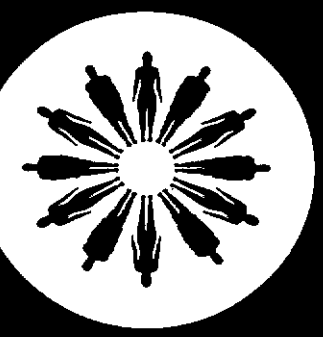

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Discussion Paper

An Analysis of the Consequences of Employer Linked Health Insurance Coverage in the United States

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December 21, 1995

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EXECUTIVE SUMMARY

The Consequences of Employer Linked Health Insurance Coverage in the U.S.

Eric Slade

In the U.S. labor market it is commonplace to observe individuals for whom job changes have resulted in increases or decreases in health insurance coverage. Simple inspection of the job changes and changes in health insurance coverage experienced by individuals would reveal that individuals commonly experience different types of job and health insurance coverage transitions. Some workers leave jobs that offer health insurance coverage for ones that do not, while other workers leave jobs that do not offer health insurance coverage for ones that do. Some workers work many years in the same job receiving their employer's health insurance coverage plan as a benefit throughout their tenure, while others work many years at the same job only to have their employer's offer of health insurance coverage withdrawn. Still others might be observed to change employers often and never receive health insurance coverage through an employer.

The usual arrangement for health insurance coverage in the U.S. today links health insurance policies to employers. Recently, a few economists have suggested that this arrangement is inefficient, insofar as individuals pass up opportunities to work in preferred jobs due to a fear that their current level of health insurance coverage would be reduced in a new job (e.g. Madrian (1994) and Cooper and Monheit (1993)). These authors term the inefficiency 'job-lock'; they conclude that employer linked health insurance coverage *does* substantially reduce the frequency of job changes and that the negative effect of health insurance is stronger for individuals with pre-existing medical conditions. They recommend increased regulation of employer linked health insurance coverage. One set of proposals would prohibit insurance companies from excluding a new employee's pre-existing medical conditions from policy coverage. A second set of proposals would require employers to offer a new employee the option of continuing the same health insurance policy which he had been receiving at his former employer.

This paper analyzes the arguments and evidence presented in existing job-lock studies, and offers new evidence regarding the effect of health insurance coverage on job mobility. It begins with a lengthy critique of existing studies. The second part of the paper presents a new model of job changes and health insurance coverage. The final section reports the results of an empirical

analysis based on data from the National Longitudinal Survey of Youth (NLSY).

Existing studies of the effect of health insurance coverage on job mobility represent a limited view of the relationship between coverage and mobility. An assumption of prior job-lock studies, that an individual's own labor supply decisions do not affect his health insurance coverage status, is counterfactual. Employment experience and the frequency of an individual's job changes are two characteristics of an individual's labor supply which affect health insurance status. Recognition of this fact implies that job mobility may affect health insurance coverage. Existing papers do not address this important aspect of the problem either theoretically or empirically. They also assume that the offer of health insurance coverage which an individual receives from his current employer cannot change. This assumption is counterfactual as well. If this assumption is relaxed the job-lock effect described in existing papers may not be valid.

The empirical work presented in existing studies of job-lock does not account for individual preferences and other unobservable differences among individuals which may affect both the frequency of job changes and health insurance coverage status. Some individuals change jobs more often than others for reasons which are independent of their health insurance coverage. They may prefer jobs which are temporary, allowing themselves the flexibility to be geographically mobile, or they may be the type of worker who is often dismissed from jobs. Either way, such highly mobile individuals are more likely than less mobile individuals to be working at jobs which do not include health insurance coverage as a benefit of compensation. Thus, the main empirical result in studies of job-lock, that job mobility is lower in jobs which offer health insurance coverage, may be a spurious correlation caused by the sorting of highly mobile individuals into jobs which do not offer health insurance coverage and of less mobile individuals into jobs which do offer health insurance coverage.

Three questions are addressed in the analytical section of the paper: (1) what factors determine changes in an individual's health insurance coverage over time; (2) how do increases in the price of health insurance coverage affect an individual's job mobility and health insurance coverage status; and (3) how does an individual's propensity for job mobility affect the probability that he will have a job that offers health insurance coverage?

I begin to address these three questions by constructing a model of on-the-job search which

includes the value of health insurance coverage. In the model an employed individual compares the benefit of staying in his current job, given the wage and health insurance benefits which he expects to receive from his current employer, to the expected value of accepting a job offer from the market, given the possible combinations of wages and health insurance benefits which he might receive from the market. He optimally chooses a reservation utility level representing the minimally acceptable job offer. Thus, job changes in the model depend upon an individual's demand for health insurance coverage and the willingness of potential insurers to insure him.

The first result of the model is an equation which describes the circumstances under which an individual's level of demand for health care will deter him from changing jobs. The equation implies that the deterrent effect of pre-existing medical conditions on job mobility is strongest for illnesses which are prolonged and medically expensive. Minor or temporary illnesses are unlikely to have a significant effect on job mobility.

The empirical section of the paper uses data from the NLSY to estimate the probability of a job change. In the empirical section I employ measures of the supply of health insurance coverage in a respondent's region of residence as explanatory variables for job changes and changes in health insurance coverage. The first finding is that there is substantial geographic variation in the continuity of health insurance coverage over time. Individuals are more likely to lose their employer linked health insurance coverage in states with high and rising costs of health care than in low cost states.

Second, increases in the employer cost of providing health insurance coverage to employees will have a significant and negative effect on job mobility. Individuals are less likely to change jobs when they are in a geographic region with high and increasing costs of health insurance. A possible explanation of this result is that individuals do not wish to change jobs when the prospects for obtaining a new job with health insurance coverage are relatively poor. In an environment where the costs of health insurance coverage are rising, the supply of health insurance coverage is likely to be low.

Third, I find that an individual's propensity to change jobs, an unobserved characteristic, is negatively correlated to the probability that he will receive health insurance coverage from an em-

ployer, which provides strong evidence that the job-lock effect found in existing studies is spurious. The analysis implies that government mandates which prohibit the exclusion of pre-existing medical conditions from new health insurance policies or require employers to extend benefits to former employees may result in fewer employers offering health benefits, and may exacerbate the job-lock problem.

Introduction

In the U.S. labor market it is commonplace to observe individuals for whom job changes have resulted in increases or decreases in health insurance coverage. Simple inspection of the job changes and changes in health insurance coverage experienced by individuals would reveal that individuals commonly experience different types of job and health insurance coverage transitions. Some workers leave jobs that offer health insurance coverage for ones that do not, while other workers leave jobs that do not offer health insurance coverage for ones that do. Some workers work many years in the same job receiving their employer's health insurance coverage plan as a benefit throughout their tenure, while others work many years at the same job only to have their employer's offer of health insurance coverage withdrawn. Still others might be observed to change employers often and never receive health insurance coverage through an employer.

Currently in the U.S. most individuals' health insurance policies are linked to an employer.[1] The socially relevant difference between this status quo of health insurance coverage distribution in the U.S. and a regime in which health insurance coverage policies are not linked to employers is that the employer linked system creates a relationship of dependence between a worker's job mobility, i.e, employer changes and employment status changes, and his price schedule for medical care.[2] This relationship has two main outcomes. Each raises a distinct social welfare concern. One, an individual's job mobility can cause changes in his 'out of pocket' medical care expenditures, i.e., personal health care expenses not covered by health insurance, thus creating an uninsurable risk.[3] Two, individuals may be deterred from a job change by the prospect that a job change

[1] In the U.S. non-elderly adults usually obtain private health insurance through either their own or their spouse's employer. Using data from the National Medical Care Expenditure Survey, Farley and Wilensky (1983) estimate that eighty-four percent of individuals with private health insurance in the U.S. obtain it through an employer. More recent citations of this percentage vary between eighty and eighty-five percent.

[2] Under the guidelines of the Consolidated Omnibus Budget Reconciliation Act (COBRA) when an individual separates from an employer the price to him of that employer's health insurance policy dramatically increases, and in a matter of months coverage will in most cases cease altogether (see Madrian 1994). He must obtain health insurance from a new employer in order to continue his coverage at an employment based group premium rate. Otherwise, he will either be uninsured or will have to pay for health insurance coverage at an individual premium rate; either way he will likely be worse off, since employment based health insurance coverage is less expensive than individual coverage, *et ceteris paribus*, and the cost of treatment without health insurance coverage is potentially very large.

[3] The effect of health insurance, i.e., a contract that reduces or eliminates the risk of variation in an individual's medical expenditures across different states of health, on individual welfare was first analyzed in Arrow (1974). Job

might cause their current price of medical care to increase. Authors who have written about the effect of employer linked health insurance coverage on job mobility have termed this effect, which may reduce the rate of job mobility in the labor market below its efficient level, 'job-lock'.[4] The implication of changes in health insurance regulation for each of these two outcomes should be considered whenever changes are proposed, because regulatory changes are likely to cause opposite reactions through these two channels.

Several studies have examined the job-lock effect. Recent studies by Madrian (1994), Buchmueller and Valletta (1994), Cooper and Monheit (1993), Holtz-Eakin (1993), and Penrod (1993) attempt to test the hypothesis that a current employer's offer of health insurance coverage reduces the frequency of employer changes. Two of the studies, Madrian (1994) and Cooper and Monheit (1993), strongly support the hypothesis; two of the studies, Holtz-Eakin (1993) and Penrod (1993), do not support the hypothesis; and the last study provides ambiguous support for the hypothesis. Thus, these studies represent a conflicting body of empirical evidence on the existence of a job-lock effect in the U.S. The fact that it has been difficult to show conclusive evidence of job-lock is mysterious, since the job-lock hypothesis has such intuitive appeal and the casual evidence of job-lock is so pervasive.[5]

I argue here that existing job-lock papers have obscured the structural relationship between job changes and changes in health insurance coverage by approaching their analysis from the point of view that job mobility decisions are made in a static environment and with perfect certainty. In

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mobility represents another source of risk for an individual, because an involuntary job exit may cause an individual's price of medical treatment to change. Hence, there is a risk of variation in an individual's medical expenditures across different employment states and employers. In a later chapter of this thesis I will analyze the effect of universal (non-employer based) health insurance on individual welfare, and show that universal coverage is welfare improving in this regard.

[4]If job mobility is the mechanism by which individuals are sorted into the jobs for which they are best matched (e.g., Jovanovic, 1979; Jovanovic, 1984; Jovanovic and Moffitt, 1990; Topel 1986; Topel and Ward, 1992), employment based health insurance may impede the sorting process. From the view of an individual a job change may result in an increase in the price of health insurance coverage or loss of coverage. These actual and potential costs may reduce the frequency of job changes relative to their frequency when health insurance is perfectly portable, i.e., not linked to a specific employer. It is in this sense that employer linked health insurance coverage is claimed to create an inefficiency.

[5]Most of us either know or know of someone who has delayed or forgone a job change for fear of losing health insurance coverage of their own or their family's medical expenses.

particular, no paper has examined the mechanism (alluded to above) which connects job changes to changes in health insurance coverage.[6] This mechanism has not been formalized or discussed in the models presented in job-lock papers. A formal statement of that mechanism would illustrate that: (1) pre-existing medical conditions, which have been the basis for job-lock in all of the existing studies, are only one type of causal factor among the many types of potential causal factors which might create a job-lock effect; and (2) the causal link between portability of health insurance coverage and job mobility, which is emphasized in all of the existing studies, may be invalid. Policy prescriptions for making health insurance portable across employers may be ineffective or have a negative effect on the ability of individuals to maintain continuity of health insurance coverage over an extended period of time, since they may cause an increase in the employer cost of offering health insurance coverage as an employment benefit.

The models of the job mobility decision that appear in existing studies have been based on two overly restrictive assumptions – the state of the world is static, and individuals know all relevant outcomes with perfect certainty. However, the process which determines an individual's job mobility and changes in health insurance coverage is *dynamic*, and depends on uncertain events. It is dynamic in that an individual's decision to leave a job today depends on the tradeoff that exists between the future value of continued job search and the future value of accepting a current job offer. These calculations depend upon changing information and expectations of future uncertainties. An essential element of the job mobility decision (as it relates to changes in health insurance coverage) is an individual's prospects for obtaining insurance coverage in the future, both from his current employer and from prospective employers. Existing studies do not address this dynamic aspect of the job mobility problem. One innovation of my analysis is that I develop a dynamic model of job mobility and changes in health insurance coverage which includes uncertainty over wage and health insurance outcomes, and I re-examine the conclusions of previous studies within this more flexible framework.

The model generates two new conclusions regarding the existing job-lock studies. Previous studies have claimed that the demand for health insurance coverage is negatively related to job mobility when insurance is linked to an employer, due to the effect of the exclusion of pre-existing

[6]This mechanism is essential to the job-lock story, because unless a job change could result in a change in health insurance coverage an individual would not feel locked into a job based on his reliance on his current employer's health insurance package.

medical conditions.[7] I show that the negative effect of pre-existing conditions on job mobility is a special case in a dynamic model of job mobility; in the theoretical model pre-existing conditions may increase the probability of a job change as well as diminish it. I derive a statement of the condition under which pre-existing conditions will reduce job mobility.

The theoretical model also provides new insight into the causes of job-lock. A key assumption of previous studies is that pre-existing medical conditions are the sole causal factor which can create a job-lock effect; the model implies that any factor which reduces the probability that an individual would be able to obtain health insurance coverage at a different job may also cause a job-lock effect. I examine shifts in the market supply of employer linked health insurance coverage as an additional source of job-lock.

The source of identification of parameter estimates in existing studies of job-lock is unclear, because in each case the empirical model of job mobility obscures the structure of the relationship between job changes and health insurance status. I clarify the identification issues by examining the exact structure of the estimation problem. The structural econometric model highlights the fact that the job-lock effects estimated in previous studies have been underidentified, a fact that the reduced form models in those studies do not reveal.

