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Job Match Quality: Measurement and Applications

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Ganna Tsupryk

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GANNA TSUPRYK

We, the dissertation committee for the above candidate for the

Doctor of Philosophy degree, hereby recommend acceptance of this dissertation.

Debra S. Dwyer - Dissertation Advisor

Associate Professor of School of Health, Technology and Management

Adjunct Associate Professor, Department of Economics

Hugo Benitez-Silva - Chairperson of Defense

Assistant Professor, Department of Economics

Mark R. Montgomery

Professor, Department of Economics

Kelly Noonan

Associate Professor Department of Economics, Rider University

This dissertation is accepted by the Graduate School

Lawrence Martin

Dean of the Graduate School

Abstract of the Dissertation

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There are two main contributions to this dissertation: to assess the impact of the proliferation of information through the internet on job match quality and to construct an indicator of latent job match quality based on theoretical predictions from the employee's perspective. It has been theorized that information in the labor market is a valuable resource in not only expanding the job offer set available to searchers, but also in facilitating efficiency from the more informed choices.

This dissertation uses a sample of relatively homogeneous recent college graduates from the Baccalaureate and Beyond 2000/01 study to test our hypotheses regarding the impact of information on utility from the job for these young labor market entrants. The first part of the dissertation focuses on measurement of well-being. We are able to construct an indicator of utility using rich data on job satisfaction – not only overall satisfaction, but seven other aspects of the job. Building on a literature that argues in favor of a utility framework that incorporates non-pecuniary attributes of the job as utility enhancing in theory, we allow for multiple attributes of the job for constructing an indicator of well-being on the job. Exploratory and confirmatory factor analysis of our satisfaction instruments support a pecuniary and non-pecuniary component in the utility function for a better indicator of well-being on the job, or match quality from the employee perspective. We are able to examine differences in weights on components of the utility function by gender and other characteristics. The next part of the dissertation tests our hypotheses regarding the propensity for the internet as an efficient search method for maximizing well-being on the job.

Following the introductory chapter that includes the motivation for this work, the literature review, and the underlying theoretical framework, Chapter 2 focuses in on the measurement of utility from the job and the importance of wages relative to other attributes to individuals when assessing job outcomes. To test for internal consistency, we find that the binary overall job satisfaction indicator is highly correlated with self reports of satisfaction on the seven specific job attributes. Interestingly wages are not

responsible for explaining most of the variation in this overall indicator of satisfaction. Rather challenge and importance of the work performed proves to be more important for recent college grads. While this may not be true for the general population, it does suggest that using wages as a sufficient statistic for utility is not likely appropriate in general. This motivates further analysis of self reports of job satisfaction to improve on wages as an indicator of job outcome success.

Factor analysis reduces our data from 7 indicators to 2 mutually exclusive indicators important in explaining job outcome success.[1] We analyze the effect of the two factors on the probability of being satisfied with the job overall and find that the non-pecuniary factor is at least as influential as the pecuniary one. Wages also significantly increase the propensity to be satisfied as long as we exclude other attributes of the job. Once we include the other factors, wages are actually negatively associated with overall satisfaction.[2] This confirms our assumption that non-monetary aspects of the job define a portion of the individual's utility that cannot be ignored in models of well-being. Studies that rely on wages as an outcome indicator in the labor market may bias results since it relies on the unrealistic assumption that all individuals place equal weights on wages in the utility function. It ignores the literature on happiness and reference groups that suggests individual assessments of their own well-being depends on attributes and therefore are heterogeneous. We would underestimate well-being for those who make choices that are driven by other components of the job, which might lead to inefficient reform policies. For example, women may place less weight on wages, and more weight on flexibility on the job. A model of wages would then underestimate the well-being of women in the labor market. There are a number of important policy issues that can be addressed with a model that better captures heterogeneous preferences and well-being, such as the issue of the persistent gender wage gap, which we do address in this dissertation, as well as gaps by race and college major choice.

We go further in this chapter to compare three definitions of individual's utility from the job and estimate the effect of various job attributes, wages, and individual characteristics on individual's well-being, namely: the binary overall satisfaction index, log of annual earnings, and our preferred index of utility obtained from factor analysis.[3] We are the first to provide a comparison of several measures of individual utility in this way and examine gender differences across them. We find that while females are at a disadvantage regardless of indicator used, the gap is larger in the model of wages than the other indicators – suggesting that there is more to happiness on the job than pay.[4]

Finally in the third chapter of this dissertation we use our preferred index of utility to explore the role of information in job match quality. In an attempt to identify the

[1] The two factors constructed from the exploratory analysis are mutually exclusive. They are not necessarily so from confirmatory analysis where we impose the pecuniary and non-pecuniary components based on our priors. The results are robust to choice of factors used.

[2] Wages may reflect productivity or effort once we account for compensation as well.

[3] Based on validity tests.

[4] This does not mean to suggest that there is no discrimination in pay for women. They are making choices that place more weight on other job attributes. Whether the compensating differential for these attributes is fair is not within the scope of this paper.

consequences of the proliferation of information , particularly through the internet, we are the first to empirically analyze its effect on individual utility from the job. Exploring cross-sectional variation in well-being on the job, we employ and assess the effects of retrospective data on job search methods used to produce the current job, while controlling for observed heterogeneity and correcting for sample selection. We perform the analysis alternating the dependent variable to further understand how important it is to go beyond wages as an indicator of well-being. We find strong positive effects of performing an internet job search on employee's well-being, regardless of how it is measured, controlling for selection into employment status as well as into search status. We find that those who search online have a higher probability of being unemployed as well as a greater propensity to continue searching on the job (given lower costs, this is not surprising).

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1 The concepts of job search, job matching and match quality

1.1 Introduction

Efficiency in any market may be defined as the production of the best outcome using minimal resources. In a market as large as that for labor, where processes are complex, and "best outcomes" are difficult to identify, an evaluation of the functioning of the market is difficult – and yet given how important it is to the functioning of the economy as a whole, an important endeavor. In order to effectively evaluate this market, we need a complete picture of the institutions relevant for the supply and demand of labor. This includes an understanding of the peculiarities of labor market dynamics[5], and the processes that underlie them. The two main agents, employers (demand) and employees (supply), seek to maximize different objectives given initial conditions and constraints. What is produced is a job match which has a level of quality associated with it. That quality is a function of the propensity for the match to maximize objectives of suppliers and demanders at minimal cost to each. For the employer, it will be an employee that will produce on the production possibilities frontier to maximize profits. For the employee it will be to maximize utility over consumption and other attributes related to the work.

The match occurs as the output of a production process with job search and job advertising as inputs[6]. This process results in the generation of job offers that are then accepted or rejected based on the quality of the match. This dissertation focuses on the input by the employee who chooses some amount of investment in the search process

[5] Labor dynamics are determined by workers entering and exiting labor force, changing their employment status and changing jobs. Job search process usually precedes job finding and job change. Economists distinguish voluntary and involuntary job separation and employed and unemployed job search. There is large and constantly growing literature that analyses all aspects of labor market dynamics and job search in particular (see, for example, Devine and Kiefer (1991) for the review of more than 500 empirical studies of job search. More of them are reviewed in Van den Berg (1999)).

[6] There is an extensive literature that studies job search and job matching models in the equilibrium framework (see, for example Jovanovic (1979) and Miller (1984)).

(search effort)[7]. The search effort involves both financial and time costs and workers are constrained in both. Employees choose effort and ultimately jobs based on their reservation value for a job[8].

It is a well established fact that monetary compensation (wages) are a significant and highly valued component of total compensation from work in the labor force. Existing models that analyze behavior of suppliers of labor typically place most of the weight, if not all, on this form of compensation in the utility function. There is a growing literature acknowledging other economic factors (health insurance, pensions, etc.), as well as non-monetary benefits (promotion possibilities, job security, flexible hours, etc.), that increase utility and influence behavior in the labor market (Dey and Flinn, 2005; Atrostic, 1982). Unfortunately, in empirical analysis we do not typically observe an individual's reservation compensation, which would include weights on various components in the utility function; nor do we observe their distribution of offers. What we do observe are the outcomes of the decision-making process – and often an incomplete set of outcomes. We also observe indicators of the taste shifters and factors that supposedly determine the reservation compensation (Clark, 1998; Clark 2001; Frey and Stutzer, 2002).

It is acknowledged in the economic literature, as well as in the sociological literature that differences in match quality result from the variation in characteristics of jobs and workers, and are affected by the methods and strategies, which job seekers use to find a job (Fountain, 2005). Job search methods and strategies differ in terms of quantity, quality and cost of information, especially nowadays, when the internet job search became widely used. In the last decade much attention has been paid to how the internet is transforming labor markets, changing the way unemployed and employed workers search for jobs, and the way firms recruit workers (Autor, 2001; Freeman, 2002). Tens of thousands of internet job search websites exist at this point, hundreds of companies post their information about career opportunities[9], and the effect of proliferation of the information through online job search resources on the quality of job match is particularly interesting. Figure 1.1 provides a schematic description of the processes that take place at the labor market, factors and driving forces that influence the behavior of agents.

In my dissertation we use the first wave of the Baccalaureate and Beyond Longitudinal Study 2000/2001, the sample of recent college graduates. It contains unique data on worker's outcomes and factors and search methods. We use factor analysis to examine the factors that influence the job match quality from the individual's perspective. We find that there are at least two factors that influence individual's well-being on the job: pecuniary and non-pecuniary.

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[7] This dissertation considers the workers' outcomes, though, it would be interesting to examine job matching outcomes from both, employer's and employee's perspectives, but the empirical data on the labor outcomes from the demand side is rarely available.

[8] The model of McCall (1970) is one of the examples of the intertemporal structural models of the process of job search (offer generating and acceptance) in the utility framework. See also Kiefer and Neumann (1979), Flinn and Heckman (1982), Wolpin (1987), Stern (1989), and Eckstein and Wolpin (1990).

[9] See, for example: http://www.jobfactory.com for the list of the job search websites, online recruitment agencies and etc.

I broaden the definition of utility to include non-pecuniary benefits of the job and find a criterion to evaluate job match quality in the utility framework, constructing a continuous index of utility on the job. We use this new index to evaluate the role of observed individual characteristics on utility from the job comparing the results to those from traditional wage regression and the regression of Overall Job Satisfaction as alternative measures of individual well-being on the job. We find that, for example, women (on average) get lower utility from the job then men, though the magnitude of the difference is not that large as the gender wage difference.

Controlling for heterogeneity of preferences and sample selection, we examine the role of an internet job search in improving match quality, when measured with constructed utility index. We find that employed individuals, who do not search on the job and were using internet job search, have higher utility on the job, when compared to employed non-searchers, who were using traditional job search methods.

The remainder of this dissertation is organized as follows. The first chapter of my dissertation reviews the literature on several broad categories: job search, matching and match quality, and information; introduces the main questions and summarizes my contributions to the literature. Also, it introduces the theoretical model, which will be used in second and third chapters of my dissertation, and gives description of the data.

The second chapter contains empirical analysis of job attributes, the construction and the test of the job match quality measure.

The third chapter empirically examines the influence of internet job search on the job match quality, measured by utility index, constructed in Chapter 2.

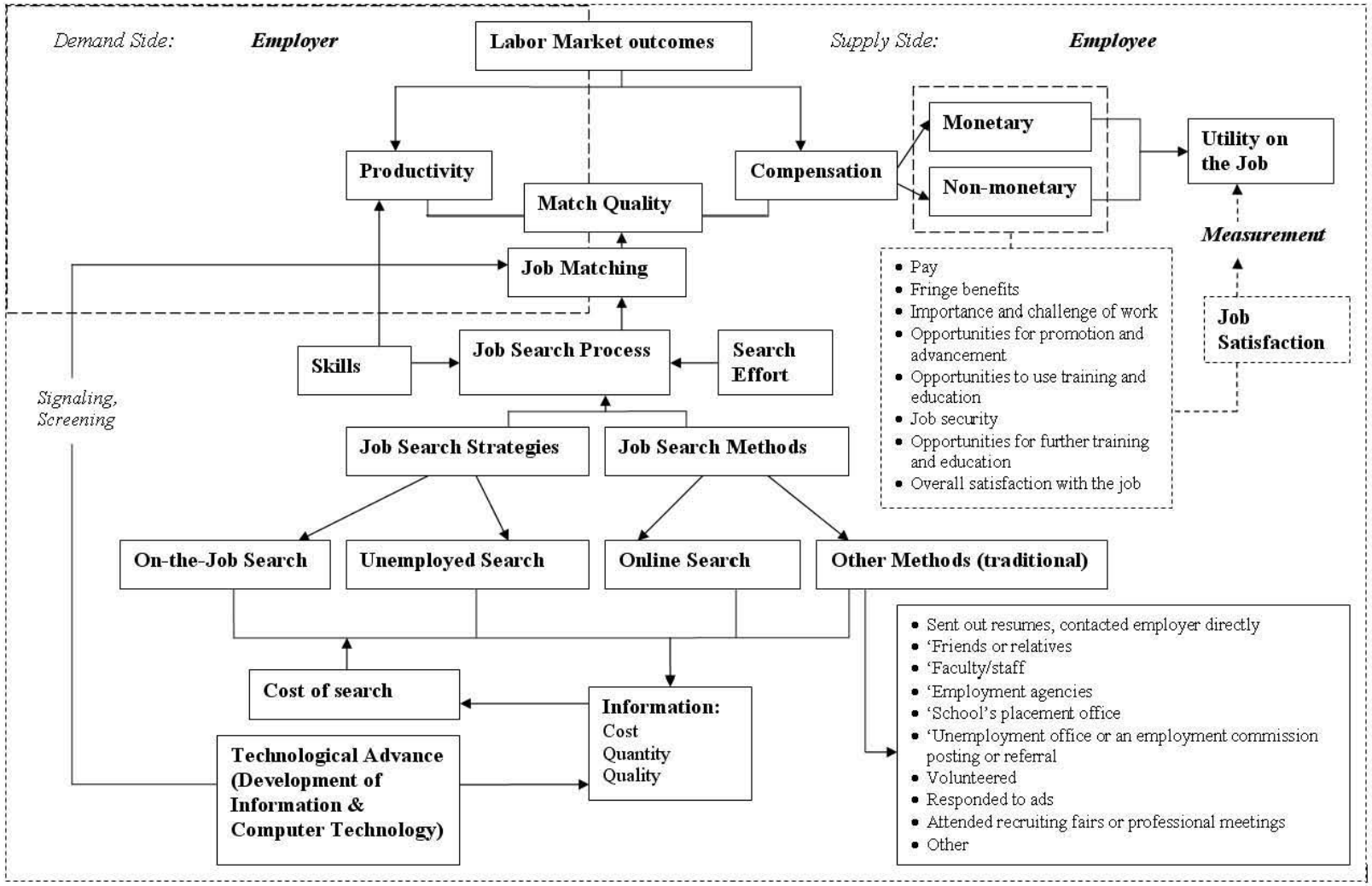

Figure 1.1. Modeling Labor Market processes

1.2 Literature review

This dissertation analyzes the factors that influence individual's well-being on the job, and is aimed to find a criterion to evaluate the quality of a job match in the utility framework to investigate the effect of the information on job match quality from the individual perspective.

This section summarizes two distinct sets of the economic literature: the literature on measurement of job match quality, job satisfaction and utility and the literature that talks about job search, job search methods and job search strategies. First studies the components of the individual well-being on the job, proposes measures of the job match quality, and establishes the background for the conceptual framework we use in this dissertation, while second studies the components of the job search and matching process. Efficient labor markets require efficient job-matches, which require information. Therefore, understanding search has implications for studying effects of information on the worker's well-being of the labor market.

1.2.1 Literature on measurement of job match quality

This dissertation analyzes the factors that influence individual's well-being on the job, and is aimed to find a criterion to evaluate the quality of a job match in the utility framework. Therefore, this section reviews the existing literature that studies the components of the individual well-being on the job, proposes measures of the job match quality, and establishes the background for the conceptual framework we use in this dissertation.

There are two main types of compensation to consider while modeling the processes that take place at the labor market: pecuniary and non- pecuniary benefits. Thus, the factors that an individual cares about at work are, for example, fringe benefits, work environment, work conditions, job tasks, etc. The individual is seeking to find a job that provides a package of the factors that are particularly important to him based on his own tastes and preferences. Thus, in a process of job search, an individual is trying to approach some level of total compensation, consisting of pecuniary and non-pecuniary job benefits, that he has in mind as close as it is possible given both monetary and time constraints. At the stage of accepting a job offer the individual considers not only the increase of wealth, but rather the fact that he will become better off or worse off, choosing the one with higher expected level of well-being.

Total compensation, or full wage, as it is called in some literature sources (Atrostic, 1982), is defined as the sum of money wages and all non-pecuniary job components. While money wages are always observed at the stage of accepting a job offer, non-monetary components are often not known until the worker accepts the job and works there for some time.

There is empirical evidence from the reduced form analysis showing that non-wage job characteristics have significant effect on the job offer acceptance and important in the evaluation of well-being (Bartel, 1982; Gottschalk and Maloney, 1985; Dey and Flinn, 2005). The studies that analyze the individual's well-being on the job emphasize the importance of the accounting not only for the type of termination (voluntary or involuntary) from the previous job, but also the influence of non-pecuniary benefits, that varies across individuals, depending on worker's characteristics (for example, age and gender).

Bartel (1982) adds to the search and non-wage job characteristics literature by examining individual job mobility behavior. Considering fringe benefits, the author focuses on a set of non-pecuniary occupation specific job attributes that describe working conditions. The analysis considers the relative importance of non-wage job attributes for labor market outcomes of the individuals, controlling for age group. The research shows that 41% of the people in the sample, who reported that they were "better off" on a new job, actually had lower real wage rates, compared to their previous job. She finds

significant effects of non-wage benefits on the quit probability, which varies across age groups.

Using the findings of Bartel (1982), Gottschalk and Maloney (1985) evaluate the probability of being better off on a new job based on self reported well-being. The contribution is made by investigating the fact that for individuals who were notified of a layoff in advance, the choice of search strategy (unemployed versus on-the-job search) does affect the probability of finding a new job which is preferable to an old one. They used a simple extension of a matching model (with permanent layoffs), where self-reported relative well-being in the new job compared to the former job. Controlling for sample selection and using a bivariate probit model for the probability of being reemployed, conditioned on job separation, and the probability of being more satisfied with new job, they find that the probability of an increase in well-being is negatively (significantly) correlated with unemployment. The underlying conceptual model of search, which is used in this dissertation, builds upon the model of Gottschalk and Maloney (1985). The discussion of the conceptual framework will follow.

Traditionally, in the economic literature monetary wages are considered as one of the most important job outcomes, along with duration of unemployment spells. One of the first studies with well established structural model, Blau (1991), investigated the hypothesis that at work the individual considers not only the increase of wealth, but rather the fact that he is better off or worse off taking a particular job offer. The author argues that the individual makes the decision about a complete package of job characteristics, choosing the one that gives him a potentially higher level of utility. In his research, Blau includes hours of work together with wages in the utility function, as an example of such a package, assuming that the utility has the Cobb-Douglass functional form[10]. The author estimates two models: the Expected Utility Maximization (EUM) and the Expected Wealth Maximization (EWM). Comparing the estimation results obtained from those two types of models, he makes a conclusion that EWM model fails to predict the accepted offers. Blau finds that EWM model that takes into account only wage benefits, predicts that over 40% of job offers would be mistakenly rejected. Predictions of the EUM model, which accounts for non-wage attribute of the job, are more accurate. Moreover, estimating the model using utility function that contains both wages and hours of work, the author allows that the weights on wages and working hours are not equal, but assumes they are the same for all individuals,[11] and estimates them in both a structural dynamic and reduced form model, getting similar results. The findings of this work justify my assumption that not accounting for non-monetary components of the job, one might come to the wrong conclusion about individual's well-being on the job. The theoretical model of utility from the job that is used in this dissertation is based on Blau (1991).

Dey and Flinn (2005) analyses the effect of health insurance on utility and job matching. The authors directly test the "utility-augmenting effects" of health insurance in an employment match. They find that some workers tend to choose jobs which yield lower wages, but have higher quality health benefits. This provides evidence of that,

[10] Utility increases with wages and decreases with hours of work.

[11] The assumption that might be argued.

first, the individuals get positive utility from job characteristics other than wages, and, second, different job aspects that are highly valued by some individuals, might have much less impact on the utility of the others.

Utility from total compensation is not observed, but one could assume that it depends on some particular job characteristics, such as wage[12], job security, and some set of fringe benefits, opportunities for promotion, training and getting more education. It is reasonable to assume, that the combination of all those job characteristics will yield some positive amount of utility, but we can not assume that every individual gets the same amount of utility from a particular set of job characteristics (Clark, 1998; Clark, 2001; Frey and Stutzer, 2002). Further, there may be some trading-off between compensation components.[13] One might suppose that an individual with a particular set of characteristics would prefer higher salary accompanied with fewer fringe benefits to the lower salary with more broad set of benefits, or vice versa.

Utility represents preferences (rational and well informed) (Mongin, 2001). Individuals reveal their preferences by making choices. They choose the job which has higher total compensation, hence, utility. Individual's value of utility represents how much he values the whole package of job characteristics. Thus, for evaluation of the quality of match it is important to capture the value of utility from total compensation of the job, because, making a choice, the employee cares about the well-being, or satisfaction that he draws from a set of job characteristics. This dissertation proposes a measure for utility which represents self-evaluation of individual's well-being on the job. Self reported job satisfaction, as a measure of subjective well-being, can serve as proxies for utility (Frey and Stutzer, 2002). Each individual evaluates his subjective level of well-being regarding his expectations and relatively to other people. Also his past experience and current circumstances might influence evaluation of well-being. Well-being is usually represented in empirical data in the form of self-reported satisfaction with all sorts of things, situations and activities: satisfaction with life, job satisfaction, etc. This way, job satisfaction would serve as a measure of individual's well-being on the job, or match quality from employee's point of view.

In order to estimate the effect of job characteristics on the individual's utility, we need to obtain the "value" of the job characteristics, which is different for each individual and somewhat subjective, and can be measured using job satisfaction response data. Job satisfaction shows how satisfied the individual is with his job overall or, in case of multiple indicators of satisfaction, how satisfied he is with each characteristic peculiar to the job he currently is employed in. However, given how little has been done with this qualitative data, and the subjective nature of the response, it is important to explore the usefulness of these indicators of job utility.

While satisfaction concept (job satisfaction, life satisfaction, etc.) is very popular in the sociology and psychology literature as a measure of the overall well-being of an individual, it is rarely used by economists for several reasons. Main reason is that the Job Satisfaction variable is self reported. So, what exactly does it represent? Some economists express a concern that it would be highly correlated with the respondent's

[12] The individual might have a particular reservation value for wage, which often is not observed.

[13] Although good jobs will have higher compensation overall with more of each of the components, comparing within relatively homogenous jobs in quality (overall compensation level) we are likely to see those tradeoffs.

mood, or the current health status, or some other characteristics that are not observed. Though, nowadays more economists became supportive of the use of this self-reported variable, because it is has been found to predict future labor market behavior of the individuals well. They also emphasize the importance of job satisfaction as a part of social welfare and its usefulness in measuring job match quality. Such decisions as labor force participation and employment, turnover, job acceptance, work schedule, and work effort are all likely to depend in part upon the workers' job satisfaction, which represents their subjective evaluation of their job quality (Clark, 1998).

In the case when there is only one variable, usually called 'Overall Satisfaction with the Job', as an overall measure of the utility, what kind of information it contains? What does it depend on (correlated with)? How does it vary across heterogeneous individuals in ways that are observed and unobserved?

The concept of job satisfaction is often studied in connection with the determinants of labor market mobility, namely the probability of quitting: workers who are dissatisfied should be more likely to quit[14]. Economics literature also studies the factors which might influence job satisfaction. There are various aspects that are viewed as the determinants of job satisfaction: gender differences, age differences, occupational differences and other economic variables (Freeman 1978; Borjas, 1979; Bartel, 1981; Clark, 1998).

Freeman (1978) is one of the first examples of an attempt to bring the economists' attention to discovering the potential value of subjective Job Satisfaction as an economic variable. Freeman borrows a definition of job satisfaction from industrial psychologists. Accordingly to that definition, "job satisfaction is a positive emotional state resulting from the appraisal of one's job" (Locke, 1976). Based on that definition there is already a potential problem in interpreting responses of the individuals. By definition, the individuals estimate their own well-being relying not only on facts, but sometimes on their emotions and feelings about their current state and the ideas about the job. Each individual has in mind some hypothetical alternative (unobserved to the analyst), to which he compares his current job[15].

First, Freeman finds that subjective job satisfaction status is definitely a signal of evident employment status in the next period, since job satisfaction is a significant predictor of quits[16] with an effect which is at least as influential as that of monetary wages. He concludes that satisfaction is at least potentially useful as a variable for modeling employment behavior, since it contains important economic information. Second, after using Job satisfaction as a dependent variable to estimate the effect of several economic variables on job satisfaction and on the probability of quitting, author suggests

[14] That is under the assumption that it is possible to compare satisfaction across individuals.

[15] See, for example Belfield et al (2002), which focuses on the well educated subset of the workforce – resent UK college graduates. The research addresses differences in job satisfaction across education levels. They find that resent college graduates, as a peer group, form satisfaction levels relatively to each other, and in a matching framework examines the connection between job satisfaction and education quality, which raises peer group status and increases the job offer rate.

[16] Similar findings were reported in Akerlof, Rose and Yellen (1988) and McEvoy and Cascio (1985) on US samples, and by Clark, Georgellis and Sanfey (1998) using ten waves of German panel data.

that non-pecuniary factors must be taken into account, when modeling job-to-job mobility, and that further effort is required to measure and analyze those factors.

Trying to identify what kinds of individuals report to have "good jobs", Clark (1998) finds that overall, women and older workers do somewhat better than men and younger workers. Based on joint analysis of job values and job outcomes it is concluded that there is sorting process. Workers sort into jobs which are attractive from their point of view: for example, those who say that having higher wages is very important tend to be in jobs that pay well.

