Differences in underemployment between the United States and The Netherlands

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SOM theme D: Demography and geography

Abstract

In this paper the method of cross nation comparison has been applied to analyze wage impacts of labor market institutions. The countries under comparison are the US and the Netherlands. By means of stochastic wage frontier models it has been shown that labor market institutions, in particular, higher unemployment benefits and collective bargaining lead to substantial less underemployment in the Netherlands than in the US. Information channels also play a role, especially in the US, although to a smaller extent.

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I. Introduction

Studies of wage determination often attribute variation in labor market outcomes to differences in labor market institutions. Important institutions are information channels, social security, rules with respect to the obligation to accept a job offer, collective bargaining and the role of trade unions. The impact of the labor market institutions should vary (like earnings) across workers by human capital endowments, across regions by labor market conditions, and across and between occupations.[1] For instance, it has been argued that professional, white collar, blue collar and service workers employ quite different job search strategies, and that search outcomes (jobs and earnings) likely vary by quantity and quality of labor market information utilized in the process. In a similar manner, variations among workers in the attainment of potential (maximum attainable) earnings – the downside of which results in job "mismatches" and underemployment – can be attributed to institutions. Such institutions, and in turn the level of underemployment, vary considerably among countries, and reflect in part important differences in the role, and level of effort, of national governments in matching workers with job opportunities and providing social security.

In this study we consider and examine this contention by measuring the impacts of labor market institutions within the Netherlands and the United States. These countries have been chosen because of the substantial differences between them and the availability of comparable datasets. In this respect, differences among countries in labor market institutions have received little attention within the labor literature, particularly with regard to underemployment. This neglect is related in part to the difficulty of measuring public policy impacts within a national setting. In particular, empirical evidence in this area can only be obtained infrequently when institutional changes occur. Moreover, adjustments to institutional change often take place with considerable time lags--such that resulting behavioral effects are difficult

[1] For excellent reviews of earnings studies, see Ehrenberg and Smith (1991), Chapters 8, 9, and 11, and Polachek and Siebert (1993). In addition, see Devine and Kiefer (1991) for a comprehensive review of empirical job search literature.

to disentangle from other changing conditions.

However, institutional linkages to underemployment can be (also) examined by means of cross-nation comparisons of labor market systems.[2] The purpose of this study is to utilize this approach to investigate the impacts of labor market institutions on underemployment, inferences being drawn from experience in the Netherlands and the United States. A brief overview of labor market institutions in the two countries is presented in the following section, along with a general discussion of each country's public employment service. Next, a formal model of job search is developed in Section III, where differential institutions are shown to impact reservation wages and, in turn, the degree of underemployment. The method by which underemployment is obtained from earnings "frontiers" is also discussed. Separate econometric estimates of these frontiers for the Netherlands and the United States, in both the aggregate and for major occupational groups, are presented and compared in Section IV. Conclusions are presented in a final section.

II. Labor market institutions

The most important labor market institutions which impact underemployment are:

(I) information channels and job search costs

(II) unemployment insurance (UI) benefits

(III) collective bargaining and the role of trade unions

Below these institutions will be briefly discussed. Because the empirical analysis in section IV makes use of data for the period 1980 - 1985 we will describe the institutions in this period.

In the United States, the role of family, friends, and relatives in providing labor market information on employment opportunities and associated job characteristics has often been emphasized. Such information networks have been cited as particularly important for blue collar and service workers. For example, Lansing and Mueller (1967) documented the importance of such information sources for search within both national labor markets and economically depressed areas. The

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[2] Methodological issues associated with this approach are examined in Folmer and Nijkamp (1985) and Folmer (1986).

dominance of personal information networks also appears in early case studies of (unemployed) workers, such as Lurie and Rayack (1966) and Sheppard & Belitsky (1965).

A nationwide public employment service was established in the United States in the 1930's, prompted initially by the Wagner-Peyser Act of 1933 and subsequently by Title III of the Social Security Act of 1935. The U.S. Employment Service is administered at the state level, and federally funded through unemployment insurance taxes. Early case studies such as Wilcock and Franke (1963) attribute only modest success to this organization in disseminating employment information.[3] Studies for the eighties indicate that neither potential employees nor employers appear to rely upon the Service as their primary source of labor market information. For example, only 24 percent of unemployed jobs seekers in 1982 utilized public employment services while 78 percent searched using "employer directed" methods.[4] Data for 1990 reported by Layard et al (1991, p. 239-240) are very much in line with these percentages and confirm the greater importance of direct employer contacts in the US and the relative unimportance of public employment agencies.[5]

The reliance of blue collar job-seekers on information provided by friends and relatives on the one hand, and upon employer-directed information (often at the plant gate) on the other, is indicative of a more limited search network than that utilized by white collar workers, and particularly by individuals with professional and technical occupations [Swigart (1984)]. For the latter, the utilization of local and national newspaper and magazine advertisements, professional organizations, and private employment agencies both broadens the search process and limits the importance of the public employment service. Studies of white collar workers in

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[3] This may be attributed, in part, to the ever changing demands placed upon the service. In this regard, see Levitan, Mangum and Marshall (1976), Chapter 14. In addition, see Cassell (1968).

[4] See U.S. Department of Labor (1983), Table 34. Since the average number of job search methods used was 1.63, percentages such as these will add to more than 100 percent.

