

**THE PH.D. AS A SIGNAL BY ECONOMISTS
SEEKING NON-ACADEMIC JOBS**

by

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ABSTRACT: Economists in the non-academic job market compete in two dimensions, education versus experience. At entry levels within the non-academic field, a job candidate with a masters degree and little research experience may face an incumbent/rival with considerably more research experience and with an equivalent or a lower education degree/level, seeking promotion to the same position. The employer weighs experience against education in deciding between the hiring of a new job candidate or promotion from the ranks. This paper illustrates the use of Ph.D.s as a signalling device in the non-academic labor market for economists.

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Economists pursuing academic careers acquire a Ph.D. and publications in order to obtain job tenure and promotions. In the academic job market, a Ph.D. degree or a promising "A.B.D." is a must at the entry level. Teaching experience and publications are an asset in this market, but competition for a job does not pit a fresh Ph.D. against an experienced teacher sans doctoral degree. All candidates for entry-level positions hold the same degree, although graduates from relatively prestigious schools may be at an advantage.

The non-academic job market, in contrast, attaches importance to research experience, with publications as evidence of it. Non-academic positions are typically in the government or private sector, and in research institutions. Economists in the non-academic market compete in two dimensions, education and experience. At entry levels within the non-academic field, a job candidate with a masters degree and little research experience may face an incumbent/rival with considerably more research experience and with an equivalent or a lower education degree/level, seeking promotion to the same position. The younger candidate, in terms of years since graduation, can improve his hiring chances by investing in further schooling. These candidates may compete against experience with a higher degree, a Ph.D., which involves a gain in research experience that may or may not be recognized. The employer weighs experience against education in deciding between the hiring of a new job candidate, or promotion from the ranks. This paper illustrates the use of Ph.D.s as a signalling device in the non-academic labor market for economists. Although this paper addresses a situation of recruitment, the analysis may be extended to one of job retention against lateral entries.

Signals, Credibility, and the Hiring Decision

Spence (1973) defines signals as "observable characteristics attached to the individual that are subject to manipulation by him" [pp. 357]. Signals act as a proxy to meet

an informational gap in purchase/hiring decisions. For instance, education serves as a signal proxy for the productivity of a worker, which is unknown to the employer *ex ante*. Similarly, a university uses grades to judge academic capabilities of a student seeking admission or financial awards. Signals function as a decision base, enabling the market to clear when a decision of sale or purchase in a market is subject to uncertainty regarding the product. Spence (1973, 1976) includes education, previous work, and service records in the category of labor market signals. Given uncertainty, subjective assessment based on signals perceived is an essential element of the economic decision-making process.

Signals involve costs for the sender, and the individual will invest in education if there is sufficient return, as defined by the offered wage schedule [Spence 1976]. Equilibrium is established when the employer's or receiver's expectations are consistent with the signals received. Active signals are created when the receiver anticipates the effect of their own responses on the pattern of investment in the signals, and attempts to compete in this dimension.

The signal relayed by an agent may, or may not, be a true or reliable one. The receiver has the freedom not to believe it [Sobel 1985]. In Sobel's world, there is uncertainty regarding the reliability of information transmitted by a signal. Sobel develops a model that describes the nature and properties of an equilibrium in this information trade under uncertainty. The strategies of the sender and the recipient of a signal for a simple one-stage game may be different from that in a multistage game. The thrust of Sobel's argument concerns the implications for the actions/strategy of an individual who supplies information signals to a recipient. The receiver has no means of checking the information received, so he relates the reliability of the signal to his judgement on the reliability and motives of the signal sender. If the signal sender's action-history begets trust, then the signal recipient is inclined to trust the sender and consider the signal as reliable. A recipient may first build trust by giving reliable information signals before

betraying trust. Such behavior demonstrates the importance of establishing credibility by a history of honest behavior.

