In And Out Of Unemployment - Labour Market Dynamics And The Role Of Testosterone

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Introduction

The paper in a nutshell

- 'Joblessness leaves permanent scars on individuals' (Arulampalam, 2001, p. 585)
  - *Observable factors* (individual or household characteristics, past unemployment experience,...)
  - *personality traits and non-cognitive skills* (locus of control, the Big 5 personality traits,...)
- Hormones:
  - testosterone linked to risk-attitude and aggression, motivation, pro-social behaviour
  - Predictor for men's labour market performance
  - Affect occupational choice
- In this paper: **Testosterone $\Longleftrightarrow$ Entering unemployment and re-entering employment**

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- Data: *Understanding Society* $\Longleftrightarrow$ *Health and biomarkers Survey*
- Two samples of initially employed and initially unemployed men aged 20 to 60
- Findings:
  - *Unemployed men*: risk of remaining unemployed significantly declines in the level of testosterone
  - *Employed men*: risk of becoming unemployed significantly higher for men with high level of testosterone
  - Robust against various specifications

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Literature review

Existing literature

Testosterone plays a role across various dimensions

- Health issues (e.g., cardiovascular disease)
- Demographic outcomes (e.g.,fertility, divorce and mating)
- Labour market outcome
  - Higher earnings after prolonged prenatal testosterone exposure
  - Education to be lower among people with low testosterone levels
  - Choice of occupation:
    low testosterone $\rightarrow$ people-oriented jobs
    high testosterone individuals $\rightarrow$ things-oriented jobs

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Testosterone and non-cognitive skills / individual characteristics:

- Association with risk-taking, dominant behaviour and aggression
- But also status-enhancing pro-social behaviour
- More willing to engage in competitive tasks and they showed more persistence solving an undo-able task
- Positive association with numeric capabilities
- perform better in face-to-face situations

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Testosterone and employment dynamics:

- Higher testosterone levels associated with pro-social behaviour $\rightarrow$ larger social networks
- Job search (assessment centres/job interviews) might favour competitive, dominant and pro-social individuals
- In employment, employers learn about their employees' productivity $\rightarrow$ competition-seeking and dominant behaviour may become less critical
- Men with low testosterone tend to be more risk-averse $\rightarrow$ prefer jobs that offer more stability

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What we expect:

1. Individuals with high testosterone levels are more likely to leave unemployment
2. Employed individuals with high testosterone levels face a greater risk of unemployment

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2. Employed individuals with high testosterone levels face a greater risk of unemployment

Data

Health and biomarkers Survey

- Spine: *Understanding Society* data
  - Started in 2009 with 9 waves available
  - 40,000 households at Wave 1 with a range of individual- and household-related information
- 5 months after their Wave 2 or Wave 3 (2010-2013) $\rightarrow$ 20,000 adults received health assessment visit from a registered nurse (*Health and biomarkers survey*)
- Blood samples were taken to extract a range of biomarker data, including measures of growth hormones (testosterone, DHEA's, IGF-1).

