

Inside or Outside the IP System? Business Creation in Academia

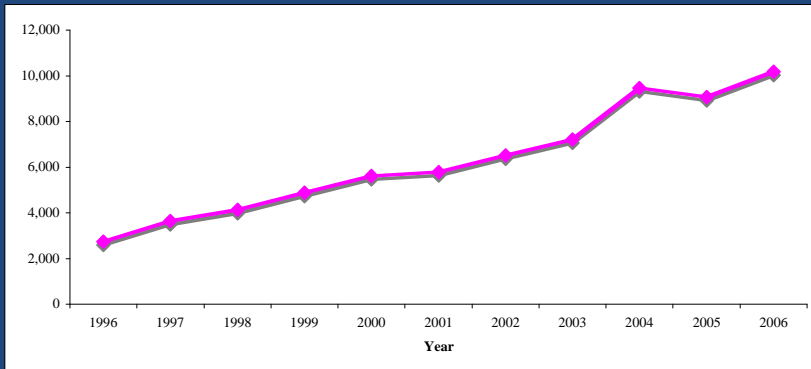
Scott Shane (CWRU)

Academic Entrepreneurship, Innovation, and Policy

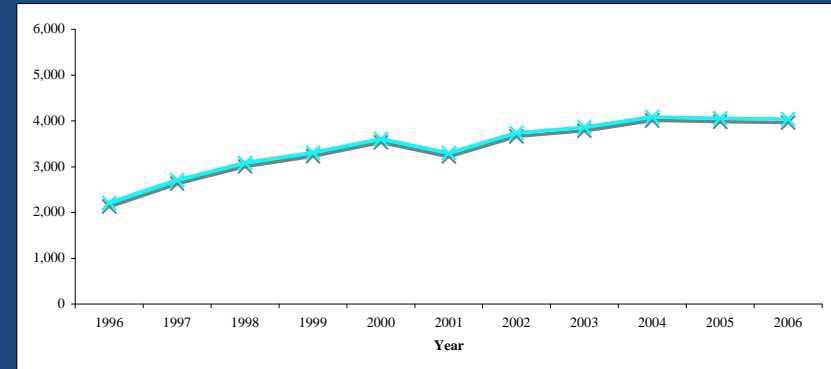
- Academic research is a key engine of economic growth and competitive advantage
- But university research often distant from “real” economic needs
- Since academics respond to economic incentives
- Adopt policies to facilitate knowledge transfer and commercialization – the Bayh-Dole story

Trends in Academic Entrepreneurship

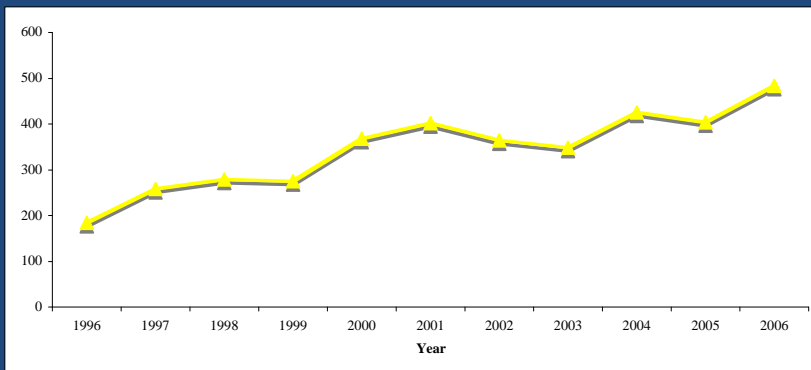
New U.S. Patent Applications Filed



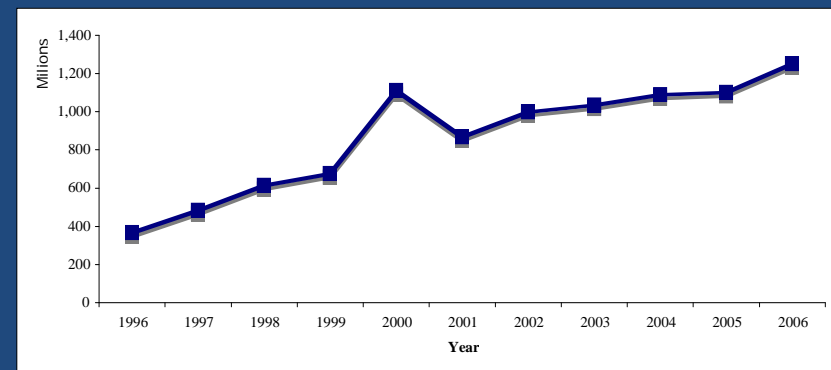
Licenses/Options Executed



Start-ups established



Gross License Income Received



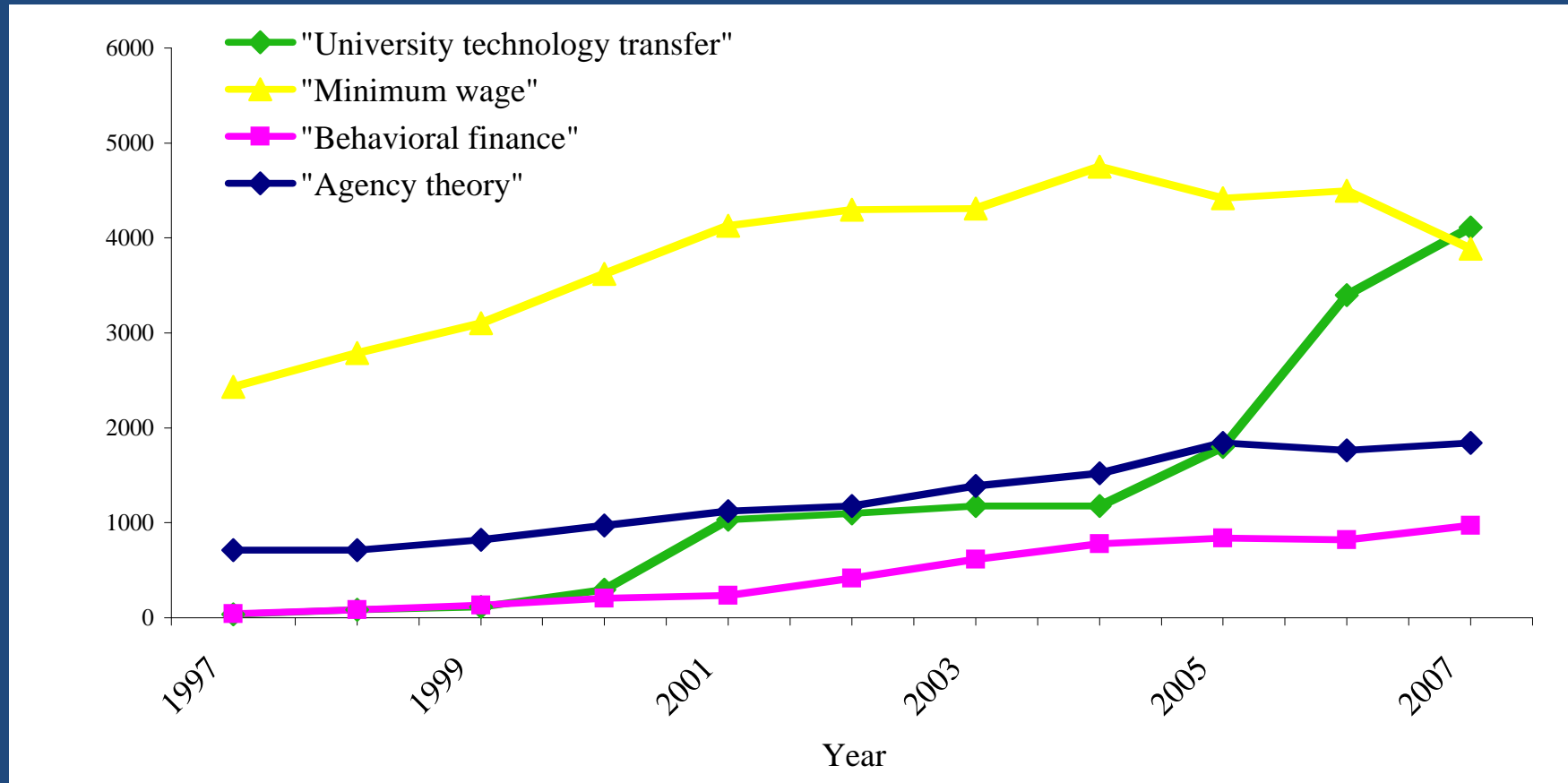
Source: AUTM (1996-2006)

