

# 3000 euros on the sidewalk

Marco Bertoni, Giorgio Brunello, Daniele Checchi e Lorenzo Rocco

# Background

- It is well known that Italy spends less than other developed countries for research
- Many complain that research funds in academia are limited, especially for young researchers
- In 2017 the FFABR program (*Fondo finanziamento attività di base della ricerca*) was launched
  - The top 75 percent of applying assistant professors and the top 25 of applying associate professors receive 3000 euros in research funds, freely usable, without any ex-post evaluation
- Very surprisingly, less than 50 percent of eligible scholars applied, with relatively few differences by field, university and region.

# Questions

- Why was the application rate so low?
- Is there any flaw in the program design?
  
- This presentation will be mainly descriptive. Your comments are very much appreciated

# Outline

- Policy and the algorithm to compute the score
- Data description
- The decision to apply
- Productivity and the application rate
- Counterfactual outcomes

# FFABR: The Policy

- 45 million euro in the 2017 Italian Budget Law to support the research activities of assistant and associate professors
- Managed by ANVUR
- Two step procedure
  - Allow ANVUR to access research output between 2012 and 2016 (by July 10 2017)
  - Check publications list identified by ANVUR and propose corrections (by September 30)
- Just two clicks
  - Little time and effort to apply
- In June 2017 ANVUR published the call on its website; after that university research offices wrote emails to spread the information; reminders about the deadlines
- The procedure was operated on the CINECA platform

# FFABR: The Policy

- ANVUR produced for each applicant a score. The research fund (3000 euro) was granted to
  - Assistant professors scoring above the 75<sup>th</sup> percentile of applicants (by research area)
  - Associate professors scoring above the 25<sup>th</sup> percentile of applicants (by research area)
- Principal investigators and heads of local units of important research grants (EU, Italy) could not apply, as well as part-timers and those on leave

# Computing the score

- Articles in journals (GEV list complemented with ASN list), chapters and monographs with ISBN published between 2012 and 2016
- Evaluation:
  - Articles
    - Scimago A: 10 points
    - Scimago B: 7 points
    - Sciamgo C (or tier A in ASN list): 4 points
    - Scimago D and E (or non A in ASN list): 1 point
  - Chapters: 1 point
  - Monographs: 10 point (at most 1)
- ANVUR sets a maximum number M of publications to be considered, by field (for instance 6 for SECS-P/01, 9 for SECS-P/07 and 10 for SECS-S/01)
- Co-authorship weighting:
  - single authored or one co-author publications weight 1
  - publications with more than one co-author weights  $1/(1+\log_{10}(N-1))$
- ANVUR sorts publications by their value and consider the first M co-authorship-weighted publications
- The score (P) is the sum of their values weighted by co-authorship

# Thresholds by field

Awarded applicants are those with P > threshold

field	Associates	Assistants
SECS-P/01	42	18
SECS-P/02	48	20
SECS-P/03	52	13
SECS-P/05	63	17
SECS-P/06	42	15
SECS-P/07	40	16
SECS-P/08	47	19
SECS-P/09	24	13
SECS-P/10	38	25
SECS-P/11	28	10
SECS-P/12	21	13
SECS-P/13	42	15
SECS-S/01	57	18
SECS-S/03	36	11
SECS-S/04	28	12
SECS-S/05	30	24
SECS-S/06	37	13



# Sample

- All full time assistants and associate professors in scientific area 13 (economics, business and statistics) hired until 2017
- Excluded those non eligible (typically because PI or head of local unit of large competitive government/EU research grants)
- Excluded SECS P/04 and SECS S/02 because they are very small
- Eventually:
  - 1333 associate professors
  - 1224 assistant professors (both RU and RTD)

# Application rates, by field, region and size

field	Associates	N	Assistants	N
SECS-P/01	0.46	202	0.48	184
SECS-P/02	0.52	120	0.60	77
SECS-P/03	0.44	48	0.63	49
SECS-P/05	0.57	14	0.39	18
SECS-P/06	0.43	49	0.54	35
SECS-P/07	0.38	175	0.53	188
SECS-P/08	0.48	146	0.55	163
SECS-P/09	0.45	22	0.56	18
SECS-P/10	0.42	50	0.39	31
SECS-P/11	0.49	53	0.51	55
SECS-P/12	0.47	58	0.44	43
SECS-P/13	0.42	26	0.62	39
SECS-S/01	0.52	149	0.59	117
SECS-S/03	0.50	44	0.50	44
SECS-S/04	0.60	20	0.80	25
SECS-S/05	0.56	27	0.60	15
SECS-S/06	0.61	130	0.58	123
all fields	0.48	1333	0.54	1224

	Large	Small	Total
North	0.50	0.53	0.51
Center	0.49	0.60	0.52
South and Islands	0.52	0.45	0.50
Total	0.50	0.53	0.51

Small: < 40 associates and assistants

# Summary statistics – Applicants’ P score

## Associates

field	mean P	p25(P)	p75(P)	N
SECS-P/01	32.2	21.0	42.0	93
SECS-P/02	35.9	23.0	48.0	63
SECS-P/03	40.3	26.0	52.0	21
SECS-P/05	43.6	26.5	62.0	8
SECS-P/06	35.8	19.0	42.0	21
SECS-P/07	30.2	19.0	40.0	66
SECS-P/08	36.2	22.0	47.0	70
SECS-P/09	14.0	8.0	24.0	10
SECS-P/10	30.3	19.0	38.0	21
SECS-P/11	21.1	13.0	28.0	26
SECS-P/12	19.8	14.0	21.0	27
SECS-P/13	34.0	22.0	42.0	11
SECS-S/01	44.0	30.0	57.0	77
SECS-S/03	27.3	20.0	36.0	22
SECS-S/04	21.0	9.0	27.5	12
SECS-S/05	27.3	20.0	30.0	15
SECS-S/06	28.6	21.0	37.0	79

## Assistants

field	mean P	p25(P)	p75(P)	N
SECS-P/01	26.0	18.0	33.0	87
SECS-P/02	31.3	20.0	44.0	46
SECS-P/03	21.8	13.0	30.0	31
SECS-P/05	27.1	17.0	38.0	7
SECS-P/06	32.2	15.0	46.0	19
SECS-P/07	24.0	16.0	30.0	99
SECS-P/08	28.7	19.0	36.0	89
SECS-P/09	18.9	13.0	24.0	10
SECS-P/10	32.4	24.5	36.0	12
SECS-P/11	18.1	9.5	24.5	28
SECS-P/12	16.6	13.0	22.0	19
SECS-P/13	23.2	15.0	28.0	24
SECS-S/01	30.3	18.0	43.0	69
SECS-S/03	22.5	11.0	29.0	22
SECS-S/04	20.5	11.0	26.5	20
SECS-S/05	32.8	24.0	45.0	9
SECS-S/06	22.5	13.0	33.0	71

# Demographics- associates

## Associates

field	Non Applicants			Applicants		
	female	avg. age	avg. tenure	female	avg. age	avg. tenure
SECS-P/01	0.28	54.2	15.2	0.43	47.4	12.3
SECS-P/02	0.30	52.2	13.4	0.43	47.4	10.9
SECS-P/03	0.33	50.2	13.4	0.29	45.1	12.1
SECS-P/05	0.17	49.2	9.0	0.25	46.0	11.1
SECS-P/06	0.14	52.1	13.7	0.43	48.8	11.3
SECS-P/07	0.39	48.3	13.9	0.41	45.0	12.1
SECS-P/08	0.51	48.8	13.8	0.56	46.4	12.5
SECS-P/09	0.33	47.9	14.5	0.20	49.3	14.9
SECS-P/10	0.45	48.5	12.5	0.29	44.9	11.6
SECS-P/11	0.48	49.1	14.6	0.65	45.7	12.6
SECS-P/12	0.45	59.3	15.8	0.26	52.0	13.8
SECS-P/13	0.67	56.1	14.4	0.64	51.0	15.2
SECS-S/01	0.50	50.3	14.8	0.49	46.7	13.3
SECS-S/03	0.32	53.7	16.4	0.45	47.9	13.3
SECS-S/04	0.63	56.9	17.0	0.58	49.0	12.6
SECS-S/05	0.50	54.6	15.7	0.67	52.9	14.5
SECS-S/06	0.51	53.5	15.7	0.43	48.9	13.1
<b>all fields</b>	<b>0.40</b>	<b>51.5</b>	<b>14.4</b>	<b>0.45</b>	<b>47.4</b>	<b>12.6</b>