The structural model also reveals that existing estimates of the job-lock effect and of the effect of health insurance coverage on job mobility are biased, because measures of the demand for health insurance coverage and indicators of health insurance status are correlated with unobservables in econometric specifications of the probability of job exits. In particular, if the propensity of an individual to change jobs is negatively correlated with the probability that he will be in a job that offers health insurance coverage or with other measures of health insurance demand, then the parameters which represent the marginal effects of these variables on job mobility will be biased away from zero. In estimating job exit probabilities existing studies of job-lock do not control for the endogeneity of these variables to job mobility.

I use panel data from the National Longitudinal Survey of Youth (NLSY) to address this

[7] In existing job-lock studies the exclusion of pre-existing health conditions by insruance companies is advanced as the basis of job-lock. Some individuals have existing medical conditions for which they expect to receive medical treatment in the future. Currently, most insurers in the U.S. only pay for medical treatment of conditions that are diagnosed after the start date of a health insurance policy, which usually begins at the start of a new job. Individuals know that their pre-existing conditions will not be covered in a new health insurance policy, so the exclusion introduces a cost of moving to a new employer that may deter an individual from changing jobs.

endogeneity issue. I exploit the fact that the NLSY data contains the entire labor force history for a large sample of individuals over a roughly 15 year period to control for unobserved determinants of job mobility. The resulting parameter estimates show a dramatic change in sign and a clear consistency with the theory of job changes once I control for the unobserved determinants of job mobility.

In another new result, the dynamic model of job mobility points to the employer cost of offering health insurance coverage to employees as being an important determinant of health insurance coverage, of changes in health insurance coverage, and ultimately of job mobility. I use measures of the geographic variation in health insurance costs across states as exogenous explanatory variables in my empirical model of job transitions and transitions in health insurance coverage. These cost factors exhibit a strong effect on health insurance coverage, on changes in coverage, and on job mobility. I discuss the policy implications of these results for potential health insurance reform initiatives.

The NLSY is unique among existing data sets in that it includes longitudinal health insurance coverage information over a long period of time. I use this information to generate the first ever examination of job/health-insurance-coverage-status transitions over time. The results of this analysis contradict the assumption of previous studies that an offer of health insurance coverage from an individual's current employer will be offered in the future with certainty.

The NLSY data do have certain limitations stemming from the youthfulness of the NLSY respondents. However, the NLSY is an underutilized source of information for studying the dynamics of health insurance coverage and job mobility, since it is the only data set that contains both health insurance coverage and employment histories for a large sample of individuals over a long period of time.

The analytical framework presented here also represents a non-trivial innovation to existing models of job mobility. The dynamic model is an extension of the partial equilibrium on-the-job search model of Mortensen (1986) and others. I derive a useful generalization of the standard search model, by allowing uncertainty over the level of compensation that will be offered by the current employer in the future to affect the 'reservation utility level', the analogous component in my model to the reservation wage of the standard search model. Thus, the model incorporates the possibility of shocks to either the current employer's wage level or the price of health insurance coverage in the current employer's health insurance policy. Expected improvements to the current employer's wage or health insurance compensation offer increase the reservation utility level and

delay job mobility, while expected declines in the current employer's wage offer or increases in the employee's cost of the health insurance coverage reduce the reservation utility level and increase the probability of a job change.

Previous Research

Stoppage of health insurance coverage or reduction of health insurance coverage are two possible outcomes of job changes when health insurance coverage policies are linked to employers. The implication of this fact for the frequency of job changes has been studied in several recent articles. In a series of articles (Madrian, 1994; Buchmueller and Valletta, 1994; Cooper and Monheit, 1993; Holtz-Eakin, 1993; and Penrod, 1993) there have been attempts to estimate the effect of the demand for health insurance coverage on job mobility by health insurance status. The issue addressed by these authors is whether or not employer linked health insurance coverage is a deterrent to job mobility.[8]

The conclusions of studies of job-lock vary. Madrian (1994) uses the 1987 National Medical Expenditure Survey (NMES) to estimate the effect of health insurance coverage on job mobility. Her main conclusion is that within the group of employees who have purchased a health insurance policy directly from an insurance company, i.e., a health insurance policy not purchased through an employer, job mobility is 25% lower for those who, in addition to their outside coverage, obtain health insurance coverage from their employer. Also using the NMES, Cooper and Monheit (1993) find that married males are 25 percent less likely to change jobs when they receive employment related health insurance coverage. Using the Survey of Income and Program Participation (SIPP), Buchmueller and Valletta (1994) find that health insurance reduces job mobility for single women but not for single men or for men who are household heads. In a study that compares job mobility in the U.S. and in Germany, Holtz-Eakin (1993) uses the Panel Survey of Income Dynamics (PSID) to estimate job mobility in the U.S. He finds no evidence of job-lock. Finally, Penrod (1993) finds no significant job-lock effect using the SIPP.

The hypothesis that is proposed in these studies, that an increase in an individual's demand for health insurance coverage will have a negative effect on his job mobility when he receives health insurance coverage from his current employer begs two, more fundamental questions: (1) what is the reasoning which underlies a claim of association between a welfare loss for individuals and employer linked health insurance coverage; and (2) by what mechanisms can we expect this association to operate empirically? The theoretical frameworks and empirical approaches that have been used in existing studies of job-lock at best lead to very incomplete answers to these two questions, and at worst they lead to misleading answers.

[8] I refer to these articles collectively as 'job-lock articles'.

A formal treatment of expectations is important for a model of job mobility, since an individual's expectation of future compensation offers determines his valuations of both his current job and potential jobs in the market. A determination of the future value of a job involves considerable uncertainty. Wage rates change often. They may increase when a firm's revenues increase or with a promotion, and they may decline when revenues slag or with a demotion. Health insurance coverage may also change often, even at the same firm. A given employer might change his company's health benefits package to include a higher coinsurance rate or a higher employee premium contribution. An employer who does not offer health benefits to employees may decide to start; an employer who offers health insurance to employees may decide to discontinue that offer. Each of these compensation changes as well as the changes that occur in the employment market in general affects the value that an individual places on his current job and the probability that he will leave that job.

The models used in existing studies do not represent this decision process accurately, because they do not include an account of individual expectations. I derive a dynamic model of job changes, below, which includes a reasonable account of expectations. The model shows that it is an individual's expectations of changes in compensation, either at his current job or if he were to search for a new job, that determines job mobility.

The model implies that: (1) the empirical specifications used in existing studies of job-lock are misspecified and do not identify a job-lock effect; (2) the exclusion of pre-existing medical conditions from new health insurance policies is only one of many factors which may cause job mobility to be lower in an employer linked health insurance coverage regime compared to a regime of national health insurance coverage; and (3) certain proposed legislative solutions to the problem of job-lock, such as proposals to allow employees to continue to purchase their health insurance coverage through a previous employer (known as continuation coverage mandates) and proposals to prohibit health insurance companies from excluding pre-existing medical conditions from coverage, if enacted, are likely to be either ineffective or counter-productive measures. They are unlikely to increase job mobility to the level which would exist in a regime of national health insurance coverage, and, by increasing the employer cost of offering health insurance coverage, they may cause some employers to eliminate or restrict the health insurance coverage they offer to their employees.

Theoretical and Methodological Issues

Theories of the demand for health insurance coverage (e.g., Arrow, 1963; Arrow, 1974; Pauly, 1968; Pauly, 1986; Ehrlich and Becker, 1972; Viscusi, 1979), the determination of fringe benefit levels (e.g., Farley and Wilensky, 1983; Lee, 1993; Mitchell, 1990; Rosen, 1986; Rosen, 1974), and the decision to change jobs (e.g., Burdett, 1978; Burdett and Mortensen, 1978; Jovanovic, 1979; Flinn and Heckman, 1982; MacDonald, 1988) form the background for the current job-lock articles. An overview of this earlier research would reveal a more complex picture of the structural relationship between health insurance coverage and job mobility than that which is presented in the later literature. A model of this structural relationship would illustrate that the job-lock effect is a corollary outcome of life-cycle job mobility and its effect on health insurance coverage.

Structurally, causation between health insurance coverage and job mobility runs in both directions. Health insurance coverage may affect job mobility, but also job mobility may affect health insurance coverage. Involuntary job changes may occur because of a layoff, firing, or employer bancruptcy; or because a job is seasonal. Voluntary job mobility may occur because a better job (e.g., higher pay, better work conditions, more enjoyable job responsibilities) is found; for personal reasons (including illness, family responsibilities, family geographic mobility, or active military duty); or because an individual is footloose, i.e., they may have a preference for a lifestyle that includes frequent geographical moves. Any job change, whether voluntary or involuntary, may result in a change in an individual's price of health insurance coverage. A change in insurance price is very likely to occur in the event of a job change, both because variation in health insurance prices across employers is the norm, and because an individual's risk characteristics are likely to be re-evaluated when he subscribes to a new health insurance policy. An increase in the price of health insurance will certainly occur if an individual leaves an employer that offers health insurance for one that does not, and a decrease will occur if he leaves an employer that does not offer health insurance for one that does.[9] When an individual does leave an employer the expected change in his price of insurance depends upon, among other things, his health status, the number of potential opportunities he has for obtaining employer based health insurance coverage, and the cost of health insurance in his state.

The job-lock hypothesis is that an individual will be deterred from changing jobs when he expects that a job change would cause an increase in his price of health insurance coverage. The basis of the deterrent is that an individual has this expectation. Hence, there must be a mechanism

[9] One reason that an employer can purchase health insurance more cheaply than can an individual is that transaction costs create an economy of scale in the purchase of insurance.

which creates this expectation. Job-lock articles omit any exposition of this mechanism, which is the basis of the job-lock effect. My model includes a formal exposition of this mechanism. It shows that pre-existing medical conditions, which are the sole source of job-lock in existing studies, are in fact only one of many potential sources of a health insurance based deterrent to job mobility.[10] I discuss the theoretical and empirical implications of this fact below.

A common bond among the articles which have analyzed job-lock is that job mobility is modeled as a static decision process. The job mobility decision is presented as a static comparison of the utility of a current job offer with the utility of an alternative job offer. An individual chooses the job that offers the most utility net of moving costs.[11] The studies are almost identical in that utility is specified as a linear function of wage income and health insurance. The resulting models are similar to the following one:

$$M^* = \alpha(w^c - w^a) + \beta(I^c - I^a) + \gamma C + u \tag{1}$$

$$M = \begin{cases} 1 & \text{if } M^* < 0 \\ 0 & \text{if } M^* \geq 0 \end{cases} \tag{2}$$

where M^* is a latent index of utility; w^c and w^a are wages on the current and alternative jobs; I^c and I^a are zero-one indicators of whether or not current and prospective jobs offer health insurance coverage; C represents the cost of changing jobs; α, β, and γ are parameters; u is a random error term; and M is an indicator of job mobility.[12]

The analysis of job-lock focuses on the sign of the parameter γ in (1), the marginal effect of moving costs on the utility of a job change. Indicators of the demand for health insurance coverage, such as whether or not a respondent's wife is pregnant, are included in C, the cost of changing jobs. The logic of this specification is that indicators of health insurance demand proxy for the level of medical care utilized by an individual (or his family) for his (their) current medical conditions – medical conditions which would pre-exist the start date of any new health insurance policy, were the individual to change jobs. Hence, these indicators of the demand for health insurance coverage

[10] I show that shocks to the price of medical care are another potential cause of job-lock.

[11] This model was first used to study fringe benefits and job mobility by Mitchell (1983).

[12] The models differ mainly in their specification of the terms w^a and I^a, the expected market wage and health insurance offers, respectively. One strategy is to predict w^a and I^a using information on individual human capital characteristics. Another specification of (1), used by Madrian (1994), omits these terms altogether, but includes measures of human capital characteristics, such as years of education and years of employment experience. Previous econometric specifications of (1) and (2) are discussed below.

proxy for the cost of changing jobs, because a new health insurance policy would exclude pre-existing medical conditions from coverage. In job-lock articles a negative estimated value for γ is interpreted as evidence in support of the job-lock hypothesis.

However, γ is not theoretically identified. In (1) the term $(I^c - I^a)$ represents the change in health insurance coverage that would occur if an individual were to accept an alternative job offer, so the parameter β represents the marginal utility of that change in health insurance coverage. Theory predicts that the marginal utility of health insurance coverage is increasing in an individual's expected medical expenditures (e.g., Arrow, 1974; Rothschild and Stiglitz, 1976).[13] Hence, according to theory, β should vary across individuals according to their demand for health insurance coverage. This is the crux of the identification issue – the same health insurance demand indicators that enter C, the cost of changing jobs, should be allowed to affect β, the marginal utility of a change in health insurance coverage, because both C and β may be affected by an individual's underlying demand for medical care. Stated differently, an increase in an individual's demand for medical care may directly increase his demand for health insurance coverage through its effect on the marginal utility of such coverage (given by β), and it also may indirectly decrease the supply of health insurance coverage offered to him through the exclusion of pre-existing medical conditions (represented by C). It is impossible to separate out these two effects using indicators of an individual's health insurance demand alone.

This argument suggests that determinants of health insurance supply, if exogenous to an individual, would be useful for identifying γ. I argue, below, that measures of the geographic variation in the cost of health insurance across states are exogenous to individuals and are determinants of health insurance supply.

