Are patents signals for the IPO market? An EU-US comparison for the software industry

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1. Introduction

- IPOs are important events in a firm's life cycle.
- **SMEs go public in order to improve their innovative capabilities through raising a high amount of cash which :**

- gives VCs the opportunity to exit (Black and Gilson, 1998),
- capture a first-mover advantage (Maksimovic and Pichler, 2001)
- help to finance valuable projects,
- facilitate takeover activity
- Attract valuable resources: workforce and alliance partners
- Remunerate entrepreneurship activity

- **IPO creates information asymmetry between firms and investors**
- **Several studies have found that some metrics of firm quality are considered as signal for investors:**

- Influence of individuals (Certo et al., 2007)
- Role of venture capital (Gompers, 1995)
- Internationalization (Lipuma, 2011)
- Firm's financial performance
- Public support

Reducing problems of asymmetric information

- This empirical study addresses a double gap.
- **1) Do patents signal for IPO value in software industry?**
- **Patents have become particularly controversial in the software industry.**
- **-** to enforce patents may impede rather than promote innovation.
- **-** any positive effect patents will be annulled by the higher transaction cost, multiplied threat of litigation
- **-** strategically used, especially by established firms to build “thickets” for anticompetitive reasons.

- **2) What is the value of patents and other metrics of “quality” as signals to evaluate software IPOs in two different geographical regions** ?

- Are financial markets providing incentives for growth-up software companies to multiply patent applications before going public?.

2. The role of patents as a signal for investors in high-tech companies

- Innovation literature proposes that the value of patents is a signal (Hsu and Ziedonis 2008)
- reap indirect benefits though the “information spillovers”.
- patents as a non-financial signal of firm quality

- Patents facilitate the financing of software firms by Venture Capital.
- Depending on the stage of firm’s development (Mann, 2005)
- Depending on the sub-sector (Mann, 2005)
- Different effects on patenting through the venture capital cycle (Mann and Sager, 2007)

US

- However, there is little evidence to validate this claims in **EUROPE** too.

3. The value of patents through space

- Few evidence about the value and nature of patents in Europe for SMEs and high-tech companies(especially for the Software industry)

- **Literature has shown** :
- **Differences in patent systems concerning the legal standars and their operational desing (van Pottelsberghe de la Potterie, 2007) :**
- The patentable subject matters (patentability of computer programs and BM)
- The requirements for patentability- USTPO (novelty, usefulness, and non-obviousness) and the EPO (novelty, industrial application, and inventive step) (Graham et al., 2002)
- the procedures that ensure the "quality of patents" as the examination procedures and the fees. (Graham et al., 2002, van Pottelsberghe de la Potterie, 2010)

- **Patents in Europe seem to remain harder to get in comparison to the US (Jaffe and Lerner, 2004)**

- **It can be expected a different magnitude in the value of patents as a signal in different geographies.**

- **The main hypothesis of this paper is that the importance of a signal which may vary between regions is related to the scarcity of the signal.**

4. Methodology and simple

- Our approach to build the dataset was to identify software (USSIC737) IPO deals from the United States, Germany, the United Kingdom, France, Sweden, Italy and Spain, between 1st January 2000 to 31st December 2009 in ZEPHYR database.

- After having cleaned up the database for our study, our sample is composed of 476 software firms (234 from the US and 242 from the EU). IPO information of each firm is matched with patents metrics searched by hand using the company name from the Questel-Orbit QPAT database

- Doubtful matches were verified by checking the inventor name, the address information, the content of abstracts and the co-applicants names.

4.1 Econometric model

- This study includes an OLS model using the amount of cash collected by firms at their IPOs as the dependent variable. This measure of IPO performance avoids potential problems of over allocation in the pre-money valuation (Ritter and Welch, 2002; Higgins et al., 2011).

- A log-transformed variable of IPO valuation and Tobin's *Q* is used to addresses the valuation data skew and reduce its heterogeneity.

- Coefficients should reflect the differences in the value of patents as signals for investors (receptors of signals) and also the differences in the importance of use of patents for the industry (emitters).