# Demographics- assistants

## Assistants

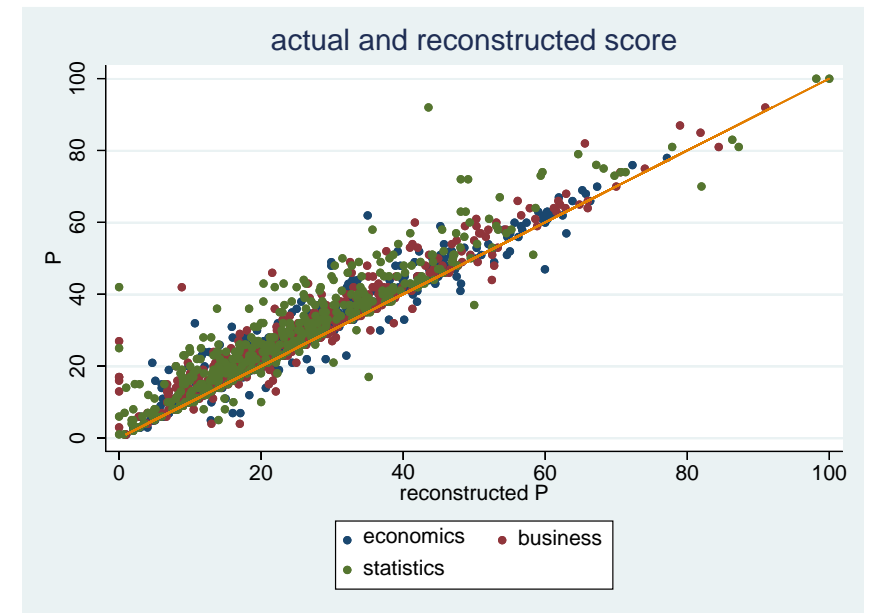
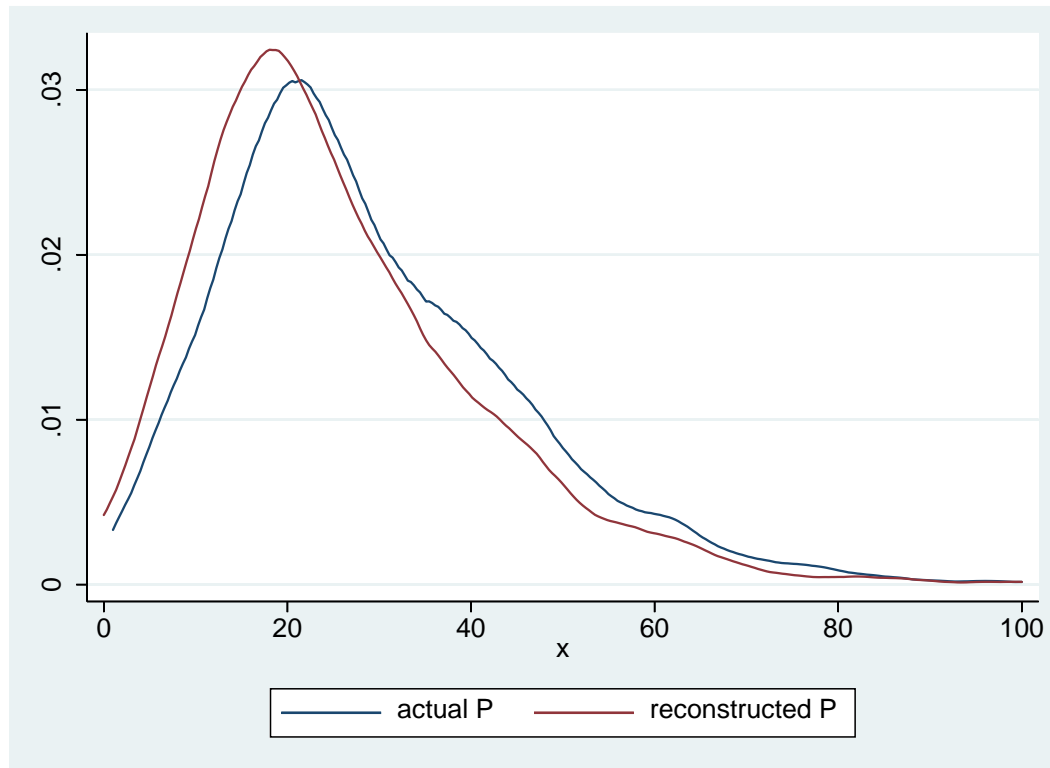
field	Non Applicants			Applicants		
	female	avg. age	avg. tenure	female	avg. age	avg. tenure
SECS-P/01	0.39	46.6	10.6	0.56	43.8	8.3
SECS-P/02	0.39	47.9	10.3	0.48	41.9	7.2
SECS-P/03	0.61	44.1	8.8	0.52	43.7	9.1
SECS-P/05	0.27	43.8	7.6	0.71	39.0	3.7
SECS-P/06	0.50	43.2	6.3	0.37	41.9	5.3
SECS-P/07	0.49	44.7	10.6	0.58	41.1	7.6
SECS-P/08	0.53	43.9	9.2	0.61	41.2	7.7
SECS-P/09	0.25	42.0	10.0	0.40	39.9	7.4
SECS-P/10	0.47	43.2	8.1	0.58	40.5	6.9
SECS-P/11	0.30	42.3	10.3	0.54	39.5	6.8
SECS-P/12	0.42	50.6	10.9	0.47	50.6	9.7
SECS-P/13	0.33	55.1	12.8	0.50	48.9	10.5
SECS-S/01	0.65	46.1	9.5	0.59	41.8	7.9
SECS-S/03	0.36	48.5	12.8	0.55	43.9	8.7
SECS-S/04	0.60	49.2	12.0	0.60	49.3	10.0
SECS-S/05	0.33	48.5	9.3	0.44	41.2	7.4
SECS-S/06	0.37	48.7	12.9	0.44	43.8	9.3
<b>all fields</b>	<b>0.45</b>	<b>46.1</b>	<b>10.3</b>	<b>0.54</b>	<b>42.8</b>	<b>8.1</b>

# Reconstructed P score

- P score observed only for applicants
- We use data from the MIUR catalogue of scientific publications and the ANVUR algorithm to reconstruct the P score for both applicants and non applicants
- Compared to ANVUR, we do not have the evaluations provided by VQR referees.
  - According to FFABR rules, the highest between the latter and the bibliometric classification should be used → under-estimation of the reconstructed P score
- For applicants, we have checked that the reconstructed score is very correlated (0.95) with the actual score
- We use the reconstructed P score as measure of productivity

# Actual and reconstructed P score

	P score		reconstructed P		correlation between P and reconstructed P		N
	mean	std. dev.	mean	std. dev.			
Non applicants			16.87	15.13	econ	0.960	410
Applicants	29.01	16.07	25.51	15.36	business	0.957	463
					stats	0.932	431



# Regression analysis

- We estimate linear probability models for the probability of applying
- We find that the probability of applying
  - increases non-linearly with the reconstructed P score
  - is higher for females among assistants, but not among associates
  - Is lower for longer tenure in the rank



	(1)	(2)	(3)	(4)
rec. P	0.034*** (0.004)	0.034*** (0.004)	0.028*** (0.004)	0.028*** (0.004)
rec. P squared	-0.053*** (0.011)	-0.052*** (0.011)	-0.044*** (0.011)	-0.043*** (0.011)
rec. P to the third	0.003*** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)
rec P. X female		-0.001 (0.002)	-0.000 (0.001)	-0.000 (0.001)
female		0.068 (0.042)	0.052 (0.041)	0.053 (0.041)
age			0.028 (0.020)	0.026 (0.020)
age squared			-0.033* (0.018)	-0.031* (0.019)
tenure in the rank			-0.012*** (0.004)	-0.013*** (0.004)
Observations	1,334	1,334	1,334	1,334
R-squared	0.160	0.163	0.190	0.261
Univ FE	N	N	N	Y
SSD FE	Y	Y	Y	Y

Probability of applying  
Associates

	(1)	(2)	(3)	(4)
rec. P	0.035*** (0.004)	0.035*** (0.004)	0.030*** (0.004)	0.031*** (0.004)
rec. P squared	-0.058*** (0.014)	-0.054*** (0.014)	-0.049*** (0.014)	-0.047*** (0.014)
rec. P to the third	0.002* (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)
rec P. X female		-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.002)
female		0.099** (0.044)	0.100** (0.043)	0.109** (0.044)
age			-0.011 (0.019)	-0.013 (0.019)
age squared			0.006 (0.019)	0.009 (0.020)
tenure in the rank			-0.007* (0.004)	-0.009** (0.004)
Observations	1,223	1,223	1,223	1,223
R-squared	0.154	0.160	0.176	0.263
Univ FE	N	N	N	Y
SSD FE	Y	Y	Y	Y

Probability of applying  
Assistants

# Peers

- We tentatively ask whether the probability of applying depends on the productivity of peers
- Peers = scholars in the same university, rank and macro-field (economics, business, statistics)
- Compared to the effect of own productivity, the peer's effect is very small, if any
  - Better peers seems to discourage application among associates, where competition is fiercer.