This argument raises the possibility that an increase in an individual's demand for medical services may induce job mobility rather than deter it. For example, suppose a young couple is planning to have their first child in the near future. If neither of them receives health insurance coverage through a job, one or the other may begin looking for a new job that offers health insurance coverage, even if alternative jobs offer lower wages than their current jobs. Since the cause of the increase in their demand for health insurance coverage – namely, their increased demand for children

[13]This claim rests on the assumption that an individual's marginal utility of medical treatment is higher when he is sick than when he is healthy. If an individual is willing to pay more for a marginal amount of medical treatment when he is sick compared to when he is healthy, then the shadow price of health insurance coverage will also be higher for the sick than for the healthy, holding other variables constant.

– should not have any marginal effect on the employer supply of health insurance coverage, their probability of a job exit would increase (not decline, as is predicted by the job-lock argument).

The decision to change jobs cannot be accurately represented in a static theoretical framework, such as the framework in (1) and (2). When an individual assesses the utility of accepting an alternative job offer he compares the expected utility he would receive from the alternative job to the expected utility he would receive were he to reject the alternative offer and stay at his current job. In a static framework the compensation that he would receive at his current job, i.e., *ex post* compensation, is equivalent to the compensation that he currently receives, i.e., *ex ante* compensation. In a dynamic framework the two quantities are not equivalent.

In a dynamic model expected changes in compensation affect the mobility decision, since they affect the value of staying at one's current job. An individual's level of compensation at his current job may change for myriad reasons. Some compensation changes may be unexpected and randomly distributed, but others may be expected. For example, an individual may expect to be fired or layed off, or may know that he will be forced to quit. Both cases represent expected decreases in current compensation. Alternatively, an individual may expect an impending promotion, which may represent an expected increase in compensation. Expected decreases in compensation lower the value of staying at a current job and increase the probability of a job change; expected increases in compensation have the opposite effect.

The previous two paragraphs imply that (1) is misspecified in that the terms w^c and I^c represent components of the *ex ante* compensation offer from the current employer, while the appropriate specification would include the expected *ex post* wage and *ex post* health insurance offers. The difference is an important one, because it suggests the following question: what are the determinants of an individual's expected *ex post* wage and health insurance coverage offers? That question is not asked in existing studies of job-lock, whose focus has been the effect of pre-existing health conditions on job mobility and not the determinants of health insurance coverage or wage rates. In those studies an individual's current health insurance coverage is treated as an exogenous variable, so the question of what factors influence an individual's health insurance coverage never arises. I argue, below, that geographic variation in health insurance costs at the state level as well as other measures of human capital are important determinants of health insurance status. I use these variables to predict the mean of the distribution of health insurance offers in the labor market.

Empirical Issues and Results

Although existing job-lock studies reach different conclusions with regard to job-lock, all of them confirm three previously established facts. One, individuals with employer linked health insurance coverage are less likely to leave their jobs than individuals without such coverage (Klerman, Buchanan, and Leibowitz, 1992). Two, there is a positive relationship between continuity of employment and continuity of private health insurance coverage (Monheit and Schur, 1988; Swartz and McBride, 1990). Three, there is a positive correlation between health insurance benefits and wage income (Klerman, 1992; Kronick, 1991; Swartz and McBride, 1990). These three facts tell us that good jobs, i.e., those that pay high wages and are long lasting, are more likely to offer health insurance coverage than those that do not, and that individuals who have a strong attachment to the labor force and are of high skill are more likely to have employer linked health insurance coverage than those individuals who have a weak attachment to the labor force and are of low skill.

Although previous descriptive studies have shown a negative relationship between the probability that an individual has a health insurance policy from his current employer and the probability that an individual will change jobs it is a greater task to show that health insurance coverage reduces job mobility. To show causality we would ideally want to have an experiment, wherein we could independently assign health insurance coverage to a group of individuals and observe their job changes while holding constant across individuals all other determinants of health insurance coverage. In reality we could never control for the determinants of health insurance coverage, and health insurance coverage is not independently assigned. Rather, it is an outcome of an individual's choices and opportunities. A more realistic strategy would be to examine how individual mobility patterns vary as we vary an exogenous determinant of health insurance coverage. We could then make inferences as to how job mobility differs across individuals with different exogenously determined propensities for health insurance coverage. This is the proposed strategy in the existing studies of job-lock.

The authors of these studies estimate the probablity of a job change. Although all the authors begin their analysis using the simple theoretical framework in (1) and (2), each author chooses a unique econometric specification. Cooper and Monheit (1993) estimate (1) directly. They specify the following two *alternative job* regime equations:

$$w_i^a = b_w' X_{wi} + e_{wi}$$

and

$$I_i^a = b_I' X_{Ii} + e_{Ii}$$

where X_{wi} are person i's characteristics that determine his offered wage rate; b_w is vector of parameters; and e_{wi} is a normally distributed error term. The components of the equation for I_i^a are similarly defined.

Cooper and Monheit estimate the two regime equations using the observed (current employer) wage as the dependent variable in the wage equation, and the observed zero-one indicator of whether or not an individual receives health insurance at his current job as the dependent variable in the health insurance equation. Using the estimates of b_w and b_I they create the variables $\hat{I}_i^a$ and $\hat{w}_i^a$, the predicted values of I_i^a and w_i^a for every individual i in their sample. They represent the term $(I_i^c - I_i^a)$ with $(I_i^c - \hat{I}_i^a)$, the residuals from the insurance regression, and the term $(w_i^c - w_i^a)$ with $(w_i^c - \hat{w}_i^a)$, the residuals from the wage regression. Finally, they estimate (1) and (2) by adding these two residual terms to the right hand side of a Probit model for job mobility. Their estimates of α and β are statistically significant, and both are negative. Thus, those who the model predicts would gain health insurance coverage after changing jobs (low $I^c - I^a$) are more likely to change jobs than those who are predicted to lose coverage (high $I^c - I^a$). Using this interpretation their results are consistent with the hypothesis that having employer linked health insurance coverage reduces job mobility.

However, their results may be just a spurious outcome of model misspecification. There are likely to be unobserved characteristics of individuals or employers which determine both the probability that an individual will be in a job that offers health insurance coverage and the probability that an individual will change jobs. For example, we know from previous theoretical and empirical arguments that large employers are more likely than small employers to offer health insurance coverage. We also know that average wage rates are higher at large employers compared to small employers. Finally, we know that mobility rates are lower at large employers than at small employers. It may be true that the latter two of these correlations are outcomes of a selection process in which individuals who have characteristics (unobserved to the econometrician, but known to both employers and individuals) which make them above average in terms of productivity and below average in terms of mobility are selected into jobs with large employers.[14] If such a selection process

[14] After all, large employers have a greater incentive than do small employers to select less footloose, i.e., less mobile, workers, because job mobility increases the administrative cost of both health insurance and pension benefits, and large employers have a cost advantage over small employers in offering both types of benefits. The observed correlation between large employers and high wage rates has been well documented, but is more difficult to explain. The fact that the correlation cannot be easily explained is itself evidence that it is the outcome of unobserved characteristics.

operates in the labor market, then an individual with those unobserved selected characteristics will be more likely than an individual without those characteristics to be observed in a job that offers health insurance and less likely than same to change jobs.[15]

More formally, there may be unobserved attributes of individuals that create a correlation between u, the error term in the mobility equation, and e_I, the error term in the insurance equation. If $E(u\,e_I) < 0$, then estimates of β will be negative even if there is no causal link from health insurance coverage to job mobility.

Madrian (1994) does not estimate (1) directly. Her econometric specification of (1) and (2) is as follows:

$$M_i = b_1 w_i^c + b_2 I_i^c + b_3 C_i + b_4 (C_i\, I_i^c) + u_i$$

where the measures of C_i in her study are whether or not a respondent's wife was pregnant, family size, and an indicator equal to one if a respondent was not covered under another health insurance policy not linked to his current employer. She proposes that among individuals who receive health insurance from their current employer the cost of changing jobs should be higher for those who, in addition, have a high demand for employer linked health insurance coverage than for those who do not. Hence, she expects her estimates of b_3 and b_4 to be negative.

Her results confirm the main result of the Cooper and Monheit study, that individuals with employer linked health insurance are less likely to change jobs than individuals without such coverage.[16] Just as in the Cooper and Monheit paper, this result does not necessarily imply a causal relationship from health insurance to job mobility, because health insurance coverage is endogenous to the job mobility equation.[17]

Madrian's tests for job-lock are derived from her estimates of b_3 and b_4, the coefficients of health insurance demand indicators (pregnancy, no outside health insurance, and family size) and their interactions with health insurance coverage.

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[15] An analogous argument may be made on the basis of employer rather than individual characteristics. Some employers may be more likely than others to both offer health insurance coverage and be preferred by workers. Employees of those companies will be more likely than the average employee to have health insurance coverage, and less likely than same to change jobs.

[16] Her estimates of b_2 are statistically significant at the 5% level and negative in all of her specifications.

[17] There may be unobservable characteristics of individuals or jobs that determine both the probability of a job change and the probability that a job will be one that includes health insurance coverage. See previous paragraphs for a full exposition of this point.

Almost all of these coefficients are statistically insignificant at the 5% level; her results do show a negative and significant coefficient to the interaction of health insurance coverage and family size (table 4) and a negative and significant coefficient to the interaction of health insurance coverage and pregnancy (table 5), but all other coeffecients are insignificant. In many cases Madrian appears to have miscalculated the standard errors of her test statistics, erroneously concluding that her evidence supports a statistically significant test statistic when in fact it does not.[18] Also, her results show that a spouse's pregnancy increases the probability of a job change, when theory predicts that it should reduce that probability.

Also, all three of Madrian's measures of C are endogenous to the job mobility equation. For example, it is quite possible that individuals who are in stable employment situations are more likely to have a spouse that is pregnant than individuals who are in unstable employment situations. This tendency would produce a negative correlation between C and u. If $E(C\,u) < 0$ then estimates of b_3 would be negative even if C were not a cause of lower job mobility, and estimates of b_4 would also be negative, since $E(I\,C) > 0$ in this case.

This point is equally true for individuals who do not have outside (not employer linked) health insurance coverage and individuals who have large families. It may be true that individuals who have higher than average job mobility are more likely to purchase outside health insurance coverage than those who are characterized by below average job mobility. If you are a mobile person it may make sense to purchase outside coverage, because you know that your high job mobility puts you in a higher than average risk category for losing your employer linked coverage. This positive correlation between risk of job change and purchase of outside health insurance coverage would show up in (1) as a negative correlation between C and u.[19] Hence, an individual's unobserved proclivity for job mobility may cause a negative correlation between u and C, which again would produce negative estimates of b_3 even if additional health insurance coverage were not a determinant of job mobility.

[18]For example, in table 3, specification 3, she reports a p-value of .017 for 'Job-Lock, Test 1'. The correct calculation shows a normally distributed test statistic, $z = (\hat{\beta}_2 + \hat{\beta}_3)/\sqrt{\widehat{Var}(\beta_2) + \widehat{Var}(\beta_3)} = (-.039 + .211)/\sqrt{.1075^2 + .1339^2} = 1.00$, or a p-value of .159.

[19]The measure of C in this case is 'no additional health insurance coverage'. It is a slightly confusing measure of mobility costs. Individuals who own additional (not employer linked) health insurance coverage are said to have a lower reliance on their employer linked coverage. Hence, mobility costs, C, are lower for this group than for those who do not have additional coverage. If, in this case, C is defined as one for those individuals who do not have additional coverage and zero otherwise, then a positive value of C represents the group with the higher mobility costs.

Estimates of b_4 would also be negative if $E(IC) > 0$ in this case; that is, if individuals who have employer linked coverage are less likely to purchase outside coverage than individuals who do not have employer linked coverage.

Finally, the number of children is an endogenous measure of moving costs, because the risk of a job exit may be a determinant of an individual's decision to have a family. If individuals wait until they are in a stable job before choosing to start a family then there will be a negative correlation between u and C, which in this case is measured as the number of children. In this case, as in the previous two, $E(IC)$ is positive, since insurance demand is increasing in the number of children and both insurance supply and familly size are increasing in an individual's age. Again, estimates of b_3 and b_4 may be spuriously negative due to the effect of unobserved variables.

Penrod (1993) attempts to address the issue of the endogeneity of measures of health insurance demand to a job mobility equation. He estimates (1) by two-stage-least squares, instrumenting for the measures of health insurance demand. He creates an instrument for an individual's predicted level of medical expenditures based on an exogenous set of characteristics.[20] Penrod's claim is that the instrument represents an exogenous measure of an individual's demand for health insurance coverage in a job mobility equation, since the two-stage method eliminates the unobserved correlation between the demand measure and job mobility.

However, his instrument still is endogenous in the job mobility equation, since all of the exogenous characteristics used in the first stage equation are predictors of health insurance coverage itself. Thus, the instrument and health insurance coverage status will, in theory, be positively correlated; in turn this fact implies that the instrument will be negatively correlated with the error term in the job mobility equation, creating a spurious negative correlation between the index and job mobility.

The endogeneity issue may be moot, as the instrument was negative, but was not a significant predictor of job mobility. Nonetheless, consistent with the other studies, Penrod did obtain a significant and negative estimate of β, the coefficient of health insurance coverage in (1).

[20]Penrod's method is more complicated than the standard 2SLS method, since the SIPP data that he uses contains no medical expenditure information. His 'instrument' for medical expenditures is constructed using data from the National Medical Care Utilization and Expenditure Survey (NMCUES, 1982). Using medical expenditure information in the NMCUES he runs a regression of total medical expenditures on a set of exogenous individual characteristics which he believes are determinants of medical expenditures. He uses the estimated coefficients from the expenditure regression along with information on individual characteristics from the SIPP to predict a level of medical expenditures for each individual in his SIPP sample. This index is his instrument in the job mobility probit equation.

