Compensating Differentials and Worker Selection of Fringe Benefits: Evidence from the Medical Expenditure Panel Survey 1997-2006

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December 2009

Abstract: With rapidly rising health care costs, the goal of attracting and retaining the most productive employees to offset the rising cost of employee benefits has become more important than ever. In this paper, we evaluate empirically the importance of worker selection into jobs with different combinations of fringe benefits and how this impacts mobility and wage outcomes. More precisely, we use a framework in which a worker's decision to move into a job with or without benefits is based on his or her comparative advantage with respect to skills, health status, and unobserved individual-specific traits; we account for a broader set of fringe benefits than health insurance, including whether a worker gets a retirement plan, paid sick leave, or paid vacation and we exploit richer information on health insurance to distinguish between workers who are offered coverage and hold it versus those who are offered and turn it down.

I. Introduction

Since the 1950s, fringe benefits, including employer-provided retirement plans, health insurance, paid time off, and sick leave have become an increasingly important part of workers' compensation. According to the Bureau of Labor Statistics' 2007 Employer Costs for Employee Compensation Survey, among private establishments, fringe benefits accounted for approximately 29.3% of total compensation (U.S. Bureau of Labor Statistics, 2008). While employer-provided benefits are costly, firms may offset these costs through lower wages, implying a predicted, inverse relationship between wages and non-wage benefits.

The idea of a tradeoff between wages and employer-provided benefits has long been accepted from a theoretical standpoint (Woodbury, 1983). However, there is much less agreement within the empirical literature as to whether such a tradeoff exists.[1] Most studies that have used worker-level data do not find evidence of a negative compensating differential. Rather than finding the predicted inverse relationship between wages and benefits, these studies instead find no relationship or a *positive* relationship. A common interpretation of this finding emphasizes the role of worker selection whereby firms may recoup the cost of fringe benefits through attracting and retaining more productive workers. As a result, the estimated tradeoff is contaminated by an ability bias.

In this paper, we are interested in empirically testing the importance of worker selection into jobs with or without benefits and its impact on wages and mobility outcomes. We revisit the question of compensating wage differentials associated with fringe benefits using an empirical approach which, in addition to estimating the effect of fringe benefits on the level of wages (the tradeoff), evaluates empirically the impact of worker selection into jobs with or without benefits on the structure of wages. With increasing costs of fringe benefits, in particular health insurance, analyzing the nature and testing the importance of worker selection can provide valuable insights to the evaluation of the cost of employer-provided benefits.

Cross-sectional studies have been limited in addressing the problem of worker selection stemming from the correlation between unobserved ability and the receipt of a particular fringe benefit. Recognizing this limitation, more recent work has utilized a variety of study designs and econometric techniques, including instrumental variables (Olson, 2002, Jensen and Morrisey, 2001), natural experiments (Gruber, 1994; Adams, 2007), and panel data methods in an attempt to control for individual-specific, time-invariant unobserved effects (Miller, 2004, Simon, 2001, Levy and Feldman, 2001). However, in many instances, these studies still have not found robust evidence of a tradeoff.[2] One possibility is that the estimated relationship between fringe benefit receipt and wages may be contaminated if unobserved individual heterogeneity is time-varying. For example, a worker may search for and switch to a job that better matches his ability and skills, both of which are likely to vary over a worker's career.[3] In this case, a change in the receipt of non-wage benefits

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[1] See Currie and Madrian (1999) for a literature review and a discussion about the empirical debate on the wage-health insurance tradeoff and Morrisey (2002) for a discussion of issues in the empirical literature on compensating wage differentials. Most studies focus on health insurance or on only one benefit. Montgomery, Shaw and Benedict (1992) find a negative trade-off between wages and pension level in the contractual model they estimate. Baughman, DiNardi and Holtz-Eakin (2003) find some evidence of wage reduction associated with the offering of family-friendly practices. Altonji and Usui (2007) find a positive association between hourly wages and paid vacation.

[2] Exceptions to this include Gruber and Krueger (1991) who find evidence of an offset for workers' compensation insurance, Gruber (1994), who looks at the effect of mandated maternity coverage on the wages of women of childbearing age, Miller (2004) who finds an offset equal to 10-11 percent of wages, and Adams (2007) who looks at the effect of a change in premium rating for the small group market in New York.

[3] Ability may not be perfectly observed and workers and firms build expectations about it conditional on past observations of the worker's productivity. Expected ability evolves over time following the evolution of worker productivity. A similar argument could be applied to unobserved heterogeneity coming from individual differences in preferences for benefits. Such preferences may not be known and individuals learn about it as they progress through life, if productivity is a function of this unobservable valuation of benefits.

between the old job and new job may still be correlated with a change in the unobserved ability of the worker and the presence of worker selection stemming from endogenous worker mobility is still affecting the estimates (Gibbons and Katz, 1992).

While this example represents a labor supply-side effect, there may also be a response from the demand-side, whereby skills and unobserved ability are differently rewarded by firms according to whether or not they offer fringe benefits. Workers may not be identically productive across jobs or benefit sectors, defined as groups of jobs classified by whether total compensation includes or does not include particular fringe benefits, and may have a comparative advantage in some jobs or sectors based on skills, health status, and unobserved ability. As a result of non-random selection and the mobility of workers into different benefit sectors, the wage-health insurance tradeoff cannot be fully addressed by simply employing fixed-effects analysis.

The analysis in this paper extends the literature on compensating wage differentials associated with fringe benefits by specifically analyzing the nature and importance of worker selection into firms that offer or do not offer fringe benefits. In contrast to previous studies which have focused mainly on the level effects of benefits, particularly health insurance, on wages, our approach empirically evaluates the importance of worker selection into jobs with or without benefits through an estimation of its effect on wages in terms of the *returns* to holding a job with benefits. While the issue of worker selection into jobs with benefits is not new, especially in the literature stream focusing on health insurance, empirical evidence of its importance is sparse.[4] To our knowledge, the only paper that empirically analyzes worker selection is Lehrer and Pereira (2007) who show that worker selection into jobs with health insurance has taken on increasing importance in explaining the wage inequality in the United States.

The empirical model builds on an extended version of the Mincer wage equation with benefit dummies to capture the compensating wage differentials (or the level effects). We augment this equation by including interactions of the benefit indicators with skills and health status. The interaction terms represent the returns to skills and health status by benefit sectors. Significantly different returns to skills and/or health status across benefit sectors suggests that workers with given levels of skills and health status have a comparative advantage in a particular benefit sector and select into it accordingly. The complete selection model assumes that worker sorting and mobility decisions across benefit sectors are driven by the worker's unobserved individual specific traits, for example preferences for benefits or ability. This model addresses the main issue that has limited prior work: endogeneity in worker mobility across firms. Several recent studies have adopted this approach, analyzing sector-specific wage differentials, whereby sectors are defined by union status (Lemieux, 1998), industries and occupations (Gibbons Katz, Lemieux and Parent, 2005), job ranks (Lluis, 2005) and firm size (Ferrer and Lluis, 2008).

Furthermore, our analysis revisits the issue of the tradeoff between wages and health insurance by taking into account additional variables likely to affect the tradeoff. In particular, we include measures to capture the effect of other forms of non-wage compensation. This is important if

[4] To our knowledge, there is no empirical evidence of worker sorting in the pension literature (or other fringe benefits such as paid vacation or sick leave). However, pension as deferred compensation and its implications in terms of worker selection has been discussed theoretically: pension attracts stayers (Lazear, 1990) or savers (Ippolito, 2002). Some empirical evidence is found in the health insurance literature which shows that workers with low preferences for health insurance are disproportionately employed in firms that do not offer coverage (Marquis and Long (1995), Levy (1998) and Monheit and Vistnes (1999)).

firm compensation policies and a worker's decision to join a firm are based on wages and the full set of benefits, including health insurance, retirement plans, paid vacation, and sick leave. We also consider the influence of a worker's health status (in addition to skills) as well as changes in health status on wages and mobility. Health status has been found to have a significant impact on employment and wages (Pelkowski and Berger, 2004, Kapur, Escarce, Marquis and Simon, 2005). We also explicitly account for differences between workers who have an offer of health insurance and do not hold the coverage relative to those who are offered coverage and hold it. This allows us to test for whether the incidence is specific to only those who hold insurance coverage. Due to data limitations, prior work has not been able to fully account for these other components of compensation and for the health status of the worker.

The methodology in our paper is closely related to Lehrer and Pereira (2007), who also consider the possibility of both supply and demand-side effects of health insurance provision on wages and estimate a wage equation in which skills (including ability) are differentially rewarded by whether a worker receives health insurance or not. Although their estimation methodology permits identification of the returns to ability by health insurance sector while treating health insurance choice as endogenous, their data from the displaced workers supplement of the Current Population Survey (CPS) limits their ability to apply a more general estimation framework which addresses the issue of endogeneity with respect to workers' mobility decisions. Moreover, the CPS only provides information on health insurance, while worker and firm decisions likely depend on other benefits as well (Jensen and Morrisey, 2001).[5] We also extend their analysis by estimating the specific role that a worker's health status plays in his or her selection and mobility across benefit sectors and how this affects wage outcomes.

In this study, we use information from the Household Component of the Medical Expenditure Panel Survey (MEPS) for the years 1997-2006. The MEPS is a rich data source, providing information about workers, characteristics of the establishment(s) at which they are employed over time, and details of their compensation, including wages and the availability of health insurance, a retirement plan, paid vacation, and paid sick leave. Our sample is restricted to individuals aged 19 to 64 who work full time throughout the sample period. We further select individuals who are not married (e.g., single, divorced or widowed) in order to remove the additional complexity that results from spousal health insurance on employment decisions (Dranove, Spier and Baker, 2000, Royalty and Abraham, 2006). To minimize errors in reporting benefits between two consecutive periods, we replicate the analysis of the structure of wages by benefits sector over the sample of job changers.

