

Returns to Postgraduate Education in Portugal: Holding on to a Higher Ground?

André Almeida¹, Hugo Figueiredo^{1,2}, João Cerejeira^{1,3,4}, Miguel Portela^{1,3,4,5}, Carla Sá^{1,3,4}, and Pedro Teixeira^{1,5,6}

Project funded by Fundação Francisco Manuel dos Santos

1) Centre for Research in Higher Education Policies (CIPES); 2) Department of Economics, Management, Industrial Engineering and Tourism, University of Aveiro; 3) Economic Policies Research Unit (NIPE); 4) School of Economics and Management, University of Minho; 5) Institute for the Study of Labor (IZA); 6) University of Porto, Faculty of Economics

The literature:

- Substantial returns to postgraduate education observed in the UK and in the US despite the large increase in the number of postgraduate workers ([Autor et al., 2008](#); [Lindley and Machin, 2016](#))
- What motivates these returns?
 - “postgraduate-biased” tech (work) change \Rightarrow stronger demand through creation of postgraduate jobs
 - demand inertia \Rightarrow stronger displacement and deskilling effects with earnings differentials resulting mainly from graduates moving down the occupational ladder
- Recent evidence for the US and UK shows a slowdown in demand for cognitive skills and increasing displacement and deskilling effects ([Beaudry et al., 2016](#), [Valletta, 2016](#))

Portuguese context:

- Quick increase in the supply of workers with a college degree (massification in the 90's)
- Recent speed-up of supply of postgraduate qualifications following Bologna
- Relative inertia in the structural transformation of the employment structure
- Contraction of the demand for highly qualified workers (economic crisis)
- High but decreasing returns to college education
- Increasing heterogeneity in wage returns, especially below the median

In this paper, we...

- document the evolution of the returns for graduates and postgraduates across the wage distribution
- decompose the wage gap between graduates and postgraduates using a matching procedure that relaxes the overlapping assumption (Ñopo, 2008)
- describe skill intensity of each group occupations'
- assess the importance of displacement effects using a *shift-share analysis*

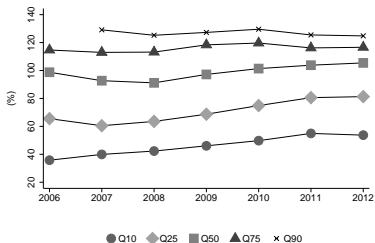
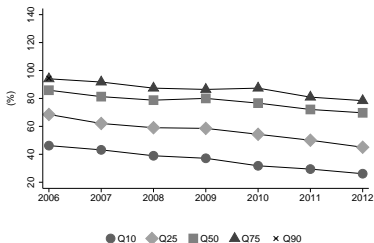
The data:

- Official employer-employee linked dataset (*Quadros de Portugal*) from 2006 to 2012 (years that discriminate graduate and postgraduate education)
- Comprises the lion's share of the Portuguese private sector
- Employees with low levels of experience (up to 10 years of experience)
- Workers with at least high school education completed;
- doctorates excluded due to their low numbers in the private sector

Estimation approach:

- Cross-sectional quantile regression: 2006 to 2012
- Simple set of controls: *exper*, *exper*², *part-time*
- We are following [Peracchi \(2006\)](#) and others, arguing that this consists in a descriptive measure of graduates' and postgraduates' relative benefits over otherwise similar individuals (with the same observable characteristics considered) but only with completed high school education
- These measures can also be seen (as argued by [Peracchi, 2006](#)) as the average price attributed to tertiary education at a particular point in time

Figure: Returns to higher education degree for graduates (left) and postgraduates (right) along the distribution



Ñopo (2008) aggregate decomposition:

- Relaxes common support assumption: no combination of controls can uniquely identify the membership into one of the groups considered in the decomposition, *i.e.*, assume an overlapping support (Fortin et al., 2011)
- We argue that relaxing the common support assumption is critical to our analysis, especially if one considers the role of occupations. Concretely, we argue that if occupations play a major role in the graduates postgraduates differentials, then graduates and postgraduates that do not share the same occupations (and the other combination of controls) are not comparable

