The evaluation of a policy mix: evidence from the interplay of two regional small business programmes

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Innovation vouchers as a policy instrument to encourage SME innovation

Innovation vouchers:

- encourage firms to engage in innovation by **reducing the cost of buying knowledge-intensive services** (e.g. testing, prototyping, support with process innovation, logistics, marketing)
- are small in size, often target SMEs, particularly those that are already doing R&D
- have **additionality effects** on SMEs' external relationships and innovation activities

Research gaps on innovation voucher policy

Less common than R&D subsidies, limited literature

Some aspects are under-explored:

1. **Effects of innovation vouchers' on SMEs' economic performance** (rather than just additionality on relationships and innovation)

   Innovation vouchers promote: more structured approach to innovation, lower time-to-market, more innovation projects and collaborations

   → expected positive effect on firms' performance: growth in sales (introduction of innovative products) and greater efficiency (improvements in internal processes)

Research gaps on innovation voucher policy

2. **Effects of policy mixes that include innovation vouchers**

   (interactions between innovation vouchers and other policy instruments)

- Our study originally combines:
  - Focus on the effects of innovation vouchers on firms' economic performance
  - Differential effects of innovation vouchers used individually, and as part of a **policy mix that also includes the provision of technology and innovation advisory services**

Policy mix

- Since the 2000s, several studies have advocated policy mixes to address complex problems, but:
  - Apart from some sectoral initiatives most policy mixes result from **non-deliberate interactions between policy instruments** planned at different times and at different levels → **risk of overlap and mutual crowding out**
  - Limited empirical evidence about **comparative effectiveness of policy mixes with respect to single policies** in the mix; no other studies consider innovation vouchers + advisory services

Policy mix case: innovation vouchers + advisory services

- Innovation vouchers primarily address SMEs' **lack of financial resources to invest in innovation**
- But SMEs often also lack the ability to identify the competences and services they need, or the right suppliers
- To increase SMEs awareness of their needs and how to address them, they could be provided with technology and innovation advisory services (Shapira and Youtie, 2016)
- We argue that **such services could be usefully combined with innovation vouchers to increase the performance of SMEs**

Potential impact of innovation vouchers + advisory services

Inputs and Actions	Intermediate Outputs	Business performance Outcomes
• Initial matchmaking with sources of expertise • Diagnostic, benchmarking, and other advisory services • Project scoping and development • **Referral to other qualified public and private sources of assistance, including innovation vouchers**	• Enhanced innovation strategy • Investment in process or facility improvements • Acquisition of new technology • New product or service development initiated • Training and skills development • Access to financing • New supplier, customer, vendor relationships • Increased collaboration with universities, technology centres, private experts	• Improved workforce productivity • New sales, including new export sales • Cost savings • Reduced waste • Improved quality • New products or services launched in the market • Jobs created or retained • Improved profitability

Adapted from Shapira and Youtie (2016)

Research question

Is the policy mix that includes both innovation voucher and

technology and innovation advice

more effective

than the innovation voucher alone

or the technology and innovation advice alone?

Our case study

- Two regional innovation policy interventions implemented in Tuscany (Italy) and co-existing in 2011-2014
  - Provision of **innovation vouchers** that SMEs can use to buy knowledge-intensive services from accredited providers
  - Creation of **intermediaries** ("Innovation Poles") that can help SMEs to access such knowledge-intensive services, by providing them with tailored technology and innovation advice
- Firms can take part in either intervention, or both

Innovation voucher policy:

- Issued in 2008, using ERDF funding
- SMEs could choose services from a list of 44 different types
- Voucher covered between 60% to 80 of the cost of the service
- Wide eligibility: SMEs operating in a wide spectrum of sectors (from manufacturing to services), the same firm could apply for more than one service both simultaneously and over time
- Average amount of the voucher was relatively small; a firm could not get more than 200,000 Euros in 3 years

Innovation poles policy:

- Twelve intermediaries specialized in different technologies and/or sectors created in 2011, using ERDF funding
- Poles had to provide **knowledge and technology advisory services** to their member SMEs:

  Visits from experts who assessed the SMEs' technology, knowledge, innovation, and competitive position

  in order to identify appropriate innovation strategies for the SMEs, including supporting them in applying for innovation vouchers and choosing the right services and providers

Data

- The two policies overlapped in 2011-14. We consider the cohorts of participants to the policies in 2011 and 2012, to allow for sufficient time to capture effects on performance

		Innovation Pole 2011-12	
		Yes	No
Innovation voucher 2011-12	Yes	178	166
	No	478	--

Time-varying data refer to three different time points. Information on the firms' background characteristics refers to one year before the start of the policy, whereas information on the outcomes of interest refers both to the year in which the policy ends and 1 year after the end of the policy.

