

Selective public grants to innovative SMEs: Do they work?

Sven-Olov Daunfeldt, HUI Research

Daniel Halvarsson, Ratio

Patrik Tingvall, Ratio

2015-12-03



RATIO

Background

- One goal of the EUs 2020-strategy, is to increase the number innovative small and medium sized firms (SMEs).
 - Vinnova (*Sweden's Innovation Agency*), spends about € 290m, annually to:

“promote collaborations between companies, universities, research institutes and the public sector. We (Vinnova) do this by stimulating a greater use of research, **by making long-term investment in strong research and innovation milieus** and by developing catalytic meeting places.”

Background

- There are no lack in theoretical motivations for publicly funded R&D, e.g.
 - Positive externalities
 - Inefficient capital markets
- In short, market failure can lead to a suboptimal level of innovation (difficult to measure).
- Yet, we know little about the economic consequences of associated policy instruments
 - **So, do they work?**

Two flagship programs

Support I (Vinn Nu)

- Started in 2002
- Annual grant of (€ 33 000) given to Swedish start-ups.
- The company have developed either a new product, a production method, or a service that has not yet reached the market.

Mission: To facilitate the commercialization innovation, attract necessary funding, human capital, and in the end foster firm growth.

Two flagship programs

Support II (Forska & Väx)

- Started in 2006.
- Annual grant (max € 54 000), given to SMEs that conduct R&D.
- Grants to fund a pilot and/or a developmental project.
 - The latter requires 50 percent co-financing, in addition to ≤ 250 employees.
- Mission: Provide opportunity to develop and realize R&D with good potential for success, and in the long run foster innovation driven growth.

RATIO

The present study

Aims to evaluate the economic effects of **Vinn Nu** (*Support I*) and **Forska & Väx** (*Support II*), for the receiving SMEs.

Variable:

- The number of employees
- Sales
- Sales growth
- Value added per employee
- Number of employees with tertiary education
- Number of employed researcher

Economic theory:

- (Labor demand)
- (Output)
- (Output growth)
- (Labor productivity)

- (Demand for skilled labor)
- (Demand for skilled labor)

Data

- Complete data over all public grants handed out from Vinnova, 2002-2010. (MISS)
- Demographic and individual information over the working population in Sweden (LISA, RAMS)
- Detailed accounting data for all Swedish firms (IFDB)

Summary over the grants

Amounts paid out (In million €: 9.2 SEK = 1 €)

Year	<i>Support I</i>		<i>Support II</i>	
	Obs.	Amount	Obs.	Amount
2002	5	0.13	0	0.00
2003	16	0.48	0	0.00
2004	5	0.17	0	0.00
2005	19	0.60	0	0.00
2006	18	0.53	150	10.11
2007	18	0.48	65	10.43
2008	12	0.53	45	6.63
2009	14	0.46	165	13.59
2010	18	0.55	121	1.20
Total	125	3.91	546	53.26

Variable description

	Sales	L	VA/ L	Share tertiary	Share researcher
1. All firms	1353	6.80	48	0.26	0.01
4. Support I	91	2.8	24	0.94	0.01
5. Support II	3218	20.3	37	0.64	0.06
6. Before grant	3251	19.5	40	0.54	0.04
7. After grant	3323	20.2	43	0.57	0.08

Regression model

“DiD”:
$$Y_{i,t}^I = \underbrace{\alpha_i + \mathbf{X}_{i,t}\boldsymbol{\beta}}_{\text{Model}} + \underbrace{\gamma T_i + \gamma(\text{Grant})_{i,t} + \theta(\text{Post})_{i,t}}_{\text{Effect}} + \epsilon_{i,t}$$

Labor demand (Cahuc and Cylberg, 2004):

- $\log L_{i,t} = \alpha_i + \beta_L \log L_{i,t-1} + \beta_w \log w_{i,t} + \beta_K \log K_{i,t} + \beta_{VA} VA_{i,t} + \epsilon_{i,t}$.

Labor productivity (Griliches, 1986):

- $\log \frac{VA_{i,t}}{L_{i,t}} = \alpha_i + \beta_{K/L} \log \frac{K_{i,t}}{L_{i,t}} + \beta_L \log L_{i,t} + \epsilon_{i,t}$.

Output (Cobb-Douglas):

- $\log O_{i,t} = \alpha_i + \beta_K \log K_{i,t} + \beta_L \log L_{i,t} + \epsilon_{i,t}$.

Demand for skilled labor (Hansson, 2000):

- $\Delta \theta_{i,t}^H = \beta_{w_H/w_L} \Delta \log w_H/w_L + \beta_K \Delta \log K_{i,t} + \beta_O \Delta \log O_{i,t} + \epsilon_{i,t}$.

Identification strategies

- I. The effect over time (i.e. only firms that receives a grant)
- II. Compared to a control group that did not receive any grant.
 - Using coarsened exact matching
- III. Compared to the average outcome for all firms (biased).

