EXTENDED ABSTRACT

Title: *Over-education and Ph.D Graduates in Italy during the Great Recession*

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1 Introduction

Among poor labor market outcomes observed in the Great Recession, over-education has recently received great attention as there is a growing concern over skill mismatch in advanced economies (Quintini, 2011). Some studies on cross-country differences in over-education high- lighted that structural differences in demand and supply rather than cyclical economic fluctu- ations affect the mismatch among graduates (Di Pietro, 2002; Groot and Van Den Brink, 2000). Instead, recent contributions stated that the business cycle can affect professional outcomes also in terms of job matching (Verhaest and Omey, 2006; Quintini, 2011; Croce and Ghignoni, 2012; Sattinger et al., 2012; Altonji et al., 2016). Moreover, these effects vary according by status of new labour market entrant or by the level and field of education in a way that accomplish predic- tions from job competition and job search models (Humburg et al., 2017; Verhaest and Van der Velden, 2013; Dolado et al., 2009;

Thurow, 1975). Liu et al. (2016) also find a countercyclical trend of skill mismatch; the correlation is more pronounced among the occupations in the private sector compared to the public one.[1]

Previous literature on the cyclical fluctuation and job mismatch nexus has usually focused on workers with different levels of education, comparing effects on low relatively to high skill workers. An investigation of overeducation among workers with the same high level education has been overlooked.[2] In this paper, we address this topic evaluating the impact of the recent Great Recession on early career's mismatch of Ph.D holders.

Although labour market polarization makes the impact of the Great Recession less dramatic for high-compared to medium-skilled workers (Acemoglu and Autor, 2011; Cockx and Ghirelli, 2016), over-education is likely to emerge also among high-skilled workers because several eco- nomic mechanisms operate in the labour market, especially during downturns. On the one hand, modern economies, such as the US, register high rates of under-employment, i.e., workers em- ployed in jobs for which they are over-qualified. Beaudry et al. (2016) even suggest that there is a structural reversal in the demand for cognitive tasks, with high-skilled individuals taking lower skill jobs, pushing lower-skilled workers even further down the occupational ladder. Barnichon and Zylberberg (2014) interpret this evidence by means of a theoretical model. By assum- ing that hiring is non random, a high-skilled worker moves down the occupational ladder to escape the competition from his/her high-skilled peers, given that the competition to obtain a low-qualification job is less intense. Thus, high-skilled workers end up by working in lower skill requirement occupations.[3]3 Barnichon and Zylberberg (2014) also demonstrate that under- employment is strongly counter-cyclical, so that, in a slack labour market, over-education - which is very closely related to under-employment - is more likely to occur. On the other hand, this trend toward expanding over-education among high skilled is corroborated by the findings of Modestino et al. (2014, 2016). They observed that during recessions it may well happen that jobs are re-categorized in terms of education level or skill requirement, given that employers adopt a strategic or opportunistic upskilling across occupations during recruitment in response to higher unemployment. Eventually, this behavior by employers changes the return to invest- ment in higher education and also high skill workers may end up being overeducated (Fogg and Harrington, 2011; Di Pietro and Urwin, 2006).

Indeed, recent papers have demonstrated that skill mismatch may be an issue also for Ph.D. workers (Bender and Heywood, 2009, 2011; Gaeta, 2015; Di Paolo and Mañé, 2016; Ermini et al., 2017). The risk of over-education has increased for Ph.D workers over the last decades following the expansion of doctoral education observed

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[1] As an example, highly-educated workers may accept mismatched jobs, expecially in the begin of their career, while engaging in on-the-job search for better jobs.

[2] As relevant exceptions that focus on graduates, see Caroleo and Pastore (2013), Croce and Ghignoni (2012), Liu et al. (2016).

[3] In this way, high-skilled workers trickle down unemployment to less skilled workers.

in many European countries. The Ph.D courses enlarged their original function of training for careers into academia as Ph.D holders are assumed to be a strategic resource to foster the emergence and consolidation of the so-called knowledge economy and to support the shift toward a learning society. However, shrinking academic positions and job contraction outside the university sector during slack labour market, as in the case of Great Recession, may have not protected Ph.D workers from overeducation, if not unemployment, regardless the contribution of growing technical progress to the search for high-skilled workers. Moreover, Ermini et al. (2017) in their study observe that the impact of certain drivers of over-education changes across the time span of the Great Recessions. These authors, however, do not provide a direct assessment of the impact of the Great Recession on overeducation.

However, it has been suggested that shocks such as the Great Recession lower the opportun- ity costs and the adjustment costs toward a reallocation of resource to accomplish the technolo- gical change. Eventually, skill requirement may change. Hershbein and Kahn (2016), analyzing job vacancy postings, observed a structural shift in the demand for higher skill occurred in those metropolitan areas that suffered larger employment shocks during the Great Recession. In ad- dition, this study detected an increase in general and IT capital investment, a structural shift in line according to a paradigm of routine-biased technological change (RBTC) which however made up-skill more likely as to complement a profitable adoption of such technologically driven changes.[4]

The Great Recession accelerated this process and Hershbein and Kahn (2016) interpret these results as evidence that recessions will be times of cleaning in terms of production, as in the tradition of the Schumpeter's creative destruction. More important for the purpose of the present paper, they suggest that routine-cognitive occupations and formerly middle-skill jobs are apparently becoming higher-skilled and, instead of a great reversal in the demand for cognitive skill, it may well be that cognitive workers still retain a substantial advantage over the low-skilled. Thus, Great Recession ends up with higher opportunities for high-skill workers to attain jobs that matched their skills, with a reduction in over-skilling.