Independent variables

- Patent metrics

  Orbit's FamPat database- "a single family record combines together all publication stages of the family"

  - Number of patent application at IPO
  - Number of patent obtained at IPO
  - Number of Forward citations at IPO_t and IPO_{t+3}
  - Number of International applications.
  - LOG PATENT APPL.INTENSITY RATIO = Log (number of patent applied +1/total assets)
  - LOG PATENT OBT.INTENSITY RATIO = Log (number of patent obtained+1/total assets)

- Financial ratios (IPO_{T-1})
  - ROA= prof. after taxes/ sales
  - Equity ratio: shareholders' funds/ total assets
- Venture capital support and Corporte VC
- Asset, revenues (IPO_{T-1}) and age at IPO
- Temporal, geographical and industrial effects

Summary Statistics

Variable	US software companies n = 234			European software companies n = 242		
	Mean	Min	Max	Mean	Min	Max
LOG (PROCEEDS)	11,19	8,51	16,34	9,33	3,14	14,75
LOG (TOBIN'S Q)	0,49	-3,29	5,06	0,43	-5,02	4,73
PATENTAPPLIED	14,10	0,00	481,0	2,07	0,00	131,0
PATENTOBTAINED	6,85	0,00	317,0	1,58	0,00	102,0
PATENTPENDING	7,25	0,00	421,0	0,50	0,00	30,0
CITATIONS AT IPO	106,22	0,00	5137,0	6,86	0,00	539,0
FCITATIONS	152,46	0,00	5802,0	12,29	0,00	676,0
SELF-CITES	23,72	0,00	889,0	0,78	0,00	82,0
INTERNATIONAL APPL (PCT)	5,68	0,00	305,0	1,17	0,00	91,0
ROA RATIO	-0,30	-9,91	0,73	-0,23	-13,16	0,70
EQUITY RATIO	0,22	-5,79	0,94	0,13	-6,34	0,90
LOG (SALES TO ASSETS)	-0,38	-7,37	2,42	-0,14	-6,12	3,09
SMALL SIZE	0,41	0,00	1,00	0,58	0,00	1,00
LOG (ASSETS)	10,70	6,01	16,97	8,90	3,53	16,47
AGE AT IPO	8,43	0,12	46,47	6,34	0,01	30,18
VCAP	0,24	0,00	1,00	0,20	0,00	1,00
CORPVCAP	0,14	0,00	1,00	0,03	0,00	1,00
SIC(7372) or NACE(58,2)	0,50	0,00	1,00	0,34	0,00	1,00
Y2000	0,31	0,00	1,00	0,28	0,00	1,00
Y2001	0,03	0,00	1,00	0,05	0,00	1,00
Y2002	0,08	0,00	1,00	0,03	0,00	1,00
Y2003	0,06	0,00	1,00	0,01	0,00	1,00
Y2004	0,12	0,00	1,00	0,11	0,00	1,00
Y2005	0,10	0,00	1,00	0,14	0,00	1,00
Y2006	0,11	0,00	1,00	0,19	0,00	1,00
Y2007	0,16	0,00	1,00	0,11	0,00	1,00
Y2008	0,01	0,00	1,00	0,05	0,00	1,00
Y2009	0,04	0,00	1,00	0,03	0,00	1,00
NASDAQ	0,86	0,00	1,00			
NYSE	0,12	0,00	1,00			
UK				0,48	0,00	1,00
DE				0,12	0,00	1,00
SE				0,08	0,00	1,00
FR				0,26	0,00	1,00
ITES				0,05	0,00	1,00

5 Results

Dependent Variable: log (PROCEEDS)

