Overeducation as hiring policy

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Abstract

In Europe as in Belgium, more and more people manage to achieve college degrees. This increase means that a lot of (more) qualified workers are available for firms. However, these firms can't offer enough qualified jobs for those workers. Qualified workers can face difficulties, and eventually get positions for which their skills are higher than those actually required for the job. This phenomenon is called « overeducation ». This paper provides first evidence regarding the direct effect of a hiring policy oriented through higher (over) education on firm productivity. Using a detailed Belgian firm panel data, and computing a measure of overeducated hiring policy robust to sectorial bias, it shows that firms that decide to implement a hiring policy of overeducation are found to be more productive than others which follow the hiring standards in terms of educational levels.

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1. Introduction

It has been widely documented that workers' level of education has substantially risen over the last decades. For instance, the number of workers having attained a tertiary level of education in the EU27 countries increased from 22.4% in 2000 to 34.6% in 2011 (European Commission, 2012). Furthermore, one of the European Union's objectives is to reach a proportion of 40% of tertiary educated workers aged between 30 and 34 by 2020 (European Commission, 2012). If this increasing level of education does not match jobs requirements, overeducation may appear (Freeman, 1976). This phenomenon represents the inadequacy between a worker's attained level of education and the level of education required for her job: a worker is considered as overeducated if her attained level of education is higher than the level of education required for her job. In Europe, overeducation increased similarly to education. For instance, the European Union (2012) shows that overeducation is an important phenomenon that concerned 36% of workers in the EU27 countries over the decade 2001-2011.

Higher levels of education, and especially overeducation, therefore appear to represent important issues whose effects need to be investigated (Mavromaras et al., 2010). This paper provides empirical evidence on the direct relationship between overeducation and firm productivity from a firm point of view. More precisely, we estimate to what extent a firm may influence its productivity by wisely using job market and by hiring more higher educated workers than other firms behaving in the same industrial sector, *i.e.* by relying on an overeducated hiring policy[2].

Unlike much of the earlier literature (still essentially focused on workers' wages, job satisfaction and related attitudes and behaviours), our econometric estimates are based on direct measures of productivity. They are also robust to a range of measurement issues, such as time-invariant labour heterogeneity and firm characteristics. To do so, we use detailed Belgian panel data and estimate dynamic panel data models at the firm level. Relying on the literature regarding educational mismatch (Baert and Verhaest, 2014; Hartog, 2000; Mavromaras and McGuinness, 2012; Verhaest and Omey, 2009, 2012; Verhaest and Van der Velden, 2013; Sanchez-Sanchez and McGuinness, 2015; Sellami et al., 2018), in which direct measures of productivity are still rare (Kampelmann and Rycx, 2012; Mahy *et al.*, 2015, Grunau, 2016), this paper shows that employing more higher educated workers than other firms belonging to the same industrial sector, *i.e.* implementing a sectorial overeducation oriented hiring decision, leads to higher levels of firm productivity.

[2] Such a firm is called in this paper an "overeducated firm"

The remainder of the paper is organised as follows. A review of the literature is presented in Section 2. Sections 3 and 4 describe our methodology and data, respectively. Our results are presented in Section 5. Finally, the last section discusses the results and concludes.

2. Literature review

2.1 Overeducation and Firm Productivity

From a microeconomic point of view, two different approaches can be found in the literature on the effect of education, and especially overeducation, on firm productivity. The first one relies on human capital theory (Becker, 1975) and states that education allows developing capabilities that make workers more productive, and that the gap in earnings should reflect these different production levels. Consequently, the effect of overeducation on productivity could be estimated through its impact on wages. Investigations, some of which control for workers' fixed unobserved heterogeneity and/or field of education, found that overeducated workers earn more than their adequately educated peers. This implies, according to human capital theory, that overeducation increases workers' productivity (see *e.g.*, Duncan and Hoffman 1981; Rumberger, 1987; Sicherman 1991; Battu *et al.* 1999; Van der Meer 2006; Dolton and Silles 2008; McGuinness and Sloane 2011).

A second strand of the literature examines the impact of overeducation on job satisfaction and other correlates of workers' productivity (such as absenteeism, shirking or turnover). The standard hypothesis here is that overeducated workers, frustrated by using fewer skills than they have, could be less satisfied, more absent, and sicker than their adequately educated peers (Vroom, 1964). The consequence would be that firms are reluctant to hire overeducated workers because of their negative impact on firm productivity. However, empirical results go in different directions, with for instance, on the one hand Tsang (1987), Hersch (1991), Tsang *et al.* (1991) or Verhaest and Omey (2009), who show that overeducated workers are less satisfied than the other workers. On the other hand, according to the results of Büchel (2002), there is no significant relation between overeducation and job satisfaction. He even finds that overeducated workers are healthier, more work- and career-minded, and stay longer in the same firm.