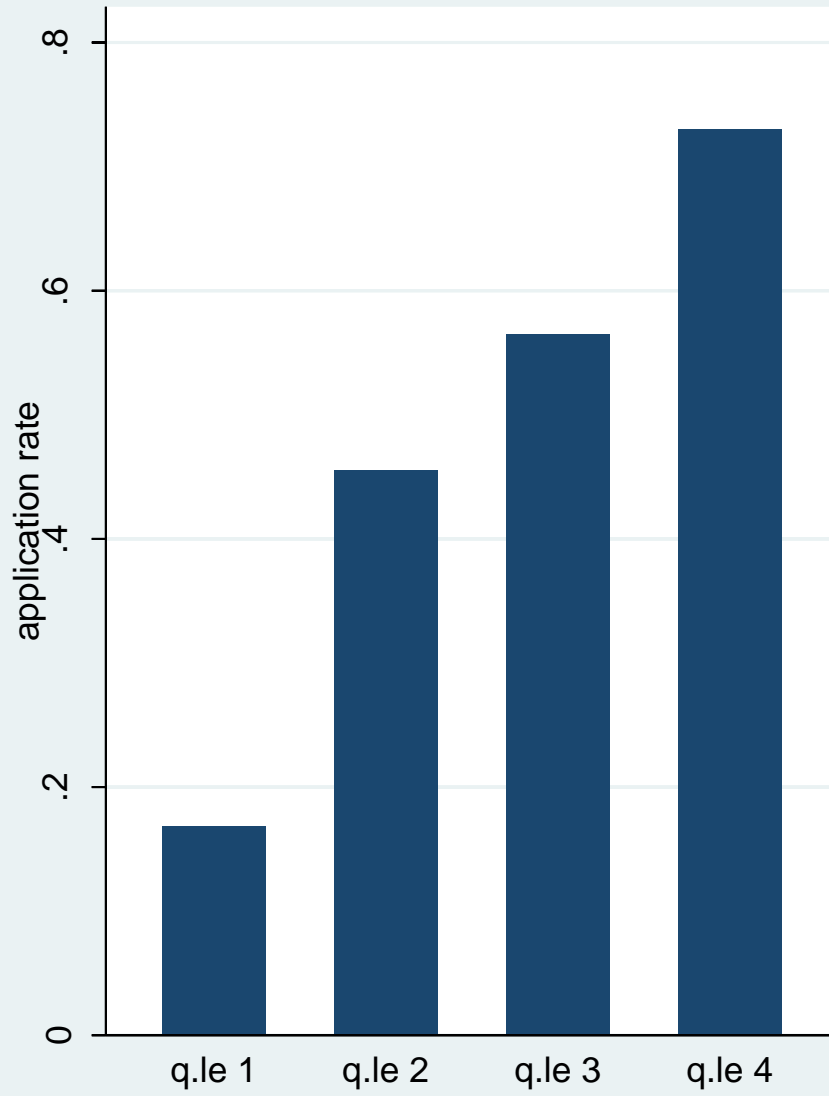
	Associates	Assistants	
rec. P	0.028*** (0.004)	0.030*** (0.004)	Peers: members of the same macro-field (econ, business, stats) of same rank, in the same university
rec. P squared	-0.044*** (0.011)	-0.049*** (0.014)	
rec. P to the third	0.002*** (0.001)	0.002 (0.001)	
Peers' rec. P	-0.005*** (0.002)	0.003 (0.003)	Identification: within university, variation across macro-fields
Singleton	0.091 (0.147)	0.086 (0.144)	
Size of peer group	-0.006 (0.004)	0.002 (0.004)	
Observations	1,334	1,223	
R-squared	0.267	0.263	
controls	Y	Y	
Univ FE	Y	Y	
SSD FE	Y	Y	

# Probability of applying and productivity

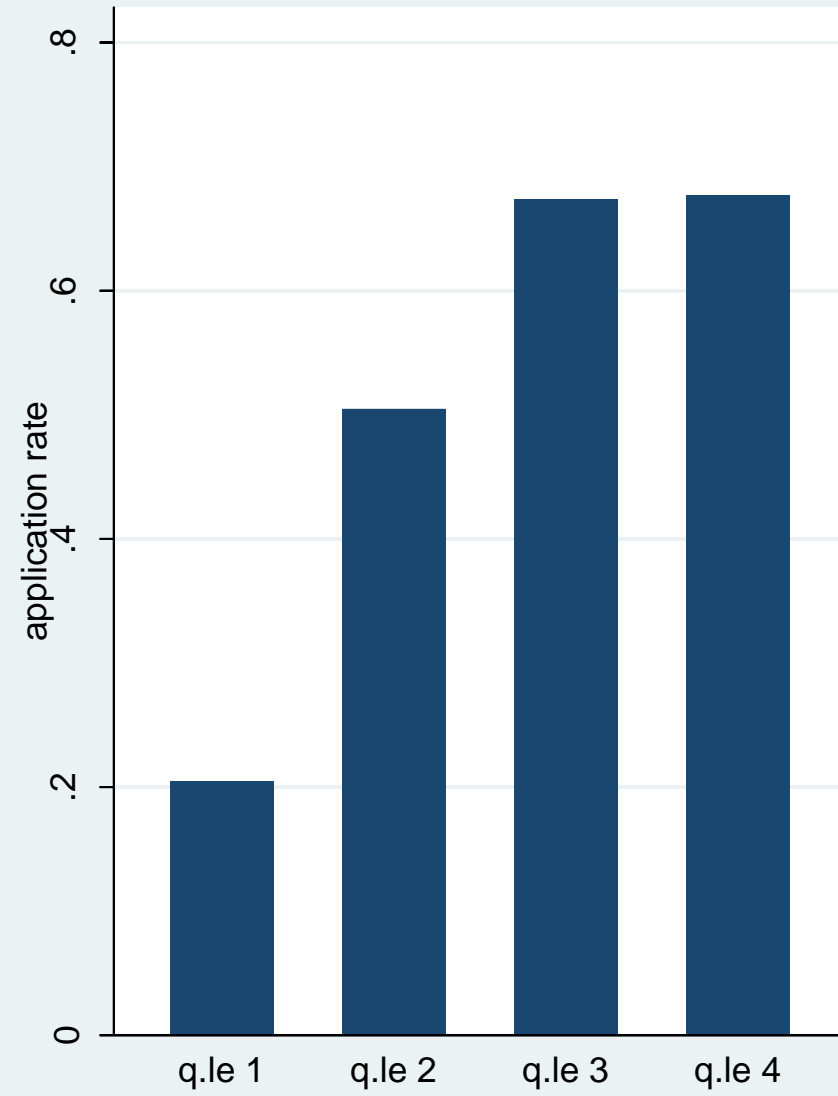
- For each rank and macro-field (economics, business and statistics), we plot the percent of applicants by quartile of the distribution of predicted scores
- More than 40% of associate professors (economics) in the second quartile of performance (awards granted only to top quartile) applied
- Less than 80% of associate professors (economics) in the top quartile applied
- More than 20% of assistant professors (economics) in the first quartile of performance (awards granted to other quartiles) applied
- Less than 70% of assistant professors (economics) in the top quartile applied