[5] After this period the local public employment services in the US have invested in computersystems to maintain their data banks on amore systematic basis. This has considerably helped the matching process in the US, but is not relevant for our empirical analysis for which data from the period 1980 - 1985 are used. Another factor which has improved the matching process on the US labor market in recent years has been the significant growth in private sector employment services that specialize in temporary and part-time positions. Some people have made these type of positions into a type of full-time work. Finally, the growth of the U.S. economy in recent years has certainly helped workers match to jobs.

other countries, such as Fineman (1983) in Britain, also suggest a reliance on expanded information sources. In this regard, training studies for upgrading blue collar and service workers recognize the need for expanded job search [Brecher (1972)].

The functioning of the U.S. Employment Service in the period 1980 - 1985 stands in contrast to its counterpart in the Netherlands, particularly for blue collar and service workers. Within the Netherlands, and in other countries such as Sweden, data-processing equipment is utilized at local employment offices for computerized job-matching. Local databases are interconnected with one another, thus making it possible to obtain information in each Public Employment Service (PES) concerning vacancies and unemployed individuals elsewhere. Several studies document the importance of the PES in job search. For instance, Heijke (1986) reports that 37 percent of those searching for employment utilized the PES as their primary information source while only 7 percent relied on friends and relatives to provide employment information. The importance of the PES in the Netherlands is also reported in a recent report of the European Commission (EC, 1994). Of the unemployed 63% rely on the PES as their main instrument of job search. Private employment services and direct application to employers and advertisements are the main method of job search for about 12% of the unemployed. Friends and relatives are of limited importance.

It should be noted that benefit entitlement in the Netherlands requires the unemployed to register at the PES, and to accept a job offer that matches individual qualifications. However, there is no requirement that an individual accept a job offer that does not match his or her job qualifications, or that requires relocation. Because most of the unemployed are obliged to register, information maintained by the PES on these individuals is rather complete and up-to-date.

The opposite is true for information concerning vacancies since employers are not required to notify the PES of their employment needs. However, because employers must obtain the agency's permission to discharge workers, and thus must maintain satisfactory relations with this body, vacancies for lower skilled workers are often posted with the PES.

Nevertheless, there is evidence that employers prefer to fill vacancies for higher skilled workers through information channels maintained outside the PES,

such as informal networks to include friends and relatives as well as formal channels utilizing both local and national newspaper and magazine advertisements. The following provides at least partial support for this circumvention of the PES, particularly in filling vacancies for higher skilled workers. Employers have a natural tendency to prefer the employed and recent school graduates to the unemployed because the latter are assumed to be less qualified. This applies in particular to the medium and long-term unemployed, a group that is strongly overrepresented among individuals registered at the PES [Folmer and Van Dijk (1988)]. Because employed workers and recent school graduates usually do not initially register at the PES, employers tend to exploit the personal and formal recruitment channels maintained outside the PES. However, the PES is also exploited in addition to other personal and formal recruitment channels.

The results of a survey of employers by Gaspersz and Van Voorden (1987) indicate that personnel with lower qualifications are primarily recruited by means of the PES (80%), on the internal labor market (75%) and by employment agencies (66%). Personnel with middle-level qualifications are recruited for the most part via advertisements in national newspapers and magazines (83%) or internally (75%), while professional and technical workers are almost always recruited through national newspapers and magazines (90%). Furthermore, Gaspersz and Van Voorden (1987) report that employers utilize on average 2.8 recruitment channels.

In summary, for lower skilled workers and their job vacancies, the PES is an important source of information, even in cases where reemployment is ultimately finalized on the basis of other information. For higher skilled jobs, both job-seekers and employers rely on information provided in national newspapers and magazines, a situation not unlike that in the United States. Thus, for jobs at all occupational levels there exists a well organized information system in the Netherlands.

It should be observed that the PES in the Netherlands is not only directly instrumental with respect to job matching in the sense that it provides job searchers with information on job openings and employers with information on potential workers, but also indirectly in the sense that it provides labor market information in general. Moreover, it is often instrumental with respect to training, application techniques, etc. (Bajema, 1993).

The observations above are supported by information in the upper portion

of Table 1 indicative of public employment effort in the two countries[6]. For instance, both relative expenditures on employment and training services and employment within benefit administration in the Netherlands exceed comparable figures for the United States.

Turning now to unemployment insurance (UI), selected characteristics of the benefit systems in the Netherlands and the United States are shown in the middle panel of Table 1. In this regard, the institutional underpinnings of the two systems are similar with respect to eligibility, benefit determination, and taxation. However, both the duration of UI benefits and their relative magnitude in terms of the average replacement rate (benefits/past earnings) are significantly higher in the Netherlands than in the United States. As will be discussed in Section III, such UI benefits reduce the opportunity cost of unemployment and job search, and thus augment the effects of better labor market information by raising observed wages (relative to potential wages) and reducing underemployment.

The next institutional aspects to be addressed are the role of trade unions and collective bargaining. Some differences between the U.S. and the Netherlands are presented in Table 1. Trade union density in the Netherlands is substantially higher than in the U.S. This also holds for collective bargaining. Moreover, in the Netherlands bargaining is predominantly sectoral; in the U.S. it takes place predominantly at company or even plant level. Finally the index for labor standards defined as the rules and regulations that govern working conditions including such issues as working time, employment stability, workers' representation rights and minimum wages is substantially higher in the Netherlands than in the U.S. The

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[6] The comparison is biased because the unemployment rate in the Netherlands was higher than in the United States. However, the difference in unemployment rates does not fully account for the differences observed.