These two approaches thus lead to different conclusions: while human capital theory suggests that investing in overeducated workers should lead to higher levels of productivity for such firms, job satisfaction studies don't necessarily come to the same end. Moreover, the two approaches suffer from methodological limitations. For example, human capital theory

supposes that the level of education influences marginal productivity and wages in the same way. But the relationship could be more complex than that (see *e.g.* Spence (1973) and the signaling theory). Moreover, wages cannot be linked strictly to productivity in every case. That is, in some non-competitive models of wage determination such as rent-sharing or collective bargaining models, wages do not necessarily reflect marginal productivity, and workers with equal productive characteristics are found to receive different wages (Blanchflower and Bryson 2010; Manning 2003; Mortensen 2003). As for job satisfaction theory, many studies seem to forget that job satisfaction is not the only factor influencing productivity through education (Judge *et al.*, 2001).

But, the main shortcoming of these studies is that they all investigate the effect of overeducation on productivity in an *indirect* way. Hartog (2000) already noted this issue and stated that it would be interesting to know the *direct* effect of overeducation on productivity instead of its *indirect* effect through wages, job satisfaction, or other related characteristics of workers. As far as we know, direct estimates of the impact of overeducation variables on firm productivity (assessed through the value added per worker) have so far only been provided by Kampelmann and Rycx (2012), Mahy *et al.* (2015) or Grunau (2016). These studies differ as regards the impact of overeducation on productivity which is found to be significant and positive in the two former studies and insignificant in the latter. Additional work is thus needed to improve the understanding of this nexus. Moreover, their results leave the door open for further developments.

3. Methodology

3.1 Overall Specification

We basically find in the literature three ways to measure the required education for a job and the incidence of educational mismatch. The first one, called the objective measure or job analysis approach (such as the American Dictionary of Occupational Titles, DOT) is based on the evaluation by professional analysts of the level and type of education that is required for a specific job. The second approach, based on self-assessment, requires the employee/employer to determine the type and level of formal education that is necessary for the achievement of the tasks associated with a given job. The third approach, called empirical or realized matches approach, derives the required level of education for a job from what workers in the corresponding job or occupation usually have attained. The required education is then computed on the basis of the mode (or the mean) of the education in a given occupation.

Each measure has its own advantages and weaknesses (for a detailed discussion see e.g. Hartog, 2000), so that it is impossible to say that one measure is strictly better than the others and in practice the choice of a measure is often dictated by data availability (McGuinness, 2006). Given the feature of ours, we use realized matches in this paper. Thus, we consider a firm as *oriented through overeducation* if it hires more highly educated (i.e. workers with attained level of education[3] corresponding to a non-university degree or a university degree) than the mean of firms belonging to the same industrial NACE 3-digits sector.

To examine the impact of such hiring policy on direct measure of firm productivity, we use a specification aggregated at firm level. More precisely, we estimate the following firm-level productivity equation:

$$\ln VA_{j,t} = \beta_0 + \beta_1(\ln VA_{j,t-1}) + \beta_2 Att_{j,t} + \beta_3 O_{j,t} + \beta_4 X_{j,t} + \gamma_t + \vartheta_{j,t} \quad (1)$$

In this equation, $VA_{j,t}$ is the productivity of firm j at year t, measured by the average value added per worker; $Att_{i,j,t}$ is the average percentage of workers within the firm j at year t with a level of attained education i (i corresponding to (i) primary, (ii) secondary, (iii) post-secondary non-university or (iv) post-secondary university (or more)); $O_{j,t}$ is a binary variable that takes the value 1 if the firm j hires more highly educated workers than the mean of the whole firms belonging to the same industrial sector, *i.e.* if the firm j is an overeducation oriented firm; $X_{j,t}$ is a vector representing aggregated characteristics of the firm j at year t: the shares of women, blue-collar and workers under indefinite term contracts, the size of the firm (in number of workers) and the sectorial affiliation (19 dummies); γ_t is a set of 11 year dummies; and $\vartheta_{j,t}$ is the error term.

This equation therefore investigates the relationship between the decision to hire more educated workers than other firms behaving in the same industrial sector and the productivity of the latter, when controlling for year dummies and mean firm characteristics. The inclusion of the lagged dependent variable among the regressors accounts for the potential state dependence of firm productivity and aims to improve the parameters of interest in our preferred specifications.

