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Abstract

This paper provides a novel explanation of “educated unemployment,” which is a salient feature of the labor markets in a number of developing countries. In a simple job-search framework we show that “educated unemployment” is caused by the perspective of international migration, that is, by the possibility of a “brain drain.” In addition, the analysis shows that a developing country may end up with more educated workers despite the brain drain and educated unemployment.

Kurzfassung

Dieser Aufsatz liefert einen neuen Erklärungsansatz für Arbeitslosigkeit bei gebildeten Personen, einem hervorstechenden Kennzeichen des Arbeitsmarktes in vielen Entwicklungsländern. In einem einfachen Stellensuchmodell wird gezeigt, dass die Arbeitslosigkeit von gebildeten Personen durch die Aussicht auf internationale Migration verursacht ist, d.h. durch die Möglichkeit der Abwanderung hoch qualifizierter Arbeitskräfte. Darüber hinaus zeigt die Untersuchung, dass ein Entwicklungsland trotz der Abwanderung hoch qualifizierter Arbeitskräfte und trotz der Arbeitslosigkeit von gebildeten Personen letztendlich dennoch über eine größere Anzahl gebildeter Arbeitskräfte verfügen könnte.

1. Introduction

There are two salient features of many writings on human capital in developing countries. First, a fraction of the educated workforce migrates to developed countries. Since educated workers are one of the scarcest resources in developing countries, it has been argued that the migration of educated workers is a "brain drain" for the developing countries (for a systematic review see Bhagwati and Wilson 1989). Second, in a number of developing countries, a large fraction of the educated workforce is unemployed. For example, in their influential development economics textbook, Gillis et al. (1996) allude to the Sri Lankan experience as a striking example, noting that half of the country's new university graduates were unemployed in the 1970s.[1] The phenomenon of educated unemployment in those developing countries contrasts sharply with the pattern of unemployment in developed countries. In the latter, the unemployment rate and educational attainment are strongly negatively correlated (Ashenfelter and Ham, 1979).

However, while there has been extensive research on the "brain drain,"[2] the issue of "educated unemployment" has attracted little attention in the economics literature, despite references to its importance in development economics textbooks. A notable exception is an article by Bhagwati and Hamada (1974). In a fixed-wage framework, Bhagwati and Hamada argue that a high foreign wage

[1] Also, Mathew (1997) reports that in urban Kerala, India in 1983, the unemployment rate of university graduates was 11.34 percent for males and 25.69 percent for females, which is much higher than the unemployment rate of those who had no education (3.52 percent for males, and 1.52 percent for females), and the unemployment rate of those who had up to primary education (6.73 percent for males, and 8.43 percent for females). More recently, Boudarbat (2004) shows that in 2000, the unemployment rate of university graduates in Morocco was about four times that of individuals who had acquired less than six years of schooling.

[2] The topic of the brain drain is also regularly taken up in the informed press (see the short overview in Stark (2004)).

can increase the fixed wage rate of the educated in the home country by affecting people's psychology and that, in turn, the higher fixed wage increases unemployment.[3] However, since educated unemployment is not a serious problem in all the developing countries, Bhagwati and Hamada could not explain why a high foreign wage affects the psychology of people in some countries but not in others.

The current paper provides an alternative model of "educated unemployment". In the model developed in this paper, "educated unemployment" is caused by the perspective of international migration, that is, by the possibility of a "brain drain." In a simple job-search framework we show that an individual's reservation wage in the labor market of the home country increases with the probability of working abroad. Consequently, workers who fail to line up employment abroad are less likely to immediately immerse themselves in work in their home country. Instead, they enter unemployment in order to engage in a repeated attempt to secure foreign employment. Thus, we provide a new explanation for the phenomenon of "educated unemployment" observed in developing countries. Our theoretical analysis provides a basis and a rationale for rigorous empirical tests of this important phenomenon which, to the best of our knowledge, are absent in the received literature. Moreover, our main argument that international migration and "educated unemployment" are closely linked seems to be consistent with considerable anecdotal evidence and policy-related research.[4]

We integrate the "educated unemployment" - international migration perspec-

[3]For example, Bhagwati and Hamada (1974, p. 20) state: "The presence of international income-inequality implies that, for the educated elite which is better informed about the developed world, and more integrated therewith regarding the notions of a 'good life' and related values, the salary levels demanded and fixed by the elite groups tend to reflect the salary levels of comparable groups in the more developed countries."