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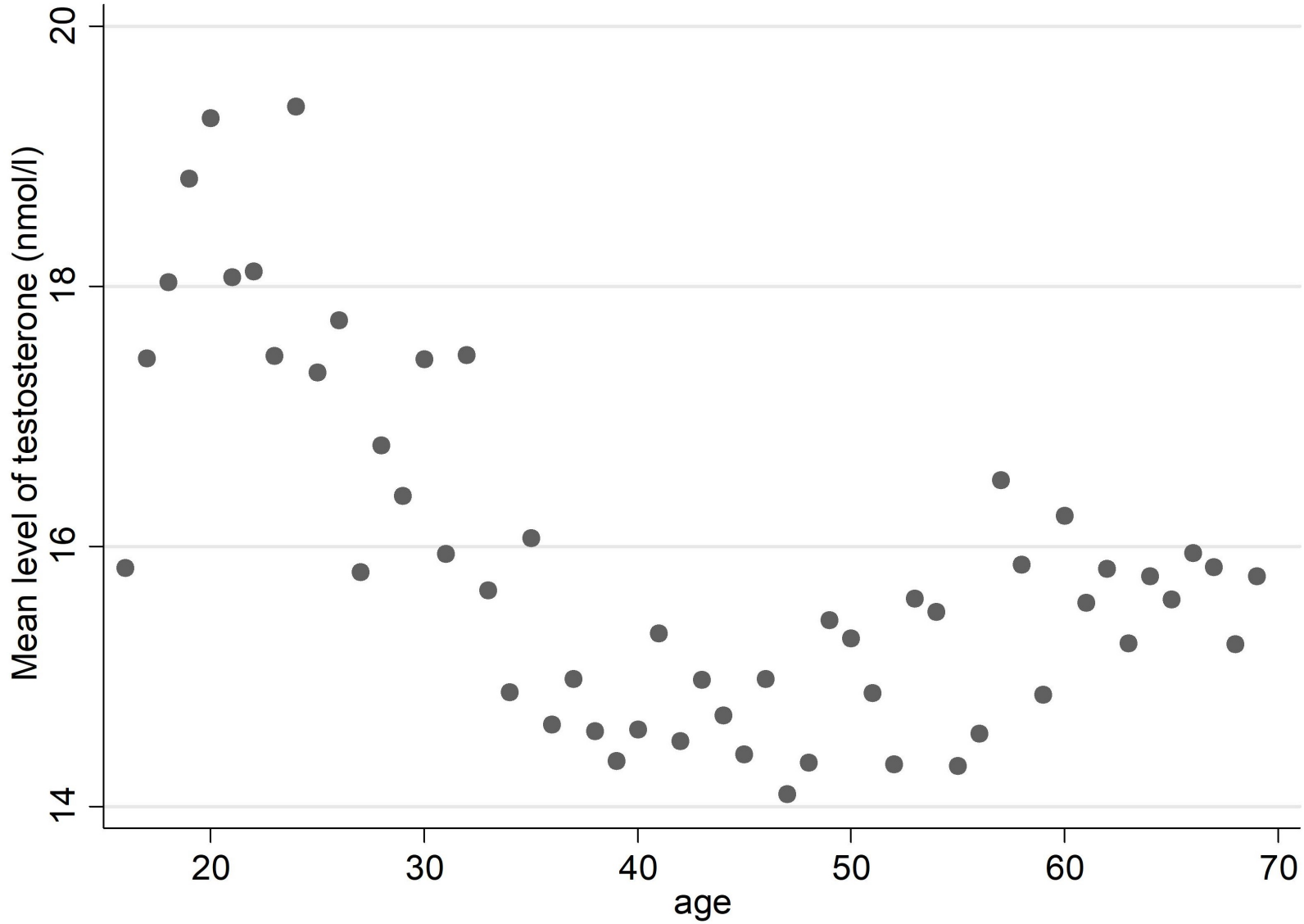
Data

Table: Level of testosterone (nmol/l) and interview time

The start time of the interview (hour)	Testosterone (nmol/l) Mean	Std Dev
9	17.50	6.31
10	17.68	5.87
11	17.38	6.25
12	17.31	6.03
13	16.05	6.48
14	16.05	5.76
15	14.49	5.39
16	14.83	5.62
17	15.14	5.21
18	14.64	5.52
19	14.06	4.94
20	13.24	4.42

Data

Figure: Level of testosterone (nmol/l) and age



Data

Longitudinal data

Dataset preparation:

1. *Health and biomarker Survey* $\rightarrow$ men aged between 20 and 60 and unemployed (N=109) or, if employed, an employee (N=1,771)
2. Merge with *Understanding Society*
3. Keep those individuals who have not changed their position between the nurse visit and the first pre-period
4. For $t = -2$, we allow the individuals to be either employed or unemployed

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Table: Database and number of days between consecutive interviews

		Days until the next interview	
	Period t	Mean	Std Dev
Primary survey	-2	366	23
Primary survey	-1	151	25
Health and biomarkers survey	0	217	30
Primary survey	1	369	36
Primary survey	2	377	82
Primary survey	3	-	-

Methodology

Dynamic reduced-form model:

$$y_{it} = 1\left(\alpha_1 y_{it-1} + x'_{it=0}\beta + \nu_i + \epsilon_{it}\right) \tag{1}$$

where $i = 1, \ldots, N$ are individuals, $t = 1, \ldots, T$ refer to the waves and $y_{it} = 1$ if i was unemployed at wave t and 0 otherwise.

