Young and old firms: all the same in front of R&D subsidies

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- Productivity gap EU-US $\Rightarrow$

Lower % of YICs in EU and lower R&D (Cincera and Veugelers, 2013)

- Public agents have designed tools to promote innovation

- Scarce literature avaluating these tools

- However, there is an interaction between tools between the type of tool and firms' characteristics (Colombo et al., 2013)

MAIN PURPOSE: Analyse the role of firm age on

- the propensity to apply for a selective public R&D call
- the propensity to obtain an R&D subsidy.

– Mixture between different fimrs' characteristics, sectoral and regional variables

- Firms' characteristics: firm size, firm age, financial variables, export (+), internal R&D (+).
- Propensity to apply: previous experience (+)
- Sectoral and regional variables: HT manuf (+), Metropolitan areas

- Mixture between public agency's criteria, firms'characteristics and projects' characteristics.

- Firms' characteristics: firm age, firm size, HT/KIS.
- Projects' characteristics: project size(+), export and commercial viability(+), cooperative (+)
- Picking-the-winner strategy: number of previous awards.

⇒ Liability of newness vs liability of obsolescence

- A direct impact due to the learning process that firms have
- An indirect impact via the requirement of better financial ratios, larger firm size or others in order to apply and to obtain public subsidies.

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Hypothesis 1: Young firms show...

- a larger propensity to apply for R&D subsidies.
- a lower propensity to apply for R&D subsidies.

Hypothesis 2: Young firms show...

- lower likelihood to be awarded with R&D subsidies.
- higher likelihood to be awarded with R&D subsidies.

SABI - Sistema de Análisis de Balances Ibéricos (Mercantile Register). 2004-11

ACC1Ó - Four public calls between 2007-2010 from the initiative "'InnoEmpresa"'.

- Non-refundable R&D subsidies targeted at innovation projectects.
- Participating projects = 2,263
- Awarded projects = 1,093
- Total amount of subsidies = 45,204,656 euros

Table: Number of observations, the innovation projects and subsidies.

Period 2007-2010

	All	<7 years	7 to 15	16 to 25	25
Number of observations					
Non-participants	68,837	20,598	24,968	15,514	7,757
Non-awarded participants	388	85	116	109	78
Awarded participants	299	64	76	86	73
Project budget (Mean value)					
Non-awarded participants	124,064.8	103,120.5	103,284.1	135,071.2	162,412.8
Awarded participants	134,333.9	176,050.6	94,501.9	116,277.6	160,501.0
Subsidy (Mean value)					
Amount of subsidy	26,279.5	28,677.17	23,590.62	25,031.38	28,447.41

Source: SABI database and ACC1Ó

First step: Probability of applying

$$y_{1it} = \begin{cases} 1 & \text{if } y^*_{1it} = f(x_{1it})\beta_1 + u_{1it} > 0, \\ 0 & \text{otherwise} \end{cases}$$

where x_{1it} is a vector of explanatory variables:

firm size, (quadratic) firm age, cash-flow ratio, long-term debt ratio, High-tech manufactures and KIS AND export activity, priority, previous application, location in metropolitan area (1) and in metropolitan area (2), and time dummies.

Second step: Probability of being awarded

$$y_{2it} = \begin{cases} 1 & \text{if } y^*_{2it} = f(x_{2it})\beta_2 + u_{2it} > 0, \\ 0 & \text{otherwise} \end{cases}$$

where,

x_{2it} is a vector of explanatory variables:

firm size, (quadratic) firm age, cash-flow ratio, long-term debt ratio,

High-tech manufactures and KIS, and time dummies AND project size, cooperation,

previous concession

Eqs (1) and (2) may contain some commonly omitted variables and therefore the correlation term ρ between u_{1it} and u_{2it} will be unequal to zero:

1. Some firms apply for support because they have discovered particularly promising R&D projects.
2. Screening of projects in the government agencies will also tend to create selection bias, since those firms that obtained a subsidy may attract more external funds due to the certifying role of public subsidies.