[3] The workers' educational attainment is available in 4 categories in our dataset. This information, reported by firms' human capital departments (on the basis of their registers): (i) primary education; (ii) general, technical and artistic secondary education; (iii) higher non-university education, short; (iv) university (or more) and non-university education.

3.2 Estimation Techniques

Equation (1) has been estimated with different methods: pooled ordinary least squares (OLS), a fixed-effects (FE) model, and the generalized method of moments (GMM) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). The OLS estimator with standard errors robust to heteroscedasticity and serial correlation is based on the cross-section variability between firms and the longitudinal variability within firms over time.

However, this OLS estimator suffers from a potential heterogeneity bias because firm productivity can be related to firm-specific, time-invariant characteristics that are not measured in micro-level surveys (*e.g.*, an advantageous location, firm-specific assets such as patent ownership, or other firm idiosyncrasies).

One way to remove unobserved firm characteristics that remain unchanged during the observation period is to estimate a FE model. However, neither pooled OLS nor the FE estimator address the potential endogeneity of our explanatory variables. To control for this endogeneity issue, in addition to state dependence of firm productivity and the presence of firm fixed effects, we estimate equation (1) with the dynamic system GMM (GMM-SYS).

The GMM-SYS approach boils down to simultaneously estimating a system of two equations (respectively in level and in first differences) and relying on internal instruments to control for endogeneity. More precisely, overeducation variable and other endogenous input factors are instrumented by their lagged levels in the differenced equation and by their lagged differences in the level equation.

4. Data and Descriptive Statistics

Our empirical analysis is based on a large dataset covering all years from 2008 to 2016. It covers all firms operating in Belgium and with activities within sections A to T of the NACE Rev. 2 nomenclature[4]. Then firms for which data are missing or inaccurate have been excluded.[5] Our final sample covering the period 2008-2016 consists of an unbalanced panel of 289,445 observations, related to 48,197 firms.

[Insert Table 1 about here]

Descriptive statistics of selected variables are presented in Table 1. They show that the annual firm-level value added per worker represents on average 123,572 EUR. On average,

[4] Note that both sections E and U were misleading in our data and have thus been dropped from the analysis.
[5] For instance, we eliminate a small number of firms for which the recorded value added was negative.

23.41% of workers are considered as highly educated, i.e. they possess at least a post-secondary degree. Then, 35.69% of firms register a higher percentage of highly educated workers than other firms belonging to the same NACE 3-digits sectors, meaning they are implementing, according to our specification, a hiring policy of overeducation as regards to other firms. Moreover, we find that around 30.30% of employees within firms are women, 47.26% are blue-collars, and 93.60% are working under indefinite term contracts. Finally, firms are essentially concentrated in the following sectors: wholesale and retail trade, repair of motor vehicles and motorcycles (24.88%); manufacturing (16.67%) and construction (13.44%).

5. Results

We first estimate equation (1) by OLS with standard errors robust to heteroscedasticity and serial correlation. The results presented in the second column of Table 2 first reveal that levels of attained education exert an increasing effect on productivity. That is, the more the firm hires higher educated workers, the higher their impact in terms of firm productivity. More precisely, they show, on a global view, that increasing the share of workers with higher levels of education increases firm productivity. That is, increasing the share of workers with a secondary, higher and university education by 1% is expected to affect productivity by -0.6%, 1.7% and 7.6%, respectively. Concerning our main variable of interest, overeducation, results show that exploiting market opportunities by relying on an overeducation hiring policy, thus by hiring a larger proportion of highly educated workers than the mean of the whole firms belonging to the same industrial sector, leads to a surplus productivity of 1.7% compared to firms that do not.

[Insert Table 2 about here]

However, these estimates suffer from the fact that time-invariant unobserved workplace characteristics are not controlled for. They can also be inconsistent due to endogeneity of some variables.[6] To control for these potential biases, we thus re-estimate equation (1) using the dynamic GMM-SYS estimator. When related to the overeducation variable, the results confirm OLS investigations. That is, the results show that implementing an overeducation hiring policy increases the firm productivity. More precisely, firm productivity is expected to increase by 4.1% after such implementation, providing support to the fact that highly educated workers may

[6] The FE estimator only controls for the potential bias related to the time-invariant unobserved workplace characteristics. So, only OLS and GMM results are reported. FE results are available on request.

improve firm productivity thanks to their higher level of human capital they can bring to the firm[7].

6. Conclusion and Discussion

Educational mismatch is an important and growing phenomenon in Europe, and workers are found to be more and more educated, which results in a risk for workers to be allocated to jobs that do not match their level of education. Using a large panel dataset covering the Belgian private sector over the period 2008-2016, this paper provides first evidence regarding the direct impact of educational mismatch on firm productivity in a hiring decision perspective. It therefore fills a gap in the literature on overeducation as existing studies do not investigate whether it would worth for a firm to rely on such a phenomenon in their hiring decisions.