# econ

## Associates

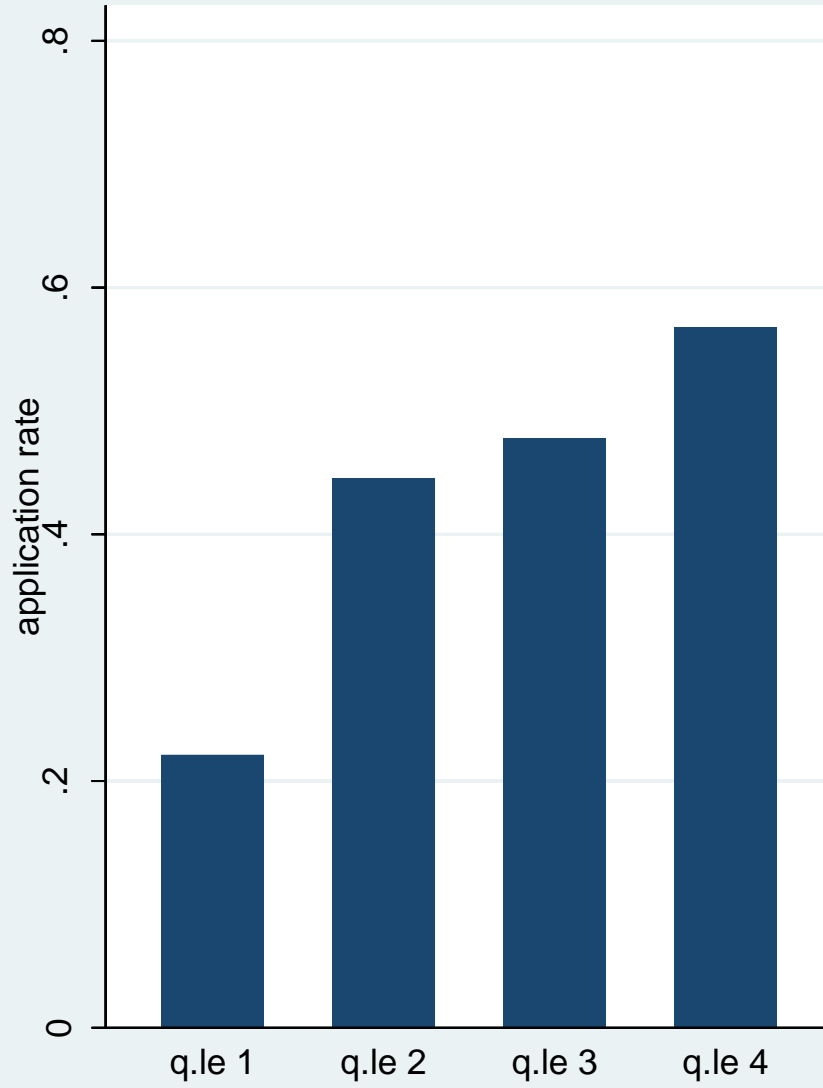


## Assistants

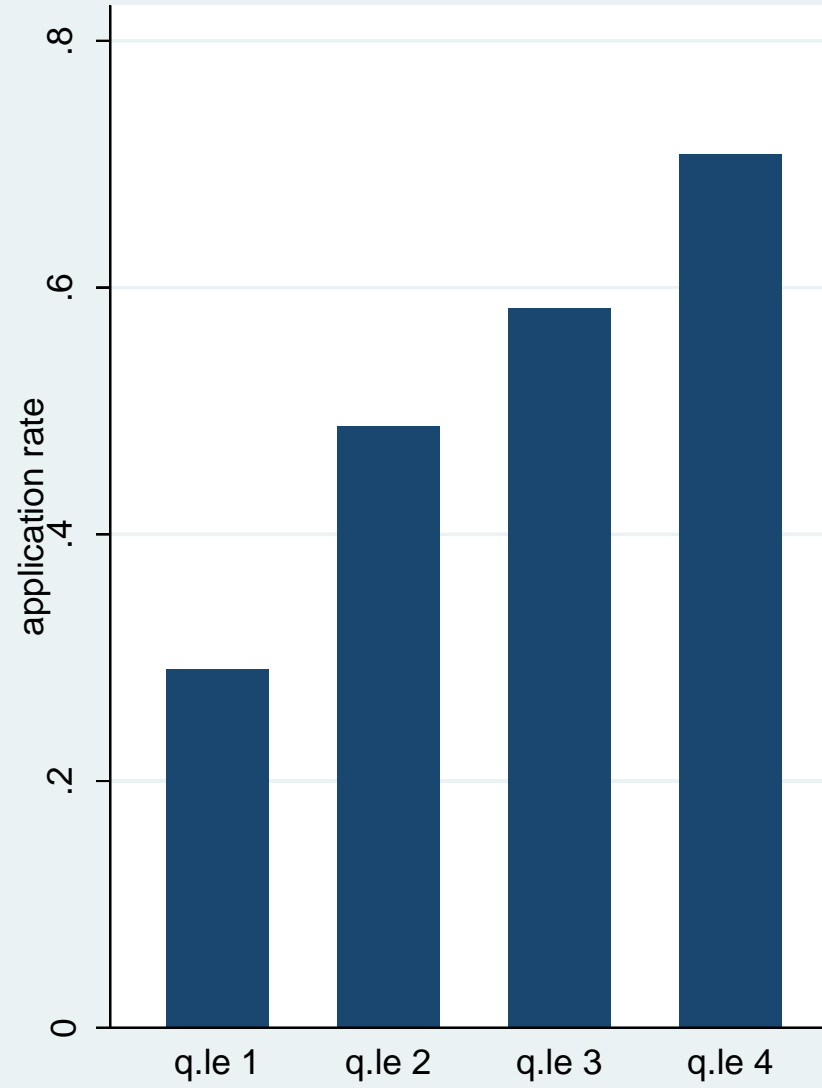


# business

## Associates

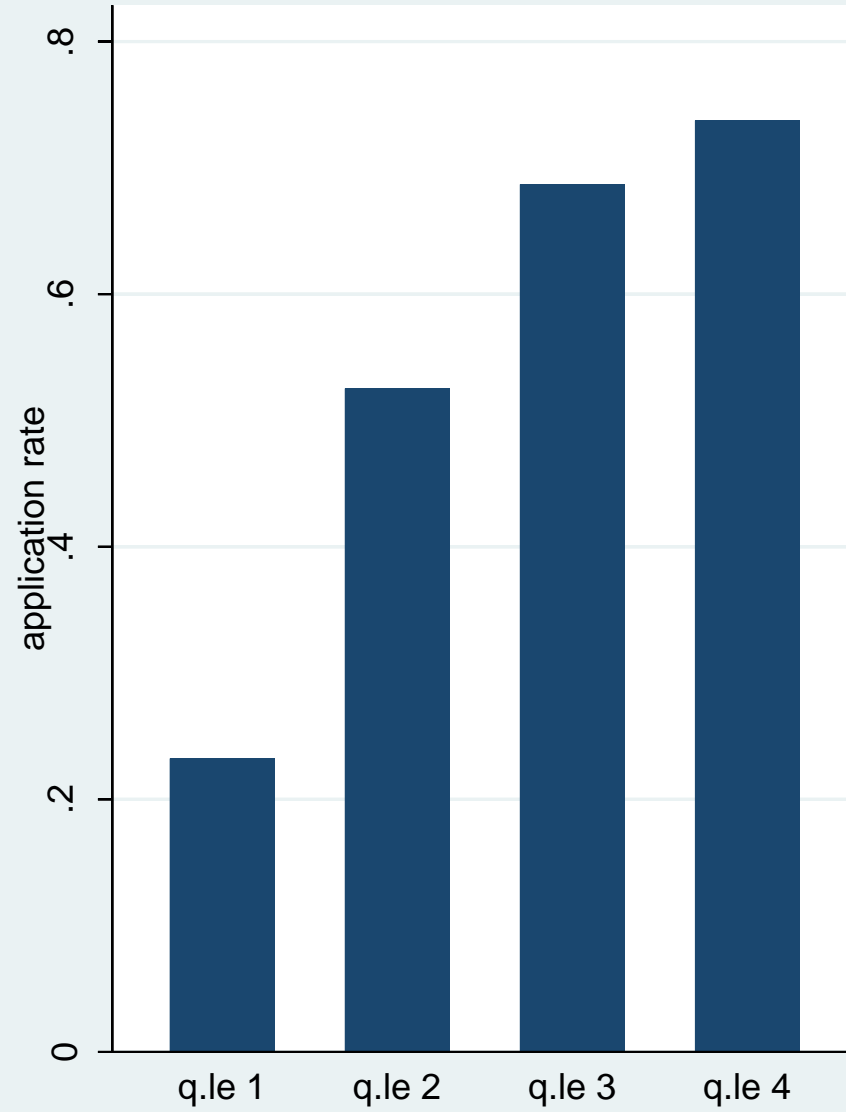


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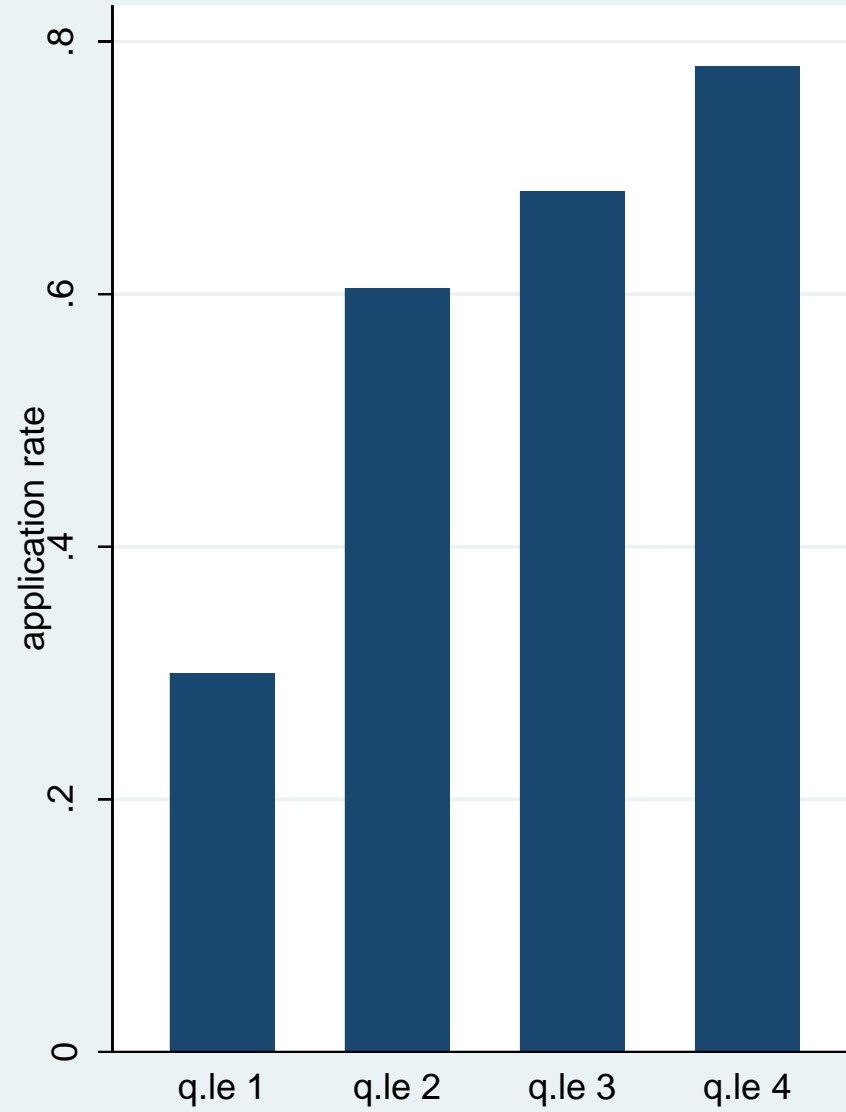


