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Why Do Women Study So Much? The Role of Signaling and Work Commitment

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Abstract

Abstract This paper proposes theoretical explanations for several gender-based differences observed in the labor market. Empirical evidence indicate that females acquire more schooling than males do but earn lower wages. To explain these phenomena, we analyze an economy in which females use education to signal their commitment to the workplace.

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1 Introduction

A great deal of empirical evidence supports the assertion that males' wages are higher than females' wages (Blau and Kahn 1997, 2000 and 2006). However, in the US and in most of the OECD countries the number of females college graduates is higher than their male counterparts (Goldin, Katz, and Kuziemko, 2006 and Goldin and Katz 2009).

In the present paper we provide a new explanation for the above mantioned phenomenon. We take Goldin (2014) as our point of departure. Goldin shows that a worker's hourly output is an increasing function of his total working hours. In a related paper, Goldin and Katz (2015) show that the hourly product of pharmacies is not a function of their total working hours and as a result females choose this profession which has a lower gender gap. Cortes and Pan (2015) provide additional evidence for the above mentioned observation. In the present paper we extend their work and show that females use their college diploma to signal the future amount of interruptions in their working life and as a result more females attend college than males.

We make three main assumptions: First, frequent absences reduce the amount of human capital that an individual may acquire. Second, the rate of absenteeism is private information known only to an employee and his current employer. The third assumption is that the utility cost of work effort is increasing in home hours, as in Becker (1985). We also assume, as is customary in the literature, that the only difference between males and females is that females have a positive home product due to fertility and child care, among other factors. The result of these assumptions is that females' outside employers do not observe the total amount of human capital that they have acquired via on the job training.

In equilibrium, due to their higher product, females who have attended college have a higher wage than their less-educated counterparts. As a result, the opportunity cost of home production is higher for female college graduates than high school graduates, and college-educated women will allocate less time to home production, resulting in both a higher product and the acquisition of additional human capital (via on the job training). As a result, females who have attended college have a higher experience premium than women with less education, and women have an added return to schooling through

signaling.

Our results are in line with Dougherty (2005) who finds that females have a higher schooling premium than males. He also finds that half of females' higher schooling premium can be explained by controlling for selection bias (such as the presence of children) and shows that there is less discrimination against females with more schooling.

2 The Model

We analyze an economy with two periods and two types of agents: males and females. Males and females differ in one important way: females have a positive home product in the first period while males do not. The model assumes that the acquisition of human capital is decreasing in home hours and that employers cannot observe the product of each individual. Employers may only observe the current level of absenteeism and schooling. Outside employers may only observe schooling, so that the alternative wage of each individual is a function of the expected amount of human capital acquired through on-the-job training by individuals with his level of schooling[1].

We assume that individuals differ in their ability. Individuals with a higher ability have a lower cost to attend college. If we relax the assumption of asymmetric information, our model becomes a classic model for the analysis of investment in human capital.

We also assume that every individual can choose his or her rate of absenteeism. An individual can choose a positive rate of absenteeism and to exert effort both at home and in the market, which implies producing less in the market; or a zero rate of absenteeism and to exert an effort only in the market. We assume that a female who chooses a positive rate of absenteeism produces Q at home in the first period. To simplify matters, we assume that females do not have a home product in the second period and that males' home product equals 0 at all periods[2]. The home product of an individual (either a male

[1]We do not discuss the wage bargaining process due to space constraints. However, as discussed below, all agents of the same type (less-educated males, less-educated females, college-educated males and college-educated females) acquire the same amount of human capital in equilibrium. Hence, all individuals of the same type produce the same output and the alternative wage of each individual (which equals the individual's wage) coincides with his output.

[2]We can show that all the qualitative results of the model hold as long as we assume that females'

or a female) who chooses a zero rate of absenteeism is 0.

We also assume that individuals may attend college before the first period.

Formally, we make the following assumptions:

1. Absence reduces the amount of human capital that an individual has acquired.

2. The rate of absenteeism is private information known only to each employee and his current employer.

That is, even if employers can observe whether an employee works part or full time, they cannot observe the rate of absenteeism chosen in previous periods, and outside employers cannot observe how many hours each employee works per day and how many times each employee has left early.

3. We assume that courts and outside employers cannot observe the product of each employee. Hence, the alternative wage of each employee equals his expected product.