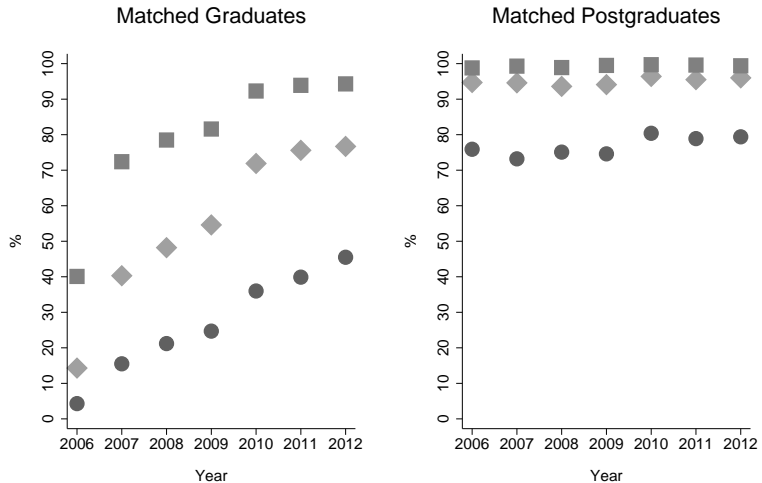
Ñopo (2008) aggregate decomposition:

- Non-parametric matching exercise which allow us to divide the workers of each group in matched and unmatched workers, where unmatched workers correspond to those workers that do not have a similar counterpart in the other group. These workers are considered to be out of the support group
- Divides the gap into 4 components
 - compositional and wage structure effect for those workers that have similar characteristics
 - 1 component due to differences in the composition of matched and unmatched graduates
 - 1 component due to differences in the composition of matched and unmatched postgraduates

Ñopo (2008) aggregate decomposition:

- Additional controls considered: industry, ownership, localization, legal character of the firm, number of workers and real gross sales of the firm, and **occupation** (within industry)
- **Main contribution:** it allow us to disentangle 2 different drivers of postgraduates' premiums:
 - higher wages within occupations shared with lower qualified graduates;
 - access to better paid and more demanding (more skill intensive) occupations.

Figure: Percentage of matched graduates and postgraduates for each year considering different sets of control



- It is possible to find for postgraduates a similar graduate counterpart for almost all the workers in the sample even when controlling for industry
- This percentage falls considerably when considering occupation

These results stand in line with our argument and reinforce the importance of relaxing the overlapping support assumption when considering the role of occupation

Figure: Concentration of graduates and postgraduates in different occupations and industries for the years 2006 and 2012. Each circle is weighted by the number of workers of that group

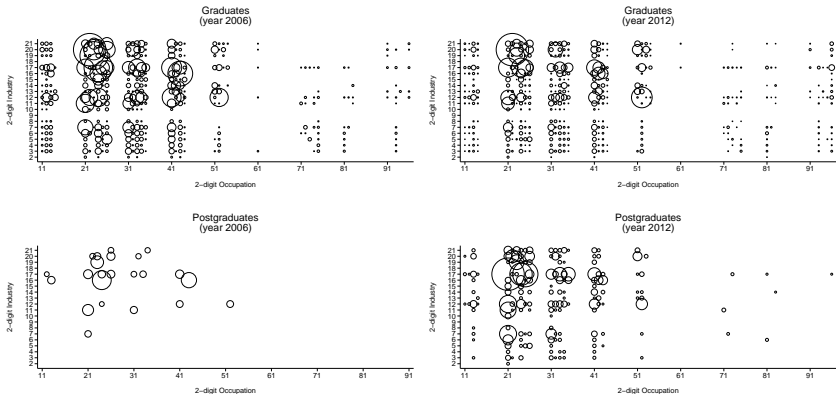


Figure: Wage gap (in relative terms) between **matched** graduates and postgraduates along the distribution in 2006 (on the left) and 2012 (on the right) after \tilde{N} opo (2008) decomposition