Table 1. Public Employment Service, Unemployment Insurance: Selected Characteristics

Characteristic	Netherlands	United States
Public Employment Service[a]		
Labor Market Training as Percent of GDP	0.22	0.10
Public spending on active Programs Expenditures as Percent of GDP	1.07	0.25
Employees in Unemployment Benefit Administration (per 1000 persons in the labor force)	1.30	(0.5-0.8)[b]
Unemployment Insurance[c]		
Maximum Benefit Duration	36 months	12 months[d]
Subject to Income Tax	Yes	Yes
Initial Relation to Earnings	Proportional	Proportional
Initial Gross Replacement Rate (percent at Average Production Earnings (1988)	70	50
Wage Bargaining		
Trade Union density	26	16[e]
Collective bargaining	71	18[e]
Predominant bargaining level	Sectoral	Company plant[f]
Economy wide bargaining coordination	limited	lacking
Indices for labor standards[g] (synthetic index)	5	0

[a] See OECD (1991), Table 7.12 and OECD (1992), Table 2.15 and Table 2.16.
[b] Authors' estimate from Appendix 2, OECD (1992) and national unemployment benefits personnel reported by U.S. Employment Service.
[c] See OECD (1991), Table 7.2 and Table 7.3.
[d] Basic coverage is 26 weeks, current extension is for 52 weeks.
[e] OECD, 1994, p.173
[f] OECD, 1994, p.175
[g] OECD, 1994, p.154. The synthetic index for the stringency of regulations on labor standards covers: fixed terms contracts, employment protection, minimum wages and employees representation rights. The highest scores are 7-8 meaning strong government regulation for, for instance, Sweden.

above differences are expected to lead to larger variation in wages in the US than in the Netherlands.

Based upon these differences in labor market institutions operative within the Netherlands and the United States (reflected by job search information and cost), two hypotheses can now be developed concerning the magnitude of underemployment in the two countries. First, within wage (earnings) regimes undifferentiated by occupation, measured underemployment will be significantly less in the Netherlands than in the United States. Such an expectation derives from the quality of the job-matching (information) program, higher relative UI benefits and minimum wages, trade union density and collective bargaining in the former country. Second, among occupational groups differences in underemployment are expected both within and between the two countries.

Blue collar workers are expected to be most underemployed in both countries because of the relative large heterogeneity of this category. It is made up of manual workers and includes both skilled and unskilled workers. All the institutions mentioned above contribute to the gap between the U.S. and the Netherlands, in particular the availability and use of information channels.

Professional and technical workers are highly specialized. In both countries this category is expected to have a higher W/W* ratio than blue collar workers because of better job search skills as a consequence of higher education. As indicated above, professional and technical workers in the US and the Netherlands employ similar labor market information channels. As shown in Table 1, the major differences between the U.S. and the Netherlands derive primarily from maximum benefit duration and the initial gross replacement rate. These differences provide a lower cost of job search in the Netherlands and thus a lower likelihood of a job mismatch.

The category other white collar workers in the Netherlands is strongly dominated by public sector workers. Wage differentiation is rather limited for these workers. Hence, this category is expected to have the highest W/W* ratio both within the Netherlands and compared to the U.S. These hypotheses are investigated below within a formal model of job search, and by an econometric technique explicitly designed to measure potential earnings, and thus underemployment.

III. Labor market institutions and underemployment

A. The Job Search Model

Workers in this study are assumed to obtain observed wages, W, through optimal search activity.[7] Time is represented by a sequence of discrete periods of fixed length. The *number* of random wage offers "drawn" from the wage distribution $F(W_o)$ per unit time is assumed to follow the Poisson distribution, with parameter λ representing the "offer arrival rate." In addition, λ as well as parameters of $F(W_o)$ are assumed to be known by searchers and unchanging over time. Finally, although workers may choose among offers received during the current time period, they are prohibited from "recalling" offers extended during previous periods.

Given $F(W_o)$, λ, interest rate δ, and an offer equal to ${}_rW$, the marginal benefit to *continued* search can be represented as

$$B(W_r) = (\lambda/\delta) \int_{W_r}^{\infty} (W_o - W_r)\, dF(W_o), \tag{1}$$

$B(\bullet)$ being convex, nonnegative, and strictly decreasing in W_r. Hereafter, W_r is termed the "reservation wage," the optimal value of which is chosen to equate the marginal cost of continued search with $B(W_r)$. Given an offer equal to ${}_rW$, the marginal cost of continued search this period can be defined as

$$C(W_r) = c + W_r - \ell - UI. \tag{2}$$

The first term on the right-hand side of equation (2) represents out-of-pocket cost while the latter three terms define the opportunity cost of continued search, each

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[7] Here we abstract from the excellent literature survey of Mortensen (1986) and, to a lesser extent, the reviews by Devine and Kiefer (1991) and Lippman and McCall (1976). In these surveys, prospective employers differentially evaluate a given seacher's (invariant) job skills; consequently, potential employers tender different offers, W_o, to the searcher according to the wage distribution $F(W_o)$.

expressed per unit of time. In the latter regard, one relinquishes W_r by continued search, an amount reduced somewhat by the value one places on "leisure," ℓ, and by unemployment insurance, UI, as well. In the case of employed U.I. is the present wage whereas ℓ is not relevant.

As stated, the optimal reservation wage is determined by the searcher to equate the marginal benefits and costs of continued search in equations (1) and (2), respectively. This also implies that the "optimal stopping rule" is to accept any offer that either equals or exceeds the reservation wage implied by $B'(W_r) = C'(W_r)$. Such a determination is illustrated in Figure 1 for a specific individual with (initial) marginal benefit and cost curves B_1 and C_1, respectively. Based upon these two curves, search should terminate when an offer, W_o, either equals or exceeds W'_r.