[4]For example, see King (1987) and Tullao (1982).

tive with the recent literature on the "beneficial brain drain,"[5] which contends that compared to a closed economy, an economy open to migration differs not only in the opportunities that workers face but also in the structure of the incentives that they confront: higher prospective returns to human capital in a foreign country impinge favorably on human capital formation decisions at home. The analysis of this paper shows that a developing country may end up with more educated workers despite the brain drain and educated unemployment. In other words, the average level of human capital in the country may well be higher under migration than in the absence of migration. This higher level can play a critical positive role in determining long-run, future output growth, the present-day gloom of "educated unemployment" notwithstanding.

Sections 2 and 3 set up the basic analytical framework and present a model of educated unemployment. Section 4 presents an analysis demonstrating that the perspective of international migration can lead to a "brain gain" despite "brain drain" and the possibility of being unemployed after acquiring a higher level of education. Section 5 offers conclusions and complementary reflections.

2. Migration and "educated unemployment "

Consider a world that consists of two countries: home, H, and foreign, F. Country H is developing and is poorer than developed country F. Due to a policy of selective migration by F, only educated individuals (say university graduates) of H have a chance of working in, hence migrating to, F.

In this section we analyze the behavior of the home country's educated indi-

[5] For example, see Stark, Helmenstein, and Prskawetz (1997, 1998), Mountford (1997), and Stark and Wang (2002).

viduals. In the next section we incorporate into the model the cost of education and we analyze the decision to acquire education.

In this section we assume that everyone in H is educated. The decision making process of an educated individual is illustrated by Figure 1:

Figure 1 is to be inserted here

An educated individual makes decisions in (at most) three stages:[6]

(1) The first stage. When an individual graduates from a university, the individual participates in a draw that results in probable work in F. If the individual obtains a winning ticket, his income will be

$$w^f \ .$$

The probability of being selected into work in F is

$$p \ .$$

(2) The second stage. (Note that there is no second stage for individuals who win the draw.) An individual who graduates and fails to secure work in F faces the following choices: to work or to wait for another draw. Waiting for another draw frees time to search for a job in F. Alternatively, if the individual were to work, little time (and energy) would be available for preparing applications and, in addition, the individual's academic qualifications could depreciate, thereby lowering the probability of being picked up for work in F.[7]

[6] We assume that relative to the duration of the individual's working life, the duration of the three stages is short.

[7] Schaafsma and Sweetman (2001) show that "working experience in the source country yields virtually no return in the host country."

The assumption that individuals choose unemployment while waiting for another draw of going abroad is particularly consistent with the job-search theory. In fact, the assumption that the probability of finding a (new) job is higher when an individual does not hold a job, but instead concentrates on searching for a job, is at the heart of the literature on job search and the natural rate of unemployment (see, for example, Mortensen (1986), Acemoglu and Shimer (1999), and Rogerson, Shimer, and Wright (2005)). The rationale underlying this assumption is that searching for a job requires time and effort. The received job-search theory refers to domestic markets. It is reasonable to assume that finding a job in a foreign labor market requires even more time and effort.[8]

For simplicity, we assume that if the individual works, he cannot participate in any additional draw so that his probability of ending up working in F is zero. If the individual does not work and awaits another draw, his chances of going abroad are

$$p' \ .$$

(3) The third stage. (Note that the third stage only applies to those who waited for another draw in the second stage.) If an individual wins this draw, he will go abroad. Otherwise, he will work at home, receiving the home country's mean wage rate.