Following Freeman (1978) and continuing his research on job satisfaction, Clark (2001)[17] analyses job separation using cross-sectional job satisfaction responses to predict quits. The author finds that wages, hours of work and tenure are not the only important factors to consider, when studying mobility, but there are even more important job aspects, which are captured by the job satisfaction variables: job security and pay are shown to predict quit behavior most accurately. The same job characteristics were indicated by the individuals themselves when they were asked to name the most important job aspects. Analyzing the quit regression, the author comes to the conclusion that individuals tend to put different weights on different job characteristics, based on the personal characteristics: age, gender, part-time or full-time work schedule. Dissatisfaction[18] with the ability to use their initiative at work is the first reason to quit for both women and workers of less than 30 years of age. At the same time, the most important characteristics for older workers are pay and job security, and hours and promotion are the most important ones for part-time workers.

Clark (1998) uses job satisfaction to examine the notion of "good jobs", namely, What determines the worker's perception of a "good job"? He considers the relation between six self-reported job quality variables, such as pay, hours of work, future prospects (promotion and job security), how hard or difficult the job is, job content: interest, prestige and independence, and interpersonal relationships (with co-workers and with management), and self-reported job satisfaction. Since the regression analysis[19] shows strong correlation of overall job satisfaction with all of the job characteristics, author concludes that overall job satisfaction might serve as a summary measure of the whole set of job characteristics that are typically not observed. Also, the author suggests that , since there are multiple aspects of a good or satisfying job, concentration on pay and hours is not likely to result in a complete picture of where the good jobs are and of workers' behavior patterns.

Thus, job satisfaction is one of the key components to understanding the behavior of workers and its outcomes and there might be the whole set of job aspects, which determine job satisfaction. Moreover, job satisfaction varies with individual characteristics of workers (age, gender).

There are more studies that use the individual's well-being on the job as one of the factors that influence the transition from employment to unemployment and vice

[17] The first seven waves of the British Household Panel Survey (BHPS) were used for these purposes.

[18] Other research has found that job dissatisfaction is correlated with absenteeism (Clegg, 1983) and leads to loses in productivity (Mangione and Quinn, 1975)

[19] Clark (1998) uses European sample (twelve OECD countries)

versa. Being employed means not only having a relatively stable income source to satisfy individual's consumption needs, but also having a particular status in the society (Jahoda, 1988; Farzin et al, 2006). Thus, employment provides non-pecuniary benefits that are often underestimated by economists who study compensating wage differentials. The gain in those socio-psychological benefits, associated with having a job, is valued sometimes even higher than increase in income (see, for example, Winkelmann and Winkelmann, 1998). Farzin et al (2006) argues that labor supply model should include both pecuniary wages and non-pecuniary benefits, because they are shown to be substitute incentives in employment and labor supply decisions. This finding can be an explanation of the reason why people sometimes choose lower-paying jobs and postpone retirement declining financially attractive compensation, or even volunteer. Also, this finding gives more ground in favor of including non-pecuniary job attributes in the utility, the measure for which we establish in Chapter 2 of this dissertation.

1.2.2 Literature on job search, job search strategies, and job search methods

In the last few decades interest in the job search process has proliferated resulting in a vast literature on job search. The primary concern of the empirical job search work is the behavior of unemployed and employed individuals who are seeking the best employment opportunities. Devine and Kiefer (1991) review more than 500 empirical studies of the job search. Most of the empirical literature uses reduced-form models, but the estimation of structural models is also popular. McCall (1970), Kiefer and Neumann (1979), Flinn and Heckman (1982), Wolpin (1987), Stern (1989), and Eckstein and Wolpin (1990) are some well-known examples of job search studies in an equilibrium framework. More of them are reviewed in Van den Berg (1999). What follows is a review of the various literatures on job search strategies, and job search methods.

There is a body of literature which investigates the relative efficiency of employed versus unemployed search. These studies are based on the fact that job quitters make up a rather constant fraction of the newly unemployed, at least in the United States. This may be determined by the size of unemployment benefits. These studies examine offer and acceptance probabilities by employment state, acknowledging the existence of on-the-job-search.

There are studies, which note that the fact that some individuals voluntarily leave employment in order to become full time job searchers, suggest that search while unemployed and on-the-job search may be substitutes for each other (Holzer, 1987b; Blau and Robins, 1990; Belzil, 1996).

When an individual makes a decision to search for a job, he simultaneously makes a decision about the search strategy, and chooses a search method (or a set of methods) from all the possible (and available to him) alternatives. Also, he chooses the search intensity, which may be measured with the amount of time devoted to each search method, and number of methods used. The individual may choose to search for another (better) job while continuing to work or he may choose to become unemployed and search by quitting his current job[20].

Modeling the job search in terms of the long-run equilibrium theory Jovanovic (1979) and Miller (1984) found that voluntary employment - to - unemployment movements may also be explained in a job-matching framework, by incorporating uncertainty through a random wage process or unobservable job occupation-specific characteristics.

In a reduced form model Holzer (1987b) estimated offer and acceptance probabilities using a probit specification including various demographic and local labor market characteristics and using a sample of youth from the National Longitudinal

[20] Search is less of a choice for those who are involuntary unemployed but they represent another group of searchers.

Survey of Youth. He concludes that the unemployed search is more efficient than the employed. In contrast to Holzer (1987b), Blau and Robins (1990) found that the offer arrival rate per contact is higher for the employed searchers, when they estimated a reduced-form model which takes into consideration many components of the search process. These components include job search method used, the number of applications submitted to employers, and the job offer arrival rate. But their finding is inconclusive since it does not say to what extent unobserved heterogeneity of individuals in search effectiveness can explain these results.

In Belzil (1996), the author investigated the relative efficiency of unemployed versus employed search within the representative agent framework under the assumption that there exists heterogeneity in the search technology. He developed and estimated a job search model that incorporates such differences between employed and unemployed search, by varying the arrival of offers and the location of the wage offer distribution. His findings support those of Holzer (1987, b) for younger workers and, particularly, for those with low earnings, but as to mature workers, he found that employed search is significantly more effective than unemployed search.

Also, empirical work on job quitting finds that the probability of quitting is inversely related to current earnings, making unemployed less efficient in terms of match quality (measured with wages). Belzil (1993, 1995) perform a reduced form analysis of an empirical model of job-to-job transition with self-selectivity into search strategy.

Evidently, on-the-job search differs from the unemployed (full time) search in many ways. Therefore, it is necessary to account for job search strategy (on-the-job search or unemployed search), when comparing outcomes of the searches.

As it was noted before, disparities in job match quality might be explained not only by differences in characteristics of the individuals resulting in different preferences toward job characteristics, but also by the differences in choice of job strategies – on-the job search or unemployed search, and job search methods – technical and other resources, services and means that the job seeker employs to find a job. There is an assumption in the literature that different job search methods, combined with different search strategies, might yield different amount and quality of information, influence the costs of search and the offer generating process itself, and, as a result, impact the quality of job match (Autor, 2001; Freeman, 2002; Fountain, 2005).

There is a brunch of literature that focuses on the methods that unemployed and employed individuals use to find better jobs in a shorter time. For example, Holzer (1987a) and Holzer (1988) examine a search model which shows that search method choices should be related to their costs and expected productivities as well as to non-wage income and distributions of wage offers. The empirical evidence shows that the most frequently used search methods (i.e., contacting friends and relatives and direct applications without recommendation) are also the most productive in creating acceptable offers.

Included in the literature on job search methods, are the studies of the efficiency of private and public employment services to other search methods, and their role in a job finding process (Bortnick, 1992; Addison and Portugal, 2001; Osberg, 1993). Bortnick (1992) finds that in 1991 unemployed jobseekers most often contacted employers directly, but the higher probability of employment was observed

when individuals were registering with a private employment agency. Addison and Portugal (2001) finds the frequency of its use, the state employment agencies are appeared to have low effectiveness, and to lead to lower-paying, shorter-lasting jobs. Osberg (1993) uses longitudinal data, which indicates that job-search methods change with the business cycle and that many people find jobs without any reported search. The author emphasizes sample selectivity in the choice of job-search strategies (especially a concern among users of public employment agencies).

Along with public and private employment services and other traditional job search methods, some alternative methods of job search are widely used nowadays. The internet job search is becoming very popular among both employed and unemployed job seekers of different professions, ages and social groups.

At the end of the 20-th century, when the computer technologies and the internet has developed enough to become widely used, economists started studying the influence of these technologies on every form of behavior. There are many papers in contemporary economic literature that emphasize the role of technology and technological advance in the development of the world economy in general and the labor market in particular. As information and communication technologies (ICT or IT), and particularly the internet expand into the economic activity, one can observe that high skilled workers who are able to use the new technologies are highly demanded at the labor market. Autor (2001) and Freeman (2002) are examples of studies of the process that brings many transformations in the economy including changes in the job search process and discovering new possibilities for all labor market agents.

Freeman (2002) examines some of the impact of the information economy on the labor market. He also shows that the internet affects job recruitment and job search as well as help to widen the borders and match workers and jobs from different cities, states and countries.

Autor (2001) discusses the consequences of the opening of the "new communication channels" by means of the internet for worker-firm communications, taking into consideration natural heterogeneity of the workers and jobs and the quality of forecasting of their interaction. Three labor market features that may be altered: how worker-firm matches are made; how labor services are delivered; and how local markets shape labor demand. He discussed the role of the internet in reducing the information gap, which exists at the labor market, and shows the evidence of the improvement in matching efficiency.

The author expresses some concerns about the consequences of the internet job search prevalence such as a presence of adverse selection of job applicants and difficulties to match workers and jobs in the excess application "post-internet world" under the skill-specific technology. Autor (2001) suggests that the internet reduces informational asymmetries but the consequences of that are not clear and should be studied with newly available data. Thus, we test the theoretical hypothesis stated by Autor (2001): How the internet job search influences job match quality, which is properly measured, taking into account not only wages, but also non-wage job characteristics.

Among the small number of papers in economics that employ microeconomic data to study the effect of the internet on the behavior of job searchers there are two

papers by Kuhn and Skuterud. Their first paper, Kuhn and Skuterud (2000), examines the occurrence and frequency of internet job searches among U.S. workers. It accounts individual differences in race, gender, and other demographic characteristics, the location of the job search (from home, from work, or from other access points), and the relation between the internet search and traditional job search methods. The data used for the research comes from Current Population Survey (CPS): December 1998 and August 2000 CPS Computer and Internet Supplements, and subsequent basic CPS. They find that in 1998, 15 percent of unemployed jobseekers used the internet to search, as did half of all jobseekers with home internet access; internet search rates were higher than those of traditional methods (contacting private employment agencies, friends or relatives, and registering with unions or professional organizations). This study brings the closest attention to the phenomenon of the internet job search, which was never done before. It motivates to continue studying the effect of the internet use on the outcome of the job search.

Kuhn and Skuterud (2003) tried to answer the question: "Which types of persons looked for work online, and did it help these workers find new jobs faster?" using the same dataset as in the previous paper. In the data, internet searchers have observed characteristics that typically correspond to shorter unemployment durations, and they do get employed faster. Though, when observable characteristics are held constant the differences between internet searchers and non-internet searchers is eliminated. The authors conclude that either the internet job searching is ineffective in reducing unemployment durations, or the internet job searchers are negatively selected on unobservable characteristics. This study was a first attempt to look at the internet job search and its influence on labor market in terms of job search outcomes (declining unemployment durations). As well as economists, sociologists try to explain labor market outcome variations with the differences not only in individual characteristics, but also with differences in job search methods. For example, using the conceptual framework, borrowed from economics of information[21], and controlling for the employment status, Fountain (2005) investigates the effect of the internet job search on probability of finding a job in the short run and on job outcomes, measured by wages, using the same data as Kuhn and Skuterud (2003). The author comes to the conclusions: internet job search gives some advantage to the unemployed job searchers. This finding might be explained using information theory: while the cost of search for a job online is very low, compared to traditional methods, cost of screening information might exceed the costs of search using traditional methods.

In Chapter 3 of this dissertation we study the role the internet in the job finding process, investigating the effect of it on job match quality, measured with continuous utility index, constructed, using indicators of job satisfaction. We consider crossectional variations in match quality, using the retrospective information on past search method for those individuals who found their jobs and do not search anymore, controlling for observed heterogeneity and correcting for sample selection.

[21] See McCall (1970), Akerlof (1970), Spence (1973), Spence (1974), Stiglitz (1975)

1.3 Summary of contributions

It is acknowledged in the literature that economic factors (health insurance, pensions, etc.), as well as non-monetary benefits (promotion possibilities, job security, flexible hours, etc.), increase individual's utility and influence his behavior in the labor market. In empirical analysis an individual's reservation compensation is not typically observed, nor is their distribution of offers. We usually only observe an incomplete set of outcomes of the decision-making process, and indicators of the taste shifters and determinants of the reservation compensation. Thus, at the end of the job search process we observe a match between the employee and the job. Therefore, to address the main question of this dissertation, which is, From the employee's perspective, what differentiates good matches from bad matches? we identify the factors that determine employee's utility on the job.

The assumption is that good matches differ from bad matches by value of utility from the job, which in its part depends on the amount of total compensation. Thus, utility on the job is latent, but we observe total compensation and self-assessment of the individual on the job – his self-reported well-being on the job (job satisfaction overall as well as with individual components).

The individuals differ among themselves by their preferences, which depend on their characteristics (observable and unobservable). Different individuals value different things on the job: some prefer higher wages, some, like younger workers that just started their careers, value opportunities for promotion and opportunities to obtain more education, others, like middle-aged workers, are seeking stability and decent retirement plans, or, like women with children, care more about having flexible schedules (Clark, 1998). Hence, comparing two individuals that hold different compensation packages one might find that they have the same level of job satisfaction (same level of utility). So, from the employees' perspective, both matches can be considered good matches. The concept of job satisfaction is the key to understanding the job search and matching process. Job satisfaction in the data serves as an indicator of latent utility by representing what people value, when making a choice. Job satisfaction, as with any self-reported indicator of well-being, does not measure choices made, but rather the outcomes of those choices. Until recently, this type of subjective indicator was treated with skepticism and not widely used in the economics literature[22] because of concerns over non-random measurement error that might exist depending on the latent variable being measured. Recently economists are acknowledging the potential richness of this type of revealed preference. Because it is a self-assessment of well-being from the job, it may incorporate reservation compensation and preferences that are typically difficult, if not impossible, to

[22] See, for example, Freeman (1978) for discussion of use of job satisfaction variables.

observe in data. It can serve as a powerful predictor of various labor market outcomes and behaviors.

Previous literature validates the importance of this research question and motivates to further examine the influence of various non-wage job characteristics on the job match quality, which from the employee's point of view is assessed as his well-being on the job.

The purposes of this dissertation is to employ an alternative technique of data analysis to capture the role of job aspects in job satisfaction, which represents individual's well-being on the job, and serves as a measure of the utility from total compensation. It is an important indicator of quality of the outcome of job search and matching process. This dissertation constructs a continuous utility index that takes into account well-being of the individual regarding non-monetary characteristics of the job, as well as monetary ones, and estimates the effect of various job attributes, wages, and individual characteristics on the total value of utility from the job. Also, this dissertation investigates individual differences that determine the tendency to prefer some job characteristics to the others, leading to disparities in the job outcomes, namely utility from the job.

The hypothesis is that using just one component that is increasing in utility, like wage, may bias results given the unrealistic assumption that all individuals place equal weight on monetary wages in the utility function. We would underestimate well-being for those who make choices that are driven by other components of compensation, which might lead to inefficient reform policies. There are a number of important policy issues that can be addressed with a model that better captures heterogeneous preferences and well-being, such as the issue of persistent gender and race effects in wage determination models.

Using the sample of recent college graduates, coming from the Baccalaureate and Beyond 2000/01 survey, we examine cross-sectional variation in utility from the job, which accounts for both monetary and non-monetary components of the job, by individual characteristics[23]. We use factor analysis to explore the relations among seven categories of job satisfaction, available from the data. Based on those findings, the continuous index of utility from the job is constructed. Then we test it in the regression analysis, comparing this index to other measures of job match quality (monetary wages, dichotomous overall job satisfaction), and using it for other applications. For example, we investigate gender differences in utility from the job in comparison to gender wage gap. Also, we explore the role of information in match quality measured using the constructed index of utility from the job. We identify whether the internet job search that provides more information about jobs facilitates better matches (higher job match quality)[24].

[23] Such characteristics as gender, race, enrollment status, college major, occupation, and etc.

[24] See, for example Belfield et al (2002), which in a matching framework seeks to explain job satisfaction. The match here depends on reservation returns, given the information sets and job offer rates. The authors find little support for the hypothesis that job matching explains higher job satisfaction and that job satisfaction increases with the information set. The suggestion was that additional research should be done since there might have been a misspecification of the results due to the inappropriate modeling of job satisfaction.

As the existing literature reviewed shows, job search is an important process, leading to the job match of a certain quality, and the internet has had a substantial impact on quality of the job match. A few things have been done to better understand the effect of internet job searching on the duration of unemployment, but none of the economic studies explored the role of it in terms of other indicators of efficiency and welfare in the labor market. There may have been a structural shift in efficiency between employed and unemployed search with the expansion of the internet. Since the internet is less costly than almost all of the "traditional" job search methods, and also more accessible than most of them, it is reasonable to expect that more and more people will use it; and not only those who are searching for a job full time. Therefore, this dissertation studies the effect of these peculiarities of internet searches on the outcomes of the job search process, such as utility from the job, wages, and job satisfaction of employed workers, who were using the internet to look for their current job.

Using the findings of the previous literature, such as the model from the literature on job search, this dissertation fills the gaps in the existing economic literature on measuring job match quality and in the literature on the role of job search methods in predicting job match quality. Combining together the two sets of literature – literature on job search and matching, and literature on job search methods and information – this dissertation contributes to the literature that studies match quality. The main contribution of this dissertation is to redefine latent utility taking into account the multidimensionality of job satisfaction by constructing an indicator that is consistently defined across all respondents. It considers the role of both, non-monetary and monetary, components of the job in individual's utility on the job, measured by job satisfaction, while identifying the role of advances in information technology in the job match quality, including up-to-date job search methods, such as the internet job search. It examines cross-sectional variations in match quality as a result of the use of the internet job search. We employ retrospective information on job search methods used prior to finding the current job, controlling for observed heterogeneity and correcting for sample selection. Access to a unique restricted dataset allows us to do that.

1.4 Conceptual framework

The purpose of this dissertation is to find a measure of job match quality and study the influence of internet job searches on the quality of job matches among U.S. workers. To fulfill this purpose, a conceptual framework is considered. It builds upon a four step search model of Gottschalk and Maloney (1995), but includes a possibility of outcomes of search to vary depending on search methods used by individuals.

The model examines the expected result of search using four possible steps (or states) toward changing jobs (or finding a job). First, the person decides to change job (or start search for a job while unemployed). Second, the employed person, who decides to change a job, chooses to quit the job at which he is currently employed and search full time, or stay employed and search. Third, when the job seeker (employed or unemployed) receives a job offer, each time he compares the offered package of job characteristics with his reservation package and decides either to accept it or to continue to search until a better offer comes his way. Fourth, the individual evaluates the job, after he worked on it for some time and became familiar with all the job aspects, and able to give an assessment of job quality.

At baseline, when the employed or unemployed person decides to search for a job, he or she chooses the methods of search. Those methods could be either traditional or non-traditional, or some combination of those. By non-traditional methods here we mean internet use for searching. Traditional methods include using ads in newspapers, contacting potential employers, sending out resumes, contacting public or private employment agencies or friends and relatives, and all other non-internet related methods

Gottschalk and Maloney (1995) were interested in the impact of the type of job termination on the probability of finding a better job based on self-reported data about relative well-being. My hypothesis tests whether a search strategy that involves use of the internet yields better matches. The assumption is that the internet facilitates job search through improving information, available through many online job search resources. Therefore, internet job searchers might face more options to choose from resulting in better matches.

Taking into account the complexity of the job search process, this dissertation analyses the outcomes of the dynamics of the search process in a simple static model.

1.4.1 The model of utility

In a simple static model, consumers get utility (U) from "good jobs" (Π).

$$U = f(\Pi) \tag{1.1}$$

The model adopts the approach of Blau (1991) that incorporates non-wage job characteristics in this model. Individuals are heterogeneous in their preferences about those characteristics. Each individual is seeking to maximize his utility by accepting a job offer only if the expected utility from the total compensation package is greater than his reservation utility[25]. Different individuals put different weights on monetary and non-monetary components of the job in the utility function. The functional form for utility proposed by Blau (1991) is the Cobb-Douglas utility function:

$$U = W^{1-\alpha} V^{\alpha} \tag{1.2}$$

where U is per-period utility when employed at earnings of W and some combination of non-wage benefits, V, per period. It is assumed that potential employers offer workers the package of total compensation on a job consisting of wages and non-monetary benefits. A worker accepts only the offer that will give him utility from the total compensation package which is greater or equal to his reservation utility level.

The parameter α represents the weight which an individual puts on each component of the utility function: wages, W, and non-wage benefits, V, which can be broken down into availability of health insurance, job security, job training, and educational opportunities.

Suppose also that the parameter α is a function of individual characteristics

$$\alpha = f(H, M, K, V^S, G) \tag{1.3}$$

where H is health status, M is marital status, K is the number of dependent children, V^S represent benefits of the spouse, and G is gender. In other words, α varies by individual characteristics that drive preferences for pecuniary versus non-pecuniary compensation.

We expect that those in poorer health, married or with kids will have a higher weight, α, if the benefits include health insurance or job security. We expect that gender of the individual and the presence of spousal health insurance will greatly influence the value of α. We conjecture that men and women might have different expectations about a job's total compensation.

[25] We assume additive separability of individual's lifetime utility, so that utility from the job adds to it.

Adopting a human capital approach, we suppose that "good jobs" or job quality could be produced by individuals and can be represented by a production function as follows:

$$\Pi = g(SE \mid E, G, SK) \tag{1.4}$$

where E is ability (education), G is gender[26], SK is skills and SE is search effort (intensity and time of search), assuming that E, G, SK are all exogenously predetermined at the time of the search. At the time of the search outcome that we care about, these decisions have already been made. In other words, we model search effort and the outcome of the search (utility achieved) given investments made toward these ends.

The job seeker chooses his optimal search intensity (how many search methods to use) and how much time to spend searching based on his budget and time constraints. The budget constraint is as follows:

$$T_w \cdot W + I_U + (A - L) - P \cdot X = T_S \cdot C_S \tag{1.5}$$

where a sum of earnings, $T_w \cdot W$, unearned income, I_U, assets, A, liabilities, L minus spending on consumption goods, $P \cdot X$, equals total job search cost, $T_S \cdot C_S$.

The time constraint is defined as:

$$\Omega = T_w + T_S + T \tag{1.6}$$

where total time of an individual, Ω, is spent on work, T_w, job search, T_S, and leisure and consumption of other goods, T.

The greater the unearned income, the more time can be spent on the search, the greater the search cost could be. The greater the sum of the liabilities, the less time should be spent searching.

Each consumer maximizes utility, choosing search effort, subject to the budget constraint, production constraint, and time constraint based on their preferences. We assume utility is increasing at a decreasing rate over both arguments, W and V. Across homogenous jobs (in quality) usually wages decrease as non-wage benefits increase. In other words, jobs of equal total compensation for a given type of employee might vary in quantities of W and V, and α determines the magnitude of the influence of both W and V on utility[27]. Comparing W and V across heterogeneous jobs is not useful, since W and V will look like complements rather than demonstrate tradeoffs. For this reason we must control for type of job options given personal attributes. The production function determines offer arrival properties.

Considering the production constraint, equation (1.4), we impose that the offer arrival will be positively correlated with predetermined variables, such as E and SK, but the influence of the variable G on production of the job is ambiguous, as well as the

[26] The gender wage gap is the reason why we believe, that G variable is one of the variables in the production function.

[27] The assumption is that those consumers, who are more concerned about non-wage benefits (those with higher α), might benefit from the internet job search.

influence of the variable SE on production. The testable hypothesis of interest is the relationship between Π and *SE*. One would assume that the effect of SE on production is positive, and the internet job search improves the offer set and outcomes.

Now, let us consider the main choice considered in this work over search intensity and time, and the role of the job search methods (online or traditional) used in that choice. Each job seeker chooses his search intensity and time devoted to search. There are time and monetary costs to the alternative choices one makes, which are expressed in the standard budget and time constraint: the higher the cost, the lower the demand for that choice.

The internet search has changed the choice set (both time and intensity of search). Accordingly to the budget constraint, the more resources the searcher has, the longer search period he can afford. The internet job search potentially decreases the amount of resources needed for a particular period of search.

Assuming that the internet search reduces time of search, the use of the internet search affects costs of search negatively: use of the internet job search decreases total cost of search[28]. Under this assumption, the internet job search should affect the production of jobs (and ultimately utility) in two ways. First, the internet job search expands the information set and number of jobs in the distribution. Second, the internet job search increases probability of finding a job, which matches the individual's criteria (we call it reservation compensation), so the influence of the internet search is positive on both, wages and non-wage characteristics. The effect of the internet job search on utility is also positive, since the internet has indirect impact on utility by revealing to an individual his place in a job distribution that was previously unobserved. Also, people's well-being (satisfaction) on the job is relative to the alternative. The internet directly impacts well-being (satisfaction) by revealing alternatives.

Since wages are more predictable (by searcher) than non-wage benefits, for the people, who put more weight on non-wage benefits than on wages, the internet search has more utility to gain.

In the regression analyses, those weights could be controlled via observed variables, for example, the variables which represent gender, age, college major. College major is correlated with preferences and therefore an indicator of the weight, as opposed to gender which is an exogenous factor.

In this dissertation worker's total compensation on the job is the outcome of the job search. Utility will be maximized when the best job is found. Utility is measured over monetary and non-monetary components of compensation, so the level achieved in total compensation determines the individual's utility. It is assumed that agents are rational and choose the best job as defined by the conceptual framework proposed above. So the total compensation is the observed optimal outcome of the search.