Our empirical strategy exploits information on worker mobility decisions to quantify the relative importance of worker selection based on observable skills, health status and unobservable ability. We then test for the existence of compensating wage differentials after controlling for the presence of these various sources of selection effects. Overall, we find strong evidence of the importance of worker selection into jobs with or without benefits where the selection is based on skills, health status and individual-specific traits. In particular, we find that workers with greater skills and health status are more likely to be holding jobs with the full set of benefits. Moreover, we find that among job changers, healthier worker are less likely to seek a job

[5] Their main objective is to analyze changes in the wage-health insurance relationship over time and how these changes have influenced wage inequality since the 1980s.

that offers health insurance but more likely to switch to a job that offers health insurance if they experienced a negative health shock during the previous period. Furthermore, worker selection significantly affects the wage structure by benefit sectors. The results differ depending upon whether health insurance is offered as the only benefit available or whether it is complemented by other benefits. We find evidence of greater returns to skills and health in firms that offer the full set of benefits including health insurance and evidence of negative selection based on health status in firms that only offer health insurance.

The results regarding the tradeoff are sensitive to the sample of workers studied. While no significant tradeoff is found for the main sample of workers, there is evidence of a positive wage premium in firms that offer other benefits (whether complemented or not by health insurance) among the sample of job changers, even after controlling for worker selection based on skills, health status and individual-specific traits. Regarding group incidence of health insurance we find that although the wage differentials associated with holding and being offered health insurance are different, the difference disappears after controlling for worker selection.

The paper is organized as follows. Section II describes the data, measures, and selection of our sample. In section III, we estimate the wage differentials associated with health insurance along the line of prior studies, augmenting the wage equation with a set of variables to capture the provision of non-wage benefits offered to workers. In section IV, we present the endogenous sector choice methodology and the empirical specification that we use to obtain results for the estimated effects of benefits on wages, taking account of worker selection based on observable and unobservable skills. Section V provides concluding remarks.

II. Data and Measures

Data:

We use the Household Component (HC) of the 1997-2006 MEPS, which is an annual survey fielded by the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. The MEPS-HC sample is drawn from respondents to the National Health Interview Survey, and provides a nationally representative sample of the non-institutionalized civilian population of the United States. The MEPS contains individual and household-level data on employment, health insurance coverage, other employer-provided benefits, demographic characteristics and health status. The survey uses an overlapping panel design consisting of five rounds of interviews covering a two-year period of time.

Measures:

The MEPS collects several employment and compensation measures, including each individual's hourly wage rate ($2003) for his current main job in each round. Surveyors top-coded all wage rates above the 99th percentile and then recoded these to the maximum reported value (99th percentile). In addition to wages, the MEPS also asked each worker about employer-provided benefits. With respect to health insurance, we define two indicator variables. The first of these captures whether a worker has an offer of health insurance through his employer but does not hold that coverage (EHI Offered) and the second is an indicator that

captures whether a worker has an offer and holds that coverage (EHI Held). The reference category captures a worker not having an offer of health insurance.

The MEPS also collects information about whether a worker reports having a retirement plan, paid vacation, and paid sick leave as part of total compensation. We define binary indicators for each of these other benefits, as well as an index measure, defined as the sum of the binary indicators. Given the panel format of the data, it is possible to track workers over time as they change jobs and move to a job that may provide a different combination of wage and non-wage compensation.

The MEPS contains two variables relating to firm size: the number of employees at the establishment and a binary indicator for whether the firm has more than one location. Other employment characteristics include the worker's job tenure (years), whether the worker is a member of a union, and a set of binary indicators for one digit SIC industry and occupation categories.

In addition to the compensation and employment variables, we define a set of measures to capture a worker's demographic and human capital attributes. These measures include age, age-squared, years of education, race, gender, and a five-category measure of self-reported health status.[6] While this measure of self-reported health status likely contains measurement, researchers have found that it correlates highly with actual health (Butler, Burkhauser, Mitchell and Pincus, 1987). Since there may be variation in the provision of wages and benefits geographically and over time, we also include four geographic region dummies (Northeast, Midwest, South, West [excluded]) and an indicator for a worker residing in a metropolitan statistical area (MSA). Finally, we include year and round indicator variables to control for time trends.

Estimation Samples**:**

We focus our attention on individuals who are employed full-time, defined as working at least 30 hours per week for each of the five survey rounds. Additionally, we restrict our sample to those individuals who are not married, although they may have dependent children. We also exclude individuals who receive health insurance through other sources (public or private) than their own employer. The number of person-round observations in our primary sample is 30,098, corresponding to 9,403 unique workers. Table 1 in Appendix A provides summary statistics for the primary sample of workers.

In addition to our primary sample, we define a sub-sample of job changers, which includes those individuals who report changing jobs at least once during the two-year period. In the MEPS, surveyors asked each worker about whether he or she changed jobs between consecutive rounds. Using a worker's response to this question, we are able to identify the sample of job changers as well as the round in which the job change took place. This sub-sample is valuable because we can be more confident that an observed change in benefits reflects a "true" change and not a potential reporting error. This sample contains 3,202 workers who reported at least one job change between two consecutive rounds.

[6] The variable is coded such that a value of 1 corresponds to poor health and a value of 5 to excellent health.

We also have information on the type of job change. We classify involuntary job changes as arising from the following reasons: "business dissolved" and "lay-off".[7] Focusing on involuntary job changes which result from an exogenous shock, allows us to further control for factors related to unobserved ability or taste for benefits that could affect mobility and wages in the new job.

Our analysis in the next section is divided into three parts: 1) an analysis of the wage effects of being offered or holding health insurance as well as being offered other benefits using the empirical strategy commonly adopted in the literature on compensating wage differentials, 2) an analysis of the effects of skills and health status on workers' choice of and mobility into jobs with benefits to confirm the relevance of these two factors in determining worker selection across benefit sectors and 3) an analysis of the returns to skills and health status across the different combinations of health insurance and benefits offered to evaluate empirically the importance of worker selection effects based on skills, health and unobserved individual traits. Note, our analyses use sampling weights provided in the MEPS.

III. Wage Differentials Associated with Health insurance and Other Benefits

In this section, we replicate the methodology in the literature estimating compensating differentials in order to compare the results using the MEPS data to those obtained from other panel datasets and to analyze whether and how the estimated differentials vary when distinguishing health insurance offered and held as well as adding information on the provision of other benefits.

Consistent with the empirical literature on compensating differentials, we adopt a Mincer wage equation framework in which an individual's log of hourly wage is a function of human capital variables, including years of education, age and job tenure (levels and quadratics). We also include job and firm characteristics, such as occupation, industry, establishment size (in logs), and whether the individual is a union member. Finally, we control for geographic region, residence in an MSA, year and round dummies.

We augment the wage equation with two measures of health insurance: EHI Held (implying a worker is offered coverage and holds it) and EHI Offered (implying a worker is offered coverage but does not take it up). The reference category is not having an offer of health insurance as part of compensation. Also, we include three binary indicator variables for whether a worker has a retirement plan, paid vacation, and paid sick leave to capture other components of compensation.

The first column of Table 1 provides parameter estimates and standard errors for a simple OLS specification of log wages, including the two health insurance measures. In column (2), we add the three benefit indicators to the specification. In the third column, we modify the way in which we control for the presence of other benefits by using a single benefits index, constructed

[7] Since a layoff can result from individual-specific poor performance and therefore affects wage in the new job, we also performed the estimations dropping that category in the definition of involuntary job changes. The results did not change in terms of the magnitude of the estimates. The standard errors were higher due to the large drop in sample size.

as the sum of the benefit indicators for retirement plans, paid vacation, and paid sick leave. While the index measure is less informative of the specific effects of each benefit, it allows us to implement and interpret more easily wage specifications that estimate different returns by benefit sectors and include a large number of interaction variables.

From this first set of results estimated using our primary sample of workers, we find positive wage differentials associated with both measures of health insurance, as well as retirement plans, paid vacation, and paid sick leave. In the first column, the estimated coefficient on the EHI Held indicator suggests an estimated 20.5% average wage differential, after controlling for worker, firm and job characteristics. Individuals working in firms that offer health insurance but who do not hold it (EHI Offered), appear also to enjoy a 2.6% wage premium. Once we control for the availability of other fringe benefits, we observe a notable decline to 11.4% in the estimated wage differential for holding health insurance and no wage differential among those who are offered but do not hold coverage (second column of table 1). This finding suggests that previously estimated wage differentials associated with health insurance are likely to have picked up the effect of other forms of compensation omitted in previous studies. The estimated wage premia associated with the other benefits are all positive and statistically significant, with the largest corresponding to holding a retirement plan (14.3%). When we use a benefits index (which captures an average benefits effect), we find the estimated wage differential to be equal to 7.9% (column 3 of table 1). As mentioned above, these estimates likely reflect an omitted ability bias, whereby high-wage workers who have greater ability or other individual-specific unobservable traits, are more likely to select jobs that offer them non-wage compensation.