# stats

## Associates



## Assistants

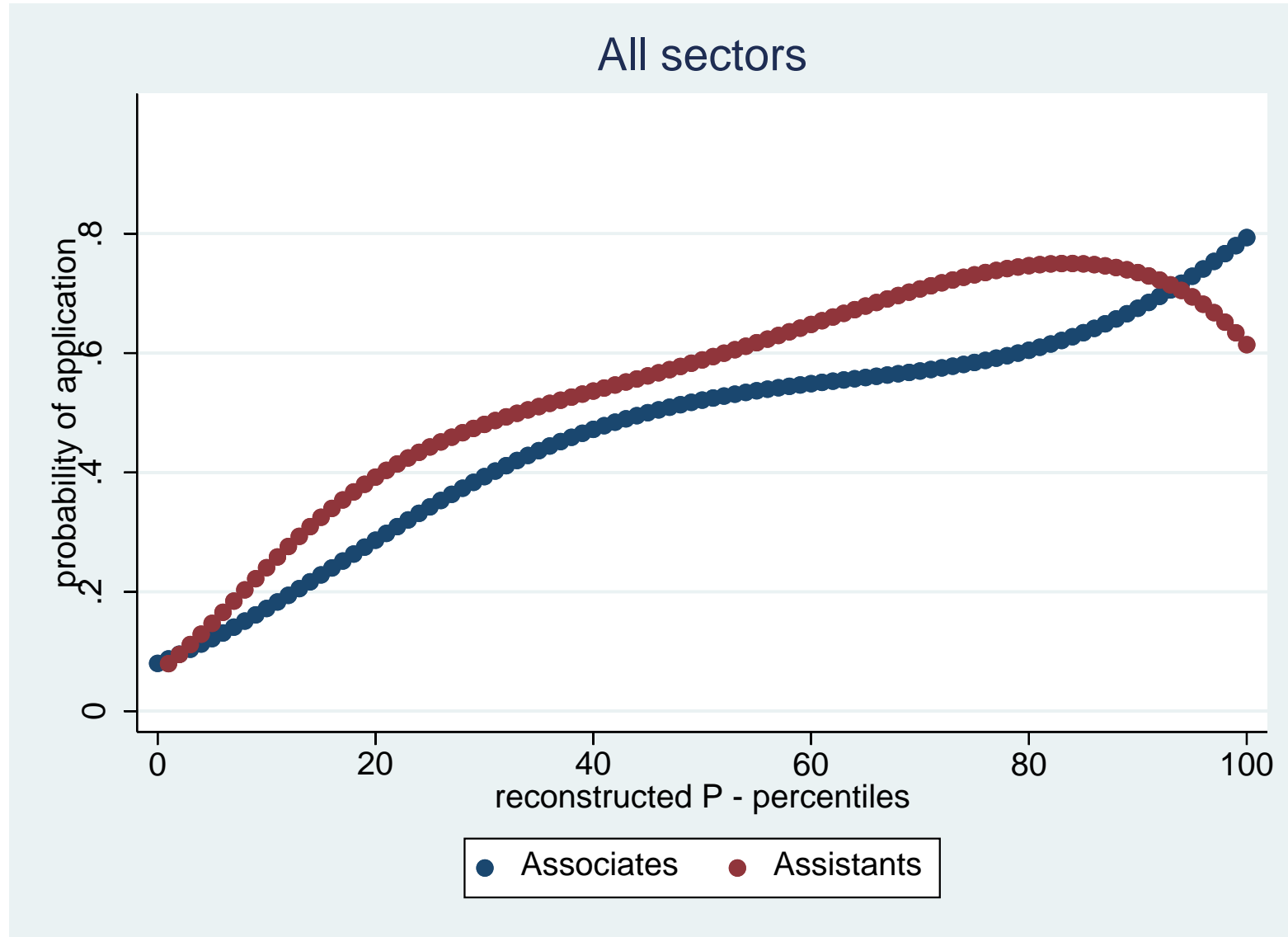




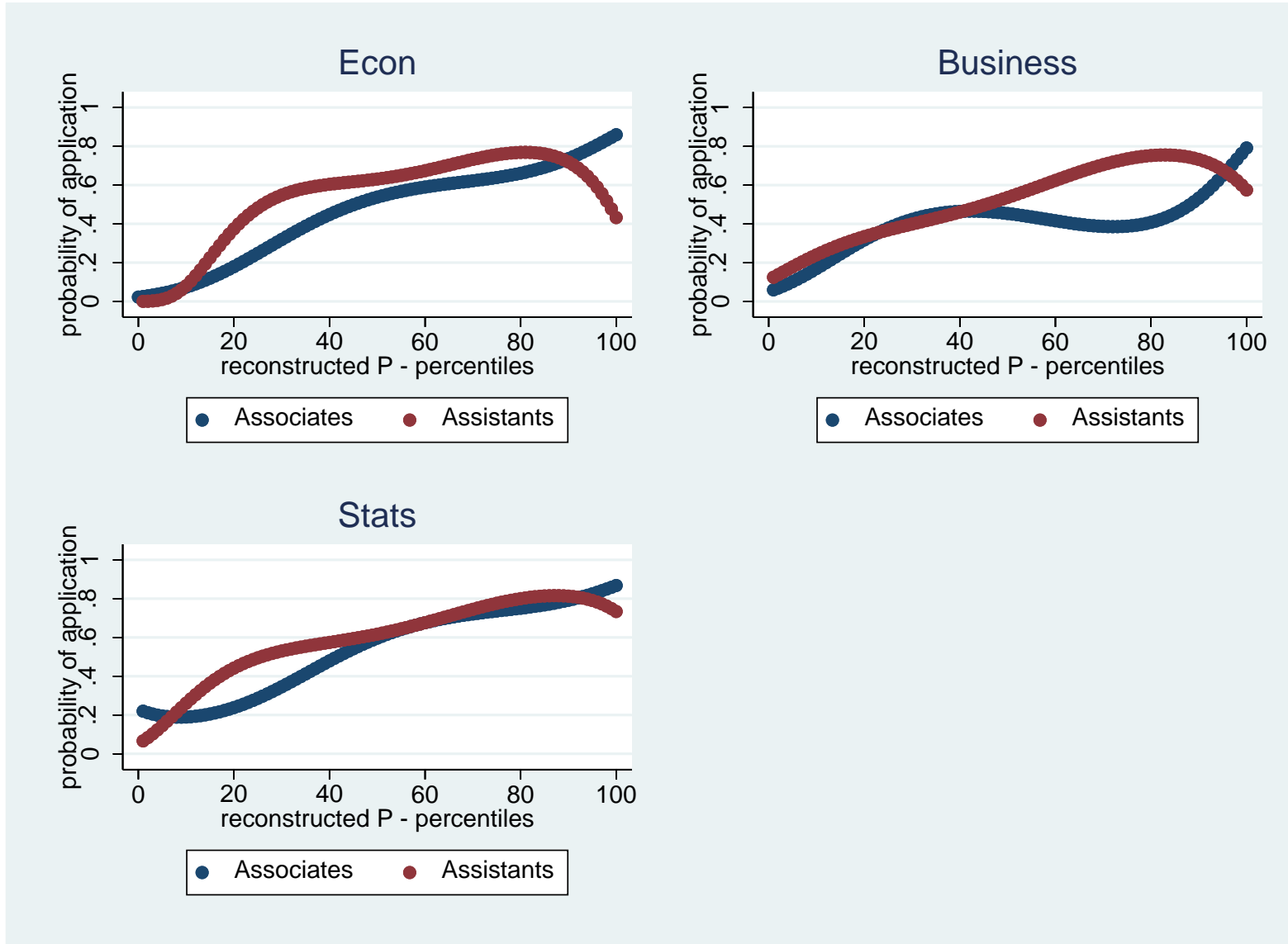
# Empirical issues

- Rather long right tail in the P score distribution
- This is an issue when fitting parametrically the proper functional form
- Do applicants consider the absolute P score or a more relative measure, such as their P score percentile?
- We turn the reconstructed score into percentiles by field and rank

