UNIVERSITÀ DEGLI STUDI DI TORINO

brick Bureau of Research on Innovation, Complexity and Knowledge

Collegio Carlo Alberto

Academic inventions outside the university: Investigating patent ownership in the UK

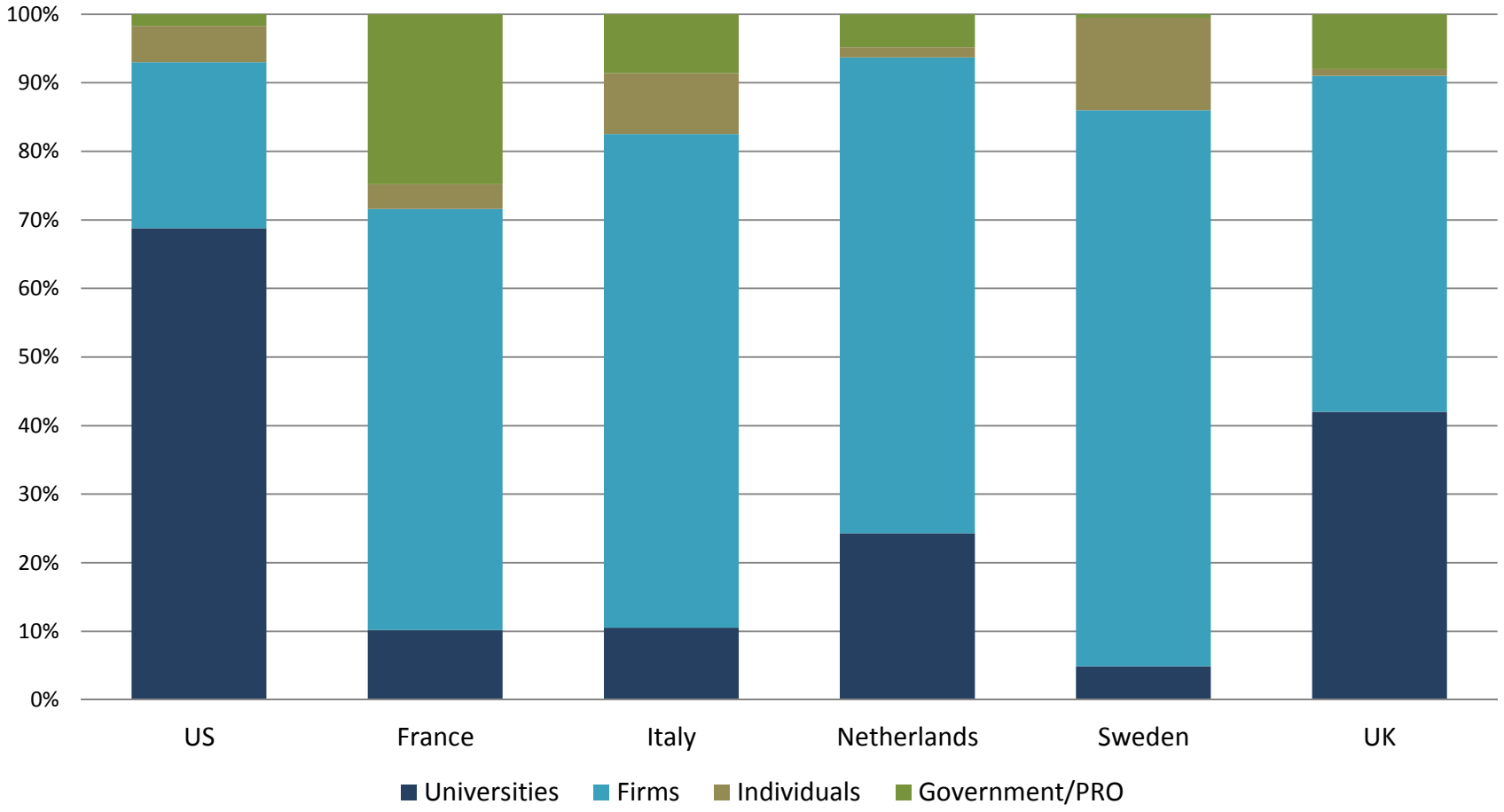
Cornelia Lawson
BRICK-Collegio Carlo Alberto
University of Turin
University of Nottingham

APE-INV Final Conference, Paris

Background

- Starting with the Bayh-Dole act in the US, several countries have moved to actively pursue the protection of IP arising from university research.
- This led to a more rigid IPR regime for academic staff – but universities in Europe were still lagging behind.
- Recent research revealed a much larger involvement in patenting in Europe that **does not follow the US model of university ownership** but had **flourished under non-university ownership models** (*Geuna and Nesta, 2006; Lissoni et al. 2008)*
- Even in the US, *Thursby et al. (2009)* and *Markman et al. (2008)* showed the existence of different ownership models even in the US