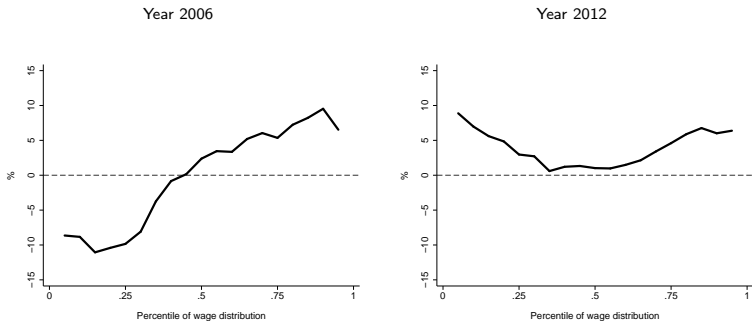
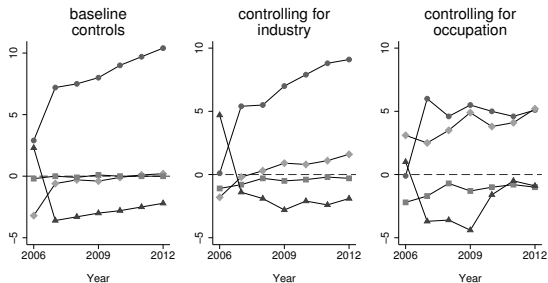


Figure: Ñopo (2008) decomposition controlling for baseline characteristics in the matching procedure (on the left), after introducing industry (on the middle) and after introducing occupation within industries (on the right)



- D0 – Wage–structure among matched
- ◆ DF – Diff. in the composition of matched and unmatched graduates
- DM – Diff. in the composition of matched and unmatched postgraduates
- ▲ DX – Diff. in the composition among matched workers

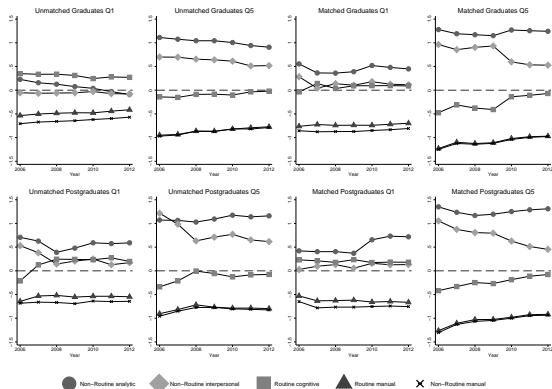
- The wage gap (**Delta**) between graduates and postgraduates has increased over time
- Without controlling for occupation, either controlling or not for industry, the major part of the wage gap is attributable to the wage-structure effect, *i.e.* remains unexplained
- Controlling for industry in the matching procedure only slightly improves the explanation power by reducing **Delta-0**
- Controlling for occupation reduces significantly the unexplained part of the gap. In this case, approximately half of the wage gap can be explained by differences in endowments of matched and unmatched graduates (**Delta-F**).

- We argue that this results from the difficulty in graduates guaranteeing a place in some occupations, forcing them to accept different and lower paid jobs
- We argue that the evolution in Delta-M and Delta-F resume the changing role played by postgraduate education in Portugal
 - during the first years of postgraduate massification, postgraduate education acted as a way to access better paid occupations or, in other words, to jump to a higher ground.
 - since 2010 the rapid increase in the number of postgraduates and the escalation of the economic crisis in Portugal transformed postgraduate education into a way to hold on to a higher ground.
 - furthermore, even those who manage to enter do not obtain the same returns as postgraduates

Differences in skill intensity:

- *O*NET database (version 21.0)*: measures of task importance within occupation
- We grouped these tasks into 5 broad categories inspired by [Acemoglu and Autor \(2011\)](#) work: *non-routine cognitive analytical; non-routine cognitive interpersonal; routine cognitive; routine manual and non-routine manual*
- then computed a normalized *index* for the importance of each group of tasks for each *2-digit* occupation
- and computed the average importance of each type of task on the top and bottom of the wage distribution of each group (*1st* and *5th* quintiles)