If we assume that individual-specific traits are time-invariant and identically rewarded across benefit sectors (no worker selection due to comparative advantage), fixed-effect estimations can correct for such bias. Our fixed-effects model estimates are shown in column 4. Here we see that the positive wage differential associated with EHI held now disappears and the EHI offered differential is now negative, although quite small (-1.8%).[8] The benefit wage differential has also declined to a wage premium of 4.2%. These results suggest that full-time workers who hold jobs with non-wage compensation, including a retirement plan, paid sick leave, and/or paid vacation, are paid significantly more than workers in jobs with none of these benefits. While these results illustrate the importance of individual-specific heterogeneity on the wage-benefits tradeoff, it is still possible that these estimated wage effects may be capturing selection effects if a worker's skills, health status, and unobserved ability are not identically productive across all benefit sectors, or if workers have a comparative advantage in a given benefit sector based on his or her level of skills, health and individual traits.

In the next section, we investigate the role and importance of skills and health status in determining worker selection and mobility across benefit sectors. Then, in section V, we introduce an empirical method to evaluate worker selection effects on wages and test for the existence of compensating wage differentials after controlling for these selection effects.

IV. Determinants of Worker Selection and Mobility into Benefit Sectors

[8] In further investigations of this wage penalty associated with being offered but not holding health insurance, we ran fixed-effect estimations separately for male and female. While for male the wage penalty is mainly driven by being offered but not holding health insurance, for female the estimated wage penalty associated with being offered health insurance is similar whether she holds it or not. The result including male and female therefore reflects mainly male's behavior.

We analyze possible determinants of worker selection and mobility across benefit sectors as a function of various worker characteristics, controlling for job and firm characteristics.[9] The empirical framework is based on discrete choice models in which the latent variable (unobserved by the econometrician) reflects the net benefits associated with two outcomes: (1) *holding a job* with a given set of benefits to analyze the determinants of worker selection into benefit sectors and (2) *switching to a job* with a given set of benefits to analyze the determinants of mobility across benefit sectors. We define the following four benefit sectors: no health insurance offered and no other benefits, no health insurance offered but other benefits offered (at least one of the three), health insurance offered (or held) but no other benefits, and health insurance offered (or held) and other benefits.

In examining the determinants of worker selection into particular benefit sectors, we assume that utility increases with the number of benefits offered. We define a discrete variable as a count variable B_i with 3 outcomes: =0 for no health insurance offered and no other benefits, =1 for either one of the two combinations: no health insurance offered but other benefits (at least one of the three), or health insurance offered (or held) but no other benefits, =2 for health insurance offered (or held) and other benefits. We estimate an ordered logit for the likelihood of holding a job with *more* benefits, where the base category is the value 0 for no health insurance and no other benefits. The first column of Table 2 describes the results of this analysis. We find that education, age, the worker's current wage level, and his or her health status all statistically significantly increase the likelihood of holding a job with more benefits. Whether the worker is female and the presence of children also have a statistically significant positive impact on holding a job with more benefits. Whether the worker is unionized as well as the size of the firm in which the worker is employed both have a statistically significant positive impact on holding a job with more benefits as well.

In the analysis of the determinants of worker mobility across benefit sectors, we exploit the dynamic nature of our data and use the sample of job changers to estimate the probability of switching to a new job that offers more benefits than the previous one $P(B_{it} > B_{it-1})$, as a function of worker, job and firm characteristics evaluated prior to the job change, at round t-1. We find that the level of wage in the previous job significantly reduces the likelihood of changing to a job with more benefits, consistent with the presence of a tradeoff between wage and non-wage benefits. We also find that age significantly reduces the likelihood of changing to a job with more benefits (column 2, Table 2). The lack of significance of the other variables and the overall weaker results of this analysis among job changers may be due to the different valuation and tax treatment of health insurance versus other benefits. We suspect that mobility and selection may be driven mainly by the presence or not of a job that includes health insurance. In fact, a simple look at the data shows that the frequency of job changes to a job where health insurance is held is 11.4% of the observations while it is only 1.9% for job changes to a job with more benefits (other than health insurance) as most jobs have at least a retirement plan, or sick leave, or paid vacation policies.

In columns 3 and 4, we estimate an alternative specification, focusing only on the probability that an individual switches to a job that offers health insurance (regardless of whether it is held).

[9] See Mitchell (1983) for discussion of worker mobility and costs that are related to the loss of fringe benefits.

More precisely, it is the conditional probability of switching to a job that offers health insurance, conditional on currently holding a job without health insurance. We are particularly interested in human capital and health status variables as determinants of a worker switching to a job with health insurance. The hypothesis of positive worker selection into jobs with benefits put forth in previous studies of the wage-benefits relationship suggests that education and age (proxies for experience) should significantly increase the likelihood of switching to a job with benefits. The wage in the previous job may be an indicator of the worker's productive abilities other than education and experience. Positive selection would imply a positive effect of the wage in the previous job on the likelihood of switching to a job with benefits. In other words, high wage workers are more likely to select into jobs with benefits. On the other hand, an explanation based on job matching offers the opposite prediction: if the wage reflects job match quality then only poor matches are likely to change jobs, then a negative relationship between the wage in the previous job and the likelihood to switch to a job with benefits would be expected. In other words, moving to a new job would be mainly driven by the opportunity to improve wages.

Health status may affect the likelihood of switching to a job with benefits and health insurance in particular. Individuals with poorer health status may decide to switch to a job with health insurance. Similarly, an individual who experiences a deterioration in health status between two periods may decide to join a firm in order to have access to an offer of health insurance.[10] Therefore, we estimate the effect of the worker's health status prior to the period of the decision to change jobs as well as the effect of a deterioration in the worker's health status prior to the job change. The latter is measured as an indicator variable for whether the change in health status between rounds t-2 and t-1 is negative (e.g., good to fair or fair to poor). Results from this model (columns 3 and 4) show that wage in the previous job, education, age, female and firm size in the previous job significantly increase the likelihood of switching to a job with health insurance. Interestingly, an individual's level of health status prior to the job change decision actually reduces the likelihood of experiencing a job change from a job without health insurance to a job with health insurance, suggesting that healthier workers would be less likely to seek jobs with health insurance. Column 4 reports the specification in which we include a dummy to indicate the presence of a deterioration in health status prior to the decision to change jobs. Here, the effect on the likelihood of switching to a job with health insurance is strongly positive. The effects of the other variables are similar to those in column 3.

The last column re-estimates the specification in column 4 with random effects in order to take into account unobserved individual-specific traits such as individuals' valuation of health insurance benefits. Interestingly, the effects of the variables including previous period health deterioration and wage in the previous job become stronger, suggesting that the previous estimates suffered from a *negative* bias. Assuming individuals with stronger tastes for health insurance are more likely to switch to a job with health insurance, the bias suggests that unobserved preferences for health insurance are negatively correlated with heath status deterioration (it is higher for individuals with health deterioration) and with the wage in the previous job (it is lower for high-wage individuals).

[10] Bhattacharya and Vogt (2007) offer a model of sorting with this particular prediction and Kapur, Escarce, Marquis and Simon (2008) show evidence of the effect of worker health (measured as expected health costs) on employment distortions in small and large firms that offer health insurance.

In summary, the analysis in Table 2 shows strong evidence of worker sorting based on skills, health status and unobserved ability or preferences for benefits. In addition, the results suggest that there is evidence of positive selection into jobs with more benefits with respect to skills, but that selection can be positive or negative in terms of health status. Healthier workers are more likely to *hold* a job with more benefits and they are less likely to *switch* to a job with more benefits. This effect is strong and significant for those switching to a job with health insurance. Furthermore, workers who experience a deterioration in health status between two periods are more likely to switch to a job with health insurance in the following period, suggesting additional evidence of negative selection into jobs with health insurance as it relates to health status. Based on the estimated coefficient, the log odds ratio equals 1.138 which implies that workers who experience a deterioration in health status between two periods are 13.8% more likely to switch to a job with health insurance in the following period.

V. Worker Selection Effects on Wage Outcomes

The issue of identification and estimation of the wage differentials between workers with an offer of health insurance and those without one involves addressing selection issues on the two sides of the market. The equilibrium configuration of wages and insurance depends on *both* the profit-maximizing decisions of firms as well as the utility maximizing choices of workers (Jensen and Morrisey, 2001). The problem exists not only for the analysis of health insurance effects on wages but for the effects of other benefits too. An empirical analysis of the wage-benefits relationship must take into account a two-sided selection mechanism: workers with a given level of skills and preferences select firms in which their skills are best valued since they have a comparative advantage in such firms, and firms, both those that provide benefits and those that don't, must decide whether or not to hire workers with a given level of skills. In this section we investigate this idea by estimating a wage equation framework in which a worker's productive characteristics, captured by his or her skills and health status, are interacted with benefit sector dummies in order to estimate and test for the presence of differential returns to skills and health status. We extend the basic Mincer wage equation by adding benefit-specific indicators along with interactions between benefit-specific dummies and human capital variables. It is these interaction terms that reflect the differential returns.

In the simple case of no comparative advantage based on unobserved-specific traits, the wage equations by benefit sectors are defined as:[11]

$$w_{NBit} = \alpha_{NB} + \beta_{NB}SK_{it} + \gamma_{NB}H_{it} + \delta X_{it} + \theta_i + \mu_{it} \qquad (1a)$$
$$w_{Bit} = \alpha_{B} + \beta_{B}SK_{it} + \gamma_{B}H_{it} + \delta X_{it} + \theta_i + \mu_{it} \qquad (2a)$$

where SK_{it} summarizes measured worker characteristics including education, age, sex and race and H_{it} is a measure of self-reported health status, all of which may be differently productive across sectors that provide benefits and those that do not, X_{it} includes control variables regarding the worker's occupation and industry (both one-digit classifications), the size of the establishment in which the individual works, whether the firm has multiple locations, whether

[11] The complete model with comparative advantage and selection based on skills, health and unobserved individual traits is presented in appendix B.

the worker resides in an MSA, whether the worker is unionized, and year and round dummies. These controls are assumed to have identical effects across sectors. θ_i is unobserved individual-specific traits assumed here to be time invariant and identically productive in the benefit and non benefit sector.

