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The Macroeconomic Consequences of Financing Health Insurance

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Abstract

Employer-financed health insurance systems, like that used in the United States, distort firms' labor demand and adversely affect the economy. Since such costs vary with employment rather than hours worked, firms have an incentive to increase output by increasing worker hours rather than employment. Given that the returns to employment exceed the returns to hours worked, this results in lower levels of employment and output. In this paper we construct a heterogeneous agent general equilibrium model where individuals differ with respect to their productivity and employment opportunities. Calibrating the model to the U.S. economy, we generate steady state results for several alternative models for financing health insurance: one in which health insurance is financed primarily through employer contributions that vary with employment; a second where insurance is funded through a non-distortionary, lump-sum tax; and a third where insurance is funded by a payroll tax. We measure the effects of each of the alternatives on output, employment, hours worked and inequality.

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1 Introduction

Employer-financed health insurance systems, like that used in the United States, distort firms' labor demand and adversely affect the economy. Unlike most developed countries, health insurance in the United States has long been financed primarily through employers. de Navas-Walt, Proctor and Mills (2004) report that about 60 percent of Americans obtain health insurance through employers, though this percentage has been steadily declining for decades. According to the Bureau of Labor Statistics (2005), healthcare costs now represent over 7 percent of the average employer's total compensation costs. Since such costs vary only with employment rather than hours worked, firms have an incentive to increase worker hours rather than employment.

While it is clear that the costs of providing health insurance are significant, little attention has been paid to quantifying the macroeconomic consequences of employer-based health insurance (EBHI) systems. The literature is clear on the fact that EBHI affects labor market outcomes. Cutler and Madrian (1998) found that rising healthcare costs accounted for up to a 3 percent increase in hours worked in the U.S. during the 1980s. More recently, Baiker and Chandra (2005) estimated that rising insurance premiums led to an 8 percent decline in employment between 1996-2002. Given these labor market distortions, it is possible that the U.S.'s reliance on employer-funded health insurance is reducing macroeconomic output. Furthermore, these distortions may also have implications for wage inequality.

In this paper we attempt to quantify the macroeconomic consequences of alternative models for financing healthcare. Specifically, we address two questions: one, what are the distortionary costs of the U.S.'s existing EBHI system? and two, what would be the macroeconomic impact of adopting a single-payer, universal healthcare system? To address these questions, we construct a heterogeneous agent general equilibrium model where individuals differ with respect to their productivity and employment opportunities. Each period firms make a decision as to how many workers of each type to hire, as well as a decision on hours per worker. The benchmark model is calibrated to match the most pertinent aspects of the U.S. economy. From the benchmark model, aggregate employment, output and asset distribution are computed and compared to those generated from a number of alternative models where health insurance is funded at the national level through either a lump-sum tax on employers or payroll taxes. The results of these experiments have important implications for ongoing policy debates over healthcare reform.

2 Health Insurance and Employment

Provision of health insurance by employers can affect labor market outcomes for a number of reasons. This can occur through either productivity,[1] labor supply,[2] or through changes in the structure of employment driven by employers' demand. Because of the empirical controversy surrounding the effects on productivity and labor supply, this paper focuses only on simulating the demand-side effects. Specifically, we concentrate on the firm's choice regarding its optimal levels of employment and the number of hours worked.

The first issue related to the provision of health insurance and the demand for labor is whether firms are able to shift the cost of providing health insurance to their employees in the form of lower wages. In other words, rising healthcare costs for firms might simply result in a reduction in wages. If firms could make this shift, the cost of providing health insurance benefits would have a negligible effect on labor demand, and no effect on the hours-employment trade-off. However, this does not appear to be the case. As Currie and Madrian (1999) conclude, there is little empirical evidence to suggest that a trade-off between insurance costs and wages exists. Overall, the literature indicates that EBHI systems like that of the U.S. do in fact raise the costs of production. Specifically, EBHI affects the costs associated with hiring labor services.

The salient feature of EBHI is that the costs vary with the level of employment rather than the number of hours worked. The implication is that these costs should affect the overall structure of employment, leading firms to hire fewer workers to work more hours. The existing literature appears to support just such a trade-off (Ehrenberg 1971, Ehrenberg and Schumann 1982, Beaulieu 1995, and Cutler and Madrian 1998). In fact, Cutler and Madrian (1998) found that rising health insurance costs accounted for a significant increase in hours worked in the U.S. during the 1980s, while Baiker and Chandra (2005) found that rising insurance premiums led to a large decline in employment between 1996-2002.

