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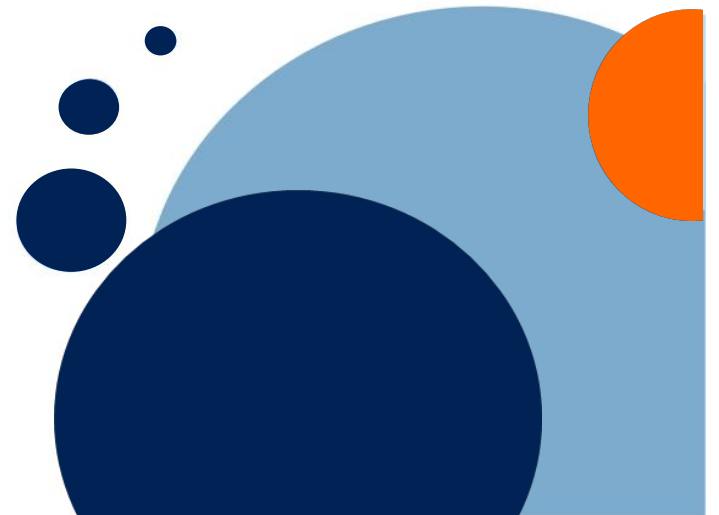
**IRCES**

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# **Gender and career progression in academia: European evidence**

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# AIM OF THE WORK

Aim of the paper is to analyze career progression of researchers in Europe focusing on gender differences, by identifying positive and negative determinants of the duration (number of years) between successive career stages.

Specifically, we intend to offer two contributions to literature:

- an analysis of the determinants of career progression over a long period of time, along three steps in the career stages of European researchers.
- to study women's career progression timing including both elements related to personal conditions and determinants that belong to academic context such as work experience abroad and institutional factors.

# THEORETICAL BACKGROUND

A first stream of literature tends to model the analysis of PhD holders career focusing on two main topics:

- elements that could define permanence in academia such as productivity and preferences (Balsmeier and Pellens, 2014), gender and family (Fox and Stephan, 2001), perceptions of incentives (Fitzenberger and Schulze, 2013), determinants of exit from academic research (Geuna and Shibayama, 2015).
- decision of researchers at certain critical points that influence the shape of their career as the choice of a research topic (Gläser et al, 2014), regional or international mobility (Fernández-Zubieta et al 2015; Franzoni et al 2014; Canibano et al. 2020), and opportunities for career progress.

High emphasis on factors that influence permanence and career progression in academia but few attention to the distance between the “critical junctures” identified.

# THEORETICAL BACKGROUND

A second stream of literature focuses on gender differences and gender gaps in academic careers.

Women in academic career experience disadvantage because the organizations in which they operate have been structured and defined by men (Bailyn, 2003; Probert, 2005).

As a result, women's entry and performance in academia tends to be directly influenced by gender elements that is structural and uncorrelated to equal opportunity policies and practices (Reed et al, 2011; Silander et al, 2022).

# THEORETICAL BACKGROUND

We base our analysis on the contribution of Faria et al. (2013) that present a theoretical model where each research institution tend to maximize the number of high quality researchers on individual characteristics ( $Z_t$ ), personal productivity ( $A_t$ ), institutional elements ( $K_t$ ).

$$\theta(P_t) = \int_0^{\infty} \{f(P_t, A_t, Z_t, K_t) - c(P_t, p_t)\} e^{-rt} dt$$

Among the results deriving from the model, the time it takes for low-level researchers to pass to the next stage is relevant for determining the number of high-level researchers:

$$T = \{f'(A_t, Z_t, K_t)\}^{\frac{1}{c'(\sigma, r)}}$$

# DATA

We base our analysis on MORE (Mobility Survey of the Higher Education Sector) longitudinal database that includes information on 10.000 university researchers across Europe classified in four career levels:

- (i) up to the point of PhD (first stage),
- (ii) PhD holders not yet fully independent (second stage),
- (iii) established researchers that have developed a level of independence (third stage),
- (iv) researchers leading their research area (fourth stage).

We consider researchers in the last three stages, i.e. only persons that have already a research career ongoing.