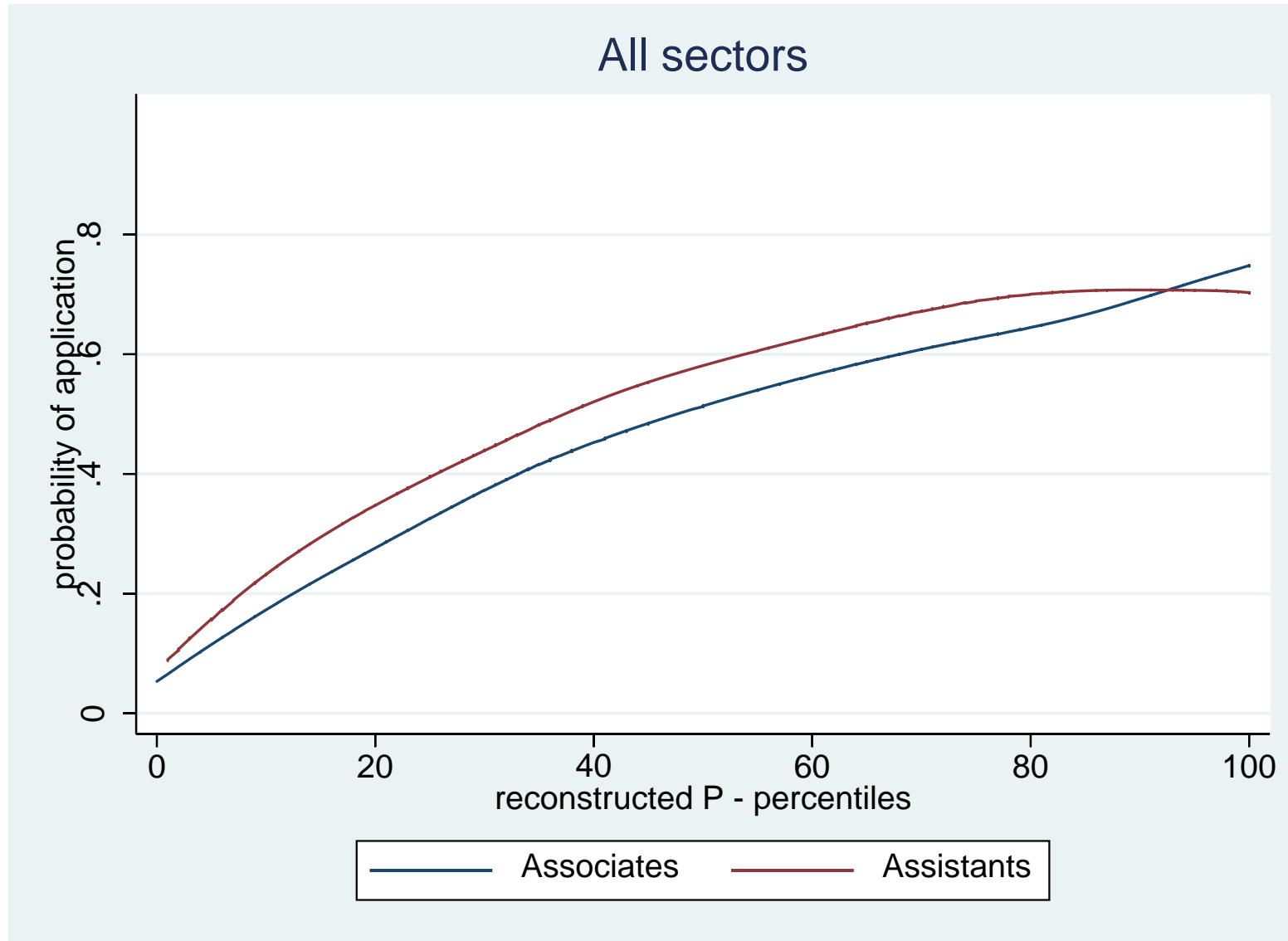
# Parametric – quartic polynomial



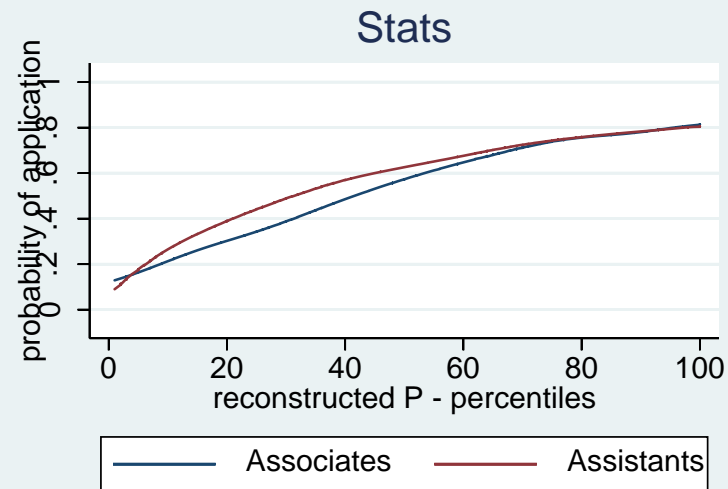
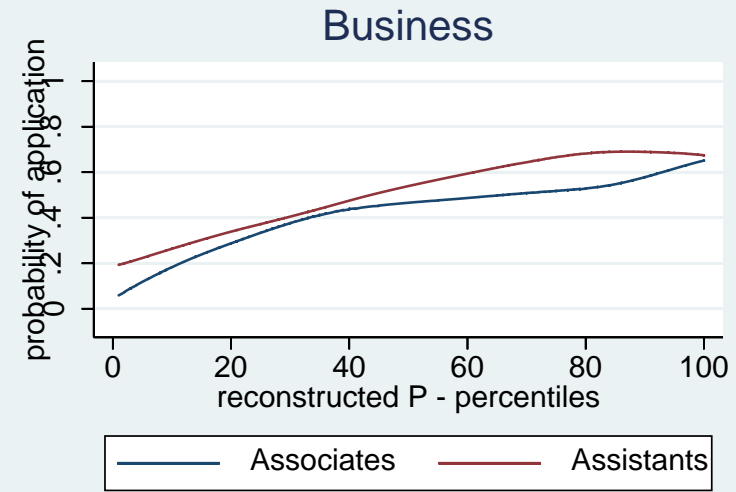
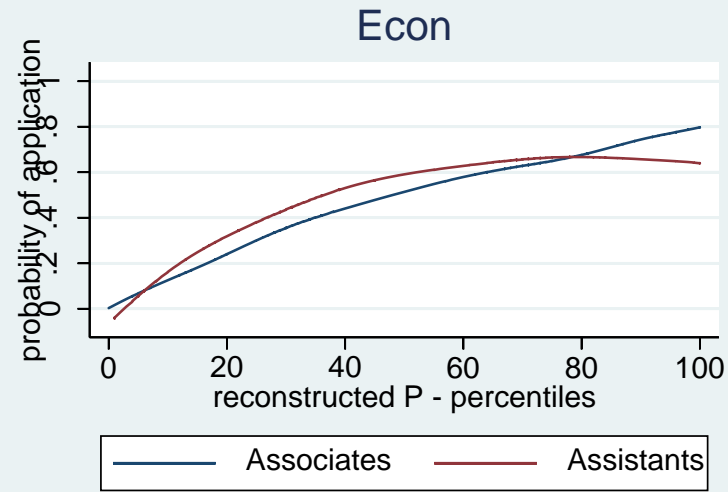
# Parametric – quartic polynomial



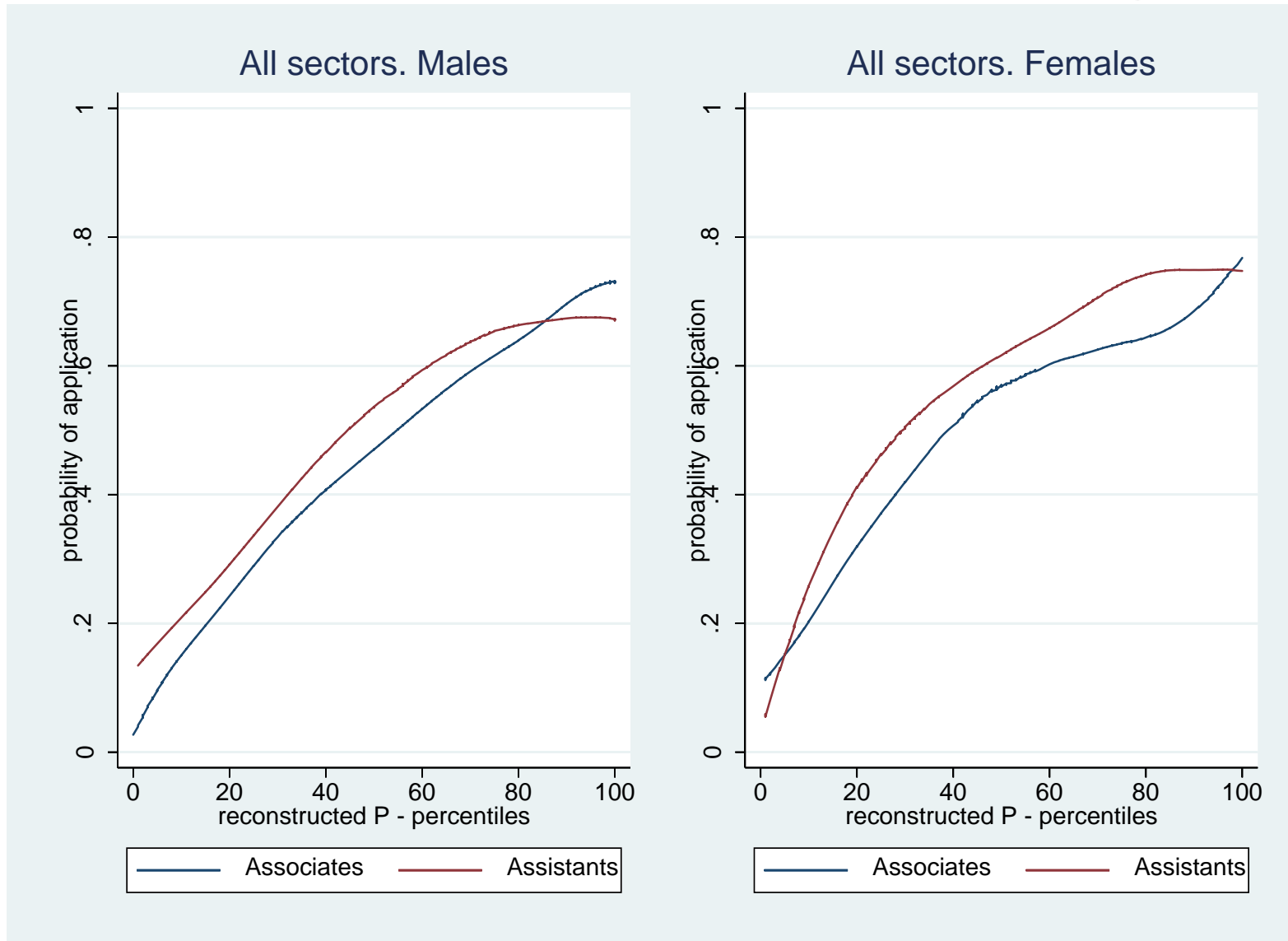
# Non-parametric. Lowess smoothing



# Non-parametric. Lowess smoothing



# Non-parametric. Lowess smoothing



# The cost of applying

- Cost of applying seems trivial
- Yet costs should include
  - reputational concerns (the ranking is made public)
    - These costs are higher for the low performing
  - re-allocating attention from other tasks
    - for the high performing focusing attention on the project requires re-allocating attention from rewarding research
    - for the low performing focusing requires re-allocating time from other rewarding activities (leisure, consulting...)