The job offers in the second and the third stage follow an independently identical distribution. The cumulative distribution function of the wage offer, $\widetilde{w}$, is

[8]Information on the employment status of migrants at home in developing countries prior to migration is scanty. Rudimentary studies suggest that on several occasions, nearly half of the migrants from India were unemployed prior to migration (Srivastava and Sasikumar, 2003). Additional empirical work on the employment status of individuals prior to their international migration would be of considerable interest.

$F(\bullet)$. We assume that $F(\bullet)$ is differentiable. We also assume that

$$\widetilde{w} \in [w^l, w^h]$$

and that the density function, $\frac{dF(w)}{dw} \equiv F'(w)$, is strictly positive in its domain, that is

$$F'(w) > 0 \quad \forall w \in [w^l, w^h] \ .$$

The expected income of the (risk-neutral) individuals in the third stage is

$$(1 - p')\overline{w} + p'w^f \tag{2.1}$$

where $\overline{w}$ is the mean wage in H, namely,

$$\overline{w} = \int_{w^l}^{w^h} w dF(w) \ .$$

In the second stage, if the individual receives a wage offer w at H, he will accept it if and only if

$$w > \frac{1}{1+r}[(1 - p')\overline{w} + p'w^f] \ , \tag{2.2}$$

where r is the individual's discount rate.

We define

$$w^c \equiv \frac{1}{1+r}[(1 - p')\overline{w} + p'w^f] \ . \tag{2.3}$$

Then, the individual will accept the wage offer at H if and only if

$$w > w^c \ .$$

Thus, w^c is the individual's reservation wage at H.

Further simplifying, we assume that[9]

$$w^l \geq \frac{1}{1+r}\overline{w} \; ; \tag{2.4}$$

educated unemployment will not exist in the absence of an additional possibility of migration (that is, when $p' = 0$).

Then, the fraction of the educated who are unemployed is[10]

$$u \equiv P(\widetilde{w} \leq w^c) = F(w^c) \; . \tag{2.5}$$

Clearly,

$$\begin{aligned} \frac{du}{dp'} &= \frac{du}{dw^c}\frac{dw^c}{dp'} \\ &= F'\frac{(w^f - \overline{w})}{1+r} \; . \end{aligned} \tag{2.6}$$

Note that the assumption that F is developed and H is developing naturally implies that $w^f > \overline{w}$. Since $F' > 0$,

$$\frac{du}{dp'} > 0 \; . \tag{2.7}$$

In addition, noting that $w^c \equiv \frac{1}{1+r}[\overline{w} + p'(w^f - \overline{w})]$,

$$\frac{du}{d(w^f - \overline{w})} = F'\frac{p'}{1+r} > 0 \; . \tag{2.8}$$

In summary, we have the following proposition.

Proposition 1: *(1) The unemployment rate of university graduates in a developing country will increase as the probability of migration rises. (2) The unemployment rate of university graduates in a developing country will increase as the wage gap between the developed country and the developing country increases.*

[9] Although this assumption is not necessary, resorting to it highlights the notion that "educated unemployment" is caused by the prospect of migration.

[10] Note that in the current model, to facilitate our concentrating on essentials, unemployment applies only to stage 2 of the individuals' decision making processes.

Proposition 1 implies that in a developing country, "educated unemployment" is caused by the prospect of international migration, that is, by the possibility of a "brain drain." The greater the probability of being selected for work in the foreign country and the greater the wage gap between the foreign country and the developing country, the more serious the "educated unemployment" problem. The intuition underlying the proposition is straightforward. From (2.3) we can see that w^c increases with p' and with w^f, and that it decreases with $\overline{w}$, which means that the individual's reservation wage in the home labor market increases with the probability of working abroad and with the international wage gap. Consequently, the unemployment rate will increase as the reservation wage rises.