# DATA

We excluded from the sample selection researchers who present inconsistent data on the succession of stages, in order to avoid ambiguity in calculating the duration of career stages, which represent our dependent variable.

Among the other variable we consider:

- personal characteristics: gender, age, presence of partner and children, country where she/he works;
- academic experience: international mobility, research area, job quality;

We add data related to the female percentage of researchers for each country and for each year, collected in OECD Science, Technology and Innovation dataset.

Final sample includes 5,286 observation with information on career progression toward stages three and four between 1998 and 2016.

# DATA

Variable	Observations	Mean	Min	Max
Duration stage 2	3,950	5.26	0	32
Duration stage 3	1,258	7.27	0	35
Gender	5,286	0.42	0	1
Age stage 3	5,286	38.99	24	69
Age stage 4	5,286	44.47	26	75
Partner	5,286	0.79	0	1
Children	5,286	0.69	0	1
Female quota reseachers stage 3	4,664	36.59	17.45	54.67
Female quota reseachers stage 4	4,925	37.21	17.71	54.67

	Female	Male	Total
Stage 2	637	699	1,336
Stage 3	1,171	1,521	2,692
Stage 4	434	824	1,258
Total	2,242	3,044	5,286



# METHODOLOGY

We can measure duration of each career phase only if there is a transition from a position to subsequent.

To overcome endogenous sample selection problem, we use Extended Regression Model.

We have a two-phase regression: a first regression related to the sample selection and a second regression that represent our main analysis.

Sample selection regression is:

$$\text{Selection}_{iat} = a_0 + a_1 \cdot \text{gender}_i + a_2 \cdot \text{age\_dis}_{ia} + a_3 \cdot \text{academics}_{c\ t-1} + a_4 \cdot \text{mobility}_{ia} + a_5 \cdot \text{teaching}_{ia} + \epsilon$$

Main regression has the following form:

$$L_{aict} = \alpha_0 + \alpha_1 \cdot \text{gender}_i + \alpha_2 \cdot \text{age}_{it} + \alpha_3 \cdot \text{age}_{it}^2 + \alpha_4 \cdot \text{family}_i + \alpha_5 \cdot \text{mobility}_{ai} + \alpha_6 \cdot \text{field}_i + \alpha_7 \cdot \text{job\_quality}_i + \alpha_8 \cdot \text{academics}_{c\ t-1} + \epsilon$$

# RESULTS

## Transition from stage 2 to stage 3

Stage duration – Dependent Variable: Duration of stage 2	
	Coefficient
Gender	-0.5577***
Age	1.0225***
Square age	-0.0083***
Presence of partner	-0.1294
Presence of children	0.0161
International mobility	
Up to 3 years	-0.9042***
More than 3 years	-1.0212**
Distance between international experience and change of stage	0.4854***
Research area	
Engineering and Technology	-1.2332***
Humanities	-1.6886***
Medical Sciences	-2.059***
Natural Sciences	-0.3236
Social Sciences	-2.1133***
Female quota of researchers	-0.0186**
Wage comparison with non academic sector	-0.2943**
Job security	0.0579
Quality of life	-0.2451
Constant	-18.767***

Selection regression - Dependent variable: Access to stage 3	
	Coefficient
Gender	-0.0838**
Age distribution	-0.1289***
Female quota of researchers	-0.0011
Any international mobility considered	-0.3043***
Commitment to teach	
Medium	0.7127***
Intensive	0.6646***
Constant	0.1313

Number of observations: 4603

# RESULTS

## Transition from stage 3 to stage 4

Stage duration – Dependent Variable: Duration of stage 3	
	Coefficient
Gender	-0.6415**
Age	0.1866
Square age	0.002
Presence of partner	-0.0175
Presence of children	0.1729
International mobility	
Up to 3 years	-0.5019
More than 3 years	-1.220
Distance between international experience and change of stage	0.4137**
Research area	
Engineering and Technology	-0.7179
Humanities	-1.3733**
Medical Sciences	-1.3934**
Natural Sciences	-0.0582
Social Sciences	-1.4938**
Female quota of researchers	-0.0438**
Wage comparison with non academic sector	-0.2863
Job security	0.2094
Quality of life	0.6056*
Constant	-2.8056