Ownership of Academic Patents



Source: Lissoni et al. (2008, 2009, 2012); Thursby et al. 2006; Sterzi (2013)

Background - UK

- No Bayh-Dole like legislation in the UK.
- But: In 1948 the National Research Development Corporation was formed to commercialise inventions from publicly funded research (later BTG).
- Strengthening universities: The 1977 Patents Act states that employee inventions belong to the employer (the university) which resulted in **a move towards a university ownership model**.
- Thus, share of university owned inventions is **much higher than** compared to the **rest of Europe** (40% share)
- But, industry ownership remains strong (50%) *Sterzi, 2013*

Industry Ownership

A result of industry sponsored research projects

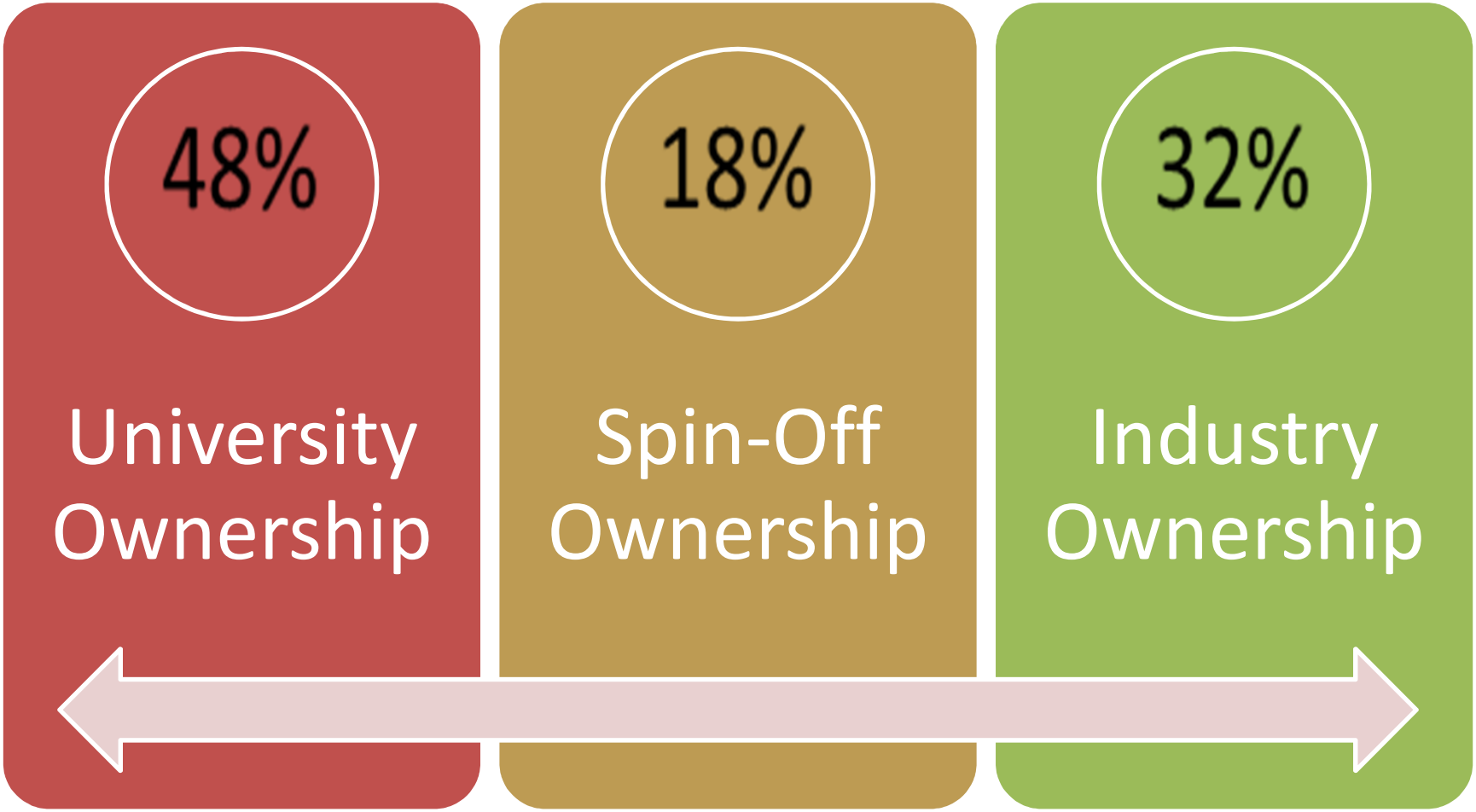
- Joint research with IP agreements
- *Lee (2000)* reports that researchers and firms involved in joint research report patentable outcomes
- *Lawson (2013)*: Positive effect of industry funding regardless of patent ownership
- *Hottenrott and Lawson (2013):* Contact with SMEs better explains patenting rates of German professors. This may be indicative of better support for the university ownership model from SMEs.