As a result of these assumptions, outside employers cannot observe the amount of human capital acquired by each individual through on-the-job training, although they may observe her level of schooling.

4. The ability of each individual i, A_i, is drawn from a distribution $G(A)$ within the support $[0, 1]$. We denote the cost of acquiring schooling by $c(A)$ and assume that $c'(A) < 0$.

5. Individuals are risk neutral and do not discount time.

6. Individuals plan their lifetime earning and participation paths under conditions of certainty, a competitive labor market and a perfect capital market.

7. There is no depreciation of human capital.

8. There is a free entry of firms into the economy.

9. There are no search costs or elements of friction. As a result, the alternative wage of each employee coincides with the highest wage offer he can receive.

We now turn to the production function. Recall that individuals who choose a positive rate of absebteeism produce a lower output than individuals who choose a zero rate of absenteeism during the period of absence (either the first or the second period). And individuals who choose a zero rate of absenteeism in the first period acquire additional

home product in the second period and males' home product in all periods is lower than their market product.

human capital during that period and produce a higher product in the second period.

We use $s, s \in \{0, 1\}$ to denote whether an individual attended college ($s = 1$) or not ($s = 0$) and ex to denote the amount of experience acquired by an individual. Recall that $ex = 1$ only for individuals who acquired additional human capital through on-the-job training. Hence $ex = 0$ for two groups of individuals: the first one includes all individuals in the first period while the second one includes any individual who chose a positive rate of absenteeism in the first period. Note that $ex = 1$ only in the second period for individuals who chose a zero rate of absenteeism in the first one.

The product of an individual who chooses a zero rate of absenteeism is given by

$$TP = \alpha + \beta s + \gamma ex$$

where β denotes the schooling premium and γ denotes the experience premium.

The product of an individual who chooses a positive rate of absenteeism is given by

$$TP = (\alpha + \beta s + \gamma ex)\, q, q < 1$$

We now turn to the characterization of the equilibrium. Each individual's strategy consists of attending college or not and choosing a rate of absenteeism. Each firm's strategy consists of the wage offered as a function of the individual's gender and whether she has attended college (which are the only observable variables).

Observation 1 Males choose a zero rate of absenteeism. Males who have attended college (high school) enjoy a wage of $\alpha + \beta$ (α) in the first period. In the second period, males who have attended college (high school) enjoy a wage of $\alpha + \beta + \gamma ex$ ($\alpha + \gamma ex$).

Proof. Males who choose a zero rate of absenteeism enjoy a wage of $\alpha + \beta s$ while males who choose a positive rate of absenteeism enjoy a wage of $(\alpha + \beta s)\, q$ in the first period. Males do not have a positive home product and do not derive any utility from choosing a positive rate of absenteeism. Hence, all males choose a zero rate of absenteeism and acquire additional human capital.

■

We add the following assumption:

$$\alpha + \beta > (\alpha + \beta)\, q + Q > \alpha q + Q > \alpha \tag{1}$$

As a result of the first inequality, the first period product of a college-educated female who chooses a zero rate of absenteeism is higher than the first period product of a college-educated female who chooses a positive rate of absenteeism (the sum of her home and market product). The last inequality implies that the first period product of a less-educated female who chooses a positive rate of absenteeism is higher than the first period product of a less-educated female who chooses a zero rate of absenteeism.[3] The second inequality holds under the assumption that β is positive. Recall that $s = 1$ if the individual attended college and 0 otherwise. As such, β represents the return to schooling of college attendance.

Using the assumption captured is Equation (1), one can show that in an economy without asymmetric information, we obtain the following:

Observation 2 A college-educated female chooses a zero rate of absenteeism. A less-educated female chooses a zero rate of absenteeism (a positive rate of absenteeism) if $(1-q)\,\alpha + \gamma - Q > (<)\, 0$.

Proof. Calculating the life-time utility of a college-educated (less-educated) female and the assumption captured in Equation (1) . ■

However, in an economy with asymmetric information, choosing a positive rate of absenteeism incurs another cost - an individual who chooses a positive rate of absenteeism does not acquire additional human capital through on-the-job training (regardless of whether he or she has attended college). An individual who does not acquire additional human capital produces less in the second period (and enjoys a lower wage in equilibrium). As a result of this assumption, the second period product of a female who chooses a positive rate of absenteeism is lower than the second period product of a female who chooses a zero rate of absenteeism in the first period.