Variables	1		2		3		4		5		6	
	Coef.	t-stat	Coef,	t-stat	Coef,	t-stat	Coef,	t-stat	Coef,	t-stat	Coef,	t-stat
PATENTAPPLIED	0,0052	5,16 ***	0,0089	2,54 **								
PATENTOBTAINED					0,0090	7,38 ***	0,0106	2,52 **				
PATENTPENDING									0,0059	3,56 ***	0,0332	1,53
CITATIONS AT IPO	0,0005	0,41	0,0065	0,22	0,0018	1,31	0,0074	0,24	0,0006	0,54	0,0055	0,19
LOG TOTAL ASSETS	0,3673	10,21 ***	0,6770	6,09 ***	0,3843	10,6 ***	0,6773	12,40 ***	0,3845	9,89 ***	0,6804	6,24 ***
LOG SALES TO ASSETS	0,1122	3,27 ***	0,0264	0,32	0,1178	3,39 ***	0,0276	0,33	0,1234	3,35 ***	0,0209	0,25
VCAP	0,1690	1,77 *	0,3955	2,26 **	0,1657	1,70 *	0,3910	2,24 **	0,2371	2,30 **	0,4091	2,34 **
AGE AT IPO	0,0036	0,52	-0,0146	-1,45	0,0031	0,46	-0,0148	-1,47	0,0038	0,55	-0,0144	-1,43
SIC(7372) or NACE(58,2)	0,1020	1,01	-0,3331	-2,03 **	0,0983	0,96	-0,3323	-2,02 **	0,0993	0,97	-0,3284	-2,01 **
y2001	-0,4037	-2,12 **	-1,1953	-2,85 ***	-0,4063	-2,14 **	-1,1971	-2,86 ***	-0,4644	-2,43 **	-1,1940	-2,86 ***
y2002	-0,6371	-3,65 ***	-1,5392	-4,79 ***	-0,6546	-3,69 ***	-1,5414	-4,81 ***	-0,6755	-3,58 ***	-1,5409	-4,77 ***
y2003	-0,6455	-2,70 ***	-0,7827	-2,99 ***	-0,6461	-2,74 ***	-0,7480	-2,94 ***	-0,6933	-2,83 ***	-0,8513	-2,92 ***
y2004	-0,5669	-3,95 ***	-1,2194	-5,20 ***	-0,4880	-3,22 ***	-1,2155	-5,19 ***	-0,6287	-3,81 ***	-1,2315	-5,22 ***
y2005	-0,7298	-4,23 ***	-1,1951	-5,24 ***	-0,7484	-4,36 ***	-1,1996	-5,25 ***	-0,7705	-4,25 ***	-1,1729	-5,17 ***
y2006	-0,5878	-3,86 ***	-1,5192	-7,05 ***	-0,5568	-3,71 ***	-1,5203	-7,06 ***	-0,6497	-3,81 ***	-1,5186	-7,06 ***
y2007	-0,4686	-3,54 ***	-1,3531	-4,18 ***	-0,4635	-3,44 ***	-1,3562	-4,19 ***	-0,5253	-3,49 ***	-1,3466	-4,15 ***
y2008	-0,8589	-3,90 ***	-2,7763	-5,68 ***	-0,8544	-3,92 ***	-2,7798	-5,69 ***	-0,9988	-3,96 ***	-2,7650	-5,65 ***
y2009	-0,4056	-1,62	-2,9544	-5,88 ***	-0,4036	-1,64	-2,9571	-5,89 ***	-0,4695	-1,81 *	-2,9368	-5,83 ***
NYSE	0,2435	1,43			0,1882	1,07			0,3090	1,65 *		
DE			0,4208	1,97 **			0,4216	1,97 **			0,4126	1,93 **
SE			0,4796	1,36			0,4809	1,37			0,4697	1,33
FR			-0,5881	-2,61 ***			-0,5858	-2,60 **			-0,6020	-2,70 ***
ITES			0,2744	0,76			0,2765	0,76			0,2527	0,70
cons	7,5049	19,96 ***	4,5266	8,95 ***	7,3279	19,4 ***	4,5263	8,92 ***	7,3671	18,71 ***	4,4965	8,97 ***
R-square	0,5913		0,7123		0,5803		0,7121		0,5658		0,7123	
observations	234		242		234		242		234		242	

* Significat at 10%

** Significat at 5%

*** Significat at 1%

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Alternative models

Dependent Variable: log (PROCEEDS)