Moreover, we have assumed for the sake of simplicity that only educated individuals (say university graduates) of the home country have a chance of working in, hence migrating to, the foreign country. If we modify this assumption slightly, such that a better educated individual in a developing country faces a higher probability of working abroad, then by similar logic to Proposition 1, we will obtain the result that the unemployment rate is higher for individuals with higher education.

3. The choice of acquiring higher education

The benefit that education without migration confers is simply H's mean wage rate of educated workers

$$\overline{w} \ .$$

When migration is a possibility, the expected payoff from the three stages

described in the preceding section is

$$\begin{aligned} V &\equiv pw^f + (1-p)\{\int_{w^c}^{w^h} w dF(w) + F(w^c)[\frac{p'w^f + (1-p')\overline{w}}{1+r}]\} \\ &= pw^f + (1-p)[\int_{w^c}^{w^h} wF'(w)dw + F(w^c)w^c] \ . \end{aligned} \tag{3.1}$$

Clearly,

$$\begin{aligned} \frac{dV}{dw^f} &= p + (1-p)[-F'(w^c)w^c + F'(w^c)w^c + F(w^c)]\frac{dw^c}{dw^f} \\ &= p + (1-p)F(w^c)\frac{p'}{1+r} > 0 \ . \end{aligned} \tag{3.2}$$

Let us assume that

$$p' = p(1+\alpha) \tag{3.3}$$

where α is a fixed parameter. To ensure that $0 < p' < 1$, we assume that

$$-1 < \alpha < \frac{1}{p} - 1 \ .$$

Then,

$$\begin{aligned} \frac{dV}{dp} &= w^f - [\int_{w^c}^{w^h} w dF(w) + F(w^c)w^c] \\ &\quad +(1-p)[-F'(w^c)w^c + F'(w^c)w^c + F(w^c)]\frac{(w^f - \overline{w})(1+\alpha)}{1+r} \\ &= w^f - [\int_{w^c}^{w^h} w dF(w) + F(w^c)w^c] + (1-p)F(w^c)\frac{(w^f - \overline{w})(1+\alpha)}{1+r} \ . \end{aligned} \tag{3.4}$$

We further assume that

$$w^f > w^h \ . \tag{3.5}$$

To rule out the unreasonable possibility that all the educated are unemployed, we assume that

$$w^c < w^h \ . \tag{3.6}$$

Then, we have that

$$\begin{aligned} & \int_{w^c}^{w^h} w dF(w) + F(w^c)w^c \\ \leq & \int_{w^c}^{w^h} w^h dF(w) + F(w^c)w^h \\ = & w^h \int_{w^c}^{w^h} dF(w) + F(w^c)w^h \\ = & w^h(F(w^h) - F(w^c)) + F(w^c)w^h \\ = & w^h \ . \end{aligned}$$

Therefore,

$$w^f > [\int_{w^c}^{w^h} w dF(w) + F(w^c)w^c] \ , \tag{3.7}$$

and it then follows from (3.4) that

$$\frac{dV}{dp} > 0 \ , \tag{3.8}$$

the benefit of acquiring a university education in H increases as the probability of migration rises.

We next incorporate the cost of acquiring education. Our idea is that individuals differ in their abilities and familial background, hence in their cost of acquiring education. We normalize the size of the (pre-migration) population of H to be Lebesgue measure 1. Suppose that an individual's cost of obtaining education, c, follows the uniform distribution

$$\widetilde{c} \in [0, \Omega] \ .$$

We assume that the (lifetime) income of an uneducated individual is constant, and we denote it by Φ. Then, recalling the assumption that only individuals

with university degrees have any chance of migrating, an individual will choose to acquire a university education if and only if

$$V - c \geq \Phi \tag{3.9}$$

Let us define

$$c^* \equiv V - \Phi \ . \tag{3.10}$$

It follows that an individual will obtain a university education if and only if his cost of education maintains

$$c \leq c^* \ .$$

Since $\widetilde{c}$ follows a uniform distribution and the population size of the economy is of Lebesgue measure 1, both the proportion and the number of educated individuals are given by

$$\frac{c^*}{\Omega} \ . \tag{3.11}$$

From (3.10) we get

$$\frac{d(c^*/\Omega)}{dp} = \frac{1}{\Omega}\frac{dV}{dp} > 0 \ , \tag{3.12}$$

where the inequality sign in (3.12) follows from (3.8). We thus have the following proposition.