It is our hypothesis that the level of utility achieved is a direct consequence of the search intensity which is also a choice. Both, the search intensity and resulting compensation outcome, are the consequence of the individual attributes that define

[28] We need to allow for heterogeneity in access to the internet, which will determine cost of the internet use because of varying skills. Assuming that the job searchers choose the search methods based on its availability (which depends, among other things, on the ability (or skills) of the individual to use this particular job search method) and its costs, we can say that there is potential heterogeneity in choosing internet search.

individual constraints. This translates into an econometric specification, where we model the outcome, *U(W,V)*, against the search choice, after controlling for relevant observed and unobserved heterogeneity.

The focus of this research is to examine the role of the internet on various job search outcomes. Matches are the outcomes of the choices made during the search process. The theoretical framework defines the assumptions behind the model, and we derive testable hypotheses regarding the outcomes of the search, controlling for heterogeneous preferences, as well as production, time and budget constraint. First, we can say that there are theoretical reasons to believe that not only wages, but also non-monetary characteristics are important for a worker to make a decision about accepting a job offer, and, second, the internet job search influences individual's utility. Therefore, the next step is to construct a model which takes into account all the factors and to test it empirically.

This dissertation uses data from the Baccalaureate and Beyond Longitudinal Study that contains extensive information on job outcomes, search methods, and individual characteristics. In the analysis of the quality of a job match from the employee's perspective[29], we use responses to detailed questions about the job search process, as well as outcomes that include response about job satisfaction over seven aspects of the job.

The chapters of this dissertation that follow use the theoretical model represented above. Chapter 2 of this dissertation is dedicated to the construction of the utility index and testing it. Utility index constructed in Chapter 2 is used in Chapter 3 for the purposes of the empirical test of the hypothesis that the internet job search influences utility outcomes of workers.

[29] We allow for heterogeneous preferences that result in heterogeneous weights on components of the utility function.

1.5 Data

The data used in this dissertation come from the 2000/01 Baccalaureate and Beyond Longitudinal Study (B&B:2000/01). B&B:2000/01 follows a cohort of students who were identified as recipients of a bachelor's degree during the 1999–2000 academic year, and focuses on all types of baccalaureate degree holders, providing information of interest regarding higher education in the United States. The B&B:2000/01 survey was sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES). It surveys a nationally representative sample of 10,028 college graduates who completed a bachelor's degree between July 1, 1999, and June 30, 2000. Base year data were collected during the 1999–2000 cycle of the National Postsecondary Student Aid Study (NPSAS) data collection. NPSAS:2000, the base year collection for B&B:2000/01, was a comprehensive, nationwide study designed to determine how students and their families pay for postsecondary education and to provide demographic information on the postsecondary student population in the United States. The survey focused on time to degree completion, participation in post-baccalaureate education and employment, and the activities of newly qualified teachers . NPSAS has been conducted since 1987 at 3- and 4-year intervals. However, B&B:2000/01, the first and only planned follow-up survey of this cohort, was conducted in 2001, and there will be no further follow-up with the B&B:2000/01 cohort (Bradburn *et. al*., 2003).

1.5.1 Descriptive statistics of the whole sample

Table 1.1 provides some overall summary statistics for the sample of B&B:2000/01 including demographic characteristics, employment, earnings, and college major distribution. The sample of B&B:2000/01 is a sample of college graduates, 62 percent of 1999–2000 of whom were women[30]. The bachelor's degree recipients came from diverse racial and ethnic backgrounds. About three-quarters were white; 8 percent were black or African American; and 6 percent were Asian. About half of the students, who completed a bachelor's degree in 1999–2000 did so by age 22[31]. However, 10 percent were older than age 35. A majority of them are in the labor force (93%) and working (88%), holding mostly full time job (84% out of all employed). Only 23% of recent college graduates are continuing their education. There is a lot of job searching in the sample with much of it coming from on-the-job-searching (22% of employed searched for a job).

[30] Statistics in Table 1.1 are unweighted. Women are oversamled in this dataset.

[31] This statistic is from Bradburn *et. al*. (2003), which uses weighted sample.

Table 1.1 Descriptive statistics for full sample of B&B:2000/01.

Variable	Observations	Mean*		Min	Max
Age	10028	25.30	(6.95)	18	74
Age>35 (%)	10028	0.10	(0.30)	0	1
Male	10028	0.38	(0.49)	0	1
Married	10028	0.31	(0.46)	0	1
Children (any)	9625	0.19	(0.39)	0	1
Race: Indian	10028	0.01	(0.10)	0	1
- Asian	10028	0.05	(0.21)	0	1
- black	10028	0.08	(0.27)	0	1
- island	10028	0.01	(0.08)	0	1
- other	10028	0.05	(0.22)	0	1
- white	10028	0.82	(0.38)	0	1
Military	9424	0.01	(0.09)	0	1
Self employed	9538	0.03	(0.17)	0	1
Labor Force	9989	0.93	(0.25)	0	1
Laid off	9989	0.01	(0.10)	0	1
Employed	9989	0.88	(0.33)	0	1
Unemployed	9989	0.04	(0.21)	0	1
Full time job	8417	0.84	(0.37)	0	1
Weekly hours of work	10028	34.21	(18.34)	0	80
Search for new job (employed)	9636	0.22	(0.42)	0	1
Annual earnings	7982	31563.97	(21226.55)	100	500000
Earn more than $30,000 a year	8680	0.45	(0.50)	0	1
Continuing education (post BA)	9974	0.23	(0.42)	0	1
post BA full time	9974	0.15	(0.36)	0	1
Current job is a career start	8343	0.72	(0.45)	0	1
Current job is non-major-related	8435	0.22	(0.41)	0	1
GPA (while in college)	9883	3.19	(0.49)	0	4.00

* Standard deviations are in parenthesis

1.5.2 Sampling

The employed participants of the B&B:2000/01, who are not looking for a job and not self-employed, were asked about the strategy of their previous job search. The employed and unemployed participants of the B&B:2000/01, who are at the moment looking for a job, were asked about their current job search strategy. The outcomes of search, such as monetary wages and non-wage benefits, are only available for those individuals who are currently employed (but not self-employed), and self-assessed satisfaction with wages, benefits and various job characteristics are only available for those who are employed (but not self-employed) and report no further job search.

For the purposes of the analysis of the outcomes of the employment behavior, we restrict my sample to the labor force participants that are younger than 36 years old[32] and are not self-employed.

[32] Individuals older 35 years old might show patterns of behavior toward job search and valuation of job satisfaction different from those of younger individuals. See, for example, Borjas (1979), Clark (1998), Clark (2001)

1.5.3 Descriptive statistics of the selected sample

The demographic characteristics for the restricted sample are represented in the Table 1.2, while Table 1.3 represents sample statistics on employment and earnings[33]. College graduates in the sub-sample were on average were 23 years old, 61 percent of them were women, 28 percent were married. Vast majority of the college graduates were employed (94%), some of them were searching for new jobs while employed (24%). College graduates on average were earning 30,7 thousand dollars a year.

[33] College major, occupation, and industry distribution are reported in the Appendix.

Table 1.2 Summary statistics for sample of labor force participants: demographics

Variable	Observations	Mean*		Min	Max
Age	8175	23.29	(3.04)	18	35
Male	8175	0.39	(0.49)	0	1
Married	8175	0.28	(0.45)	0	1
Children (any)	7861	0.13	(0.34)	0	1
Race Indian	8175	0.01	(0.09)	0	1
- Asian	8175	0.05	(0.21)	0	1
- black	8175	0.08	(0.26)	0	1
- island	8175	0.01	(0.09)	0	1
- other	8175	0.05	(0.22)	0	1
- white	8175	0.82	(0.38)	0	1

* Standard deviations are in parenthesis

Table 1.3 Summary statistics for sample of labor force participants: earnings, employment

Variable	Observations	Mean*		Min	Max
Laid off	8141	0.01	(0.10)	0	1
Employed	8141	0.94	(0.24)	0	1
Unemployed	8141	0.05	(0.22)	0	1
Search for new job (employed)	7864	0.24	(0.43)	0	1
Full time job	7833	0.79	(0.41)	0	1
Current Job is a career start	7273	0.73	(0.44)	0	1
Weekly hours of work	8175	36.64	(16.38)	0	80
Annual earnings	7042	30705	(19552.29)	100	500000
Earn more than $30,000 a year	7065	0.48	(0.50)	0	1
Continuing education (post BA)	8132	0.20	(0.40)	0	1
post BA full time	8132	0.13	(0.33)	0	1
GPA (while in college)	8056	3.16	(0.479)	0	4.00
Current job is non-major-related	7356	0.22	(0.41)	0	1

* Standard deviations are in parenthesis

2 Quality of the Job Match: It's Not All about Money

2.1 Introduction

The purpose of this chapter is to analyze the factors that influence individual's well-being on the job and to find a criterion to evaluate the quality of a job match in the utility framework.

This dissertation studies a particular component of individual utility– utility from the job. Along with income, which was used as a proxy for individual utility in most economic analyses, representing individual well-being or happiness[34], nowadays subjective life satisfaction plays that role more often. The debate on use of subjective indicators of happiness has proliferated in last decades in economic literature.

Economists contribute large amount of empirical analysis to happiness study. In the economic literature happiness is studied in terms of influence of various monetary and non-monetary factors on individual's well-being in general. Extensive happiness research is surveyed in Kahneman *et al.*, (1999), and Frey and Stutzer (2000). The variable that is considered to represent happiness in the empirical research is self-reported satisfaction.

The studies of individual well-being find that non-financial variables are important for determining of self-reported satisfaction or happiness. Frey and Stutzer (2002) studies the relations between happiness and utility and argues that self-reported well-being can serve as a measure of individual utility.

Economic studies of utility usually viewed from two positions: objective and subjective. "Objectivists" are concerned with observability issue and use conventional belief that utility is cardinal, depends on the amount of individual consumption only, and therefore interpersonal comparison of individual well-being is impossible (Hicks and Allen, 1934). There is also quickly developing literature on non-objectivist analysis of utility in economics. This literature examines utility that depends across individuals and considers emotions, goal completion and status. Accordingly to that approach, individuals evaluate their level of well-being regarding their expectations, relatively to other people, and accounting for their past experience and current circumstances.

[34] Discussing individual well-being, economists often use terms happiness, utility, life satisfaction, well-being and welfare interchangeably (Frey and Stutzer, 2000; Frey and Stutzer, 2002; Easterlin, 2003).

Economists consider subjective and objective studies of utility being two complementary approaches that coexist.

Frey and Stutzer (2002) is one of the examples of such subjective approach to individual utility. It notes that subjective well-being that is used to measure happiness (or individual's subjective utility) is a broader concept than any other utility measure. Since people want to be happy and it is their ultimate goal, demand for happiness is not derived demand. Though, individuals value things differently, and therefore have their own set of things that make them happy, subjective well-being might be captured through direct questions when individuals are asked how satisfied (happy) they are with their lives. This way the analysis based only on individual's observed choices may be incomplete. This self reported variable in the survey serves as an indicator of utility in the analysis of individual's behavior. Often, the goal of such analysis is to determine what aspects of people's lives make them happy.

Frey and Stutzer (2000) discusses the factors that influence individual's well-being. Important factors that for decades have been studied by psychologists are personality type and demographic characteristics of the individual, including age gender, education, and family setting[35]. Also, economic factors such as belonging to particular income group, employment status together with unemployment rate and inflation influence individual well-being in various ways. For example, wealthier individuals often report higher life satisfaction than their poorer counterparts, but over time increase in income does not influence national well-being, when comparison across nations is made. Unemployment and inflation are directly correlated with unhappiness mostly due to non-pecuniary stress associated with person being unemployed or living in the unstable economic environment (Clark and Oswald, 1994; Oswald, 1997; Winkelmann and Winkelmann, 1998). Even political conditions in the society have some impact on individual happiness (Frey and Stutzer, 2000).

This way, based on the literature on measurement of individual well-being, which validates further use of subjective responses, we have established that there are many factors that global life satisfaction depends on, and that individuals give an assessment of their well-being based on a many factors besides their monetary conditions (Easterlin, 2003). Individuals compare their self-assessed well-being to their own well-being in the past, the well-being of friends, relatives, and other reference groups. Also, there might be some adaptation to various life events that might influence the assessment of individual's happiness in the short run differently than in the long run.

Trying to establish the connection of various life events and individual happiness, Easterlin (Easterlin, 2003) considers the issue of relative importance of each attribute in the individual happiness function. He emphasizes interdependence of preferences among individuals. Accounting for the fact that individuals assess their well-being under the influence of various circumstances and life events and relatively to each other, it would be helpful to establish the weights that individual put on each component in their utility function and find some groups for which those weights are common[36]. Though, due to

[35] Frey and Stutzer, 2000 surveys the findings from the previous literature on determinants of happiness.

[36] There is a possibility that a one only response may be sensitive to exogenous shocks that affect overall "happiness" and consequently the satisfaction response, e.g. two people with identical preferences and job attributes might have different response if one experiences a death in a family. We assume such unobserved

complexity of the notion of happiness and its assessment it is virtually impossible to find any justifiable thresholds that are observed directly and determine comparison groups[37]. One possibility would be comparing the well-being within percentiles of monetary income or by income groups (Easterlin 1974, 1995), the other possibility is to compare by gender, education level or by other demographic category, also by college major, industry or occupation. The neighborhood effect might be captured through postal zip codes. Ideally those weights should be obtained accounting for all those factors.

Similarly to overall utility, individual utility on the job has several components, some of them can be monetized, and some of them are non-monetary. Clark (2001) suggests that job satisfaction would serve as a measure for utility from the job. It uses overall job satisfaction to predict quits, controlling for wages and hours of work. Clark obtains a summary measure of "job quality" or utility at work, looking at the relations among eight categories of job satisfaction on different aspects of the job, such as promotion, pay, relations with management, job security, use of initiative, the work itself, and hours worked. He concludes that dissatisfaction with pay and job security are the most significant quit predictors, and that different demographic groups do not value job aspects equally.

The purpose of this dissertation is to evaluate the influence of various factors on the well-being of the individual on the job, such as demographic characteristics (gender, race), and preceding job search behavior. Therefore we need to obtain a continuous index of utility that is consistently defined across all respondents. To accomplish this goal, this chapter constructs the measure of the individual's well-being that accounts for all the information that is contained in individual's responses about various aspects of job satisfaction in the data.

Viewing utility from the job in the latent variable framework, this chapter finds an index, which would predict the relation between latent utility and job characteristics. Assuming that individual draws utility on the job from all monetary and non-monetary job attributes, we expect to find at least two components of utility from the job – pecuniary and non-pecuniary.

The data is used for the analysis comes from B&B:2000/01. It is a cross-section of recent college graduates that report back one year after they were surveyed during their graduation year. Except demographic, socio-economic characteristics the respondents were asked eight questions on job satisfaction: pay, fringe benefits importance and challenge of work, opportunities for promotion and advancement, opportunities to use training and education, job security, opportunities for further training and education, and, finally, overall satisfaction with the job. The approach is to use all the information that is

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shocks are not correlated with our internet job search indicator, so that estimated effects are not biased. Other factors that drive preferences and relative responses - reference groups - are taste-shifters we control for like gender.

[37] There is another procedure, called cluster analysis (Aldenderfer and Roger, 1984), which is directed to uncover the underlying structure of the variables, but it is more often used to group the cases rather than variables. The purpose of cluster analysis (or segmentation analysis, or taxonomy analysis) is to identify a set of homogeneous subgroups of cases in a population, the way that within-group variation is minimized and between-group variation maximized. Cluster analysis would be an appropriate procedure to analyze the patterns of behavior among groups of individuals, though it requires a valid assumption on hoe those groups are made. Without having particular comparison groups clustering procedure is impossible to perform.

contained in these indicators of job satisfaction, because having only the binary Overall Job Satisfaction variable might be not enough to capture utility (well-being) from the job. Instead, we use factor analysis to identify latent components of utility from seven correlated binary indicators of job satisfaction to construct an index for utility from the job.

There are two types of factor analysis: exploratory factor analysis and confirmatory factor analysis. First, we perform exploratory factor analysis to uncover the latent structure in the relations among the job satisfaction indicators that are available in the data. At this point, we seek to identify the number of unique common factors across seven indicators. We expect that exploratory factor analysis results in finding several (at least two) common factors that are combining the effects of several corresponding variables. Based on my findings from the exploratory factor analysis, we make an assumption about the exact number of components entering the individual's utility function. Second, we perform confirmatory factor analysis, imposing the restriction about the number of the factors and their structure, in order to obtain components of utility from total compensation.

Thus, we employ factor analysis to study the patterns of relationship among seven indicators of job satisfaction to uncover the structure of unmeasured directly independent variables. As a result of factor analysis we answer such questions as How many factors are needed to explain the pattern of relationships among these seven variables? What is the nature of those factors? How well do the hypothesized factors explain the observed data? How much purely random or unique variance does each observed variable include?

Further, based on the assumptions of the theoretical model about the functional form of the individual's utility from the job and the findings of factor analysis, we construct an index of utility from the job and use it in the multivariate regression analysis. We compare the effect of various demographic variables on various measures of utility from the job: monetary wages, binary Overall Job Satisfaction and the utility index that we construct in this chapter.

2.2 Indicators of job match quality in the data

The purpose of this chapter is to construct a measure of the individual's utility, using data on employee's job outcomes. Along with demographic, employment characteristics, college majors, industry, occupation, and information about job search the B&B:2000/01 contains extensive set of qualitative and quantitative measures of job outcomes[38]. The B&B:2000/01 survey is unique in the sense that it has information on a substantial set of job characteristics as well as individual preferences over those characteristics[39]. Thus, there is data not only on monetary wages, non-wage benefits, but also job satisfaction over seven aspects of the job (including pay, benefits, and many others), and overall job satisfaction.

Respondents who are working were asked about various characteristics of their current job. All of the currently employed college graduates were posed a question regarding whether they are satisfied with some particular characteristics and benefits their job has:

- Pay
- Fringe benefits
- Importance and challenge of work
- Opportunities for promotion and advancement
- Opportunities to use training and education
- Job security
- Opportunities for further training and education
- Overall satisfaction with the job.

Table 2.1 presents the summary statistics on these job satisfaction variables.

A majority of currently employed college graduates (86 percent) were satisfied with their job overall. However, 35 percent of respondents were unsatisfied with their wages, the same number of respondents wished to have better opportunity for career growth and promotion, 18 percent wished their current job was more challenging. Also, 27 percent were dissatisfied with fringe benefits, which should include health insurance, pensions, paid time off, etc.

[38] See Chapter 1 for the data description and the discussion of sampling issues.

[39] Self reported evaluations of satisfaction on each of seven job characteristic and separately on overall job satisfaction are represented in binary format (Yes or No) responses.

Table 2.1 Job Satisfaction (1/0)

Variable	Observations	Mean*	
Pay	7328	0.66	(0.48)
Fringe benefits	7278	0.73	(0.45)
Importance and challenge of work	7322	0.82	(0.38)
Opportunities for promotion and advancement	7257	0.67	(0.47)
Opportunities to use training and education	7317	0.80	(0.40)
Opportunities for further training and education	7303	0.78	(0.41)
Job security	7304	0.86	(0.35)
Overall satisfaction with the job	7319	0.86	(0.35)
Satisfaction Index	7347	5.27	(1.85)

* Standard deviations are in parenthesis

2.3 Constructing a utility index

While it is believed that these measures of satisfaction contain valuable information about individual's preferences, it is not clear how reliable the responses are in terms of consistency of reporting behavior across heterogeneous respondents. In other words, what do they measure, and how do they overlap? The purpose of this section is to answer these questions as well as to pool the information contained in these seven overlapping indicators to get a (possibly smaller) set of relevant indicators of utility.

As we established earlier, self-reported job satisfaction might serve as a proxy for utility from total compensation. Table 2.2 presents correlations among all available indicators of job satisfaction[40], to assess overlap. It is encouraging that the Overall Job Satisfaction variable is highly correlated with all the indicators of the satisfaction. As Table 2.2 shows, the highest correlation is between the Overall Job Satisfaction variable and the variable Challenge (the correlation coefficient is 0.82). This fact acts in favor of the conjecture that not only monetary component is important in the process of forming of job satisfaction (the correlation coefficient on variable Pay is 0.67).

Since job satisfaction is a subjective measure that is not observed directly, we treat it as latent variable. There are seven binary variables in the data, which measure job satisfaction on seven different categories and come from individuals' responses. Thus, firstly we explore the nature of these measures, which are self-reported variables and it is assumed that they contain some measurement error. We perform factor analysis to analyze the relations between seven indicators of job satisfaction and identify latent factors that are connected to individual's utility from the job. It will allow us to construct a continuous index of utility from the job and the test of it will follow.

The primary goal of factor analysis is to explain the covariances or correlations between several observed variables which serve as indicators of few latent variables (factors). Factor analysis belongs to the multiple general linear hypothesis (MLGH) family of procedures (Bollen, 1989). Many of its assumptions are the same as in multiple regression models. As a result of factor analysis a table is generated. The rows of this table are the observed raw indicator variables and the columns are the factors. Factors (latent variables) explain as much of the variance in these indicator variables as possible. The cells in this table are called factor loadings that show, which variables are most heavily loaded on given factors. The factor labeling process involves some subjectivity,

[40] Since all the variables are binary, tetrachoric correlations are calculated and presented in Table 2.2. tetrachoric correlations assume a latent bivariate normal distribution (x_1, x_2) for each pair of variables y_1, y_2, with a threshold model for the manifest variables, y_i if and only if $x_i>0$. The means and variances of the latent variables are not identified, but the correlation of x_1, x_2 can be estimated from the joint distribution of y_1, y_2. These are called the tetrachoric correlation coefficients (Drasgow., 1988).

as well as how many factors to retain[41]. Principal components analysis (PCA) and principal axis factoring (PAF) (or common factor analysis) are types of factor analysis that are most widely used for exploratory factor analysis. For confirmatory factor analysis in structural equation modeling option PAF is preferred (Velicer and Jackson, 1990). Exploratory factor analysis is widely used as a data reduction technique, where as confirmatory factor analysis allows to impose some restriction about the relations among the variables (factor loadings, correlation matrix) as well as about the number of factors.

[41] To determine the number of the retained factors, the Cattell scree test (Cattell, 1966) was used. The scatterplot of the factors is obtained such a way that factors are plotted as the X axis and the corresponding eigenvalues as the Y axis. The eigenvalues drop, as we move from first factor to the next. When the drop ceases and the curve makes an elbow toward less steep decline, all further components after the one starting the elbow are dropped (see Figure A1 in the Appendix). Some authors suggest that reasonable criteria for how many factors to retain, is to look at the eigenvalues, and drop all the factors with eigenvalues of less then some arbitrary number, that might range from 1 (or close to 1), which used mostly for principal components, to 0.4 or 0.3 (Kaiser rule) (Velicer and Jackson, 1990). In my analysis those rules give same results.

Table 2.2 Correlation matrix*

Variable	Overall Satisfaction	Satisfaction with Pay	Benefits	Challenge	Promotion	Use education	Get more education	Job security
Overall Satisfaction	1	-	-	-	-	-	-	-
Satisfaction with Pay	0.67	1	-	-	-	-	-	-
Benefits	0.57	0.47	1	-	-	-	-	-
Challenge	0.82	0.41	0.35	1	-	-	-	-
Opportunity of promotion	0.78	0.48	0.47	0.65	1	-	-	-
Opportunity to use education	0.76	0.33	0.44	0.72	0.66	1	-	-
Opportunity to get more education	0.75	0.32	0.47	0.65	0.67	0.87	1	-
Job security	0.62	0.35	0.50	0.47	0.48	0.52	0.57	1

*Tetrachoric correlations, number of observations is 7117.

2.3.1 Exploratory factor analysis

Using several different techniques of exploratory factor analysis it is possible to distinguish several factors which combine together two or more job satisfaction variables each[42].

Table 2.3 reports eigenvalues from exploratory factor analysis. Table 2.4 reports factor loadings. The cutoffs are somewhat arbitrary: we look for are significant loadings and the change in eigenvalues between factors. Using a cutoff value of eigenvalue equal to 0.3, we learn that there are two significant factors. Based on the loadings the first factor combines components from the seven tied to non-pecuniary job attributes, which are also correlated with pecuniary ones and factor 2 represents only pecuniary job attributes.

We also perform a graphical method first proposed by Cattell (1966). We plot the eigenvalues shown in the Table 2.3 in a simple line plot. We find the place where the smooth decrease of eigenvalues appears to level off to the right of the plot. Cattell suggests that to the right of this point there is only "factorial scree". According to this criterion we drop those factors to the right of that point and we retain two factors. This way, using two distinct approaches, we obtain same results: two factors are retained.

Analyzing the results from exploratory factor analysis, we can conclude following. There are all the indicators of job satisfaction might be grouped in two groups. The way they are combined, we can name the factors: “Non-pecuniary” factor and “Pecuniary factor”, where the first factor explains most part of the common variance[43]. Thus, Non-pecuniary factor which, we believe, represents corresponding component of the utility is at least as important as Pecuniary one. This way, the data seem to fit the priors that there are two key components in the utility function over job attributes, since several methods of exploratory factor analysis show that there are two significant factors. In the next section we restrict the number of factors to two and set the correlation matrix to have zero correlations between some indicators, so that there are two mutually exclusive latent factors: pecuniary and non-pecuniary.

[42] Factor analysis explains common variance among the variables (not the total variance, as principal component analysis).

[43] The results from various methods of factor analysis (iterated principal factor, maximum-likelihood factor) are presented in the Appendix (Table A1).

Table 2.3. Eigenvalues for Exploratory Factor Analysis

Factor	Eigenvalue
Factor 1	3.74
Factor 2	0.41
Factor 3	0.14
Factor 4	-0.04
Factor 5	-0.07
Factor 6	-0.13
Factor 7	-0.19

Table 2.4.Factor loadings for Exploratory Factor Analysis

Variable	Factor1 (Non-monetary+ Monetary)	Factor2 (Monetary only)
Satisfaction with		
Pay	0.51	0.36
Benefits	0.59	0.33
Challenge	0.76	-0.10
Opportunity for promotion	0.78	0.06
Opportunity to use education	0.87	-0.28
Opportunity to get more education	0.87	-0.23
Job security	0.64	0.14

2.3.2 Confirmatory factor analysis

After exploring the correlations among observed variables and performing exploratory analysis we found that there are two latent factors (the components of utility from the job, $\xi_i's$), which are measured with the indicator variables (seven measures of job satisfaction, $x_i's$)[44].