Buchmueller and Valletta (1994) emphasize the roles of pension coverage and job tenure in their estimates of job mobility. Their econometric model is similar to the following one:

$$M_i = b_1 Pension_i^c + b_2 Tenure_i^c + b_3 w_i^c + b_4 I_i^c + u_i$$

where $Pension_i^c$ is a dummy variable for whether individual i has a pension with his current employer; $Tenure_i^c$ is a measure of i's tenure with his current employer; w_i^c is the observed wage rate; and I_i^c is the observed health insurance indicator. In their model the value of a job is determined in part by fringe benefits (other than health insurance coverage) offered as part of compensation. The authors argue that pension coverage should be included in the mobility equation, because theoretically pensions represent a cost of changing jobs. They also argue that current job tenure measures the durability of a job, and should be a predictor of job mobility.

Although theory does predict that pension coverage and job tenure are related to the cost of changing jobs and the durability of a job, respectively, theory also suggests that unobservable characteristics of individuals and employers may be determinants of pension coverage, job tenure, and job mobility. For example, some individuals may be footloose. These individuals will select jobs which entail below average moving costs. They are less likely than the average individual to select a job which offers a pension, because those jobs entail higher than average moving costs. Also, their preferences imply that footloose individuals will have below average tenure and a higher than average probability of a job change.

The effect of unobservables is even more perverse in this specification. The employer cost of offering health insurance benefits and the employer cost of offering pension benefits have some common cost factors. For example, both sets of costs are decreasing in employer size. These shared cost factors produce a correlation between the probability that a job offers health insurance coverage and the probability that a job offers pension benefits. Hence, in Buchmueller and Valetta's specification I^c will be negatively correlated with u directly, through the means discussed previously, and indirectly, through its correlation with unobserved determinants of $Pension^c$. Other interactions between unobservables are possible, since all of the variables on the right hand side of the specification above represent outcomes of individual choices. Given these many potential sources of bias it is difficult to interpret the estimates they obtain.

Finally, the study of Holtz-Eakin (1994) is similar in methodology to the studies of Madrian (1994) and Penrod (1993). His main interest is in comparing the effect of health insurance on job mobility in the U.S. to that in Germany. In the estimates for the U.S. he finds no evidence of

job-lock.

A critical weakness in the empirical specifications of existing job-lock articles is their inclusion of the observed health insurance indicator on the right hand side of the empirical job mobility equation. I have described how unobservable characteristics of individuals or employers may be determinants of both health insurance coverage and job mobility, and may cause estimates of the coefficient to health insurance coverage to be negative and biased downwards.

The inclusion of the health insurance coverage dummy in the mobility equation leads to another more fundamental problem. Recall that the correct model specification should include the expectation of *ex post* health insurance coverage (not the observed health insurance coverage) in the mobility equation. This claim can be supported empirically as well – I provide support for the claim in the empirical section below. The difference between the observed health insurance coverage and the expected *ex post* health insurance coverage is the expected change in health insurance coverage. Thus, expected changes in coverage have been omitted from the econometric specifications used in existing job-lock studies.

This source of model misspecification is likely to cause the estimates of parameters in (1) to be biased. If expected changes in the current employer's compensation offer, which are omitted from (1), are correlated with either $(w^c - w^a)$, $(I^c - I^a)$, or C then estimates of the parameters α, β, or γ will be biased.

An individual's state of health may be a determinant of both his expectations of future changes in his current employer's wage and health insurance coverage offers and his demand for health insurance coverage. The positive correlation between illness and the demand for health insurance coverage should already be clear. There may also be a negative correlation between illness and changes in compensation. An individual may expect either reductions in his current employer's wage offer or restriction of his health benefits following a serious illness.[21] A negative correlation between expected changes in compensation and the demand for insurance coverage would cause a negative correlation between C and u in (1), since indicators of health insurance demand are included in C and expected changes in compensation are omitted from (1). If $E(C\,u) < 0$ then

[21] An employer may cancel his current employee health insurance benefits plan or switch to a new health insurance plan in order to exclude coverage of a high cost employee. An employee who takes an extended leave of absence due to illness or pregnancy may find that her pre-leave opportunities for promotion have been curtailed or that her responsibilities have been reduced. Both outcomes will have a negative effect on her expectations of future wage offers.

estimates of γ will be biased downward.

Also, characteristics of the state in which an employer is located may affect both an individual's current health insurance coverage offer and his expectations of changes in his current employer's health insurance coverage offer. As I argue in the next section state level regulations and health care industry characteristics cause the employer cost of health insurance coverage to vary from state to state. Trends in regulations and characteristics produce state level shocks to the cost of health insurance. Hence, trends in state level factors affect the level of health insurance coverage offered by employers. If individuals base their expectations of changes in their employer's health insurance coverage offer on these trends then in (1) I^c will be correlated with u and estimates of β will be biased (although the direction of the bias depends on the relationship between current health insurance coverage and expected future health insurance coverage).

Data Issues

Previous studies of job mobility and wages (Topel and Ward, 1992; Abraham and Farber, 1987; Topel, 1986; Altonji and Shakotko, 1987; Altonji and Williams, 1993; Flinn, 1986; Flinn and Heckman, 1982; Gönül, 1988) have attempted to eliminate the possible bias of parameter estimates caused by unobserved individual and employer characteristics. These studies use records of individual employment and wage histories to 'control for' unobserved permanent and transitory components of job mobility and wages, respectively. They show that parameter estimates in models of wages and job mobility change significantly when the estimation strategy does not account for the effect of unobservables. Empirical studies of job mobility and health insurance coverage need to address these same empirical issues; these issues apply to an analysis of health insurance coverage and job mobility equally as well as to an analysis of wages and job mobility, because health insurance coverage is a subtitute form of compensation for wages.

Estimation of the full set of relationships between health insurance coverage and job mobility requires an extensive individual level data set. Relevant individual information would include, for example, the history of an individual's wages, timing of job changes, health insurance premiums, demand for medical care, and compensation offers. No existing set of data contains complete information in each of these categories. The limitations of currently available data imply that any empirical study of health insurance coverage and job mobility will be unable to address one or more empirical issues. Still, it is surprising that none of the existing studies of job-lock use data containing longitudinal health insurance coverage information or discuss the implication of

longitudinal data for their analyses, since the dynamics of health insurance coverage is the central theoretical issue in those studies.

The data sets used in existing studies are the SIPP (Buchmueller and Valetta, 1994; Penrod, 1993), the PSID (Holtz-Eakin, 1993), and the NMES (Cooper and Monheit, 1993; Madrian, 1994). The SIPP and the NMES are both short panels.[22] The PSID is a long panel data set. The PSID began in 1968, has continued for more than 25 years, and is a much used source of longitudinal labor market and demographic data.

Existing evidence suggests that changes in health insurance coverage status over time are an important fact for individuals in the U.S. Swartz (1994) calculates that 37 million americans experience a spell without health insurance coverage lasting between 1 and 11 months sometime during a year, and another 21 million are without health insurance coverage for at least a year. While the SIPP, NMES, and PSID are panel data sets, none contain longitudinal health insurance coverage information.[23] Thus, none of the existing analyses can measure the prevalence of individuals who experience changes in health insurance coverage over time.

For the same reason, the data sets used in prior studies of job-lock could not be used to analyze the determinants of changes in an individual's health insurance coverage over time.[24] As I argue below it is important to know the causes of changes in an individual's health insurance coverage, since it is those underlying causes which are determinants of job mobility rather than insurance coverage itself.

Data which include records of individuals' work histories have been essential in past studies of job mobility. In those studies the authors attempt to control for unobserved individual proclivities for job changes using a variety of econometric techniques.[25] In each case unobserved factors were

[22]Panel information in the SIPP extends 36 months, while in the NMES information was collected for a period of approximately 15 months.

[23]The SIPP and the PSID collected health insurance coverage information only for a single point in time with a one-time supplementary questionnaire. The NMES collected health insurance information at all five interview dates. However, only the health insurance information at the first interview date was used by Madrian. It is questionable whether or not the five observations on health insurance coverage taken at roughly three month intervals is a useful data source for a longitudinal analysis of health insurance coverage. So far this issue is moot.

[24]To emphasize the obvious, note that without longitudinal health insurance coverage data such an analysis would be bereft of a dependent variable.

[25]Topel and Ward (1992) provide a detailed discussion of the importance of longitudinal work history information

found to be correlated with relevant explanatory variables, such as job tenure and wage rates. Job-lock studies have not controlled for unobserved determinants of job mobility, although in the case of the PSID it has been possible. The job mobility literature implies that consistent estimates of health insurance effects on job mobility can only be obtained using several observations of job transitions for each individual in a data sample.

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for studies of job mobility.

A Job Search Model with Insurance

In this section I develop a job search model in which an individual searches for both a price of health insurance coverage and a wage. By including both the value of health insurance coverage to an individual and the distributions of health insurance offers from an individual's current employer and the market, the model represents a dynamic specification of both an individual's health insurance choice decision and his job mobility decision. The model shows how the probability of a job change is affected by shifts in the current employer and market distributions of health insurance offers, and changes in an individual's demand for health insurance coverage.

The model is in the tradition of the job matching model of Jovanovic (1979) and the job search model as presented in Burdett (1978) and Mortensen (1986).[26] I adapt these models to include the value of health insurance coverage in the individual's search decision. The reservation wage in the traditional search model is replaced in my model with a reservation utility level which reflects the utility value of both wage income and the price of health insurance.

Job mobility decisions in the model are guided on the one hand by factors which determine the growth of compensation – educational attainment and increases in employment experience – and on the other by factors which determine an individual's actual and desired level of health insurance coverage – location specific costs and an individual's demand for health services. An employee's valuation of a given set of offers from his current employer and the market depends upon his preference for compensation in the form of health insurance coverage relative to compensation in the form of wage income. Also, the offer distribution of prices for health insurance coverage from the market and the evolution of health insurance offers on the current job depend upon location specific variation in the employer cost of providing health insurance coverage as part of compensation.

Utility maximization is modeled as having both a dynamic job search component and a static consumption component. The consumption decision is made by choosing a utility maximizing level of health insurance coverage, I, and level of consumption of other goods, X, given a budget constraint. The solution to this problem is represented by an indirect utility function which maps wage rates and prices of health insurance coverage into a measure of utility. Offers of employment consist of a wage rate and a price of health insurance, which an indivdual values according to his utility function. An individual's job search problem is conditioned on his indirect utility function and the distributions of compensation offers he faces from his current employer and the market.

[26] See also Topel (1986), Topel and Ward (1992), MacDonald (1988), and others.

The following three sections outline the static consumption decision, the determination of the employer offer distribution, and the search problem. A comparative static analysis characterizes the circumstances which would create job-lock and the differences between dynamic and static models of job changes.

The Consumption Decision

Individuals choose a level of health insurance and other goods given a price schedule for insurance. To begin suppose that the utility function is

$$U = U(X, I; \alpha) \tag{3}$$

where X is a composite commodity, I is insurance, and $\alpha \in [0, 1]$ is a parameter. Utility is increasing in both X and I, but the marginal rate of substitution between them depends on α. The individual's underlying demand for medical care is represented by α, which indicates the preference for insurance relative to other goods. The budget constraint is given by

$$w = X + pI \tag{4}$$

where w is the wage, the price of X is set equal to one, and p is the price of insurance. Compensation offered by employers consists of a pair, (w, p). The employment offer that an individual accepts is determined in the search problem of the next section.

The solution of the problem stated in (3), (4) is specified as

$$u(w, p, \alpha) = w\, e^{-\alpha p} \tag{5}$$

where u is the indirect utility function.[27] Equation (5) shows the relationship between an individual's preference for insurance and wages. For fixed utility level, $\bar{u}$, the following results apply:

$$\frac{dw}{dp} > 0, \qquad \frac{d^2 w}{dp d\alpha} > 0. \tag{6}$$

For given utility levels bid-asked curves are increasing in w and p, with slopes that are increasing in α. Thus, in (p, w) space, utility increases to the northwest, and bid-asked curves steepen in response to an increase in the preference for health insurance.

Figure 1 illustrates the health insurance and wage location decision for an individual. He faces a continuum of potential (w, p) offers along the curve AB. For a given market price of health

[27]Specification (5) is unattractive in that it implies individuals are risk-loving in regards to changes in the price of health insurance coverage, p. However, none of the results below will depend upon this assumption.

insurance, P, employers locate themselves on AB. At B an employer offers the highest wage, $w(0)$, but a zero share of health insurance coverage. At A an employer offers the lowest wage, $w(1)$, and full insurance coverage. At other points on AB employers offer some combination of wages and partial insurance coverage. Given a choice among any of these wage and health insurance combinations an individual with bid-asked curve U_0 would choose point C, where his bid-asked curve is tangent to the employer offer curve. At C he receives the compensation package (w_0, p_0).

The Employer Compensation Offer Distribution

In this section I motivate the specification of the own employer and market compensation offer distributions. A compensation offer distribution is a probability distribution function of utilities provided by employment offers. Employment offers are pairs (w,p). The offer distribution from the market, i.e., from alternative employers, may be represented as $F[u(w,p)]$ or $F(u)$ or $F(w,p)$, but in all cases the argument of F is intended to be the utility value of a particular (w,p) pair. Similarly, the offer distribution from an individual's current employer is given by $F(y)$. Employers are passive actors in the partial equilibrium search model presented below, yet their characteristics as well as characteristics of an individual determine his possible utility offers,

In this model employer specific determinants of an individual's compensation offer distributions are an employer's location and the quality of a job match. Employer location is a determinant of compensation, because there is state-specific variation in the cost of employer provided health insurance coverage.[28] There are three sources of state variation in insurance costs. The first is state mandates. States mandate that all employer provided health insurance policies must provide minimum levels of insurance coverage, including coverage for specific kinds of health services. Although the list of mandated treatments varies among states, examples of such treatments include mental health care, physical therapy, alcoholism treatment, and midwife services. State mandates increase the minimum cost of offering health insurance, since they expand the range of 'usual'

[28]Employers face different price schedules for health insurance coverage, because employer size, the rate of employee turnover, and characteristics of the state where the employer is located all affect the employer premium rate. I make the assumption that an individual's observed state of residence is exogenous to his health insurance coverage choices. Although an employer's size and turnover rate are also important determinants of health insurance price, those characteristics are correlated with other choice variables in the model, such as an individual's decision to work at a particular employer. For that reason they are not considered to be exogenous determinants of compensation in the model.

health care services covered in a health insurance plan.[29]

States also have a more traditional regulatory role with regard to the insurance industry. States require insurance companies to hold minimum cash balances for payments of claims. Some states prohibit employers from offering HMO coverage. States tax the premiums paid by employers to insurance companies, and they place surcharges on hospital bills paid by insurance companies. The expense of compliance with a state's regulations contributes to the cost of premiums for employee health insurance coverage.