- covariates: age (linear and second order polynomial), highest qualification, self-rated health, region, urban identifier, household size, long-term disability and legal marital status.
- $\nu_i \sim iid\ N(0, \sigma_\nu^2)$ and $\nu_i \perp x_{it=0}, \epsilon_{it} \forall i, t$

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Methodology

Employment sequences in the pre-periods

Four possible combinations

- Employed:
  - Continuously employed ($y^1_{it=0}$): $y_{it=-2} = y_{it=-1} = 0$
  - Short-term employed ($y^2_{it=0}$): $y_{it=-2} = 0$ and $y_{it=-1} = 1$
- Unemployed:
  - Continuously unemployed ($y^3_{it=0}$): $y_{it=-2} = y_{it=-1} = 1$
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Methodology

Individual-specific error term ν_i takes the following form (see Wooldridge, 2005):

$$\nu_i = \sum_{r=2}^{4} \lambda_r y_{it=0}^r + a_0 + \alpha_i \tag{2}$$

Plugging (2) into the original specification (1) results in:

$$y_{it} = 1\left(\alpha_1 y_{it-1} + x_{it=0}'\beta + \sum_{r=2}^{4} \lambda_r y_{it=0}^r + a_0 + \alpha_i + \epsilon_{it}\right) \tag{3}$$

Methodology

Interaction model:

$$y_{it} = 1\Bigg(\sum_{r=2}^{4} \gamma_r y_{it=0}^{r} \left(y_{it-1} = 0\right) + \sum_{r=1}^{4} {}_r y_{it=0}^{r} \left(y_{it-1} = 1\right) + x_{it=0}'\beta + \sum_{r=2}^{4} \lambda_r y_{it=0}^{r} + a_0 + \alpha_i + \epsilon_{it} \Bigg) \quad (4)$$

Methodology

Including testosterone as a covariate:

- *Model 1:* include the absolute level of testosterone (nmol/l) as a covariate and control for the hour of the nurse visit
- *Model 2:* include absolute level of testosterone as a second-degree polynomial
- *Model 3:*
  1. Health and biomarkers Survey to construct a sample of men with a positive level of testosterone in the age range 16 to 70 who had their interview started between 9 am and 8 pm
  2. OLS model to estimate the deviation from the time- and age-corrected mean
  3. Three groups: (i) lowest decile, (ii) 2^{nd} to 9^{th} decile, (iii) 10^{th} decile

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Descriptives

	Full Sample	Initially unemployed	Initially employed	t-test (p-value)
Testosterone (nmol/l)	15.24	16.67	15.15	0.0057
	(5.60)	(6.89)	(5.50)	
Testosterone (categorical)				
1st decile	10.59	14.68	10.33	0.1525
2nd – 9th decile	80.16	70.64	80.75	0.0102
10th decile	9.26	14.68	8.92	0.0441
Age	43.71	43.13	43.75	0.5279
	(9.95)	(11.75)	(9.83)	
Highest qualification				
Degree	29.95	16.51	30.77	0.0016
Other higher degree	11.76	10.09	11.86	0.5787
A-level etc	23.62	17.43	24.00	0.1173
GCSE etc	22.07	28.44	21.68	0.0988
Other qualification	8.4	11.93	8.19	0.1722
No qualification	4.2	15.60	3.50	0.0000

Descriptives

Table: Unemployment risk differentiated according to testosterone level

Testosterone (categorical)	Full Sample	Initially unemployed	Initially employed
$\text{unemployed}_t \vert \text{unemployed}_{t-1}$			
1st decile	74.42	86.49	-
2nd – 9th decile	59.90	70.00	33.33
10th decile	70.59	81.58	38.46
$\text{unemployed}_t \vert \text{employed}_{t-1}$			
1st decile	1.30	12.50	1.13
2nd – 9th decile	1.73	8.70	1.61
10th decile	3.78	14.29	3.61

Results

Base regression

Model	Full Sample (1)	(2)	(3)
testosterone nmol/l	0.0167	-0.0273	
	(0.0127)	(0.0502)	
(testosterone nmol/l)^2		0.00123	
		(0.00136)	
testosterone			
1st decile		reference category	
2nd – 9th decile			-0.132
			(0.242)
10th decile			0.355
			(0.299)
Observations	5,460	5,460	5,460
LogLikelihood	-556	-555.6	-559.7

Results

Base regression

	Initially unemployed		
Model	(1)	(2)	(3)
testosterone nmol/l	-0.0843*	-0.274*	
	(0.0443)	(0.165)	
(testosterone nmol/l)^2		0.00524	
		(0.00417)	
testosterone			
1st decile		reference category	
2nd – 9th decile			-2.027**
			(0.812)
10th decile			-2.331**
			(1.001)
Observations	309	309	309
LogLikelihood	-93.76	-92.90	-98.25