Seven observed variables, $x's$, measure job satisfaction on seven categories: pay, benefits, job security, challenge at work, promotion opportunity, opportunity to get more education, opportunity to use education obtained earlier. They measure latent factors, ξ's, with error δ. Suppose, there are two latent factors: ξ_1, ξ_2. Each indicator has the component, $\Lambda_x \xi$, and measurement error δ:

$$x = \Lambda_x \xi + \delta \tag{2.1}$$

$E(\delta) = 0, \quad E(\xi\delta') = 0$, all the variables in x and ξ are written in deviations from their means.

With seven indicators and two factors the model is as follows:

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \end{bmatrix} = \begin{bmatrix} \lambda_{11} & \lambda_{12} \\ \lambda_{21} & \lambda_{22} \\ \lambda_{31} & \lambda_{32} \\ \lambda_{41} & \lambda_{42} \\ \lambda_{51} & \lambda_{52} \\ \lambda_{61} & \lambda_{62} \\ \lambda_{71} & \lambda_{72} \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \end{bmatrix} \tag{2.2}$$

$COV(\xi_i, \delta_j) = 0$, for all i and j, $E(\delta_j) = 0$, for all j, $COV(\delta_i, \delta_j) = 0$ for all $i \neq j$.

Factor loadings ($\lambda_{ij}'s$) indicate which variable "loads" on which factor (direct effect of the *j*-th factor on the *i*-th observed variable).

[44] For confirmatory factor analysis we use technique of Bollen (1989) borrowing notation.

I impose several restrictions about the structure of the relationship between each latent factor and its measure to perform confirmatory factor analysis. Equation (2.3) shows that in this model utility depends on two latent factors, which are described as "pecuniary" (the factor, that captures the monetary aspects of utility) and "non-pecuniary" (the factor, that captures non-monetary aspects of utility).

$$\begin{aligned} U &= f(Pecuniary\ factor,\ Non-pecuniary\ factor) \\ U &= f(\xi_1, \xi_2) \end{aligned} \tag{2.3}$$

To make those two factors uncorrelated, we impose the restriction that factor loadings are equal zero for the "pecuniary" indicators that are assumed not to represent "non-pecuniary" factor and vice versa, namely $\lambda_{12} = \lambda_{22} = \lambda_{31} = \lambda_{41} = \lambda_{51} = \lambda_{61} = \lambda_{71} = 0$. First two indicators x_1 and x_2 load on ξ_1, and five others x_3 to x_7 load on ξ_2. Thus, the model for confirmatory factor analysis is represented by system of equations (2.4):

$$\begin{aligned} x_1 &= \lambda_{11} \cdot \xi_1 + \delta_1 \\ x_2 &= \lambda_{21} \cdot \xi_1 + \delta_2 \\ x_3 &= \lambda_{32} \cdot \xi_2 + \delta_3 \\ x_4 &= \lambda_{42} \cdot \xi_2 + \delta_4 \\ x_5 &= \lambda_{52} \cdot \xi_2 + \delta_5 \\ x_6 &= \lambda_{62} \cdot \xi_2 + \delta_6 \\ x_7 &= \lambda_{72} \cdot \xi_2 + \delta_7 \end{aligned} \tag{2.4}$$

where ξ_1, first latent factor, is measured by two indicators x_1 and x_2 (satisfaction with pay and benefits), and ξ_2, second latent factor, is measured by five indicators x_3, x_4, x_5, x_6 and x_7 (satisfaction with challenge at work, promotion opportunity, opportunity to get more education, use education, and job security). Path diagram, which represents the imposed restrictions, is presented by Figure 2.1 It shows the causal relations among observable and latent variables and the error terms. Table 2.5 contains the list of the variables in the model for confirmatory factor analysis and their properties.

The model can be estimated with confirmatory factor analysis.

$$\begin{aligned} \Sigma(\theta) &= E(xx') \\ &= E[(\Lambda_x \xi + \delta)(\xi' \Lambda'_x + \delta')] \\ &= \Lambda_x E(\xi\xi') \Lambda'_x + \Theta_\delta \\ &= \Lambda_x \Phi \Lambda'_x + \Theta_\delta \end{aligned} \tag{2.5}$$

Φ is the covariance matrix of the latent factors ξ, and Θ_δ is the covariance matrix of errors of measurement δ.

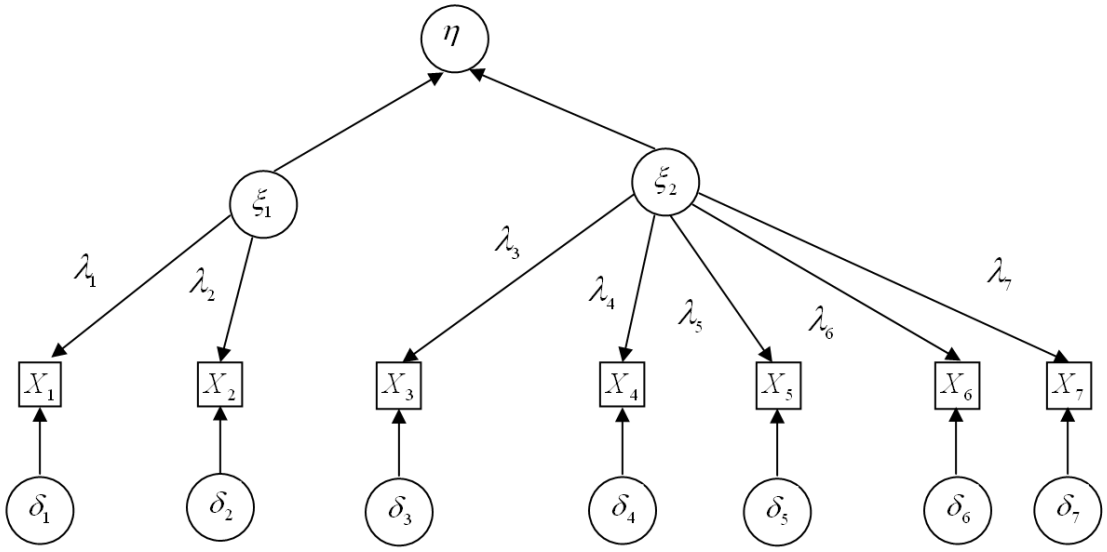

Figure 2.1. Path Diagram

Table 2.5. Variables in the model

Notation	Observable/ Unobservable variable	Nature	Name of variable
ξ	unobservable	latent factor	Well-being
X	observable	indicator, measure of latent factor	Satisfaction on seven categories (1/0)
δ	-	error of measurement	-
λ	-	factor "loading"	-
η	unobservable	latent factor	Utility from total compensation

Next step would be to estimate factor loadings Λ_x.

$$\Lambda_x = \begin{bmatrix} \lambda_{11} & 0 \\ \lambda_{21} & 0 \\ 0 & \lambda_{32} \\ 0 & \lambda_{42} \\ 0 & \lambda_{52} \\ 0 & \lambda_{62} \\ 0 & \lambda_{72} \end{bmatrix}. \tag{2.6}$$

I estimate factor loadings for the restricted factor analysis. We modify the matrix of tetrachoric correlations from Table 2.2 (dropping Overall Job Satisfaction variable) to impose the restrictions we define above. Using method of principal factors, we obtain two factors: non-monetary factor and monetary factor. Each of them combines five and two categories of job satisfaction respectively. The eigenvalues and factor loadings for confirmatory factor analysis are represented in Table 2.6 and Table 2.7.

As a result of factor analysis we get two factors that summarize the influence of the seven indicators on the latent utility. The way our seven indicators of job satisfaction are grouped during exploratory factor analysis testifies in supports our prior assumptions that there are pecuniary and non-pecuniary component of our latent variable. Based on the results from confirmatory factor analysis and using two predicted factors, we construct the continuous index of the utility from total compensation and then test it in the multivariate regression[45].

[45] In this research we do not explore the issue of weights that individuals put on monetary and non-monetary components of utility. This will be included in future work. Instead we will use factors to construct utility index and use it as dependent variable to look at the effect of individual characteristics on utility from the job.

Table 2.6. Eigenvalues for Confirmatory Factor Analysis

Factor	Eigenvalue
Factor 1	3.16
Factor 2	0.68
Factor 3	0.07
Factor 4	0.01
Factor 5	-0.08
Factor 6	-0.13
Factor 7	-0.25

Table 2.7.Factor Loadings for Confirmatory Factor Analysis

Variable	Factor1 (Non-monetary)	Factor2 (Monetary)
Satisfaction with		
Pay	0	0.58
Benefits	0	0.58
Challenge	0.77	0
Opportunity for promotion	0.75	0
Opportunity to use education	0.91	0
Opportunity to get more education	0.90	0
Job security	0.60	0

2.4 Measurement Error model

Using factor analysis we obtained two factors to serve as measures of each component of the utility function defined in equation (2.3) (W and V). It provides some information on how in general individuals weight the two components of the compensation that we call pecuniary and non-pecuniary[46]. In exploratory factor analysis we allow the data to define the attributes of the job that belong in the utility function - and they are two attributes, which combined give us overall utility from the job, which we seek to measure. In confirmatory factor analysis, we construct indicators of the same thing, except that we impose he restriction on what belongs in the utility function based on equation (2.3), and construct components of utility into pecuniary (W) and non-pecuniary (V) and calculate the value of utility from each of them.

To construct an index of utility from the job, which is the purpose of this section, we need to find a way to combine them. One of the possibilities is to add the two components together. That would assume an additively separable function of utility from the job, which is not justified. The other approach is to impose a functional form, like Cobb-Douglas, and multiply them. But there is more information to strengthen our index.

We can refer to an indicator of overall utility. There are two of them in the data. The one that has been used in much of the literature, wages, which virtually assumes that the weight α is zero and then also assumes utility increases in wages for all individuals equally. The other indicator is the one that is less used and perhaps subject to more noise or subjectivity, and that is the response to the question about one's overall satisfaction with the job. In this section we construct the standard measurement error model, where we use wages and overall satisfaction as indicators of utility from the job. As instruments of unobserved components of utility we use the factors constructed from the factor analysis models.

The first step, we construct new variable for each type of factor analyses, which is a product of two factors. After that we analyze whether it might serve as a proper utility index. For that purposes we obtain some correlation patterns, reported in Table 2.8, and descriptive statistics, reported in Table 2.9 for whole sample, and in Table 2.10 by gender, race and performance while in college [47].

Table 2.9 describes the job satisfaction for whole sample. Factors obtained from both types of factor analysis are distributed around zero. The variables constructed from combining the factors together ("utility index") are very similar for both types of factor analysis. They range approximately between 3 and 13. Therefore, for my future analysis we use the index of utility, constructed using factors from confirmatory factor analysis.

[46] Assuming that all individual weight them the same way.

[47] Descriptive statistics relatively to Overall Satisfaction and relatively to wages are reported in Appendix.

Table 2.10 shows that there is some variation in wages. It is mostly observed in comparison of earnings of men and women that supports the existing theory about gender wage gap. Also, there is a difference in Overall job satisfaction in favor of men. Our index that was constructed based on the assumption of Cobb-Douglas utility function behaves the same way as overall satisfaction. Analyzing racial difference, we noted that there is no gap in wages between Blacks and non-Blacks, but there is substantial difference in Overall job satisfaction and in utility index. As to marital status, singles are on average earning less and they are less satisfied with their job and get less of utility. Comparing the groups with difference performance while in college, one can note that those with higher college GPA are on average earning less, but their well-being at work, represented by Overall satisfaction or by utility index (based on seven characteristics of job satisfaction) is higher.

Table 2.8. Correlation among constructed factors, indicator of Overall Satisfaction, constructed utility index and wages

	Overall Satisfaction	EFA Cobb-Douglas utility	EFA Non-pecuniary factor	EFA Pecuniary factor	CFA Cobb-Douglas utility	CFA Non-pecuniary	CFA Pecuniary	Log of Annual Earnings
Overall Satisfaction	1.00	-	-	-	-	-	-	-
EFA Cobb-Douglas utility index	0.52	1.00	-	-	-	-	-	-
EFA Non-pecuniary factor	0.62	0.75	1.00	-	-	-	-	-
EFA Pecuniary factor	-0.02	0.49	-0.20	1.00	-	-	-	-
CFA Cobb-Douglas utility index	0.58	0.87	0.94	0.03	1.00	-	-	-
CFA Non-pecuniary factor	0.59	0.60	0.98	-0.39	0.85	1.00	-	-
CFA Pecuniary factor	0.40	0.86	0.55	0.56	0.77	0.36	1.00	-
Log of Annual Earnings	0.09	0.26	0.22	0.09	0.25	0.18	0.23	1.00

Table 2.9. Descriptive statistics of new variables, obtained from factor analyses (whole sample)

Variable	Mean	Standard deviation	Min	Max
Exploratory FA:				
Non-Pecuniary factor	0.00	0.80	-2.21	0.66
Pecuniary factor	0.00	0.78	-2.19	2.27
Cobb-Douglas (EFA)* utility index	8.89	3.01	1.81	13.42
Confirmatory FA:				
Non- Pecuniary factor	0.00	0.83	-2.10	0.57
Pecuniary factor	0.00	0.64	-1.20	0.53
Cobb-Douglas (CFA)* utility index	9.20	3.46	1.61	12.62
Number of observations	7117	-	-	-

Note: * since factors might have negative value, they are normalized by adding 3

Table 2.10. Mean values of indicators of well-being

Variable	Male	Female	Married	Single	Non-black	Black	GPA>3	GPA=<3
Log of annual earnings	10.30	10.10	10.25	10.15	10.18	10.18	10.15	10.21
Overall satisfaction	0.87	0.85	0.89	0.85	0.86	0.78	0.87	0.84
Exploratory factor analysis:								
Non-pecuniary	0.04	-0.02	0.08	-0.03	0.01	-0.11	0.02	-0.03
Pecuniary	0.07	-0.04	-0.01	0.01	0.02	-0.22	0.00	0.00
Cobb-Douglas utility index	9.2	8.68	9.12	8.79	8.96	8.01	8.94	8.79
Confirmatory factor analysis:								
Non-pecuniary	0.02	-0.01	0.09	-0.04	0	-0.05	0.01	-0.02
Pecuniary	0.07	-0.04	0.02	-0.01	0.02	-0.21	0.02	-0.03
Cobb-Douglas utility index	9.47	9.02	9.51	9.07	9.25	8.5	9.28	9.05
Number of observations	2889	4430	2083	5236	538	6579	2659	4660

Note: * since factors might have negative value, they are normalized by adding 3

2.5 The regression analysis of the disparities in well-being in the samples

In this section of the dissertation we perform some sensitivity analysis and test the constructed utility index as a measure of match quality. We use the constructed utility index in the regression, controlling for wages and benefits and correcting for sample selection. We compare results using alternative definitions of utility, including the traditional wage outcome and the dichotomous overall job satisfaction response.

Since we only observe utility for those who work we need to control for selection into employment status. We will follow Heckman (1979) on two step selection model, which will be discussed in the next section.

2.5.1 Empirical model and estimation issues

Testing the constructed utility index we have to deal with the fact that the sample for which we observe the information on job compensation (wages, benefits and job satisfaction) is a non-random sample. This information is only available for those individuals who are currently employed and is missing for unemployed labor force participants[48]. This introduces the possibility of selection bias, since unobservable factors that affect selection may be correlated with unobservable factors that affect the probability that the person's reservation utility is met, and the offer is accepted. We use two step model, following Heckman (1979), to control for selection bias.

Consider Heckman's two equation model for control for selection bias on a random sample of *I* observations. Main equation, which represents utility from the job obtained by each working individual, is as follows:

$$U_i = X_{1i}\alpha_1 + u_{1i} \tag{2.7}$$

Selection equation represents hours each individual devotes to work in a certain equal period of time[49]:

$$H_i = X_{2i}\alpha_2 + u_{2i},$$

$$E(u_{1i}) = E(u_{2i}) = 0 \qquad E(u_{ji}u_{j'i'}) = \sigma_{jj'} \quad i = i' \qquad = 0 \quad i \neq i' \tag{2.8}$$

Obviously, data are missing on H_i for unemployed job searchers.

The population regression is $E[U_i \mid X_{1i}] = X_{1i}\alpha_1$, which cannot be estimated as OLS, because the observations are missing accordingly to some sample selection rule (SSR). Namely, there are no observations for the individuals with zero working hours.

The regression for the nonrandom sub-sample of available data is:

$$E[U_i \mid X_{1i}, SSR] = X_{1i}\alpha_1 + E[u_{1i} \mid SSR] \tag{2.9}$$

Data available on U_i if $H_i > 0$, for the employed individual, but if $H_i = 0$, U_i is not observed (individual is unemployed). Since u_{1i} and u_{2i} are not independent, selected sample regression depends on both, $X_{1i}\alpha_1$ and $X_{2i}\alpha_2$:

[48] Section 4 of Chapter 1 of this dissertation talks about the sampling issues.

[49] See Heckman (1979)

$$E[U_i \mid X_{1i}, H_i > 0] = X_{1i}\alpha_1 + E[u_{1i} \mid u_{2i} > -X_{2i}\alpha_2] \tag{2.10}$$

Then,

$$U_i = E[U_i \mid X_{1i}, H_i > 0] + \upsilon_{1i} = X_{1i}\alpha_1 + \frac{\sigma_{12}}{(\sigma_{22})^{1/2}}\lambda_i + \upsilon_{1i} \tag{2.11}$$

where λ_i is the inverse Mill's ratio[50].

The results from several specifications of Heckman selection model are reported in Table 2.11, Table 2.12 and Table 2.13 – wage regression, probit regression[51] of Overall satisfaction and, finally, regression of utility index respectively.

[50] $\lambda_i = \frac{\phi(Z_i)}{1-\Phi(Z_i)} = \frac{\phi(Z_i)}{\Phi(-Z_i)}$, where the $\phi(Z_i)$ and $\Phi(Z_i)$ are, respectively, density and distribution function for a standard normal variable, and $Z_i = -\frac{X_i\alpha_2}{(\sigma_{22})^{1/2}}$.

[51] See, for example, Heckman (1978) for the techniques of estimating Heckman probit regressions.

2.6 Results

In the factor analysis, we construct alternative indices of overall utility using the seven indicators of job satisfaction and then we perform some sensitivity analysis. The summary of the findings is that there are two major factors that influence an individual's utility on the job: a pecuniary one, which accounts for wages, health insurance, pension and other monetary benefits, and a non-pecuniary one, which accounts for challenge at work, opportunity for promotion, growth and education, and job security[52].

As we saw in Table 2.8, the overall job satisfaction indicator is strongly correlated with both factors with the non-pecuniary factor having at least as much weight in predicting overall job satisfaction. Based on these findings we conclude that an appropriate measure of utility from one's job should include both kinds of compensation.

We construct a utility index that accounts for that finding and uses the assumptions of the theoretical model regarding the functional form of utility from the job.

This utility index is constructed using the factors obtained from confirmatory factor analysis[53], based on the assumption of Cobb-Douglas utility function, with two inputs: monetary benefits and non-monetary benefits of the job, and is used in the model to assess differences in utility from work by gender. Also, for comparison we use alternative measures of individual's well-being on the job, including the traditional wage outcome and the overall job satisfaction response. The results from multivariate analysis, comparing three measures of match quality: dichotomous Overall Job Satisfaction, Log of annual earnings, and constructed index of the Utility from the job, are reported in Table 2.11, Table 2.12, and Table 2.13 respectively[54].

[52] By accounts for we mean they appear to be more correlated, or are loaded by these variables more strongly.

[53] Since the results from both models with different specifications of utility index (EFA or CFA) are similar. We present only the ones from CFA Cobb-Douglas utility.

[54] Since all three outcome variable exist conditionally on the fact that an individual is employed, we perform the correction for sample selection, using Heckman selection model, as it said earlier. The complete description of the results in represented in the Appendix (Tables A2-A4).

2.6.1 Description of the results

We investigate the gender effect on overall job satisfaction (represented by the self-reported binary variable) in a probit model controlling for sample selection[55] and compare it to results from regression of annual earnings (also controlling for sample selection). Table 2.11 and Table 2.12 report the estimation results from the probit (with marginal effects) and wage regression. We find that being a female has a negative effect on overall job satisfaction, but the magnitude of the difference by gender is much lower than the gender wage gap[56]. A gap in wages persists and does translate into slightly lower overall well-being from work for women, but the consequence on utility is smaller. This suggests that some of the gender differences in wages might be explained by the fact that there are differences in weights, which individuals put on components of job compensation from the job, by gender. Non-pecuniary factor and Pecuniary factor show robust effects on Overall Job Satisfaction, because they are not collinear, whereas coefficient on Log wage is very sensitive to model specifications. It is less predictive of well-being, measured by Overall Job Satisfaction, when controlled for other components of utility. The negative coefficients that we observe on Log wage and on Medical insurance, when controlling for Non-pecuniary and Pecuniary factors, might be explained by the fact that Pecuniary factor captures all the information on wages and monetary benefits and what is left, indicates that higher paying jobs are more demanding and stressful and that decrease well-being.

Comparing models 3and 4 to 5 and 6, we note that positive effect of Non-pecuniary factor from EFA is greater that that of CFA Non-pecuniary factor, and that CFA factors are closer in magnitude to each other, but still CFA Non-pecuniary factor has stronger positive effect on Overall Job Satisfaction than Pecuniary one. That difference in magnitudes might be explained by how the factors were constructed, and larger values of the coefficients on Non-monetary factors do not contradict our findings from analysis of correlations among indicators of job satisfaction. There we found that among seven job satisfaction variables, Overall Job Satisfaction is most highly correlated with Challenge.

Continuing the investigation of the gender differences in the well-being on the job, we perform multivariate analysis of utility from the job. Table 2.13 represents the results from the regressions of the continuous utility index, controlled for sample selection.

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[55] The choice of the variables that belong in the selection equation (selection into employment status) is based on correlation matrices, represented in the Appendix. The variable that represents past employment behavior of the individual (Employed while was enrolled in college) is correlated with current employment status of the individual and not correlated with his outcome variable (job satisfaction, earnings, utility index).

[56] After controlling for college major, we observe about 11% of gender wage gap (see Appendix).

The significance of the negative effect of gender in this model is stronger than in case of overall satisfaction, however the magnitude of the effect is small (0.40 difference out of a scale from 4 to about 13), which translates into 4% of gender differences in utility from the job (on average) compared to 2% of a gender gap in job satisfaction and 14% in earnings (raw means). Since the utility index accounts for pecuniary and non-pecuniary characteristics it tells us that on average females have lower satisfaction on all job components. But the magnitude of the effect is not very large[57].

As we expected, utility depends not only on wages, but also on fringe benefits, such as health and life insurance, retirement benefits, subsidies or other factors, such as the fact that the job is a start of individual's career (which might reflect that job is challenging and there are opportunities for growth), or the fact that the job is part time (which has something to do with more flexible hours) since coefficient on Log Earnings is statistically significant, but not particularly large (0.25), compared to coefficients on other job attributes (benefits). The fact that the job is non-major-related is negatively correlated with individual's utility and it does not contradict our priors, because such job would require more learning and less opportunities, at least at the beginning of the career, which is relevant, since our sample consists of recent college graduates.

Just comparing two traditional measures of well-being (earnings and job satisfaction) on the job we can conclude that earnings and job satisfaction are accounting for different things that are not always correlated, otherwise the result would be identical. Therefore we cannot reject the hypothesis that there is more than one factor that influences individual's well-being on the job[58], and that without capturing these other factors we misrepresent the quality of job match and any model of how the supply side of the market behaves. Overall satisfaction represents self-assessment of the individual's utility from the job he chose. Women may have lower wages, but their assessment of job satisfaction depends on something else, for example job security or health insurance or flexible schedule. The binary overall satisfaction variable is limited in measuring degree of satisfaction, but it signals that job satisfaction, if properly captured, may serve as a better measure of utility on the job than wages. One of the ways is to use a utility index, constructed, combining all the job components and validity of which we tested in this chapter of the dissertation.

This way, using this index of utility we are able to re-examine differences in overall well-being by gender, race and other individual attributes to see if this might explain part of the pay differentials we observe. In other words, these subgroups may place a different (lower) weight on pecuniary attributes of job and therefore have lower

[57] We tested the assumption about just having one comprehensive factor (obtained from EFA) that represents utility from the job. The results show that retirement benefits, employee's legal counseling, and medical insurance are most important job attributes that influence utility, if it is represented by single factor. The other fringe benefits and wages are also positively and significantly influence utility. The gender gap is in favor of males, the coefficient is -0.05 (here value of dependent ranges 0.79 to 3.66 and its mean value is 3, using adjusted value of factor). It translates in 1.7% of gender gap. For the results see Appendix.

[58] See, for example, Ward et al. (2000) and Belfield et al (2002), for the analysis of gender differences in job satisfaction on a sample of 900 academics from five Scottish Universities. The analysis had not shown wide variation in job satisfaction by gender, but finds that academics value non-pecuniary components of job more than pecuniary ones compared to other sectors of the workforce, which might be explained by the fact that female and male workers in academia most probably will have the same expectations about the job.

reservation wages in exchange for greater benefits, flexibility, or other job attributes. There reservation compensation is likely to be equivalent. This does not address the issues of discrimination and equal work for equal pay, but rather just what might be going on in terms of choices people make and how satisfied they are with those choices.