Variables	7		8		9		10		11		12		13		14	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
PATENTAPPLIED	0,0051	4,94 ***	0,0085	2,42 **												
INTERNATIONAL APPL (PCT)					0,0090	8,57 ***	0,0108	2,49 **								
SELF-CITE									0,0017	2,52 **	0,0087	1,71 *				
AT-LEAST-ONE-POB * VCAP													0,2741	2,21 **	0,6107	2,34 **
CITATIONS AT IPO	0,0004	0,36	0,0074	0,25	0,0012	1,07	0,0087	0,28	0,0011	0,92	0,0115	0,34	0,0022	1,30	0,0145	0,48
LOG TOTAL ASSETS	0,3912	8,53 ***	0,7221	12,95 ***	0,4015	8,84 ***	0,7255	13,10 ***	0,3902	10,7 ***	0,6757	12,3 ***	0,4200	9,59 ***	0,6958	13,21 ***
LOG SALES TO ASSETS	0,1295	3,33 ***	0,0634	0,72	0,1352	3,50 ***	0,0631	0,72	0,1204	3,38 ***	0,0224	0,27	0,1362	3,40 ***	0,0175	0,20
ROA RATIO	-0,0695	-1,30	-0,0788	-0,94	-0,0736	-1,39	-0,0804	-0,94								
EQUITY RATIO	0,0060	0,10	-0,1923	-1,51	0,0133	0,21	-0,1929	-1,51								
VCAP	0,1729	1,74 *	0,4689	2,61 ***	0,1808	1,78 *	0,4722	2,62 ***	0,2127	2,08 **	0,4390	2,48 **				
CORPVCAP	0,0292	1,18	-0,5714	-1,52	0,0270	1,07	-0,5900	-1,55	0,0361	1,27	-0,4732	-1,52	0,0220	0,90	-0,3370	-1,14
AGEATIPO	0,0037	0,55	-0,0157	-1,56	0,0040	0,59	-0,0156	-1,54	0,0037	0,54	-0,0157	-1,55	0,0028	0,41	-0,0195	-1,97 **
SIC(7372) or NACE(58,2)	0,1085	1,05	-0,3209	-1,98 *	0,1212	1,10	-0,3157	-1,94 *	0,1105	1,05	-0,3264	-1,98 **	0,0925	0,86	-0,3766	-2,25 **
y2001	-0,4133	-2,09 **	-1,1739	-2,83 ***	-0,4197	-2,14 **	-1,1751	-2,83 ***	-0,4391	-2,4 **	-1,2061	-2,88 ***	-0,5307	-2,72 ***	-1,2232	-2,87 ***
y2002	-0,6448	-3,53 ***	-1,4646	-4,72 ***	-0,6413	-3,48 ***	-1,4652	-4,74 ***	-0,6674	-3,78 ***	-1,5526	-4,79 ***	-0,7359	-3,62 ***	-1,5592	-4,93 ***
y2003	-0,6362	-2,67 ***	-0,6716	-2,33 ***	-0,6426	-2,71 ***	-0,5962	-2,27 **	-0,6804	-2,81 ***	-0,6740	-2,88 ***	-0,7479	-3,01 ***	-0,7127	-3,01 ***
y2004	-0,5590	-3,81 ***	-1,2786	-5,58 ***	-0,5057	-3,36 ***	-1,2774	-5,57 ***	-0,5521	-3,65 ***	-1,1693	-5,04 ***	-0,5811	-3,20 ***	-1,1693	-5,11 ***
y2005	-0,7338	-4,03 ***	-1,2394	-5,80 ***	-0,7137	-3,90 ***	-1,2331	-5,78 ***	-0,7475	-4,33 ***	-1,1533	-5,04 ***	-0,8232	-4,37 ***	-1,1932	-4,72 ***
y2006	-0,6029	-3,69 ***	-1,5941	-7,54 ***	-0,5868	-3,58 ***	-1,5948	-7,53 ***	-0,6575	-4,02 ***	-1,5219	-7,01 ***	-0,6579	-3,56 ***	-1,5006	-6,94 ***
y2007	-0,4671	-3,47 ***	-1,4253	-4,36 ***	-0,4505	-3,29 ***	-1,4247	-4,35 ***	-0,5007	-3,52 ***	-1,3561	-4,16 ***	-0,5771	-3,43 ***	-1,4173	-4,20 ***
y2008	-0,9939	-4,42 ***	-2,7528	-5,57 ***	-1,0008	-4,51 ***	-2,7481	-5,55 ***	-1,2246	-4,48 ***	-2,7783	-5,68 ***	-1,2059	-4,75 ***	-2,8133	-5,72 ***
y2009	-0,4099	-1,61	-2,8258	-5,66 ***	-0,3728	-1,48	-2,8171	-5,64 ***	-0,4904	-1,9 *	-2,9572	-5,83 ***	-0,5293	-1,97 **	-3,0084	-5,85 ***
NYSE	0,2174	1,26			0,2057	1,14			0,2867	1,59			0,2906	1,44		
DE			0,5449	2,60 *			0,5473	2,60 **			0,4236	2 **			0,4375	2,10 **
SE			0,6002	1,68			0,5972	1,67 *			0,4651	1,32			0,4867	1,39
FR			-0,4663	-2,08 ***			-0,4683	-2,09 **			-0,5904	-2,62 ***			-0,5358	-2,37 **
ITES			0,2751	0,74			0,2658	0,71			0,2679	0,73			0,1775	0,47
cons	7,2350	15,38 ***	4,1128	8,07 ***	7,1197	15,37 ***	4,0816	8,05 ***	7,2942	19,2 ***	4,5444	8,94 ***	7,0525	16,34 ***	4,4545	8,98 ***
R-square	0,5945		0,7259		0,5857		0,7254		0,5619		0,7126		0,5268		0,7097	
observations	234		242		234		242		234		242		234		242	