We are now ready to analyze the market wages of females (recall that females who choose a positive rate of absenteeism also produce Q at home). Note that we assume asymmetric information only with respect to the accumulated amount of human capital. No information asymmetries are observed in the first period.

Due to the private-information assumption, a female's decision to choose a zero or a positive rate of absenteeism is not publicly known, and females with the same amount of

[3]For a discussion of this assumption, see Zax, Rosenboim and Shavit (2014).

schooling have the same alternative wage in the second period regardless of their chosen rate of absenteeism. The following observation differs from the previous in that absenteeism is private information, known only to the employee and her current employer.

Observation 3 A college-educated (less-educated) female chooses a zero (positive) rate of absenteeism, has a wage of $\alpha+\beta$ ($q\alpha$) in the first period and a wage of $\alpha+\beta+\gamma ex$ (α) in the second period.

Proof. Using the assumption captured in equation (1), we obtain that

$$(\alpha+\beta s)\, q + Q < \alpha + \beta s \tag{2}$$

and

$$\alpha q + Q > \alpha$$

Hence, the first period product (the sum of home product and market product) of a college-educated female who chooses a zero rate of absenteeism is higher then the first period product of a female who chooses a positive rate of absenteeism, while the first period product of a less-educated female who chooses a positive rate of absenteeism is higher than the first period product of a female who chooses a zero rate of absenteeism. Moreover, recall that the amount of human capital acquired during the first period is unobservable. Hence, the wage in the second period is not a function of the choices which are made during that period. Therefore, we obtain that all females who attend college choose a zero rate of absenteeism and acquire experience. ■

In other words, by choosing a zero rate of absenteeism, a female who attended college enjoys a higher consumption during the second period than by choosing a positive rate of absenteeism (recall that females' consumption in the second period equals her wage plus her home product). However, a less educated female enjoys a lower consumption during that period by choosing a zero rate of absenteeism.

Hence, in equilibrium, each college educated female chooses a zero rate of absenteeism while less educated female chooses a positive rate of absenteeism.

To conclude: Males enjoy an increasing wage-experience profile, due to the increase in their human capital during the first period. However, among females, the return to experience is higher among those who have attended college in the second period, since firms know that only those females acquired additional human capital in the first period.

Observation 4 More women attend college than men when the experience premium is higher than females' home product $(\gamma - Q > 0)$.

Proof. The life time utility of a college-educated female is given by her life time wage which equals $\alpha + \beta + \alpha + \beta + \gamma - c(A)$. The life time utility of a less-educated female is given by $q\alpha + \alpha + Q$. We obtain that females with ability A_f, such that $\alpha + \beta + \alpha + \beta + \gamma - c(A_f) = q\alpha + \alpha + Q$ are indifferent between attending college or not. Hence $c(A_f) = (1-q)\alpha + 2\beta + \gamma - Q$

The life time utility of a college-educated male is given by his life time wage which equals $\alpha+\beta+\alpha+\beta+\gamma$. The life time utility of a less-educated male is given by $\alpha+\alpha+\gamma$. We obtain that males with ability A_m, such that $\alpha+\beta+\alpha+\beta+\gamma-c(A_m) = q\alpha+\alpha+\gamma$ are indifferent between attending college or not. Hence, $c(A_m) = (1-q)\alpha + 2\beta$.

$c(A_m) - c(A_f) = Q - \gamma$. ■

In the analyzed economy there are only two rates of absenteeism (zero and positive). We can extend our model and analyze an economy with three rates of absenteeism (zero, low and high) in which males choose zero rate of absenteeism, college-educated females choose a low rate of absenteeism and less-educated females choose a high rate of absenteeism. In such an economy college-educated females have a lower wage than college-educated males. We do not discuss it due to space constraints.

3 Conclusion

The difference between males' and females' wages is a well-documented empirical observation, across countries and periods of time. Other evidence shows that the number of female college graduates has surpassed that of males and that females enjoy a higher schooling premium than males. This paper provides an explanation for the higher amount of female college graduates and their return to schooling. We show that as a result of their higher wage, college-educated females choose to exert a higher amount of effort at the market, acquire more human capital and have a higher experience premium.

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