Abstract: This paper discusses the claim made in Altonji and Pierret (1997) and Lange (2005) that a high speed of employer learning indicates a low value of job market signaling. It is first discussed intuitively in light of Spence’s original model and then evaluated in a simple extension of a model developed in Altonji and Pierret (1997). The analysis provided indicates that, if employer learning is incomplete, a high speed of employer learning is not necessarily indicative of a low value of job market signaling.

Keywords: Job Market Signaling, Employer Learning

JEL Codes: J0, J3, D82
Introduction

Job Market Signaling (JMS), introduced by Spence (1973), proposes that high-ability workers differentiate themselves by acquiring educational signals. If higher ability individuals find it less costly to acquire educational signals this process will lead to a separating equilibrium in which workers are differentiated by ability.

Altonji and Pierret (1997) (hereafter AP) investigate the relationship between the speed of employer learning (SEL) and the value of job market signaling in a simple signaling model in which employers learn very quickly. In their model workers have an incentive to acquire education only if the returns are exorbitantly high. They conclude that the value of signaling cannot be very high if employers learn quickly.

Lange (2005) estimates the speed at which employers learn about workers’ true productivities. He concludes that employer learning is rather fast and, partially based on the argument provided by AP, uses this result to downplay the economic significance of job market signaling.

The contribution of this paper is to provide a different interpretation and to challenge the contention that a high speed of employer learning is indicative of a low value of signaling. Section 2 of the paper provides an intuitive discussion of the signaling process. Section 3 extends AP’s model by introducing the possibility that employer learning is incomplete and provides evidence for an important role of JMS even if employer learning is very fast. Section 3 attempts to reconcile the contrasting views by discussing the relationship between the speed of EL and the existence of JMS. Section 4 concludes.
The Speed of EL and the Value of JMS: An Intuitive Discussion

Lange (2005) estimates the speed at which employers learn and finds that employers are able to reduce their average expectation error concerning the productivity of a worker by 50% over the first 3 years. He concludes that this is rather fast. He then argues, partially based on the argument provided in AP, that job market signaling is of limited value.

In Spence (1973) employers hire workers according to educational signals that are correlated with the workers’ true productivity. In equilibrium the employers’ beliefs about the informational content of the educational signals are confirmed. In order to achieve equilibrium and react to changes in the productivity/signal relationship it should be beneficial for employers to have their beliefs confirmed sooner rather than later.2 Figure 1 (adapted from Spence(1973)) illustrates the signaling process. Thus the findings of Lange (2005) should imply that this process works rather efficiently. It does not take employers long to detect workers that obtained the wrong signal and “masquerade” as high ability workers. Therefore, the value of the educational signal should be positively correlated with the speed of employer learning. It also shows that employers would not value JMS if employer learning was slow.

Lange (2005) supplements his mathematical treatment with a graphical. Figure 2 reproduces his graph (Figure 3 in Lange (2005)). The figure shows two average productivity paths, one for low ability workers and one for high ability workers. It also shows two earnings paths (dashed lines) for a low ability worker who (wrongly) decides to go to college corresponding to two different speeds of employer learning. The area

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2 I assume that some workers acquire the wrong level of education (either because they don’t know their type with certainty or because they are cheating) so that employers need to learn about workers after hiring.
between the solid and the dashed lines corresponds to the worker’s return to acquiring the college degree. It is clear from the graph that a higher speed of employer learning will limit the worker’s return. Lange uses this argument to show the inverse relationship between the speed of employer learning and the value of an educational signal. While the argument seems intuitive the return shown is not the return to an educational signal originating in the JMS model. It is the return to an out-of-equilibrium choice of schooling. The person shown in the graph is “masquerading” as a high-ability worker. The earlier individuals with the “wrong” signal can be detected, the more efficient the process of JMS is. The results provided in Lange (2005) can thus also be interpreted as evidence that a higher speed of EL makes JMS more valuable to employers.

The Speed of EL and the Value of JMS: Extending AP’s Model

AP’s argument that a high speed of employer learning implies a low value of signaling is based on the following model: Assume that there are 2 types of workers, 0 and 1, with productivities $Y_1$ and $Y_0$ ($Y_1 > Y_0$). Workers are paid their expected productivity. Individuals choose between one year of schooling or no schooling at all. Schooling costs are higher for type 0. In signaling equilibrium $(1+k) = Y_1/Y_0$ represents the ratio of productivities of the two types of workers. Employers learn nothing for two years and then instantly acquire full information. With zero interest rates this implies that the present value for a $Y_1$ type without schooling is

$$PV(Y_{1,\text{NoSchool}}) = 2 \cdot Y_0 + (T - 2) \cdot (1+k) \cdot Y_0 \quad (1)$$

The present value of $Y_1$ with one year of schooling (no earnings while in school) is equal to

$$T \cdot (1+k) \cdot Y_0 \quad (2)$$
This implies that type $Y_1$ will choose school if

$$(T-1) \cdot (1+k) \cdot Y_0 > (T-2) \cdot (1+k) \cdot Y_0 \quad (3)$$

or $k > 1$.