Data

Outcome variables

- Firm size (log transformations of sales; workforce in term of the number of self-employed plus employees)
- Productivity (per-capita value added; Total Factor Productivity)
  - Increases in these variables can be interpreted as improvements in firm performance as a consequence of increased innovativeness of the firm, which might lead to greater commercial success, or to greater efficiency

Sources of data: Tuscany's regional government; AIDA (Italian companies information database)

Methodology

- Propensity score matching approach applied to the case of **multiple treatments** (Lechner, 2002a, 2002b):
  1. Innovation vouchers for knowledge-intensive services
  2. Technology and innovation advisory service provided by an Innovation Pole
  3. Combination of treatments 1 and 2
- The treated group is always formed by firms that are recipients of a specific innovation policy, and control groups are formed by firms treated with one of the two alternative policies, in **pairwise comparisons**

Methodology

- Propensity scores (predicted probability of receiving one of the three treatments for each firm) are estimated with a multinomial probit on the outcome variables at the pre-treatment year (TFP, log-transformations of sales, number of employees) + firm age, industry dummies
- Treated and control firms matched using the Mahalanobis distance computed over the two propensities scores, and the set of explanatory variables of the multinomial probit
- Difference-In-Differences estimator on the matched samples

Averages of outcome variables by treatment in the pre-treatment period

	Policy Mix Mean	Voucher Mean	Polo Mean	H_0:M=V p-value	H_0: V=P p-value	H_0:M=P p-value
Firmage	27.4	25.6	26.6	0.191	0.423	0.467
ln(sales)	15.32	15.35	15.16	0.800	0.127	0.199
Workers	35.1	32.2	53.4	0.406	0.226	0.278
Per-capita value added	53.9	59.0	54.6	0.127	0.167	0.794
TFP	0.380	0.407	0.281	0.599	**0.017****	**0.054***
N. of firms	178	166	478			
Relative Frequency	0.216	0.202	0.581			

Before treatment, all SMEs had similar outcome variables on average, apart from:

- Voucher-only SMEs and Policy Mix SMEs and had **higher average TFP** than Pole-only SMEs

Averages of outcome variables by treatment in the post-treatment period

Levels		Policy Mix Mean	Voucher Mean	Pole Mean	H_0:M=V p-value	H_0: V=P p-value	H_0:M=P p-value
ln(sales)	+1	15.42	15.39	15.17	0.839	**0.086***	**0.049****
ln(sales)	+2	15.48	15.40	15.21	0.569	0.139	**0.034****
Workers	+1	36.8	33.9	50.5	0.418	0.126	0.191
Workers	+2	37.5	33.7	51.0	0.283	0.112	0.199
Per-capita value added	+1	55.3	55.2	52.5	0.968	0.388	0.356
Per-capita value added	+2	59.3	58.0	55.5	0.718	0.448	0.253
TFP	+1	0.403	0.374	0.247	0.593	**0.011****	**0.002****
TFP	+2	0.443	0.418	0.297	0.674	**0.016****	**0.005****

Post treatment,

- Voucher-only and Policy Mix SMEs had **higher average sales and higher average TFP** than Pole-only SMEs