Figure 1 may be employed to illustrate several other important points regarding job search. First, for each worker, there exists a "potential" or maximum attainable wage offer (W* in Figure 1) commensurate with his or her job skills. However, with $B'(W_r) < 0$ and $C'(W_r) > 0$ in equations (1) and (2) respectively, and $B(W^*) \approx 0$, then $W'_r \leq W^*$. Thus, virtually all individuals are *underemployed* once they find a job, and the magnitude of such underemployment is related both to labor market information and to search costs. In this regard, better labor market information and/or lower search costs would improve the job-matching process, a topic that we address below.[8] Second, $E(W) \geq W'_r$ in Figure 1 due to the optimal stopping rule. Finally, even though "like" individuals will have equivalent W'_r and W* in Figure 1, their actual (observed) wages obtained during search ($W'_r \leq W \leq W^*$) will likely differ due to the stochastic nature of the search process.[9]

In Section II, considerable differences were noted between the Netherlands and the United States in labor market institutions. We are now in a position to demonstrate how such differences affect optimal reservation wages, and in turn

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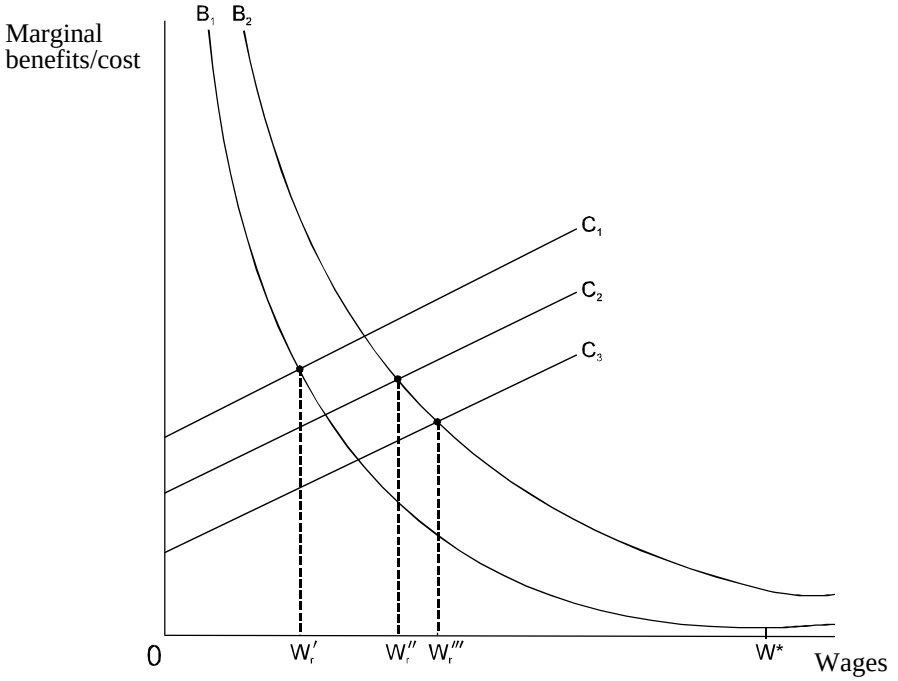
[8] In this model, labor market information is imperfect in the sense that, while the individual knows the parameters of $F(W_o)$ as well as λ (see above), he or she does not know which offers will be extended by specific firms.

[9] See Ehrenberg and Smith (1991), pp. 607-614.

Figure 1. Marginal benefits (B) and Cost (C) of continued job search and the determination of optimal reservation wages (W_r)



observed wages. For the individual depicted in Figure 1, better labor market information likely: (1) increases the rate at which offers are extended [λ in equation (1)]; and (2) decreases out-of-pocket search costs [c in equation (2)].

Marginal benefit and cost curves shift to B_2 and C_2 respectively in Figure 1, and the optimal reservation wage is increased from W'_r to W''_r.[10] In this regard, underemployment is reduced to the extent that the optimal reservation wage, and in turn the observed wage, are increased relative to the potential wage, W*. Higher UI benefits (per unit time) *reinforce* the information effects above by reducing the opportunity cost of continued search in equation (2), and thus by shifting the marginal cost curve in Figure 1 downward from C_2 to C_3. Consequently, the optimal reservation wage is increased to W'''_r, and underemployment is further reduced in that the observed wage [$E(W) \geq W'''_r$] is increased relative to W*.

Collective bargaining has no direct impact on the marginal benefits and costs of search. Rather it influences the setting in which search takes place. Since collective bargaining in the Netherlands takes place at the sectoral level, an individual's wage range is more or less fixed once he/she has received and accepted a wage offer. In the U.S. on the other hand collective bargaining generally takes place at either the company or plant level. This means that there likely exists a much larger variety in terms of wages for individuals with the same labor market characteristics.

In what follows, it is convenient to base comparisons of national labor market efficiency (job matching) upon the ratio W/W* rather than upon the difference W* - W. Such a comparison, of course, must be "ceteris paribus," and it is to that issue that we now turn.

Based upon the above discussion, observed wages of individuals, W, are obtained as accepted offers from the distribution $F(W_o)$, and thus are determined by arguments of the latter. In this regard, observed wages are dependent upon: (1) a group of personal attributes ("inputs") traditionally assumed to augment human capital stock, H; (2) job characteristics, J; and (3) regional labor market conditions, R. Inputs in H include education and work experience, while job characteristics, J, relate to duties performed (often proxied by industry of employment). However, given $F(W_o)$ and the optimal stopping rule, W is also related to the underlying determinants of job search information and cost in equations (1) and (2). Although such information and cost likely depend upon H, J and R above (for instance, information is likely to increase with H), both information and search cost will systematically vary between the two countries based upon differential labor markets institutions.