Evidence of differential returns to a worker's productive characteristics across benefit sectors would imply that workers of a given level of skills and health status have a comparative advantage in a given benefit sector.[12] It may also capture the effect of selection based on unobserved (and unmeasured by the econometrician) individual-specific traits which are likely to be correlated with skills and health status. To address this issue, we use a more general wage specification in which in addition to skills and health status, we allow unobserved individual-specific traits to not be equally productive across benefit sectors. Moreover, the model allows workers to select jobs based on a comparative advantage with respect to individual-specific traits in addition to skills and health status. This extended wage equation model, which borrows from the endogenous sector choice model developed in Gibbons, Katz, Lemieux and Parent (2005) and the GMM estimation technique, is necessary to implement empirically the model are described in appendices B and C respectively.[13]

The model provides specific predictions about the sources of worker mobility across benefit sectors. Workers switch to a job with benefits as a result of a change in beliefs about the value of their individual trait and how well it is rewarded in the current sector as compared to other sectors. This means that unobserved ability and/or tastes for benefits, as well as an *increase* in these unobserved individual characteristics, should help to predict future switches to a job that includes benefits as part of total compensation. An illustration of the non-random allocation of workers across benefit sectors based on individual trait θ_i is presented in Figure 1.

For selection outcomes related to measured skills and health status, the model's predictions in terms of worker selection depend on their respective correlation with unobserved individual-specific traits which further depend on the interpretation of θ_i (talent or tastes for benefits). The nature of the resulting selection outcomes for these two variables (positive or negative selection) is therefore an empirical question. We discuss below different possible outcomes.

If θ_i represents an individual's talent or ability, it is likely to be positively correlated with skills. In this case, the selection outcome for skills (illustrated in the bottom part of Figure 1) is such that a skilled worker would be more likely to be observed in a job that provides benefits as well as to switch to a job with benefits following a change in expected θ_i. Similarly for health status, one can imagine a positive correlation with θ_i if it represents ability. A healthier worker would be more likely to end up in a job with benefits and the returns to health status would be greater in those benefit sectors that include health insurance, relative to the non-benefit sectors. Therefore if θ_i represents ability, the model suggests positive selection with respect to θ_i and both health status and skills.

[12] In a perfectly competitive labor market the returns to skills and health equalize as workers freely move between benefit sectors and no differential returns should be observed at equilibrium. However the literature on benefits and especially health insurance report evidence of costly mobility and job lock (Madrian 1994). Furthermore, even assuming costless mobility, differential returns to skills and health may arise if selection based on unobserved individual-specific traits is not taken into account. We further investigate this last point when using the complete selection model.

[13] See appendix B for more details on the complete selection model.

If θ_i represents tastes for benefits, the correlation with skills may be positive but not necessarily, as a less skilled worker may value benefits more because of the financial protection that it provides. It is also possible that health status is negatively correlated with θ_i if tastes for benefits, in particular health insurance, increase as a worker's health status declines. In this case, it is possible to observe positive selection based on θ_i but negative worker selection based on health status. Since health insurance is one of the benefits offered whose main purpose is to provide financial protections against costs associated with negative health shocks, one may well observe that a decrease in health status leads to a switch to a job with health insurance. In fact, the analysis reported in Table 2 confirms this prediction. In the case of negative selection, the returns to health status are expected to be negative or decreasing in health. Going back to Figure 1, while a worker with a higher θ_i will optimally select sector J (positive returns to θ_i), if the slope for sector J is negative (negative returns to health) and the slope for sector K is less negative or positive, unhealthy workers will optimally select sector J while healthy worker select sector K.

The first two columns of Table 3 reiterate the OLS and fixed-effect model estimates from equations (1a) and (2a) above in which comparative advantage and selection are based only on skills and health status. Column 3 presents the GMM estimation results of the full selection model which includes comparative advantage based on unobserved traits as well.[14] Column 4 presents the GMM estimation results for the sample of involuntary job changers.

Starting with the first half of the table which presents the estimates of the returns to skills by benefit sectors, one can see that the OLS estimates (first column) are all positive and significant. More importantly for the selection argument, the returns to skills are not identical across benefit sectors. In particular, firms that offer both health insurance and other benefits (pension and/or paid vacation and/or sick leave) are associated with the largest returns to skills. Going back to the two-sided selection model defined earlier, this means that on the one hand, firms that provide the complete benefit package are also firms that reward skills more (relative to firms that do not offer the full set of benefits) and that workers that select these firms are workers that have greater skills than workers that select firms that do not offer the full set of benefits. The value of the statistic for the test of equality of returns across benefit sectors is large and the null of equality is clearly rejected. However, the OLS estimates are likely to be contaminated by an ability bias. The fixed-effect estimates which control for unobserved ability or tastes for benefits (column 2), show returns that are slightly different. Although the result of the test also rejects the null of equality of returns across benefit sectors, the sector with the largest returns to skills is now the one in which firms offer other benefits but not health insurance. This suggests that the OLS estimates of the returns to skills in firms offering the full set of benefits, including health insurance, were contaminated by an ability bias. That part of the returns to skills result reflected, for example, either greater ability or a greater preference for health insurance.

The GMM estimates of the returns to skills (column 3) are much smaller than the fixed-effect estimates. Taking into account non-random selection based on unobserved individual-specific traits allows one to fully control for the correlation of such unobserved traits with the choice and mobility of workers across benefits sectors. The test of equality of returns cannot reject the

[14] The results correspond to the estimation of equations (1b) and (2b) in appendix B or equation (5) in appendix C.

null at the 5% level. This suggests that the OLS and fixed-effect estimates of the returns to skills by benefit sector reflected the correlation between individual traits and skills. Note, however, that the returns to skills in firms that offer health insurance and other benefits are still positive and statistically significant suggesting that in these firms' workers have greater skills than in the other sectors. For the sample of involuntary job changers (column 4), the estimates of the returns to skills are largest in firms that offer other benefits without health insurance and those that provide the combination of health insurance and other fringe benefits. Statistical testing clearly rejects the null of equality of returns across benefit sectors. Overall, one can conclude that for the whole sample of workers, there is some (weak) evidence of worker selection based on skills in firms that offer health insurance and other benefits. The evidence is stronger (especially in firms that offer other benefits not including health insurance) among involuntary job changers.

The second half of Table 3 shows the results for the returns to health status. The OLS estimates show statistically significant positive returns to health status, suggesting positive selection with respect to health status. However, the fixed-effect and GMM estimates suggest that sectors where firms offer no benefits and those where only health insurance is offered (but no other benefits) are associated with negative selection. This suggests that workers in these sectors tend to have poorer health status than workers in sectors that offer other benefits (complemented or not with health insurance).

The next half of Table 3 shows the estimates of the intercepts or compensating wage differentials. The OLS and fixed-effects estimates show evidence of positive wage differentials (relative to offering no benefits) in firms that offer other benefits (complemented or not with health insurance). Moreover, they show negative wage differentials for firms that offer only health insurance. The GMM estimates are drastically reduced and not statistically significant in all the sectors. For the sample of job changers, positive and large wage differentials are found in firms that offer other benefits (complemented or not with health insurance). This result, in conjunction with the greater returns to skills in these same firms and the positive selection in terms of health status noticed previously, suggests that our sample of involuntary job changers may not be a representative sample of workers experiencing a random exogenous job shock. In fact, by construction, the individuals selected must have left their job and be in a new job between two consecutive rounds which means within approximately six months, given the survey design. This sample contains job changers that were able to very quickly find a new job and therefore experience "easier" mobility. Overall, our sample of involuntary job changers is likely to be more skilled than the broader population of involuntary job changers.

The bottom half of Table 3 displays the GMM estimates of the returns to individual-specific traits by benefit sectors. For the full sample of workers, there is evidence of positive selection based on these traits in all the benefit sectors (relative to the non benefit sector). The returns are all significantly different from one (the normalized return in the no benefit sector). Note that the returns are larger in the sector that offers health insurance and no other benefits. This result is further confirmed over the sample of involuntary job changers. In this case, the only sector which has returns to individual-specific traits significantly greater than one (and large as well) is the sector in which firms offer health insurance but no other benefits. This result is consistent with the idea that workers with greater taste for benefits choose firms that offer them and

among job changers, it shows that firms that offer health insurance and no other benefits attract workers with greater tastes for health insurance. Following this last result, another explanation for the rapid movement to a new job (in addition to greater skills or ability) may be a change (deterioration) in health status. This may explain the strong negative selection effects based on health previously found for this sample of workers.

In terms of the quality of the GMM estimations, the overidentification tests always reject the null that the instruments used are not valid.[15] We also ran separate F tests for analyzing the predictive power of the instruments and the results (shown in appendix C Table 2) show that our instruments are good predictors of lagged wages and current period benefits dummies.

Overall, the results related to the selection effects on wage outcomes for the whole sample of workers suggest that there is strong evidence of worker selection based on individual-specific traits (taste for benefits or ability). Workers with greater levels of such traits have a comparative advantage in working in a firm that offers benefits compared to firms that offer no benefits. Moreover, after taking this non-random selection mechanism into account, the results show evidence of worker selection based on skills and health status into firms that offer health insurance complemented with other benefits. On the other hand, for the whole sample of workers, once selection based on skills, health status and unobserved individual traits is taken into account, we find no such evidence of compensating wage differentials.