Averages of outcome variables by treatment in the post-treatment period

Changes to pre-treatment		Policy Mix Mean	Voucher Mean	Pole Mean	H_0:M=V p-value	H_0: V=P p-value	H_0:M=P p-value
Δln(sales)	+1	0.11	0.04	0.01	**0.071***	0.359	**0.004****
Δln(sales)	+2	0.16	0.05	0.05	**0.009****	0.999	**0.001****
ΔWorkers	+1	1.71	1.68	-2.91	0.966	0.602	0.587
ΔWorkers	+2	2.36	1.42	-2.42	0.397	0.669	0.581
ΔPer-capita value added	+1	1.46	-3.81	-2.11	**0.055***	0.471	**0.069***
ΔPer-capita value added	+2	5.44	-0.98	0.92	**0.052***	0.436	**0.049****
ΔTFP	+1	0.02	-0.03	-0.03	**0.077***	0.962	0.131
ΔTFP	+2	0.06	0.01	0.02	0.197	0.913	0.245

Post treatment,

- Policy Mix SMEs had higher average **change in sales and in per-capita value added** than Pole-only SMEs and than Voucher-only SMEs

- **Average effects on Treated for participants in rows versus participants in columns, measured as difference in outcome**
- **Table reports ATT computed using ln(sales)**

		Voucher	Pole	Policy Mix
Voucher	+1		**0.316****	-0.046
	+2		0.277	-0.099
Pole	+1	-0.003		-0.179
	+2	0.060		-0.175
Policy Mix	+1	**0.298****	**0.372****	
	+2	**0.387****	**0.380****	

Considering matched samples, in terms of effect on sales:

- Vouchers outperform Poles
- **Policy mix outperforms both Vouchers and Poles**

A positive ATT indicates "on-average higher rate of [performance] for [firms which] participate in the programme given in the row compared with matched firms which participate in the programme given in the column".

- **Average effects on Treated for participants in rows versus participants in columns, measured as difference in outcome**
- **Table reports ATT computed using number of workers**

		Voucher	Pole	Policy Mix
Voucher	+1		**7.0****	2.2
	+2		**6.6***	1.8
Pole	+1	2.1		0.1
	+2	2.5		-0.2
Policy Mix	+1	**7.1****	**9.1****	
	+2	**7.9****	**9.4****	

Considering matched samples, in terms of effect on number of workers:

- Vouchers outperform Poles
- **Policy mix outperforms both Vouchers and Poles**

- **Average effects on Treated for participants in rows versus participants in columns, measured as difference in outcome**
- **Table reports ATT computed using per-capita value added (thousands euro)**

		Voucher	Pole	Policy Mix
Voucher	+1		**7.9****	3.6
	+2		**7.4***	2.2
Pole	+1	0.9		-0.7
	+2	1.8		-0.6
Policy Mix	+1	**5.6***	**6.9****	
	+2	**7.4***	**7.7****	

Considering matched samples, in terms of effect on per-capita value added:

- Vouchers outperform Poles
- **Policy mix outperforms both Vouchers and Poles**

- **Average effects on Treated for participants in rows versus participants in columns, measured as difference in outcome**
- **Table reports ATT computed using TFP**

		Voucher	Pole	Policy Mix
Voucher	+1		**0.156****	0.002
	+2		**0.142****	-0.002
Pole	+1	-0.047		-0.063
	+2	-0.035		-0.066
Policy Mix	+1	**0.089***	**0.160****	
	+2	0.090	**0.142****	

Considering matched samples, in terms of effect on TFP:

- Vouchers outperform Poles
- **Policy mix outperforms both Vouchers and Poles**

Conclusions

- Our analysis strongly supports the stronger effect of the policy mix intervention with respect to the individual policies.
- The policy mix outperforms the technology and innovation advisory service alone, and the voucher alone, on all four outcomes.
  - The **more innovative firms** (those which have participated in the policy mix, and their matched samples) **particularly benefit from the policy mix, compared with vouchers alone or the technology and innovation advisory service alone**.

Conclusions

- In terms of comparisons between single instruments, vouchers outperform technology and innovation advisory services on all four outcomes.
  - The **more innovative firms** (those which have participated in the vouchers and their matched sample) **benefit from vouchers more than from technology and innovation advisory services**.
- The **less innovative firms** (those which used the technology and innovation advisory services only, and their matched samples) **do not have any additional benefits from using vouchers or the policy mix**.

Conclusions

- The mix of innovation vouchers supported by the provision of technology and innovation advisory services, appears to be a promising innovation policy concerning the increase of revenues and employment, but also of labour and total factor productivity
- This however only holds for firms that were more innovative to begin with