

Could hiring costs explain the relationship between education and employment: evidence from Saudi University-level data

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Abstract

While the theoretical literature predicts that high level of education increases employment, a vast amount of empirical data showed that, regardless of whether it is in developing countries or developed countries, unemployment rates strongly hit the most educated population. In this paper, we provide a theoretical model in which hiring costs are not exogenous and constant as in the previous theoretical literature, but endogenous and proportional to the worker's qualification degree. Basing on this assumption, our model shows a negative relationship linking education and employment which is in line with the observed reality. The numerical simulation section shows that reducing hiring costs will encourage individual investment in education and reduce unemployment by enhancing firms' labour demand. Finally, by using information from the "Charter for Employment of Non-Saudi Staff" we show that in Saudi universities, the cost of recruiting a non Saudi faculty member increases with that faculty qualification degree, which is in line with the key assumption of our theoretical model.

Keywords: *Employment, Education, hiring cost.*

JEL Classifications: *I25, J23, J24.*

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Introduction

In the 1960s, the Human Capital Theory put forward by Schultz, (1961) and Becker, (1962) suggested a positive relationship between education and employment. Then according to the Job-competition Model Theory (Thurow 1975, Boudon, 1974 and Hirsch 1977) enterprises preferred to employ those applicants with relatively high educational levels. More recently *Pissarides (1990), Laing and al. (1995) and Burdett and Smith (2002)* showed a positive correlation between the firms' job creation decisions and the workers' decision to invest in education. According to *Acemoglu (1999)*, an

increase in the proportion of skilled workers leads firms to shift job creation from unskilled workers to skilled ones. *Machin and Manning (1999)*, showed that education is one of the main determinant factor of workers' employability in the long run. *Moen (1999)*, argued that the worker's probability of finding a new job increases with human capital investment. The study of *Higashi (2002)* shows that the higher the firm specific human capital is the lower the unemployment rate is. More recently, *Brunello and al, (2009)* finds that the high mobility of educated workers decreases their unemployment probability.¹

Under the influence of this literature, many countries devoted major efforts to educational development. However, inconsistency between education and employment is very serious according to a vast amount of empirical data and unemployment rates remain still high in many developed and developing countries. For example, Philip Cometh (1985) showed that unemployment rate increased with the educational level in developing countries. More recently, Maarten H. Wolbers (2000), after studying the relevant data of Holland from 1980 to 1994, found that those with low educational levels had higher unemployment probabilities. Finally, Mirela Ionela (2012) showed that, according the Eurostat study, the relationship between education and employment has suffered in recent years, in Romania.

The aim of this paper is to contribute at explaining theoretically the negative relation between education and employment as well as the persistence of high unemployment rates observed in many countries despite their considerable investment in human capital. We developed a theoretical model in which hiring costs are not constant and exogenous as in the previous theoretical literature, but endogenous and proportional to the worker's qualification level. Our key assumption in this model is that hiring costs generally increase with skill requirements for job applicants which will influence the firms' demand for skilled labour, as these costs are an important component of total labour costs.

Therefore, different from previous studies, this paper, besides studying the influence of education on employment, fully takes into account the influence of education on the hiring costs already proved empirically. Indeed, Stevens (1994) showed that hiring skilled workers can be very expensive. However, firms have the possibility of reducing external hiring by training unskilled workers internally. Blatter et al (2012) finds that hiring costs of swiss firms are generally higher in occupations with higher skill requirements. For example, hiring costs in engineering or information technology substantially exceed the respective costs for manual labor occupations, such as masonry.

A further explanation of this finding is that workers in engineering and information technology have been relatively scarce in recent years, which increases the required search effort for firms to fill a vacancy. As a consequence, results suggest that firms will offer more internal training positions to satisfy their demand for skilled workers. More recently, Muehlemann and Pfeifer (2013) provide evidence that the costs for

¹ Many empirical studies such as Nickell (1979), Mincer (1991), Devine and Kiefer (1991) Machin (2000), Kadamira (2003), Givord and Maurin (2003), Farber (2004), Pfeifer and McIntosh (2008), Chiunda (2008), Garrouste, Kozovska and Perez (2010), Riddell and Song (2011)...confirm this relationship.

filling a vacancy for skilled labour in Germany are substantial, ranging on average from 4,000 to 6,000 Euros.