The analysis based on the sample of involuntary job changers shows stronger effects for this particular group of workers in terms of the returns to skills and health and there is evidence of positive compensating wage differentials in firms that offer other benefits (with health insurance complemented or not).[16] The results suggest that job changers with higher skills, better health status, and lower preference for benefits are observed in firms with either no benefits or with a comprehensive set of benefits, while those with lower-skill, lower health status, and a strong taste for health insurance are observed in firms that offer health insurance but no other benefits. Workers with health issues and an increased preference for health insurance may be willing to join firms that offer health insurance only, at the cost of receiving no other benefits. This result is consistent with the idea of workers' (and firms') reallocation of compensation choice between health insurance and other benefits possibly in response to increasing health insurance premiums (Goldman, Sood and Leibowitz, 2005).

Our analysis and results are subject to limitations. First, employers may require workers to pay an out-of-pocket premium in order to hold health insurance. Unfortunately, this information is not available for all of the years of the data and as a result, this omitted information may impact our estimates of the compensating wage differentials (Pauly, 2001). Second, we acknowledge that our measures of non-wage compensation are coarse. Optimally, we would like to know the value associated with each of the benefits provided, but again the MEPS does not contain this information. To the extent that the value of benefits varies within and across sectors, or along other firm dimensions (e.g., size), this may affect our ability to precisely estimate the wage-

[15] Hansen test based on the minimized value of the objective function that characterizes the moment conditions. The distribution of the statistic follows a χ^2 with l-k degrees of freedom where l is the number of instruments and k is the number of parameters (Hansen 1982).

[16] We ran additional GMM estimations further dividing the main sample of workers by gender and age. We find that for male workers below age 30, the results are very similar to those found for the sample of involuntary job changers. Simple tabulations confirm that our sample of involuntary job changers has a greater proportion of male and younger workers than the main sample of workers.

benefit relationship. Finally, the present empirical framework does not address the issue of firm-specific heterogeneity and the idea that "good" firms (good in unobservable dimensions) may be more likely to offer benefits. As the results seem to suggest, there is still a significant wage premium associated with being offered benefits including health insurance. Firms may face different health insurance markets (Dafny, 2008) or may be subject to different kinds of tax incentives, depending on the state in which they are located (Stabile, 2002). Both of these factors may influence their likelihood of offering benefits and health insurance. In sum, the positive wage premium may be explained by location advantages, and unobserved or unmeasured (in our current dataset) sources of firm heterogeneity.

VI. Conclusions

In this paper, we revisit the question of the existence of a trade-off between wages and health insurance by extending previous work in the following way: 1) we use an econometric framework and GMM estimation method which allows us to address the issues of endogenous choice of benefits and endogenous mobility into benefit sectors encountered in the literature and estimate the extent of worker selection based on unobserved individual traits, skills and health status, 2) we extend the analysis of the wage-health insurance relationship by taking into account possible combinations of health insurance with other fringe benefits (retirement, sick leave and paid vacation) and by including information on workers' self-reported health status, and 3) we also analyze whether there are differential wage effects for holding health insurance versus being offered at the firm but not holding it.

Based on the first part of our analysis, we find no significant wage effect associated with holding health insurance and a small negative effect (often not significant) associated with being offered health insurance but not holding it. We therefore conclude that the results do not suggest any evidence of a group incidence effect being important. Additionally, we find clear differences in the relationship between wages and benefits depending on the type and/or combination of benefits being offered as part of compensation. In particular, selection outcomes and their effect on wages differ by whether other benefits are combined or not with health insurance. This implies that health insurance compensating wage differentials (or any compensating differentials associated with a single benefit) estimated in the literature absent any controls for the presence of other benefits are biased.

Regarding worker selection, there is strong evidence that skills and health status drive workers' choice of benefit sector and mobility into jobs with health insurance, even after controlling for individual-specific unobserved heterogeneity. In particular, a deterioration in health status increases significantly the likelihood of seeking a job that offers health insurance. Workers who experience a deterioration in health status between two periods are 13.8% more likely to switch to a job with health insurance in the following period.

For the effect of worker selection on wages, across the whole sample of workers, we find strong evidence of non random selection based on individual-specific traits into the benefit sectors (relative to the non benefit sector). After controlling for this, we find some additional evidence

of selection based on skills and health status. However, we find no evidence of compensating wage differentials, even after taking into account of these different sources of worker selection.

For the sample of involuntary job changers, the results suggest a particular match between workers and jobs. More highly skilled workers, those in better health, and workers with higher individual-specific traits are more likely to select jobs with either no benefits or the comprehensive set of benefits (health insurance and other benefits). They are also more likely to receive a positive wage premium. We also find that workers with lower health status and stronger tastes for benefits (presumably health insurance) are more likely to choose jobs with health insurance only, at the cost of receiving no other benefits and no significant wage premium.

The results regarding the presence of compensating wage differentials associated with benefits reveal no significant premium for the primary sample of workers. For the sample of involuntary job changers, we find a significantly positive wage premium in jobs where workers receive other benefits, whether complemented or not by health insurance. In contrast, we find no similar positive wage premium in jobs that offer only health insurance. Overall these results are inconsistent with the theory of a wage-benefit trade off. Given the previous selection outcomes found for the sample of involuntary job changers, firms that offer other benefits (including health insurance) seem to be able to pay higher wages by attracting higher skilled and healthier workers. Based on our findings, one could speculate that if a tradeoff does exist, then it may be occurring through the allocation of other non-wage benefits (e.g., retirement plan, paid vacation, paid sick leave) rather than through the decision to offer/accept lower wages. For example some workers with strong preference for health insurance would be willing to trade-off other benefits for health insurance.

Based on these results, future work might be to more precisely quantify and decompose the wage gap into the parts that are due to firm-specific policies (the intercepts reflecting the positive wage premiums) and those due to worker selection based on individual traits, skills and health status. Obtaining more specific information about regional variations in health insurance premiums would help instrument for firm-specific health insurance offering decisions.

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Figure 1 : Non random Selection of Workers across Sectors Based on Unobservable θ

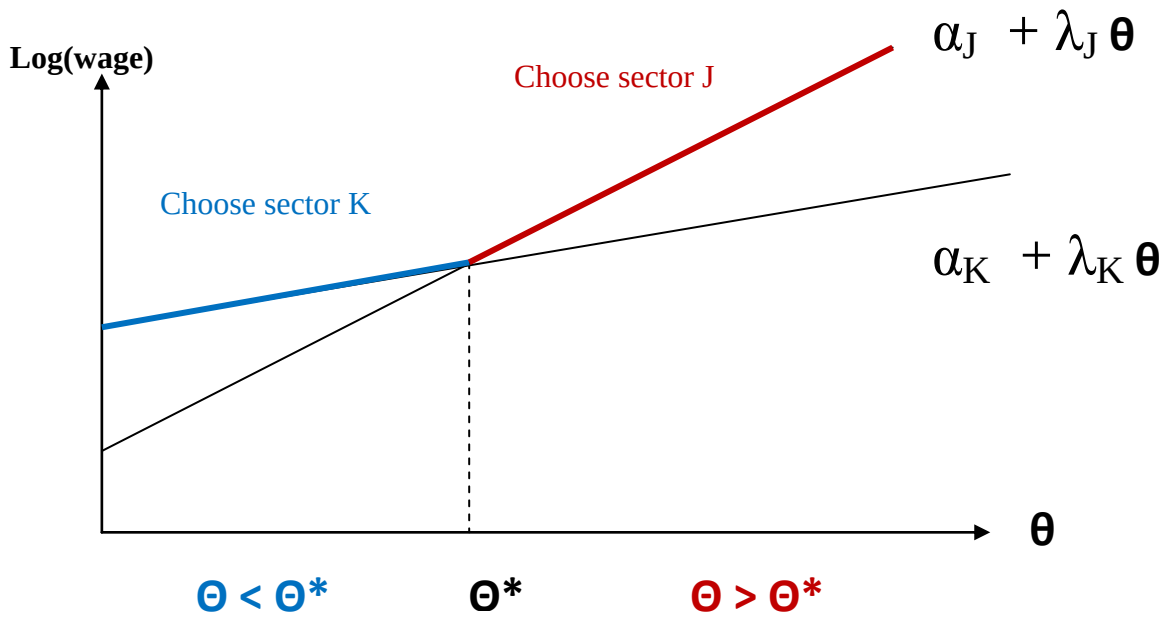

Figure 2 : Non random Selection of Workers across Sectors Based on Observable S

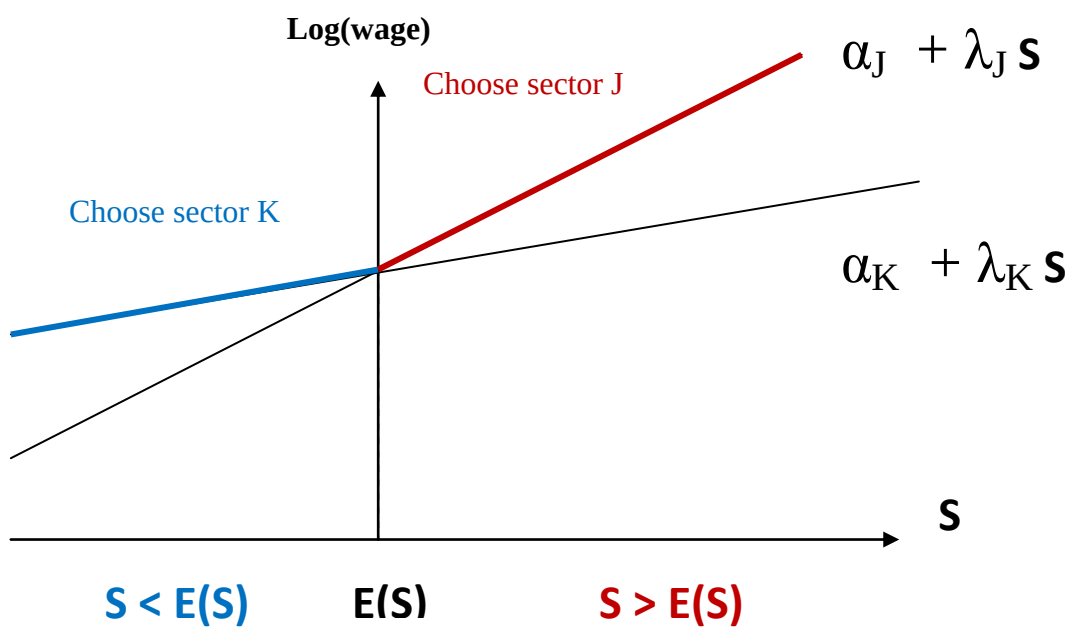

Table 1. Wage Differentials by Employer-Provided Health Insurance and Other Benefits[1]