The Situation in 2006

Activity	USA (AUTM N=161)
Licenses and options executed	4,038
Startups	484
Invention disclosures	6,384
New US patent applications	10,183
License income (\$'000)	1,249,082,798

Source: AUTM (2006)

Academic Entrepreneurship is a “hot” topic



Source: Google scholar

The venture creation process in academia

- Research → Invention → Disclosure to TTO → Patent → License or Start up based on Patent
- So policies are based on presence of formal IPRs, particularly patents
- But formal IPRs neither effective nor used in many sectors, leading lots of commercial, knowledge transfer activities by academics not to be patented
- Nevertheless, we study what we can measure – Academic research and public policy evaluation focuses on IP-based measures of entrepreneurship (patents, licensing, spinoffs)

What Previous Research Tells Us Increase Academic Entrepreneurship

- Individual
 - Age
 - Being male
 - Higher academic rank
 - Being in biological sciences and engineering
 - Emphasize research; high publication rate
- University
 - Institution quality
 - Amount invested in R&D
 - Ties to industry
 - Located in a major city with venture capital activity

Questions

- Just how big is academic entrepreneurship *outside the IP system*?
- How does inside the IP-system entrepreneurship differ from outside the IP system entrepreneurship?
- Are “IP-based” policies appropriate for “non-IP-Based” forms of academic entrepreneurship?
- Is the extent of academic entrepreneurship systematically underestimated, and current analyses distorted?

Data and Research Design

- E-survey to **58,321** tenured or tenure track faculty members and post docs at all Carnegie I and II during second half of 2007
 - Voluntary participation
 - Four follow-up electronic messages sent to non-respondents
 - 11,572 responses (20%)

Data and Research Design

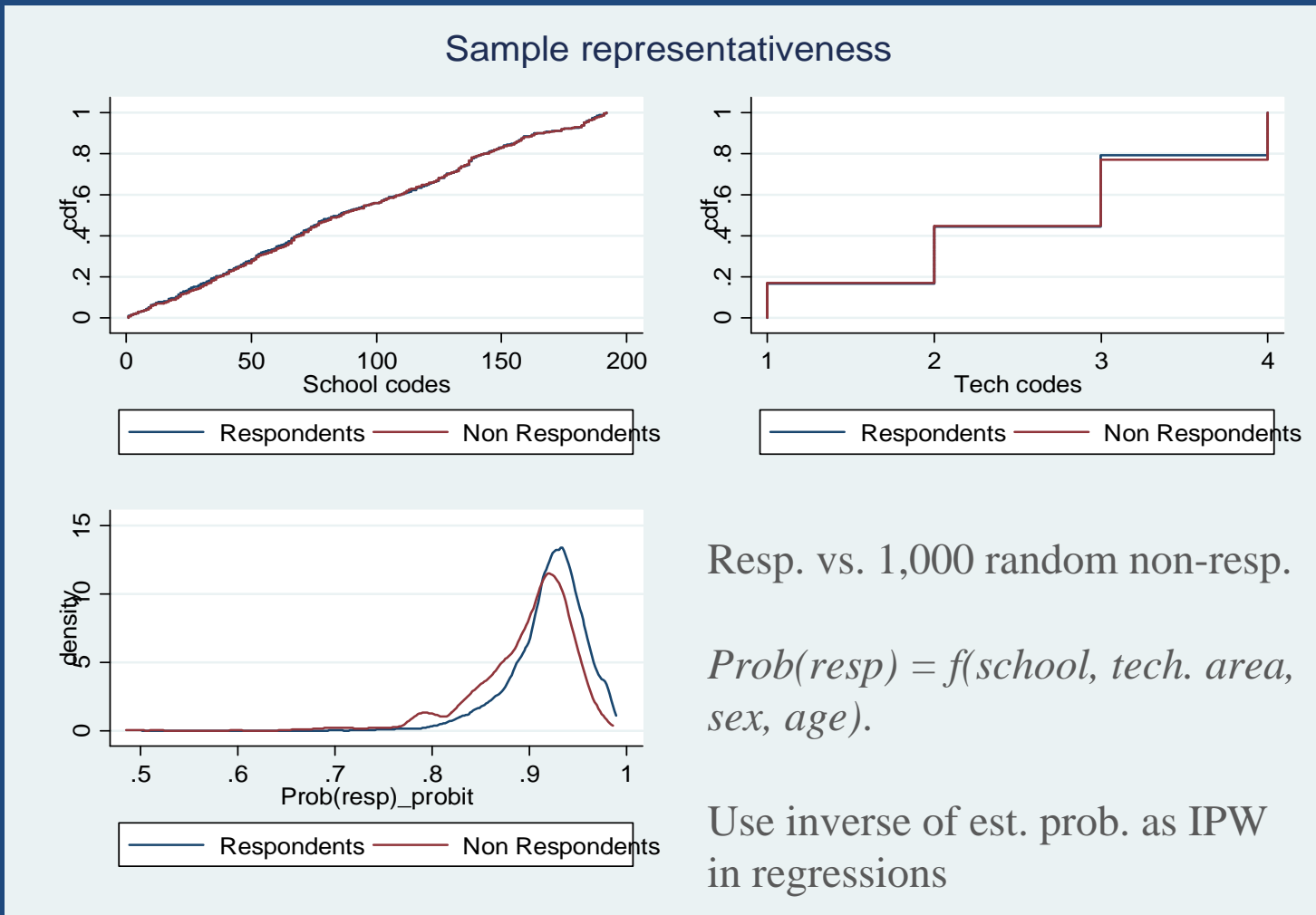
- Questions
 - Demographics: Gender; Age; Academic rank; Experience + Uni., Dept.
 - Academic activities in 2006-2007: Percentage of time in research, teaching; interaction with industry; research funding; cumulated publ. record
 - Commercial activities:
 - Invention disclosures, patents issued, licenses
 - Equity
 - **New businesses started**
 - Overall
 - On patent
 - **And not based on patent**