Proposition 2: *The number of individuals undertaking university education will increase as the probability of migration rises.*

This proposition implies that while the prospect of migration causes the unemployment rate of educated individuals in the home country to increase (2.7), it also induces *more* individuals to acquire education (3.12). The end result may be an increase in the *number* of unemployed university graduates. Thus, Propositions 1

and 2 provide an explanation for the phenomenon of educated unemployment by linking it to migration.

4. A brain drain versus a "brain gain "

In this section, akin to Stark, Helmenstein, and Prskawetz (1997, 1998), we seek to examine whether the prospect of migration can result in a larger number of educated individuals in the home country. Since in our model only educated individuals have a positive probability of migration, it follows that if the prospect of migration results in a larger number of educated individuals in the home country, then it will a fortiori result in a higher fraction of educated individuals in the home country.

The following proposition shows that the "brain gain" caused by the prospect of migration may be larger than the loss from the brain drain.

Proposition 3: *There exists a positive level of p at which the number of university graduates remaining in the developing country is higher than the number of university graduates in the developing country when $p = 0$, for any given α, if $w^f > (3+\alpha)\overline{w}$.*

Proof. We first note that c^* is a function of V and hence of p, so we define

$$c^* \equiv c(p) \ . \tag{4.1}$$

Then, under the migration prospect, the number of university graduates *remaining* in the developing country is

$$\begin{aligned} & \frac{c(p)}{\Omega} - [p\frac{c(p)}{\Omega} + (1-p)p'\frac{c(p)}{\Omega}F(w^c)] \\ = \ & c(p)[(1-p)(1-p(1+\alpha)F(w^c))]/\Omega \ . \end{aligned} \tag{4.2}$$

Let us define

$$\frac{K(p)}{\Omega} \equiv \frac{c(p)(1-p)[1-p(1+\alpha)F(w^c)]}{\Omega} - \frac{c(0)}{\Omega} \ ,$$

that is, $\frac{K(p)}{\Omega}$ is the difference between the number of educated individuals in the home country when $p > 0$, and the number of educated individuals in the home country when $p = 0$.

Since

$$K(p) \equiv c(p)(1-p)[1-p(1+\alpha)F(w^c)] - c(0) \ ,$$

we know that

$$K(0) = 0$$

and that

$$\begin{aligned} K'(p) &= c'(p)(1-p)[1-p(1+\alpha)F(w^c)] \\ &\quad -\{1-p(1+\alpha)F(w^c) + \\ &\quad (1-p)(1+\alpha)[F(w^c) + pF'(w^c)\frac{(w^f - \overline{w})(1+\alpha)}{1+r}]\}c(p) \ . \end{aligned}$$

We seek to show that $K'(0) > 0$ which, by the continuity of $K(p)$, will imply that $K(p) > K(0)$ in the small (positive) neighborhood of $p = 0$. Note that

$$K'(0) = c'(0) - [1 + (1+\alpha)F(w^c)]c(0) \ .$$

When $p = 0$, we know from assumptions (2.4) and (3.3) that educated unemployment will not exist in the absence of an additional possibility of migration, which implies that $w^c = w^l$. Then, from the last line of (3.4) and upon noting

that $F(w^l) = 0$, we get

$$\begin{aligned}
\frac{dV}{dp}|_{p=0} &= w^f - [\int_{w^c}^{w^h} wdF(w) + F(w^c)w^c] + (1-p)F(w^c)\frac{(w^f - \overline{w})(1+\alpha)}{1+r} \\
&= w^f - [\int_{w^l}^{w^h} wdF(w) + F(w^l)w^l] + (1-p)F(w^l)\frac{(w^f - \overline{w})(1+\alpha)}{1+r} \\
&= w^f - \overline{w} \ . \qquad (4.3)
\end{aligned}$$