Finally, employer premiums vary according to other costs of health care that are state specific. The two most important ones are the cost of uncompensated care and the cost of quality of care. Hospitals incur financial losses when a patient's bill is not paid in full. Hospital care that results in financial loss is termed 'uncompensated'. Although there are many reasons why patients do not pay the full cost of their treatment, much of uncompensated care is attributable to uninsured patients and patients who are covered by Medicaid insurance. Medicaid usually does not pay the full cost of treatment for Medicaid recipients, and patients covered by Medicaid (who are eligible for Medicaid only if they are poor) are often unable to pay the balance of their hospital bills. Uncompensated care is a large expense for hospitals. In an effort to recover some of the losses from uncompensated care hospitals charge higher prices for health services delivered to individuals with private insurance coverage. This practice is known as 'cost-shifting' (see Phelps, 1986). Insurance companies pass on the extra costs from cost-shifting to insurance subscribers in the form of higher health insurance premiums (to the extent allowable by the market). Since Medicaid reimbursement schedules are state specific and the size of the uninsured population differs between states, there is state variation in the cost of uncompensated care.

Quality of care also varies between states. Just as with other industries, the scale and quality of health services is partially determined by agglomeration effects. For example, Boston is well known as a city with a relatively large share of the best surgeons in the country. Minneapolis is also well known as a city where patients receive a relatively high quality of care. Hospitals differ in their ability to provide certain expensive services, such as MRI or catheterization for heart attack patients. States that have high quality health care are ones whose hospitals are able to provide the most advanced technology and the best trained employees. Quality of care, however, is positively

[29]Employers who self-insure are usually exempt from state mandates, but self-insuring may only be less expensive than compliance, and not less expensive than purchasing commercial insurance in the absence of state mandates. Hence, state mandates may increase the employer cost of health insurance coverage even if an employer self-insures.

related to cost. Hence, state level differences in the quality of care are a source of state level variation in the cost of health services and ultimately in the premium price of health insurance policies.

An important assumption in models of job mobility is that compensation offers are heterogeneous across employers. Without such an assumption there would be no value to job search, because an individual would not expect search to gain him a permanent increase in earnings. Perhaps the central contribution of Jovanovic (1979) was to formally introduce the idea that employee productivity depends on the quality of the match between an individual's skills and an employer's technology.[30]

Models of job mobility after Jovanovic's have taken an agnostic view toward the question of why variation in compensation levels across employers would exist, and have made reference to Jovanovic's job match assumption on *a priori* grounds. However, justification of the job match assumption and heterogeneity of offers requires only two mild assumptions. One, a firm's labor production technology is fixed, and two, there are decreasing returns to learning by doing. With these two assumptions the general idea of job matches has a very intuitive explanation without any claim of uncertainty or information asymmetry.

A firm's labor production is a large set of tasks that, when completed, produce a particular good. Tasks are bundled into smaller sets of tasks called jobs. The number of jobs and the tasks that each one includes is determined according to the organization of tasks that makes a firm most efficient. An individual is hired by a firm to perform a particular job based on his abilities and experience. To the extent that an employee is more or less productive in completing his assigned set of tasks his employer will compensate him with higher or lower pay, respectively. However, there is a natural ceiling to compensation for a particular set of tasks, because there is a technological limit to the efficiency with which any particular set of tasks can be completed. The more productive a worker becomes in a job the less room there is for improved productivity. Thus, over time, workers may gain skills that increase their potential productivity more in an alternative job (with a different set of tasks) than their actual productivity in their current job. Since the competitive firm only rewards actualized worker productivity (not potential productivity), at the margin current pay will increase less than potential pay in an alternative job.

[30] In his model an employee's productivity at a particular employer is determined in part by a match component which is drawn randomly at the start of a job from a distribution of matches. Jovanovic's model investigated the implications of this idea when an individual becomes more certain about the quality of his current match over time.

Here are two examples of increases in potential productivity that have a lesser effect on actual productivity in the current job. First, a telephone operator who takes night classes in culinary school increases his potential productivity as a chef, but does not increase his productivity as an operator. Second, for a waiter who has worked in the same restaurant for ten years, the marginal increase in his productivity over the next year in the job of waiter may be less than the marginal increase in his potential productivity in the job of restaurant manager.

It might be objected that if an employee is more productive in a different job with the same employer, then why doesn't the employer assign him the set of tasks that make him most productive? The constraint here is that in most cases tasks are not divisable, and there may already be an employee that occupies the alternative job. Furthermore, given the firm's technology of production, it may be inefficient to create a duplicate job for the employee. In the waiter example, over time the waiter might develop the skills to be a manager, a job which pays more than his current job, but to have two managers may cause a net reduction in the restaurant's efficiency. The waiter would have to move to a different restaurant to realize his potential productivity.

Consistent with the literature on earnings, human capital characteristics of an individual are also included as determinants of the compensation offer distribution. In my model an individual's job experience, educational attainment, and health status are used as indicators of his level of human capital. I represent human capital characteristics with the variable K. The state specific cost of health insurance cost is denoted by s. The distribution of utility offers from the market is given by

$$F[u(w,p)] = F(u;\, K, s), \quad F_K(u;\, K, s) < 0, \quad F_s(u;\, K, s) > 0. \tag{7}$$

General human capital shifts the offer distribution to the right, while increases in state costs shift the offer distribution to the left. The distribution of the current employment offer is given by

$$\tilde{F}(y) = \tilde{F}(y;\, K, s), \quad \tilde{F}_K(y;\, K, s) < 0, \quad \tilde{F}_s(y;\, K, s) > 0, \tag{8}$$

where y is the next utility draw from the current employer. Again, general human capital shifts the offer distribution to the right, while increases in state costs shift the offer distribution to the left.

Figure 2 illustrates a graphical derivation of the employer utility offer curve. Given a compensation level an employer locates in p, w space according to the share of insurance that minimizes his cost of compensation. Both the average fixed cost of providing health insurance and the price per unit of health insurance vary across employers due to differences in employer sizes and employee

turnover rates. The figure shows the location decision for two firms. Employer one faces an insurance price schedule given by C_1. If he offered no insurance coverage he would pay a wage $w(0)$, and the price of insurance coverage to workers would be the market price $p(0)$. In order to offer any health insurance coverage he must pay a fixed cost, M_1, for each employee. He chooses to locate at point A, where he offers full insurance coverage and a compensation package $w(1), p(1)$. Employer two has a higher fixed cost of offering health insurance coverage, M_2, and faces a steeper health insurance price schedule. He locates at point D, where he offers w_2, p_2, less insurance coverage at a higher unit price and a higher wage than employer one. The market utility offer curve is given by the locus of points AB, where p is decreasing in the employer share of full insurance coverage. The probability that a compensation draw from the offer distribution will contain at least a certain level of insurance coverage depends on the density of employer offers at different points of AB.

Several implications of the static utility maximization model can be illustrated. The effect of state variation in health insurance costs on the utility offer distribution is illustrated in Figure 3 *a*. The figure shows offer curves for two states. In state 1 the offer curve is A_1B_1, and in state 2 the offer curve is A_2B_2. Prices of health insurance policies are higher in state 2 than in state 1 – the market individual price of health insurance in state 2, $p_2(0)$, is greater than the market individual price of health insurance in state 1, $p_1(0)$. The higher cost of health insurance in state 2 is reflected in the offer distribution, which is below the offer distribution in state 1 except for employers who do not offer health insurance coverage to their employees.

Figure 3 *b* shows the effect of the preference for health insurance on job choice. Person 1 has a higher demand for health insurance coverage than person 0, which is reflected in the greater steepness of person 1's bid-asked curve, U_1. He locates at point D, where he receives more health insurance coverage and a lower wage than does person 0, who locates at point C ($p_1 < p_0$ and $w_1 < w_0$).

Figure 3 *c* shows the effect of the quality of an employer match on the offer distributions. In the figure an individual has drawn a low value of the employer matching component relative to the market as a whole. He is located at point C, where he receives w, p. Meanwhile, the market offer distribution is given by A_1B_1 for an average value of the employer match component. He can expect to gain an increase in compensation by searching for an alternative job.

Figure 3 *d* shows how pre-existing health conditions may result in job-lock. In the figure an individual with a pre-existing health condition has located at point C, where his compensation is p, w. In the absence of a pre-existing condition his other job opportunities would be given by

the curve A_1B_1. However, the cost of treatment for his condition would be excluded from a new health insurance policy, so his actual market opportunities are given by the lower curve, A_2B_2. He would prefer any alternative compensation offer along the curve A_1B_1 to the left of point C, but his pre-existing condition has lowered his market opportunities such that he prefers point C to any of the points along the curve A_2B_2. In this sense his current state of health locks him into his current job.

The Search Decision

This section provides an outline of the implications of job search behavior for the joint determination of job mobility and health insurance coverage. The search model is adapted from models by Topel (1986) and Mortensen (1986). The model here differs from those models in two respects. First, utility here depends on the value of both wage income and health insurance coverage as opposed to wage income alone. The difference is cosmetic only, because it changes none of the predictions of the traditional search model. However, it does allow for separate treatments of changes in health insurance demand, health insurance supply, and wages; the theoretical job-lock effect can be made explicit within this framework.

The second difference is substantial compared to the first. I allow for a dynamic effect in the level of compensation offered by a current employer. Dynamic effects are not new to on the job search models. Mortensen (1986) and Jovanovic (1979) describe dynamic models, and several other examples of such models have appeared in the literature. The dynamic behavior modeled in those papers has not been adopted into mainstream applied work, however.[31] The model of Topel (1986) is similar to the model here, but dynamic effects are not illustrated or explored in his model. The search model presented here allows for a simple dynamic effect of expected changes in the level of current compensation, while the expression for the first order condition remains relatively tractable and empirically relevant.

In the model young workers enter the labor market, and receive a compensation draw from the distribution of offers conditional upon their human capital characteristics. Heterogeneity in match-specific productivity across firms and individuals is a *de facto* source of variation in initial wage offers. The offer is accepted as long as it exceeds the utility of leisure, which is a fixed constant for all youths.[32] Upon accepting a job an individual will search for a new job if the prospects for obtaining a better job than the current one are good enough. Job offers from the market are uniformly distributed across locations, so that conditional on individual characteristics the expected level of health insurance contained in an offer from the market is independent of an individual's current employer's location. However, expected health insurance coverage will depend upon an individual's current employer's location through the distribution function of compensation

[31] An exception is the study of Lancaster and Imbens (1984).

[32] The model does not allow for search behavior among individuals who are entering the labor market for the first time.

offers from an individual's current employer.

The setup and solution of the search problem are given in the appendix. Briefly, time in the model is continuous and is represented by $t \in [0, \infty]$. The set of information available to an individual at any time t is given by $\Omega(t)$. Finally, $V^S(y)$ is the value of rejecting a job offer from the market and continuing the job search, given that y will be the new compensation package offered by the current employer. The first order condition for the problem is given by:

$$u^*(t) = \tilde{u}(t) - c + \frac{d\, E_{\Omega(t)}\left[V^S(y)\right]}{dt} + \frac{\lambda}{r}\int_0^\infty \int_{u^*}^\infty \left(u - r\, V^S(y)\right) dF(u)\, d\tilde{F}_{\Omega(t)}(y) \qquad (9)$$

where u^* is the reservation utility level; $\tilde{u}$ is the utility of current job compensation; c is the per-period cost of search; the expression $d\,E[V^S(y)]/\,dt$ is the derivative with respect to time of the expected value of search in the next instant, given a new utility offer from one's current employer, y; λ is the arrival rate of employment offers from the market; r is the discount rate; u is the instantaneous utility of a compensation offer from the market; $F(u)$ is the is the distribution function of utility offers from the market; and $\tilde{F}(y)$ is the distribution function of the current employer's next compensation offer, y. The expression $dF(u) = f(u)du$, and the expression $d\tilde{F}(y) = \tilde{f}(y)dy$. Substituting equation (5) into (9) gives:

$$u^*(t) = \tilde{w}(t)e^{-\alpha\,\tilde{p}(t)} - c + \frac{d\, E_{\Omega(t)}\left[V^S(y)\right]}{dt} + \frac{\lambda}{r}\int_0^\infty \int_{u^*}^\infty \left(u - r\, V^S(y)\right) dF(u)\, d\tilde{F}_{\Omega(t)}(y) \qquad (10)$$

Equation (10) is similar to equation (2.8) in Mortensen (1986) and equation (7′) in Topel (1986). In (10), both anticipated and actual changes in compensation from the current employer affect the reservation utility level.[33] Expected shocks to the current utility offer are reflected in the term $d\,E[V^S(y)]/\,dt$ on the right hand side of (10). I assume that the value of continued search, $V^S(y)$, is strictly increasing in y, i.e., the value of staying at one's current job and continuing to search for a new job is increasing in the compensation that will be offered by one's current employer.[34] This assumption implies that an individual's reservation wage is increasing in expected shocks to

[33] This is a departure from Mortensen (1986, section 2.1), who holds constant the net current utility cost of search and the expected future value of search. It is also a clarification of the model of Topel (1986).