I. Effects over time

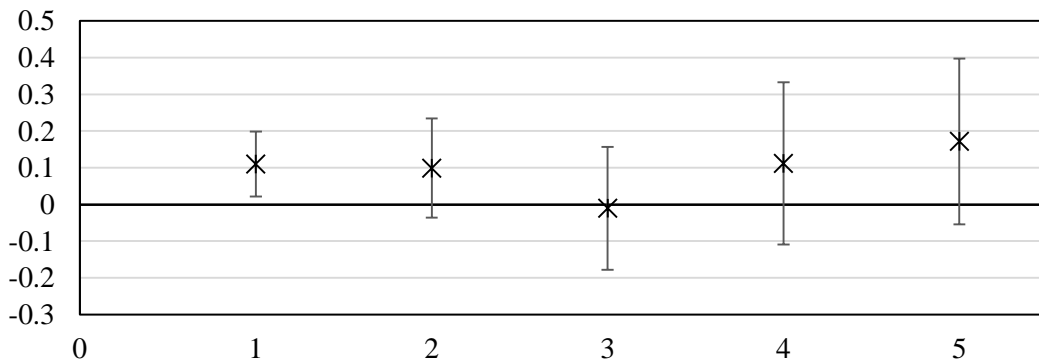
	Labor demand (System GMM)	Output (Within)	Output growth (Within)	Labor prod. (Within)	Demand for skilled labor (tertiary) (Within)	Demand for skilled labor (researchers) (Within)
Grant/turn-over	-1.3e-06 (-2.61) ^{***}	-1.2e-05 (-5.49) ^{***}	-1.6 e-05 (-3.59) ^{***}	-3.4e-06 (-7.37) ^{***}	3.7e-08 (-0.14)	1.3e-06 (3.91) ^{***}
Post-grant dummy	-0.0627 (-2.64) ^{***}	-0.0440 (-0.78)	-0.0413 (-0.66)	-0.0120 (-0.40)	-0.0084 (-1.26)	-0.0040 (-0.74)

II. Effects compared to control group

	Labor demand (System GMM)	Output (Within)	Output growth (Within)	Labor prod. (Within)	Demand for skilled labor (tertiary) (Within)	Demand for skilled labor (researchers) (Within)
Grant/turn-over	-2.5e-06 (-4.24) ^{***}	-1.3e-05 (-6.75) ^{***}	-1.8 e-05 (-4.93) ^{***}	5.5e-07 (0.80)	-1.9e-07 (-1.18)	1.4e-06 (4.23) ^{***}
Post-grant dummy	0.0331 (1.49)	0.1357 (3.01) ^{***}	-0.0801 (-2.51) ^{**}	0.0221 (0.68)	-0.0051 (-1.20)	0.0007 (0.19)



Post grant individual year dummies



Summary and conclusions

- The only positive effect from receiving a grant was found on firms' output. On average, sales increased by 14 percent the period after the grant. However, the effect is limited to only small firms.
- The lack of positive effects are especially noteworthy since we know that there are other costs associated with offering public grants such as rent seeking behavior and unfair competition.
- All in all we find little evidence that *Support I* and *Support II* do increase long term (5 years) firm growth.

Further comments

1. The purpose of selective public grants must be concretized to facilitate evaluation.
2. It is important to differentiate between effects and mere changes.
3. More empirical evaluations are greatly needed.
4. Self evaluations are problematic.
5. To make possible an evaluation, providing data should be mandatory.
6. Randomized field experiments can be used with great benefit.

Thank you for listening!

RATIO

Prior evaluation studies

Support I and II

- Bergman et al. (2009) finds that these grants have been decisive for the initiation of many R&D projects and increasing the size of many projects (based on 34 interviews).
- Samuelsson and Söderblom (2012) studies the effects from receiving *Support I*, and find evidence of increased employment, higher value on immaterial assets and equity; no effect on turn-over or survival; and a decreased net result (RD-design).

Prior evaluation studies

Vinnova's self evaluation:

Vinnova is obliged to account for changes in the recipient firms regarding (Ministry of Enterprise, 2013), (i) the number of employees, (ii) turn over, (iii) value added

- In Vinnova's (2014a) self evaluation they find that:
 - Part 1. The grants resulted in unequivocal positive growth effects (survey)
 - Part 2. The grants resulted in no significant effect on the number of employees or on value added per employee.
(PSM by Statistics Sweden)

Identifying a control group

$$\widehat{ATT} = \frac{1}{\sum_{i=1}^n T_i} \sum_{i=1}^n T_i \mathbb{E}[Y_i(T_i = 1) - Y_i(T_i = 0) | \mathbf{X}]$$

- We do not use Propensity Score Matching:
 - Choose firms such that $P(T=1|x_1, x_2, x_3)$ is balanced between treated (T) and control (C)
- We use Coarsened Exact Matching (monotonically imbalance reducing)
 1. Coarsen the variables $f(x_1) (T) = f(x_1) (C)$
 2. Perform an exact matching such that:
 $f(x_2) (T) = f(x_2) (C)$
 $f(x_3) (T) = f(x_3) (C)$