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[10] Notice that an increase in the offer arrival rate, λ, in no way affects W* in Figure 1, the maximum attainable wage instead being determined by the upper tail of the offer distribution $F(W_o)$, which is invariant. For an examination of how the optimal reservation wage would change (up or down) commensurate with changes in the mean and/or variance of $F(W_o)$, see Mortensen (1986).

B. Measuring Underemployment

With the above in mind,

$$W = W(H, J, R) \tag{3}$$

will be estimated for each country, with major occupational groups represented initially by binary independent variables, and subsequently by individual equations. Also, the "potential" or maximum attainable wage for each worker, W*, is solely a function of the offer distribution, $F(W_o)$, and thus of its determinants H, J, and R above. Consequently, for each individual characterized by H, J, and R, $W^* = \max [W(H, J, R)] \geq W$.

The degree of underemployment varies inversely with W/W*, and for any group of individuals, with E(W/W*).[11] Thus, measuring underemployment requires that a potential wage, W*, be determined and compared with the observed wage, W, for each individual within our research population (described below). In addition, such a determination must be "ceteris paribus" in terms of the inclusion of independent variables for the estimation of equation (3), as well as the disaggregation of the analysis to accommodate unmeasurable institutional attributes of job search information and cost that vary across countries and occupations. Finally, based upon the job search model outlined above, our estimating equation must explicitly reflect a stochastic wage with a two-sided distribution as well as a separate underemployment term (W* - W) which is nonnegative.

Such a model (wage equation) can be stated as

$$W = f(\mathbf{z}) + v - u^*, \tag{4}$$

where W is again the observed wage, $\mathbf{z}$ is a vector of all wage determining variables representing human capital stock, job characteristics and regional labor market conditions, v is a symmetric error, and u* is a nonnegative error. In addition,

$$W^* = f(\mathbf{z}) + v. \tag{5}$$

This model has the same general form as the stochastic frontier production function

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[11] Hofler and Murphy (1992) interpret W/W* as an index of "underpayment," and demonstrate how such underpayment varies with labor market information.

of Aigner, Lovell and Schmidt (1977), and is similar to the earnings frontiers developed by Herzog, Hofler and Schlottmann (1985), Hofler and Murphy (1992), Hofler and Polachek (1985), and Polachek and Yoon (1987). Based upon equations (4) and (5), notice that $W/W^* = 1 - (u^*/W^*) = 1 - u$. In addition, note that: (1) $u = 0$ when $W = W^*$, (2) $u > 0$ when $W < W^*$, and (3) u varies across individuals as W/W^* varies. Finally, because the nonnegative error term satisfies these three characteristics, it is asserted that u^* in equation (4) captures the effect of underemployment. Thus, this wage frontier, equation (4), is the explicit equivalent of equation (3).

For any N individuals within a given country and/or occupational group (professional and technical, other white collar, or blue collar and service),

$$E(W/W^*) = (1/N)\sum_{i=1}^{N} [1 - u_i^*/W_i^*)]. \quad (6)$$

When equation (4) is defined in semilogarithmic form and -u is exponentially distributed, equation (6) can be expressed as

$$E(W/W^*) = E[\exp(-u)] = 1/(1 + \mu_u), \quad (7)$$

where μ_u is the mean of u. Comparisons of mean levels of underemployment between countries and/or among occupational groups can then be made on the basis of equation (7).

IV. Econometric results

A. Data

A comparative empirical examination of the outcome of the job search process (described above) is made possible by the availability, and consistency, of survey data in the two nations. The Dutch OSA survey [Vissers et al. (1986)] provides labor

force data for a national sample obtained in April, 1985, and is the most adequate file of its type in the Netherlands containing wage information. Individual records of the Dutch survey provide information on such characteristics as weekly wages, sex, age, education, occupation and industry.

Although alternative micro-data sources were available for the United States, this study utilizes individual records obtained from the Survey of Income and Program Participation [Nelson, McMillen, and Kasprzyk (1985); U.S. Department of Commerce (1986)]. This Survey (SIPP) is the only major U.S. data source which permits wage comparisons with Dutch individuals as of April, 1985 for a large number of observations, and for personal characteristics defined consistently between the two countries.[12]

The hypotheses formulated at the end of Section II are expected to hold both for males and females, though not to the same degree. An important reason for differences in degree of underemployment by sex is discrimination (Haagsma, 1995). This implies that estimation on the basis of a pooled dataset for males and females would be incorrect. Because of the relatively small number of observations on females in the Dutch dataset the analysis is restricted to males.

The common universe for our comparative analysis was designed to maximize labor force participation as well as sample consistency. Both samples include white members of the civilian labor force aged 16-60, and exclude individuals attending college, members of the armed forces, and inmates of institutions. The self-employed, as well as part time workers, were also excluded from the research population in order to better represent within our analysis the job search process described in Section III-A. Based upon these restrictions, the resulting samples consist of 1141 and 8117 observations for the Netherlands and United States, respectively.

Table 2 provides information on the industrial and occupational structure of the Dutch and U.S. labor force as tabulated from their respective samples. Of particular interest to this study are variations in individual attainment of potential earnings between the two countries, on an occupation-by-occupation basis. In this

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[12] The research population for the United States comprises individuals within the sample as of April, 1985 (Wave 6), and allows linked records back to September, 1983 (Wave 1). The Dutch OSA Survey asked individuals for retrospective information as of January, 1980.

respect, the occupational distribution in Table 2 is essentially the same within the Netherlands and the United States. The distribution of employment by industry is also quite similar between the countries, although a higher proportion of workers in the United States are employed in wholesale and retail trade.