Specifications Estimation /Sample Variables[2]	(1) OLS	(2) OLS	(3) OLS	(4) FE
Health Insurance				
EHI Held	0.205***	0.114***	0.102***	0.000
	(0.009)	*(0.011)*	*(0.010)*	*(0.004)*
EHI Offered	0.026**	-0.002	-0.017	-0.018***
	(0.013)	*(0.013)*	*(0.013)*	*(0.005)*
Other Benefits				
Retirement		0.143***		
		(0.006)		
Sick Pay		0.072***		
		(0.008)		
Paid vacation		0.013		
		(0.010)		
Other Benefits Index			0.079***	0.042***
			(0.003)	*(0.002)*
R2	0.47	0.48	0.48	0.11
N (observations)	30098	30098	30098	30098

Notes:
1- Sample of workers not married. The estimations also includes education, quadratic functions of age and job tenure, number of kids, the log of firm size, a dummy indicating whether the establishment has multiple locations, whether the worker is unionized, dummies for female, nonwhite, metropolitan area, 4 region dummies, 5 one digit occupation dummies, 7 one digit industry dummies and year and round dummies.
2- Robust standard errors in parenthesis. Asterisks denote: ***Statistically significant at $\alpha = 0.01$, ** at $\alpha = 0.05$, * at $\alpha = 0.10$.
3- Index computed as the sum of dummies for pension, sick pay and paid vacation.

Table 2. Determinants of Benefits Choice and Worker Selection across Benefit Sectors Logistic Estimations[1]

Explanatory Variables[2]	Ordered Logit Likelihood of Holding a Job with More Benefits All Workers	Logit Likelihood of changing to a Job with More Benefits[3] Job Changers	Logit Likelihood of changing to a Job with Health Insurance (held or offered)[3] Job Changers		Random Effect Logit Likelihood of changing to a Job with Health Insurance (held or offered)[3] Job Changers
Health Deterioration				0.480**	0.760***
				(0.206)	*(0.289)*
Health	0.061***	-0.049	-0.163*	-0.227**	-0.186
	(0.021)	*(0.110)*	*(0.096)*	*(0.100)*	*(0.154)*
Wage	0.099***	-0.090***	0.043**	0.042**	0.089***
	(0.008)	*(0.032)*	*(0.019)*	*(0.019)*	*(0.024)*
Education	0.083***	0.021	0.069*	0.060	0.152**
	(0.009)	*(0.049)*	*(0.040)*	*(0.041)*	*(0.067)*
Age	0.022***	-0.015*	0.008	0.008	0.017
	(0.002)	*(0.009)*	*(0.008)*	*(0.008)*	*(0.013)*
Non White Dummy	-0.035	-0.164	-0.262	-0.243	-0.446
	(0.049)	*(0.254)*	*(0.190)*	*(0.192)*	*(0.330)*
Female Dummy	0.330***	0.112	0.336*	0.373**	0.659**
	(0.047)	*(0.230)*	*(0.186)*	*(0.188)*	*(0.317)*
Kids Dummy	0.081*	0.220	-0.097	-0.092	-0.264
	(0.043)	*(0.208)*	(0.180)	*(0.181)*	*(0.300)*
Union Dummy	1.068***	-0.542	0.233	0.229	0.761
	(0.101)	*(0.609)*	*(0.552)*	*(0.560)*	*(0.815)*
Firm Size (/100)	0.277***	-0.049	0.206***	0.203***	0.357***
	(0.017)	*(0.079)*	*(0.058)*	*(0.058)*	*(0.100)*
City Dummy	-0.071	-0.319	0.229	0.228	0.496
	(0.050)	*(0.251)*	(0.193)	*(0.291)*	*(0.378)*
Log Likelihood	-13566.3	-489.18	-730.1	-676.9	-676.1
Observations	30098	4311	1453	1453	1453

Notes:
1- Sample of workers not married. Robust standard errors in parenthesis *** for statistically significant at $\alpha = 0.01$, ** at $\alpha = 0.05$, * at $\alpha = 0.10$.
2-The estimations also includes a dummy indicating whether the establishment has multiple locations, 4 region dummies, 5 one digit occupation dummies, 7 one digit industry dummies, and year and round dummies.
3- All the right-hand side variables are lagged so that it is their value while in the previous job which is considered.

Table 3. Estimations of the Effects of Worker Selection on Wages across Benefit Sectors

Variables[1]		(1) OLS	(2) FE	(3) GMM	(4) GMM Involuntary Job Changers
		All Workers			
Estimated Returns to the Skill Index					
Not Offered/Held	No Other Benefits	1.403***	1.935***	0.927*	0.314
		(0.122)	*(0.252)*	*(0.539)*	*(0.739)*
Not Offered/Held	Other Benefits	1.408***	2.218***	0.317	1.260**
		(0.160)	*(0.250)*	*(0.252)*	*(0.548)*
Offered/Held	No Other Benefits	1.562***	1.722***	0.699	-0.337
		(0.168)	*(0.258)*	*(0.770)*	*(0.867)*
Offered/Held	Other Benefits	2.263***	1.950***	0.374**	1.575***
		(0.047)	*(0.245)*	*(0.175)*	*(0.611)*
Test of Equality of Returns		25.63	9.68	6.76	12.09
(p-value)		*(0.000)*	*(0.000)*	*(0.080)*	*(0.007)*
Estimated Returns to the Health Index					
Not Offered/Held	No Other Benefits	0.079**	-0.020**	-0.018	-0.000
		(0.037)	*(0.009)*	*(0.020)*	*(0.045)*
Not Offered/Held	Other Benefits	0.061	0.027**	0.010	0.031
		(0.050)	*(0.011)*	*(0.019)*	*(0.033)*
Offered/Held	No Other Benefits	0.186***	-0.004	-0.004	-0.208**
		(0.052)	*(0.013)*	*(0.020)*	*(0.089)*
Offered/Held	Other Benefits	0.106***	0.004	0.005*	0.021*
		(0.012)	*(0.003)*	*(0.003)*	*(0.014)*
Test of Equality of Returns		1.21	3.70	3.38	7.89
(p-value)		*(0.304)*	*(0.011)*	*(0.336)*	*(0.04)*
R2		0.47	0.11	-	-
Observations		30098	30098	22309	885

Notes:
1-Sample of workers not married. Also includes the log of firm size, a dummy indicating whether the establishment has multiple locations and for metropolitan area, 4 region dummies, 5 one digit occupation dummies, 7 one digit industry dummies, and year and round dummies.
***=p<.01, **=p<.05, *=p<.10, $^{+}$=returns to θ_i significantly different from 1 at the 5% level.

Table 3. Estimations of the Effects of Worker Selection across Benefit Sectors On Wages
-Continued-

Variables[1]		(1) OLS	(2) FE	(3) GMM	(4) GMM
		All Workers			Involuntary Job Changers
Estimated Wage Differentials[2]					
Not Offered/Held	Other Benefits	0.075***	0.093***	0.066	0.120***
		(0.020)	*(0.008)*	*(0.051)*	*(0.040)*
Offered/Held	No Other Benefits	0.032	-0.019***	0.027	-0.062
		(0.019)	*(0.007)*	*(0.036)*	*(0.044)*
Offered/Held	Other Benefits	0.279***	0.080***	0.051	0.132***
		(0.014)	*(0.007)*	*(0.051)*	*(0.038)*
Estimated Returns to Unobserved Individual Traits[2]					
Not Offered/Held	No Other Benefits			1	1
Not Offered/Held	Other Benefits			1.024***+	0.976***
				(0.010)	*(0.027)*
Offered/Held	No Other Benefits			1.034***+	1.056***+
				(0.017)	*(0.037)*
Offered/Held	Other Benefits			1.008***+	1.004***
				(0.004)	*(0.013)*
Test of Equality of Returns					
(All Returns =1)				14.66	3.36
(p-value)				*(0.002)*	*(0.339)*
Overidentification Test		-	-	75.09	39.40
				(0.215)	*(0.999)*
R2		0.47	0.11	-	-
Observations		30098	30098		885

Notes:
1-Sample of workers not married. Also includes the log of firm size, a dummy indicating whether the establishment has multiple locations and for metropolitan area, 4 region dummies, 5 one digit occupation dummies, 7 one digit industry dummies, and year and round dummies.
***=p<.01, **=p<.05, *=p<.10, +=returns to θ_i significantly different from 1 at the 5% level.
2-The base category is Not Offered/Held and No Other Benefits.