Basing on this assumption our model predicts the observed negative relationship between education and employment. By using information from the “*Charter for Employment of Non-Saudi Staff*” we show that in Saudi universities, the cost of recruiting a faculty member increases with that faculty qualification degree, which is in line with the key assumption of our theoretical model. The paper is organized as follows: The next section introduces our theoretical model. Section 3 provides numerical simulations of the model. Section 4 describes the data and confirms statistically our theoretical assumption. Section 5 concludes.

II - The model

We consider a closed economy in steady state, where time is continuous and discounted at a rate, ρ and agents (individuals and firms) are risk neutral and live infinitely. The number of individuals and firms are fixed and normalized to unity.

Each Firm maximizes its value by deciding its labour demand, noted by, L , which stands simultaneously for employment rate. Skilled labour is the only production factor in our model. To hire an educated worker, the firm must pay a recruiting cost that we assume to be *endogenous and proportional to the worker’s educational level*, namely $c^h(E) = hE$.

Each individual with the educational level, E , invests in education and pays the cost, $c^e(E) = \sigma E$, to improve his own productivity which increases firm’s marginal product of labour, $y(E) = E^\alpha$.

As it is supposed that the total number of the labourers equals 1; the firm’s labour demand, L , can be used to indicate the probability to be employed which is the same for all individuals. An occupied job can be destroyed and the employed workers move to an unemployed situation with probability, δ .

II-1- Value functions

The individual’s value of being unemployed U follows a standard formulation and reads as

$$\rho U = L(W - U) \quad (1)$$

Where W is the the value of being employed in a job that pays $w(E)$

$$\rho W = w(E) + \delta(U - W) \quad (2)$$

Combining Eqs(1) and Eqs (2) gives

$$W - U = \frac{w(E)}{\rho + \delta + L} \quad (3)$$

The net value of the representative firm’s writes

$$\rho V_i = y(E) - w(E) \quad (4)$$

II- 2- First-order conditions

II-2-1- The firm

The representative firm maximizes its net value

$$\text{Max}_{L_i > 0} V_i - h E L_i \quad (5)$$

By substituting the expression (4) of V_i , this problem re-writes

$$\text{Max}_{L_i > 0} \left(\frac{(y(E) - w(E))}{\rho} - h E \right) L_i \quad (6)$$

The first-order condition for the firm's job supply reads as:

$$\frac{(y(E) - w(E))}{\rho} - h E = 0 \quad (7)$$

II-2-2- The individual

The representative individual decides about his educational level that maximizes his net value, $U - c^e(E)$.

$$\text{Max}_{E > 0} U - c^e(E) \quad (8)$$

Substituting U , the first-order condition writes:

$$\frac{\beta L}{\rho + \beta L} \frac{y'(E)}{\rho} = c^{e'}(E) \quad (9)$$

II-3-Intra-firm Nash bargaining

The gain generated by a new job is divided using a Nash-bargaining framework, where The parameter $\beta \in (0, 1)$ refers to the bargaining power of workers,

$$\beta V_i = (1 - \beta)(W - U) \quad (10)$$

Substituting equation (3) in (10) gives

$$\beta(y(E) - w(E)) = \frac{(1 - \beta)w(E)}{\rho + \delta + L} \quad (11)$$

Thus the wage, $w(E)$, which satisfies the Generalized Nash Bargaining solution," writes

$$w(E) = \frac{\beta(\rho + \delta + L)}{\rho + \delta + \beta L} y(E) \quad (12)$$

Given the definitions of $y(s) = s^\alpha$ and $c^e(E) = \sigma E$ we introduced above and substituting $w(E)$ by Eqs (12), the equilibrium educational level of the representative individual writes

$$E = \left(\frac{\alpha \beta L}{(\rho + \beta L)\sigma} \right)^{1(1-\alpha)} \quad (13)$$

Thus, the labour demand of the representative firm which stands simultaneously for the employment rate of the economy, writes

$$L = \frac{1 - \beta}{\beta h E^{1-\alpha}} - \frac{\rho}{\beta} \quad (14)$$

II-4- Equilibrium

In general equilibrium both firms and workers maximize their respective value functions. While by combining equations (13) - (14) one can show that the equilibrium employment rate, \hat{L} expression:

$$\hat{L} = \frac{(1 - \beta)\rho\sigma}{\beta h \alpha} \quad (15)$$

Thus, the workers' equilibrium educational level, \hat{E} can be written as

$$\hat{E} = \left(\frac{(1 - \beta)\alpha}{\rho\sigma(1 - \beta) + \alpha h \rho} \right)^{1(1-\alpha)} \quad (16)$$

Eqs (15) shows that, contrarily to the common belief, the equilibrium employment rate of the economy, \hat{L} decreases with the parameter of education rentability, α .