B. Earnings Estimates

Based upon the discussion above, the natural logarithm of 1985 weekly earnings (wage and salary income) was regressed against sets of variables representing both personal and region characteristics, as well as industry affiliation. Personal characteristics [H in equation (3)] include age (and age squared), years of education and household relationships (family size and marital status). Marital status is represented by a binary variable set equal to unity for individuals who are single. In addition, given the importance of job transfers for white-collar workers [Schlottmann and Herzog (1984)], a binary variable (mover) was set equal to unity for 1980-1985 interprovince migration in the Netherlands, or 1983-1985 interstate migration in the United States.[13] Finally, a variable denoting number of weeks an individual reported looking for work or on layoff within the above intervals was included as a measure of work interruption (and reduced experience as well as (perceived) lower productivity).

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[13] As discussed in note 9, the Dutch OSA survey provides baseline information as of 1980 while the SIPP sample begins in mid-1983.

Table 2. Mean Industry-Occupation Characteristics of the Labor Force By Country (Proportion)[a]

Characteristic	Netherlands	United States
Industry[b]		
Agriculture, Forestry, and Fisheries	.01	.04
Construction	.11	.10
Manufacturing	.23	.27
Transportation, Communication, and Public Utilities	.10	.09
Wholesale and Retail Trade	.16	.20
Commercial Services and Public Administration	.38	.30
Occupation[c]		
Blue Collar and Service	.50	.52
Professional and Technical	.29	.27
Other White Collar	.22	.21

[a] For a definition of the research population, see the text. Sample observations for the Netherlands and the United States are 1141 and 8117 respectively. Characteristics are reported as of April, 1985.

[b] Industry classification is at the three-digit level. This classification was based on the closely matched SBI (Standard Bedrijfsindeling) used by the Dutch Central Bureau of Statistics and the U.S. Standard Industrial Classification System.

[c] Occupational groups are matched at the three-digit level. The Central Bureau of Statistics OSA and Census Occupational Classification System codes were utilized for the Dutch and U.S. data, respectively.

Regional characteristics [R in equation (3)] were included within the analysis to adjust for intracountry differences in local labor market conditions. For the Netherlands, a single variable was set to unity (vs. zero) to reflect higher relative unemployment in peripheral (nonmetropolitan) areas. Two binary variables were employed within the U.S. regressions, and were designed to obtain consistency with the Dutch data. These latter variables were set to unity (and zero otherwise) for individuals residing in nonmetropolitan areas and/or in states with above average unemployment rates.

Finally, job characteristics [J in equation (3)] relate to duties performed while at work, and are represented within the earnings analysis by a regime of dummy variables. With the exception of manufacturing (the omitted category), these industries correspond to those considered in Table 2.

Separate earnings frontiers were estimated for the Netherlands and the United States by maximum likelihood techniques. This procedure provides consistent estimates of all parameters, after which the two-component error term, v-u in equation (4), can be decomposed into separate estimates of v and u.[14] In this regard it was assumed that v and u in equation (4) are independent, that v is normally distributed with a zero mean and finite variance, and that u is derived from an exponential distribution with mean μ_u and variance μ_u^2.

Straightforward estimation of equation (4) is not possible because of sample selection bias. This kind of bias is relevant here because W is observed only for those who are working. Individuals who are not working were dropped from the sample on which the wage equation is estimated. As shown by Heckman (1979) straightforward estimation of a relationship (ie the wage equation) without correcting for the deletion of observations confounds the parameters of interest with parameters of the function specifying the probability of being in the sample.

The problem of selectivity will be handled here by the application of the procedure advocated by Heckman (1979). In the present situation it comes down to probit estimation of an employment model on the basis of the sample for each

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[14] See Schmidt and Lovell (1979) and Jondrow, Lovell, Materov, and Schmidt (1982) for a discussion of the frontier estimation technique. Polachek and Yoon (1987) and Herzog, Hofler, and Schlottmann (1985) have also obtained consistent and asymptotically efficient estimates of earnings frontiers by maximum likelihood techniques.

country including both employed and unemployed. The probit model gives the probability to be employed at the date of the interview and hence to earn a wage. From this model the inverse of Mill's ratio is estimated. The inverse of Mill's ratio is used as a regressor in the wage equation estimated on a subsample consisting of the individuals who were employed at the date of the interview.

The use of the estimated Mill's ratio introduces a stochastic regressor in the likelihood function. This means that the standard errors must be corrected since the standard procedure for estimating standard errors understates the true standard errors. The correct asymptotic variance-covariance matrix is given by Heckman (1979). In the case the null hypothesis of no selection bias holds the usual standard errors are appropriate. This hypothesis can be tested by means of the t-distribution (Heckman, 1979). The employment models are given in Appendix 1. The estimated models are in line with various empirical models such as Devine and Kiefer (1991) and Van Dijk and Folmer (1985). The inverse of Mill's ratio obtained for the total sample was used in the wage equations for both the total sample and the occupational subsamples.

Earnings frontier coefficient estimates are provided in Tables 3 - 4 for the Netherlands and United States, respectively. In both tables, estimates shown in the first column were obtained for the entire sample, and will later be employed to address the first of the two hypotheses developed in Section II. In these aggregate equations, major occupation groups are represented by dummy variables (blue collar and service workers comprising the omitted category). The latter three columns of each table provide earnings estimates by occupation, and will subsequently be utilized to investigate how underemployment likely varies within each country by job search methods and other labor market institutions (the second hypothesis).