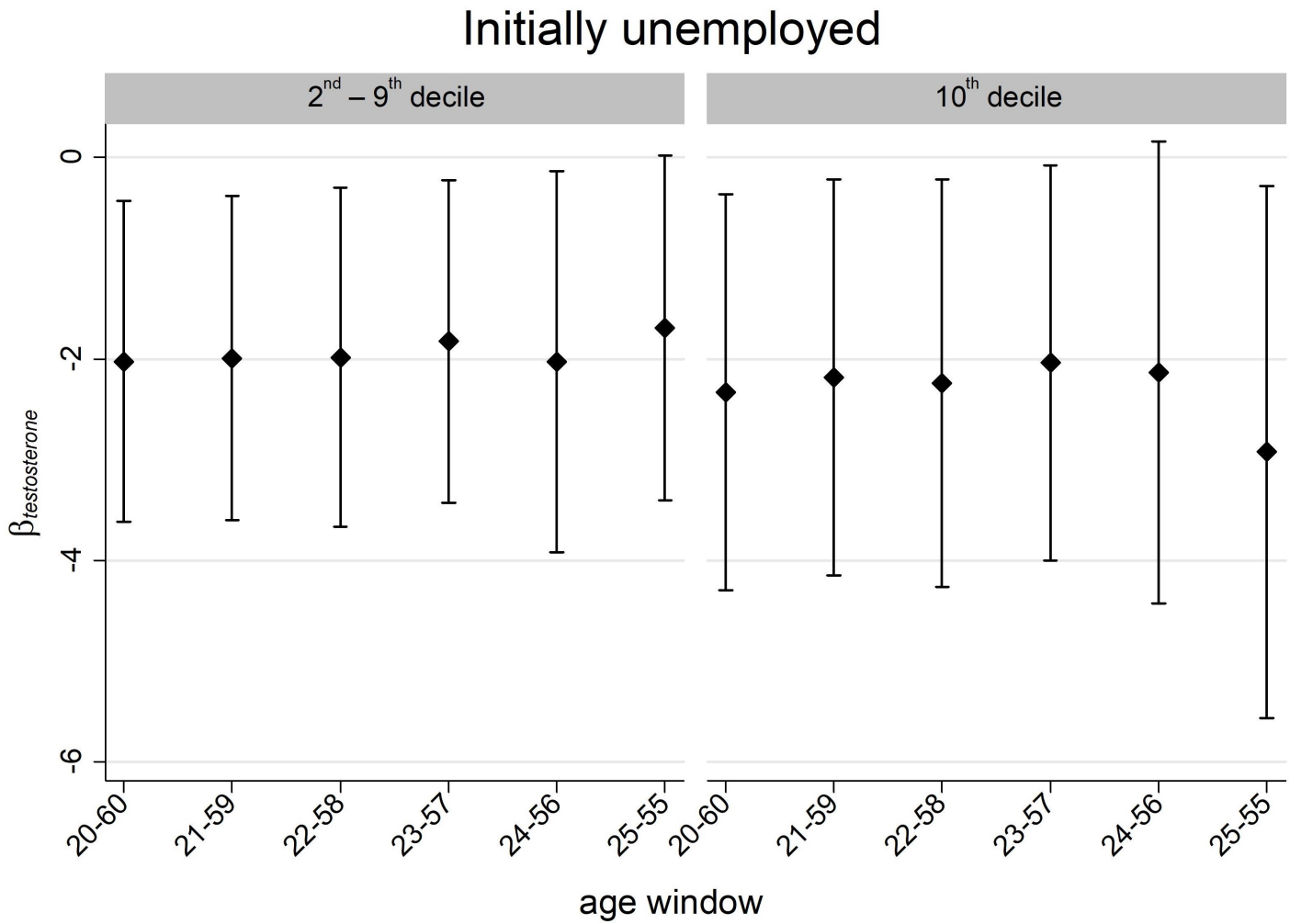
Results

Base regression

	Initially employed		
Model	(1)	(2)	(3)
testosterone nmol/l	0.0270*	-0.006	
	(0.0138)	(0.052)	
(testosterone nmol/l)^2		0.001	
		(0.001)	
testosterone			
1st decile	reference category		
2nd – 9th decile			0.162
			(0.274)
10th decile			0.622*
			(0.339)
Observations	5,151	5,151	5,151
LogLikelihood	-435.9	-435.6	-438.8