The Signal Decision for Non-Academic Jobs

Suppose job candidates for a research position in the non-academic firm or set of firms consist of two types of economists. Type I economists are fresh graduates (new entrants) with a masters degree. Type II workers have greater/longer experience in the same firm at a lower level in the employment hierarchy and apply for the same position as the Type I economists. Q and P denote the employer's perception of productivity for Type I and Type II economists, respectively. If $P > Q$, then the employer fills the position with existing experienced Type II workers from the ranks otherwise the employer hires Type I economists. The accepted signal of the productivity differential between the two sets of economists, $P - Q$, is the information base for the employer. Current (experienced) workers argue that it is experience which counts and that $P \geq Q$; any productivity differential accrues to those with experience on the job.

In order to be hired by this firm, Type I economists need to demonstrate or convince the employer that their productivity is greater than that of Type II workers, $Q > P$. In order to persuade the employer of their superior productivity, they can invest in a Ph.D. signal to enhance their image, with education as an acceptable signal for productivity. Type II economists may also invest in the Ph.D. option as a signal, reducing the effectiveness of the strategy of Type I candidates. The employer may then question the credibility of the signal. The employer's assessment of the signal depends upon the behavior of other Type II agents, which imposes an externality in signalling.

Consider the three states of the world: employment in this firm or preferred set of firms, unemployment, and alternative employment. Alternative employment refers to employment in other non-academic firms or the academic profession. Table 1 indicates the possible outcomes for Type I economists.

A number of alternative assumptions may be made regarding individual preferences over the different states of the world or outcomes. These outcomes are associated with assumed subjective probabilities. The results in this paper depend on these assumptions, which are critical to the robustness of the results. These assumptions are merely illustrative, and similar analysis may be applied to a different set of assumptions. The following assumptions imply specific preference orderings, with U indicating the utility from a particular outcome (listed in Table 1):

- i. Suppose this firm (or set of firms) represents the first employment choice for the individual. Employment in this firm is definitely preferred to alternative employment, and to unemployment, irrespective of whether the individual signals. With a Ph.D., $U(A) > U(C) > U(B)$, and without the signal, $U(D) > U(F) > U(E)$.
- ii. The individual prefers alternative employment to being unemployed. The worst state of the world is unemployment. Complete but forced leisure is not valued. $U(B) = U(E) = 0$.
- iii. Having signalled by investing in a Ph.D., the benefit or utility from alternative employment is greater than without signalling. The increased educational qualifications enable the individual to seek positions further up the job hierarchy than possible without a Ph.D. $U(C) > U(F)$.

Benefits include wage income, job satisfaction and other psychic or non-observable attributes. If benefit or utility is measured in monetary units as income or equivalent, this relationship can be evaluated for a sample of individuals.

The probabilities of a particular state occurring are influenced by the action of the individual. The probability that an individual is hired by this firm depends on whether the individual signals, and what signal he relays. The assumptions about the probabilities (P) of the different outcomes (listed in Table 1) are:

i. The likelihood of finding alternative employment is relatively high for an economist with a Ph.D. compared to without one, unless there is a recession.

$P(C) > P(F)$.

ii. The probability of being unemployed with a Ph.D. is relatively small. If the Ph.D. results in over-qualification for jobs, and there is excess supply of Ph.D. economists, the probability of being an unemployed Ph.D. may be non-zero. $P(B) = 0$.

iii. Without a Ph.D., there is a non-zero probability of becoming unemployed. This assumption seems reasonable, since it indicates the motivation for aspiring economist Ph.D.s. $P(E) > P(B)$.

iv. The probability of being hired depends on whether the signal is relayed and accepted. The Ph.D. signal improves the probability of being hired in this firm. This assumption is a reasonable representation of the real world. $P(A) > P(D)$.

v. If no signal is relayed, the probability of being unemployed increases; no signalling action carries a penalty. $P(E) > P(D)$ and $P(E) > P(F)$.

An individual maximizes the difference between the offered wage and signalling costs. The signalling decision depends on the total relative net benefits from the signal. Define EPV as Expected Present Value. NB is the flow of Net Benefits from a particular strategy option, over the time horizon or working life including the pension years of the individual. R^* is a subjective sufficiency norm. The individual seeks to maximize the total relative benefit, net of costs, over the time horizon by choosing an appropriate signal. The Type I economist invests in a Ph.D. signal if: $EPV [NB(\text{Ph.D. Signal}) - NB(\text{No Signal})] > R^*$.