Hence there may be a sample selection bias. Following Huergo and Trenado (2008, 2010) we apply a probit model with sample selection by maximum likelihood.

Table: Heckman probit estimation (cluster errors)

	Model (1)		Model (2)	
	Apply	Obtain	Apply	Obtain
Control variables				
$\text{Age}_{i,t-1}$	0.005	-0.020	0.009	-0.057
$\text{AgeSq}_{i,t-1}$	0.002	0.013	0.003	0.007
$\text{Size}_{i,t-1}$	0.134***	0.132**		
$\text{Size} \times Age6_{i,t-1}$			0.134***	0.121**
$\text{Size} \times Age7-15_{i,t-1}$			0.133***	0.160***
$\text{Size} \times Age16-25_{i,t-1}$			0.137***	0.135**
$\text{Size} \times Age26_{i,t-1}$			0.131***	0.140**
$\text{CFlow}_{i,t-1}$	0.033*	0.580		
$\text{CFlow} \times Age6_{i,t-1}$			0.286**	1.013
$\text{CFlow} \times Age7-15_{i,t-1}$			-0.051	-1.661
$\text{CFlow} \times Age16-25_{i,t-1}$			0.086	0.654
$\text{CFlow} \times Age26_{i,t-1}$			0.149	-0.309

Table: Heckman probit estimation (cluster errors)

	Model (1)		Model (2)	
	Apply	Obtain	Apply	Obtain
Control variables				
LTdebti,t-1	-2.94e-05	-0.005		
LTdebt $\times Age6_{i,t-1}$			0.015	-0.057
LTdebt $\times Age7-15_{i,t-1}$			-3.4e-05	-0.694
LTdebt $\times Age16-25_{i,t-1}$			0.009	-0.132
LTdebt $\times Age26_{i,t-1}$			0.004	0.633
			(0.003)	(0.502)
High-tech	0.0623	-1.415***	0.060	-1.138***
KIS	0.712***	-0.283	0.708***	-0.324

Table: Heckman probit estimation (cluster errors)

	Model (1)		**Model (2)**	
	Apply	Obtain	Apply	Obtain
Explanatory variables of the probability of applying				
Priority	0.139		0.142	
previousEXPsub	0.820***		0.819***	
Metrop Area 1	-0.101**		-0.101**	
Metrop Area 2	0.062		0.061	
$\text{Export}_{i,t}$	0.279***		0.277***	

Table: Heckman probit estimation (cluster errors)

	Model (1)		Model (2)	
	Apply	Obtain	Apply	Obtain
Explanatory variables of the probability of being awarded				
$\text{grSales}_{i,t}$		-0.001**		
$\text{grSales} \times Age6_{i,t-1}$				-0.001**
$\text{grSales} \times Age7-15_{i,t-1}$				0.002
$\text{grSales} \times Age16-25_{i,t-1}$				-0.001
$\text{grSales} \times Age26_{i,t-1}$				0.009
$\text{Project size}_{i,t}$		-0.010		-0.013
$\text{Cooperation}_{i,t}$		-0.224		-0.199
$\text{PreviousConcession}_{i,t}$		0.083		0.087
Constant	-10.66	-1.012	-32.71	-0.909
Mills ratio	0.0848		0.110	
Censored obs.	73709			
Uncensored obs	686			
Observations	74,395			
Wald chi2	72.78		88.66	

- Our results are in line with previous literature.
- **Does firm age affect on the likelihood to apply and obtain a R&D subsidy?** Our results show a non-significant impact).
- **Concerning the indirect effect...** Our findings show that the youngest firms will be more likely to apply if they have a larger CF ratio. Firm size is a key variable regardless the firm age. The youngest firms with lower growth sales have larger likelihood to obtain a RD subsidy.

- Policy implications: Governmental agencies promoting innovation should be aware of the difficulties that YICs face and make an additional effort to facilitate young firms responding to an R&D call.

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