Industry Ownership

A result of university spin-offs

- Several papers have investigated university spin-off formation and its role for technology transfer *(e.g. Di Gregorio and Shane, 2003; Stuart and Ding, 2006; Clarysse et al., 2011; Fini et al., 2011).*
- Spin-offs based on university inventions may present a deliberate commercialisation strategy of the university
- Researchers at universities with a higher number of spin-off companies are more likely to file a patent that is owned by a firm or an individual *(Markman et al., 2008)*

Ownership in the UK



Data

- 744 engineering academics at 13 UK universities, 2001-2008
- Names and rank collected from university websites and calendars

FACULTY OF ENGINEERING

Professors

G. A. J. AMARATUNGA, *CHU*
C. R. CALLADINE, *PET*
J. E. CARROLL, *Q*
W. N. DAWES, *CHU*
J. D. DENTON, *TH*
A. P. DOWLING, *SID*
J. E. FFOWCS WILLIAMS, *EM*
T. P. HYNES, *JN*
A. L. JOHNSON, *CL*
D. R. H. JONES, *CHR*
M. R. JONES, *DAR*
N. G. KINGSBURY, *T*
J. M. LEES, *JN*, 2003
J. P. LONGLEY, *SID*
T. J. LU, *Q*

Patent measures

- Patent applications collected from esp@cenet (includes EPO, UKIPO, USPTO etc. patent applications)
- Each entry manually cleaned and verified with Derwent World Patents Index (DWPI) that contains information grouped around a patent family
- Of the 744 researchers, 176 file at least one patent during the period 2001 to 2008 (23%)
- Total number of patents is 456
  - University owned: 219 (48%)
  - Industry owned: 226 (50%) (114 companies)
    - Spin-off owned: 83 (29 companies)

Main explanatory measures

- Funding: Information acquired from university research offices
  - 453 researchers are PI at least once
  - Industry funding accounts for 20% of funding (278 researchers)
  - In total 984 grants from 402 different companies
    - 212 SMEs: 326 grants
    - 190 Large firms: 645 grants
- University appropriation strategy: HE-BCI (2003-2007)
  - Detailed information on spin-off and patenting activities at the university level
  - we consider (following *Markman et al., 2008*):
    - Number of active spin-offs
    - Outsourcing of patent activities

  Other measures are not available or do not differ across institutions (e.g. revenue shares)

Other measures

- Publications (ISI)
- Personal Information: PhD Year, PhD Subject (theses.org)
  - 7% female
  - 40% professor
  - Mean of 20 years since PhD
  - 38% electro, 32% mechanical or civil, 30% chemical engineering

- Previous papers on ownership have primarily used patent characteristics like number of claims or citation counts as explanatory variables (*Markman et al, 2008; Thursby et al., 2009*); however, these are affected by ownership and by the norms of the respective patent office and are therefore not considered here

Results

	1st stage selection into patenting	
VARIABLES	***Patent***	
$ln\_\#spinoff_{it-1}$	0.138	**
$patent\_outsourcing_{i}$	-0.068	
$sme\_funding_{it-1}$	-0.042	
$largefirm\_funding_{it-1}$	0.031	***
$public\_funding_{it-1}$	-0.006	*
ln_prepat_{i}	0.636	***
d_prepat_{i}	-0.412	**
age_{it}	0.041	**
age_{it}^{2}	-0.001	***
$avg\_publication_{it-1}$	0.048	***
$female_{i}$	-0.281	
$prof_{it}$	0.289	**
$elec_{i}$	0.153	
$mech\_civ_{i}$	-0.285	*
constant	-1.934	***