Data and Research Design

- Additional info on universities: Carnegie Foundation + AUTM + US News
 - Ownership, Age, Size, Research Expenditures, Localization, Tech-transfer support mechanisms, TT outputs, Ranks/Tiers
- Use this info to analyze peculiarities of IP and No-IP based business creation in academia
- Wealth of info at multiple levels, big sample size
- But...
 - ...Selection?
 - ...Cross-sectional data?

Data and Research Design

- Selection: Limited on school, tech area, gender, age



Data and Research Design

- Cross sectional data
 - Descriptive study
 - But value in new info unveiled, for policy and research

Magnitude

- A lot of academics start businesses - 16 percent of the sample have done so
- Most do **not** start businesses based on a patented invention – two outside the IP-based system start-ups for every one inside the IP-based system start-up

Researchers and policy makers are missing a lot of the academic entrepreneurship

Commercialization and the “underground entrepreneurs”

Variable	Tot	Only activity	In conjunction with				
			Disclosure	Patent	License	Equity	New business on patent
Disclosure	2,950	793					
US Patent issued	2,166	99	1,822				
License (on US patent)	1,146	6	988	1,071			
Equity	957	45	691	611	409		
New business on patent	682	12	560	560	358	493	
New business not on patent	1,266	623	432	314	172	343	138

Variable	Correlation table				
	Disclosure	Patent	License	Equity	New business on patent
Disclosure	1				
US Patent issued	0.67	1			
License (on US patent)	0.46	0.64	1		
Equity	0.31	0.34	0.33	1	
New business on patent	0.37	0.41	0.37	0.59	1
New business not on patent	0.07	0.05	0.04	0.24	0.06

Look at Differences

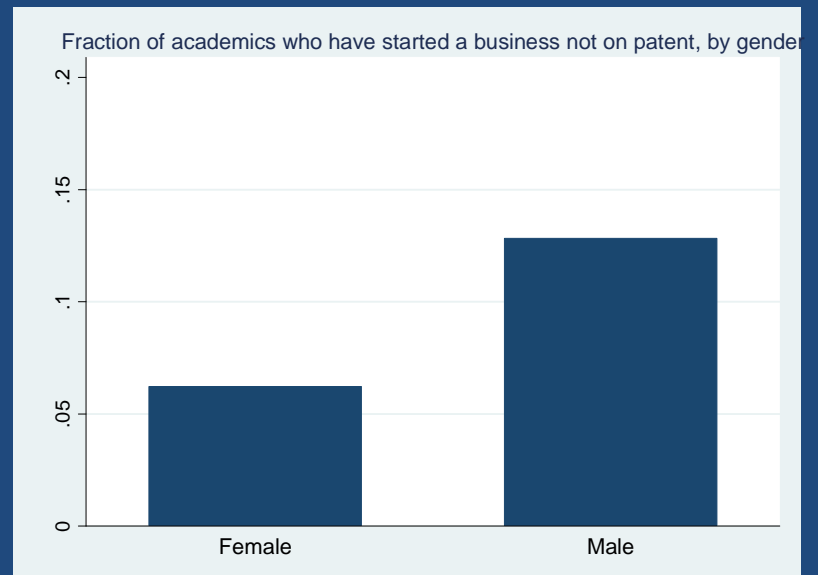
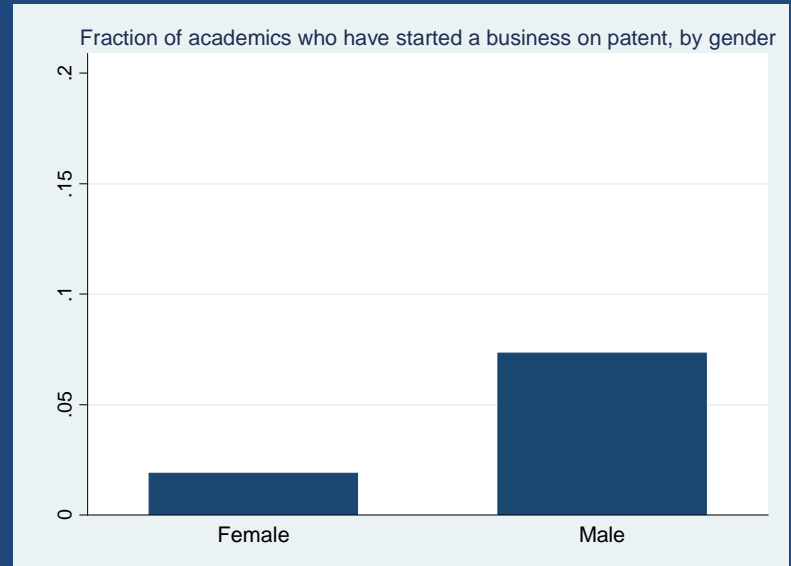
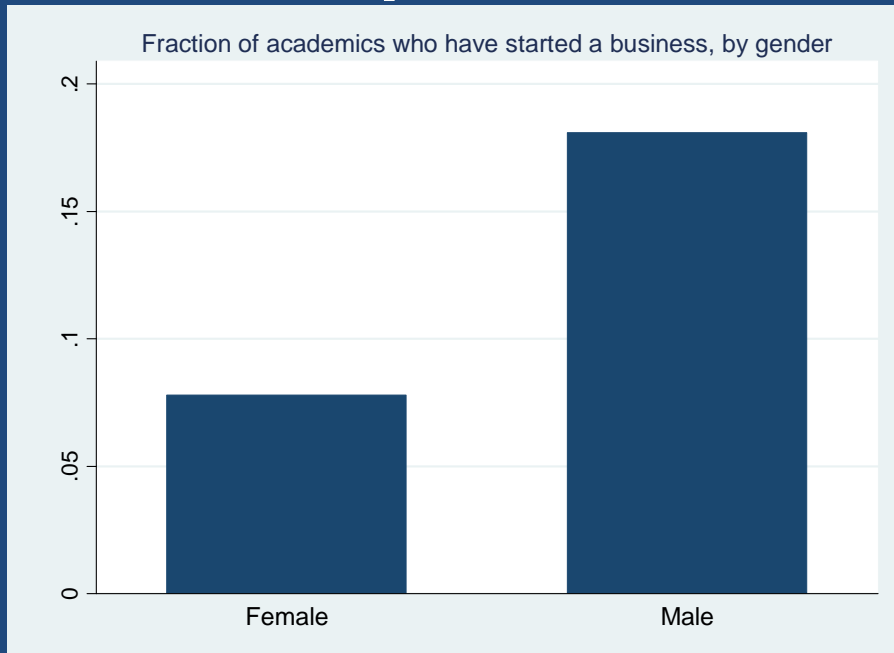
- Predict start-ups, start-ups based on patents, start-ups not based on patents, and start-ups based on patents versus start-ups not based on patents
- Linear probability models with robust standard errors
- Inverse probability weighting
- Include variables about individuals' age and gender, source of funding, publications, time allocation, academic field, university rank, location, university R&D, age and size of technology transfer office, and whether university is public or private.