Table 2.11. Probit regression of Overall satisfaction with correction for sample selection (coefficients and marginal effects)

Variable	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^
					Use factors from Exploratory FA				Use factors from Confirmatory FA			
	1		2		3		4		5		6	
Non-pecuniary factor	-		-		1.45	0.18 (0.038)***	1.46	0.18 (0.022)***	0.98	0.11 (0.015)***	0.86	0.13 (0.014)***
Pecuniary factor	-		-		0.41	0.05 (0.011)***	0.47	0.06 (0.008)***	0.83	0.09 (0.013)***	0.84	0.12 (0.013)***
Log of Annual Earnings	0.16	0.03 (0.006)***	-0.00	-0.00 (0.010)	-0.27	-0.03 (0.008)***	-0.07	-0.01 (0.007)	-0.24	-0.03 (0.006)***	-0.06	-0.01 (0.008)
Age	-		-0.04	-0.01 (0.003)**	-		-0.02	-0.00 (0.002)	-		-0.03	-0.00 (0.002)
Female	-		-0.12	-0.03 (0.011)**	-		-0.13	-0.01 (0.007)*	-		-0.11	-0.02 (0.009)
Married	-		0.15	0.04 (0.012)**	-		0.11	0.01 (0.009)	-		0.15	0.02 (0.010)*
GPA while in college	-		0.15	0.04 (0.012)***	-		0.07	0.01 (0.008)	-		0.06	0.01 (0.009)
Race: white	-		0.25	0.07 (0.016)***	-		0.13	0.02 (0.011)	-		0.18	0.03 (0.013)*
Weekly hours of work	-		-0.00	-0.00 (0.001)	-		-0.01	-0.00 (0.000)	-		-0.00	-0.00 (0.001)
Current job is part time	-		0.18	0.05 (0.021)*	-		0.11	0.01 (0.014)	-		0.16	0.02 (0.017)
Current job is a career start	-		0.68	0.18 (0.013)***	-		0.44	0.05 (0.010)***	-		0.46	0.07 (0.011)***
Current job is non-major-related	-		-0.22	-0.06 (0.012)***	-		-0.02	-0.00 (0.009)	-		0.03	0.01 (0.010)
Age*Childcare subsidy	-		0.04	0.01 (0.005)*	-		0.10	0.01 (0.004)**	-		0.09	0.01 (0.005)**
Age*Dental, Optical HI	-		0.03	0.01 (0.004)*	-		0.04	0.01 (0.003)*	-		0.04	0.01 (0.003)
Medical Insurance	-		-0.04	-0.01 (0.021)	-		-0.21	-0.03 (0.015)	-		-0.17	-0.03 (0.017)
Dental, Optical, other HI	-		-0.60	-0.16 (0.086)	-		-0.98	-0.12 (0.062)	-		-0.87	-0.13 (0.071)
Life Insurance	-		0.04	0.01 (0.015)	-		-0.13	-0.02 (0.011)	-		-0.13	-0.02 (0.012)
Retirement Benefits	-		0.03	0.01 (0.016)	-		-0.14	-0.02 (0.012)	-		-0.10	-0.02 (0.014)
Stock Option	-		0.08	0.02 (0.013)	-		0.08	0.01 (0.009)	-		0.08	0.01 (0.011)
Spending Account	-		0.10	0.03 (0.013)*	-		-0.04	-0.00 (0.009)	-		-0.03	-0.00 (0.011)
Employee Discount	-		-0.07	-0.02 (0.011)	-		-0.14	-0.02 (0.008)*	-		-0.11	-0.02 (0.009)
Childcare Subsidies	-		-0.90	-0.24 (0.119)*	-		-2.29	-0.28 (0.100)**	-		-2.11	-0.31 (0.113)**
Transit Subsidies	-		0.03	0.01 (0.015)	-		-0.10	-0.01 (0.011)	-		-0.10	-0.02 (0.012)
Fitness Subsidies	-		0.11	0.03 (0.013)*	-		0.01	0.00 (0.009)	-		0.02	0.00 (0.011)
Employee Counseling (Legal)	-		0.12	0.03 (0.012)**	-		-0.06	-0.01 (0.009)	-		-0.05	-0.01 (0.010)
Constant	-0.53	(0.304)	0.49	(0.462)	-1.35	(0.435)**	-2.86	(0.724)***	-1.34	(0.470)**	-2.63	(0.689)***

^ standard errors are in parenthesis; *p<0.05; **p<0. 01; *** p<0.001;

Table 2.11. Probit regression of Overall satisfaction with correction for sample selection (coefficients and marginal effects) (Continued)

Variable	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^	Coeff.	dy/dx^
					Use factors from Exploratory FA				Use factors from Confirmatory FA			
	1		2		3		4		5		6	
Selection												
Female	-0.03	(0.052)	-0.02	(0.053)	0.00	(0.053)	-0.01	(0.054)	-0.01	(0.055)	-0.01	(0.054)
Age	-0.01	(0.009)	-0.01	(0.009)	-0.01	(0.009)	-0.01	(0.009)	-0.01	(0.009)	-0.01	(0.009)
Married	0.17	(0.062)**	0.18	(0.063)**	0.14	(0.064)*	0.17	(0.063)**	0.15	(0.063)*	0.17	(0.063)**
Children	0.33	(0.148)*	0.41	(0.140)**	0.35	(0.149)*	0.39	(0.148)**	0.35	(0.150)*	0.38	(0.147)**
White	0.15	(0.063)*	0.13	(0.064)*	0.12	(0.068)	0.15	(0.065)*	0.14	(0.066)*	0.15	(0.064)*
GPA while in college	0.14	(0.052)**	0.14	(0.053)**	0.10	(0.054)	0.11	(0.053)*	0.12	(0.052)*	0.11	(0.053)*
Female*Children	-0.23	(0.169)	-0.34	(0.158)*	-0.29	(0.168)	-0.31	(0.169)	-0.27	(0.174)	-0.31	(0.167)
Employed While Enrolled	0.21	(0.057)***	0.21	(0.054)***	0.23	(0.057)***	0.25	(0.058)***	0.23	(0.058)***	0.24	(0.058)***
Student Loan	-0.02	(0.054)	0.02	(0.051)	0.01	(0.055)	0.02	(0.056)	0.00	(0.056)	0.01	(0.055)
Post BA Full time	-0.18	(0.068)**	-0.30	(0.061)***	-0.28	(0.075)***	-0.24	(0.068)***	-0.24	(0.077)**	-0.25	(0.067)***
Constant	0.90	(0.280)***	0.77	(0.282)**	1.04	(0.313)***	0.83	(0.286)**	0.92	(0.288)*	0.84	(0.286)**
Rho	-0.58	(0.459)	0.88	(0.070)***	0.52	(0.434)	0.67	(0.165)***	-0.03	(0.570)	0.75	(0.139)***
Number of observations	6423		5621		6250		5495		6250		5495	
Censored observations	458		458		458		458		458		458	
Uncensored observations	5965		5163		5792		5037		5792		5037	
Wald chi2	29.36		243.46		130.48		303.71		1284.32		264.92	
LR test (rho=0): chi2(1)	1.46		14.73		0.49		3.49		0.00		4.17	
Prob>chi2	0.227		0.000		0.486		0.062		0.956		0.041	
LL	-4066		-3433		-2873		-2581		-2929		-2637	
Y=	0.87		0.82		0.94		0.94		0.95		0.92	

^ standard errors are in parenthesis; *p<0.05; **p<0. 01; *** p<0.001;

Table 2.12. Regression of Log of Annual Earnings (with correction for sample selection), for whole sample and for those with Annual earnings >5000

Variable	Full sample		Sample with Annual earnings >5000	
	Coefficient^		Coefficient^	
	1		2	
Age	0.02	(0.005)***	0.02	(0.004)***
Female	-0.14	(0.016)***	-0.13	(0.011)***
Married	0.01	(0.018)	0.01	(0.012)
GPA while in college	0.00	(0.017)	0.01	(0.012)
Race: white	-0.12	(0.021)***	-0.10	(0.015)***
Weekly hours of work	0.01	(0.001)***	0.01	(0.001)***
Current job is part time	-0.28	(0.030)***	-0.26	(0.023)***
Current job is a career start	0.09	(0.017)***	0.07	(0.014)***
Current job is non-major-related	-0.06	(0.018)***	-0.06	(0.014)***
Age*Childcare subsidy	-0.01	(0.006)	0.00	(0.005)
Age*Dental, Optical HI	0.00	(0.005)	0.00	(0.004)
Medical Insurance	0.10	(0.031)***	0.08	(0.024)***
Dental, Optical, other HI	0.17	(0.123)	0.07	(0.097)
Life Insurance	0.04	(0.021)*	0.04	(0.016)**
Retirement Benefits	0.15	(0.024)***	0.12	(0.018)***
Stock Option	0.05	(0.018)**	0.05	(0.013)***
Spending Account	0.11	(0.018)***	0.11	(0.013)***
Employee Discount	0.05	(0.016)***	0.04	(0.012)***
Childcare Subsidies	0.15	(0.149)	0.06	(0.114)
Transit Subsidies	0.06	(0.021)**	0.05	(0.016)**
Fitness Subsidies	0.00	(0.018)	0.02	(0.014)
Employee Counseling (Legal)	0.01	(0.017)	0.02	(0.013)
Constant	9.14	(0.126)***	9.36	(0.096)***
Selection				
Female	0.04	(0.042)	0.04	(0.044)
Age	-0.03	(0.007)***	-0.03	(0.007)***
Married	0.02	(0.048)	0.06	(0.050)
Children	0.36	(0.098)***	0.42	(0.109)***
White	0.23	(0.049)***	0.26	(0.051)***
GPA while in college	0.06	(0.041)	0.06	(0.043)
Female*Children	-0.23	(0.112)*	-0.28	(0.126)*
Employed While Enrolled	0.12	(0.043)**	0.21	(0.049)***
Student Loan	0.06	(0.039)	0.15	(0.045)***
Post BA Full time	-0.10	(0.054)	-0.22	(0.061)***
Constant	1.01	(0.212)***	0.98	(0.224)***
Rho	-0.75	(0.018)	-0.11	(0.084)
Sigma	0.56	(0.007)	0.38	(0.004)
Lambda	-0.42	(0.014)***	-0.04	(0.032)
LR test (rho=0): chi2(1)	141.44		1.43	
Prob>chi2	0.000		0.231	
Number of observations	6086		5943	
Censored observations	909		909	
Uncensored observations	5177		5034	
LL	-6295		-4748	
Wald chi2	2896.1		3580.7	

^standard errors are in parenthesis; *p<0.05; **p<0. 01; *** p<0.001;

Table 2.13. Regression of Cobb-Douglas utility index obtained using factors from confirmatory factor analysis (with control for sample selection)

Variable	Whole Sample		Whole Sample		Sample of Females	
	Coefficient^		Coefficient^		Coefficient^	
	1		2		3	
Log of Annual Earnings	0.25	(0.085)**	0.41	(0.087)***	0.26	(0.108)*
Age	-0.12	(0.028)***	-0.10	(0.029)***	-0.13	(0.035)***
Female	-0.40	(0.091)***	-0.39	(0.096)***	--	
Married	0.21	(0.100)*	0.32	(0.105)**	0.12	(0.126)
GPA while in college	0.53	(0.094)***	0.58	(0.098)***	0.63	(0.123)***
Race: white	0.55	(0.122)***	0.53	(0.128)***	0.64	(0.152)***
Weekly hours of work	-0.01	(0.006)	-0.01	(0.005)	-0.01	(0.008)
Current job is part time	0.59	(0.189)**	--		0.62	(0.239)**
Current job is a career start	2.04	(0.109)***	--		2.13	(0.138)***
Current job is non-major-related	-0.80	(0.114)***	--		-0.73	(0.150)***
Age*Childcare subsidy	0.02	(0.039)	0.02	(0.041)	0.04	(0.051)
Age*Dental, Optical HI	0.07	(0.032)*	0.04	(0.034)	0.08	(0.041)*
Medical Insurance	0.73	(0.188)***	1.02	(0.195)***	0.46	(0.238)
Dental, Optical, other HI	-1.53	(0.769)*	-0.71	(0.805)	-1.56	(0.962)
Life Insurance	0.44	(0.128)***	0.48	(0.134)***	0.39	(0.163)*
Retirement Benefits	0.39	(0.147)**	0.53	(0.153)***	0.47	(0.185)*
Stock Option	0.20	(0.108)	0.11	(0.113)	0.17	(0.139)
Spending Account	0.50	(0.108)***	0.54	(0.114)***	0.55	(0.138)***
Employee Discount	-0.11	(0.097)	-0.40	(0.101)***	-0.06	(0.126)
Childcare Subsidies	-0.25	(0.913)	-0.17	(0.960)	-0.78	(1.187)
Transit Subsidies	0.37	(0.127)**	0.33	(0.133)*	0.57	(0.172)***
Fitness Subsidies	0.42	(0.110)***	0.44	(0.115)***	0.22	(0.144)
Employee Counseling (Legal)	0.49	(0.105)***	0.57	(0.110)***	0.48	(0.135)***
Constant	4.27	(1.078)***	3.14	(1.081)**	3.76	(1.366)**
Selection						
Female	-0.02	(0.049)	-0.02	(0.049)		
Age	-0.01	(0.008)	-0.01	(0.008)	0.00	(0.011)
Married	0.15	(0.057)**	0.15	(0.057)**	0.16	(0.070)*
Children	0.38	(0.129)**	0.37	(0.129)**	0.06	(0.098)
White	0.19	(0.058)***	0.19	(0.058)***	0.14	(0.073)*
GPA while in college	0.06	(0.048)	0.06	(0.048)	0.09	(0.062)
Female*Children	-0.28	(0.148)	-0.28	(0.148)		
Employed While Enrolled	0.25	(0.053)***	0.26	(0.054)***	0.22	(0.069)***
Student Loan	0.08	(0.050)	0.07	(0.050)	0.11	(0.064)
Post BA Full time	-0.34	(0.060)***	-0.34	(0.060)***	-0.14	(0.080)
Constant	0.92	(0.257)***	0.92	(0.257)***	0.61	(0.326)
Rho	0.25	(0.080)***	0.24	(0.073)***	0.23	(0.127)
Sigma	3.05	(0.036)***	3.22	(0.036)***	3.03	(0.048)***
Lambda	0.77	(0.249)***	0.76	(0.239)***	0.70	(0.391)
LR test (rho=0): chi2(1)	6.40		6.94		27.00	
Prob>chi2	0.011		0.008		0.150	
Number of observations	5691		5741		3468	
Censored observations	643		643		400	
Uncensored observations	5048		5098		3068	
LL	-14708		-15111		-8949	
Wald chi2	1597.65		939.98		961.46	

^standard errors are in parenthesis; *p<0.05; **p<0. 01; *** p<0.001;

2.7 Conclusion

The analysis of the effect of pecuniary and non-pecuniary factors on the probability of being satisfied with the job overall finds that non-pecuniary factor is at least as influential as pecuniary one. Thus, using just one component that is increasing in utility, like wages, may bias results, underestimating well-being on the job of those whose choices are driven by other components of the job, leading to inefficient reform policies. An example of such policy might be the one concerning the issue of persistent gender wage gap.

Comparing three definitions of individual's utility from the job, we estimate the effect of various job attributes, wages, and individual characteristics, including gender on individual's well-being from the job. We use in three models that differ by the variable, which represents individual's utility from the job: binary overall job satisfaction, log of annual earnings, and index of utility. In all three models being a female negatively correlated with utility. This way, one of the possible extensions of this work would be to further explore the issue of the gender-wage gap. Utility index, constructed in this dissertation helps understanding gender differences in well-being at work, and explains some aspects of the decision making processes of heterogeneous individuals. One of the findings of this chapter speaks to the issue of difference in how men and women value various job characteristics: when accounted for satisfaction with non-pecuniary characteristics, the outcomes for well-being on the job are different for men and women (in favor of men), but the magnitude of the difference is much smaller then if just wages are taken into account.

As was noted in the previous literature that there sorting is going on: women might sort themselves into the jobs which have particular benefits that are important for them and have lower wages (Clark, 1998; Clark, 2001). Though in this sample on average women are less satisfied than men with the job they chose – this is the evidence from all models.

Is there no gender discrimination? It is insufficient information to say. It is a well known fact that men and women chose different career paths from the beginning and there might be several reasons for that. First there are traditions which were built during centuries. Historically women have been the primary care givers for children and men the primary bread-winners in the household. This way many women are preparing themselves to be the follower, not the leader, in a career sense. While this has been changing, differences in preferences still exist that may or may not relate to the child-rearing issues. The question remains as to why there may be less monetary value on the predominantly female oriented jobs and whether these other job attributes suffice as a justifiable compensating differential.

In Chapter 3 of this dissertation we explore the issue of gender gaps in wage and well-being further. Chapter 3 addresses these issues, accounting for college major,

industry and occupation, and examining components of compensation by these categories. We use this framework to explore the influence of search method on an individual's outcome in terms of well-being. We investigate the effect of proliferation of information via the internet, using the same dataset.

3 Information in the Labor Market: It's Impact on Employee's Outcomes

3.1 Introduction

In the previous chapter we established and tested the continuous measure of individual's utility from the job. Chapter 3 of this dissertation studies the role the advances in the information technology (internet) in the job finding process.

Based on conceptual framework, discussed in the first chapter and using the assumption about the utility function and constraints, in this chapter we are seeking to answer our question of interest: Among the employed, do the internet job searchers obtain better matches than those who searched for job, using only traditional job search methods?

Thus, the main concern of this part of the dissertation is to investigate whether the internet job searchers gain utility due to expanded information set compared to users of traditional job search methods, and that utility might be greater for those individuals who value non-monetary benefits more than wages. For these purposes we examine the role of the job search methods used (online or traditional) in disparities of job outcome, considering cross-sectional variations in match quality, using the retrospective information on past search method for those individuals who found their jobs and do not search anymore, controlling for observed heterogeneity and correcting for sample selection. We also control for taste shifters and preferences via observed variables, such as gender, age, industry and occupation[59]. The index of the utility from the job, constructed and tested in the second chapter will serve as a measure of quality of the job match.

[59] Though it is correlated with preferences, college major is a choice, and therefore is endogenous, as opposed to gender which is an exogenous factor.

3.2 Job search in the data

As to the search status, we observe three potentially different groups of individuals in the data. First group consists of those who are employed and don't search for a job anymore; second group includes currently employed workers, who search for a new job; and, finally, unemployed job searchers belong to third group. The grouping into employment status and search status is shown at the Figure 3.1.

The employed participants of the B&B:2000/01, who are not looking for a job, were asked about the strategy of their previous job search. The employed and unemployed participants of the B&B:2000/01, who are at the moment looking for a job, were asked about their current job search strategy.

Depending on their search status, respondents were asked what resources they use for current job search, or had used to find their current job (for 2001) out of the following list:

- Contacted faculty/staff
- Used their school's placement office
- Visited unemployment office or used an employment commission posting or referral
- Volunteered
- Responded to an Internet or World Wide Web job notice
- Contacted friends or relatives
- Responded to newspapers or other advertisement
- Attended recruiting fairs or professional meetings
- Sent out resumes, contacted employer directly
- Contacted employment agencies
- Used other methods.

The respondents were allowed to pick up to three most frequently used job search methods from the list. Table 3.1 represents statistics on the use of job search methods by individual's search status. Among those who are employed and don't search for a job anymore, a majority (72%) were using just one job search method. The most popular job search methods was to contact friends and relatives, which was used by 30% of currently employed respondents in the past, the second best was to sent out resumes and contact employer directly (29% used it), and the third one was to search for job online (22%). As to successful strategy, three most popular search methods were the most successful ones. Figure 3.2 shows distribution of the individuals into successful search methods.

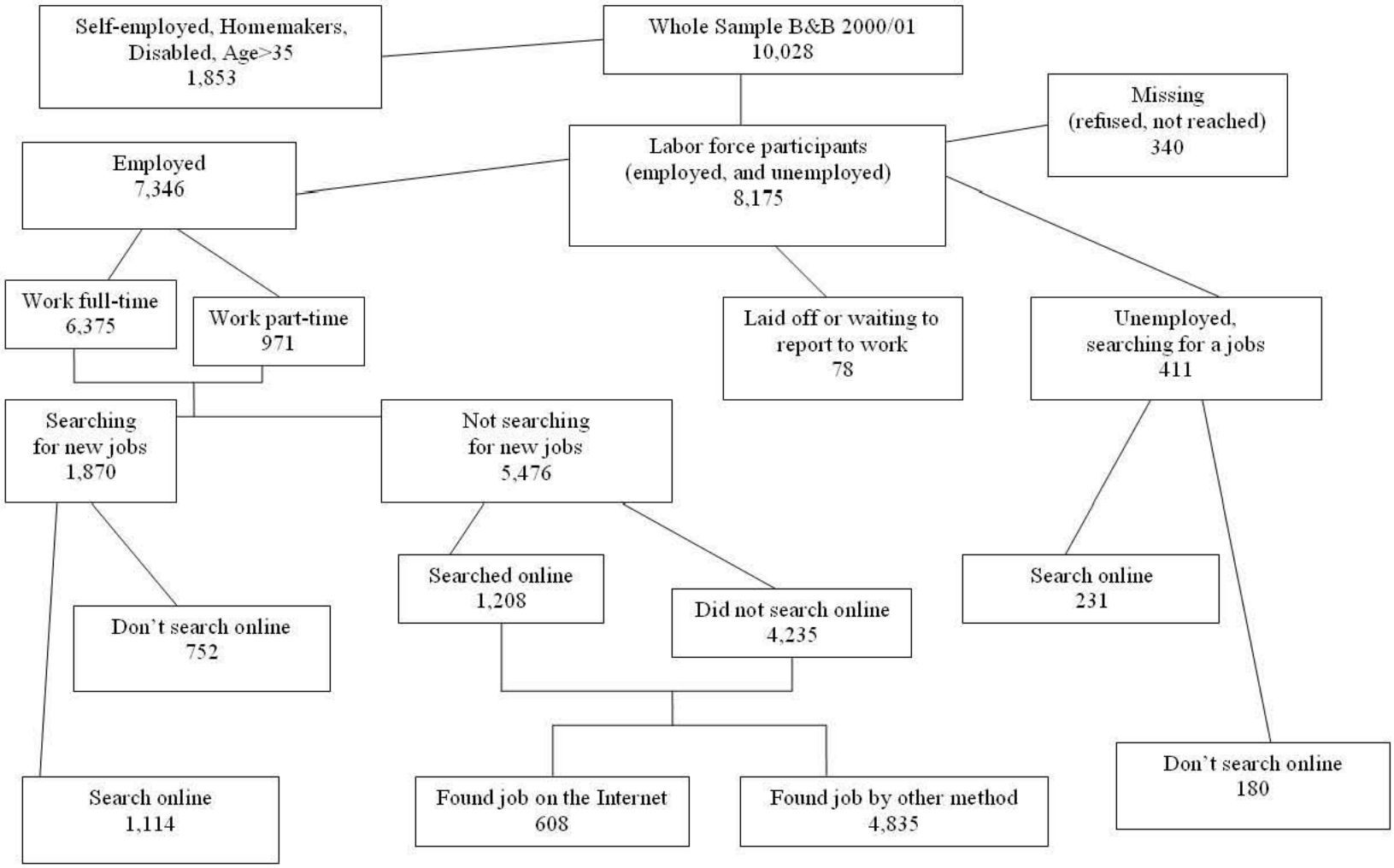

Figure 3.1. Grouping in the sample of B&B:200/01 survey

Job seekers (employed and unemployed) were asked the same thing, but relatively to their current search. The most popular job search methods was to search for job online, contact friends and relatives, which was being used by 59% of currently employed and unemployed job seekers, the second best was to respond to newspapers or other advertisement (38% used it), and the third one was to sent out resumes and contact employer directly (36%).

It is assumed in the survey, that unemployed and employed individuals, who currently search for jobs, were using same strategy they currently use in the past. In particular, employed job seekers were using the same set of methods they are using now and prior to finding their current job. There is a potential problem with this assumption. The individuals that are currently employed might have fewer options to choose from as to job search methods compared to themselves in the past and to those who were looking for a job while they were just from college. Such options as Attending recruiting fairs or professional meetings, Using their school's placement office, Contacting faculty/staff might be unavailable for those who currently employed. Also, here we confront the issue of comparing two different job search strategies: search while unemployed and on-the-job search. On-the-job searchers might choose those job search methods, which have lower time cost compared to unemployed searchers, who would choose methods of job search with lower monetary costs.

Table 3.2 shows grouping in the sample of recent college graduates by search status, which show labor force attachment. The majority of the individuals are employed (94%). Among them 25% search for another jobs while employed. A majority of them search for jobs on the internet (60%), while others search just using traditional job search methods. Among those, who do not do on-the-job search, 22% report that they searched for their jobs online, and a half of them found their jobs via the internet.