Then, from the equality in (3.12), we know that $\frac{dc^*}{dp} = \frac{dc(p)}{dp} = \frac{dV}{dp}$. Therefore,

$$\frac{dc(p)}{dp}|_{p=0} = c'(0) = \frac{dV}{dp}|_{p=0} = w^f - \overline{w} \ .$$

When $p = 0$, $V = \overline{w}$. Hence, from (3.10) and the definition $c^* = c(p)$

$$\begin{aligned}
c(0) &= V - \Phi \\
&= \overline{w} - \Phi \ . \qquad (4.4)
\end{aligned}$$

Therefore, $K'(0) > 0$ if and only if

$$w^f - \overline{w} - [1 + (1+\alpha)F(w^c)](\overline{w} - \Phi) > 0 \ . \qquad (4.5)$$

Since

$$1 + (1+\alpha)F(w^c) < 2 + \alpha \ ,$$

(4.5) will be satisfied if

$$w^f - \overline{w} - (2+\alpha)(\overline{w} - \Phi) > 0 \ ,$$

that is, if

$$w^f > (3+\alpha)\overline{w} - (2+\alpha)\Phi \ . \qquad (4.6)$$

Since $\Phi > 0$, it follows that when $w^f > (3+\alpha)\overline{w}$, (4.6) will be satisfied, in which case we will have that

$$K'(0) > 0 \ .$$

Hence, by the continuity of $K(p)$, we must have that $K(p) > K(0)$ in the small (positive) neighborhood of $p = 0$. ■

Proposition 3 shows that a developing country may end up with more university graduates despite the brain drain of university graduates. Noting that there is a reduction of the population in the wake of migration, the proposition also implies that the developing country may end up with a higher fraction of educated individuals, despite the brain drain of university graduates.

Combining Propositions 1 and 3 yields the following corollary.

Corollary 1: *A positive level of educated unemployment in a developing country co-exists with a larger number of university graduates in the country than the number of university graduates in the country under no educated unemployment if* $w^f > (3 + \alpha)\overline{w}$.

Since there are fewer individuals in the country under feasible migration, and since there are more educated individuals in the country under feasible migration, it must follow that the average level of human capital in the country is higher under migration than in the absence of migration. This higher level can play a critical role in determining long-run output growth, an issue to which we will turn in a follow-up paper.

5. Conclusions

Since the late 1960s (Todaro, 1969), the development economics literature has pointed to a stark connection between migration and unemployment: workers

change their location, but not their productive attributes, in response to an expected wage at destination that is higher than their wage at origin, only to end up unemployed. We propose a different connection between migration and unemployment wherein workers move into unemployment at origin in response to an expected wage at destination; workers improve their productive attributes. While the flight of human capital and the unemployment of human capital occupied the center stage of development economics at about the same time (the 1970s), analysts and policymakers did not make a causal connection between the two phenomena except for noting that unemployment induced a desire to migrate. Our analysis considers a link: in a simple job-search framework we show that an individual's reservation wage in the home labor market increases with the probability of working abroad. Thus, our model implies that such unemployment would be smaller in the absence of the migration possibility. Furthermore, we integrate our model into the recent literature of "beneficial brain drain." The analysis shows that a developing country may end up with more educated individuals despite the brain drain and educated unemployment. Our theoretical analysis provides a basis and a rationale for rigorous empirical tests of the link between international migration and educated unemployment, which are absent in the received literature. Such empirical endeavors will constitute an interesting topic for future research.

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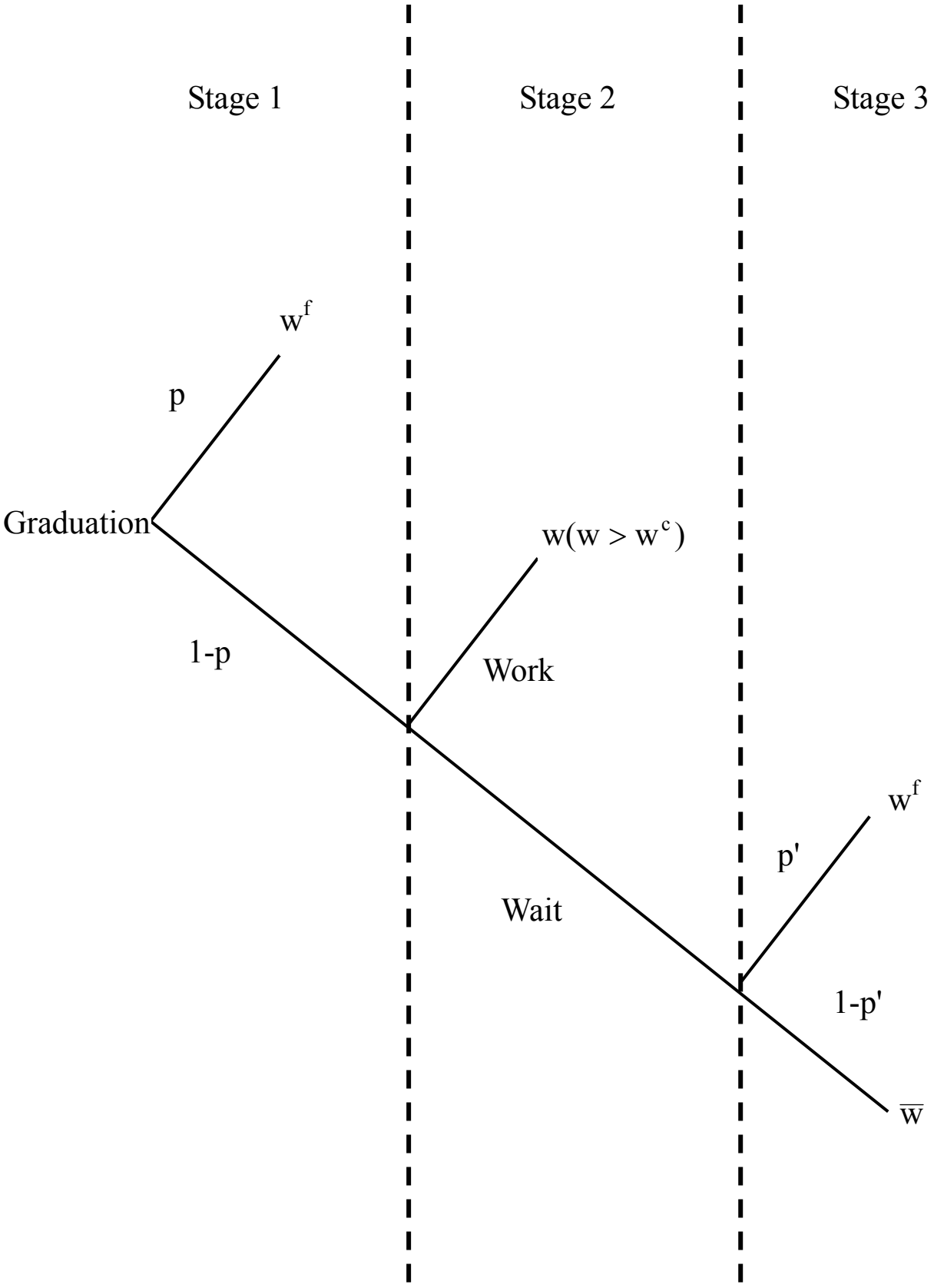

Figure 1: Stages in the decision making process of an educated individual

The following papers have been published so far:

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