So What's Different?

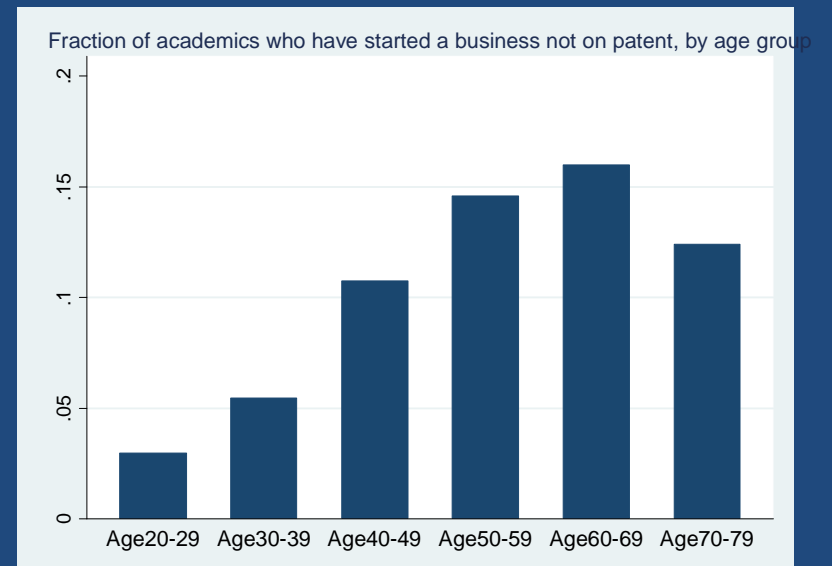
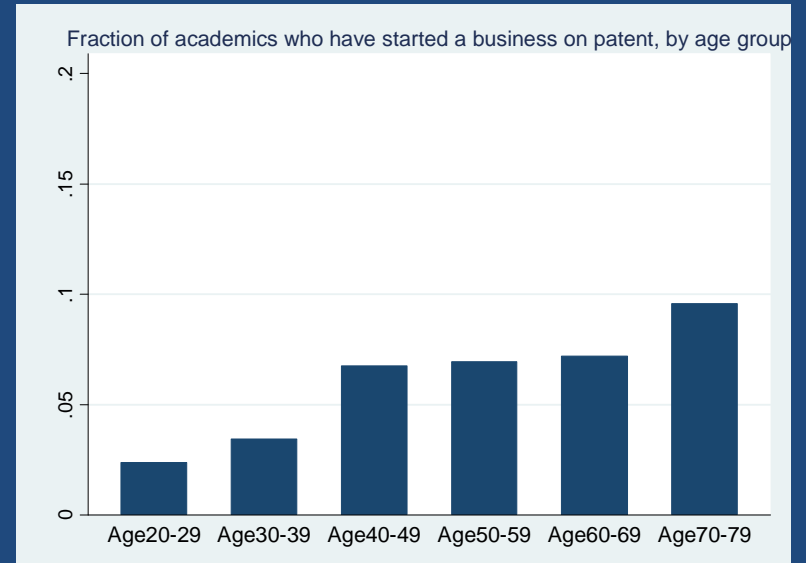
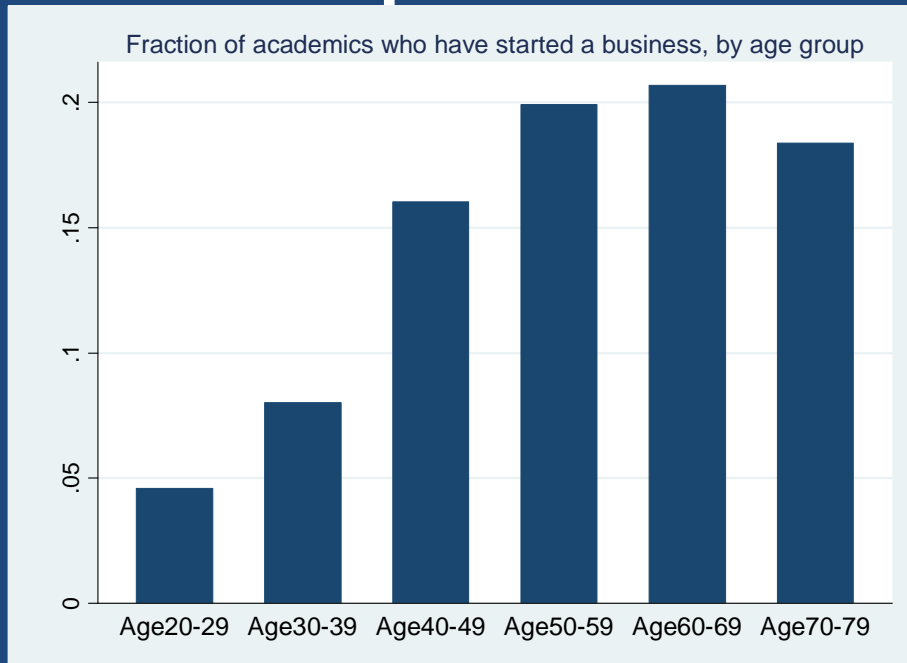
Inside the IP-System Entrepreneurs are:

- More likely to be female
- Younger
- Publish more
- More likely to raise money from industry
- Spend more time on research
- Spend less time on teaching
- More likely to be located in the Northwest
- Less likely to be in a large town
- More likely to be from a higher ranked university
- More likely to be in a biomedical field

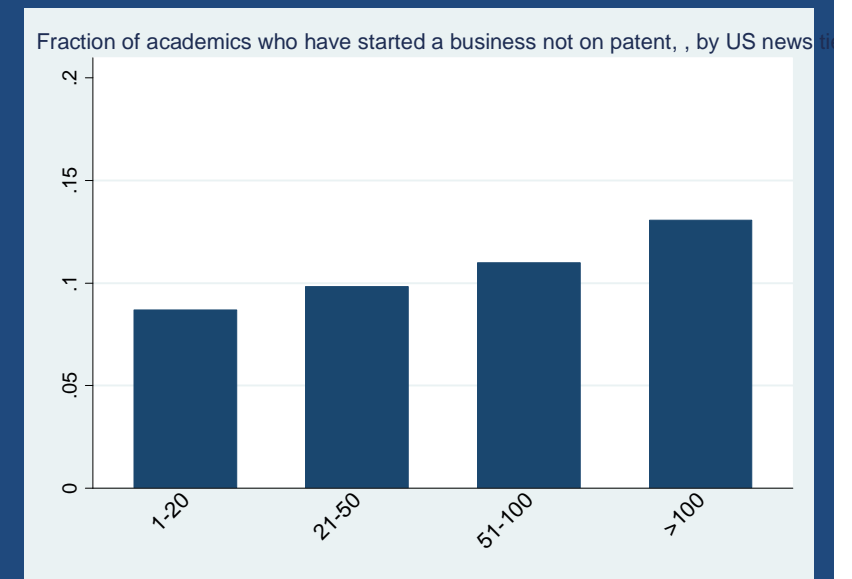
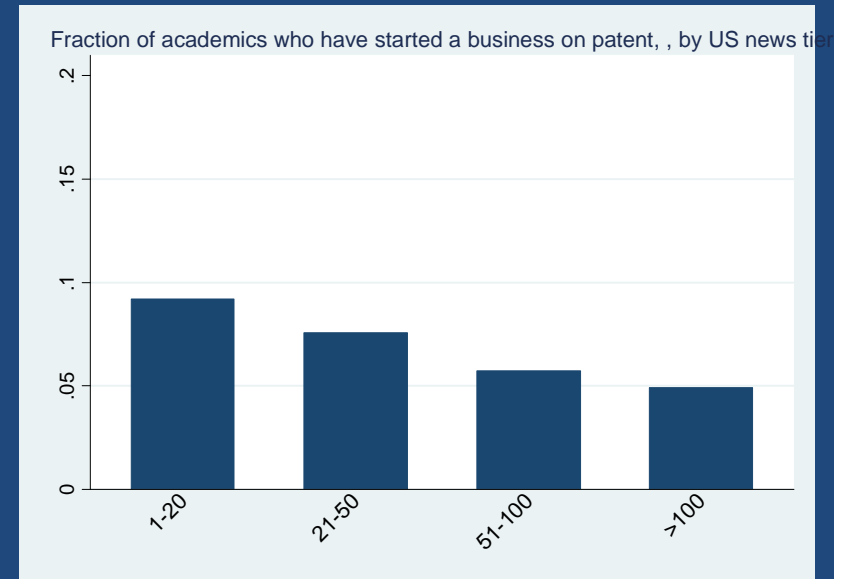
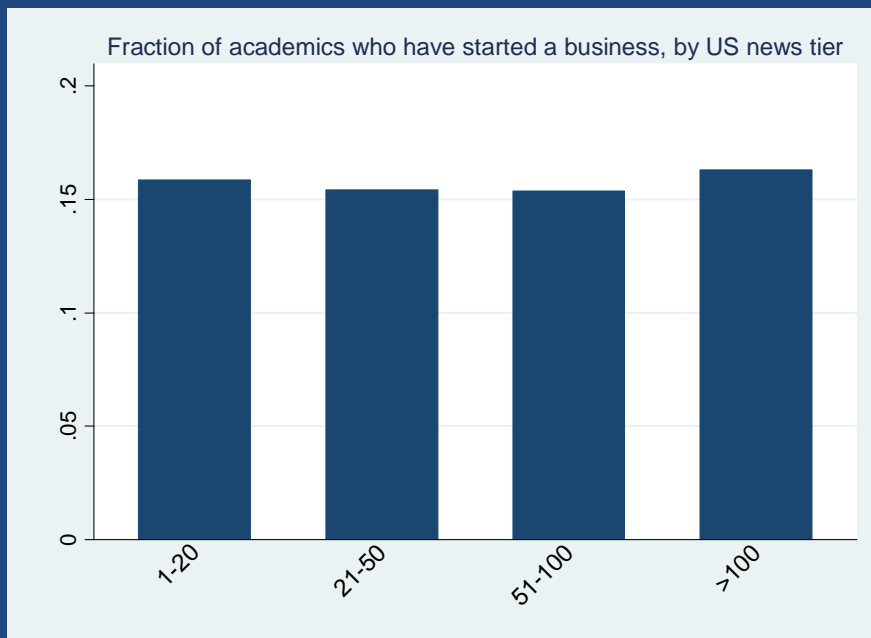
New businesses and Gender