Table 3.1 Job search methods used (by search status)

Variable	Job search methods used in the past (only non-searchers)		Successful job search methods (only non-searchers)		Job search methods currently used			
					all searchers		on-the-job searchers	
	Mean*		Mean*		Mean*		Mean*	
Responded to an internet or WWW job notice	0.22	(0.42)	0.11	(0.32)	0.59	(0.49)	0.60	(0.49)
Contacted friends or relatives	0.30	(0.46)	0.25	(0.43)	0.31	(0.46)	0.30	(0.46)
Contacted employment agencies	0.05	(0.22)	0.04	(0.20)	0.05	(0.22)	0.04	(0.21)
Contacted faculty/staff	0.05	(0.23)	0.04	(0.20)	0.04	(0.21)	0.04	(0.21)
Sent out resumes, contacted employer directly	0.29	(0.45)	0.21	(0.41)	0.36	(0.48)	0.37	(0.48)
Responded to newspapers or other advertisement	0.16	(0.36)	0.10	(0.30)	0.38	(0.49)	0.38	(0.49)
Attended recruiting fairs or professional meetings	0.08	(0.27)	0.06	(0.25)	0.04	(0.19)	0.03	(0.18)
Used their school's placement office	0.11	(0.31)	0.09	(0.28)	0.06	(0.23)	0.05	(0.21)
Visited unemployment office or used an employment commission posting or referral	0.02	(0.12)	0.01	(0.10)	0.02	(0.15)	0.02	(0.14)
Volunteered	0.01	(0.11)	0.01	(0.11)	0.00	(0.07)	0.00	(0.07)
Used other methods	0.09	(0.29)	0.08	(0.26)	0.07	(0.25)	0.07	(0.26)
Used single job search method	0.72	(0.45)	-	-	-	-	0.35	(0.48)
Number of observations	5443		5443		2277		1866	

*Standard deviations are in parenthesis

Table 3.2 Internet job search rates of labor force participants, classified by labor force status

Labor force status	Total # of ind-s	Job search (including IJS)		Internet job search (IJS)					
				Present		Past			
						Used IJS		Found job via internet	
		# of ind-s	% out of total	# of ind-s	% out job searchers	# of ind-s	% out of non-searchers	# of ind-s	% of those who used IJS
Employed	7,346	1,870	25.5	1,114	59.6	1,208	22.1	608	50.3
Unemployed	411	411	100	231	56.2	-	-	-	-
Total	7,757	2,281	29.4	1,345	59.0	1,208	22.1	608	50.3

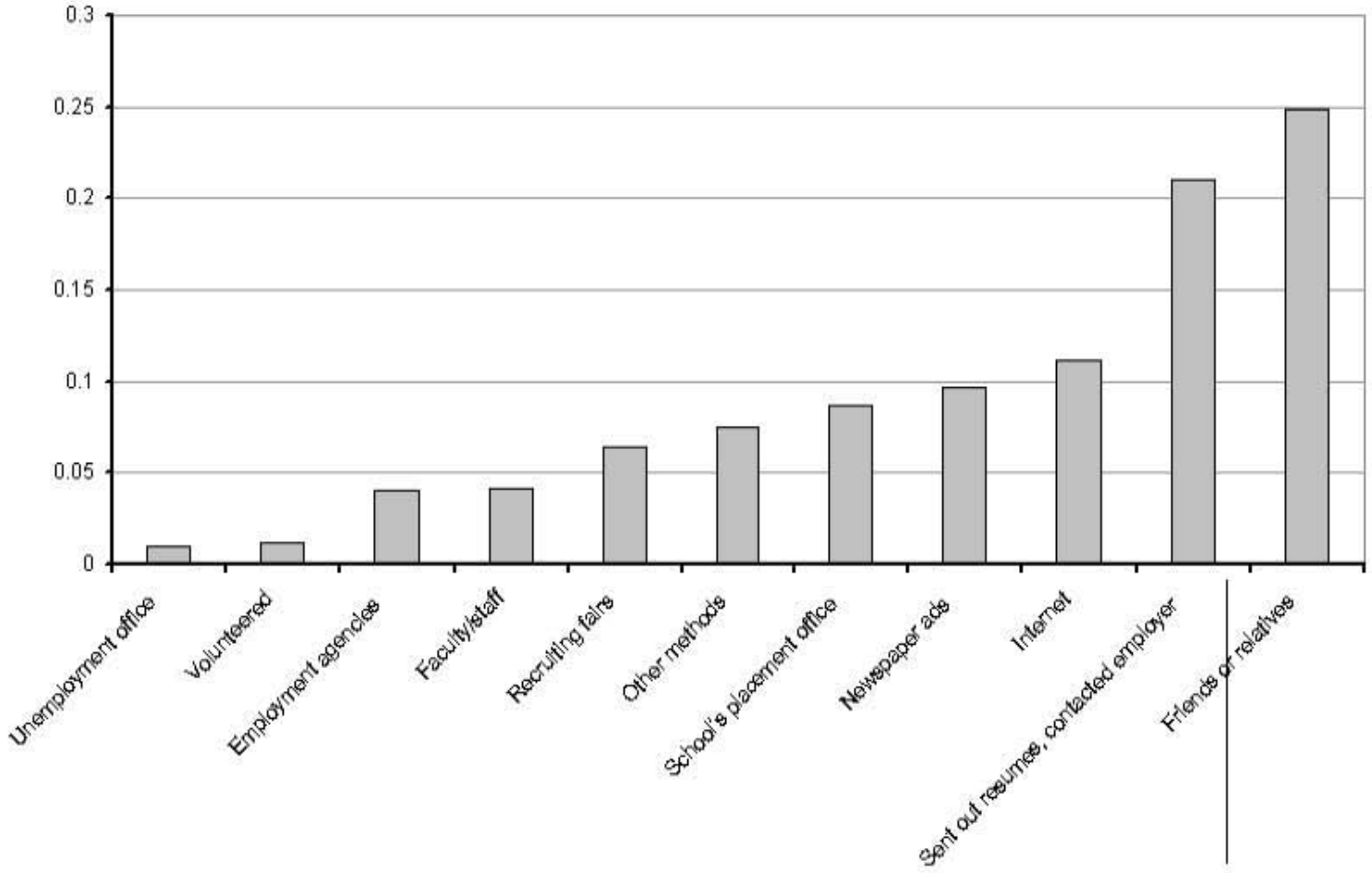

Figure 3.2. Successful job search methods

3.3 Descriptive statistics for outcome variables

In Chapter 2 of this dissertation, using confirmatory factor analysis we obtained utility index, which represents individual's utility from the job, which is said to have Cobb-Douglas functional form. This variable was obtained from two factors (pecuniary and non-pecuniary), which were calculated from a set of seven binary indicators of job satisfaction on given job attributes using confirmatory factor analysis. Individual's annual earnings and overall satisfaction are also available from the data. Table 3.3 contains descriptive statistics by population groups. Females are less satisfied with their jobs compared to males; they have lower wages, and also have lower utility. They have lower values on both factors, pecuniary and non pecuniary. We observe same trends when compare single individuals and their married counterparts. When we compare outcome variables by race (white and non-white), we observe that non-whites have lower job satisfaction and index of utility on the job, but higher wages than whites. Individuals with college GPA greater or equal to three have lower wages, but higher job satisfaction and utility than those, who's GPA is lower than three.

Table 3.4 represents descriptive statistics of all the search outcomes by search status (annual earnings, job satisfaction and utility). Those will be used in regressions as dependent variables, as it was said in the first chapter of my dissertation. As it was mentioned above, these outcome variables are reported only by employed workers. Therefore, the issue of selection into employment has to be addressed. We use Heckman selection model to correct for sample selection.

Mean earnings of currently employed individuals are distributed around 31,000, and 86% of the employed individuals are satisfied with their jobs overall. Mean value of the Utility index is 9.2.

Except the selection into employment status, which is discussed in Chapter 2 of this dissertation, there exists another selection problem. Second step of selection is into "no-on-the-job-search": some individuals choose to search on the job and some don't. Current job searchers report lower earnings, job satisfaction, both factors, and utility index. This explains why they search – because they are not happy about the characteristics of their current jobs (outcomes of their previous job search).

Currently employed individuals, who do not search for a job and report that they used internet job search to find their current jobs, report higher annual earnings and have higher utility index, since the values of both, pecuniary and non-pecuniary, factors are higher than that for those, who did not search online, while overall satisfaction is the same.

As to on-the-job searchers, who report current use of the internet job search for find new jobs, they report higher annual earnings than non-internet searchers, but have lower utility index.

This might be because the internet job searchers get more information about potential jobs, and since they compare their current job relative to next best alternative, they might have higher propensity to be dissatisfied with their jobs, because they assess their job satisfaction having broader information set compared to non-internet searchers, and therefore they might have higher propensity to search. This way the use of the internet job search might be endogenous[60].

The descriptive statistics show that there is propensity to search online among the on-the-job searchers. That might be explained by lower cost of information, which is available through the internet and low time and monetary cost of browsing the internet resources.

There are several types of selection problems in the data, which have to be addressed in the analysis. First, individuals differ by their employment status: outcome variables are missing for those, who are currently unemployed. Second, the whole sample consists of two groups, which differ by their job search status: job searchers and those, who do not search for a job. First group consists of on-the job searchers and unemployed job searchers, second group includes only employed individuals. Thus, among the employed individuals there are two groups: job searchers and those, who are not searching for jobs anymore. The information about the job search methods, used to find their current jobs, exists only for employed non-searchers. Those, who report that they are currently searching for a job (employed and unemployed job-searchers), where asked only about their current search methods. Figure 3.3 describes the selection issues in the sample.

The summary of descriptive statistics on individual characteristics (taste shifters, skills and abilities) by search status is represented by Table 3.5.

Next section of this chapter presents the econometric model and suggests ways to deal with selection issues.

[60] There is additional concern about selection into search methods. Kuhn and Skuterud (2003) showed that there might be an adverse selection problem: individuals might sort into internet job search (unobserved heterogeneity). We deal with that problem using sample of recent college graduates, who are relatively homogeneous in terms of computer use, also, we control for ability (GPA while in college). The internet job search is endogenous to total compensation more than to satisfaction. Therefore it is more of a collinearity problem.

Table 3.3. Descriptive statistics by population groups

Variable	Male	Female	Married	Single	White	Non-white	GPA>=3	GPA<300
Annual Earnings	34795.92	28082.31	31792.89	30279.20	30424.71	32120.51	30316.20	31448.56
Overall Satisfaction	0.87	0.85	0.89	0.85	0.87	0.82	0.87	0.84
Non-Pecuniary factor	0.02	-0.01	0.09	-0.04	0.01	-0.05	0.01	-0.02
Pecuniary factor	0.07	-0.04	0.02	-0.01	0.02	-0.08	0.02	-0.03
Utility index	9.47	9.02	9.51	9.07	9.27	8.83	9.27	9.05
Number of observations	2815	4302	2036	5081	5933	1184	4671	2446

Table 3.4. Descriptive statistics by search status (outcome variables)

				No job search		Current on-the-job search			
Variable	Employed	Current on-the-job search	No job search	past IJS	no past IJS	Current IJS	No curent IJS	Any IJS	No IJS at all
Annual Earnings	30701.48	28141.18	31533.33	33764.33	30903.57	29153.09	26663.81	31554.38	30257.53
Overall Satisfaction	0.86	0.64	0.93	0.93	0.93	0.61	0.68	0.78	0.89
Non-Pecuniary factor	0.00	-0.49	0.17	0.21	0.16	-0.54	-0.43	-0.15	0.07
Pecuniary factor	0.00	-0.31	0.11	0.15	0.10	-0.34	-0.28	-0.08	0.04
Utility index	9.20	6.92	9.98	10.20	9.91	6.74	7.17	8.55	9.50
Number of observations	7114	1813	5298	1175	4094	1079	702	2254	4824

Table 3.5 Descriptive statistics by search status: individual characteristics

			Employed				Unemployed	
	All employed		Don't search for a job		Search for a job			
Variable	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
Age*	7650	23.31 (3.05)^	5476	23.30 (3.08)^	1870	23.34 (2.97)^	411	23.12 (2.96)^
Male	7650	40%	5476	39%	1870	42%	411	38%
Married	7650	28%	5476	30%	1870	23%	411	17%
Children (any)	7355	14%	5471	14%	1869	13%	409	7%
Asian	7650	5%	5476	5%	1870	4%	411	9%
Black	7650	8%	5476	7%	1870	10%	411	8%
White	7650	83%	5476	84%	1870	81%	411	77%
Military	7186	1%	5355	1%	1821	-	-	-
Full time job	7339	84%	5463	86%	1865	80%	-	-
Current job is career start	7270	73%	5405	79%	1856	57%	-	-
Continuing education (Post BA)	7626	20%	5464	21%	1866	17%	410	24%
Post BA Full Time	7626	12%	5464	13%	1866	11%	410	21%
Annual earnings*	7039	30701.48 (19551.41) ^	5045	31533.33 (16648.85) ^	1731	28141.18 (26386.66) ^	-	-
Earn more than $30,000 a year	6571	52%	4759	55%	1561	41%	-	-
Current job is not-major-related	7353	22%	5476	19%	1870	30%	-	-
GPA (while in college)*	7540	3.16 (0.48) ^	5404	3.20 (0.47) ^	1846	3.08 (0.48) ^	402	3.12 (0.51) ^
GPA in college major*	6535	3.33 (0.47) ^	4720	3.36 (0.46) ^	1633	3.28 (0.47) ^	340	3.29 (0.46) ^
Current job search	7346	25%	-	-	-	-	-	-
Fringe benefits								
Medical Insurance	7316	80%	5452	83%	1858	72%	-	-
Dental, Optical, other HI	7287	73%	5430	76%	1851	63%	-	-
Life Insurance	7193	64%	5360	68%	1827	54%	-	-
Retirment Benefits	7264	73%	5418	76%	1840	63%	-	-
Stock Option	7177	31%	5342	32%	1829	28%	-	-
Spending Account	7132	29%	5307	32%	1820	23%	-	-
Employee Discount	7262	41%	5408	41%	1848	41%	-	-
Childcare Subsidies	6976	17%	5175	17%	1796	15%	-	-
Transit Subsidies	7180	17%	5339	17%	1835	16%	-	-
Fitness Subsidies	7275	27%	5417	28%	1851	22%	-	-
Employee Counseling	7075	42%	5260	45%	1809	35%	-	-
College major								
Business/management	7484	11%	5365	11%	1835	12%	404	9%
Engeneering	7484	6%	5365	6%	1835	5%	404	5%
Computer/information science	7484	4%	5365	4%	1835	3%	404	2%
Math	7484	1%	5365	2%	1835	-	404	1%
Physics/Chemistry	7484	2%	5365	2%	1835	2%	404	1%
Life Sciences	7484	8%	5365	8%	1835	8%	404	9%
Education	7484	15%	5365	16%	1835	12%	404	4%
Health	7484	10%	5365	11%	1835	9%	404	7%
Social/behavioral sciences	7484	18%	5365	18%	1835	19%	404	26%
Humanities	7484	13%	5365	12%	1835	15%	404	19%
Vocational/technical	7484	2%	5365	2%	1835	3%	404	2%
Other technical/professional	7484	9%	5365	9%	1835	11%	404	14%
Undeclare Major	7650	2%	5476	2%	1870	2%	411	2%

*Age ranges from 18 to 35; GPA and GPA in major range from 1 to 4; Annual earnings ranges from 100 to 500,000
^ Standard deviations are in parentheses

Table 3.5 Descriptive statistics by search status: individual characteristics (continued)

			Employed				Unemployed	
	All employed		Don't search for a job		Search for a job			
Variable	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
Occupation								
Educators	7323	23%	5449	25%	1863	17%	-	-
Business and management	7323	20%	5449	19%	1863	22%	-	-
Engineering/software engineering/architecture	7323	4%	5449	5%	1863	3%	-	-
Computer science	7323	6%	5449	6%	1863	6%	-	-
Medical professionals	7323	9%	5449	10%	1863	7%	-	-
Editors/writers/performers	7323	3%	5449	3%	1863	4%	-	-
Human/protective service professionals	7323	6%	5449	6%	1863	6%	-	-
Research, scientist, technical	7323	6%	5449	6%	1863	6%	-	-
Administrative/clerical/legal	7323	7%	5449	6%	1863	9%	-	-
Mechanical, laborers	7323	3%	5449	3%	1863	5%	-	-
Service industries	7323	11%	5449	10%	1863	15%	-	-
Other	7323	1%	5449	1%	1863	1%	-	-
Industry								
Public Administration/Public Safety	7018	12%	5214	12%	1794	12%	-	-
Manufacturing	7018	5%	5214	5%	1794	6%	-	-
Construction	7018	2%	5214	2%	1794	2%	-	-
Finance/Insurance/Real Estate	7018	8%	5214	8%	1794	8%	-	-
Services	7018	26%	5214	25%	1794	30%	-	-
Wholesale and Retail Trade	7018	7%	5214	6%	1794	9%	-	-
Education	7018	24%	5214	6%	1794	17%	-	-
Health care	7018	13%	5214	13%	1794	12%	-	-
Other	7018	3%	5214	3%	1794	4%	-	-

*Age ranges from 18 to 35; GPA and GPA in major range from 1 to 4; Annual earnings ranges from 100 to 500,000
^ Standard deviations are in parentheses

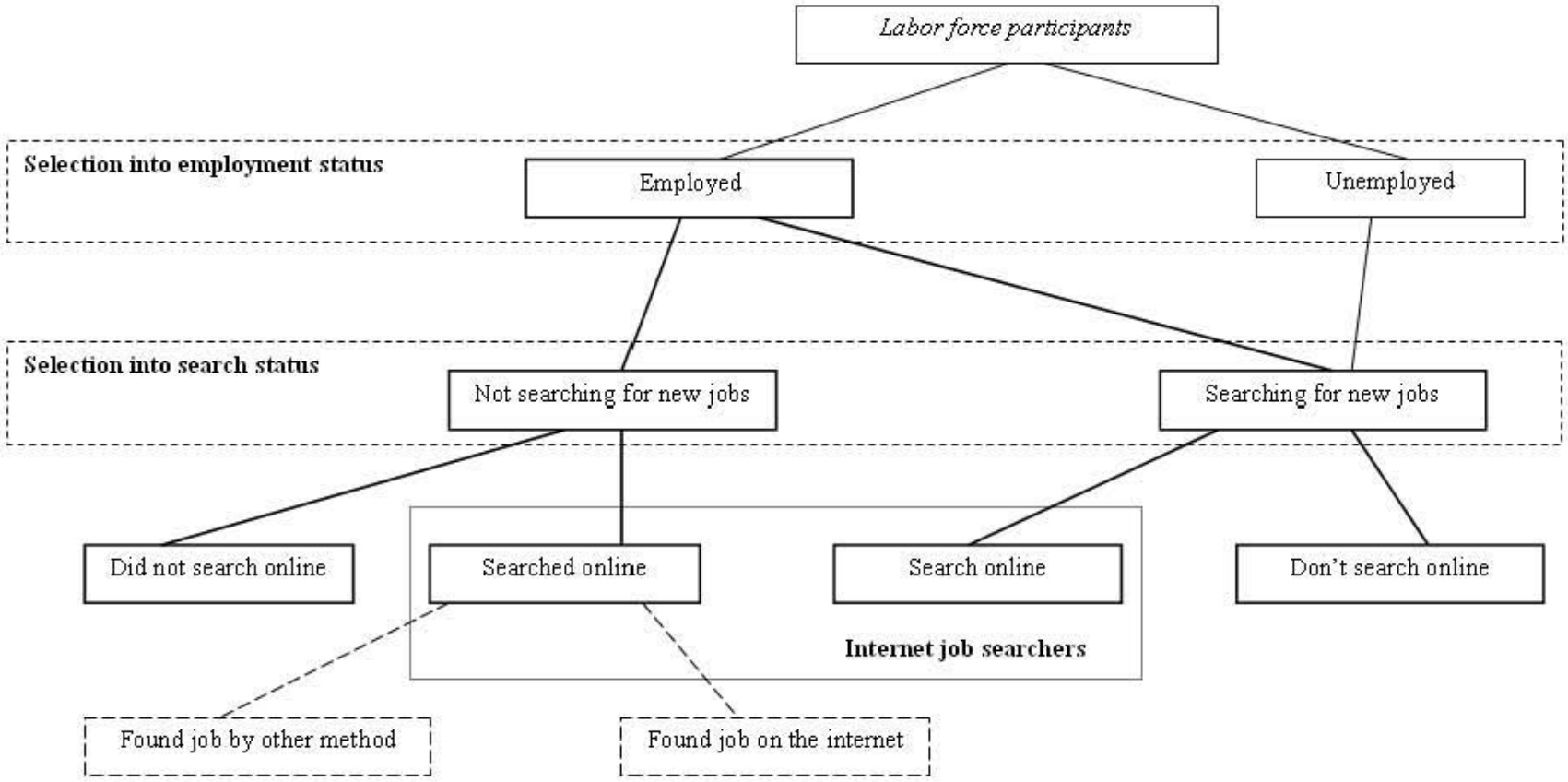

Figure 3.3. Model of selection into search status

3.4 Econometric model

The focus of this analysis is the individual differences in level of utility gained from internet job searching. We seek to recover parameters of the regression of the continuous utility index for internet searchers compared to non-internet searchers. We also seek to compare overall utility from internet searching holding other inputs to total compensation and utility constant. This can be described as follows:

$$U_i = X_i' \cdot \alpha + IJS_i' \cdot \beta + e_i \ , \tag{3.1}$$

where IJS_i is the internet use in job search of the individual i, X_i is other exogenous characteristics, e_i is the error term.

From this we learn whether the utility on the job is different for internet versus non-internet job searchers.

There are several issues we need to discuss in order to proceed with the estimation of the model of the utility. First issue would be the measurement of the utility from the job, which is addressed in Chapter 2 of this dissertation. There we discuss how we deal with unobservable non-pecuniary part of total compensation by using self-reported job satisfaction, available from B&B: 2000/01 survey. We construct a continuous index of utility from the job, which is consistently defined across all employed individuals.

The second issue is that the sample of people who where asked to report their job satisfaction is not a random sample. Only those individuals, who were currently employed, were able to answer the set of questions about job satisfaction. This introduces a possibility of selection bias.

Another selection bias may result from the fact that our variable of interest – internet job search in the past (IJS), exists only for those individuals, who were currently employed and did not search for another job. Those, who were employed and searched at the time of the interview where asked only about their current search, as well as unemployed job searchers[61]. We will turn to the latent variable framework to correct for selection bias.

The next section discusses the estimation techniques we use in an attempt to address these econometric issues.

[61] One of the options of dealing with this issue is to assume that unemployed and employed job searchers use the same methods they were using previously. This assumption might be used for unemployed job searchers, but for on-the-job searchers it might be unrealistic. The next section discusses the consequences of using it.

3.4.1 Empirical model and estimation issues

To consider the issue of selection bias we use the latent variable framework in which usually there is a selection equation, determining whether the person is in the sample, and main equation, determining the individual's job outcome[62]. This framework will be expanded to include another selection equation.

A latent variable EM^*_i, which is a linear function of a vector of individual characteristics Z_i, and a random component u_i, determines whether the person is in the sample of the employed. If this latent variable exceeds the threshold C_1, a dichotomous variable EM_i is set equal to one and the person is included in the sample of the employed, this way this observation gets selected into the next stage:

$$\begin{aligned} EM_i^* &= Z_i'\gamma + u_i \\ EM_i &= 0 \; if \; EM_i^* \le C_1 \\ EM_i &= 1 \; if \; EM_i^* > C_1 \end{aligned} \tag{3.2}$$

$EM_i=0$, means that the individual is unemployed,

$EM_i=1$ – the individual is employed,

$\Rightarrow$ observation gets into second selection equation.

In the next selection equation, another latent variable NS^*_i, a function of a vector of characteristics Q_i, and a random component θ_i, determines whether the person is in the sample of those who do not search for a job. If this latent variable exceeds the threshold C_2, a corresponding dichotomous variable NS_i is set equal to one and the person is included in the sample of the non-searchers, and gets into the main equation:

$$\begin{aligned} NS_i^* &= Q_i'\mu + \theta_i \\ NS_i &= 0 \; if \; NS_i^* \le C_2 \\ NS_i &= 1 \; if \; NS_i^* > C_2 \end{aligned} \tag{3.3}$$

$NS_i=0$ means that the individual searches on-the-job,

$NS_i=1$ – the individual does not search on-the-job,

$\Rightarrow$ observation gets into main equation.

[62] The classical Heckman section model is discussed in the previous chapter, Chapter 2. See Amemiya (1974), Heckman (1979), and Tunali (1982) for a more complete explanation of this problem.

Similarly, a vector of characteristics X_i and a random component e_i determine whether the variable in the main equation U_i takes on the value of U_i*. Thus, the main equation is the regression of past internet job search (IJS_i) and individual characteristics (X_i) on utility from the job (U_i) is:

$$\begin{aligned} U_i^* &= X_i' \cdot \alpha + IJS_i' \cdot \beta + e_i \\ U_i &= U_i^* \ if \ NS_i = 1 \end{aligned} \qquad (3.4)$$

U_i is not observed if $EM_i=0$.

IJS is not observed if:

$NS_i=0$ (search on the job),

$EM_i=0$ (unemployed search),

which yields the complete model:

$$\begin{aligned} &pr(EM_i = 1) = pr(u_i > C_1 - Z_i'\gamma), && \text{selection equation 1} \\ &pr(NS_i = 1) = pr(\theta_i > C_2 - Q_i\mu), && \text{selection equation 2} \\ &U_i = E[U_i \mid X_i, IJS, \quad NS_i > C_2, EM_i > C_1] + e_i && \text{main equation} \end{aligned} \qquad (3.5)$$

If the three error terms in all the equations are independent, they can be estimated separately. If this is not the case, then the three equations must be estimated jointly[63].

Unmeasured factors that affect selection may be correlated with unmeasured factors that affect the individual's utility. For example, we only observe self-reported job satisfaction for the people who already accepted an offer and became employed. These people may have lower reservation utility than those, who are still looking for a job[64]. Therefore we cannot disregard both this potential selection bias problems. To test for robustness, we try two different approaches of correction for sample selection, using three distinct models, which have different assumptions. Afterwards we compare the results.

First, we estimate the two selection equations simultaneously in a bivariate probit, using maximum likelihood, and test for independence. For a bivariate probit we will use the whole sample of individuals: employed non-searchers, unemployed searchers, and those who search for a job, while employed. Using the predicted probabilities of being employed and the predicted probabilities of being non-job-searcher, we calculate two inverse Mill's ratios (obtain Heckman's λ from each selection equation). We use those λ's in the OLS regression of individual's utility on the job on the sample of those individuals, who are employed and do not search for

[63] There are consequences to that: the standard Heckman selection model cannot be estimated. The construction and estimation of Full Information Maximum Likelihood Model would be preferable, but we leave it for future work, and assume independence.

[64] Therefore, we observe some on-the job search, which signals that some employed accepted job offers with lower utility, than their reservation levels.

new jobs. This way we escape the issue of measurement of our variable of interest (IJS), which was discussed in the previous section.

The second step, we estimate the effect of the internet job search on utility from the job. We estimate this model making slightly different assumptions about the sample. Since our question of interest is to analyze the individual differences in the utility from the job among the employed, we use just the sample of the employed. Also, since we can not assume that the individuals, who currently are searching for jobs, were using the same methods in the past, we need to control for sample selection into search method. This way, using the sample of employed individuals, who do not search on the job, we estimate the effect of the use of internet job search to find their current job on the utility from the job, controlling for sample selection into search status, leaving all the unemployed out of the analysis. The standard Heckman selection model is used, where selection equation and main equation are similar to (3.3) and (3.4).