Given the above different employment scenarios, the revealed impact of the Great Recession on over-skilling is a matter of empirical investigation, a task which will be fullfilled with the present paper.

Within this context, the aim of the current paper is to expand the relevant literature on job mismatch by examining two different definitions of over-education, i.e. over-skilling and over- qualification, using data from four cohorts of Ph.D recipients surveyed from 2004 to 2010 by the Italian National Institute of Statistics (hereafter

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[4] Actually, Hershbein and Kahn (2016) show that upskilling is relatively concentrated in routine-cognitive occu- pations. In contrast, routine-manual occupations in harder-hit metropolitan area exhibit a sharp relative decline in employment shares following the Great Recession.

ISTAT). In particular, our study contributes to the existing literature on the over-education of Ph.D graduates in three main respects. First, focusing on the Italian case, we assess the effect of the recent structural financial and economic crisis on mismatch in the labour market of the most skilled workers. Our dataset includes Ph.D graduates' information just before and after 2008. Consequently, we are able to evaluate the impact of the Great Recession on the probability of matching skills and educational level to occupational attainment. In so doing, we adopt different proxies to take the recession effect into account.

A first indicator for the Great Recession we generated is *crisis*, a dummy variable that assumed value one if Ph.D graduates were awarded their degree during the economic crisis, i.e. from 2008 onwards, and zero otherwise. This variable captured global discontinuity in the economic system due to adverse fluctuations and the related eco- nomic contraction. According to our sample, this cut-off distinguishes respondents to the first ISTAT survey (graduated in 2004 and 2006) from respondents to the second one (graduated in 2008 and 2010).

Moreover, under the assumption that the crisis resulted in a general slowdown of growth and a decline in the values of the main economic indicators, we elaborated two further indicators to depict the behavior of a worsening local labour market that, before and after the economic crisis, operated in significantly different economic conditions and with different opportunities for the newcomer Ph.D holders.

Accordingly, as a second indicator of the Great Recession, we approximated the crisis of labour market prospects by computing the variation of the value added (*varVA*) registered in the provincial job area of a worker who entered the labour market as a Ph.D holder before and after the crisis. Higher values of *varVA* denote a lower exposure to the economic crisis pointing out the growth of value added across the two points of time.

Finally, according to Martin (2012), differences in the region's sensitivity to an economic fluctuation can be observed because of its economic resilience. We built on the concept of resilience to elaborate a measure of regional difference in employment opportunities. We basically compared percentage growth in employment in a region relative to the national one, before and after the crisis. By so doing, we were able to assess if the crisis had worsened the capacity of the labour market to give workers an occupation. For the post-recession, this measure corresponds to the economic resilience described by Martin (2012). In fact, the impact of the crisis depends on the real exposure of the local labor market to the fluctuation and on its capacity to restructure economically in response to a crisis. To our knowledge, the nexus between territorial economic resilience in the broad sense and over-education has not yet received attention. We think that investigation of this relationship is of interest, given that more resilient labour markets can offer more opportunities for skill-job matching because they are better able to drive regional trans- formation, to retain manufacturing, and to innovate a high-tech economy - that is, to offer more abstract and non-routine occupations to high skilled workers. Accordingly, we used *resilience* as an additional proxy to evaluate the impact of the crisis on the risk of over-education

among Ph.Ds. Values of resilience above zero indicate the greater resistance of the province to economic shocks compared to the nation. In contrast, values less than zero indicate a decreased ability to cope with a recessionary period compared to the national average.

Second, we contribute to better understanding of the determinants of over-education by distinguishing over-qualification from over-skilling in order to assess the sensitivity of results to measurement of educational mismatch.

Finally, we improve the evidence on the situation of Italian Ph.D graduates. Before the present study, only Gaeta (2015) and Ermini et al. (2017) analyzed overeducation among Italian Ph.D graduates but solely Ermini et al. (2017) adopted both the two surveys of the professional out- comes of all Italian Ph.D graduates carried out issued by ISTAT (2014). Moreover, to the best of our knowledge, none of these studies fully and directly explored the effects of the ongoing severe economic crisis on Ph.D over-education. Focusing on this strand of high skilled workers is important to shed light on the returns to public investment, given that Ph.D education is mostly publicly financed in Italy. Furthermore, it helps to determine the capacity of the economy to keep pace with technological change - and thus avoid the 'low skill, low technology trap' (Snower, 1996; Di Pietro, 2002) - which requires skilled labour to be allocated to the appropriate level. Since over-education represents a source of individual, firm and societal costs especially when it concerns very highly-educated individuals, investigating it may furnish valid suggestions to calibrate policy measures to ensure that Ph.D graduates achieve jobs well-positioned in the labour market in terms of skill match.

Our main results confirm that the Great Recession reduced the risk of over-skilling while the impact on over-qualification is less robust. Ph.D recipients who are self-employed are instead penalized in the labor market when job mismatch is examined. Among other determinants, and in contrast with previous findings for college graduates, it emerges that socio-demographic variables do not impact strongly on Ph.D over-education. Remarkably, among Ph.D workers, social background seems not to affect significantly the likelihood of skill and title mismatch. Among Ph.D-related features, the most striking driver of over-education is completion of study period abroad.