Is the Length of the First Job Search Spell a Valid Measure of External Effectiveness of University Programmes?

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Summary. The aim of this paper is to show that labour-market outcomes related to holding a job are not valid measures of the relative impact of different programmes, while better performing measures are those related to holding jobs reaching given quality standards. For this purpose, we develop a simple job-search model: graduates decide whether to accept a job offer depending on the utility of the different options. If graduates with better work prospects are more selective than others, it can be shown that neither the exit rate from unemployment, nor the probability of being employed at a given time, are necessarily higher for those coming from "the best" university programmes. On the other hand, under mild conditions, neither the waiting time for a job reaching given quality standards nor the probability of having a "good job" depend on individual behaviour, but only on work opportunities: this makes the latter indicators better measures of external effectiveness. Nevertheless, while cross-sectional data suffice for assessment of the working condition, evaluation of the waiting time for a "good job" requires longitudinal data.
Keywords: University educational programmes; External effectiveness; Transition from school to work; Job search models; Hazard function.

1. Introduction

The process of integrating young adults into the labour market is a common problem at the international level (OECD, 1998), as is shown by high youth unemployment rates in many countries. From a comparative standpoint, the assessment of the role of national school systems in the process of transition towards the labour market is one of the most interesting areas of investigation in this particular field (Muller & Shavit, 1998; Van der Velden & Wolbers,

2001; Iannelli, 2001; Brauns *et al.*, 2001). Other studies focus on the effects of various educational levels and programmes in individual countries (Nguyen & Taylor, 2003) or on earning returns to schooling (Angrist & Krueger, 1991; Harmon & Walker, 1995; Colussi, 1997; Checchi, 1997).

From a different perspective, occupational outcomes are considered as indicators of the *external effectiveness* of educational programmes (Gori *et al.*, 1993; Biggeri *et al.*, 2001; Rampichini & Petrucci, 2001; Bratti *et al*, 2004).

One of the aims is to rank[1] professional training courses, schools, universities or specific university study programmes, with respect to their ability to favour the entry of young people into the labour market. Ideally, the purpose should be to assess the net impact of attending a particular course: occupational outcomes are then assessed by controlling for characteristics of the individual and of the context. The main problem to face is the selection process, if the propensity to choose a particular study programme depends on attributes that would make the individuals interesting to potential employers, even in the absence of the study programme itself.

To evaluate the external effectiveness of scholastic or university education in general, various authors (Biggeri *et al.*, 2001; Rampichini & Petrucci, 2001; Nguyen & Taylor, 2003; Porcu & Tedesco, 2004) use as indicator the length of the first job-search spell after attaining a qualification. Others (Giommi & Pratesi, 2001; Bratti *et al.*, 2004) focus instead on the probability of employment at a given time. The use of these indicators is based on the (implicit) assumption that better job prospects correspond to shorter time needed to enter the labour market. As we will see, however, these suppositions may be confuted.

Purpose of this paper is: a) to show the limits of occupational outcomes related to work in itself as indicators of the external effectiveness of study programmes; b) to assess the validity of alternative indicators of external effectiveness, related to performance of a work activity that reaches a given standard of quality.

The idea is simple. Having a job means that:

(i) a job opportunity came up;

(ii) one chose to accept the opportunity.

Hence, the waiting time for first employment depends on the effective willingness of graduates to accept the jobs that are proposed to them. Using a simple job-search model, it can be shown that the waiting time to first job is not necessarily briefer for graduates with better job prospects if they have higher ambitions.

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[1] The approach, which originated in the growing demand for accountability in public sector activities, is particularly widespread (but also frequently criticized) in Great Britain, where all levels and types of educational institutions are subject to comparative evaluation. The resulting rankings (*league-tables*) of performance indicators are easily accessible to the public (http://education/guardian.co.uk). For a critical analysis of this approach, see Goldstein & Spiegelhalter (1996).

The choice of which indicators to use depends critically on the nature of the information obtained: in particular, whether the data concern employment at the time of the interview, or rather the entire work history observed over a given period.

The present paper is divided as follows: Section 2 presents the job-search model, reproducing a "world" characterized by very simple operative mechanisms. The aim is not to propose an innovative specification of the processes regulating, at the micro level, the match between work demand and supply, but rather to show that the premises underlying the use of the waiting time for first employment as indicator of the external effectiveness of study programmes may not hold. The theoretical results, presented in Sections 3 to 5, can be illustrated by means of a simulation exercise, developed in Section 6. Working histories for graduates of different study programmes are generated under alternative hypotheses on job opportunities and choice criterion. The conclusions follow.

2. The model

The process regulating the search for work involves two categories of actors: the subjects looking for employment and that of potential employers. The latter choose whether, and to whom, they will make work available, while the former chooses whether to accept the proposals.

Our model is based on the idea, borrowed from economics literature, that people's choices are based on comparing the values of the *utility* function[2] corresponding to the different options. In this paper, utility can assume a very general connotation, diverging from what is hypothesised in job-search models that refer to earnings (Jensen & Westergard-Nielsen, 1987; Eckstein & Wolpin, 1995). Ideally, one should refer to the variety of features that characterise job quality: type of contract, relevance to academic qualifications, need for qualifications, utilization of knowledge and skills acquired, and remuneration.

The model is characterized as follows. Every employment offer is associated with a specific value of the utility function. We assume that the utility ascribed to a job is the same for all graduates, depending only on the characteristics of the job itself. The job offers that each graduate can receive vary, however, among subjects. One and only one job opportunity is allowed for each

[2] The concept of utility is based on the notion that individuals derive satisfaction from consumption of material goods and from leisure time; utility is a measure of this satisfaction (Borjas, 1999). The decision whether to work or not (and how much to work) therefore depends on the hourly wage and on individual preferences (expressed by the indifference curve). The wage below which the individual decides not to work is called the "reservation wage".

subject at each time t, with utility value described by the random variable $U_L^i(t)$ with distribution g. We formulate the following:

ASSUMPTION 1 $\quad U_L^i(t) \sim g^i(u_L(t)) = g(u_L \mid x)$,

where X is the vector of the individual characteristics which the potential employer is able to observe. X could indicate the graduate's gender, degree of motivation or intelligence, social class, and store of knowledge and skills acquired during university (represented by the disciplinary field and the particular study programme).

The $U_L^i(t)$ are i.i.d. random variables over i and t: quality and quantity of work offers do not change over time, do not depend on previous or future offers[3], and do not depend on offers received by other people.

The assumption that, at each t, one and only one work offer arrives[4] does not rule out that individuals may receive offers with varying frequency. If $P(U_L(t)=0) > 0$, the absence of offers at time t corresponds to the arrival of an offer with zero utility.

Each individual chooses whether to accept or refuse a work opportunity in relation to the threshold, u_S, the minimum level of utility that he or she is willing to accept. The choice criterion is as follows:

ASSUMPTION 2 $\quad$ *accept the job if* $u_L \geq u_S$*;*
reject the job if $u_L < u_S$.

We also assume that the threshold does not change over time within the spell[5]. The threshold is described by U_S , which is related to individual characteristics z:

ASSUMPTION 3 $\quad U_S^i \sim f^i(u_S) = f(u_S \mid z)$.

In principle, factors X and Z are distinct (Logan, 1996) in that they are determined by different actors (X affects the choices of potential employers, who decide to whom they will propose the job offer, while Z relates to graduates' choices). However, it is plausible that the elements characterizing these factors are mostly the same. If individuals behave in a rational way, those with good

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[3] For the sake of simplicity, we do not allow for dependence on local labour market conditions, nor for structural negative duration dependence in the exit rate from unemployment, which could occur for example because of loss of skills or loosening of social networks (in these cases the i.i.d. assumption would have to be relaxed).

[4] Discrete choice (Mc Fadden, 1974) and job-search models typically refer to situations in which individuals choose among a number of work opportunities (as well as the conditions of no work or of waiting for future employment). The model presented here can be related to a similar circumstance, if we hypothesize that $U_L(t)$ represents the utility corresponding to the best offer arriving at time t.

[5] The condition is too restrictive if individuals become less selective as time in unemployment grows longer. This could happen because of discouragement.

employment prospects will tend to be more selective, and vice versa[6]. This could be true, for example, for subjects who are especially talented, or who belong to a high social class, or attended a university programme providing knowledge or skills that are in great demand on the market.

The dependence of U_L and U_S on common factors implies that they are generally positively correlated. We assume however that:

ASSUMPTION 4 $\quad U_L(t) \perp U_S \mid X, Z$,

implying that correlation is spurious. The reason is that work offers cannot depend in a causal sense on the individual's threshold, since such threshold is not observable by the potential employers.

Let us assume, in conclusion, that study programmes can be arranged according to the "value added"[7] which they potentially offer to the graduates in terms of marketable skills. If programme *A* provides a higher "value added" than programme *B*, offering better job prospects other things being equal, we say that *A* is preferable to *B*. We assume that, *ceteris paribus*:

ASSUMPTION 5 $\quad G^A(u_L) > G^B(u_L) \qquad \forall\ u_L$

ASSUMPTION 6 $\quad F^A(u_S) > F^B(u_S) \qquad \forall\ u_S$

where $G(u_L) = \mathrm{P}(U_L \geq u_L)$ and $F(u_S) = \mathrm{P}(U_S \geq u_S)$. The "best" programmes offer better employment prospects and lead to more selective behaviours of graduates.

Let *S* represent the body of possible study programmes, with *A* and *B* any two elements of *S*, and *A* preferable to *B* in the sense indicated above. *I* is an indicator of occupational outcome. We say that *I* is a valid indicator of external effectiveness of degree programmes if, *ceteris paribus*, one of the following relations holds:

$$E^A(I) > E^B(I) \qquad \forall A, B \in S \mid A \succ B \quad , \tag{1a}$$

$$E^A(I) < E^B(I) \qquad \forall A, B \in S \mid A \succ B \quad . \tag{1b}$$

That is, indicator *I* must capture the existing differences among programmes.

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[6] Jensen & Westergard-Nielsen (1987) – in a perfectly rational environment, where the graduate knows the distribution of employment opportunities – derive the optimal reservation wage, which depends explicitly on the distribution of job offers. On the other hand, Eckstein & Wolpin (1995), while observing a positive correlation between estimated reservation wage and average salary of job offers, maintain that such dependence is not theoretically necessary.

[7] The term "value added" is frequently employed in the literature on league tables. Notice that we do not address here the problem of how to control over the potential confounding factors due to the selection process. The reasoning is here always "other things being equal".

If I is the length of a spell, for example the duration of first employment search after graduation, then (1) is equivalent to:

$$P^A(T = t \mid T \geq t) > P^B(T = t \mid T \geq t)\ , \qquad (2)$$

where T is the duration itself and $P(T = t \mid T \geq t)$ is the discrete-time hazard function. If condition (2) holds, the speed of leaving unemployment is greater for the "better" programme A than for B, and the average duration shorter.

Employing instead a binary indicator of working condition at some time t, say $L(t)$, condition (1) corresponds to:

$$P^A(L(t) = 1) > P^B(L(t) = 1), \qquad (3)$$

meaning that the employment probability should be higher for A than for B.

3. Waiting time to the first job

If T is the duration of the first employment search spell, the hazard function can be expressed as:

$$P(T = t \mid T \geq t) = P(U_L(t) \geq U_S \mid U_L(t\text{-}1) < U_S,\ldots, U_L(1) < U_S). \qquad (4)$$

Starting from the particular case in which the threshold utility is a constant given Z, we obtain:

$$P(T = t \mid T \geq t) = P(U_L(t) \geq u_S \mid U_L(t\text{-}1) < u_S,\ldots, U_L(1) < u_S) = P(U_L \geq u_S) \qquad (5)$$

as the utility of job offers at subsequent times are assumed i.i.d.. Note that the exit rate does not change with increasing elapsed time in unemployment.

Let us now take two subjects, identical for all other relevant characteristics, one of whom gained degree A, the other degree B. If A is preferable to B, for assumption 6 we will have $u_S{}^A \geq u_S{}^B$. Condition (2) holds if:

$$P(U_L{}^A \geq u_S{}^A) > P(U_L{}^B \geq u_S{}^B),$$

that is, $G^A(u_S{}^A) > G^B(u_S{}^B)$. However, without additional assumptions, it is not possible to derive relation (2) in the general case, as is shown in Figure 1.

Now let U_S be a random variable. From (4) we derive that:

$$P(T = t \mid T \geq t) = \int_{u_S} P(U_L(t) \geq U_S \mid U_L(t\text{-}1) < U_S,\ldots, U_L(1) < U_S)\ du_S \qquad (6)$$

For t=1 we obtain that:

$$P(T = 1) = P(U_L(1) \geq U_S) = \int_{u_S} P(U_L(1) \geq u_S \mid U_S = u_S)\ P(U_S = u_S)\ du_S$$
$$\int_{u_S} P(U_L \geq u_S)\ P(U_S = u_S)\ du_S \qquad (7)$$

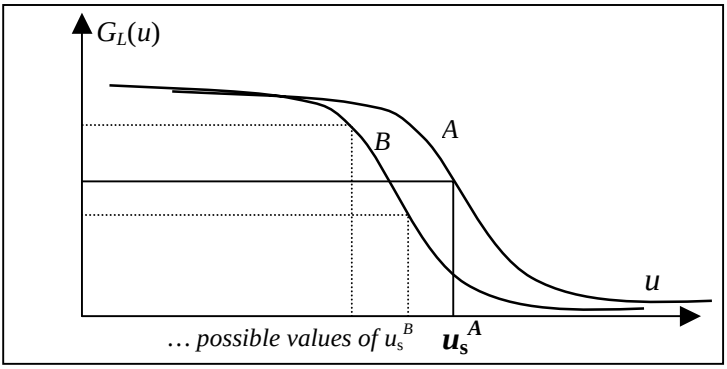

Figure 1. A priori it cannot be assessed whether $P(L(t) = 1)$ is higher for A or B

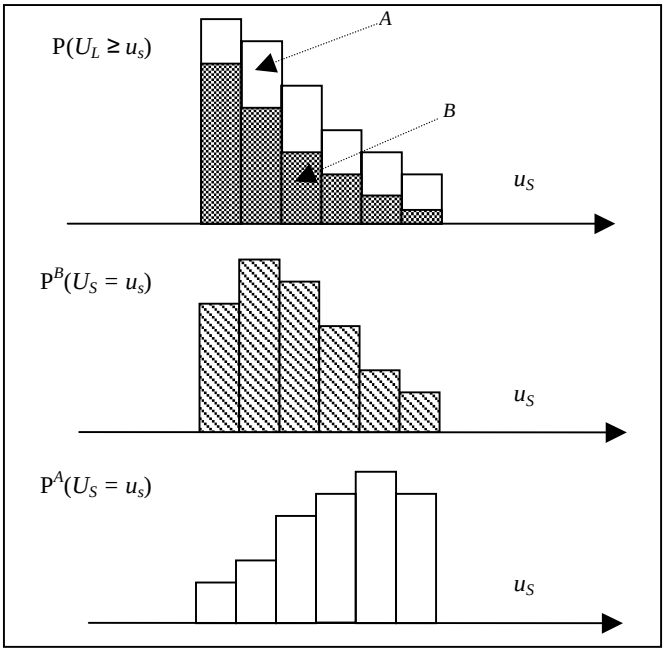

Figure 2. Factors in the integral function (7).

Separately analyzing the two factors inside the integral (see Figure 2) we observe that:

- $P(U_L \geq u_S)$ decreases with u_S. Thus, given u_S, this probability is higher for *A* than for *B* by assumption 5;
- $P(U_S = u_S)$ gives more weight to high values of u_S for *A*, to low values of u_S for *B* by assumption 6.

Without other assumptions, it is not possible to assess *a priori* which of the integrals representing $P^A(T = 1)$ or $P^B(T = 1)$ takes a larger value. Similar results hold for a generic value of t[8].

To conclude, the link between quality of education and time needed to enter the labour market is not clear-cut. The waiting time to first employment is therefore not a valid indicator of external effectiveness, in the sense indicated in Section 2.

4. Probability of employment at time t

The model described in Section 2 specifies how the first work episode after graduation begins, but does not formulate assumptions about its duration or about how the later periods of employment may start. Nevertheless, the employment condition at time *t* also depends on these factors.

Wishing to limit the model's complexity, we formulate the additional hypothesis[9]:

ASSUMPTION 7 *The first work episode has a minimum duration equal to t.*

In this framework, the graduate proves to be employed at time *t* if by that date he or she is offered at least one job with a utility higher than his/her personal threshold of acceptability. Therefore:

$$P(L(t)=1)=P\{max[U_L(1),U_L(2)...U_L(t)]\geq U_S\}$$

$$=\int_{u_S} P\{max[U_L(1),U_L(2)...U_L(t)]\geq u_S \mid U_S=u_S\}P(U_S=u_S)du_S$$

$$=1-\int_{u_S}[P(U_L(1)<u_S)P(U_L(2)<u_S)...P(U_L(t)<u_S)]P(U_S=u_S)du_S$$

$$=1-\int_{u_S}[P(U_L<u_S)]^t P(U_S=u_S)du_S$$

For the same reasons produced with reference to (7), the general validity of relation (3) cannot be demonstrated.

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[8] Knowledge of u_s would help eliminating spurious duration dependence, but would not change the terms of the problem: relation (2) is still not generally true.

[9] The hypothesis, which is not very realistic in a world where temporary or short-term jobs are increasingly common, has the effect of overestimating $P(L(t)=1)$.

5. Indicators based on quality work

Measures based on employment rate are not valid indicators of external effectiveness of study programmes because a favourable value of the indicator does not always correspond to study programmes offering better employment prospects. This occurs because subjects behave differently in the labour market.

The role of individual behaviour weakens if we take indicators based on holding a job that reaches a given quality standards. This standard may be defined with reference to the same dimensions used to connote the concept of utility: type of contract, earning, relevance of university education, need for the acquired expertise, and degree to which acquired skills and knowledge are used. A "good" job is thus a job that achieves a predefined minimum level of utility, u_0.

Two assumptions have to be added to those formulated in Section 2:

ASSUMPTION 8 $\quad u_S^i \leq u_0 \qquad \forall\ i,$

meaning that all graduates are willing to accept jobs that reach the standard, and

ASSUMPTION 9 *when graduate i finds a job, u_S^i, changes and takes the value of the utility of the current job.*

Assumption 9 implies that, if presented with an opportunity with a utility higher than that of the work they are already doing, individuals change job (assuming that there are no job-to-job costs).

In this framework, indicating with T_Q the time before the first quality job, we obtain that:

$$P(T_Q = t \mid T_Q \geq t) = P(U_L(t) \geq u_0 \mid U_L(t-1) < u_0, ...U_L(1) < u_0) = P(U_L \geq u_0),$$

because $U_L(t)$ are assumed to be i.i.d.. The speed with which individuals find a "good" job, therefore, varies only in relation to work opportunities, and not to personal choice criterion. Thus, if A is "better" than B, $G^A(u_0) > G^B(u_0)$ by assumption 5, and the waiting time for A will be, on average, shorter.

Let us now consider the probability of performing a quality job at time t. Let $L_Q(t)$ be the binary random variable assuming value 1 in favourable cases. The following should hold:

$$\mathrm{P}(L_Q{}^A(t)=1) \geq \mathrm{P}(L_Q{}^A(t)=1) \tag{8}$$

Let us see. A graduate will have a good job at time t if by that date he receives a work offer with a utility higher than u_0. Therefore:

$$P(L_Q(t)=1) = P\{max[U_L(1), U_L(2)...U_L(t)] \geq u_0\}$$

$$= 1 - \left[P(U_L(1) < u_0)P(U_L(2) < u_0)...P(U_L(t) < u_0)\right]$$
$$= 1 - \left[P(U_L < u_0)\right]^t = 1 - \left[1 - G(u_0)\right]^t .$$

Since $G^A(u_0) > G^B(u_0)$ by assumption 5, condition (8) is verified.

Thus, both the length of the search for a quality job and the probability of holding a "good" job at some time *t* lend themselves well to assessing the external effectiveness of study programmes.

6. Simulation exercise

The theoretical results described in Sections 3-5 can be illustrated with a simulation. Working histories for 1000 individuals have been generated (Table 1) under different distributional assumptions for U_s and $U_L(t)$.

Degree *A* is always preferable to degree *B*. In case 1, differences between A and B refer to working opportunities only, while in cases 2-7 they refer to the choice criteria as well.

Waiting time to first job. Average waiting times can be higher for programme *A* or for programme *B* (Table 2). *A* performs much better than *B* only in case 1, where U_S^A and U_S^B have the same distribution, i.e. the study programme does not affect the choice criterion. In all other cases, only small differences are observed.

Table 1. Distributional assumptions for U_s and $U_L(t)$. Threshold u_0=3.

	U_S^A	U_S^B	U_L^A	U_L^B
Case 1	*Uniform*(2,3)	*Uniform*(2,3)	*Uniform*(0,4)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,3.2) & otherwise \end{cases}$
Case 2	*Uniform*(2,3)	*Uniform*(1,2)	*Uniform*(0,4)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,3.2) & otherwise \end{cases}$
Case 3	*Uniform*(2,3)	*Uniform*(1.5,2.5)	*Uniform*(0,4)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,3.2) & otherwise \end{cases}$
Case 4	*Uniform*(2,3)	*Uniform*(1,2)	*Uniform*(0,3.5)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,3.2) & otherwise \end{cases}$
Case 5	*Uniform*(2,3)	*Uniform*(1.5,2.5)	*Uniform*(0,3.5)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,3.2) & otherwise \end{cases}$
Case 6	*Uniform*(2,3)	*Uniform*(1,2)	*Uniform*(0,4)	$\begin{cases} 0 & with\ p = 0.25 \\ Uniform(0,4) & otherwise \end{cases}$
Case 7	*Uniform*(2,3)	*Uniform*(1,2)	*Uniform*(0,4)	$\begin{cases} 0 & with\ p = 0.50 \\ Uniform(0,4) & otherwise \end{cases}$

Table 2. Waiting time to the first job. Statistics based on simulated data.

	MEAN		MEDIAN		S.D.	
	A	***B***	***A***	***B***	***A***	***B***
Case 1	2.85	7.62	2	5	2.4	9.1
Case 2	2.83	2.56	2	2	2.5	2.0
Case 3	2.88	3.65	2	3	2.4	3.3
Case 4	3.86	2.51	2	2	4.1	2.1
Case 5	4.13	3.84	3	3	4.7	3.6
Case 6	2.71	2.17	2	2	2.2	1.7
Case 7	2.95	3.18	2	2	2.6	2.4

Table 3. Waiting time to the first "good" job. Statistics based on simulated data.

	MEAN		MEDIAN		S.D.	
	A	***B***	***A***	***B***	***A***	***B***
Cases 1-3	4.0	21.1	3	15	3.5	20.0
Cases 4-5	6.8	22.2	5	17	6.5	20.6
Case 6	4.1	5.4	3	4	3.6	4.9
Case 7	3.8	7.7	3	6	3.3	7.6

Table 4. Probability of being employed six time units after graduation. Statistics based on simulated data.

	% EMPLOYED AFTER SIX TIME UNITS	
	A	***B***
Case 1	92.6	60.6
Case 2	93.4	93.8
Case 3	94.6	84.5
Case 4	83.4	94.2
Case 5	83.7	85.2
Case 6	92.8	97.8
Case 7	92.4	89.5

Waiting time to first "good" job. Differences between programmes are much more marked here (Table 3). In all cases, average spells are much shorter for *A* than for *B*.

Probability of being employed at time t. The percentage of individuals holding a job six time units after graduation is not uniformly higher for *A* than for *B*, as we would expect if the indicator was a valid measure of effectiveness (Table 4). In this case, as occurs for the waiting time to the first job, the difference is markedly more favourable for *A* in case 1 only.

Table 5. Probability of having a "good" job six time units after graduation. Statistics based on simulated data.

	% HOLDING A "GOOD" JOB AFTER SIX TIME UNITS	
	A	***B***
Cases 1-3	81.3	22.2
Cases 4-5	59.6	23.6
Cases 6	81.7	67.7
Case 7	80.9	55.8

Probability of having a "good" job at time t. The percentage of graduates holding a job which reaches given standards of quality at time t=6 is everywhere much higher for those with degree *A* (Table 5).

7. Conclusions

We have argued that indicators referring to jobs reaching a given standard of quality are the most appropriate for the evaluation of external effectiveness, nevertheless we have to acknowledge that data required to construct these indicators are much more demanding than those related to the holding of "any job" (Table 6).

Table 6. Data requirements for the evaluation of external effectiveness

INDICATORS	DATA REQUIREMENTS
Probability of being employed at time *t.*	Occupational condition at time of interview.
Waiting time to first job.	(Beginning time of job-search). Beginning time of first job.
Probability of having a "good" job at time *t.*	Occupational condition at time of interview. Characteristics of current job .
Waiting time to first "good" job.	Beginning and end time of all jobs. Characteristics of all jobs.

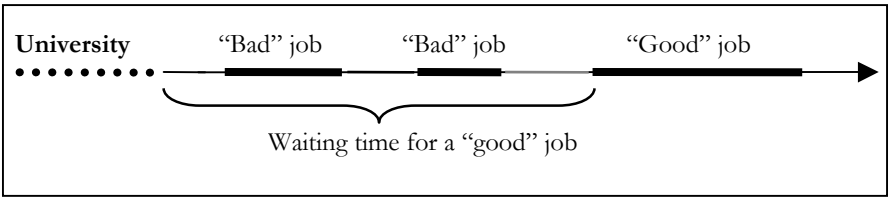

Figure 3. The assessment of time to a "good" job requires event history data.

Waiting time to the first "good" job has the highest data requirements: *event history* data on working careers are needed (Figure 3). Given the deep changes that have occurred in the labour market in recent years, this kind of information is particularly relevant, as lifelong jobs are now much less widespread among young people.

The nationwide survey on Italian graduates carried out by ISTAT (2004) does not collect event history data. Thus, the assessment of waiting time to the first "good" job is not feasible now. Nevertheless, these surveys do collect detailed information on the current job, thus the quality of the current job can be evaluated.

In conclusion, given data limitations, it seems to be a much more sensible practice to evaluate the external effectiveness of university programmes by referring to the "probability of having a job reaching a given quality standard at time *t*" rather than employing the "waiting time to the first job".

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