Results from matching

Univariate matching variable	Demand for labor	Prod.	Output/Output growth	Demand for skilled labor
ln(value added)	80,7 (59,6)			
ln(wage per employee)	81,1 (70,3)			
Share with tertiary education	92,5 (58,7)	93,0 (58,2)	93,6 (58,2)	
Share researcher	90,5 (79,3)	92,2 (76,0)	92,6 (76,1)	
Profit margin	91,2 (92,2)	87,9 (92,1)	90,3 (92,1)	86,1 (91,7)
ln(number of employees)		91,5 (64,0)	91,0 (64,0)	
ln(capital intensity)		81,5 (80,0)		
ln(capital stock)			82,2 (73,1)	
growth capital stock				79,1 (75,1)
Growth turn-over				78,0 (73,9)
Multivariate balance (%)	1,1 (0,5)	9,5 (6,9)	10,5 (7,9)	18,9 (17,9)
Number of strata	6 257	12 621	13 980	332
Matched strata	282	347	360	53
Matched obs. (C)	484 598	348 723	312 295	674 996
Non matched obs. (C)	210 129	346 004	382 432	19 731
Matched obs. (T)	503	484	483	513
Non matched obs. (T)	11	30	31	1

Which firms receive a grant

Selection model	L < 10	9 < L < 30	L > 30
Share with tertiary ed.	(+)***	(+)***	(+)***
Growth, share with tertiary ed.	(+)***		
ln(Number of employees)	(+)***		(-)***
Growth number of employees	(+)***		
Profit margin	(-)***		
ln(capital intensity)	(+)**	(+)***	(+)***

F&V
Vinn Nu

– Similar to above
– Hard to predict

RATIO

	Mod. 1	Mod. 2	Mod. 3	Mod. 4	Mod. 5	Mod. 6	Mod. 7	Mod. 8
		L < 6	5 < L < 21	L > 20		L < 6	5 < L < 21	L > 20
	Effect over time				Effect versus control group			
ln(number of emp.) (t-1)	0,2347 (7,33) ^{***}	0,1729 (4,95) ^{***}	0,2352 (5,90) ^{***}	0,1843 (3,43) ^{***}	0,2522 (29,0) ^{***}	0,4873 (26,5) ^{***}	0,3315 (17,4) ^{***}	0,2588 (16,9) ^{***}
ln(Value added)	0,3769 (7,64) ^{***}	0,3706 (7,19) ^{***}	0,4103 (5,53) ^{***}	0,4653 (5,64) ^{***}	0,1578 (7,58) ^{***}	0,3921 (19,2) ^{***}	0,3343 (6,96) ^{***}	0,3602 (15,0) ^{***}
ln(Wage)	-0,4406 (-6,50) ^{***}	-0,35012 (-5,60) ^{***}	-0,6358 (-8,67) ^{***}	-0,8009 (-7,15) ^{***}	-0,3982 (-28,8) ^{***}	-0,4538 (-24,7) ^{***}	-0,6861 (-23,2) ^{***}	-0,7826 (-24,9) ^{***}
Share tertiary	-0,1143 (-0,80)	-0,0741 (-0,65)	0,1227 (1,18)	-0,3403 (-1,78) [*]	0,0016 (0,04)	-0,1932 (-3,88) ^{***}	0,0200 (0,14)	-0,6067 (-2,10) ^{**}
Share researchers	-0,2374 (-2,42) ^{**}	-0,3344 (-2,68) ^{***}	0,0248 (0,24)	-0,0263 (-0,09)	-0,0205 (-0,63)	-0,0252 (-0,81)	0,1629 (1,50)	-0,0293 (-0,34)
Profit margin	0,6111 (-5,19) ^{***}	-0,6397 (-4,93) ^{***}	-0,5642 (-3,17) ^{***}	-0,9303 (-4,81) ^{***}	-2,2e-05 (-1,23)	-0,0739 (-1,91) [*]	-0,0007 (-0,66)	-0,0001 (-2,04) ^{**}
Grant/turn over	-1,3e-06 (-2,61) ^{***}	1,4e-07 (0,22)	-1,2e-05 (-0,34)	-0,0002 (-0,28)	-2,6e-06 (-4,92) ^{***}	-3,0e-06 (-2,34) ^{**}	-1,8e-05 (-0,63)	0,0008 (0,57)
Post-grant dummy	-0,0627 (-2,64) ^{***}	-0,0016 (-0,04)	-0,0315 (-1,50)	-0,0054 (-0,25)	0,0249 (1,08)	-0,2153 (-3,39) ^{***}	0,0166 (0,69)	-0,0167 (-0,64)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
obs.	2 750	680	1 123	947	544 381	369 019	129 741	45 621
AR(2) test: p-val	0,842	0,746	0,582	0,008	0,481,	0,062,	0,610,	0,068,
Sargan test: p-val	0,000	0,000	0,000	0,000	0,000,	0,000,	0,000,	0,000,

Tabell 9. The effect on demand for labor. Dependent variable, *ln*(number of employees). Sys-GMM.

Not: *, **, ***: signifikante on 10, 5, 1 percent. Industry dummies on the 2 digit. Robust standard error