In addition, according to (15) and (16), a higher recruitment cost parameter, h decreases both \hat{E} and \hat{L} . Thus, increasing hiring costs reduces the individuals' incentives to invest in education as well as the firms' incentives to hire skilled workers. Finally, a higher education cost, σ , by reducing the workers' educational level, \hat{E} in Eqs (15), increases the employment rate, \hat{L} in Eqs (16). This negative relationship between employment and education which is in line with the observed reality results from the interactions between different effects namely,

1- *The firm's value effect* (positive encouragement effect): by increasing the firm's marginal product of labour ($y(E) = E^\alpha$), the worker's education level, \hat{E} , raises the firm's value in Eq. (4) which encourages its labour demand.

2- *The worker's value effect* (positive encouragement effect): according to Eq.(2), the employment rate \hat{L} raises the individual's value by increasing the probability of being employed, which, encourages individuals to invest in education (Eq. (13)).

3- *The hiring cost effect* (negative encouragement effect): according to the key assumption of this model ($c^h(E) = h E$), a higher worker's educational level, \hat{E} , is associated to a higher *hiring cost* which reduces the firm's value Eqs. (6) and reduces its labour demand (Eq.(14)).

4- *The wage effect* (negative encouragement effect): according to Eqs. (12), a higher worker's educational level, \hat{E} , is associated to a higher wage which reduces the firm's value (Eqs. (12) and discourages its labour demand (Eq.(14)).

Taken together, it seems that the wage effect and the hiring cost effect which are an important component of total labour costs dominate the two *positive value effects* and

lead to the negative relationship between education and employment observed in the reality.

III- Numerical simulation of hiring cost effects

The numerical exercise first starts defining a benchmark situation then the effects of varying the parameter of hiring cost, h , on the equilibrium educational level, \hat{E} and the employment rate, \hat{L} are determined. The key parameters are fixed as following: the discount rate $\rho = 0,2$. It is assumed that the worker's bargaining power is $\beta = 0,5$ as in Pissarides (2009) the education rentability $\alpha = 0,2$ and the education cost $\sigma = 0,1$

Table 1, below, shows the corresponding employment rate \hat{L} and educational level, \hat{E} for each level of hiring cost, h .

Table 1: The effects of increasing the hiring cost on education and employment

hiring cost, h	<i>Educational level</i> \hat{E}	<i>Employment rate</i> \hat{L}
0,1	7,14	1,00
0,15	6,25	0,66
0,2	5,55	0,50
0,3	4,54	0,33
0,4	3,85	0,25
0,5	3,33	0,20
0,6	2,95	0,16
0,7	2,63	0,14
0,8	2,38	0,12
0,9	2,17	0,11
1,0	2,00	0,10

Source: Author's calculations based on equations (15) and (16) using the benchmark parameter values and varying γ from 0, 1 to 1.

According to Table 1, increasing the hiring cost reduces the individuals' incentives to invest in education. Indeed, the \hat{E} decreases monotonically with h from 7,14 in the case of $h = 0,1$, to 2,00 in the case of $h = 1$. The table shows that the employment rate decreases from 100% to 10% only by increasing the hiring cost from 0,1 to 1. These results confirm the widely held belief along which hiring costs reduce firm's demand for labour, as these costs are an important component of total labour costs. Finally, these numerical results provide support to our theoretical model. It is important to underline that making any other set of parameters implies different numerical values for \hat{E} and \hat{L} . Nevertheless, results are qualitatively unaffected. To say it differently, the results presented above are robust with regard to parameter changes.

IV- A case study of Saudi Universities

The present section aims at proving and justifying statistically the original theoretical assumption of our model by analysing the structure of faculty hiring costs of Saudi Universities and showing that they are not exogenous as assumed by the standard literature, but positively related to the faculty's qualification degree as assumed in our theoretical model.