[34] This assumption is required, because increases in current compensation reduce the expected net gain from search. That is, increases in current compensation reduce the probability that an offer from the market will exceed the current offer. The assumption implies that the negative effect of current compensation increases on the expected net gain from search are outweighed by the positive effect of those increases on the utility that would be received if an individual stays in his current job.

compensation on the current job. For a positive shock ($dE[V^S(y)]/dt > 0$), the strength of the shock is positively related to the current reservation utility level, $u^*(t)$. Thus, an unexpected positive shock to the expected wage level or negative shock to the expected price of health insurance coverage on a current job, if not reflected in the distribution of utility offers from the market in general, cause the reservation utility level to increase.

Comparative Statics

Expressions for comparative static effects are easily derived if stationarity is imposed on the model.[35] Stationarity is imposed on (10) by assuming that the current job utility offer is a fixed constant. When stationarity is imposed, equation (9) reduces to:

$$u^* = \tilde{w}e^{-\alpha\tilde{p}} - c + \frac{\lambda}{r}\int_{u^*}^{\infty}(u-u^*)\,dF(u) \tag{11}$$

In the appendix I use (11) to derive the following comparative static results:

$$\frac{\partial u^*}{\partial \tilde{w}} > 0, \quad \frac{\partial u^*}{\partial \tilde{p}} < 0, \quad \frac{\partial u^*}{\partial c} < 0, \quad \frac{\partial u^*}{\partial \alpha} < 0,$$

$$\frac{\partial u^*}{\partial \lambda} > 0, \quad \frac{\partial u^*}{\partial r} < 0. \tag{12}$$

These results are what we would expect. The reservation utility level is decreasing in the cost of search, the current employer price of health insurance, and the preference for health insurance relative to other goods. The insurance preference effect is proportional to the price of insurance. Thus, a low price of health insurance lessens the importance of health insurance preferences as a determinant of reservation utility. The reservation utility level is also decreasing in the interest rate, r, because the present value of accepting a prospective job relative to continuing search is decreasing in r. The reservation utility level is increasing in the current employer wage and the offer rate of arrival, λ. If offers arrive frequently (high λ) the expected length of time until any given reservation utility level is exceeded is short.

Pre-existing Conditions

A special case of the stationary model illustrates the influence of pre-existing medical conditions on job mobility. An individual with pre-existing medical conditions can expect to endure a lump sum loss equal to the cost of treatment for his conditions when he moves to a new employer, because

[35] Although derivation of comparative static effects from (10) directly would yield a different set of expressions, none of the derivatives would have different signs.

pre-existing conditions are excluded from coverage in new health insurance policies. The greater the treatment cost of an individual's pre-existing conditions the greater will be his expected loss. The exclusion of pre-existing conditions has a negative effect on job mobility, because it introduces an additional cost to changing jobs.

For illustration of this point suppose that the distribution of utilities offered by the market depends on α, but that the current employer utility offer distribution does not. Specifically, the distribution of market employment offers is given by

$$G(u) = F(u + \mu(\alpha)), \tag{13}$$

where $\mu \geq 0$, $d\mu/d\alpha > 0$, $\mu(0) = 0$, and $\mu(1) = \infty$. Positive values of μ shift the market offer distribution to the left. Thus, an individual with a high demand for health insurance coverage is less likely to receive high market draws of u than an individual with a low demand. Here my interpretation of α is that it is representative of the treatment cost for an individual's pre-existing conditions. In (13), a high value of μ is associated with a low expected value of job offers. Equation (13) implies that equation (34) from the appendix can be rewritten as

$$\begin{aligned} u^*(\mu)\left(\frac{r+\lambda}{r}\right) &= \tilde{w}e^{-\alpha\tilde{p}} - c + \frac{\lambda}{r}\int_0^{u^*(\mu)} G(u)du + \frac{\lambda}{r}E_{G(u)} \\ &= \tilde{w}e^{-\alpha\tilde{p}} - c + \frac{\lambda}{r}\int_0^{u^*(\mu)} F(u+\mu(\alpha))du + \frac{\lambda}{r}E_F(u) - \frac{\lambda}{r}\mu(\alpha). \end{aligned} \tag{14}$$

In this case

$$\frac{\partial u^*}{\partial \alpha} = \frac{-\tilde{p}\tilde{w}\, e^{-\alpha\tilde{p}}r - \lambda\frac{d\mu}{d\alpha}(1 - F(u^*))}{r + \lambda(1 - F(u^*))} < 0. \tag{15}$$

Comparing (15) to (35) in the appendix we can see that the negative effect of α on u^* is reinforced. Now a high demand for health insurance coverage is associated with a low expected utility gain from job search. Although a high value of α is associated with a relatively low reservation utility level we cannot infer that a high value of α is associated with a high probability of job change, because the probability of receiving a good job offer from the market is low when α is high.

The probability of an exit to a new employer is

$$\Gamma(\mu) = \lambda\left[1 - F_\alpha(u^*(\mu))\right] = \lambda\left[1 - F(u^*(\mu) + \mu)\right]. \tag{16}$$

Hence, the probability of an exit decreases in response to an increase in α if

$$\frac{\partial \Gamma}{\partial \alpha} = -\lambda\frac{dF(\cdot)}{d(\cdot)}\left(\frac{\partial u^*}{\partial \alpha} + \frac{\partial \mu}{\partial \alpha}\right) < 0. \tag{17}$$

Since $\partial\mu/\partial\alpha > 0$ the relationship in eq. (17) holds if and only if

$$\frac{\partial\mu}{\partial\alpha} > \left|\frac{\partial u^*}{\partial\alpha}\right|.$$

Equation (17) shows that job mobility is negatively related to the demand for health insurance coverage when the demand for health insurance coverage has a greater effect on the mean of the market offer distribution than on the reservation utility level. If so, an individual with a high demand for health insurance coverage may seek a job that offers more health insurance coverage than his current job (even if the new job offered a lower wage), but he may not find that job if market offers of health insurance coverage are scarce for him. The exclusion of pre-existing conditions would reduce the probability of a job exit for some individuals even if we were not willing to accept this assumption. An individual will be discouraged from job search altogether if his value of α is high enough, since his expected net utility gain from search is negative for a high enough value of α.

An Empirical Analysis of the Job Search Model

In this section I return to the empirical issues raised in the introduction. Recall that the empirical question posed in existing studies of job-lock is whether or not pre-existing medical conditions are a greater deterrent to job mobility for an individual who has employer linked health insurance coverage than for one who does not. Although authors of existing studies differ in their assessment of whether or not the empirical evidence supports this hypothesis, none take issue with the primary policy implication of the hypothesis: if pre-existing medical conditions are a deterrent to job mobility in a regime of employer linked health insurance coverage, then government intervention in the form of legislation which either prohibits insurance companies from excluding pre-existing medical conditions from treatment coverage or forces employers to continue to offer the company's health insurance coverage to former employees is warranted.

I present a new set of empirical evidence which suggests that this stop-gap approach to public intervention in the market for health insurance coverage would in the most optimistic scenario cause only a minor improvement to the rate of job mobility, and would more likely introduce new obstacles to the acquisition of affordable health insurance coverage. Only a broader public intervention in the form of national health insurance coverage can address the inefficiencies caused by the current regime of employer linked health insurance coverage. It also questions the estimation strategies that existing studies of job-lock have used in their analyses, suggesting that the job-lock effect has not been empirically identified in past work.

The empirical model specified below highlights the sharp contrasts between the empirical implications of the job search model and those of of the models used in previous studies of job-lock. The job search model implies that expected changes in a current employer's compensation offer as well as the expected value of compensation offers from the market are key determinants of the probability of a job change. Previous models emphasized mobility costs as key determinants of that probability. An objective of the empirical analysis will be to specify an empirical model which nests the basic model of previous analyses as a special case, so that estimates of model parameters can be used to test the adequacy of existing job-lock models.

Data

The data used in this analysis is from the National Longitudinal Survey of Youth (NLSY), a panel survey of 12,686 young men and women in the U.S. Respondents were between the ages of 14 and 21 as of January 1, 1979, in the first year of the survey. The 1979 NLSY sample is representative

of the U.S. population in the given age group at that time. The survey has been administered each year since 1979.[36] Interviews have been attempted annually for each respondent.[37] The data sample extracted for this analysis pertains to the 1979 through 1992 interview years.

The NLSY is the only available data set which contains the information needed for an analysis of dynamic interactions between changes in health insurance coverage and job changes, because it is the only available data set which contains both a longitudinal record of each respondent's employment changes and a similar record of each respondent's changes in health insurance coverage. The NLSY includes employer identifiers for all jobs held since the beginning of the survey and a matching record of dates employed in each job, so that one can construct an approximately continuous record of a respondent's job changes and changes in employment status at least as far back as 1978.[38]

It is also possible to construct a longitudinal record of an individual's health insurance coverage states. At each interview since 1979 each respondent was asked whether or not he is offered health insurance coverage by his current employer, if employed, or most recent employer, if not employed.[39] One can construct a discrete (roughly annual) longitudinal record of whether or not a particular employer of a respondent offered him health insurance coverage using the answers to the health insurance offer question in conjunction with the employer identifiers.

The NLSY data also contains a rich enough longitudinal record of individual characteristics to obtain point-in-time predictions of an individual's health insurance coverage status and wage rate. The data includes measures of a respondent's employment experience, educational attainment, and health status, and codes for an individual's state of residence at each interview. The residential location information is particularly useful for generating predictions of health insurance coverage status. I use the codes for an individual's state of residence to match each individual with state

[36] At the time of this writing, the NLSY's 1995 survey year interview round had been recently fielded.

[37] Sample attrition in the NLSY has been slight relative to attrition in other popular longitudinal data sets. Unless a respondent is known to be deceased, interviews are attempted with each respondent each survey year even if a respondent was not interviewed for one or more previous interview years. This practice accounts for the low attrition rate in the NLSY. As of the 1992 survey year 91 percent of the initial respondent sample remained in the survey.

[38] In many cases the available employment record extends back to a respondent's first job, so that an individual's entire employment history can be recovered.

[39] That question has been asked in each survey year except for 1981. For that year's information I ascertain health insurance status when possible using other information, such as whether a respondent received health insurance at the time of the previous interview and whether that previous employer is the current employer.

level measures of the cost of health insurance coverage in his state. In particular, I match each individual with his state's "percentage of non-elderly population with private health insurance coverage" and "average hospital room charge for a single night's overnight stay".[40] The former is a measure of the supply of health insurance coverage and the latter measures the cost of health care in an individual's state.

However, two caveats (which relate to the youthfulness of the NLSY sample) apply to the use of the NLSY in a study of job mobility and changes in health insurance coverage. The average level of health insurance demand among NLSY respondents is likely to be below the average for a cross-section of the non-elderly U.S. population. As of their 1992 interview NLSY respondents ranged in age from 27 to 35 years old, so that even in the last survey year of my sample the average age of NLSY respondents is far below the average for a cross-section of the non-elderly U.S. population. Within this young age group the average utility value of health insurance coverage is probably, if not certainly, much lower than its average value within the national cross-section, because the incidence of illness and disease is an increasing function of age and the marginal utility of health insurance coverage is an increasing function of expected medical expenses. Hence, if the demand for health insurance coverage does have an effect on job mobility in the U.S. labor market, an analysis based on the NLSY sample is likely to underestimate the size of that effect.[41]

Second, the proportion of NLSY respondents who have changed jobs several times without ever having received health insurance coverage from an employer is likely to be higher than the analogously defined proportion of non-elderly adults in the U.S. labor force, because the rate of job mobility in a population is a declining function of its average age.[42] Health insurance coverage

[40] The state health insurance coverage percentages were calculated using the annual March interview of the Current Population Survey (CPS) from 1979 to 1992. The hospital room charges were reported in *The Source Book of Health Insurance Data*, Health Insurance Association of America, 1979–1993.

[41] As a qualification to this qualification, there is reason to believe that health insurance coverage is a significant factor in job mobility decisions even within this young NLSY sample. A significant proportion of the respondents are married and either have children or are planning to have children; their families' expected medical expenses positively affects the importance of health insurance coverage in their choice of employer. Second, age is positively related to both wealth and income, so young individuals are less able to financially withstand unexpected medical expenses than are their older counterparts. Third, the incidence of accidents and injuries is higher among the young than within a population cross-section, so the classic insurance role played by health insurance coverage may be of equal importance among the young compared to a cross-section of individuals.

[42] Jobs which offer health insurance coverage are less prevalent within the group of jobs occupied by young workers

is unlikely to be an important factor in the decision to change jobs for an individual who has never received health insurance coverage from an employer, because he is likely to believe that the probability of obtaining a job which offers health insurance coverage benefits is low based on his past inability to obtain employer linked health insurance coverage. As such, an analysis based on the NLSY will understate the interactive effects between health insurance coverage and job mobility to the extent that the NLSY has a higher percentage of respondents in the highmobility, low probability of employer linked health insurance category than does the U.S. labor force in general.

Sample Selection and Descriptive Statistics

I use only the cross-sectional sample of the survey, excluding both the military and supplemental subsamples. There were 6,111 respondents in the cross-sectional sample in the initial year of the survey. Table 3 shows how the respondents who are included in the analysis were selected. Two selection criteria account for almost 90 percent of the exclusions made from the cross-sectional sample. The first selects respondents who were interviewed at least eight times after reaching the age of 21 years old. The intention of this selection was twofold. A minimum requirement for an analysis of job mobility is that the individuals included in the analysis must be old enough to make decisions significantly independently of their parents, especially in terms of their health insurance coverage decisions. The age of 21 is admittedly an arbitrary point of enforcement for this rule, but was chosen to strike a balance between the exclusion of respondents at the lower age margin, who may be completely independent of their parents despite their age, and the inclusion of respondents who are too young to be considered independent agents. The selection rule also chooses respondents who have been interviewed eight or more times. This is intended to insure that enough information is available for each respondent for the purpose of controlling for unobserved individual characteristics in the analysis.