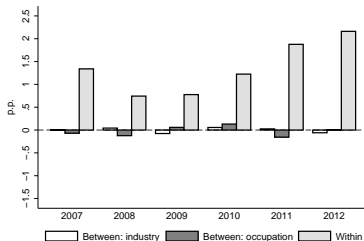
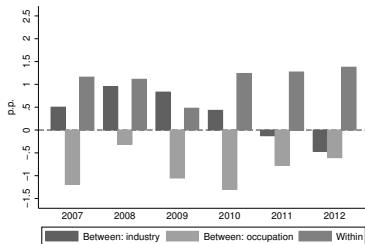
Figure: Evolution of the importance of difference types of tasks in the occupational structure of matched and unmatched workers of each groups, in different points of the wage distribution



- There are not significant differences in the importance of different types of tasks between **matched** graduates and postgraduates, both on the top and on the bottom of the distribution
- The major differences are between **unmatched** graduates and postgraduates at the bottom of the distribution:
 - unmatched postgraduates at the bottom are also in occupations that rely on non-routine analytical tasks,
 - unmatched graduates' in this part of the distribution stand out as the group with the least demanding occupations (*routine cognitive tasks*)

- Since there is higher heterogeneity in the types of tasks for unmatched graduates' occupations, we argue that for graduates, not being able to guarantee access to specific occupations, i.e. being unmatched) represents a considerable risk of deskilling
- This risk seems to have become stronger during this period
- This evidence supports the view that postgraduates might be displacing graduates from some occupations which, consequently, might lead to displacement movements between graduates and non-graduates

Figure: *Shift-share analysis* regarding the share of college educated workers in the sample (on the left), and the share of postgraduates in the total of college educated workers (on the right), considering 2006 as the base year



- Both analysis suggest that the within-job effect was the most important mechanism behind the upskilling of the Portuguese labor force
- These results suggest that there was not a sufficiently strong pattern of structural change in terms of the importance of high-skill occupations and industries in the last 7 years in Portugal
- After 2010 postgraduates may have started increasingly displacing graduates from some detailed occupations

Final remarks:

- Our results suggest that there are significant and increasing returns to postgraduate education in Portugal, while returns to graduate education have been decreasing in some cases to relatively low levels (approximately 20%)
- We show that this trend has been fostered mainly by the assignment to different occupations. We show that graduates that do not manage to share occupations (and other characteristics) with postgraduates earn considerably lower wages
- Moreover, we show that even for those graduates who manage to guarantee a place in those occupations receive lower wages compared to similar postgraduates

Final remarks (cont.):

- Finally, our results also suggest that a postgraduate degree has become an instrument to avoid the risk of obtaining low-paid and less attractive occupations or, in other words, as a way to hold on to higher grounds
- We show that the distinct rhythms of structural change and labor supply lead to significant displacement effects, with postgraduates increasingly displacing graduates, and graduates displacing non-graduates, to worse paid and less demanding types of jobs

Key references:

- Acemoglu, D. and Autor, D. (2011). *Skills, tasks and technologies: Implications for employment and earnings*, volume 4 of *Handbook of labor economics*. Elsevier.
- Autor, D. H., Katz, L. F., and Kearney, M. S. (2008). Trends in us wage inequality: Revising the revisionists. *The Review of economics and statistics*, 90(2):300–323.
- Beaudry, P., Green, D. A., and Sand, B. M. (2016). The great reversal in the demand for skill and cognitive tasks. *Journal of Labor Economics*, 34(S1):S199–S247.
- Fortin, N., Lemieux, T., and Firpo, S. (2011). *Decomposition methods in economics*, volume 4. Elsevier.
- Hastie, T., Tibshirani, R., and Friedman, J. (2009). *Unsupervised learning*. Springer.