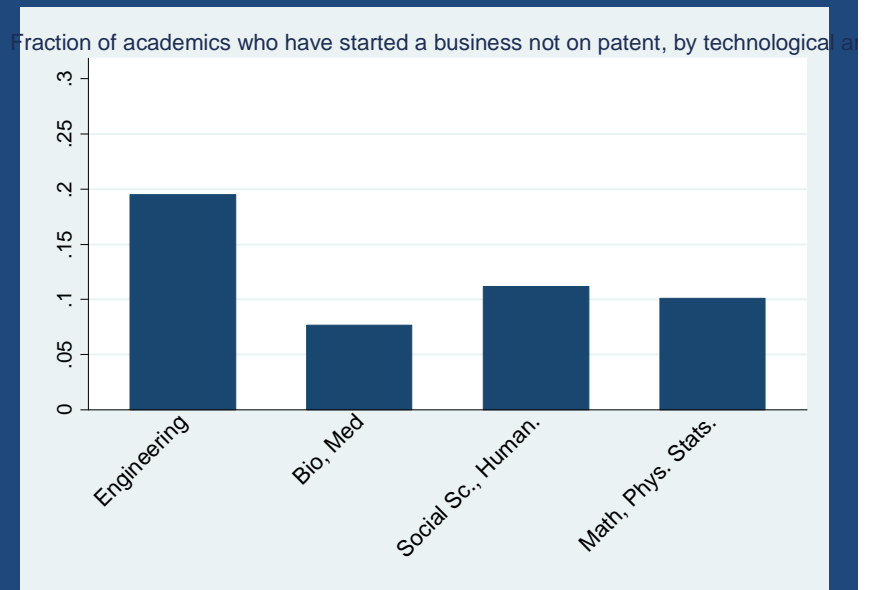
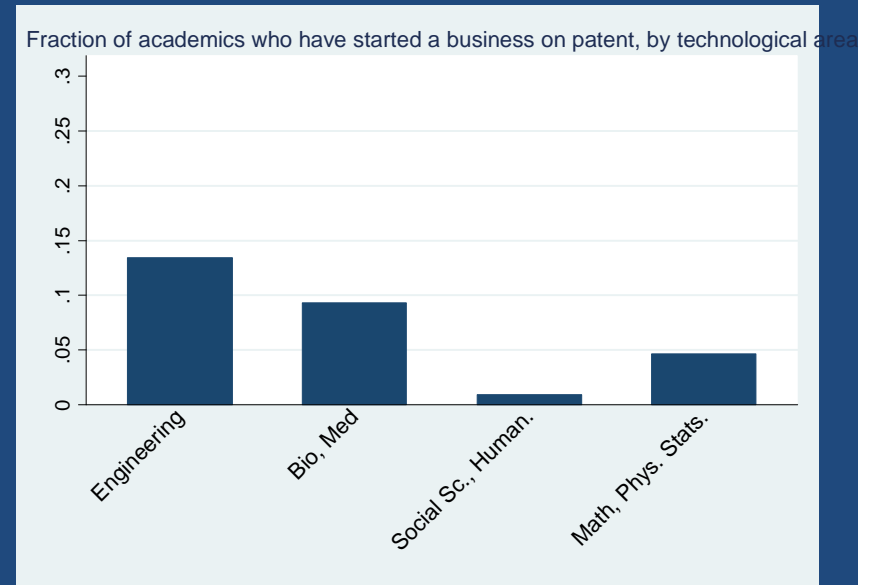
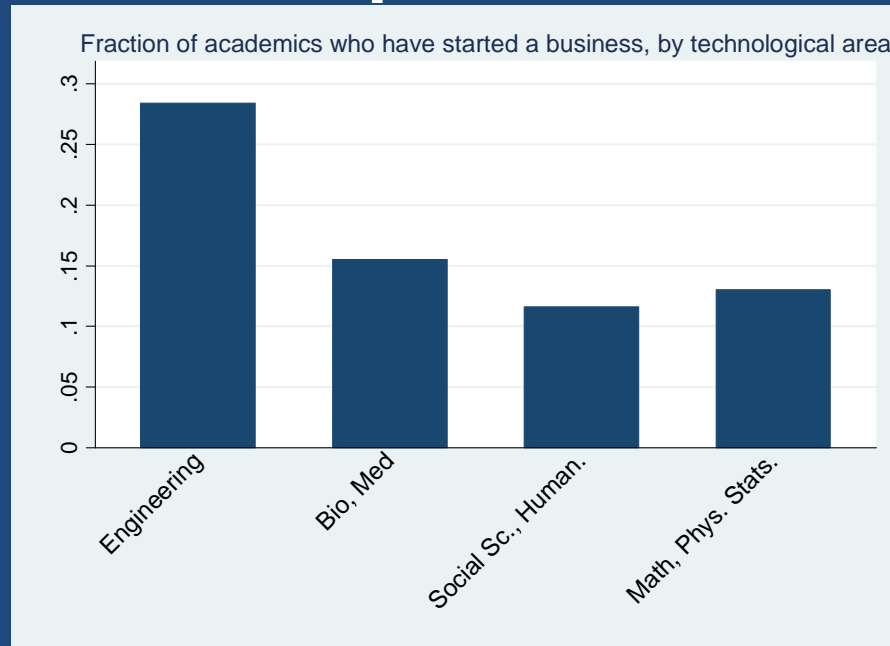
New businesses and Age