Appendix A Table 1. Summary Statistics (Weighted Means)[1]

Variables	Mean	Std Errors	Mean	Std Errors	Mean	Std Errors	Mean	Std Errors
	All		HI Held		HI Offered Not Held		No HI	
Health Insurance (=1;0)								
EHI Held	0.803	0.002	1	0	0	0	0	0
EHI Offered (not held)	0.058	0.001	0	0	1	0	0	0
Other Benefits (=1;0)								
Retirement Plans	0.622	0.003	0.738	0.003	0.295	0.010	0.089	0.004
Sick Pay	0.714	0.003	0.822	0.003	0.436	0.011	0.207	0.006
Paid Vacation	0.833	0.002	0.927	0.002	0.690	0.010	0.352	0.006
Job/Firm Characteristics								
Log Wage	2.689	0.003	2.787	0.003	2.368	0.011	2.254	0.007
Job Tenure (# years)	6.538	0.043	7.435	0.052	3.271	0.101	2.721	0.064
Unionized	0.140	0.002	0.168	0.002	0.047	0.004	0.020	0.002
Number of Employees at Establishment	175.51	1.084	199.6	1.281	121.8	0.010	58.8	1.545
Single Location Establishments	0.293	0.003	0.238	0.003	0.299	0.010	0.608	0.007
Large Firm (> 499)	0.213	0.002	0.248	0.003	0.123	0.007	0.048	0.003
Occupation *(=1;0)*								
Professional and Technical	0.259	0.002	0.295	0.003	0.163	0.008	0.090	0.004
Managerial and Administrative	0.078	0.001	0.088	0.002	0.045	0.005	0.034	0.003
Sales	0.111	0.002	0.104	0.002	0.134	0.007	0.138	0.005
Clerical	0.175	0.002	0.190	0.003	0.146	0.007	0.102	0.004
Craftsman, Operatives, Transportation	0.250	0.002	0.227	0.003	0.277	0.009	0.371	0.006
Service Workers	0.127	0.002	0.095	0.002	0.234	0.009	0.266	0.006
Location Characteristics (=1;0)								
MSA	0.868	0.002	0.872	0.002	0.866	0.007	0.846	0.005
Region1	0.189	0.002	0.201	0.003	0.137	0.007	0.142	0.005
Region2	0.235	0.002	0.245	0.003	0.204	0.009	0.191	0.005
Region3	0.356	0.003	0.339	0.003	0.427	0.010	0.422	0.007
Region4	0.220	0.002	0.215	0.003	0.233	0.009	0.245	0.006
Person Characteristics								
Education (# years)	13.39	0.014	13.73	0.015	12.44	0.052	11.81	0.037
Age	38.29	0.062	39.18	0.073	35.83	0.244	34.22	0.149
Non White	0.200	0.002	0.200	0.003	0.217	0.009	0.193	0.005
Female	0.493	0.003	0.520	0.003	0.434	0.011	0.362	0.007
Number of Kids	0.391	0.005	0.359	0.005	0.573	0.021	0.503	0.013
Job Changes	0.249	0.002	0.191	0.003	0.425	0.010	0.514	0.007

Notes: Sample of full-time workers not married. The sample has 30098 observations and 9403workers. 3202 workers are job changers.

Appendix B: Endogenous Sector Choice Model
Selection Based on Comparative Advantage and Learning

Framework of Analysis

The model that we consider is based on the idea that workers have a comparative advantage, one that is based on unobserved individual-specific traits that drives their endogenous choice of benefits. Thus, learning about these unobserved traits (e.g., ability and tastes for benefits) influences the mobility of workers across firms that provide benefits or not.

The model is based on the following assumptions: i) individuals differ in productive abilities, some of which are measured skills (human capital and health status), and others of which are unobserved by the market and the econometrician (e.g,. innate ability, tastes for particular fringe benefits), and ii) workers' measured and unobserved skills are not identically productive in all sectors. In this particular application, we define firm sectors by their provision of non-wage benefits.

This second assumption also can be viewed as implying differences in firms' total compensation decisions with respect to the particular mix of wages and benefits they provide. Firms that provide fringe benefits as part of total compensation may attach more or less importance to measured skills and unobservable individual-specific attributes as compared to those that do not provide benefits. One potential reason for this may be that firms face different monitoring costs.[17] More generally, firms that offer benefits may have a wage policy function such that average wages (irrespective of worker skills) are lower than firms that do not provide benefits. This may be done by firms in order to offset the costs of providing benefits. However, at the same time, it is possible that these firms offer higher returns to skills as a way to attract skilled workers (for example by putting more weight on education and tenure than firms that do not offer benefits).

The relationship between wages and employer-provided benefits is such that the cost of providing benefits can be offset either through lower wages (the wage-benefits tradeoff) or through attracting more productive workers (worker selection effects) or a combination of both. The comparative advantage assumption ii) above allows one to identify and estimate the effects of worker selection based on observable and unobservable characteristics on wages. This is accomplished by estimating and testing for differences in the returns to measured skills, health, and unobserved individual traits across employers that provide different combinations of benefits. The model can therefore be used to estimate the relative importance of worker selection effects in the wage-benefits relationship through these potential differential returns, as well as through the role of firms' benefits provision on wages. We measure the latter through intercept effects of indicators for benefits on the level of wages, independent of the workers' productive characteristics. It is this last effect that captures the wage-benefits tradeoff.

[17] Large firms that are also more likely to offer benefits pay for a greater number of supervisors to maintain monitoring quality at the same level as small firms (given the greater number of workers).

More formally, assume wages equal expected productivity and that firms differ in their decisions regarding total compensation. In particular, assume that firms differ in their policies regarding the mix of wages and benefits that they provide for workers' compensation. For ease of exposition, we describe a two-sector endogenous choice model, whereby the workers are allocated to sectors based on whether the firm in which they are employed provides benefits or not. In this case, the wage equations in each sector have a specific wage-benefits mix that can be written as follows:

$$w_{NBit} = \alpha_{NB} + \beta_{NB} SK_{it} + \gamma_{NB} H_{it} + \delta X_{it} + \lambda_{NB}\, \theta^{e}_{it} + \mu_{it} \qquad (1b)$$

$$w_{Bit} = \alpha_{B} + \beta_{B} SK_{it} + \gamma_{B} H_{it} + \delta X_{it} + \lambda_{B}\, \theta^{e}_{it} + \mu_{it} \qquad (2b)$$

where SK_{it} summarizes measured worker characteristics including education, age, sex and race and H_{it} is a measure of self-reported health status, all of which may be differently productive across sectors providing benefits or not, X_{it} includes control variables regarding the worker's occupation and industry (both one-digit classifications), the size of the establishment in which the individual works, whether the firm has multiple locations, whether the worker resides in an MSA, whether the worker is unionized, and year and round dummies. These controls are assumed to have identical effects across sectors.

The error term includes a random productivity shock (white noise) common to all sectors (μ_{it}) and θ^{e}_{it} summarize beliefs about individual-specific traits like innate ability or tastes for benefits, which are not perfectly observed by the market and individual. Firms build beliefs about it as they observe realizations of a worker's productivity. Formally, $\theta^{e}_{it} = E(\theta_i | y_{it-1}, .., y_{i0})$ where $y_{it-1}, .., y_{i0}$ are previous realizations of the worker's productivity.

The effect on wages of worker non-random selection into firms providing benefits or not, an effect based on SK_{it}, H_{it}, *and* θ^{e}_{it} can be summarized in the following equation:

$$WG_{it} = (\alpha_B - \alpha_{NB}) + (\beta_B - \beta_{NB}) SK_{it} + (\gamma_B - \gamma_{NB}) H_{it} + (\lambda_B - \lambda_{NB})\, \theta^{e}_{it} \qquad (3b)$$

In this equation, WG represents the wage gap at a given point in time between benefit holders and non-holders. The part of the gap describing selection effects based on measured skills, health status and individual-specific unobservable traits are captured by differences in the βs, γs, *and* λs, while the part due to benefits' wage differentials is given by the difference $\alpha_B - \alpha_{NB}$. If the difference is negative, ($\alpha_B < \alpha_{NB}$), this would be consistent with the wage-benefits tradeoff hypothesis.

The parameters associated with the returns to skills, health, and unobservable traits can be identified by exploiting variations coming from individuals changing into or out of a firm with or without benefits. The problem is that job changes are likely to be correlated with unobservable traits. The empirical model described above addresses this issue of endogenous worker mobility.

The model uses the idea that mobility is generated by symmetric learning about the individual-specific traits θ_i by workers and employers whose information set is similar. Beliefs about these traits or expected traits, defined above as $\theta^e_{it} = E(\theta_i | y_{it-1}, .., y_{i0})$, evolve over time according to a martingale process. This is the case because the market (workers and employers) has rational expectations so that the best prediction about market beliefs about θ_i at t+1, θ^e_{it+1}, is current beliefs θ^e_{it}. A change in beliefs can only be the result of a random shock ε_{it+1}, unpredictable prior to time t+1. The martingale hypothesis for the market's beliefs at time t can be described as follows:

$$\theta^e_{it} = \theta^e_{it-1} + \varepsilon_{it} \qquad (4)$$

A positive change in beliefs reflects that a worker is higher in terms of individual-specific attributes and this leads him to decide to switch to a firm in which these attributes are more productive, or similarly, to a firm with benefits which better rewards these attributes. In addition to estimating simultaneously worker selection effects and the existence of a wage-benefits tradeoff, the model can be used to test the relative importance of comparative advantage and learning effects on wages as factors affecting workers' decisions to select into a job with or without benefits.