We now turn to the estimation results in Tables 3 and 4. At the outset we observe that because of the larger number of observations the estimates for the US tend to be more significant than for the Netherlands. The overall fit of the models is quite good according to the log likelihood values and pseudo R^2s.

Table 3. 1985 Earnings Estimates for males: The Netherlands[a] (Dependent Variable is Ln Weekly Earnings)

Variables	Total Sample	By Occupation: Blue Collar and Service	Professional and Technical	Other White Collar
Constant	5.08***	5.42***	4.21***	4.87***
Personal Characteristics:				
Age	.04***	.03***	.08***	.05***
Age Squared	-.41***	-.032***	-.81***	-.52***
Education	.02***	.01**	.03***	.02***
Single	-.07	-.06	-.09	-.02***
Family Size	.01	.00	.01	.02*
Mover	.06***	.06***	.04*	.06**
Weeks Looking for Work/Layoff	-.0005*	-.0005*	-.001	-.002***
Regional Characteristic:				
Peripheral Area (Nonmetro, High Unemployment)	-.03*	-.01	-.03	-.03
Industry:				
Agriculture, Forestry, and Fisheries	-.12*	-.08	-.10	-.11
Construction	.02	.02	.09	.09
Transportation, Communication and Public Utilities	.00	.04	.01	-.02
Wholesale and Retail Trade	-.01	-.01	-.01	-.02
Commercial Services and Public Administration	.03**	.06**	.03	.03
Occupation:				
Professional and Technical	.18***			
Other White Collar	.06***			
Mill's ratio	-.12	-.19	-.25	-.30
N	1141	565	329	247
Loglikelihood	311	217	52	108
Pseudo[b] R^2	.48	.27	.39	.46

* two-sided t-test significant at the .10 level.
** two-sided t-test significant at the .05 level.
*** two-sided t-test significant at the .01 level.

[a] All variables as well as the estimation technique are defined in the text.
[b] Defined as the squared correlation between the observed and predicted dependent variable.

Table 4. 1985 Earnings Estimates for Males: The United States[a] (Dependent Variable is Ln Weekly Earnings)

Variables	Total Sample	By Occupation: Blue Collar and Service	Professional and Technical	Other White Collar
Constant	2.50***	3.66***	2.50***	2.23***
Personal Characteristics:				
Age	.14***	.12***	.13***	.17***
Age Squared	-1.44***	-1.29***	-1.26***	-1.89***
Education	.05***	.02***	.05***	.04***
Single	-.47***	-.29***	-.35***	.41***
Family Size	-.01**	-.03***	.03**	-.06***
Mover	.18***	.04	.22***	.41***
Weeks Looking for Work/Layoff	-.01***	-.01***	-.02***	-.02***
Regional Characteristics:				
Nonmetro	-.13***	-.07**	-.23***	-.11***
High Local Unemployment Rate	-.01	-.01	-.03	.01
Industry:				
Agriculture, Forestry, and Fisheries	-.22***	-.30**	-.01	.02
Construction	-.01	-.00	-.17**	.23
Transportation, Communication and Public Utilities	.05*	-.12***	-.04	.07
Wholesale and Retail Trade	-.23***	-.35***	-.17***	.02
Commercial Services and Public Administration	-.26***	-.32***	-.20***	-.11*
Occupation:				
Professional and Technical	.27***			
Other White Collar	.08***			
Mill's ratio	2.08***	.68	2.40***	.96
N	8117	4216	2202	1699
Loglikelihood	-7585	-3578	-1943	-1833
Pseudo[b] R^2	.42	.40	.28	.44

*t-test significant at the .10 level.
**t-test significant at the .05 level.
***t-test significant at the .01 level.

[a] All variables as well as the estimation technique are defined in the text.
[b] For a definition see Table 3.

The coefficients for the Mill's ratios are insignificant for the Netherlands. For the US the Mill's ratio is significant for the total sample and the professional and technical workers. The standard errors have been corrected as indicated above. The constant term in the US is substantially lower than in the Netherlands (except for other white collar workers) while the impacts of the personal characteristics are substantially larger. Although part of the difference reflects differences in the exchange rates, this also shows that wages in the US are more dependent on personal characteristics which is indicative of the influence of institutional factors, in particular wage bargaining (see also Hartog et al, 1997).

Weekly earnings are augmented by additional years of education and age (albeit at a declining rate for the latter, especially in the US), as well as by geographic mobility. The insignificant effect of migration for blue collar workers in the US is indicative of the deficiency of the information system for this category. Earnings are depressed among single individuals, and members of the labor force with interruptions to work experience. Although for the Netherlands not all coefficients are significant, their signs are according to expectations. Family size has a negative impact in the US while a positive, though insignificant, effect in the Netherlands. Turning to regional characteristics, peripheral (nonmetropolitan) locations diminish earnings in both countries, especially in the United States. In the Netherlands the impact is only significant for the total sample. Also, for the United States, earnings within agriculture, forestry, fisheries, wholesale and retail trade, commercial services, and public administration are in most cases below those in manufacturing, ceteris paribus.

In the Netherlands only few significant sectoral impacts can be discerned. Most striking is the positive impact for blue collar workers in commercial services and public administration. Finally, estimates in the first column of each table indicate, for equivalent H, J and R in equation (3), how earnings vary by occupation. In both countries earnings of professionals and white collar workers are higher than those of blue collar workers (reference group).