The third step is to estimate the model that analyzes the individual differences in the utility from the job among the employed, using the whole sample, but keeping the assumption the issues with measurement of IJS variable. It estimates the effect of the use of internet job search to find their current job on the utility from the job, controlling for general sample selection (no-on-the-job search). This way, all three categories of the individuals enter the selection equation: employed and unemployed searchers and employed non-searchers, but only the latter group enters the main equation. Selection equation calculates the probability of "surviving" both types of selection: into employment status and search status.

Next we discuss the estimation results and their implications.

3.5 Results

3.5.1 Description of the results from models of utility on the job

This section reports the results from modeling the effect of information on job search outcomes. It explores the sample selection issues, using several distinct approaches to control for it. The main question of interest is to determine the effect of the internet job search on utility from the job among the employed.

First, we perform an OLS regression analysis including all employed, and do not control for sample selection into job search status. We acknowledge limitation that internet job search is measure differently by whether or not individuals are searching on the job – which clearly is tied to job satisfaction (causality problem).

Workers in the sample are grouped into two categories: those who don't search for new job, and those who do on-the-job search. Utility index - utility from the job (dependent variable) exists for both groups, but the variable of interest (IJS) is measured differently, depending on individual's current job search status.

Table 3.6 reports the results on the sample of employed and examines the effect of internet job search on utility - addressing the problems of measurement in the indicator of internet job search.

In Table 3.6, Model 1 is OLS regression of Cobb-Douglas Utility (from confirmatory FA) among the employed, with control for individual demographic characteristics and taste shifters and any internet job search. This specification assumes that the IJS variable is measured the same way for all the respondents and ignores the problem of sample selection bias. It shows the effect of the internet job search (variable IJS) on utility. Variable IJS is constructed using two variables, which come from two different questions: question about past job search method, and question about current job search. IJS equals to one, if internet job search was used in the past as one of the job search methods (for those, who work and don't search for job) or internet job search is used currently as one of the job search methods (for those, who work and search for jobs). Unemployed job searches are not in this analysis.

The internet job search appears to be negatively (significantly) correlated with utility from the job (the coefficient on IJS is significant and influences utility negatively), but the way this variable is constructed, it captures the effect of current job search status.

Those who search are less happy with their jobs. In fact, they are searching, because they are unhappy – search status is endogenous.

To separate out the effect of job search from the effect of the search method (IJS) on utility we add a control for past internet job search among employed non-searchers (constructed as an interaction: IJS times No-Employed-Search). Model 2 shows positive and significant effect of the interaction variable, and, though the effect of the IJS variable is negative, the net marginal effect of internet job search is positive, but still these two variables capture the fact that individuals, who do not on the jobs, are happier.

Finally, we add a control for search status, to separate the effect of being a non-searcher, and find the marginal effect of the internet. In the model 3, Current Job Search, as predicted, is negatively correlated with utility from the job and now the marginal effect of the internet job search on utility is positive (0.70-0.48 = 0.22) and significant.

This is just one of the approaches of addressing the measurement issue in the variable of our interest (IJS). We keep all the employed in the model and learn that there indeed might be not only a problem with sample selection in the search status, but also here we have to deal with selection into search type. The limitation of this approach is that we don't know if the individuals, who currently search on the job, used the internet to look for their current job, and that whether there search status is likely endogenous.

The rest of this section is dedicated to the discussion of results on sample selection concerns. In the first step, we explore the influence of the internet job search on propensity to belong in each group: employed, job-searcher, and on-the-job-searcher.

Table 3.6 The effect of the internet job search on utility among the employed: OLS regression of IJS on individual's utility from the job

Variable	Coefficient/St.Err.	Coefficient/St.Err.	Coefficient/St.Err.
	1	2	3
IJS	-0.98***	-2.75***	-0.48**
	0.088	0.111	0.153
Female	-0.55***	-0.57***	-0.57***
	0.085	0.081	0.079
age	-0.04*	-0.03	-0.03
	0.015	0.015	0.014
Married	0.36***	0.34***	0.23*
	0.1	0.096	0.093
Children	-0.07	-0.01	0
	0.139	0.133	0.129
white	0.26*	0.22	0.17
	0.125	0.12	0.117
Asian	0.24	0.08	-0.03
	0.226	0.217	0.211
College GPA	0.43***	0.31***	0.22**
	0.088	0.085	0.083
PostBA Full time	-0.89***	-0.79***	-0.82***
	0.128	0.122	0.119
IJS*No-Employed-Search	-	3.39***	0.70***
		0.139	0.186
Current Job Search	-	-	-2.70***
			0.129
Constant	9.13***	9.30***	10.08***
	0.461	0.442	0.43
Number of observations	6968	6968	6968

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

The question of interest now is how the internet job search (IJS) relates to the propensity to be in various comparison groups. Individuals are grouped by employment status and search status. Table 3.7 reports the results on probit models. It shows that under the assumption that equations of employment and search type are independent (separate probit regressions): employed and unemployed job-searchers are similar (models 2 and 4) in how the IJS influences he probability of being a non-searcher. The results are consistent with theory, which says that the internet lowers the cost of searching so that internet users for job searches are more likely to search, and more likely to afford longer search durations (delay employment) so that they are less likely to be employed. Though, we cannot identify yet weather the employed searchers are searching just because costs of search are low and they can afford to just shop around, or because they are unhappy and want to change their jobs as soon as it is possible.

In the next step we test the independence of the selections into employment status and search status. Table 3.8 reports the results from a bivariate probit model.

Relaxing the independence assumption – bivariate probit regressions (seemingly unrelated probit regressions), we observe a consistent story. These two equations are correlated (ρ is non-zero and χ^2 test tells us that we can reject the hypothesis about the independence of these regressions), so that those who are not searching are also more likely to be employed (propensity to be a non-searcher and employed is positive) as expected.

If we do not allow the internet (reduced cost of searching) to influence the propensity to be searching, so that it is an exclusion restriction in the employed search equation, the effect of the internet is positive but not significant. This can be interpreted as the effect of the internet job search on the propensity to be employed, after controlling for search propensity, is positive but not significant. However, this also relies on the assumption that measurement of internet differentially by search status is not an issue. It is possible that those who use the internet while searching on the job did not use the internet to find that job and therefore are more likely to search now. Since they are included in that employed equation, the effect of internet becomes noisy.

We use this information for estimating the propensity of the internet job search (and the reduction in search and information cost) to facilitate better jobs for employees. It is clear that those who are employed and not searching – the group for which we have a clean indicator of internet job search – is significantly different from the comparison groups. Some control for sample selection is warranted. How we do so, depends on the question we seek to ask, and what we seek to identify.

Table 3.7 Probit regression

Variable	Probability of being employed	Probability of being a non-job- searcher	Probability of being a non-job-searcher	Probability of being an employed non-job-searcher
	1	2	3	4
IJS	-0.50***	-0.98***	-	-0.98***
	0.054	0.033		0.035
Female	-0.05	0.00	0.03	0.01
	0.058	0.033	0.031	0.035
Age	-0.02	-0.01	-0.01	-0.01
	0.01	0.006	0.006	0.006
Married	0.21**	0.20***	0.24***	0.18***
	0.072	0.041	0.038	0.043
Children	0.32	-0.03	0.03	-0.07
	0.175	0.056	0.053	0.058
White	0.05	0.11*	0.12**	0.09
	0.079	0.048	0.045	0.05
Asian	-0.22	0.20*	0.07	0.28**
	0.124	0.085	0.08	0.092
College GPA	0.1	0.22***	0.25***	0.24***
	0.057	0.035	0.033	0.037
Post BA Full time	-0.38***	-0.16**	0	-0.05
	0.071	0.049	0.046	0.054
Female*Children	-0.18	-	-	-
	0.2			
Employed while enrolled in college	0.26***	-	-	-
	0.062			
Stud. Loan	0.02	-	-	-
	0.06			
Constant	1.69***	0.35	-0.21	0.40*
	0.31	0.182	0.172	0.191
Number of observations	6771	7594	7708	7194

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Table 3.8 Bivariate probit regression (SUR): probability of being a non-job-searcher and probability of being employed estimated together

Variable	Probability of being Employed	Probability of being Non- search
	1	2
IJS	0.04	-
	0.049	
Female	-0.04	0.04
	0.056	0.034
Age	-0.01	-0.01
	0.01	0.006
Married	0.25***	0.25***
	0.069	0.041
Children	0.36*	0.04
	0.166	0.057
White	0.03	0.10*
	0.076	0.048
Asian	-0.27*	0
	0.12	0.086
College GPA	0.15**	0.28***
	0.056	0.035
PostBA Full time	-0.31***	-0.01
	0.069	0.048
Female*Children	-0.23	-
	0.187	
Employed while enrolled in college	0.28***	-
	0.056	
Took student loan	0.05	-
	0.055	
Constant	1.18***	-0.27
	0.299	0.182
ρ		0.99***
		0.216
Likelihood-ratio test of ρ =0:	$\chi 2(1) = 801.512$,	$Prob > \chi 2 = 0.0000$
Number of observations		6771

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Now, consider the three options of the models that control for sample selection. First option is to estimate the model that answers the question: among those who are employed, how has the internet affected utility? we only need to control for the propensity to be in the sample of employed non-searchers. Table 3.9 represents the results from the Heckman selection model, where the selection equation estimates the probability of being an employed non-job-searcher. The results show that those employed individuals, who used internet to search for their current job, have higher utility from the job, while there is sample selection, but inverse Mill's ratio is insignificant. The concern here is that we can not generalize the results because employed people may be different from unemployed in ways correlated with the internet so that we don't get the effect of the internet in general on utility outcomes. It is almost a censoring problem because those who continue to search may be more likely to use the internet and end up in higher quality matches. If this is the case, we underestimate the effect of the internet on facilitating higher utility, and the inverse Mill's ratio is not properly estimated, since we fail to identify selection. As to the effect of other variables in the main equation on utility from the job after controlling for selection into being employed non-searcher, being a female has negative significant effect on utility from the job. Women are less happy on the jobs and that might be explained by the fact that there exists gender wage gap and utility index accounts for monetary component of the job as well as non monetary. Next section of this chapter analyses wage difference by gender and compares it to difference in utility from the job. Also, being a full time student (continuing post baccalaureate education) while employed has even greater negative significant effect on utility from the job. That might be because of the differences in wages and because this variable is correlated with being a part time worker (for medical interns and graduate TA' wages are much lower than for full time workers and fringe benefits might be very limited). Also, those who continue their education hope to find better jobs after obtaining new degree, or they hope for more opportunities for promotion and higher wages, thus, their assessment of their current jobs might depend on their expectations about the future job opportunities. There might be an explanation of why they are not searching for new jobs (Post BA full time variable is positive and significant in the selection equation): often companies pay for the education of their employees.

Second model answers the more general question: how does the internet job search affect utility for everyone? we need to control for both the propensity to be employed and not searching. Given we have some empirical justification to combine those employed searchers into the comparison group with unemployed, we can do the straightforward sample selection of those who are in the sample and those who are not. Table 3.10 represents the results from the Heckman selection model, where selection equation estimates the probability of being a non-job-searcher. The results are very similar to previous ones. The concern here is that by doing that we make the assumption that unemployed searchers and employed searchers are homogeneous. Again, empirically they seem more alike than employed searchers and non-searchers from analysis above, but still we might just be unsuccessful in capturing sample selection. Though, the robustness of the coefficient on IJS variable, as well as other ones, is a good sign.

Relaxing the assumption that searchers are all the same and not heterogeneous in employment status, we estimate third model that separately controls for selection into both, employment and search status (double selection). Here we acknowledge that

internet job search is not measured the same way by our comparison groups, so that it is inappropriate to put into the search equation (of bivariate probit, Table 3.8) (it is measured differently for those who are employed searchers versus not). The results from the OLS regression of the internet job search, propensity to be employed and propensity not to search on utility are reported in the Table 3.11. They show that the internet job search influences utility positively (and it is significant), and the inverse Mill's ratio that controls for propensity to be employed is insignificant, as well as the inverse Mill's ratio that controls for propensity to search, meaning that the propensity to search has no impact on utility. The coefficients are very similar to those from previous models and even to the coefficients uncorrected regression (model 2 from the Table 3.11). Positive and significant coefficient of 0.26 - 0.27 on our variable of interest – IJS – translates into approximately 3% of increase in utility index on average, give the mean value of utility index that equals 9.2. Utility differs by gender, and comparing the models from Table 3.11 to Table 3.11, we observe that negative effect of being a female on utility index ranges from 0.57 to 0.70, translating into approximately 7% of gender gap in utility on average.

Thus, assuming that we corrected for sample selection properly, we find strong positive effect of the internet job search on individual's utility from the job. Though, the implications of using this approach are unclear, because it does not capture the correlation between error terms in the main equation and those from selection equations.

Table 3.9 Influence of the internet job search on Utility among those who are employed (corrected for selection into "No Employed Search" status)

Variable	Coefficient
IJS	0.27*
	0.108
Female	-0.61***
	0.105
Age	-0.01
	0.018
Married	-0.05
	0.181
Children	0.02
	0.162
White	0.09
	0.168
Asian	-0.19
	0.275
College GPA	-0.01
	0.209
PostBA Full time	-1.22***
	0.149
Constant	11.40***
	1.292
Selection: No Employed Search	
Female	0.05
	0.038
Age	-0.01
	0.006
Married	0.23***
	0.043
Children	-0.05
	0.086
White	0.11*
	0.051
Asian	0.08
	0.095
College GPA	0.27***
	0.038
Female*Children	0.09
	0.103
Employed while enrolled in college	-0.15***
	0.046
Student Loan	-0.08*
	0.04
PostBA Full time	0.06
	0.054
Constant	-0.04
	0.199
Mills: lambda	*-2.02*
	1.361
Number of observations	6274
Number of observations (uncensored)	4623

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Table 3.10 Influence of the internet job search on Utility among those who are employed and do not search (corrected for selection into "No Search" status, using Heckman selection model)

Variable	Coefficient
IJS	0.27*
	0.108
Female	-0.63***
	0.123
Age	0.01
	0.024
Married	-0.33
	0.32
Children	-0.06
	0.195
White	-0.02
	0.219
Asian	-0.09
	0.307
College GPA	-0.29
	0.355
PostBA Full time	-1.11***
	0.17
Constant	13.23***
	2.25
Selection: No Search	
Female	0.03
	0.036
Age	-0.01
	0.006
Married	0.25***
	0.041
Children	0
	0.083
White	0.10*
	0.049
Asian	-0.02
	0.087
College GPA	0.27***
	0.035
Female*Children	0.07
	0.1
Employed while enrolled in college	-0.07
	0.042
Student Loan	-0.07
	0.037
PostBA Full time	-0.03
	0.049
Constant	-0.16
	0.189
Mills: lambda	*-3.92*
Number of observations	6620
Number of observations (uncensored)	4623

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Table 3.11 OLS regression of internet job search on utility among the employed non-searchers, correcting for double selection compared to uncorrected OLS regression

Variable	Corrected for double SS	Uncorrected
	1	2
IJS	0.27*	0.26*
	0.109	0.108
Female	-0.70***	-0.55***
	0.164	0.093
Age	0.02	-0.01
	0.041	0.016
Married	-0.63	0.15
	0.849	0.107
Children	-0.09	0.03
	0.219	0.152
White	-0.16	0.21
	0.400	0.141
Asian	-0.18	-0.11
	0.277	0.254
College GPA	-0.70	0.26**
	1.001	0.098
Post BA Full time	-1.24***	-1.17***
	0.176	0.136
Inv. mills *Employment*	1.33	-
	1.706	
Inv. mills *NoSearch*	-7.07	-
	7.124	
Constant	15.85*	9.66***
	6.432	0.504
Number of observations	4623	4623

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

3.5.2 Description of the results from models of earnings

For comparison we perform the same type of analysis, as in the previous section, to explore the role of the internet job search on wages, using log of annual earnings. First, we use same technique to address measurement issue in the variable of interest.

As shown in Table 3.12, among the employed, the internet job search has positive significant effect on earnings controlled for demographics and ability in every specification of the model.

After control for search status, to capture separate effect of being non-searcher, and find the marginal effect of the internet. In the model 3, Current Job Search, as predicted, is negatively correlated with earnings from the job and now the marginal effect of the internet job search on earnings is positive and significant. Online search increases utility by 8% (marginal effect on IJS on log of earnings is 0.7+0.1).

The effect of the past internet on wages increases to 9%, when we use only the sample of employed non-searchers, but control for double selection (model 4 of the Table 3.12), using two inverse Mill's ratios from bivariate probit (which appear to be insignificant).

Table 3.13 represents the effect of the internet job search on log of annual earnings among the employed, using Heckman's selection model to correct for sample selection with two model specifications (different types of correction): into being employed non-searchers (first model) and into being non-searchers (second model). The results are very similar and correspond to the results from uncorrected OLS regression (model 5 of the Table 3.12). It testifies that the consequences of the sample selection might be very insignificant, but it is the case only if we identify lambda's properly.

The coefficient on Internet Job Search in wage regression is much smaller than in the utility regression: 0.07 to 0.09 in wage regression compared to 0.26 to 2.27 in utility regression, but the magnitude of the influence of IJS in wage regression is greater: 7%-9% compared to approximately 3% of increase in utility index on average, give the mean value of utility index that equals 9.2. It might be explained by the fact that the internet job searchers have higher preferences for non-monetary characteristics and higher wages would not necessary mean a utility gain if there are not accompanied with some set of non-monetary benefits. This way, looking just at the effect of the internet job search on wages we overestimate increase in individual well-being.

The same is with the gender effect on wages and on utility index. There is approximately 7% of decrease in utility index on average, which is associated with being a female, but the decrease in earnings is much greater – 19-20%. The differences by enrollment status: Full time students get lower wages (83% of differences, Post BA Full time is negative and significant) and lower utility from the job, represented by the utility index, (14% of difference on average).

Table 3.12 The effect of the internet job search on log of annual earnings

Variable	Whole sample of the employed			The sample of the employed non-searchers	
				(corrected for SS)	(uncorrected for SS)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	1	2	3	4	5
IJS	0.02	-0.10***	0.07**	0.09***	0.08***
	0.015	0.02	0.028	0.02	0.02
Female	-0.19***	-0.19***	-0.19***	-0.20***	-0.19***
	0.015	0.015	0.015	0.031	0.017
Age	0.02***	0.02***	0.02***	0.02*	0.02***
	0.003	0.003	0.003	0.008	0.003
Married	0.04*	0.04*	0.03	-0.03	0.01
	0.017	0.017	0.017	0.163	0.02
Children	0.01	0.02	0.02	0.03	0.03
	0.024	0.024	0.024	0.042	0.029
White	-0.05*	-0.06**	-0.06**	-0.07	-0.05
	0.022	0.022	0.022	0.076	0.026
Asian	0.16***	0.15***	0.14***	0.16**	0.18***
	0.04	0.039	0.039	0.052	0.048
College GPA	0.02	0.01	0	-0.04	0.01
	0.016	0.015	0.015	0.191	0.018
Post BA Full time	-0.76***	-0.75***	-0.76***	-0.83***	-0.82***
	0.022	0.022	0.022	0.033	0.025
IJS*No-Employed-Search	-	0.22***	0.01	-	-
		0.025	0.034		
Current Job Search	-		-0.20***	-	-
			0.024		
Inv.mills *Employment*	-			0.27	-
				0.321	
Inv.mills *NoSearch*	-			-0.39	-
				1.363	
Constant	9.94***	9.96***	10.02***	10.35***	10.03***
	0.081	0.08	0.08	1.23	0.095
Number of observations	6661	6661	6661	4428	4428

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Table 3.13 The effect of the internet job search on log of annual earnings among the employed (correcting for sample selection with Heckman's model)

Variable	Correction for SS into being employed non-searchers	Correction for SS into being non-searchers
	Coefficient	Coefficient
	1	2
IJS	0.08***	0.08***
	0.02	0.02
Female	-0.20***	-0.20***
	0.02	0.024
Age	0.02***	0.02***
	0.004	0.005
Married	-0.02	-0.07
	0.035	0.066
Children	0.02	0.01
	0.03	0.037
White	-0.07*	-0.09
	0.033	0.046
Asian	0.16**	0.18**
	0.051	0.056
College GPA	-0.04	-0.09
	0.042	0.078
Post BA Full time	-0.83***	-0.81***
	0.028	0.03
Constant	10.31***	10.62***
	0.255	0.48
Selection equation:	*No Employed Search*	*No Search*
Female	0.06	0.04
	0.039	0.037
Age	-0.01	-0.01
	0.006	0.006
Married	0.22***	0.25***
	0.044	0.042
Children	-0.03	0.02
	0.087	0.084
White	0.13*	0.12*
	0.052	0.05
Asian	0.08	-0.02
	0.096	0.089
College GPA	0.28***	0.28***
	0.038	0.036
Female*Children	0.08	0.06
	0.104	0.101
Employed while enrolled in college	-0.15**	-0.07
	0.046	0.043
Student Loan	-0.06	-0.05
	0.04	0.038
PostBA Full time	0.08	-0.01
	0.054	0.049
Constant	-0.06	-0.19
	0.202	0.192
Mills: lambda	-0.31	-0.63
	0.269	0.506
Number of observations	6079	6425
Number of observations (uncensored)	4428	4428

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

3.6 Conclusion

The inverse Mill's ratios are not significant, though, compared to uncorrected model, after controlling for sample selection coefficient on our variable of interest (IJS) becomes larger in magnitude and remains significant. Insignificance of lambdas might be a sign that we did not identify selection properly, but stability of the coefficient on our variable of interest implies that the positive significant effect of IJS on utility is robust[65].

Among those individuals that are employed and do not search for a job anymore, those who were searching for their jobs using internet get higher utility compared to those who used only traditional job search methods. We can conclude that the internet job search improves quality of match. Next step is to control for unobserved heterogeneity, but the nature of the dataset (it is a cross-section, but there is one longitudinal aspect - the question about past internet job search) does not let us to use fixed effect model.

The question we were seeking to answer in this part of the research was, How the new job search strategy (internet job search) that appeared recently affected the well-being of the workers? Internet job search might have appeared to be a substitute for some other job search methods, than we would not observe any difference in the search outcome (utility on the job), but the results we get are consistent with our priors – the internet job search, when used alone or in combination with other job search methods helps to find better jobs, the jobs that give higher utility[66].

It reveals the place in distribution, by increasing the information set, providing more information about the jobs, than other methods, provide better information about non-pecuniary aspects of the jobs, and decreases the costs of search.

[65]More results from sensitivity analysis are available upon request. If we add more variables into the main regression, the coefficient of interest are stable. Adding the control for poverty level %'s does not change the results much.

[66] The data we use comes from the year 2000, the sample is homogeneous in terms of the internet access and internet use, since it is the sample of college graduates, though unobserved heterogeneity remains an issue.

Conclusions

Viewing job match quality from the employee's perspective, this dissertation is an attempt to identify the factors that determine employee's utility from the job. It uses self-assessed job satisfaction on seven job aspects and overall job satisfaction to construct a measure for individual utility from the job. This dissertation uses the sample of recent college graduates, coming from the Baccalaureate and Beyond 2000/01 survey followed up one year after graduation, to construct a measure of individual's utility on the job and investigate the effect of the internet job search on individual's well-being on the job, using constructed utility index.

Performing correlation analysis of binary indicators of job satisfaction we find that overall job satisfaction is highly correlated with satisfaction on all seven variables representing satisfaction on seven job aspects. Also, we find that highest correlation is between overall job satisfaction and satisfaction with importance and challenge of work, not with satisfaction with pay. Therefore, the first conclusion is that individual's utility from the job has several components, besides monetary wages. Accounting for that finding we construct an index of utility, which employs all of the information on self-reported job satisfaction available from the data. It summarizes seven categories of job satisfaction that are combined in two categories: pecuniary aspects and non-pecuniary aspects.

To construct the utility index, first, we use factor analysis to explore the relations among seven indicators of job satisfaction. We find that those seven indicators might be combined in two factors: one that represents all non-monetary indicators and one that contains all the information on monetary one. Thus, the second conclusion is that there are at least two major factors that utility from the job depends on. This way we reduce the number of variables that represent job satisfaction to two, naming them "Pecuniary factor" and "Non-pecuniary factor" accordingly to the nature of indicators they summarize. Next, we analyze the effect of those factors on the probability of being satisfied overall with the job and find that non-pecuniary factor is at least as influential as pecuniary one, and that wages are negatively significant for the probability of being overall satisfied with the job, after controlling for both factors, even though wages alone have positive effect on overall job satisfaction. Our third conclusion is that non-monetary aspects of the job play major role in defining individual's utility from the job an should not be disregarded. This finding is consistent with findings of Freeman (1978), Atrostic (1982), Bartel (1982), Gottschalk and Maloney (1985), Clark (2001), and Dey and Flinn (2005).

We construct a continuous utility index in a way that takes into account well-being of the individual regarding non-monetary characteristics of the job, as well as monetary ones. We estimate the effect of various job attributes, wages, and individual characteristics on the total value of utility from the job, in three model settings that differ

by the variable, which represents individual's utility from the job: binary overall job satisfaction, log of annual earnings, and index of utility obtained from factor analysis. This dissertation is among the first to provide a comparison of several measures of individual utility from the job. It uses gender difference to compare three approaches of measuring individual utility from the job. Our third conclusion is that the effect of gender might be overestimated when well-being on the job is represented only by monetary wages. In the model, which uses utility index as a measure of individual's utility, being a female is also negatively correlated with utility, but the magnitude of the effect is smaller then in the model, that used wages. Though wages are important, other job aspects play major role when individual gives an assessment of job satisfaction. Given historical trends in society, males and females are different in terms of their preferences. Usually women prepare themselves to be a caregiver for the children or combine that role with working in the labor force. Thus, women might consider themselves happy with their jobs even if their salaries are lower then the salaries of men, because they might value non-pecuniary aspects of the job higher then pay. Moreover, predominantly female occupied industries often have lower salaries and considering the study of Easterlin (2003) individuals might assess their well-being by comparing themselves to other individuals. Thus, since there are predominantly female oriented jobs that have low wages, women that work there do not consider themselves unhappy comparing their job packages to those of other females.