We use information from the "Charter for Employment of Non-Saudi Staff ", given in appendix 3, to provide descriptive statistics on the different compensation and installation fees of non Saudi faculty as distinct from Saudi faculty, such as transportation allowance, housing allowance, furnishing allowance, children education allowance, air tickets to the home country that Saudi universities have to incur to fill a faculty position vacancy by recruiting a non Saudi faculty member from the external labor market. All costs are reported in Saudi Arabian ryals (SAR).

The rules and regulations of this Charter govern the employment of the Faculty members, lecturers, language teachers, demonstrators and any employee who is bound to follow the rules and regulations of faculty members, including: researchers, research assistants, technical staff with a university degree etc....in this paper we limit our analysis to the principal following qualification degrees for faculty members, which we ranked as following:

- 1- Technical assistant
- 2- Teaching assistant
- 3- Language teacher
- 4- Lecturer
- 5- Researcher
- 6- Assistant professor
- 7- Associate professor
- 8- Full professor

Figure 1 Different hiring costs of Saudi Universities in SAR

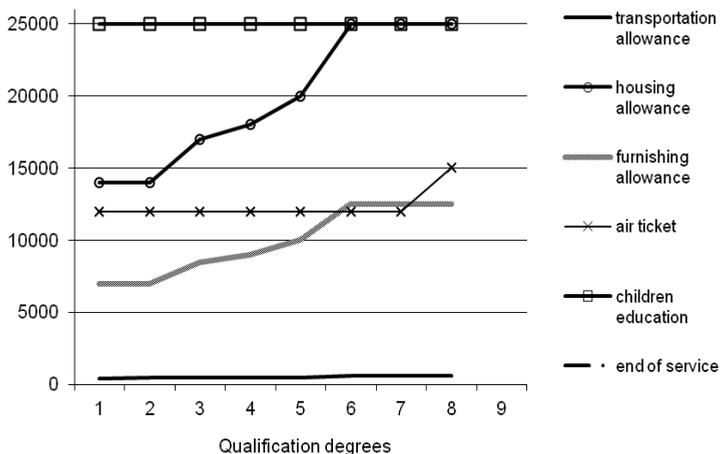
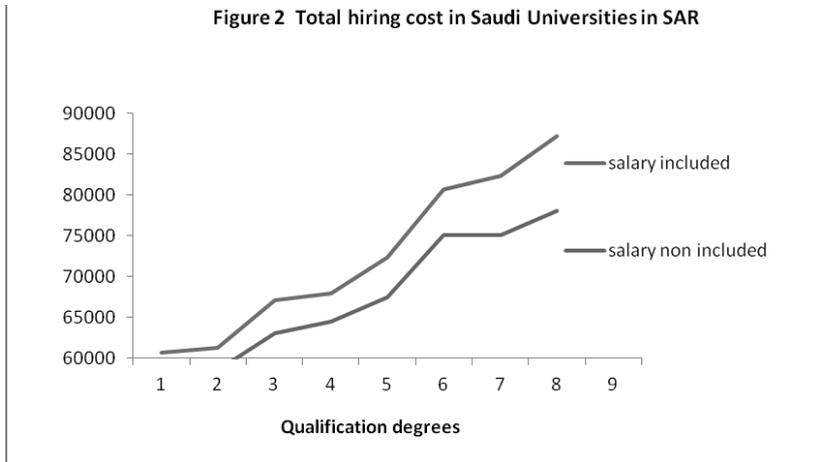


Figure 1 shows the different compensation and installation fees, detailed in appendix 1 and 2, that Saudi universities have to incur when recruiting a non Saudi faculty member. One can see that all costs increase with the faculty qualification degree, Which Is in line with the key assumption of our theoretical model



By summing all these costs, Figure 2 shows that the total recruitment cost, calculated in appendix 2, Increases strongly in qualification degrees and range, from 60000 SAR to 90000 SAR. The cost of hiring a full professor is 1,5 times higher than that of recruiting a teaching assistant. A finding in line with the previous empirical studies and thus justify the key assumption of our theoretical model.

Conclusions

Different from previous theoretical studies, this paper developed a theoretical model in which hiring costs are not constant and exogenous, but endogenous and proportional to the worker's qualification level. Basing on this assumption, our model shows a negative relationship linking education and employment which is in line with the observed reality. The numerical simulations sections show that reducing hiring costs will encourage individual investment in education and reduce unemployment by enhancing firms' labour demand. To justify our theoretical assumption, we analysed the structure of hiring costs of Saudi Universities by using the "Charter for Employment of Non-Saudi Staff". We show that the hiring cost of a faculty member by Saudi Universities increases with that faculty's qualification degree which confirm and justify the original theoretical assumption of our model, namely hiring costs generally increase with skill requirements for job applicants.