The second selection criterion selects respondents whose main activity in the week preceding an interview was 'keeping house' no more than one time. This rule was chosen to be a milder substitute for a more severe rule – select only male respondents. Female respondents are usually excluded from analyses of job mobility, as their employment patterns are thought to determined by the dual roles of 'wage earner' and 'child bearer/home maker', whereas the role of men is thought

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than within the group of jobs occupied by all workers in the U.S. labor force, because the high job mobility of young workers increases the employer cost of offering health insurance coverage for the jobs they often occupy.

to be more clearly singular. However, this concern should not be so broadly applied to respondents in the NLSY sample, as they have all grown up in an era of dual wage earner families and a high labor force participation rate for women. The exclusion of home makers from the analysis is an attempt to separate out respondents whose primary role is to be a wage earner from respondents whose primary role is in the non-wage labor market.

The variables used in the analysis are defined in table 1, and table 2 reports their means and standard deviations. The variable *leave* indicates job mobility.[43] By this measure roughly 28% of the jobs end between interviews.[44] The rest of the variables defined in table 1, except for *sep_inv* and *sep_quit*, represent measures of individual i's human capital (*experien*, *expersqr*, and *grade*), the cost of labor in i's state (*unemrate*), the cost of health insurance in i's state (*hi_pct*, *pct_ch*, *lnhosp*, and *pctchghp*), i's demand for health insurance coverage (*illspell* and *child*), marital status, and age. Of all these variables the variable *illspell* stands out in table 2, because its mean is a relatively low 3.2%. An individual was away from work due to illness at least a week out of the period of time between interviews in three percent of the cases. Admittedly this low percentage does not provide very much variation for estimating a job-lock effect.[45]

Table 4 shows the weighted sample percentages for job and health insurance transitions between consecutive interviews. Each cell of the table represents a possible type of job transition and health insurance status transition. At the time of the first of the two interviews (period t) respondents are employed either in jobs that offer health insurance coverage or in ones that do not. By the time of the next interview (period $t+1$) three types of job transitions could have occured – a respondent could have quit his job; he could have left his job involuntarily due to a layoff, dismissal, or firing; or he could have stayed in his initial period job. Four types of health insurance coverage status

[43] Job mobility is considered for respondents who are employed, not in school, and not in the military as of the interview day. An individual is coded as having left a job if (1) his employer at the next interview is different than his current employer, or (2) the respondent is not employed and not in the military at the next interview. An individual is coded as staying in his current job if he is employed at the same employer at the next interview date.

[44] Altonji and Williams (1993) found the proportion of separations for any reason in their sample from the Panel Study of Income Dynamics to be approximately 24% (Table 2, all experience levels), but found the higher number of 36% for individuals with between 5 and 10 years of work experience. In my sample the average experience level is 7.45 years.

[45] This percentage is low only in the sense it provides relatively little variation for measuring the effect of health status on job mobility. It is not low in comparison with outside national statistics for this age group.

transitions are possible – had health insurance at t, had health insurance at $t+1$; had health insurance at t, did not have health insurance at $t+1$; did not have health insurance at t, had health insurance at $t+1$; did not have health insurance at t, did not have health insurance at $t+1$. Thus, there are twelve possible job and health insurance status transitions represented in the table.

Table 4 reports that in 72.5% of the cases a respondent had a job which offered health insurance in both period t and period $t+1$. Of those cases 81.7% involved a respondent who stayed in his current job (job stayer), and 18.3% involved a respondent who left his job (job leaver). In 8.55% of all the cases a respondent had health insurance at the initial interview but no longer had health insurance by the time of the second interview. Of those cases 49.1% involved job stayers and 50.9% involved job leavers. It is interesting that almost half of the cases in which health insurance was lost between interviews involved no job change.[46] Transitions in which an individual went from having no health insurance coverage in period t to having health insurance in period $t+1$ occured in 8.09% of the cases. Of those cases 40.2% involved job stayers and 59.8% involved job leavers.

In the NLSY it is possible to distinguish between involuntary job separations and voluntary ones, though not perfectly. The variable *sep_inv* equals one if an individual reported being layed off, fired, or dismissed from his job between period t and $t+1$. It is used as a measure of involuntary job mobility. The variable *sep_quit* equals one if an individual quit his current job between period t and $t+1$. It is used as a measure of voluntary job mobility.[47]

We might expect that among those individuals who between period t and period $t+1$ exited from a job that offered health insurance coverage those that voluntarily left their job would be more likely to maintain their health insurance coverage status in the next period than those who were fired, layed off, or dismissed, since an important factor in the decision to change jobs is whether or not a new job would offer health insurance coverage. Table 4 reveals that of all cases in which an individual quit a job that offered health insurance coverage 70.9% maintained their health insurance coverage status in the next period, whereas individuals were able to maintain their health insurance coverage status in only 69.11% of the cases where an individual involuntarily left a job that offered health insurance coverage.

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[46]Thus, there is reason to question the implicit assumption in existing studies of job-lock, that health insurance coverage at a current job is fixed.

[47]The distinction between a job quit and an involuntary job separation is not clear-cut in the NLSY data. A job separation was coded as a quit if an individual left his job and cited as a reason for the separation anything except *layoff*, *dismissal*, or *fired*.

For the same reasons we might expect that among individuals who between consecutive periods exited from a job that did not offer health insurance coverage job quitters would be more likely to obtain a job that offers health insurance coverage than those who involuntarily left their job. This also appears to be true in the data. Among individuals who in period t quit a job that did not offer health insurance coverage 59.42% obtained a job in period $t+1$ that offered health insurance coverage versus 53.17% of individuals who left their period t job involuntarily.

A Preliminary Look At The Data

For illustration I estimate a model of the transitions in table 4 by multinomial logit. Two logit equations were estimated, one for those individuals who did not have health insurance coverage in period t and another for individuals who did have health insurance coverage in period t. Thus, the outcomes in the prior equation are those transitions that appear in the first column of table 4 and the outcomes in the latter equation are those transitions that appear in the second column of table 4.

The results of the first multinomial logit (no health insurance coverage in period t) are reported in table 8a. Tables $5a-5d$ show predictions of the probability that an individual will experience a transition from a job that does not offer health insurance coverage in period t to a job that offers health insurance coverage in period $t+1$. Each column of each table represents that transition probability, conditional on the type of job transition that occurred. Possible job transition types are: job quit, involuntary job separation, and no job change. In the rows of these tables I vary the level of a measure of state health insurance costs.[48]

In table $5a$ I vary the value of the variable *hi_pct*, the percentage of the state population covered by private health insurance.[49] The rows of the table represent the minimum, the 25th, 50th, and 75th quartiles, and the maximum of state private health insurance coverage rates from the CPS sample. The first column of the table shows that the probability of making the transition from a job that does not offer health insurance coverage in period t to one that does in period $t+1$, given

[48] I do this by assigning every person in the sample the same value for a particular cost measure. I use the estimated model parameters to predict the transition probability given the assigned level of the cost measure.

[49] Private health insurnace coverage rates may be a measure of the employer supply cost of health insurance coverage in a respondent's state. States with lower supply costs are likely to have higher coverage rates. Here I use the estimated proportion of the state population that is covered by private health insurance. The percentages were calculated using the March extract of the Current Population Survey (CPS) for the years 1980-1992.

that an individual quits his job, is increasing in the proportion of the state population covered by health insurance. The second column confirms this result for involuntary job separations; the transition probability in this column increases in state health insurance availability, but is clearly lower than for job quits. In the third column, which represents no job change, the supply effect does not appear to hold.[50]

Table 5*b* shows the effect of changes in state health insurance coverage percentages on the probability that an individual makes the same transition in health insurance status between interviews. For all types of job transitions the probability of the transition is positively related to the coverage percentage change. An individual is more likely to make the transition when there are positive shocks to a state's supply of private health insurance coverage than when there are negative shocks.

Tables 5*c* and 5*d* confirm the results of tables 5*a* and 5*b* using a different cost measure. Here the probabilities of the health insurance status transition are negatively related to both a state's level of hospital prices and annual change in hospital prices.[51] Again we see that the transition probability is higher for job quits than for involuntary job separations, and that the effect of state costs is more dramatic for the latter than for the former.

Tables 6*a* through 6*d* report the predictions for the probability that an individual will experience a transition from a job in period t that does offer health insurance coverage to a job in period $t+1$ that does not offer health insurance coverage. As in the previous tables, the columns in tables $6a - 6d$ condition on the type of job transition that occurs, and the rows condition on levels of the state health insurance cost measures.

The results of tables $6a - 6d$ are roughly symmetric to the results in tables $5a - 5d$. With a couple of exceptions the probability of a transition from a job that offers health insurance to one that does not is positively related to the state health insurance cost measures.[52] Tables 5*a* and 5*b*

[50] I leave the exception represented in column three unexplained. The coefficients reported in table 8a are in many cases not significant, and thus the results reported in column three and in the other tables should be taken with a grain of salt. Moreover, individuals who stay at their same job may be insulated from market effects in the short run, since it is an expensive proposition for an employer to create a health insurance coverage benefit when none was previously offered.

[51] The cost of hospital care in a state is a determinant of the cost of health insurance policies sold in that state. I use the average daily hospital room charge within a state in constant 1983 dollars. The prices are taken from the *Source Book of Health Insurance Data*, Health Insurance Association of America, 1979–1992.

[52] The exceptions to the stated relationship between state costs and health insurance transitions appear in column

show that the probability of loss of coverage is decreasing in both the state availability of health insurance coverage and the changes in state availability. Tables 5c and 5d show that the transition probability is increasing in both the average state hospital room charge and the annual increase in the average hospital room charge.

The other outstanding feature of tables $6a - 6d$ is that the probability that health insurance will be lost is higher for individuals who leave their job than for individuals who remain in the same job, and it is higher for those who involuntarily leave their job than for those who quit.

Empirical Specification and Identification

The argument up to this point implies a model of job changes in which an individual's criterion for job mobility is based on his best forecast of the likelihood of changes in the utility of compensation offered to him, where such changes may occur in the event of a job change or in the absence of a job change. Authors of existing studies of job-lock have focussed on the determinants of an individual's health insurance demand as key factors in this forecast. To repeat their familiar argument, individuals who have an unusually high demand for health insurance coverage are deterred from changing jobs by their fear that a job change would cause at least a partial elimination of health insurance coverage.

In general, it is not possible to recover a measure of job-lock using indicators of an individual's demand for health insurance coverage, because demand measures do not have an unambiguous effect on job mobility.[53] Also, factors which influence the employer cost of providing health insurance coverage as an employment benefit are what create a job-lock effect. An individual's level of health insurance demand is an important source of job-lock only in proportion to its effect on employer costs. Other factors, such as state regulations of health benefits may be more important contributors to job-lock than individual demand factors.

I establish these claims by deriving an expression for the probability that an individual will change jobs over a specific period of time, which I discuss and estimate.

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2 of table 5a and column 1 of table 5b. In these columns increases in state costs appear to decrease the chance of a transition from a job that offers health insurance coverage to one that does not. I attach the same disclaimer to these exceptions as to the exceptions in tables $5a - 5d$. I would claim that the exception proves the rule that emerges from these tables.

[53]This point is separate from the point that existing studies of job-lock use measures of health insurance demand which are partially determined by an individual's preference for job mobility.

According to the job search model, the probability that individual i will change jobs during a discrete time interval, Δt, is

$$\Gamma_i(u^*(t), \Delta t, \lambda) \equiv Pr(M_i = 1 | u^*(t), \Delta t, \lambda) = \Delta t \, \lambda \, [1 - F(u_i^*(t))], \tag{18}$$

where M_i is an indicator function for job changes. $\Gamma_i(t)$ is implicitly a function of all the parameters which determine $u^*(t)$ in (10). Equation (10) can be rewritten as:

$$\begin{aligned} u^*(t) &= \tilde{w}(t) e^{-\alpha \tilde{p}(t)} - c + E_{\Omega(t)} \left[\frac{dV^S(y,t)}{dt} \right] + \frac{\lambda}{r} \\ &\int_0^\infty \left\{ [1 - \Phi(\bar{u}(t))] (\mu_u(t) - rV^S(y,t)) + \sigma_u(t) \phi(\bar{u}(t)) \right\} \phi(\bar{y}(t)) dy, \end{aligned} \tag{19}$$

where Φ is the standard normal distribution function; ϕ is the standard normal density function; $\bar{u} = (u^* - \mu_u)/\sigma_u$; μ_u is the mean of the market utility offer distribution; σ_u is the standard deviation of the market utility offer distribution; $\bar{y} = (y - \mu_y)/\sigma_y$; μ_y is the mean of the current employer utility offer distribution; and σ_y is the standard deviation of the current employer utility offer distribution. From (19) and (18) it is clear that

$$\begin{aligned} \Gamma_i &= \Gamma_i(\tilde{w}(t), \tilde{p}(t), \alpha, c, \lambda, r, \mu_u(t), \mu_y(t), \sigma_u(t), \sigma_y(t), \Delta t) \\ &= \Delta t \, \lambda \{1 - \Phi [\bar{u}_i (\tilde{w}(t), \tilde{p}(t), \alpha, c, \lambda, r, \mu_u(t), \mu_y(t), \sigma_u(t), \sigma_y(t))]\}. \end{aligned} \tag{20}$$

Equation (20) suggests the following likelihood function for data on job changes:

$$L = \prod_{i=1}^{N} [\Gamma_i(\cdot)]^{M_i} \, [1 - \Gamma_i(\cdot)]^{1 - M_i} \tag{21}$$

By a short argument we can see that many of elements of (21) are not identified. First, we know that $\delta\Gamma/\delta\mu_u(t) > 0$ and $\delta\Gamma/\delta\mu_y(t) < 0$, which implies that $\Gamma(\cdot)$ is increasing in $\mu_i(t) \equiv \mu_{u,i}(t) - \mu_{y,i}(t)$.[54]

In words, the probability of a job change is increasing in the difference between the mean of the market utility offer distribution and the mean of the current employer utility offer distribution.