# Can we explain our results?

- When costs are non-trivial, the low performing will apply if they grossly misjudge the standard or if they are overconfident
- When costs are non-trivial, the high performing may not apply
- The marginal utility of the award may be lower for the high performers who have abundant research grants (but not such as to disqualify them)



# An illustrative model

- $\theta_i$ : individual productivity
- $\theta_i + \gamma_i$ : individual perceived productivity, signal
- $(\theta, \gamma)$  are joint normally distributed
- $S$ : threshold, common knowledge equal for everyone
- An individual applies if  $p(\theta > S | \theta_i + \gamma_i) \times 3000 - c > 0$
- Hence, if  $p(\theta > S | \theta_i + \gamma_i) > \frac{c}{3000}$  all individuals with signal  $\theta_i + \gamma_i$  apply and viceversa.
- Let  $f(\theta + \gamma)$  be the number of individuals with signal  $\theta + \gamma$
- Define  $1_{\theta+\gamma}$  a dummy which indicates if individuals with signal  $\theta + \gamma$  apply
- The application rate of scholars with productivity  $\theta$  is  $\pi(\theta) = \int_{\gamma} f(\theta + \gamma) \times 1_{\theta+\gamma} d\gamma$

# An illustrative model

- For given  $\theta, S, c$  there is a  $\bar{\gamma}(\theta, S, c)$  such that for  $\gamma > \bar{\gamma}(\theta, S, c)$  all individuals with signal  $\theta + \gamma$  apply
  - Intuition: when the signal is optimistic enough, people apply.
- Hence the application rate is
- $$\pi(\theta) = \int_{\gamma > \bar{\gamma}(\theta, S, c)} f(\theta + \gamma) d\gamma = 1 - \Phi(\theta + \bar{\gamma}(\theta, S, c))$$
- Implications:
  - $\theta + \bar{\gamma}(\theta, S, c)$  decreases with  $\theta \rightarrow \pi(\theta)$  increases with  $\theta$  (normality assumption)
  - $\bar{\gamma}(\theta, S, c)$  increases with  $S \rightarrow \pi(\theta)$  decreases with  $S$
  - $\bar{\gamma}(\theta, S, c)$  increases with  $c \rightarrow \pi(\theta)$  decreases with  $c$ 
    - $\pi(\theta)$  will never be 1

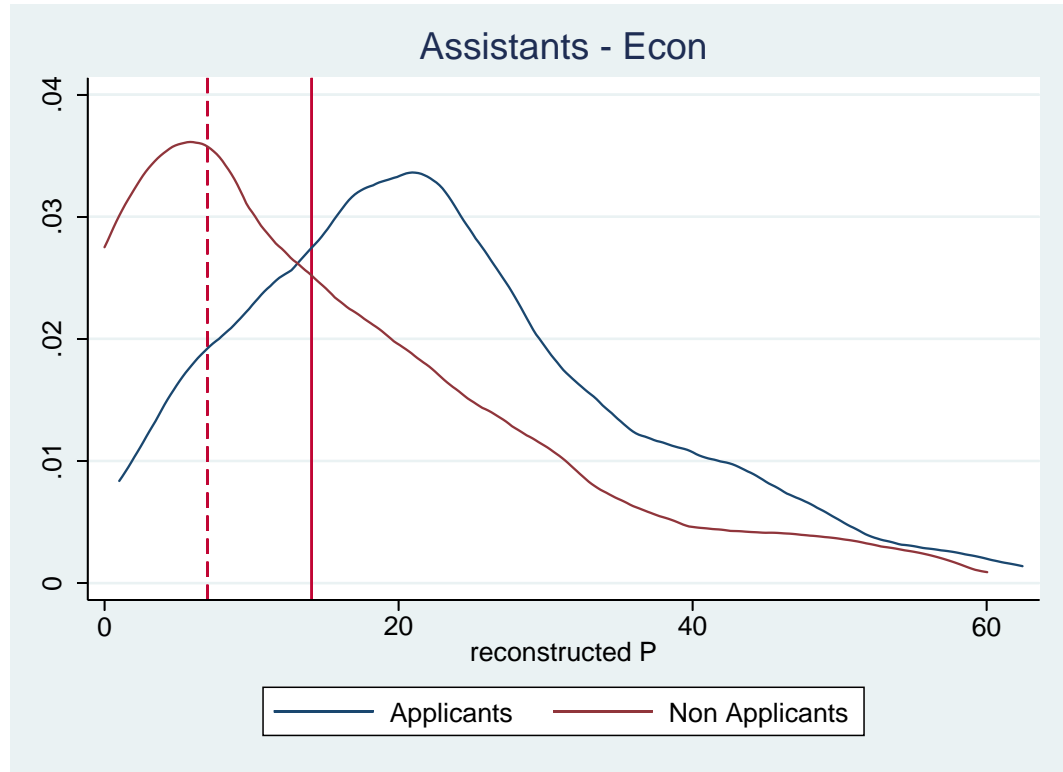
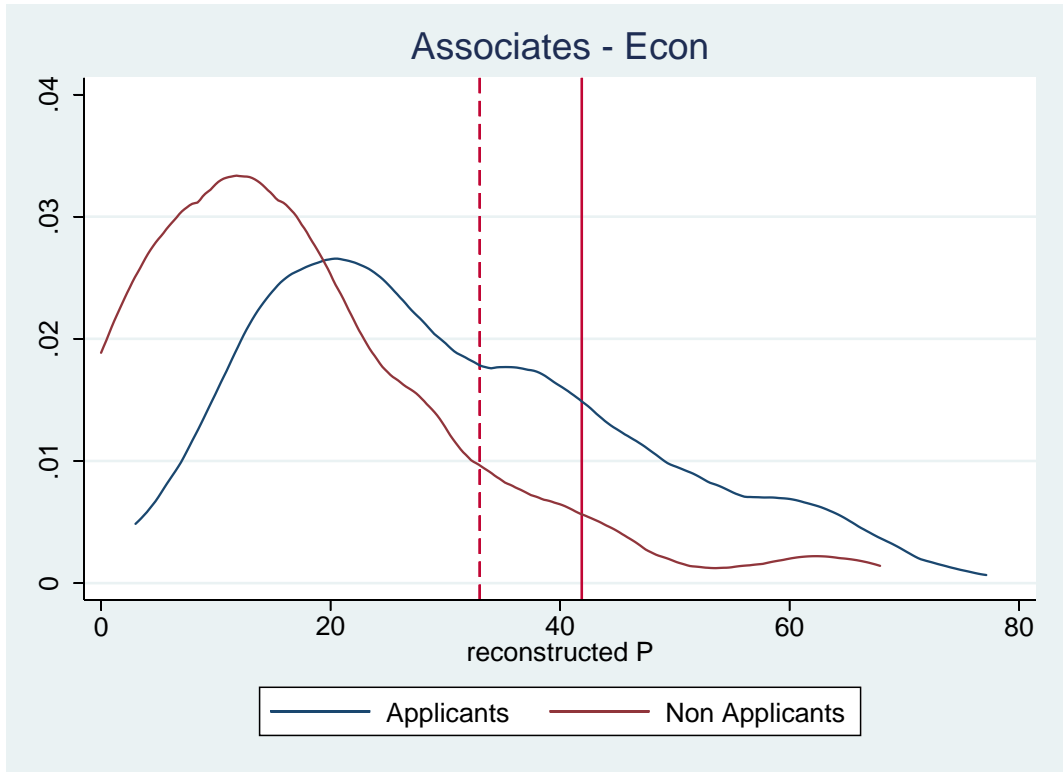
# An illustrative model

- The model can be enriched by allowing  $c$  to vary across individuals or by letting the marginal utility of research funds vary across researchers.
  - E.g.  $u(X_i(\theta_i) + 3000)$

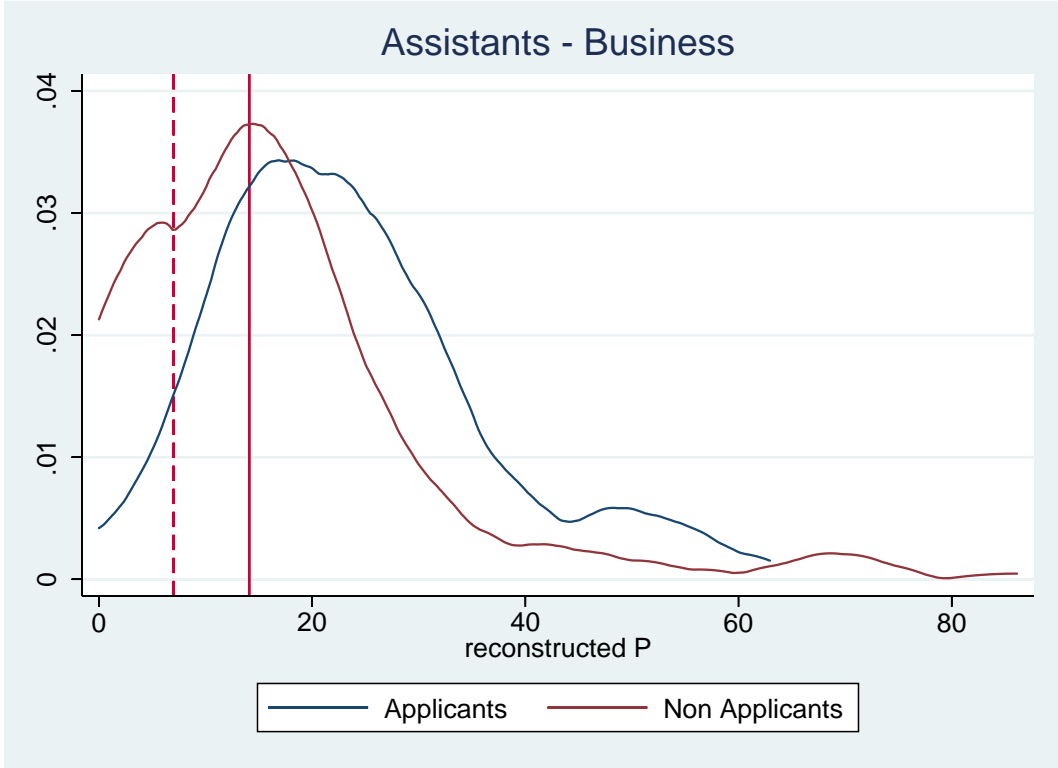
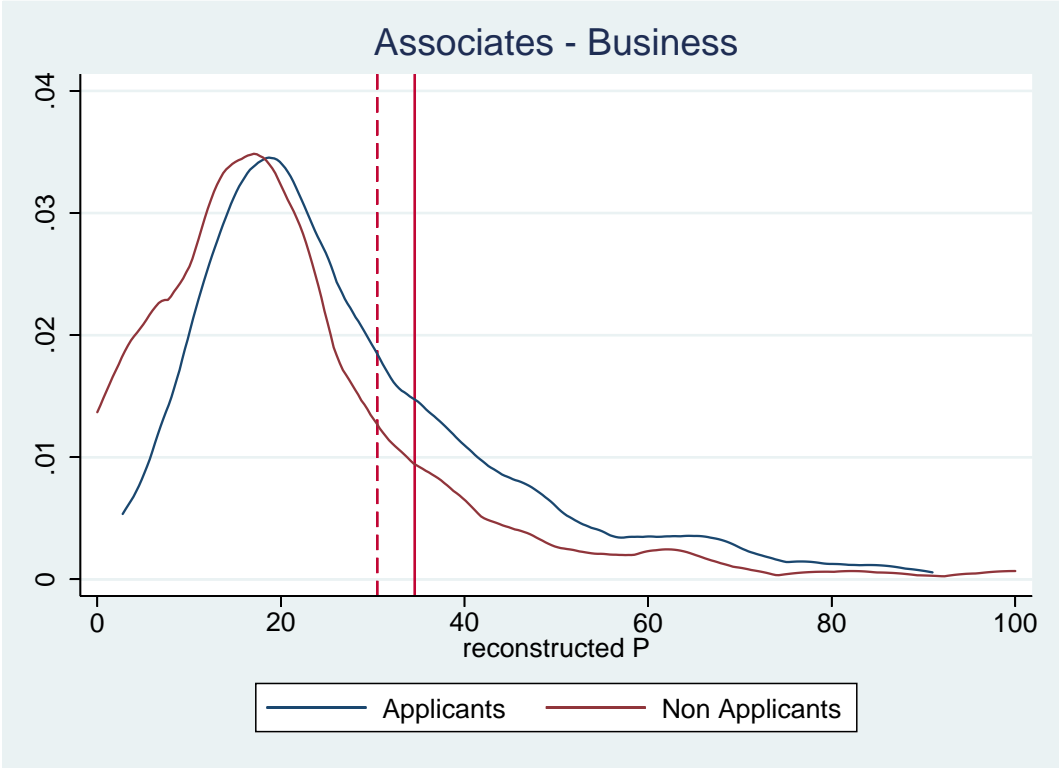
# Policy design: Setting the threshold