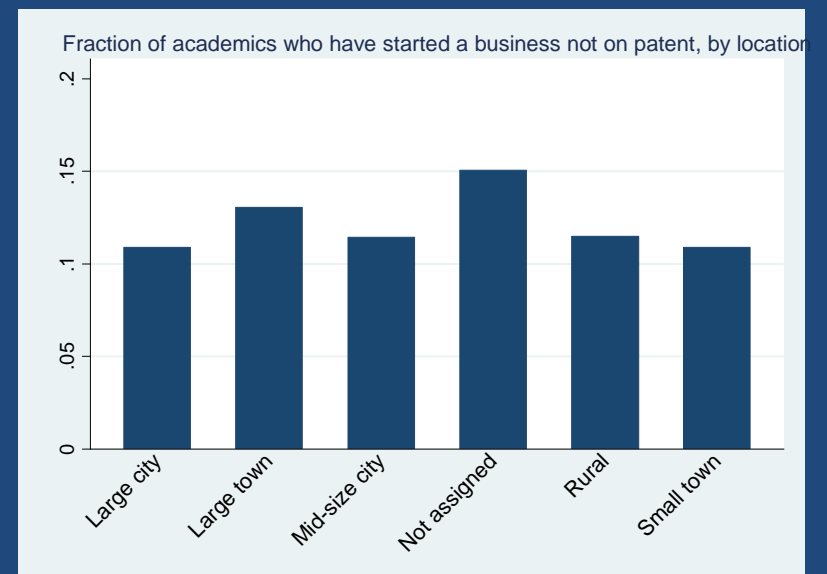
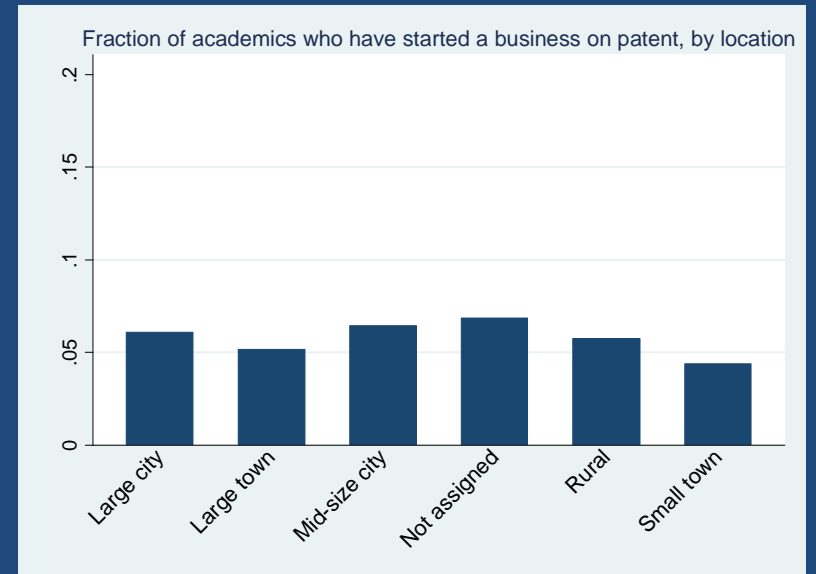
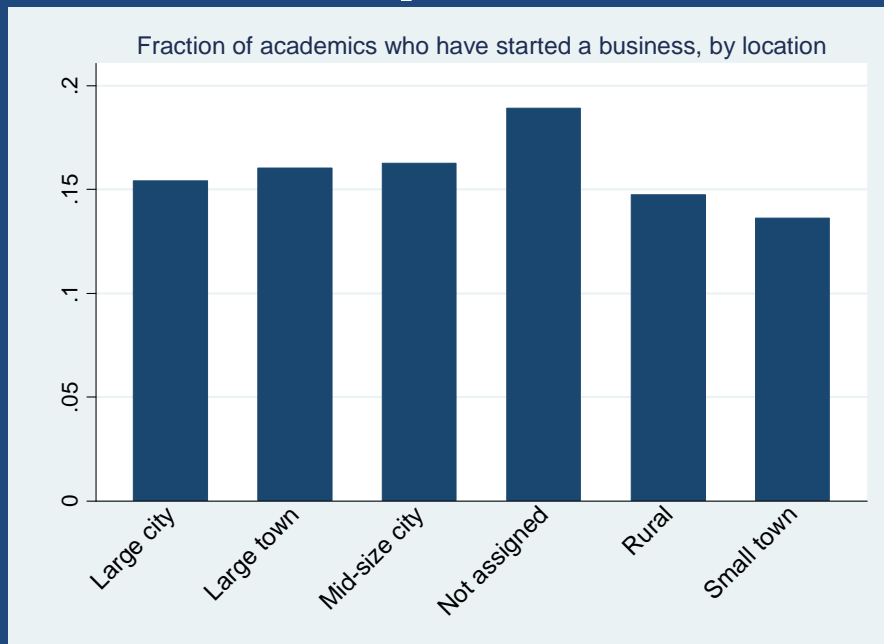
New businesses and University rank



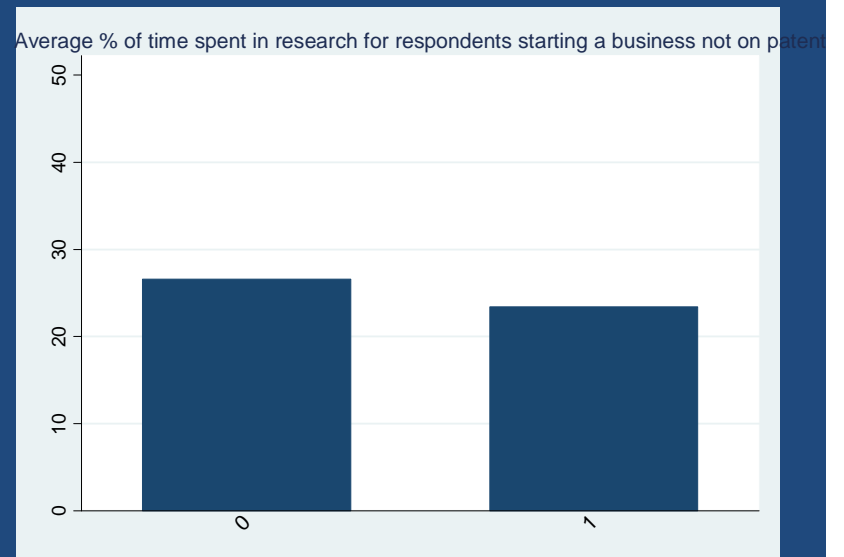
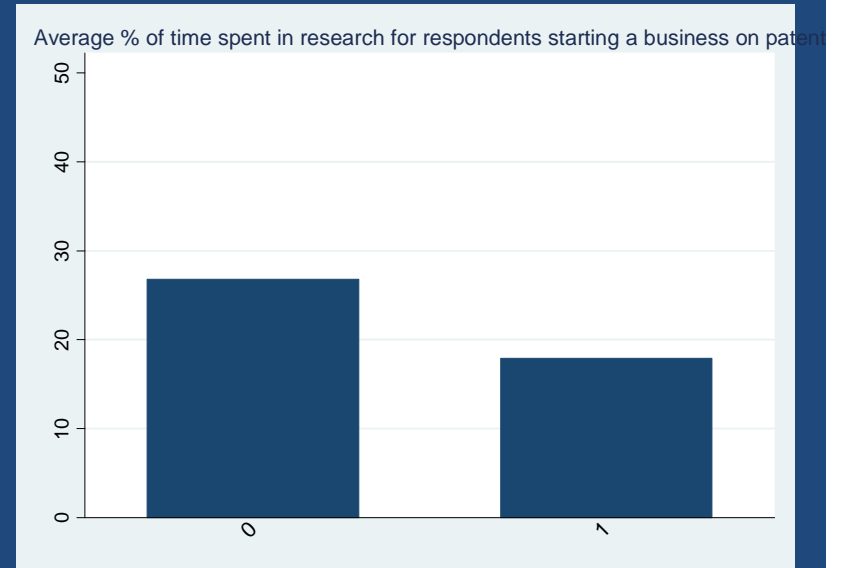
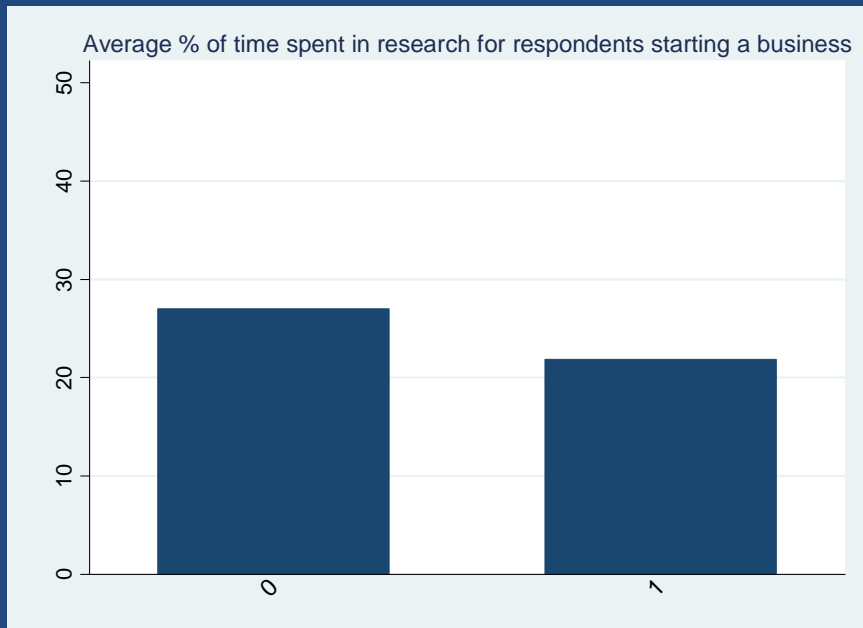
New businesses and Technological areas