* Significat at 10%
** Significat at 5%
*** Significat at 1%

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Variables	*LOG (PROCEEDS)*								*LOG OF TOBINS' Q = LOG (PROCEEDS / TOTAL ASSETS)*							
	15		16		17		18		19		20		21		22	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
LOG PATENT APPL.INTENSITY RATIO									0,1150	2,66 ***	0,2567	2,83 ***				
LOG PATENT OBT.INTENSITY RATIO					0,0898	2,65 ***	0,2301	2,59 ***					0,0898	2,65 ***	0,2301	2,59 ***
PATENTAPPLIED	0,0029	4,09 ***	0,0063	2,14 **												
PATENTAPPLIED*DE			0,0760	2,24 **												
PATENTAPPLIED*FR			0,0911	4,46 ***												
PATENTAPPLIED*ITES			-0,0440	-0,84												
PATENTAPPLIED*SE			0,0960	0,75												
PATENTAPPLIED*EU	0,0135	3,64 ***														
LOG TOTALASSETS	0,5934	15,58 ***	0,6760	12,19 ***	0,4945	8,50 ***	0,9080	9,88 ***	-0,4789	-7,32 ***	-0,0678	-0,74	-0,5055	-8,69 ***	-0,0920	-1,00
LOG SALES TO ASSETS	0,1226	2,57 ***	0,0297	0,36	0,1333	3,39 ***	0,0412	0,52	0,1335	3,48 ***	0,0427	0,54	0,1333	3,39 ***	0,0412	0,52
VCAP			0,4081	2,28 **	0,1944	1,79 *	0,3708	2,16 **	0,1879	1,75 *	0,3736	2,17 **	0,1944	1,79 *	0,3708	2,16 **
NON VCAP*US	0,6332	4,82 ***														
VCAP*US	0,9834	6,54 ***														
VCAP*EU	0,5586	3,29 ***														
AGEATIPO	-0,0013	-0,20	-0,0193	-1,89 *	0,0035	0,50	-0,0171	-1,76 *	0,0041	0,59	-0,0173	-1,79 *	0,0035	0,50	-0,0171	-1,76 *
SIC(7372) or NACE(58,2)	-0,0448	-0,47	-0,3640	-2,21 **	0,0938	0,93	-0,3565	-2,23 **	0,0999	1,00	-0,3614	-2,26 **	0,0938	0,93	-0,3565	-2,23 **
y2001	-0,9483	-3,25 ***	-1,1623	-2,76 ***	-0,5284	-2,79 ***	-1,1838	-2,78 ***	-0,5183	-2,64 ***	-1,1769	-2,79 ***	-0,5284	-2,79 ***	-1,1838	-2,78 ***
y2002	-1,1193	-6,71 ***	-1,5338	-4,79 ***	-0,7226	-3,75 ***	-1,5683	-5,08 ***	-0,7432	-3,89 ***	-1,5782	-5,11 ***	-0,7226	-3,75 ***	-1,5683	-5,08 ***
y2003	-0,9143	-3,99 ***	-0,6988	-3,12 ***	-0,6882	-2,89 ***	-1,2157	-3,6 ***	-0,6978	-2,96 ***	-1,1635	-3,58 ***	-0,6882	-2,89 ***	-1,2157	-3,60 ***
y2004	-0,9472	-6,18 ***	-1,2026	-5,10 ***	-0,5672	-3,33 ***	-1,2491	-5,37 ***	-0,5918	-3,54 ***	-1,2549	-5,39 ***	-0,5672	-3,33 ***	-1,2491	-5,37 ***
y2005	-1,0833	-7,34 ***	-1,1517	-4,92 ***	-0,7699	-4,33 ***	-1,2926	-5,52 ***	-0,8092	-4,55 ***	-1,2964	-5,57 ***	-0,7699	-4,33 ***	-1,2926	-5,52 ***
y2006	-1,1222	-6,97 ***	-1,5215	-6,93 ***	-0,6517	-3,75 ***	-1,5583	-7,35 ***	-0,6693	-3,85 ***	-1,5529	-7,30 ***	-0,6517	-3,75 ***	-1,5583	-7,35 ***
y2007	-0,9931	-5,92 ***	-1,3968	-4,11 ***	-0,5626	-3,62 ***	-1,4238	-4,5 ***	-0,5984	-3,81 ***	-1,4228	-4,50 ***	-0,5626	-3,62 ***	-1,4238	-4,50 ***
y2008	-2,2467	-5,86 ***	-2,7533	-5,31 ***	-1,0787	-4,12 ***	-2,7708	-5,78 ***	-1,1251	-4,42 ***	-2,7840	-5,82 ***	-1,0787	-4,12 ***	-2,7708	-5,78 ***
y2009	-1,6611	-4,98 ***	-2,9309	-5,75 ***	-0,4787	-1,89 **	-2,9748	-5,98 ***	-0,5265	-2,06 *	-2,9939	-6,01 ***	-0,4787	-1,89 **	-2,9748	-5,98 ***
NYSE	0,2240	1,23			0,2981	1,56			0,2874	1,53			0,2981	1,56		
DE	0,3980	1,81 *	0,3443	1,56			0,4118	2,02 **			0,4121	2,00 **			0,4118	2,02 **
SE	0,0928	0,30	0,4308	1,06			0,4852	1,4			0,4930	1,43			0,4852	1,40
FR	-0,7140	-3,19 **	-0,6390	-2,86 ***			-0,5532	-2,46 **			-0,5480	-2,44 **			-0,5532	-2,46 **
ITES	0,3495	1,10	0,3451	0,87			0,2999	0,84			0,3086	0,86			0,2999	0,84
cons	4,8860	13,51 ***	4,5755	8,88 ***	7,0984	17,14 ***	4,5236	9,14 ***	7,1096	17,35 ***	4,5509	9,16 ***	7,0984	17,14 ***	4,5236	9,14 ***
R-square	0,7324		0,7193		0,5448		0,7167		0,7209		0,4479		0,7191		0,4476	
observations	476		242		234		242		234		242		234		242	