If all or the majority of Type I economists invest in a Ph.D., and the employer perceives a Ph.D. as indicative of superior technical education and higher productivity vis-a-vis Type II economists, then the firm hires fresh graduates or Type I candidates. The net

benefit to Type I economists is $U(A)$ net of costs. A Spencian equilibrium is established when the employer's expectations are consistent with the signal received.

The Ph.D. signal may be perceived as an insurance against the risk of unemployment, since the probability of outcome B is near zero. The economist with a Ph.D. reduces the utility loss suffered, since the Ph.D. improves his prospects for employment elsewhere, $P(C) > P(F)$. The economist is better off with a Ph.D. so long as $U(C) > U(F)$.

The signal costs include direct financial costs incurred in pursuing studies, as well as the opportunity cost of wages foregone. Since the Ph.D. involves a period of study when the individual could have been working (at a lower job level), the economist loses seniority and work experience. The loss of status and reduced living standards of a Ph.D. student relative to a white-collar wage earner also involves psychic costs. A portion of these costs may be offset if the Type I economist receives financial assistance, or if the gain in research experience during the process of study is recognized.

The comparisons in this exercise involve the utility from the net income flow, and not the monetary value of the direct and indirect benefits and costs. A probabilistic feature enters the analysis since the different strategy options do not simply result in differing outcomes, but alter the probability of an individual being in a particular outcome. The individual evaluates the net income benefit from a probabilistic state, rather than the benefit from a state per se. A strong element of subjectivity pervades this analysis, with the individual's decision to signal depending on his perceived probabilistic income benefit from a strategy option.

The signalling decision depends on the degree to which the individual is risk-averse, which is hypothesized to be related to their age. Type I economists in this model are younger (new entrants in the non-academic job market). Type I economists tend to be more ambitious and optimistic with higher expectations regarding the benefits from a Ph.D. The number of future working years is greater for younger economists. So the present value

of benefits is calculated over a greater range. Costs are of a shorter duration and independent of working life, so costs would not increase commensurately. Net benefits from signalling are of longer duration for younger economists and may be greater than for experienced Type II workers.

Older economists (Type II) who wish to relay the same signal may find it difficult to persuade current employers to grant them study leave. Type II workers may not be willing to quit their current position for an uncertain future. These economists may find alternative employment more difficult to obtain, in spite of their experience, given the age stipulations in job advertisements. The probability of alternative employment is likely to be greater for younger economists. Younger economists are better able to adjust their lifestyles and standards of living to the rigors of a student. Older economists have commitments to family and have a greater status to lose, but they may have greater wealth accumulation to accommodate the adjustments. Younger Type I economists, at the beginning of their careers, have little seniority and experience to lose. Fresh graduate will find it easier to return to further studies, although the impatience of youth may counteract this tendency.

Conclusion

This paper models the decision to pursue a doctoral program in economics as a rational decision based on an individual's preference orderings. Individuals with a different pattern of preferences may rationally choose not to signal, or to use an alternative type of signal. This analysis suggests that the net benefits from signalling may be greater for younger job candidates entering the job market for the first time, than for experienced (Type II) workers. So younger (Type I) economists or fresh graduates are more likely to invest in a Ph.D. signal. But this behavior is based on a set of assumptions regarding the probability of being hired by the preferred non-academic organization or set of organizations, of finding alternative employment, or of being unemployed. These

(perceived) probabilities are likely to change over time for a fresh graduate, altering the decision of whether or not to signal and affecting the choice of the signalling mechanism. As competition for jobs increase, and the probability of being hired by the preferred firm becomes smaller, an increase in the enrollment of doctoral students may be expected.

TABLE 1
Signal and Non-Signal Outcomes for Type I Economists

Strategy Options	Employment With This Firm	Unemployment	Alternative Employment
Ph.D. Signal	A	B	C
No Signal	D	E	F

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