- Two alternatives:
  - The threshold score is set by considering all professors who could apply
  - The threshold score is set by considering only the professors who applied
- The second option was chosen. Implications:
  - The threshold depends on the number and quality of applicants
  - When low performing professors do not apply, the threshold increases
  - When high performing professors do not apply, the threshold declines

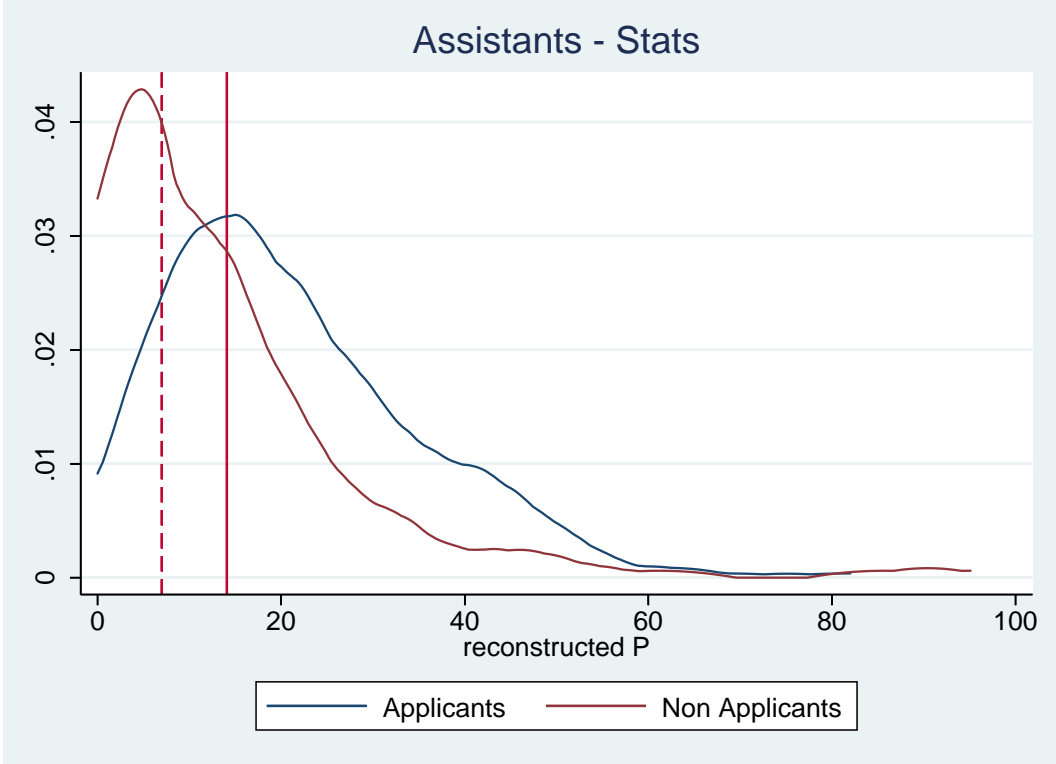
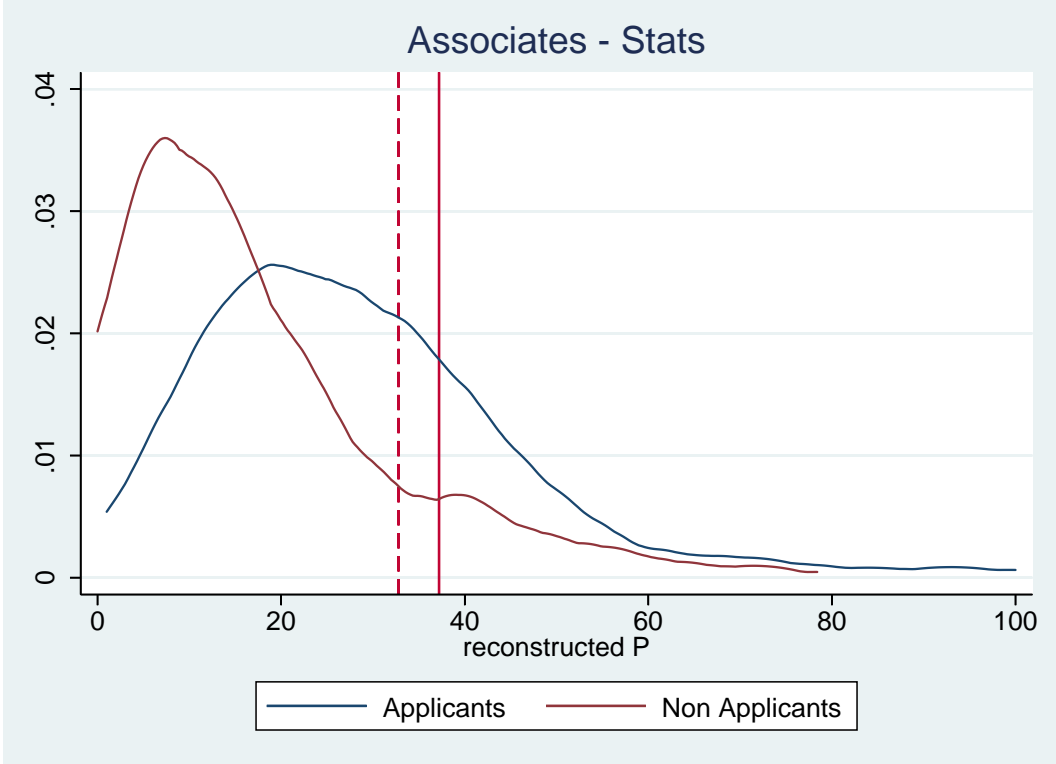
# The threshold if everyone applied



# The threshold if everyone applied



# The threshold if everyone applied



# Application-based vs universal enrolment

- Simplest procedure: universal enrolment, ex lege
  - Guarantees that funds flow to the most productive
  - Is it first best? Expensive and non necessarily utility maximising
- Actual procedure:
  - More complicated to organize and manage (inform, remind, interact...)
  - Not necessarily funds go to the most productive
  - But
    - Those who do not apply reveal that their marginal utility for research funds is small – hence research money does not go to the most productive but to those who value it more
    - If many do not apply, public funds are saved



# Application-based vs universal enrolment

- Intermediate procedure: application-based, but thresholds defined over the universe. All applicants with a score above the thresholds are funded
  - Same advantages and disadvantages as before, but more applicants are funded although fewer public funds are saved

# Concluding remarks

- Given the often claimed scarcity of research funds and the small cost of application, the low application rate is puzzling
  - had they applied, about 50 percent of the non-applicant assistant professors would have been funded
  - more so, if they applied in mass
- Why did people leave 3000 euro on the sidewalk?
  - The marginal utility of research funds is low?
    - The often voiced view that research funds are scarce is not justified
    - These euro can only be spent for research, different from 3000 euro in the paycheck
  - Have they forgot?
    - Those with low marginal utility are more likely to forget...
  - Insufficient information?
  - Afraid of not receiving the award?
    - Information could be made public at some stage...

Thank you!