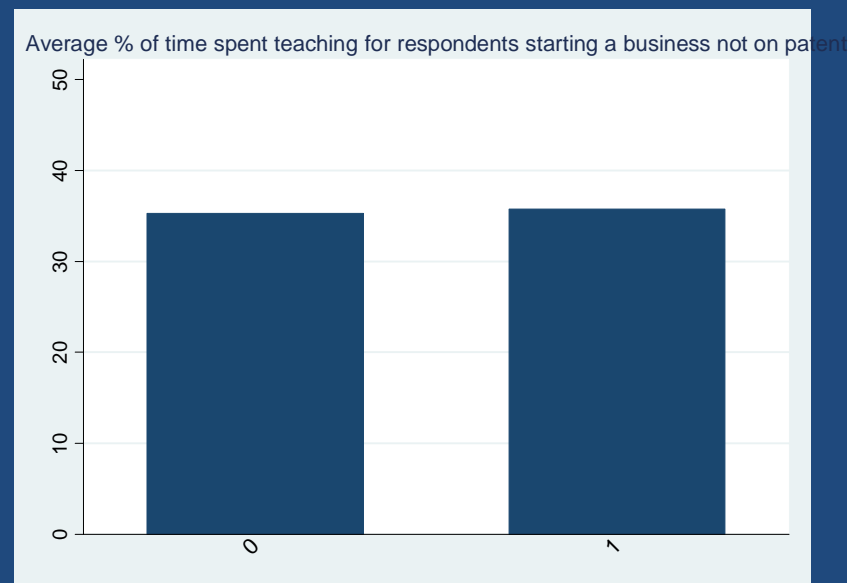
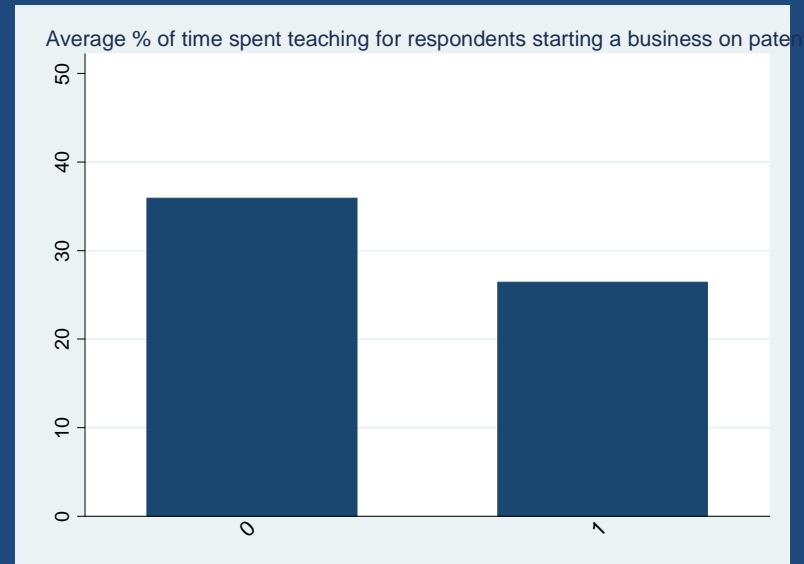
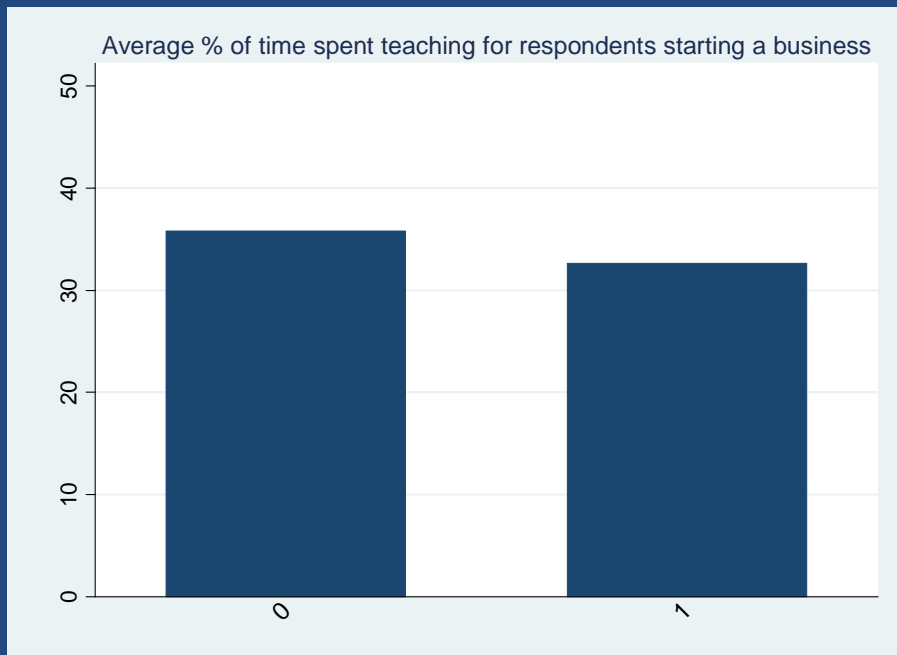
New businesses and Location



New businesses and Academic activities: research



New businesses and Academic activities: teaching



Implications

- We are missing more than we are measuring: two thirds of academic entrepreneurship is “off the radar” of researchers and policy makers
- Outside the IP system academic entrepreneurship is different from within the IP system academic entrepreneurship across a number of dimensions
 - Individual characteristics
 - Technology/discipline
 - School rankings
 - School location
 - Approach to academic job
- We have a problem in both research and public policy that needs to be fixed
 - Understanding impact of academic entrepreneurs?
 - Revisiting what we think matters?
 - Adjusting Federal legislation?
 - Changing university technology transfer policies?