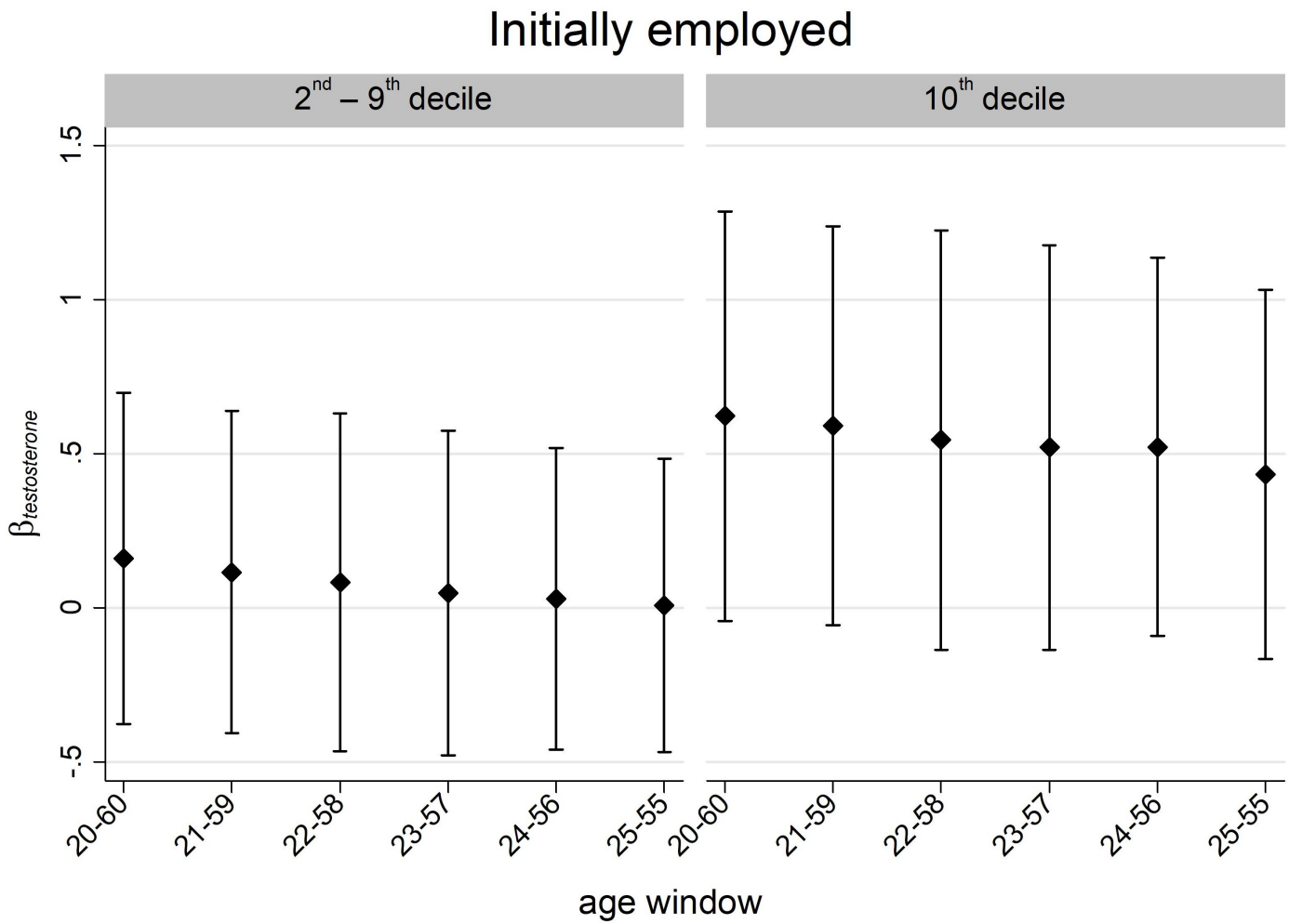
Robustness checks

Figure: Robustness check for different age ranges



Robustness checks

Figure: Robustness check for different age ranges



Robustness checks

Figure: Robustness check for different testosterone cut-off points

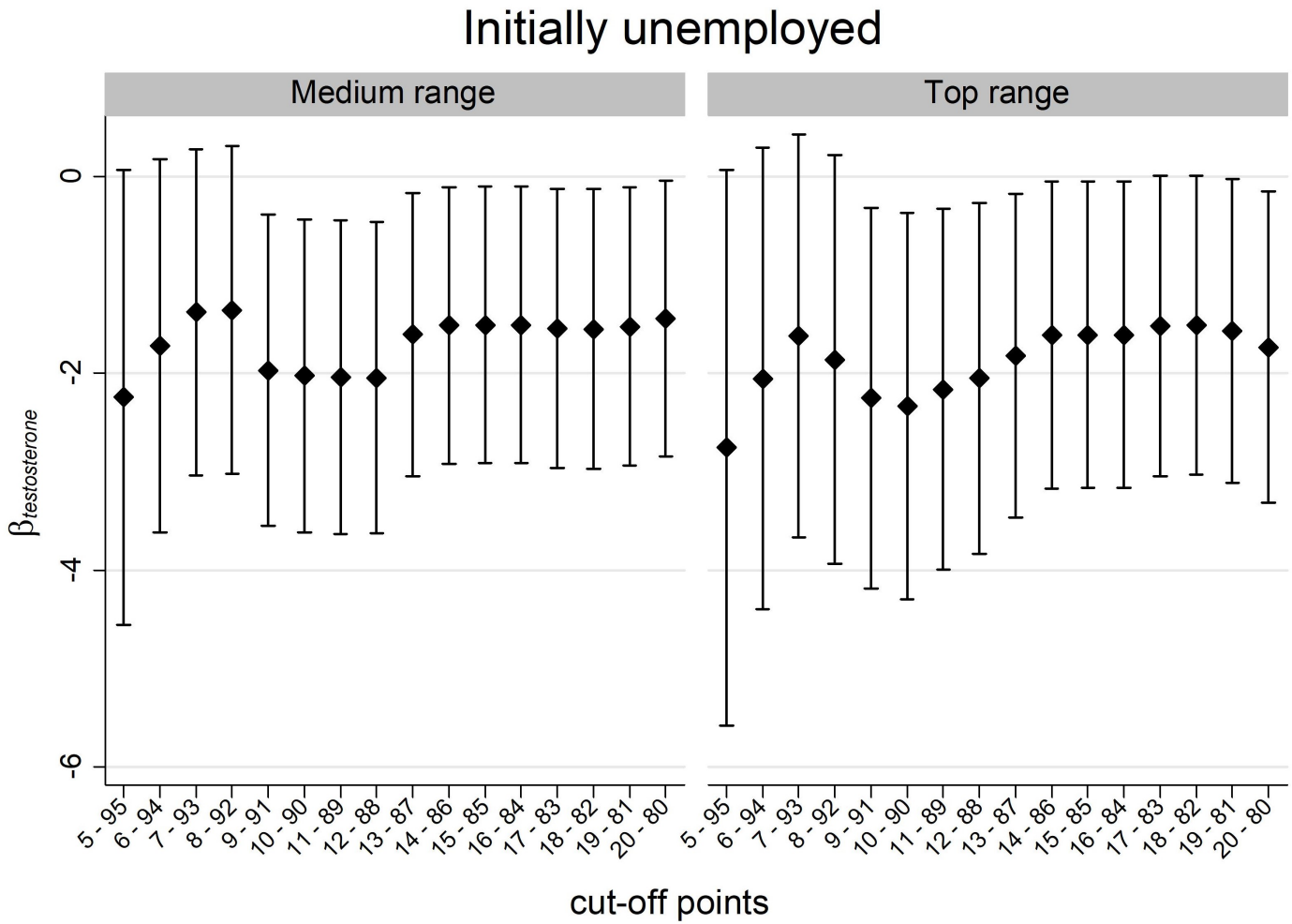


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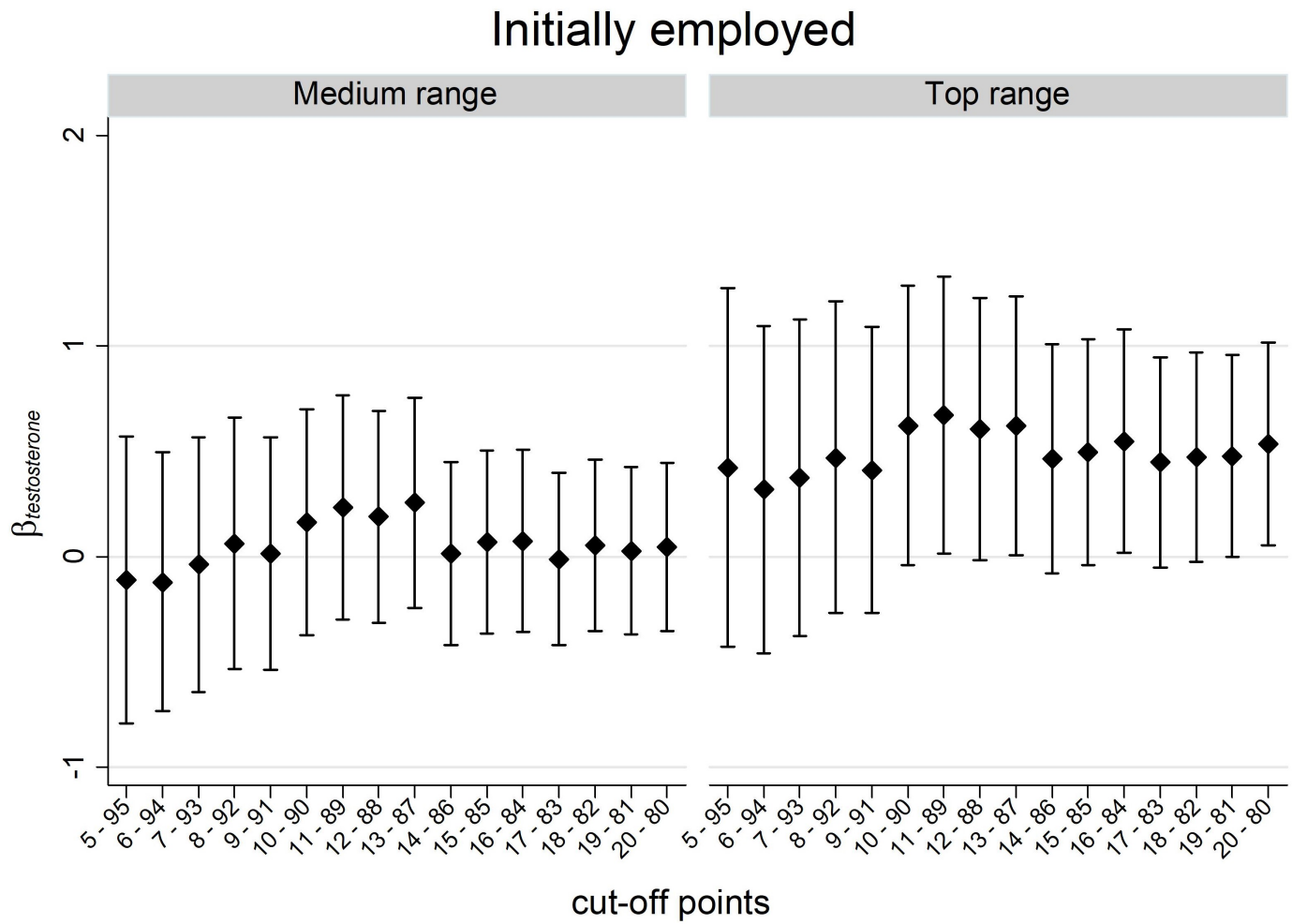
Figure: Robustness check for different testosterone cut-off points



Robustness checks

Table: Continuous (un)employment

	Initially unemployed			Initially employed
Waves unemployed	≥ 1	≥ 2	3	≥ 1
1st decile		reference category		
2nd – 9th decile	-0.267***	-0.286**	-0.285**	0.001
	(0.080)	(0.114)	(0.121)	(0.016)
10th decile	-0.169	-0.160	-0.313**	0.035
	(0.140)	(0.158)	(0.145)	(0.026)
Individuals	91	91	91	1,609

Mechanisms

Can transitions be explained by observed behaviour among individuals and personality traits (Wave 3 questionnaire):

- Numerical ability, individual's fluid reasoning scores positively associated with testosterone level
- Less likely to loose confidence in oneself
- Greater willingness to take risks
- More likely to report using the internet to search for a job

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Conclusion

1. Heterogeneous effect of testosterone on labour market transitions:
   - Initially unemployed: those with medium and high testosterone levels are significantly more likely to leave unemployment
   - Initially employed: testosterone levels above the 9th decile were more likely to enter unemployment
2. Differences in personality traits, job search behaviour and occupational sorting
3. Open task: Mendelian Randomization

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