C. Underemployment

Given the earnings estimates in Tables 3 and 4, nonnegative errors (u) for individuals within each country and model can be determined by equation (4).[15] Equation (7) can then be employed to estimate E(W/W*), the mean ratio of actual to potential earnings for members of the Dutch and U.S. labor force. These calculations are presented in Table 5. As discussed above, better labor market information and/or other more generous labor market institutions increase this ratio and, in turn, decrease underemployment. Thus, for any model (total sample or major occupational group), differences in the mean level of underemployment between the countries can be imputed based upon statistically significant differences in E(W/W*).

Given estimates for the total samples in Table 5, Dutch and American males achieve, on average, 91.7 and 68.1 percent of their potential 1985 earnings, respectively. A t-test indicates that the above rates for the Netherlands significantly exceed those for the United States.[16] Thus, evidence is provided in support of the first hypothesis, namely that underemployment among Dutch workers is significantly less than that among American workers.

Mean W/W* were also estimated on the basis of the occupation-specific earnings equations in Tables 3 and 4. These ratios are listed in Table 5 where significant pair-wise differences between countries (columns) are also noted.[17] Moreover, significant pair-wise differences within countries were found, although of much smaller magnitude than the between-country differences. These results suggest that, although differential information channels are important between occupations, the institutional differences discussed above play a crucial role. In general, the results in Table 5 confirm the research hypotheses presented above.

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[15] These errors were derived from an expression developed by Jondrow, Lovell, Materov, and Schmidt (1982). Their method employs the conditional distribution of μ [given the estimable total error (v-μ)] to obtain information about μ.

[16] Equality of W/W* between the two countries is rejected at the 1 percent level. In this regard, see the notes below Table 5.

[17] For the United States, alternative estimates to those reported in Tables 4 and 5 were obtained for individuals residing within certain Northeastern states in 1985 (Connecticut, Massachusetts, Maryland, New Jersey, New York and Pennsylvania). These estimates, for a geographic region that better approximates the transportation network and population distribution characteristics of the Netherlands, are essentially the same as those reported.

Table 5. Estimates of Mean 1985 W/W* by Occupation and Country (Percent)[a]

Occupation[b]	Netherlands[c]	United States[c]
Blue Collar and Service	91.9	68.7
Professional and Technical	93.3	70.1
Other White Collar	96.0	65.3
Total	91.7	68.1

[a] Estimates were obtained from the earnings equations shown in Tables 3 and 4. See equation (7) in Section III-B.

[b] The null hypothesis that mean W/W* for an occupation in the Netherlands is equal to the corresponding mean in the U.S. was tested by t-statistic. The alternative hypothesis is that these means are not equal. Based upon this test all hypothesis were rejected at the 1% level.

[c] Pair-wise differences within countries are significant at the 5% level or less, except for blue collar and services and professional and technical in the Netherlands, which is significant at the 10% level.

V. Conclusions

In this paper the impacts on underemployment of labor market institutions within the Netherlands and the United States have been investigated. The most important labor market institutions which impact underemployment are information channels and job search costs, unemployment insurance benefits, and collective bargaining. Wage impacts have been measured in terms of variations among workers in the attainment of potential (or maximum attainable) earnings. Empirical research in this field within a given national economy has been hampered because of infrequent institutional changes and because adjustments to institutional changes are often difficult to disentangle from other changing conditions.

In this paper a cross-nation comparison has been applied. The countries under comparison are the US and the Netherlands. Because of the quality of information channels, higher unemployment insurance benefits and more collective wage bargaining it has been hypothesized that within wage regimes undifferentiated

by occupation measured underemployment will be significantly less in the Netherlands than in the US. Moreover, among occupational groups differences in underemployment have also been hypothesized both within and between the two countries, primarily because of differences in the availability and use of information channels.

Wage frontier models have been applied to measure underemployment. The estimated models for the US and the Netherlands show strong similarities in terms of personal attributes assumed to augment human capital stock (such as age, education, duration of unemployment and marital status), regional characteristics (metropolitan vs non-metropolitan areas) and occupation (blue collar and service, professional and technical and other white collar workers). The main differences between the two countries relate to industry. For the US earnings within sectors such as wholesale and retail trade are consistently below earnings in manufacturing. In the Netherlands only three significant sectoral impacts can be discerned. Most important is the positive impact for blue collar workers in commercial services and public administration.

The empirical findings with respect to underemployment support the hypotheses. In the Netherlands the ratio of the observed wage to the potential wage ranges from 92% for blue collar and service workers to 96% for other white collar workers. In the US the observed ratios are consistently lower, with the lowest ratio for other white collar workers (65%) and the highest for professional and technical workers (70%).

In summary, labor market institutions appear to lead to substantially less underemployment in the Netherlands than in the US. From the smaller within country differences observed between occupational groups, the results suggest that information channels play much less of a role than the other institutional aspects.

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Appendix A. Employment models

The employment models are based on inter alia Kiefer and Neumann (1989) and Van Dijk and Folmer (1985). The probability of being employed and hence earning a wage is assumed to be a function of age, education, marital status, family size and location of residence in the core or the periphery in the Netherlands and a metropolitan or non-metropolitan region in the U.S.

Table A.1 Employment models probit estimates

	Netherlands		United States	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant	1.33	2.97	.36	3.81
Age	-.01	-1.14	.01	5.59
Education	.08	4.55	.04	14.57
Single	-.81	-.81	-.39	-8.95
Family size	-.06	-.07	.04	2.58
Periphery	-.37	-.37	-.08	-2.28
N		1247		9196
Loglikelihood		-325		-3068
% correctly predicted		91%		88%