Appendix C: Estimation and Choice of Instruments

For the full sample of workers, the estimable form of the wage equation is given by:

$$w_{ijt} = \sum_{j=1}^{J} D_{ijt}\alpha_j + \sum_{j=1}^{J} D_{ijt}\beta_j SK_{it} + \sum_{j=1}^{J} D_{ijt}\gamma_j H_{it} + \delta X_{it} + \sum_{j=1}^{J} D_{ijt}\lambda_j \theta^e_{it} + \mu_{it} \qquad (5)$$

where D_{ijt} is a dummy indicating whether benefits are provided or not and in the two sector model presented above, $j=NB, B$. In the analysis we perform, we define a four sector model by subcategorizing B based on different combinations of benefits (health insurance and/or other benefits). Given the finding in table 1 that there are no significant wage differential effects between being offered health insurance and not holding it and holding health insurance for the main sample of job changers, we grouped these two categories into a single one characterizing health insurance holding/offering.[18] Since retirement plans, paid sick leave and paid vacation are often provided together and to reduce the number of parameters to estimate given the large number of interaction terms, we utilize the benefit index defined above in our model specification. More specifically, we define a dummy variable indicating whether the index is strictly positive suggesting that the worker holds at least one of the three possible benefits and equal to 0 if none of the three benefits are offered. In the end, we define four possible sector choices: 1) no health insurance held or offered and no other benefits, 2) no health insurance held or offered and other benefits, 3) health insurance held or offered but no other benefits, 4) health insurance held or offered and other benefits.

Appendix C Table 1. Workers Transitions by Choice of Health Insurance and Other Benefits

Time t / **Time t-1**		**HI Not Offered/ Held**	**HI Offered/ Held**	**HI Not Offered/ Held**	**HI Offered/ Held**	**Total**
		No Other Benefits		**Other Benefits**		
HI Not Offered/ Held	**No Other Benefits**	84.91	7.93	2.75	4.41	100
HI Offered/Held		5.23	87.55	3.11	4.11	100
HI Not Offered/ Held	**Other Benefits**	3.13	0.49	75.85	20.53	100
HI Offered/Held		0.69	0.24	0.82	98.25	100
Frequency of Obs.		8.47	4.24	5.47	81.82	100

Notes:
The numbers in each cell give the percentage of observations associated with transitions from a given category of benefits at t-1 B_{t-1} to either the same category (the diagonal shaded cells) or a different category of benefits at t.

[18] In other words, we define a health insurance dummy equal to 1 if workers respond that they hold health insurance or that it is offered at their firm (even though they do not hold it) and equal to 0 if it is not offered and not held. This definition of health insurance therefore combines measures from the worker side (held) and the firm side (offered) all together.

To get an idea of the extent of worker mobility across sectors, Appendix C Table 1 above illustrates the frequency of worker transitions between two consecutive rounds in and out of the four fringe benefits sectors. From this, one can see patterns capturing transitions between jobs that result in benefits changes, relative to transitions that result in the same benefits characterization or simply stable employment across rounds. In the table, the diagonal cells show transitions associated with no change in benefits sector between two consecutive rounds. One can see that the most stable benefits situations is the one in which workers hold health insurance, whether it is combined with other benefits or not, with 98.25% and 87.55% of observation respectively. The less stable ones occur where the worker does not hold health insurance (84.91% of observations in the case without additional benefits and 75.85% in the case with additional benefits). The cells in the southwest corner of the diagonal indicate transitions to fewer benefits (than the diagonal situation) while the cells to the northeast corner illustrate transitions into jobs with more benefits. The frequencies of transitions tend to be higher for transitions to more benefits than fewer benefits. The last row of the table gives the frequency of observations associated with each benefit option. The option of both health insurance and other benefits represents 81.82% of the observations. Of the remaining 20% of observation, a bit less than half of them corresponds to no fringe benefits, about a quarter of them represents the option of no health insurance but other benefits and a quarter of them corresponds to health insurance and no other benefits.

Given that we use four dummies to capture the presence of benefits and that we need to compute interactions with the worker's skills, we apply a similar approach as Gibbons, Katz, Lemieux and Parent (2005) and Lluis (2005) for summarizing the different measures of skills. More specifically, we construct a skill index, defined as the predicted wage generated from a regression in which explanatory variables include current values of education, a quadratic in age, gender, and race dummies for the sample of all workers. This regression also includes occupation and industry dummies, dummies for whether the worker is unionized, lives in an MSA, the log of establishment size, year and round dummies. These control variables are added for consistency with previous empirical findings on the existence of wage differentials related to factors other than skill differences (potentially as a result of the existence of efficiency wages, rents or compensating differentials related to undesirable job characteristics). We normalize the skill index to have a mean of 0. Note also that to treat health status in a similar way as the skill variable, we also normalized it to have a mean of 0 over the full sample of workers.

From equation (5) above, fixed-effect estimations will not eliminate θ^{e}_{it} because it is interacted with the benefits indicator variables and it is not time invariant. The

appropriate methodology in this case is to quasi-differentiate the wage equation.[19] The final wage equation after quasi-differentiation is given by:

$$\begin{aligned}
\frac{w_{ijt}}{\sum_j^J D_{ijt}\lambda_j} &= \frac{\sum_{j=1}^J D_{ijt}\alpha_j + \sum_{j=1}^J D_{ijt}X_{it}\beta_j + \sum_{j=1}^J D_{ijt}H_{it}\gamma_j}{\sum_j^J D_{ijt}\lambda_j} + \frac{w_{ijt-1}}{\sum_j^J D_{ijt-1}\lambda_j} \\
&- \frac{1}{\sum_j^J D_{ijt-1}\lambda_j}\,[\sum_j^J D_{ijt-1}\alpha_j + \sum_{j=1}^J D_{ijt-1}X_{it-1}\beta_j + \sum_{j=1}^J D_{ijt-1}H_{it-1}\gamma_j] + e_{it} \\
\text{where} \quad e_{it} &= \epsilon_{it} + \frac{\mu_{it}}{\sum_j^J D_{ijt}\lambda_j} - \frac{\mu_{it-1}}{\sum_j^J D_{ijt-1}\lambda_j}
\end{aligned} \tag{6}$$

As a result of the quasi-differentiation, the log of wages in period t-1 appears on the right hand side of the wage equation which creates a problem of endogeneity. To address this, we instrument lagged wages. Although θ^e_{it} is now eliminated from the equation, there is a remaining source of endogeneity which results from endogenous worker mobility: a worker's decision to change to a job with our without benefits is driven by a change in expected traits, ε_{it} in the wage equation. This corresponds to the error of the martingale process for the evolution of expected ability. As a result, the benefits variables are correlated with the error term of the wage equation
and need to be instrumented as well.

The set of instruments Z_i has to satisfy the following first moment condition:

$$E(e_{it}Z_i) = 0 \tag{7}$$

Using the Generalized Method of Moment estimator provides consistent and efficient estimates of the coefficients. The objective function for the estimations can be written as:

$$\min_{\phi} e(\phi)'Z(Z'\Omega Z)^{-1}Z'e(\phi) \tag{8}$$

Where $Z'\Omega Z$ is the covariance matrix of the vector of moments $Z'e(\phi)$, Ω is the covariance matrix of the error term e_{it} and ϕ is the vector of parameters. Obtaining efficient estimates requires a two-step procedure in which the first step estimates the matrix of variance-covariance of the error term by estimating (8) with $\Omega = I$ (where I is the identity matrix).[20]

Following previous studies that use this econometric approach, we use instruments based on the lags of the benefits choice variables. The strict exogeneity condition for the panel data estimator implies that current and lagged values of the right hand side variables are uncorrelated with the error term μ_{it} of the wage equation (5). We use two sets of

[19] Quasi-differencing consists in isolating θ^e_{it} in equation (5) and use the martingale equation (6) to link the wage equations at t and t-1.

[20] Note that for the parameters to be identified, the optimization problem (8) needs the constraint that θ^e_{it} in the error term of equation (5) sums to zero overall individuals and time periods. Explanation and a proof of the necessity of this constraint is given in Lemieux (1998).

instruments. First, to instrument for lagged wages, we use the interactions between the lag of the benefit variables and the skill index. The interaction between the worker's skills and his or her choice of benefits is likely to be a good predictor of wages given the definition of wages in (1) and (2) which assumes that skills are differentially rewarded across benefit sectors.

Second, we need to instrument for the current period benefit choice correlated with ε_{it} in the error term of equation (6). We use as instruments, the interactions between the first and the second lags of the benefits variables. These interactions capture workers' job transitions prior to the current period resulting from previous period beliefs about the worker's expected individual trait. If for example, previous period beliefs were high, they may have led the worker to choose a job with benefits. As a result, these previous period job transitions help convey information about prior beliefs of individual trait which should be a good predictor of current expected beliefs and therefore current choice of benefits. Note also that because beliefs follow a martingale, changes in prior beliefs (ε_{it-1}) are not correlated with the new information in the current period from observing current worker productivity (ε_{it}) and are therefore not correlated with the error term of the wage equation. [21]

Appendix C Table 2. Tests of Predictive Power of Instruments[1]

Instrumented Variables		All Workers	Involuntary Job Changers
Lagged Log Wage		8.69	1.73
		(0.000)	*(0.009)*
Not Offered/Held	Other Benefits	71.03	3.41
		(0.000)	*(0.000)*
Offered/Held	No Other Benefits	20.38	5.36
		(0.000)	*(0.000)*
Offered/Held	Other Benefits	49.56	3.21
		(0.000)	*(0.000)*

Notes:
1- F test from a regression of the instrumented variables on the whole set of instruments.

[21] We also added interactions between benefits and worker experience to capture the impact of the variance of θ_i which enters the residual of the wage equation when the log of wages is used. See Gibbons, Katz, Lemieux and Parent (2005) for details about the wage equation when wages are considered in logs.