Type $Y_1$ individuals choose schooling only if they are paid twice as much as type $Y_0$. Since empirical estimates of the returns to schooling are between 5%-10% AP reject that the signaling plays a significant role in the labor market if employers learn sufficiently fast about workers’ productivities.

In AP’s model a high productivity worker has two choices. He can attend school and, upon graduation, work for a high-wage firm. The second possibility is not to attend school and, after a short stint at a low wage firm and upon the revelation of his true productivity, move to a high wage firm. Taken literally this would enable a worker to work in the food service industry for a short time before an instantaneous transfer into investment banking. To achieve the same occupational success the worker in AP’s model has to choose between putting in effort and acquiring an educational signal or staying in a low-paying job for a short time. It is obvious that only a very high wage differential could induce individuals to consider going to school suggesting an inversely relationship between SEL and JMS. The following analysis will show that AP’s model is an extreme case of a more general model that has different implications.

AP assumes that EL is symmetric (current employers do not have more information than potential employers) and complete (employer can obtain complete information). I will maintain the assumption of symmetric learning.

Doe employers have an incentive to learn everything about a worker? I assume that employers care only performance in the current job implying a limit on the extent of
information that the firm seeks to acquire about the worker. Therefore, I augment AP’s model by assuming that, after L years, the employer will know only a fraction \((1 - \alpha) < 1\) of the worker’s productivity. Therefore, a type \(Y_1\) individual who chooses \(S\) years of schooling will have lifetime earnings equal to

\[
(T - S) \cdot (1 + k) \cdot Y_0,
\]

where \(T\), as before, is the number of time periods and \(S\) represents the number of years of schooling\(^3\). If the individual chooses no schooling his lifetime earnings are

\[
L \cdot Y_0 + (T - L) \cdot [\alpha \cdot Y_0 + (1 - \alpha) \cdot (1 + k) \cdot Y_0].
\]

Solving for \(k\) yields

\[
k = \left( \frac{L + (T - L) \cdot \alpha}{(T - S) - (T - L) \cdot (1 - \alpha)} - 1 \right) \cdot \frac{1}{S}.
\]

Note that AP’s model is a special case in which \(S = 1\) and \(\alpha = 0\). Figure 1 shows the average return to schooling necessary to induce an individual to choose schooling for different values of schooling and employer learning. Figure 2 shows the minimum alpha (max. amount of EL) necessary to achieve empirically relevant returns to education of 10%.

Figure 1 shows that (given alpha=1/3 and T=40) limiting learning reduces the return necessary to induce an individual to attend school to a reasonable range. The results also show that, conditional on attending school, the return to an educational signal might increase with the speed of employer learning (as conjectured in section 2). Figure 2 displays the alpha necessary to generate an average return to schooling equal to 10%.

\(^3\) It is assumed that the individual either chooses 0 or \(S\) years of schooling.
Note that an alpha=0 implies that employers will have all information at the end of L years. Remarkably, even if learning only takes one year, employers are allowed to learn between 60 and 75 percent of a worker's ability without requiring the return to the educational signal to exceed empirical values.

**The Speed of EL and the Existence of JMS**

One can reconcile the conclusions of this paper with the views expressed in AP and Lange (2005) by examining the relationship between the speed of EL and the existence of JMS. Imagine a world in which EL is extremely slow. Considering the inability of employers to confirm their beliefs under such a regime it is very unlikely that JMS would exist (although employers would highly value a good signal). Furthermore, there is no room for JMS when employers learn about the true productivity of a worker instantaneously. Employers would not be willing to pay much for a signal (and, as AP show, workers won’t be willing to pay). Combining the two scenarios one is lead to believe that there is a negative correlation between the SEL and JMS. However, it does not make sense to discuss this relationship in scenarios in which JMS does not exist. The argument of this paper is that, if JMS exists, it does not follow that a higher speed of EL implies a low value of JMS. Figure 3 illustrates this.

**Conclusion**

This paper provides evidence against the view that a high speed of employer learning implies a low value of job market signaling. It was shown qualitatively that the postulated relationship seems at odds with Spence’s original model. Furthermore when perceiving employer learning as an imperfect process with a sufficient degree of residual
incompleteness, the conclusion of Altonji and Pierret (1997) fails to hold. Future work should identify the relationship between the speed of employer learning and the existence of job market signaling and investigate the determinants of the relationship in the region where signaling exists.
References


Employer’s Conditional Probabilistic Beliefs

Offered Wage Schedule as a Function of Signals and Indices

Hiring, Observation of Relationship between Marginal Product and Signals

Signaling Decisions by Applicants; Maximization of Return Net of Signaling Costs.

Cost of Signal

Source: Spence (1973)
Simulated Returns to Schooling
(alpha=1/3, T=40)

Minimum Alpha necessary to generate a Return to Schooling of 10%
Experience

Low Ability (without Signal)

Earnings

Low Ability (with Signal and high Speed of Employer Learning)

High Ability (with Signal)

Low Ability (with Signal and low Speed of Employer Learning)

Low Ability (without Signal)

Figure 2
Value of Job Market Signaling increases with Speed of Employer Learning?