This does not prove non-existence or existence of the gender wage gap, but rather provides some justification of subjective approach to study utility from the job, adding to the findings of Clark (2001), Frey and Stutzer (2002), and Easterlin (2003).

Overall, our utility index captures not only monetary component of the job, but also non-monetary one, therefore we observe less variation in utility from the job, when using indicators of job satisfaction to proxy it, opposite to just using wages. The fact that individuals are staying at lower paying jobs is explained by their satisfaction from other job characteristics besides wages.

The individuals differ among themselves by their preferences, which depend on their characteristics (observable and unobservable). Hence, comparing two individuals that hold different compensation packages one might find that they have same job satisfaction (same level of utility). That might be because of different weights that individuals assign to each component. That issue of difference in the weights that individuals put on different job aspects is to be addressed in the future work.

And finally, this dissertation uses constructed utility index to explore the role of the information in job match quality. This paper is among the first to look at the influence of the information represented by use of internet job search method on individual's well-being on the job. In the attempt to identify the consequences of proliferation of the information through the internet and following Autor (2001) and Freeman (2002), which theoretically discuss the importance of such research, this dissertation empirically analyses the effect of the internet job search on individual's subjective utility from the job. It employs the retrospective information on job search methods used prior to finding the current job, controlling for observed heterogeneity and correcting for sample selection. Extending the work of Fountain (2005), which uses wages as an outcome of job search process and comes to inconclusive results, we compare the effect of the internet job search on each of the two measures of utility

from the job – wages and utility index. In both cases we find strong positive effect of the internet job search on individual's well-being on the job among the employed controlling for sample selection into both employment and search status. We find also that those who search online have higher probability of being unemployed and search. This might be explained by the fact that the information online is less costly than almost all of the "traditional" job search methods, and also more accessible than most of them, therefore unemployed job searchers can afford longer unemployment spells, as well as employed job searchers might spend more time searching, waiting for better offer to come along.

In sum, this dissertation redefines latent utility taking into account the multidimensionality of job satisfaction, and considers the role of both, non-monetary and monetary, components of the job in individual's utility on the job, while identifying the role advances of information technology in the job match quality, including up-to-date job search methods, such as the internet job search. It examines cross-sectional variations in match quality as a result of the use of internet job search.

This dissertation not only studies important issues and has several essential findings, but also provides an agenda for future work. Future research will examine several questions. First, we will address the issue of weights that individuals put on different job aspects when give an assessment of job satisfaction. More advanced technique of factor analysis will be used to allow for thresholds that individuals compare themselves to.

Second, it is unclear what people mean answering that they look for jobs on the internet. To answer this question we will have to deal with heterogeneity in responses on question about the internet job search and try control for unobserved heterogeneity using fixed effects model and longitudinal data.

Third, the more general question, Why there may be less monetary value on the predominantly female oriented jobs, and are these other non-monetary job attributes suffice as a justifiable compensating differential? This question is partially addressed by the analysis of gender differences in utility by major in comparison to those in wages by major, represented in the Appendix.

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Appendix

Table A1. Factor analysis and correlations

			1. Method:	**iterated**	**principal**	**factors**	**(7057 obs.)**			
				Factor1	**Factor2**	**Factor3**	**Factor4**	**Factor5**	**Factor6**	**Factor7**
			Eigenvalue	3.89	0.58	0.31	0.11	0.06	0.01	0.00
	0.50		Pay	0.52	0.42	0.21	-0.08	0.04	0.06	
	0.37		Benefits	0.62	0.44	-0.22	-0.04	0.07	-0.04	
Uniqueness	0.25	**Factor loadings**	Challenge	0.78	-0.15	0.31	0.16	0.04	0.00	
	0.31		Promotion	0.79	0.04	0.19	-0.10	-0.13	-0.05	
	0.08		UseEd	0.89	-0.32	-0.07	-0.06	0.15	-0.01	
	0.09		GetMoreEd	0.88	-0.26	-0.20	-0.08	-0.10	0.05	
	0.45		Security	0.66	0.16	-0.19	0.23	-0.06	0.01	
			Pay	0.11	0.33	0.21	-0.15	0.07	0.14	
			Benefits	0.14	0.52	-0.28	-0.05	0.17	-0.10	
			Challenge	0.17	-0.07	0.62	0.48	0.02	0.01	
		Scoring coefficients	Promotion	0.15	0.16	0.37	-0.23	-0.34	-0.17	
			UseEd	0.28	-0.55	-0.06	-0.21	1.07	-0.18	
			GetMoreEd	0.28	-0.31	-0.62	-0.24	-0.87	0.31	
			Security	0.10	0.19	-0.20	0.44	-0.08	0.00	
			Factors	Mean	Std. Dev.	Min	Max			
			ipf1	0	0.81	-2.26	0.68			
			ipf2	0	0.90	-2.47	2.58			
			ipf3	0	0.87	-2.74	2.93			
Correlations				ipf1	ipf2	ipf3				
			ipf1	1						
			ipf2	-0.16	1					
			ipf3	-0.07	0.12	1				
			2. Method:	**principal**	**factors**					
				Factor1	**Factor2**	**Factor3**	**Factor4**	**Factor5**	**Factor6**	**Factor7**
			Eigenvalue	3.74	0.41	0.14	-0.04	-0.07	-0.13	-0.19
	0.60		Pay	0.51	0.36	0.11				
	0.52		Benefits	0.59	0.33	-0.14				
Uniqueness	0.37	**Factor loadings**	Challenge	0.76	-0.10	0.21				
	0.36		Promotion	0.78	0.06	0.15				
	0.15		UseEd	0.87	-0.28	-0.03				
	0.16		GetMoreEd	0.87	-0.23	-0.14				
	0.54		Security	0.64	0.14	-0.16				
			Pay	0.11	0.29	0.08				
			Benefits	0.11	0.36	-0.16				
			Challenge	0.14	-0.01	0.40				
		Scoring coefficients	Promotion	0.17	0.20	0.31				
			UseEd	0.29	-0.52	0.05				
			GetMoreEd	0.28	-0.29	-0.50				
			Security	0.10	0.20	-0.19				
			Factors	**Mean**	**Std. Dev.**	**Min**	**Max**			
			pf1	0	0.80	-2.20	0.66			
			pf2	0	0.78	-2.18	2.26			
			pf3	0	0.62	-1.94	2.13			
Correlations				pf1	pf2	pf3				
			pf1	1						
			pf2	-0.19	1					
			pf3	-0.06	0.17	1				

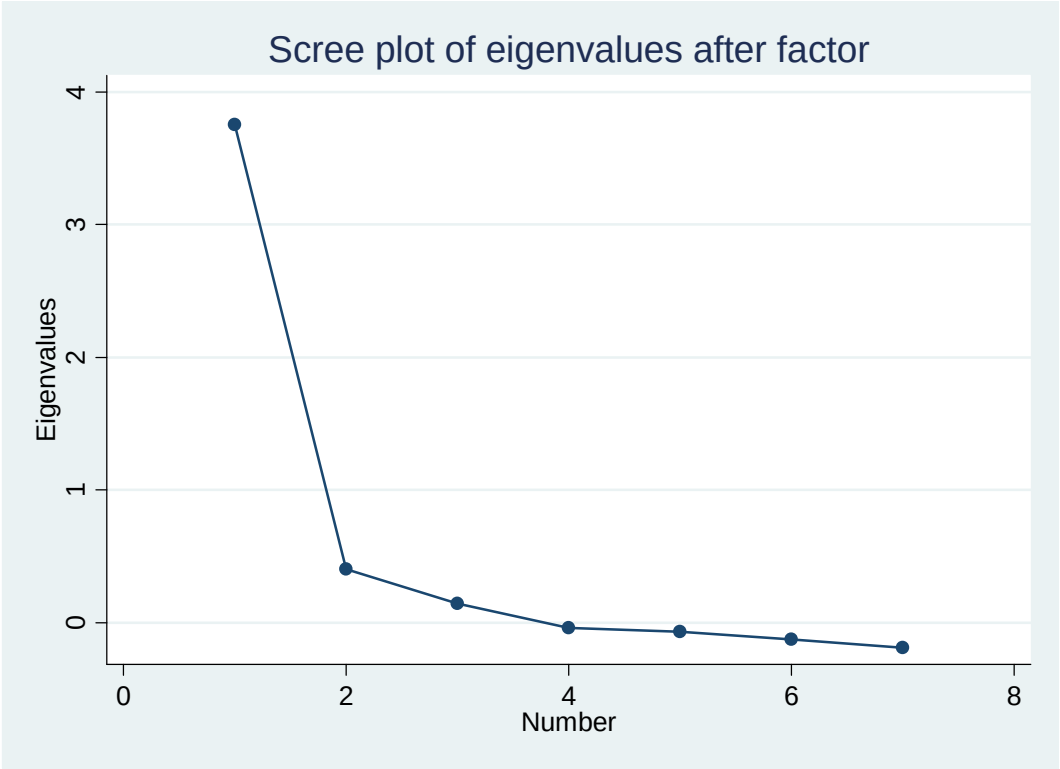

Figure A1. Cutoff rule of Cattell.

Table A2. Choice of the exclusion restriction for Heckman Selection model. Matrix of tetrachoric correlations

Variable	Employed	Female	Married	Children	White	Female*Children	Employed whhile enrolled	Student loan	Post BA full time
Employed	1	-	-	-	-	-	-	-	-
Female	-0.012	1	-	-	-	-	-	-	-
Married	0.202	0.031	1		-	-	-	-	-
Children	0.186	0.007	0.718	1	-	-	-	-	-
White	0.089	-0.040	0.160	-0.175	1	-	-	-	-
Female*Children	0.081	1.000	0.605	1.000	-0.212	1	-	-	-
Employed while enrolled	0.162	-0.007	-0.020	0.005	-0.000	-0.143	1	-	-
Student loan	-0.002	0.012	0.018	0.166	-0.202	0.236	0.174	1	-
Post BA full time	-0.173	0.0211	-0.205	-0.202	-0.066	-0.282	0.092	-0.083	1
N=6468									

Table A3. Choice of the exclusion restriction for Heckman Selection model. Matrix of tetrachoric correlations

Variable	Female	Married	Children	White	Female*Children	Employed whhile enrolled	Student loan	Post BA full time	Overall Satisfaction
Female	1	-	-	-	-	-	-	-	-
Married	0.027	1	-	-	-	-	-	-	-
Children	-0.004	0.714	1	-	-	-	-	-	-
White	-0.054	0.153	-0.184	1	-	-	-	-	-
Female*Children	1	0.598	1	-0.224	1	-	-	-	-
Employed while enrolled	-0.013	-0.027	0.014	-0.012	-0.143	1	-	-	-
Student loan	0.019	0.009	0.150	-0.207	0.215	0.177	1	-	-
Post BA full time	0.034	-0.206	-0.185	-0.061	-0.257	0.113	-0.086	1	-
Overall Satisfaction	-0.077	0.140	0.056	0.154	0.057	-0.076	-0.109	0.140	1
N=6468									

Table A4. Regression of utility index obtained using single factor model from exploratory factor analysis (with control for sample selection)

Variable	Coefficient^	
Log Annual Earnings	0.05	(0.020)*
Age	-0.02	(0.004)***
Female	-0.05	(0.022)*
Married	0.08	(0.024)**
College GPA	0.08	(0.023)***
White	0.10	(0.029)***
Weekly hrs of work	0.00	(0.001)
Current job is non-major related	-0.48	(0.026)***
Medical Insurance	0.14	(0.045)**
Dental, Optical HI	0.00	(0.039)
Life Insurance	0.10	(0.031)**
Retirement Benefits	0.10	(0.035)**
Stock Option	0.01	(0.026)
Spending Account	0.10	(0.026)***
Employee Discount	-0.08	(0.023)***
Childcare Subsidy	0.08	(0.032)*
Transit Subsidies	0.07	(0.031)*
Fitness Subsidies	0.09	(0.027)***
Employee Counseling (legal)	0.13	(0.025)***
Constant	2.27	(0.216)***
selection		
Female	-0.02	(0.049)
Age	-0.01	(0.008)
Married	0.15	(0.057)**
Children	0.37	(0.129)**
White	0.20	(0.058)***
College GPA	0.06	(0.048)
Female*Children	-0.28	(0.148)
Employed While Enrolled	0.25	(0.054)***
Student Loan	0.07	(0.050)
Post BA Full tie	-0.33	(0.060)***
Constant	0.92	(0.256)***
Rho	0.16	(0.064)***
Sigma	0.74	(0.008)***
Lambda	0.12	(0.048)***
LR test (rho=0)	4.17	
Prob > chi2(1)	0.041	
Number of observation	5741	
Censored observation	643	
Uncensored observations	5098	
Log likelihood	-7638.17	
Wald chi2(.)	1101.31	

^ standard errors are in parenthesis; *p<0.05; **p<0. 01; *** p<0.001.

Table A5. Probit regression^

Variable	Probability of being employed	Probability of being a non-job-searcher	Probability of being a non-job-searcher	Probability of being an employed non-job-searcher
	1	2	3	4
IJS	-0.52***	-0.96***	-	-0.94***
	0.059	0.035		0.036
Female	-0.1	-0.02	0.01	0.01
	0.065	0.036	0.034	0.037
Age	-0.01	-0.01	-0.01	-0.01
	0.011	0.006	0.006	0.007
Married	0.23**	0.22***	0.27***	0.20***
	0.079	0.043	0.041	0.045
Children	0.32	-0.02	0.04	-0.05
	0.201	0.06	0.056	0.062
White	0.06	0.07	0.08	0.05
	0.087	0.052	0.049	0.054
Asian	-0.21	0.17	0.03	0.24*
	0.136	0.09	0.086	0.098
College GPA	0.09	0.23***	0.25***	0.25***
	0.063	0.037	0.035	0.039
Female*Children	-0.24	-	-	-
	0.224			
Employed while enrolled in college	0.23***	-	-	-
	0.069			
Stud. Loan	0.02	-	-	-
	0.067			
Constant	1.74***	0.33	-0.19	0.36
	0.341	0.194	0.183	0.203
Number of observations	5871	6617	6720	6301

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001,

^ those who continue their education full time are excluded from the analysis.

Table A6. Bivariate probit regression (SUR): probability of being a non-job-searcher and probability of being employed estimated together

Variable	Probability of being Employed	Probability of being Non- search
	Coefficient	Coefficient
	1	2
IJS	-0.02	-
	0.055	
Female	-0.08	0.02
	0.063	0.036
Age	-0.01	-0.01
	0.011	0.006
Married	0.27***	0.29***
	0.075	0.043
Children	0.35	0.06
	0.192	0.06
White	0.05	0.07
	0.085	0.052
Asian	-0.25	-0.04
	0.132	0.092
College GPA	0.13*	0.27***
	0.062	0.038
Female*Children	-0.27	-
	0.21	
Employed while enrolled in college	0.25***	-
	0.062	
Took student loan	0.04	-
	0.062	
Constant	1.31***	-0.28
	0.335	0.195
ρ	0.98***	
	0.256	
Likelihood-ratio test of ρ =0:	$\chi 2(1) = 607.905$,	$Prob > \chi 2 = 0.000$
Number of observations	5871	

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

^ those who continue their education full time are excluded from the analysis.

Table A7. Influence of the internet job search on Utility among those who are employed non-searchers (corrected for sample selection)^

Variable	Corrected for sample selection into	
	"No Employed Search"	"No Search"
	Coefficient	Coefficient
	1	2
IJS	0.24*	0.24*
	0.111	0.111
Female	-0.64***	-0.63***
	0.109	0.119
Age	-0.01	0
	0.019	0.023
Married	-0.05	-0.32
	0.224	0.375
Children	-0.06	-0.14
	0.168	0.203
White	0.15	0.08
	0.166	0.2
Asian	-0.03	0.08
	0.285	0.319
College GPA	0.09	-0.14
	0.237	0.364
Constant	11.15***	12.69***
	1.482	2.353
Selection:	*No Employed Search*	*No Search*
Female	0.04	0.01
	0.041	0.039
Age	-0.01	-0.01
	0.007	0.006
Married	0.26***	0.29***
	0.045	0.044
Children	-0.01	0.03
	0.092	0.09
White	0.06	0.07
	0.055	0.053
Asian	0.04	-0.05
	0.101	0.094
College GPA	0.27***	0.27***
	0.04	0.038
Female*Children	0.08	0.05
	0.109	0.106
Employed while enrolled in college	-0.13**	-0.06
	0.048	0.045
Student Loan	-0.08	-0.07
	0.042	0.04
Constant	-0.06	-0.16
	0.211	0.202
Mills: lambda	-1.93	-3.54
	1.59	2.503
Number of observations	5488	5762
Number of observations (uncensored)	4023	4023

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

^ those who continue their education full time are excluded from the analysis.

Table A8. OLS regression of internet job search on utility among the employed non-searchers, correcting for double selection compared to uncorrected OLS regression

Variable	Corrected for double SS	Uncorrected
	Coefficient	Coefficient
	1	2
IJS	0.23*	0.24*
	0.111	0.111
Female	-0.69***	-0.60***
	0.134	0.098
age	0.01	-0.02
	0.034	0.017
Married	-0.61	0.18
	0.983	0.112
Children	-0.19	-0.03
	0.269	0.156
white	0.02	0.22
	0.284	0.148
Asian	0.05	0.01
	0.319	0.268
College GPA	-0.49	0.34***
	0.99	0.102
Inv. mills *Employment*	1.48	-
	2.252	
Inv. mills *NoSearch*	-6.23	-
	7.209	
Constant	14.93*	9.48***
	6.505	0.522
Number of observations	4023	4023

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001,

^ those who continue their education full time are excluded from the analysis.

Table A9. Regression of utility index obtained using single factor model from confirmatory factor analysis (controlling for college major, without control for sample selection)

Variable	Coefficient
IJS	0.24*
	0.108
Female	-0.35***
	0.098
Business/management	-0.02
	0.399
Computer/information sciences	0.66
	0.444
Engineering	0.38
	0.418
Physics/Chemistry	-0.19
	0.495
Math	0.00
	0.000
Life Sciences	-0.6
	0.406
Health	-0.43
	0.398
Vocational/technical	-0.36
	0.47
Education	-0.31
	0.391
Humanities	-1.12**
	0.396
Social/behavioral sciences	-0.87*
	0.389
Other technical/professional	-0.83*
	0.404
Age	-0.02
	0.016
Married	0.1
	0.107
Children	0.03
	0.151
White	0.19
	0.14
Asian	-0.33
	0.253
GPA (while in college)	0.22*
	0.098
Post BA Full Time	-1.06***
	0.137
Constant	10.38***
	0.631
Number of observations	4599

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001,

Table A10. Regression of utility index obtained using single factor model from confirmatory factor analysis by college major (without control for sample selection)

Variable / College Major	Business/ management	Computer/ information sciences	Engineering	Physics/ Chemistry	Math	Life Sciences	Health	Vocational/ technical	Education	Humanities	Social/ behavioral sciences	Other technical/ professional
IJS	-0.06	0.83	0.45	-0.55	1.43	1.04**	0.21	1.79*	0.11	0.57	-0.02	-0.54
	0.302	0.441	0.337	0.836	0.977	0.396	0.335	0.74	0.26	0.365	0.269	0.357
Female	-0.04	0.05	0.39	-0.14	1.66*	-0.98**	0.51	-0.79	-0.42	-0.46	-0.57*	-1.04**
	0.261	0.444	0.412	0.733	0.81	0.342	0.317	0.643	0.243	0.323	0.233	0.329
Age	0.05	-0.14*	-0.03	-0.44**	-0.02	-0.1	0.01	-0.06	-0.10**	-0.02	-0.01	0.09
	0.044	0.062	0.054	0.152	0.142	0.074	0.042	0.106	0.038	0.055	0.043	0.067
Married	0.51	0.01	0.41	0.73	0.7	-0.1	0	-0.22	-0.18	0.38	-0.13	0.2
	0.33	0.448	0.395	0.885	0.89	0.444	0.29	0.741	0.212	0.366	0.288	0.371
Children	-0.08	0.99	-0.55	1.47	0.86	0.2	-0.33	1.09	0.32	-0.29	0.07	-0.39
	0.464	0.625	0.575	1.67	1.4	0.66	0.381	0.941	0.288	0.584	0.396	0.603
White	0.2	0.82	-0.02	-0.01	-2.54	0.08	0.09	1.28	0.59	0.12	-0.08	0.47
	0.404	0.672	0.482	1.217	2.058	0.497	0.396	1.02	0.342	0.478	0.329	0.467
Asian	-0.74	0.95	0.17	0.63	-2.04	-0.42	-0.98	-1.13	0.42	-1	-0.95	0.23
	0.639	0.854	0.622	1.822	2.462	0.835	0.948	2.44	1.038	0.925	0.621	1.302
GPA (while in college)	0.55	0.2	0.39	0.92	-0.37	-0.15	-0.08	0.85	0.29	-0.09	0.25	0.17
	0.284	0.402	0.314	0.776	1.057	0.388	0.302	0.698	0.24	0.316	0.236	0.331
Post BA Full Time	-0.36	0.18	0.08	-1.73*	1.26	-1.55***	-2.07***	-2.88**	-0.36	-1.29**	-0.88**	-0.36
	0.53	0.974	0.592	0.803	1.197	0.423	0.368	1.066	0.426	0.42	0.288	0.523
Constant	7.35***	12.82***	10.14***	17.63***	12.83*	13.09***	9.95***	8.06*	11.44***	10.36***	9.60***	7.39***
	1.335	1.854	1.714	4.495	4.995	2.122	1.334	3.483	1.245	1.745	1.27	1.897
Number of observations	490	162	279	87	64	370	513	112	750	558	818	396

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001

Table A11. Regression of wages (controlling for college major, without control for sample selection)

Variable	Coefficient
IJS	0.07***
	0.02
Female	-0.11***
	0.018
Business/management	0.14*
	0.062
Computer/information sciences	0.35***
	0.072
Engineering	0.30***
	0.066
Physics/Chemistry	0.00
	0.000
Math	-0.01
	0.088
Life Sciences	-0.17**
	0.063
Health	0.05
	0.062
Vocational/technical	-0.06
	0.076
Education	-0.12*
	0.060
Humanities	-0.19**
	0.061
Social/behavioral sciences	-0.17**
	0.059
Other technical/professional	-0.07
	0.063
Age	0.01***
	0.003
Married	0.00
	0.019
Children	0.03
	0.028
White	-0.04
	0.026
Asian	0.10*
	0.046
GPA (while in college)	0.01
	0.018
Post BA Full Time	-0.78***
	0.025
Constant	10.09***
	0.107
Number of observations	4402

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001,

Table A12. Regression of wages by college major (without control for sample selection)

Variable / College Major	Business/ management	Computer/ information sciences	Engineering	Physics/ Chemistry	Math	Life Sciences	Health	Vocational/ technical	Education	Humanities	Social/ behavioral sciences	Other technical/ professional
IJS	0.01	0.12	0.05	0.19	0.04	0.17*	0.05	0.16	0.07	0.20**	0.00	0.03
	0.046	0.068	0.050	0.106	0.139	0.078	0.065	0.107	0.038	0.06	0.059	0.067
Female	-0.13**	-0.22**	-0.12*	-0.10	-0.06	-0.20**	-0.09	-0.25**	-0.06	-0.06	-0.11*	-0.13*
	0.039	0.068	0.058	0.091	0.105	0.068	0.063	0.094	0.035	0.052	0.052	0.062
Age	0.02*	0.00	0.00	0.02	0.03	0.03	0.02	0.03	0.00	0.00	0.01	0.03*
	0.007	0.010	0.008	0.019	0.019	0.015	0.008	0.016	0.005	0.009	0.009	0.013
Married	-0.06	-0.05	0.03	0.06	-0.03	0.02	-0.01	-0.11	-0.01	-0.02	0.02	0.04
	0.050	0.069	0.058	0.107	0.119	0.088	0.057	0.110	0.031	0.060	0.064	0.070
Children	0.21**	0.23*	0.19*	-0.20	-0.08	0.22	-0.02	-0.07	-0.01	-0.06	-0.02	-0.03
	0.070	0.098	0.087	0.205	0.197	0.132	0.075	0.134	0.042	0.096	0.089	0.115
White	0.08	0.00	0.04	0.05	-0.32	-0.14	-0.07	-0.06	-0.10	-0.10	-0.03	-0.06
	0.060	0.106	0.077	0.154	0.315	0.100	0.079	0.148	0.049	0.079	0.072	0.090
Asian	0.16	0.10	0.17	0.22	0.58	0.18	-0.05	0.15	0.1	0.17	-0.03	0.17
	0.100	0.135	0.096	0.231	0.355	0.165	0.19	0.355	0.147	0.157	0.135	0.239
GPA (while in college)	0.03	0.16*	0.04	-0.10	0.12	-0.03	0.04	-0.01	0.00	-0.07	0.06	0.01
	0.043	0.061	0.047	0.099	0.14	0.076	0.061	0.101	0.034	0.053	0.052	0.065
Post BA Full Time	-0.59***	-0.47**	-0.93***	-0.55***	-0.86***	-0.77***	-1.11***	-0.88***	-0.28***	-0.69***	-0.92***	-0.77***
	0.077	0.155	0.086	0.097	0.156	0.081	0.075	0.15	0.060	0.068	0.064	0.097
Constant	9.97***	10.33***	10.46***	10.10***	9.46***	9.86***	10.09***	9.86***	10.25***	10.42***	9.88***	9.64***
	0.204	0.284	0.258	0.563	0.671	0.417	0.265	0.511	0.18	0.286	0.283	0.361
Number of observations	442	149	255	90	62	366	483	112	728	551	792	372

Legend b/se: *p<0.05; **p<0. 01; *** p<0.001