- Lemieux, T. (2014). Occupations, fields of study and returns to education. *Canadian Journal of Economics/Revue canadienne d'économique*, 47(4):1047–1077.
- Lindley, J. and Machin, S. (2016). The rising postgraduate wage premium. *Economica*, 83(330):281–306.
- Ñopo, H. (2008). Matching as a tool to decompose wage gaps. *The review of economics and statistics*, 90(2):290–299.
- Peracchi, F. (2006). Chapter 5 educational wage premia and the distribution of earnings: An international perspective. In Hanushek, E. and Welch, F., editors, *Handbook of the Economics of Education*, volume 1, pages 189 – 254. Elsevier.
- Valletta, R. G. (2016). Recent flattening in the higher education wage premium: Polarization, skill downgrading, or both? In *Education, Skills, and Technical Change: Implications for Future US GDP Growth*. University of Chicago Press.

Ñopo (2008) matching exercise:

- 1 Select one graduate
- 2 Select all postgraduates that share the same characteristics as selected graduates
- 3 With selected postgraduates, construct synthetic individual whose wage is the average of all of them and match him to the original graduate
- 4 Put synthetic postgraduate and original graduate in matched sample
- 5 Repeat steps 1 to 4 until exhausting original graduates sample

Endogeneity problems ("ability bias" and/or missing variables):

- Panel data would result in non-representative sample (less than 2% of our sample)
- IV approach has issues such as weakness and LATE problems
- Attempt to avoid emptying out the higher education premiums from other determinants of the returns highly correlated with higher education attainment and earnings as, for instance, the type of occupation

Endogeneity problems (cont.):

- Considering a wide set of controls also increases the likelihood of having highly correlated regressors which makes the estimates much more unstable ([Hastie et al., 2009](#))
- A large literature on this topic suggests that the causal effect of education on earnings suffers only a small bias due to innate ability ([Lemieux, 2014](#))

Table: Descriptives

	Non-graduates	Graduates	Postgraduates
nr.obs.	816959	750393	32364
gender (female)	53.1%	64.3%	51.2%
mean age	24.2 (2.4)	28.2 (2.4)	29.1 (2.8)
mean exper	6.2 (2.4)	6.3 (2.4)	5.1 (2.8)
part-time workers	19.6%	14.1%	10.4%
firm size (workers)			
less than 10 workers	50.5%	43.7 %	30.0%
more than 250 workers	2.3%	2.8%	9.9%
firm size (sales in real terms)			
less than 100k	14.4%	14.1%	8.2%
more than 100M	42.1%	44.6%	67.2%
ownership			
private	92.7%	90.1%	84.7%
public	0.7%	1.1%	2.9%
foreign	6.6%	8.8%	12.4%
occupation			
modal occupation in 2006	Salespersons	Finance, accounting, administrative organization, public and trade relations specialists	Finance, accounting, administrative organization, public and trade relations specialists
modal occupation in 2012	Salesperson	Health professionals	Physical sciences, mathematics, engineering and related techniques specialists

Notes: k stands for thousand and M for million; standard-deviations in parenthesis. Source: own computations based on Portugal, MTSS (2006-2012).

Table: List of the 10 occupations that employed more unmatched graduates and postgraduates in 2012.

Rank	Graduates		Postgraduates	
	Occupation	Industry	Occupation	Industry
1st	Health professionals	Health and social work	STEM related spec.	Business act.
2nd	Salespersons	Wholesale and retail trade	STEM related spec.	Manuf. of non-metallic prod.
3rd	Health technicians	Health and social work	STEM related spec.	Manuf. of metals prod.
4th	Office clerks	Business act.	STEM related spec.	Wholesale and retail trade
5th	Teachers	Education	IT technician	Business act.
6th	Customer support staff	Business act.	STEM related spec.	Construction
7th	Teachers	Health and social work	IT spec.	Business act.
8th	STEM related spec.	Wholesale and retail trade	Teachers	Education
9th	Office clerks	Wholesale and retail trade	Business related spec.	Business act.
10th	Business related spec.	Business act.	STEM related spec.	other act.

Source: MTSS (2006-2012).