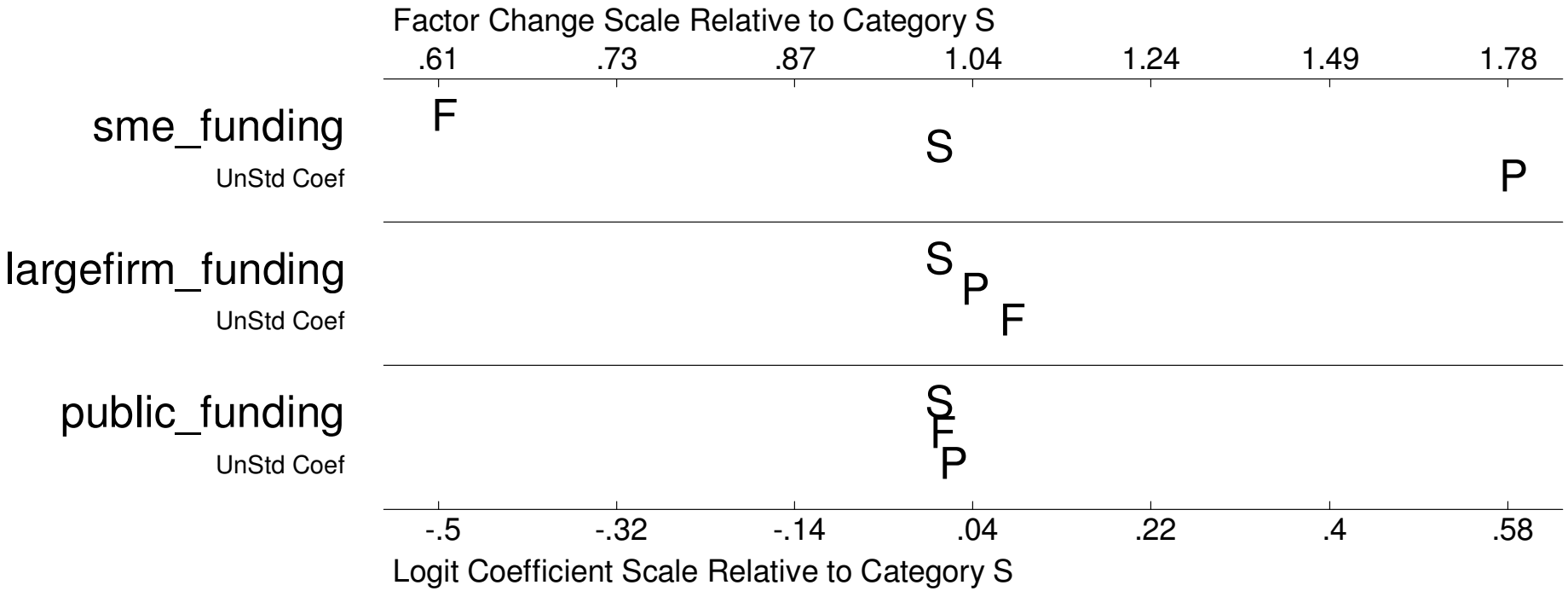
Results

	Second Stage		Second stage	
VARIABLES	***University***	***Firm***	***University/spin-off***	***Non-spin-off firm***
$ln\_\#spinoff_{it-1}$	-0.057	0.01	-0.023	0.000
$patent\_outsourcing_i$	0.419 *	-0.435	0.185	-0.176
$sme\_funding_{it-1}$	0.161 **	-0.214 ***	0.142*	-0.198 ***
$largefirm\_funding_{it-1}$	-0.034 **	0.039 **	-0.040**	0.046 **
$public\_funding_{it-1}$	0.008 **	-0.010 **	0.008	-0.008
ln_prepat_i	-0.338 *	0.470 **	-0.008	0.164
d_prepat_i	0.688 ***	-0.706 **	0.431*	-0.505 *
age_{it}	-0.057	0.024	-0.021	-0.024
age_{it}^2	0.001 *	-0.001	0.001	0.000
constant	1.306 **	-0.873	1.081*	-0.72
athrho_Select	-0.978**	0.804**	-0.676***	0.643***
athrho_Firm_Univ		-2.097***		-2.095***
Observations (uncensored)	3278 (267)		3278 (267)	
Wald-chi	82.376***		21.682*	
Log-Likelihood	-955.963		-947.337	

Robust standard errors in brackets, clustered by individual researcher (669). Coefficients are reported. Year dummies included in all models. ***p<0.01, **p<0.05, *p<0.1

Results

Multinomial logit



Odds ratios and discrete changes relative to university spin-off (S) (Long and Freese, 2005)*

*F=non-spin-off firm patent; S=spin-off patent; P=university patent

Results

Public Funding → **University Ownership**

SME Funding → **University Ownership (including SMEs)**

Large Firm Funding → **Industry Ownership**

Discussion

- Descriptive statistics showed that a **major share** of academic patents owned by industry are **owned by university spin-offs**.
- Spin-off formation may thus present an alternative appropriation strategy for universities.

- Results may indicate that universities are better able to enforce ownership rights resulting from joint research with SMEs
- Spin-off companies occupy an intermediate position between strict university ownership and strict industry ownership

- Industry sponsorship (large firms) and strong spin-off strategy encourage patenting in general

Conclusions

- If university ownership is sought the bargaining position of researchers towards large firms needs to be strengthened.
- Universities that outsource their IP activities already seem more likely to keep their IP, perhaps due to a stronger bargaining position.
- On the other hand, large firms provide much greater funding than SMEs, and universities may willingly forgo IP ownership in return for large research grants.

- Results cannot be interpreted as direct links, but they are indicative of a culture in which the appropriation of knowledge is promoted and rewarded.
- Results show that more diverse processes may be at work when decisions regarding appropriation of university research are made