*** Significant at 1%
** Significant at 5%
* Significant at 10%

6. Discussion and conclusion

	US	EU
PATENTAPPLIED	0,0052	0,0089
PATENTOBTAINED	0,0090	0,0106
PATENTPENDING	0,0059	
INTERNATIONAL APPLIC	0,0090	0,0108
SELF-CITATIONS	0,0017	0,0087
AT-LEAST-ONE-POB* VCAP	0,2741	0,6107
LOG PATENT APPL. INTENSITY	0,1150	0,2567
LOG PATENT OBT. INTENSITY	0,0898	0,2301
Amount collected at IPO (average in € millions)	158	68,5
Additional cash (in € millions)		
PATENTAPPLIED	0,8216	0,6097
PATENTOBTAINED	1,4220	0,7261
PATENTPENDING	0,9322	
PATENTW	1,4220	0,7398
CITATIONS	0,2686	0,5960
PATENTAPPLIED* VCAP	43,3078	41,8330

- The results of the analysis indicate that patent behavior impacts the amount of cash collected at IPO not only in the US but also in Europe
- Results reflect that the value of a signal varies between two regions and it is inversely related to the scarcity of the signal.
- A higher impact of the power of patents as a signal in Europe is most likely related to the difficulty of European firms to file and obtain patents (2.07 and 1.58 on average, respectively) before going public compared to the US (14.01 and 6.85 on average, respectively).

IPOs markets provides incentives for growth-up software companies to multiply patent applications before going public.

- **Even if the impact of an additional patent as a signal is higher in Europe than in the US, a more developed software IPO market (on NASDAQ and NYSE) is related with a larger amount of cash at IPO.**

- A higher number of patents applied and obtained prior to IPO allow us to suggest that patents behavior profits principally US software companies at IPO.

- This suggests that even if all the applications are related with additional cash at IPO as a R&D reward, companies interested in patenting have an incentive to apply for a patent as soon as possible, especially in Europe.

7. Implications for future research

- The results suggest that the direct monetary incentive through financial markets to IPO has helped to increase the number of patents filed by firms that previously were not necessarily interested in patent protection.

- European IPOs are providing incitations to increase the number of patents filed as soon as possible prior to IPO. There is a growth up tendency in the number of software companies filling at least one patent prior to IPO in Europe.

- Future R: (related with speculation and innovation)

  Is that direct monetary incentive at IPO encouraging speculation through applications of "dubious quality" increasing legal uncertainty in software industry?

- Future R:(**Patenting behavior prior to IPO and the survival of European Software IPOs**)
- H1: Patents conferred competitive advantages that translate into higher likely of survival in Europe?
- H2: Europeans Firms that applied for more patents were less or more likely to be acquired ?

Thank you

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