Our findings – based on the OLS (as a benchmark) and GMM-SYS (more robust) estimators and controlling for a large set of covariates, simultaneity issues, time-invariant unobserved firm characteristics and dynamics in the adjustment process of productivity suggest relying on overeducation when hiring may be beneficial for firm productivity, providing some support to the current labour market situation registering more and more overeducated. That is and more precisely, our results show that firms that hire more educated workers may see their levels of productivity increases as the percentage of highly educated workers rises also. But, the firm may also register productivity booms when it voluntarily decides to match workers with jobs for which there are found to be overeducated. These findings are consistent with figures related to Belgium's (and Europe's to a larger extent) increasing number of overeducated workers.

However, one must be careful regarding the following question : how far can the firm go in hiring overeducated workers? We may therefore question the linearity in this process of hiring overeducated workers in order to increase firm productivity. If the process is found to be linear in the link between overeducation and productivity, statistics on overeducation should continue to increase in the nearest future and firms had better to pursue hiring such workers. If not, this means that firms would reach a *maximum productivity-surplus point* after which hiring overeducated will be associated to productivity drops. The remaining question would then be to evaluate this specific *maximum productivity-surplus point.*

[7] Note that we ran a test of differences between means in order to know whether a significant difference appears between the estimated parameters for each of the two estimators, where the two parameters are not significantly different under the null hypothesis, while the two parameters are significantly different under the alternative. The results, showing that all coefficients are statistically different, are available on request.

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Table 1: Descriptive Statistics of Selected Variables, 2008-2016

Variables	Mean	Std. Dev.
Annual value added per worker (k€)	123.57	295.46
Annual value added per worker (ln)	4.48	0.66
Level of attained education (% of workers):		
- Primary	20.44	33.70
- Secondary (lower)	56.15	38.13
- Post-secondary (non-university)	16.50	24.61
- University or more	6.91	16.33
Overeducation (% of firms)	35.69	47.91
Women (%)	30.30	29.45
Blue-collar workers (%)	47.26	38.91
Indefinite term contractsge (%)	93.60	14.39
Size (number of workers)	48.85	276.18
Sector (%)		
Agriculture, Forestry and Fishing (A)	0.97	
Mining and quarrying (B)	0.20	
Manufacturing (C)	16.67	
Electricity, gas, steam and air conditioning supply; Water supply, sewerage, waste management and remediation activities (D)	0.16	
Construction (F)	13.44	
Wholesale and retail trade, repair of motor vehicles and motorcycles (G)	24.88	
Transport and storage (H)	7.01	
Accommodation and food services activities (I)	4.51	
Information and communication (J)	3.62	
Financial and insurance activities (K)	1.61	
Real estate activities (L)	1.02	
Professional, scientific and technical activities (M)	6.76	
Administrative and support service activities (N)	5.69	
Public administration (O)	0.16	
Education (P)	1.40	
Human health and social work activities (Q)	8.27	
Arts, entertainment and recreation (R)	1.54	
Other service activities (S)	2.07	
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use (T)	0.02	
Number of firm-year observations	30,727	

Table 2: Overeducation hiring policy and productivity

Estimator / Dependent variables:	Value added per worker (ln)	
	OLS	GMM-SYS[c]
Value added per worker (one year lagged, in ln)	0.817***	0.647***
	(0.003)	(0.022)
Attained education (one year lagged, in % of workers)		
Secondary degree	-0.006***	-0.001
	(0.002)	(0.019)
Post-secondary non-university degree	0.017***	-0.063*
	(0.005)	(0.038)
Post-secondary university (or more) degree	0.076***	0.042
	(0.008)	(0.058)
Overeducation (one year lagged, in dummy)	0.017***	0.041**
	(0.002)	(0.020)
Firm characteristics[a]	YES	YES
Year dummies (11)	YES	YES
Sig. model (p-value)	0.000	0.000
Adj. R squared	74.46	
Number of firm-year observations	30,727	30,727

Note: Robust standard errors are reported between brackets. ***, **, *:significant at respectively 1%, 5% and 10% levels. [a] The shares of women, blue-collar and workers under indefinite term contracts, the size of the firm (in number of workers) and the sectorial affiliation (19 dummies). [b] AR2 displays the test for second-order autocorrelation in the first-differenced errors. [c] First and second lags of explanatory variables are used as instruments in the GMM specification, excluding time dummies.