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Faculty Members, Lecturers, Language Teachers & Demonstrators

Employment Post	First Monthly Scale	Years of Experience Increment	Last Monthly Scale	Transportation Allowance	Housing Allowance
Professor	9,100	500	13,600	600	25,000
Associate Professor	7,250	450	11,300	600	25,000
Assistant Professor	5,600	400	9,200	600	25,000
Language Teacher	4,080	350	6,880	500	17,000
Lecturer	3,400	350	6,550	500	18,000
Demonstrator	2,700	300	5400	500	14,000

Researchers, Assistant Researchers & Technicians

Grade	First Monthly Scale	Years of Experience Increment	Last Monthly Scale	Transportation Allowance	Housing Allowance
First	4,855	350	7,305	500	20,000
Second	3,955	300	6,955	500	15,000
Third	2,700	250	6,450	400	14,000

Appendix-1

Some extracts from the “**Charter For Employment of Non-Saudi Staff Lecturers, Demonstrators, Researchers, Research Assistants & Technicians**” Created in 1980 and amended 1997

Appendix

	Technical assistant	Teaching assistant	Language teacher	Lecturer	Researcher	assistant professor	associate professor	Full professor
hiring costs :								
children education	25000	25000	25000	25000	25000	25000	25000	25000
Transportation allowance	400	500	500	500	500	600	600	600
Housing allowance	14000	14000	17000	18000	20000	25000	25000	25000
Furnishing allowance	7000	7000	8500	9000	10000	12500	12500	12500
Air ticket	12000	12000	12000	12000	12000	12000	12000	15000

total hiring costs(SNI)	58400	58500	63000	64500	67500	75100	75100	78100
first month basic salary	2250	2700	4080	3400	4855	5600	7250	9100
total hiring costs(SI)	60650	61200	67080	67900	72355	80700	82350	87200

Appendix-3

Article 17

- A. The university shall provide the contractee (and his family if they come for the purpose of residence) travel tickets within the limit of four full tickets including that of the contractee; the family is eligible for the tickets whether they accompany the contractee or travel separately according to the following:
1. From the domicile to the Kingdom at the start of the contract unless the contractee is already resident in the Kingdom at the time of contracting
 2. Return tickets from the Kingdom to the domicile once yearly when the contractee has annual leave. For contractees who have been contracted locally but reside abroad, return tickets will be given after the first two-year period of employment.
 3. From the Kingdom to the domicile at the end of the contract. this provision does not apply to contractees residing in the Kingdom who have served less than two years or those who have been transferred to another sponsor within the Kingdom according to the rules and regulations.

Article 18

Article 21

1. All travel tickers referred to above will be Horizon class in the case of a full professor and economy class for all others.
2. The contractee may exchange his air tickets from the Kingdom to his domicile for air tickets to any other country, provided no additional expense is incurred by the university within the rules and regulations of Saudi Airlines

Article 24

The University will provide the contractee with accommodation or pay him an annual housing allowance according to the salary scheduled in Appendix I. The university is allowed to make this payment at the beginning of each annual contract. For those whose contract period is less than one year, this payment will be proportioned. For female contractee whose guardian is also employed by the university, only the higher housing allowance will be paid regardless of where the guardian is employed (government or private). No housing allowance is payable to female contractees married to a Saudi national.

Article 25

1. If the university has not provided furnished accommodation for the new contractee, he is entitled when on the first-time contract with the university to a furnishing allowance of 50% of the annual housing allowance. This furnishing allowance is paid once only for the duration of the contract with the university. Former government employees who have not been contracted by the government for a period of two years are entitled to this allowance upon contracting with the university.

Article 26

The University will pay the contractee a monthly transportation allowance for his conveyance to and from his work location according to the table of salaries; the University may, in lieu of that allowance, provide suitable means of transport. The transportation allowance is not payable to those residing in their work location.

Article 31

The university may bear the actual educational costs of the contractee's children, excluding transportation, from the primary stage to the completion of the secondary stage on the following conditions: