

Swedish Institute for Social Research (SOFI)

Stockholm University

WORKING PAPER 1/2003

DEFINING AND MEASURING UNMET LABOUR DEMAND

by

Ante Farm

Defining and Measuring Unmet Labour Demand*

Ante Farm

Swedish Institute for Social Research (SOFI), Stockholm University
and Statistics Sweden

Phone: +46 8 162311, *Fax:* +46 8 154670, *E-mail:* Ante.Farm@sofi.su.se

Postal address: SOFI, Stockholm University, SE-106 91 Stockholm, Sweden

(January 10, 2003)

Revised version October 26, 2005

Abstract: This paper first clarifies the distinction between vacancies as ‘job openings’ (recruitment processes), which are measured in traditional vacancy statistics, and vacancies as ‘unfilled jobs’ (unmet labour demand). It then presents a method of measuring unmet demand in business surveys and illustrates this method with the questionnaire in the Swedish vacancy survey, which measures not only job openings but also unfilled jobs.

Keywords: Job vacancies, unmet labour demand

JEL-Code: J63

* This paper is part of a project to develop a Swedish vacancy survey which began in 1999 and involved the Swedish National Labour Market Board (AMS), the Office of Labour Market Policy Evaluation (IFAU), the National Institute of Economic Research (KI), the Swedish Institute for Social Research (SOFI), and Statistics Sweden (SCB). The paper draws on work done in a working party consisting of representatives of these institutes, including myself. I have also benefited from discussions (via e-mail) with Eivind Hoffmann and his detailed comments to earlier drafts; comments on earlier versions from Eskil Wadensjö and Alois Van Bastelaer; and comments from participants in a meeting at SCB in September 1999 and participants of seminars at SOFI in October 1999 and September 2000. A meeting in April 2000 with André Mares on the Dutch vacancy survey was very informative. Discussions on job vacancy statistics at Eurostat meetings in May 2000, September 2001, November 2001, and January 2002 have also influenced the paper.

1. Introduction

When producing and using statistics on vacancies it is of vital importance to note that vacancies in practice can be defined not only as ‘unfilled positions’ (as the dictionary tells us) but also as ‘recruitment processes’. For instance, according to Holt and David (1966 p. 82):

‘Firms recognize that a certain amount of time will be required to recruit, hire, and train new workers, or to recall old ones, i.e. there is a lead time in hiring workers. Consequently, new vacancies need to be created in anticipation of future needs, both to compensate for expected losses of the work force through quits, recruitments, and terminations during the lead time, and to build up the work force for higher production levels that may be desired in the future.’

Here it is obvious that ‘creating vacancies’ in anticipation of future needs does not mean creating *unfilled positions* but starting *recruitment processes*. And the purpose of these recruitment activities is to hire new workers in time, before the corresponding positions become unfilled. In other words, firms *create* ‘vacancies’ in one sense (recruitment processes) in order to *avoid* ‘vacancies’ in another sense (unfilled positions). To emphasize this distinction, vacancies as recruitment processes will be called *job openings* in this paper, while vacancies as unfilled positions will be called *unfilled jobs*.

All vacancy surveys in the twentieth century have registered job openings and not unfilled jobs, including all the surveys discussed in NBER (1966), Muysken (1994), and Verhage et al. (1997). (Partial exceptions include the Dutch annual vacancy survey 1980-1987 and the German vacancy survey by IAB, as elaborated in Section 4.) But statistics on unfilled jobs are also needed in explanations of the effect of recruitment problems on employment and unemployment. For instance, the time it takes to recruit workers adds to unemployment by making the number of employees less than the number of jobs. The difference is the number of vacancies, provided only unfilled jobs are counted.

Four different definitions of unfilled jobs are discussed in this paper, namely a *traditional definition* (‘unoccupied job openings which are available immediately’); a definition which corresponds to the *ILO-definition* of unemployment; the *classical definition* (‘unsatisfied labour demand’); and a definition recently suggested by *Eurostat* (‘job openings which are available immediately’). We find that the first three of these definitions are almost equivalent. This equivalence is useful. For, as we shall

see below, while in a given context one of these definitions may be easier to interpret, another may be easier to measure.

The paper is organized as follows. Job openings are defined more precisely in Section 2, emphasizing that not all hirings are preceded by job openings. Existing definitions of unfilled jobs are analysed and related to each other in Section 3. The problem of measuring unfilled jobs is addressed in Section 4, introducing a questionnaire designed to measure not only the number of job openings but also the number of unfilled jobs. Section 5 concludes the paper.

2. Job openings and hirings

Some hirings are made more or less directly, for example, by recalling workers previously laid off or by offering jobs to spontaneous job applicants. In other cases there is no existing pool of job applicants which a firm can turn to. Instead the firm has to attract new job applicants by advertising its demand for personnel in newspapers or other media, by placing job orders with a public or private employment agency, or by contacting potential candidates directly. And then vacancies understood as ‘recruitment processes’ arise, as discussed in, e.g., van Ours and Ridder (1992) and Burdett and Cunningham (1998).

More precisely, a *job opening* begins when a firm starts to recruit a worker and it ends when a worker offered the job accepts it or when recruiting is discontinued for other reasons. Assuming in addition that all job openings (sooner or later) end in hiring,¹ a firm has a job opening on a certain day if it has started to recruit a worker before that day but has not yet hired one.

It must be emphasized that not all hirings are preceded by job openings. Suppose, for example, that a firm is so big that it has to hire 10 workers per month to replace a constant flow of 10 separations per month, and that each month the firm hires those ten applicants who contact the firm first (assuming they are properly qualified). Then it may be difficult for the firm to say when it started to recruit a particular worker, since it always has some recruitment activities going on. In other

¹ Information on cancelled job opening is scarce, particularly on firms’ *reasons* for cancelling job openings, but what evidence there is, including Falk (1996), does suggest that the proportion of job openings which end in hiring is very high, and *at least* equal to 90 percent.

words, the firm may find it difficult to specify the number of 'job openings' it has on a particular day, but easy to specify the number of (desired) hirings per month.

Secondly, some hirings may occur without any preceding recruitment activities at all, for example, when a job applicant contacts an employer who then decides to hire. In this case one might say that 'supply creates its own demand' when a properly qualified person turns up. And then there is no job opening (recruitment process) which precedes hiring.

Thirdly, graduates from police colleges or military colleges are normally hired directly, without any job advertising at all.

Note also that even if a recruitment process precedes a hiring, it can sometimes be so short that the distinction between the recruitment process and the hiring is negligible. Examples include recalls by phone calls of former employees, or selection of casual labourers in a hiring hall at the beginning of a day. And in surveys on job openings firms may not consider recalls to be recruitment, even if the time between job offer and acceptance is long, unless instructed to do so.

3. Defining unfilled jobs

A firm does not always succeed in hiring a new worker in time to replace a separation or begin an expansion according to plan. Then vacancies as 'unfilled jobs' arise. But how should 'unfilled jobs' be defined more precisely to give an adequate measure of unmet labour demand?

3.1. The traditional definition

As noted by Burdett and Cunningham (1998 p. 447) the definition of a vacancy commonly used in economics implies that 'a firm has a vacancy if it is looking for a worker to fill an existing opening' and this excludes 'firms looking to fill future openings'. A more elaborate formulation of this 'traditional' definition is used by Layard, Nickel, and Jackman (1991 p. 272), namely: 'a job that is currently vacant, available immediately and for which the firm has taken some specific recruiting action during the past four weeks.'

To clarify this definition even further we begin by noting that 'a job ... for which the firm has taken some specific recruiting action during the past four weeks' is

essentially the same as a ‘job opening’ as defined above, that is, a job for which the employer is recruiting a new worker.

Next we observe that a job for which the employer is recruiting a new worker may still be occupied by a retiring worker who has not yet left the firm, or it may be temporarily occupied during the recruitment period by a substitute. In these cases an opening cannot be a vacancy according to the definition above, since it is not ‘currently vacant’. And by excluding these cases we define the remaining job openings as ‘currently vacant’ or ‘unoccupied’.

We finally note that for an ‘unoccupied job opening’ to be an ‘unfilled job’ it must also be ‘available immediately’. In other words, the unoccupied job opening must be a ‘current’ as opposed to a ‘future’ opening. For example, when a firm is recruiting people to a project in the future, the corresponding job openings change from future job openings to current job openings when the project begins.

To sum up this specification of the traditional definition in economics, vacancies as a measure of unmet demand are *unoccupied job openings which are available immediately*. This definition excludes occupied job openings and job openings to be filled later, in the same way as unmet supply (unemployment) excludes job seekers with a job (on-the-job search) and job seekers without a job who cannot start work until later.

3.2. The ILO-definition

Eivind Hoffmann has in Hoffmann (1999) proposed a definition of vacancies as unmet demand which corresponds to the well-known ILO-definition of unemployment. This definition, which for simplicity may be called the ILO-definition of vacancies, can be summarized as follows:

An employer has a vacancy if the employer:

- 1) would have hired a person to carry out some work if a suitable candidate had been available; and
- 2) would not have dismissed anyone as a consequence; and
- 3) a) has made efforts in the recent past to obtain job applicants, or
 - b) is in the process of screening job applicants, or
 - c) is waiting for a job applicant to accept a job offer, or
 - d) is waiting for a job applicant who has accepted a job offer to start working.

The first condition in this definition can be interpreted as an alternative formulation of ‘available immediately’ in the traditional definition of vacancies as unmet demand, and corresponds to ‘available for work’ in the ILO-definition of unemployment.

The second condition corresponds to ‘without a job’ in the ILO-definition of unemployment. It can also be interpreted as an alternative formulation of ‘currently vacant’ in the traditional definition of vacancies. More precisely, instead of asking if an employer has ‘a job which is available immediately and currently vacant’, Hoffmann is asking if an employer ‘would have hired someone if a suitable candidate had been available, and would not have dismissed anyone as a consequence’. In this way Hoffmann avoids referring to ‘unfilled jobs’. He wants to do this because the concept of a ‘currently vacant’ or ‘unfilled’ job presupposes that there is a ‘job’ or ‘post’ which exists even when no person has been hired. This Hoffmann thinks ‘is likely to be limited to large and/or bureaucratic organisations’.

Note that the second condition means that even the ILO-definition excludes job openings which are occupied during recruitment, assuming that retiring workers leave the firm soon after hiring of the workers who replace them, and that substitutes are dismissed soon after hiring of permanent personnel. In general, however, the ILO-definition does include some occupied job openings, namely job openings occupied by *internal* substitutes, since such substitutes would not leave the firm but return to their original jobs if the openings were filled.

Also note that condition 3.d is an extension of the traditional definition of unfilled jobs, since according to the traditional definition an unfilled job has to be a job opening, and a job opening is terminated when a job offer is accepted. Condition 3.d corresponds to the extended search condition in the ILO-definition of unemployment, which includes not only job seekers (corresponding to 3.a-c) but also persons who are waiting to start a new job (corresponding to 3.d).

We conclude that the difference between the ILO-definition and the traditional definition of unmet demand in general includes ‘job openings occupied by internal substitutes’ and the equivalent of ‘persons who are waiting to start a new job’ in the

ILO-definition of unemployment, a component which may be called ‘jobs which are waiting for a new employee to start’.²

3.3. *The classical definition*

In the classical literature on vacancies, including Dow and Dicks-Mireaux (1958) and Hansen (1970), vacancies were defined as ‘unsatisfied labour demand’. Identifying ‘satisfied labour demand’ with employment, this approach suggests that vacancies can be defined *indirectly* as that part of labour demand which is not employment, or as jobs which are not filled, provided, of course, that we don’t define jobs as the sum of employment and vacancies.

The concept of a ‘vacant job’ can be associated with an ‘idle machine’, as suggested, for instance, by Pissarides (1985 p. 679). Thus, starting from a firm’s number of ‘idle machines’, we can think of the firm’s number of jobs as the number of ‘idle machines’ which the firm wants to be operated.

In general we can define the number of jobs in a firm on a certain day as the number of workers which the firm would have had employed on that day if there had been no recruitment problems, that is, if the firm had been able to recruit personnel (with proper qualifications at current wages) without waiting times. An unfilled job can then be interpreted as *an unplanned dip in employment* (if related to a separation) or *an unplanned delay in employment* (if related to an expansion), or *an employment level below plan* (if related to a more permanent labour shortage).

An equivalent definition is that the number of jobs in a firm with N workers is equal to D if the firm is ready to employ $D - N$ properly qualified persons if they turn up (without firing anyone as a consequence). This is essentially the same as the definition of ‘established posts’ in Layard et al. (1991 p. 273), where the number of ‘established posts’ in a firm is equal to M if the firm will ‘advertise’ $M - N$ jobs when it has N workers. And the definitions are exactly the same if we assume, as Layard et al. (1991 p. 273) do, that ‘(i)f a firm advertises y vacancies, it must be ready to employ y (properly qualified) people if they turn up’.

² Note that the measurement of this component requires questions about not only 1) workers who have been hired but not yet started to work but also 2) cases where it is the employer and not the employee who is waiting, and 3) jobs which are not filled during the waiting time by substitutes.

Since $D = N + V$ this definition implies that *a firm has V unfilled jobs if the number of employees would have been raised by V if there had been no recruitment problems*. And this is the same as saying: 1) that a firm is ready to employ V properly qualified persons if they turn up, and 2) that this would also raise employment by V persons. Note that these conditions are equivalent to conditions 1 and 2 of the ILO-definition. It follows that the ILO-definition and the classical definition are completely equivalent if we can assume that all unfilled jobs are associated with at least some recruitment efforts, so that condition 3 of the ILO-definition is satisfied.³ Note, in particular, that both of these definitions include ‘job openings occupied by internal substitutes’ and ‘jobs which are waiting for a new employee to start’, as defined in Section 3.2.

3.4. The Eurostat-definition

We have seen that in general both the ILO-definition and the classical definition include some occupied job openings, namely job openings occupied by internal substitutes. There is another definition of unmet labour demand, suggested by, for instance, Eurostat,⁴ which may include even more occupied job openings, namely ‘job openings which are immediately available’. In fact, perhaps *all* openings occupied by retiring workers or substitutes are ‘immediately available’ to replacements or permanent personnel.

In practice job openings which are ‘immediately available’ can be defined more precisely as job openings such that new employees could start work immediately or within a specified time period. For instance, the Job Openings and Labor Turnover Survey (JOLTS) in the US measures ‘job openings’ for which ‘work could start within 30 days’.⁵ Such job openings may include most of the occupied job openings. This may imply that JOLTS measures something which is close to job openings (recruitment processes), but the difference between job openings and

³ If this assumption is not true, then the classical definition also includes unfilled jobs for which no recruiting efforts have been made in the recent past, that is, ‘hidden vacancies’, corresponding to hidden unemployment in labour force surveys.

⁴ The definition is included in Eurostat (2002) but not in the final (informal) agreement in 2002 to develop quarterly business surveys on vacancies in all EU-countries, since this agreement was restricted to the measurement of job openings.

⁵ See <http://stats.bls.gov/jlt> for a detailed description of the JOLTS program, including the questionnaire and monthly data since December 2000.

unfilled jobs in the US is not known, since JOLTS does not measure both job openings and unfilled jobs.

4. Measuring unfilled jobs

Measurement of unfilled jobs in business surveys presupposes an operational definition in terms of specific questions to firms (or establishments). An example of a questionnaire designed to measure not only the number of job openings but also the number of unfilled jobs is presented below. The example is taken from the Swedish vacancy survey, which started in July 2000, and which since January 2001 covers not only the private but also the public sector. It is statutory since July 2003.

4.1. Measuring the number of unfilled jobs

The questionnaire in Appendix 1 measures unfilled jobs according to the traditional definition as specified in Section 3.1, that is, unoccupied job openings which are available immediately. It combines two basic principles. First, a direct question about the number of job openings is asked, as in the Dutch vacancy survey.⁶ This approach rests on the fundamental assumption that employers interpret 'job openings' essentially as defined in Section 2, particularly if a brief definition is given, as in Appendix 1. Second, unmet demand is measured indirectly, as unemployment is measured in labour force surveys, by a succession of questions.

Thus, after the first question on the total number of job openings, questions are asked about how many of these job openings which are occupied on the reference day by retiring workers or substitutes, and then those job openings which are *not* occupied are divided between 'future' and 'current' unoccupied job openings. Unfilled jobs are defined operationally as a subset of job openings obtained by eliminating first 'occupied job openings' and then 'future unoccupied job openings'. This approach might be characterized as a synthesis of the Dutch annual vacancy survey 1980-1987 (which measured *occupied* job openings),⁷ and the German vacancy survey by IAB

⁶ See Van Bastelaer and Laan (1994) for a detailed presentation of the Dutch vacancy survey, including its questionnaires.

⁷ See Van Bastelaer and Laan (1994 p. 18).

which separates *current* job openings ('sofort zu besetzende Stellen') from *future* job openings ('später zu besetzende Stellen').⁸

A complete measurement of unfilled jobs according to the ILO-definition and the classical definition (as specified in Section 3) requires the measurement of two additional components, namely 'job openings occupied by internal substitutes' and 'jobs which are waiting for a new worker to start', as elaborated in Section 3.2. Both of these components may be negligible, but this is, of course, ultimately an empirical question.

4.2. *Measuring characteristics of unfilled jobs*

Interpreting unfilled jobs (unmet demand) as deviations from a planned or desired employment path, as we did when discussing the classical definition in Section 3, suggests measuring unfilled jobs by measuring these deviations. More precisely, deviations from a desired employment path can be measured using information on starting dates and desired starting dates. The basic idea is that if the starting date of a new worker comes after the starting date desired by the employer, then the period delimited by these dates is a vacancy spell (spell of unmet demand), as suggested, for instance, by Wadensjö (1978).

This approach to measuring unfilled jobs is based upon the (reasonable) assumption that an employer during recruitment of a new worker can answer a question about when she wants a new worker to start working. Note that vacancies defined in this way do include 'jobs which are waiting for a new worker to start', as the ILO-definition does, since the vacancy spell is based on the starting date and not the hiring date. But if a job is occupied some time between the desired starting date and the starting date (by a retiring worker or a substitute), then it may be necessary to eliminate at least part of this time by asking the appropriate questions, if unmet demand is to be measured exactly according to the ILO-definition.

Information on *desired* starting dates may be relatively easy to collect from employers when they report job orders to a Public Employment Service (PES). Information on *actual* starting dates may be more difficult to obtain, since a job order may be cancelled by the PES long before work starts. In any case, if the PES is to

⁸ See, for instance, IAB (1999).

produce statistics not only on job openings but also on unfilled jobs, then the only way to do so is by adding information on starting dates and desired starting dates to job orders. And then all the characteristics on individual job orders that are available to the PES can also be used in producing breakdowns of unfilled jobs.

If it is possible in business surveys to obtain information on individual recruitments, including recruitment spells, then it should also be possible to obtain information on spells and characteristics of individual unfilled jobs by asking for desired starting dates and actual starting dates. This approach may be useful in (yearly) surveys designed to give structural information on unfilled jobs, while an approach based on a questionnaire like the example given in Appendix 1 may be useful in (monthly or quarterly) surveys designed to give summary information on the number of unfilled jobs in individual firms or establishments.

5. Conclusions

Firms create ‘vacancies’ in one sense (recruitment processes) in order to avoid ‘vacancies’ in another sense (unmet demand). To emphasize this distinction, vacancies as recruitment processes may be called *job openings*, while vacancies as unmet demand may be called *unfilled jobs*.

Unfilled jobs can be defined more precisely as *unoccupied job openings which are available immediately*. This definition excludes occupied job openings and job openings to be filled later, in the same way as unmet supply (unemployment) excludes job seekers with a job (on-the-job search) and job seekers without a job who cannot start work until later.

In the Swedish vacancy survey, which measures both job openings and unfilled jobs, unmet demand is measured indirectly, as unmet supply (unemployment) is measured in labour force surveys, by a succession of questions. More precisely, unfilled jobs are defined operationally as a subset of job openings obtained by eliminating first ‘occupied job openings’ and then ‘unoccupied job openings which are unoccupied because no work is wanted by the employer until later’.

‘Occupied job openings’ exist when, during recruitment of new workers, the corresponding jobs are occupied by retiring workers or substitutes until replacements or permanent personnel have been hired. Job openings which are occupied by retiring workers reflect employers’ ability to anticipate their need for new hires and certainly

not ‘unsatisfied labour demand’. But job openings occupied by *substitutes* cannot represent completely satisfied labour demand, since the firms would not be recruiting new personnel if they did. On the other hand, workers with temporary employment who are looking for new jobs are not classified as unemployed, so a measure of unmet demand which corresponds to the usual measure of unmet supply should not include job openings occupied by substitutes.

References

- Burdett, K. and Cunningham, E.J. 1998. ‘Toward a Theory of Vacancies’, *Journal of Labor Economics*, 16, 445-478.
- Dow, J.C.R. and Dicks-Mireaux, L.A 1958. ‘The Excess Demand for Labour’, *Oxford Economic Papers*, 10, 1-33.
- Eurostat 2002. ‘Job vacancy survey: draft EP and Council regulation’, Working group on employment statistics, Doc. E1/EMPL/06/2002, European Commission.
- Falk, K. 1996. ‘1995 års uppföljning av avrapporterade platser’ (The follow-up of cancelled job orders in 1995), Pfuu 1996:2, AMS (National Labour Market Board).
- Hansen, B. 1970. ‘Excess Demand, Unemployment, Vacancies, and Wages’, *Quarterly Journal of Economics*, 84, 1-23.
- Hoffmann, E. 1999. ‘Collecting Statistics on Imbalances in the Demand for Labour’, *Statistical Journal of the United Nations ECE*, 16, 105-121.
- Holt, C.C. and David, M.H. 1966. ‘The Concept of Job Vacancies in a Dynamic Theory of the Labor Market’, in NBER (ed.), *The Measurement and Interpretation of Job Vacancies*, Columbia University Press.
- IAB 1999. *Kurzbericht* Nr. 5/31.5 (<http://www.iab.de>).
- Layard, R., Nickell, S. and Jackman, R. 1991. *Unemployment. Macroeconomic Performance and the Labour Market*, Oxford University Press.
- Muysken, J. (ed.) 1994. *Measurement and Analysis of Job Vacancies*, Avebury.
- NBER (ed.) 1966. *The Measurement and Interpretation of Job Vacancies*, Columbia University Press.
- Pissarides, C.A. 1985. ‘Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages’, *American Economic Review*, 75, 676-690.
- Van Bastelaer, A. and Laan, J. 1994. ‘The Job Vacancy Survey in the Netherlands’, in Muysken, J. (ed.), *Measurement and Analysis of Job Vacancies*, Avebury.

van Ours, J.C. and Ridder, G. 1992. 'Vacancies and the Recruitment of New Employees', *Journal of Labor Economics*, 10, 138-155.

Verhage, K.G., van Nes, P.J., and van der Weijde, I. 1997. *Employment market analysis*, Netherlands Economic Institute.

Wadensjö, E. 1978. 'Statistiken över lediga platser' ('Statistics on Vacancies'), Section 14.2 in SOU 1978:60.

Appendix 1. The questionnaire in the Swedish vacancy survey

1 JOB OPENINGS

Total number of job openings on the reference day:

A job is open if the employer has started to recruit a new worker from outside the firm on or before the reference day but has not yet hired one. During recruitment of new workers the corresponding jobs may be occupied or unoccupied according to the following questions.

2 JOB OPENINGS WHICH ARE OCCUPIED

a) Number of job openings which on the reference day are occupied by retiring workers who have not yet left the employer:

b) Number of job openings which on the reference day are occupied by substitutes or other temporary workers:

c) Number of job openings which on the reference day are occupied by consultants or personnel from a temporary work agency:

3 JOB OPENINGS WHICH ARE UNOCCUPIED

a) Total number of unoccupied job openings:

b) Number of these unoccupied job openings which on the reference day are unoccupied because no work is wanted or planned until after the reference day:

Note: Unfilled jobs (unmet labour demand) are operationally defined as a subset of job openings obtained by eliminating first occupied job openings ($1 - 2 = 3a$) and then job openings which are not available until some time in the future ($3a - 3b$).