Selection regression - Dependent variable: Access to stage 4	
	Coefficient
Gender	-0.1945***
Age distribution	-0.1028***
Female quota of researchers	-0.001
Any international mobility considered	-0.28641***
Commitment to teach	
Medium	0.0468
Intensive	0.0867
Constant	-0.5278***

Number of observations: 4631

# RESULTS

## Transition from stage 2 to stage 3 – Comparison between women and men

Stage duration – Dependent Variable: Duration of stage 2		
	Women	Men
Age	0.9904***	0.9946***
Square age	-0.0088***	-0.0073***
Presence of partner	-0.1272	-0.3246
Presence of children	-0.0567	-0.1697
International mobility		
Up to 3 years	-0.9772*	-0.7892**
More than 3 years	-0.8885	-1.0356*
Distance between international experience and change of stage	0.5264***	0.4432***
Research area		
Engineering and Technology	-2.0546***	-0.6883
Humanities	-1.9424***	-1.4424***
Medical Sciences	-2.2346***	-1.949***
Natural Sciences	-0.6363	0.0238
Social Sciences	-2.4873***	-1.7487***
Female quota of researchers	-0.0334**	-0.0055
Wage comparison with non academic sector	-0.3592*	-0.2316
Job security	0.0622	0.0193
Quality of life	-0.3082	-0.0391
Constant	-16.099***	-20.321***

Selection regression - Dependent variable: Access to stage 3		
	Women	Men
Age distribution	-0.0371	-0.2124***
Female quota of researchers	0.001	-0.0027
Any international mobility considered	-0.271***	-0.3318***
Commitment to teach		
Medium	0.8198***	0.6348***
Intensive	0.7389***	0.6214***
Constant	-0.1021	0.2695**

Number of observations:

Women 2071

Men 2532

# RESULTS

## Transition from stage 3 to stage 4 – Comparison between women and men

Stage duration – Dependent Variable: Duration of stage 3		
	Women	Men
Age	0.108	0.2279
Square age	0.0022	0.0019
Presence of partner	-0.3733	0.1514
Presence of children	-0.1538	0.46
International mobility		
Up to 3 years	-0.548	0.0843
More than 3 years	-0.5849	0.6709
Distance between international experience and change of stage	0.5795**	0.3233
Research area		
Engineering and Technology	-2.2115**	0.2838
Humanities	-3.8411***	0.2005
Medical Sciences	-3.2152***	-0.4656
Natural Sciences	-2.0201	1.1075
Social Sciences	-3.4928***	-0.268
Female quota of researchers	-0.0579*	-0.0375*
Wage comparison with non academic sector	-0.1808	-0.2822
Job security	0.3065	0.0975
Quality of life	0.1453	0.8915*
Constant	4.0398	-6.3502

Selection regression - Dependent variable: Access to stage 4		
	Women	Men
Age distribution	0.0598	-0.1955***
Female quota of researchers	0.0055	-0.002
Any international mobility considered	-0.3011***	-0.2684***
Commitment to teach		
Medium	0.0958	0.0253
Intensive	0.0311	0.1417
Constant	-0.9792***	-0.3793***

Number of observations:

Women 21865

Men 2766

# CONCLUSIONS

General model highlights some elements valid for both career phases:

- International experience could be a key point to accelerate career progression, especially in a phase of consolidation, but skills gained abroad has a short term usage.
- On the contrary, the lack of international experience represents a serious limitation to the chances of career progression.
- Women's career progression proceeds with greater difficulty but women who manage to move forward do so faster than their male colleagues. Both difficulties and time gain increase with career progression.

# CONCLUSIONS

Separate analysis by genders provides some interesting insights:

- The female presence in the academy benefits women more than men, helping a faster career progression of female researchers creating the conditions for a more favorable environment for female integration in academia.
- Wage comparison suggests that women are more motivated in academic careers. This may reflect shortage of alternatives in the labor market. This is particularly true in phase of career consolidation.
- Regressions by gender show how career progression for different positions in the “academic hierarchy” responds to different incentives, suggesting that career stages are segmented and ought to be considered with different variables.

Thanks for your attention

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