[54] By a previously stated argument $\delta\Gamma/\delta\mu_u(t) > 0$ if $\delta u^*(t)/\delta\mu_u(t) < 1$. The assumption that $\delta u^*(t)/\delta\mu_u(t) < 1$, which has traditionally been adopted in job search models (e.g., Mortensen (1986)), is adopted here. The assumption states that increases in the mean of the market offer distribution cause a less than equal increase in the reservation utility level.

We also have assumed that $\delta u^*(t)/\delta\mu_y(t) > 0$; this was the assumption that the value of search is strictly increasing in the expected utility offer from the current employer. This assumption implies that $\delta\Gamma/\delta\mu_y(t) < 0$.

This should come as no surprise. Individuals are most likely to change jobs when their expected market opportunities are better than those which they expect from their current employer.

The term $\mu_i(t)$ is helpful in illustrating the identification issues in a model of job mobility. For example, $\delta\Gamma_i/\delta\tilde{w}_i(t)$ is not identified *a priori*, because $\delta\mu_i(t)/\delta\tilde{w}_i(t)$ may equal zero. An increase in an individual's current wage offer may increase his expectations of wage opportunities in the market equally, and thus his job mobility may be unaffected.

We have seen another relevant example of underidentification. $\delta\Gamma_i/\delta\alpha_i(t)$ is not identified *a priori*, because $\delta\mu_i(t)/\delta\alpha_i(t)$ may also equal zero. The expected value of future compensation offers from an employer whose current compensation offer includes medical treatment at a high price is diminished when an individual's demand for health insurance coverage increases, but his expectations of market opportunities for improved health insurance coverage may decline equally due to the exclusion of pre-existing medical conditions from new health insurance policies.

In fact, any factor which is a determinant of both the expected compensation offer from the current employer and the expected compensation offer from the market will have no *a priori* effect on job mobility, unless a prior belief that the factor has a differential effect on market and current employer opportunities can be established.

Employment experience and educational attainment are both factors which arguably have a differential effect on market and current employer opportunities. Recall the argument from the *employer offer distribution* section above. In that section I argued that the expected compensation offer from the market exceeds the expected compensation offer from a current employer when an individual 'outgrows' his current job. An individual's current abilities may exceed the requirements of his current job, because the skills required by a given job are determined by the firm's technology, and the firm's technology may not afford an individual the opportunity to apply his full set of abilities (which change over time) to his work.

Employment experience should be negatively related to the differential between expected market and expected current employer compensation, because the rate of skill acquisition is highest at low levels of experience. Hence, individuals tend to outgrow jobs faster when they have little experience than when they have a lot. Educational attainment should also be negatively related to the differential between expected market and expected current employer compensation, because higher educated individuals are more likely to work in a firm which offers potential for job advancement, and thus are less likely to outgrow a job than individuals with lesser educational attainment.

The selection of individual's with a propensity for job mobility into jobs that do not offer

health insurance coverage has been emphasized throughout the analysis. How do preferences enter the expression for Γ in (20)? An individual's preference for job mobility is represented here as a permanent component of $\mu_i(t)$. Suppose

$$\mu_i(t) = \bar{\mu}_i + \epsilon_i(t)$$

where $\bar{\mu}_i$ represents the time invariant effect of preferences on job mobility. The interpretation of $\bar{\mu}_i$ is that individuals have permanent and subjective perceptions of the differential between market and current employer opportunities. A high mobility individual has a positive value of $\bar{\mu}_i$; he is either an optimist – believing that his market opportunities are always excellent (high $\mu_{u,i}$) – or a pessimist – always believing the opportunity offered by his current employer is unusually poor (low $\mu_{y,i}$). Either way he changes jobs often because he is always unsatisfied with his current job (high μ_i).[55]

Failure to control for $\bar{\mu}_i$ in the estimation of (21) would result in biased parameter estimates.[56] Specifically, it is known that even after controlling for observable characteristics individuals who change jobs with above average frequency are more likely than less mobile individuals to be employed in jobs that offer low wages and no health insurance coverage.[57] Thus, after controlling for observable characteristics, the $E(p\,\bar{\mu}) > 0$ and $E(w\,\bar{\mu}) < 0$. When an empirical job mobility equation includes an indicator variable for whether or not individual i's current employer offers health insurance coverage failure to control for the unobservable $\bar{\mu}$ would result in a negative estimate of the marginal effect of health insurance coverage on job mobility even if health insurance coverage had no true effect on job mobility. The same is true for the estimation of a job mobility equation which includes individual i's current wage rate. The current wage would appear to have a negative effect on job mobility even if it had no true effect. I control for the effect of unobserved job mobility preferences by estimating (21) with individual fixed effects.

I do not have any explicit measures of c, λ, r, σ_u, or σ_y in the data. These variables are thus omitted in the estimation of (20). The estimated model parameters will be biased if these variables are correlated with the variables which are included in the analysis. However, there is no theoretical argument in the literature on job mobility which associates any of the omitted variables

[55] It is also possible that he is unable to hold onto a job even if he would like to, because he frequently gets layed off or is fired.

[56] Although each individual knows the value of his own $\bar{\mu}_i$, $\bar{\mu}_i$ is unobserved by the econometrician.

[57] See the literature review above for a discussion of this point.

with the included variables. Even if the omitted variables were correlated with one or more of the included variables the parameters of the fixed effects estimation would not be biased, since none of the omitted variables are time varying.[58]

I approximate $\Gamma_i(t)$ with a linear combination of measures of employment experience, educational attainment, state health insurance costs, and health status. I also include terms for the interactions between the health insurance cost variables and the illness indicator variable to simulate Madrian's strategy for estimation of a job-lock effect.[59]

Main Results

The likelihood function in (21) was estimated in a series of probit equations.[60] Following the logic of the previous section, that those individuals who are most mobile are selected into jobs that do not offer health insurance coverage, each probit model was estimated with and without individual effects. Heckman (1981) shows that parameter estimates in the fixed effects probit model will be biased if there are too few observations over time for each individual in a data sample and all the explanatory variables are not strictly exogenous. In my sample there are approximately seven observations for each individual in the sample, which is close to the number of observations per person prescribed by Heckman. Also, a case can be made that all of the explanatory variables used in the analysis here are exogenous to job mobility.

The estimates of the core job mobility probit are reported in the first two columns of table 9a. The feature that stands out in these columns is the change that occurs in the estimates of the coefficients to health insurance cost measures between columns one and two. All of these parameter estimates change signs when I control for individual job mobility. This is evidence that the endogeneity of health insurance coverage in an equation for job mobility has a large effect on estimates of coefficients to health insurance coverage and determinants of health insurance coverage in a job mobility equation. It represents empirical evidence that the parameters estimated in existing job-lock articles are biased downward by the effect of unobserved heterogeneity.

In the fixed effects estimates the likelihood of a job change is increasing in the state supply of

[58] The omitted variables will, however, cause increase the estimated errors in the probit equation. The size of this inefficiency is unknown as the equation's standard error is not identified.

[59] See the discussion of Madrian's estimation strategy which appeared earlier in the literature review.

[60] The feasibility of these probits required that I restrict the sample to 800 individuals, who were randomly selected from the larger sample. The cost was an increase in estimated standard errors.

health insurance coverage and the percent annual change in the state supply of health insurance coverage. It is decreasing in the state price of medical care and the change in the state price of medical care. However, this picture of the effect of the state cost of health insurance coverage on job mobility, which is predicted by theory, only emerges when the model is purged of the effect of unobserved individual specific job mobility effects.

It is also interesting that the coefficient to *expersqr*, the square of years of employment experience, changes sign when fixed effects are added to the model. Although this sign change does not imply any firm conclusion, it was predicted by the theory of job mobility presented here. I claimed in the last section that individuals outgrow jobs quickly when they are young (when skills are increasing at a fast rate) and less quickly as they age (when skills are increasing more slowly). The parameter sign change bears out this .laim. According to the fixed effects estimates of the coefficients to *experien* and *expersqr* individuals change jobs less frequently at higher levels of experience, but this negative effect of experience on job mobility tends to dissipate.

Specifications (2)–(4) include interactions between the occurence of an illness and the health insurance cost measures. These terms were included as a reflection of the specifications used by Madrian (1994). According to her argument, if an individual's pre-existing medical conditions are a deterrent to job mobility, then the deterrent effect of the state cost measures on job mobility should be stronger for individuals who are sick than for those who are healthy. The last column of table 9a suggests that this may be true. Three of the four estimated interaction term coefficients are negative.

The coefficients to *illspell* do not appear to be robust across the model specifications in table 9a. Estimates of the coefficient to illness range from -.756 to 6.013. The variation in these estimates is further evidence that a job-lock effect cannot be identified using measures of an individual's demand for health insurance coverage. Nonetheless, in all but one of the columns the estimated coefficient to illness status is positive. If anything illness is a cause of increased job mobility rather than a deterrent to it.

Other Results

Tables 9b-e repeat the probit analysis while restricting the sample by sex and marital status. These specifications test the robustness of the main results to changes in the demographic composition of the sample. Table 9b restricts the sample to males only, and table 9c restricts the sample to females only. The males only and females only samples generate similar results. One significant

difference is for the estimated coefficient to job experience – $-.087$ for males and $-.013$ for females. Gains in job experience have a much stronger negative effect on job mobility for males compared to females.

All the estimated coefficients of the cost variables have the predicted sign with the exception of the estimated coefficient of *pct_ch* in the males only sample. The males only sample generates a negative but statistically insignificant fixed effect estimate of the coefficient to *pct_ch*, while the equivalent coefficient in the female sample is positive and significant. No simple explanation accounts for this contradiction. However, the estimated coefficient of *lnhosp* is negative and significant for both males and females, and the coefficient of *pctchghp* is negative and significant for males and negative but insignificant for females.

Tables 9d and 9e report results from married only and unmarried only restricted samples, respectively. Job experience has a much stronger effect on job mobility for married individuals compared to unmarried individuals; educational attainment has a stronger negative effect on job mobility for unmarried respondents compared to married respondents. These results may be counfounded by the fact that in the married sample the average age of respondents is higher than the average in the unmarried sample.

The estimated coefficients of the health insurance cost variables repeat the pattern observed in tables 9a and 9b. Increases in the state supply of health insurance coverage or decreases in the cost of coverage increase job mobility for both married and unmarried individuals. The only exception is for *pct_ch* which has a negatively signed coefficient in the fixed effects column of table 9e. The coefficient is estimated to be $-.124$ with a standard error of .726, so the aberration is clearly an insignificant one.

Conclusion

The argument presented in this study has argued for a more complete exposition of the theoretical relationship between job changes and changes in health insurance coverage and for a broadened view of the social consequences of employer linked health insurance coverage. Previous studies of job changes and changes in insurance coverage have focussed on the exclusion of pre-existing medical conditions from new health insurance policies as a potential deterrent to job changes. The evidence presented by those studies has been difficult to judge, because no study has ever provided a complete model of expected changes in insurance coverage and their role in determining job mobility.

This study has attempted to fill that gap by expositing a dynamic model of job mobility which makes explicit the value of health insurance coverage and expectations of future levels of compensation from all potential employers. The dynamic model makes clear that pre-existing medical conditions are a potential source of job-lock, but that their effect is significant only when they are severe and prolonged. The model also implies that negative shocks to the market supply of employer linked health insurance coverage, in addition to pre-existing medical conditions, can have a deleterious effect on job mobility.

The model of job mobility developed here was tested using data from the NLSY. The empirical evidence supports the view that pre-existing medical conditions are, at best, a small deterrent to job mobility. Employer costs of providing health insurance coverage to employees were found to have a much greater effect on changes in health insurance coverage and ultimately on job mobility than do individual demand factors.

The empirical results have important policy implications for health insurance reform. Proposals to remedy the negative effect of employer linked health insurance coverage on job mobility by making health insurance coverage portable across employers should be carefully evaluated. They may cause some employers to cancel their employee health insurance benefit plans or to restrict coverage by raising the employer cost of health insurance coverage, thus reducing the overall number of employers who offer health insurance coverage. Their effect may be to increase the risk that an individual will lose his health insurance coverage, either through a job change or if his current employer eliminates health insurance coverage as an employment benefit. Indirectly, the proposal could strengthen the deterrent to job mobility, thus actually reducing job mobility rather than increasing it.

Proposals to prohibit insurance companies from excluding pre-existing medical conditions from

new health insurance policies may also have unintended effects. Individuals with costly medical conditions might be encouraged by the expectation that medical coverage for their conditions would not be excluded from a new health insurance policy if they were to change jobs, a positive effect for them. However, all individuals (including those with pre-existing conditions) may be less able to find a new job that offers health insurance coverage, since the legal prohibition would tend to increase the employer cost of offering health insurance coverage, and cause some employers to cancel their employee health insurance benefit plans or reduce the coverage in those plans.

The analysis here suggests that the social goal of increasing job mobility to a level that would exist if health insurance policies were not linked to employers may only be attained by removing the link that currently exists between health insurance coverage and employers in the U.S.