Overall, the evidence from the literature suggests that EBHI systems increase firms' costs. As a result, firms reduce their demand for the number of workers while increasing their demand for hours worked per employee. The implication is that if firms could reduce the costs associated with employment, the demand

[1] Health insurance reduces the cost of health. Ultimately, health has been shown to affect labor productivity. However, the empirical literature on the relationship between insurance and health is mixed. For the purposes of this paper, we ignore the possibility of any such productivity effects. For an overview of this literature, see Currie and Madrian (1999).

[2] When the provision of health insurance is tied to employment, it affects workers' supply of labor by increasing the returns to work. Since the elasticity of labor supply for men and single women in the United States is relatively inelastic, the literature on the relationship between health insurance and labor participation rates have concentrated on retirees (Blau and Gilleskie 2001), poor women (Yelowitz 1995), and married women (Olsen 1998, Buchmueller and Valletta 1999). Overall, the labor supply effects of EBHI systems appear mixed. While older workers and married women are more likely to work when insurance is tied to employment, there are inefficiencies in the system. Because low-paying jobs often fail to provide insurance, poor women are actually less likely to enter the labor market since they would risk losing Medicaid.

for workers would increase and the hours worked would decrease. Furthermore, if the returns to employment exceed the returns to hours worked, such a change would have important implications for the level of domestic output.

3 The Model

The literature has implications for the macroeconomic model developed in this section. First, it is clear that EBHI imposes a distortionary "employment tax" on producers. Firms respond to EBHI by altering the structure of employment, substituting more hours for fewer workers. We begin to analyze the macroeconomic effects of EBHI by constructing a simple, yet realistic model of the U.S. economy. Since the primary purpose of this paper is to estimate the macroeconomic effects generated by changes in employment from moving away from the current EBHI system, we ignore the potential productivity gains related to worker health and reductions in job-lock. For tractability, we also abstract from gender and marital status effects. We also assume that all workers prefer to work full time. In the benchmark model employers provide full health insurance benefits for an exogenously determined percentage of the workers they employ, regardless of the number of hours they work.

3.1 Preferences

The economy is populated by overlapping generations of *ex ante* heterogeneous workers. Workers differ with respect to their age and their human capital (skill level). We assume three different types of human capital denoted by $hc \in \{hc_1, hc_2, hc_3\}$, where hc_1 through hc_3 represent monotonically increasing human capital levels.

Individuals are assumed to live J periods with certainty and each period a new generation is born. The fraction of individuals age j and human capital hc is given by $\mu_{j,hc}$ where $\sum_{j=1}^{J}\sum_{hc=1}^{3}\mu_{j,hc} = 1$. Each individual participates in the labor force beginning in period 1, and must retire from work in period $jret$, where $jret < J$. Therefore, individuals' ages are indexed by $j \in \{1, 2, .., jret, .., J\}$. Given that this model focuses on the distortions related to a system of employer-based heath insurance, and firms are typically not required to pay health insurance costs for former employees or retirees (with the exception of Medicaid costs which are included in the calibration of payroll taxes), the inclusion of retirement in the model should not impact the main *employment* results. However, it does indirectly affect firms' decisions. The inclusion of a retiree cohort acts as another channel through which to motivate savings, and thereby has an important impact on households' consumption/savings decisions throughout the life cycle, and by extention on the level of capital stock formation.

Each period prior to retirement, individuals face uncertainty relating to whether or not they will become employed and, if employed, whether or not they will receive health benefits. The probability of employment is determined endogenously in the model based on the demand for employment by firms. Specifically, the probability of employment differs across human capital types and is exactly equal to the percentage of workers that firms choose to employ in each period (for each type of worker). For example, if firms choose to hire only 60 percent of the low-human-capital type workers avaliable for employment, then the probability of employment for all low-human-capital workers is set equal to 0.60. The probability of receiving healthcare from an employer is calibrated exogenously to mimic the percentage of workers who currently receive employer-based health insurance. In the face of this idiosyncratic uncertainly, individuals choose the vector $\{c_j, h_j, a_{j+1}\}$ in order to maximize their expected lifetime utility, which depends on the consumption of a good and the amount of leisure time enjoyed. That is, an individual with human capital hc desires to maximize:

$$\mathrm{E}\sum_{j=1}^{J} \beta^{j-1}\, U(c_{j,hc}, \chi, l_{j,hc}) \tag{1}$$

where $c_{j,hc}$ is the consumption of goods and $l_{j,hc}$ is the amount of leisure time for an individual of age j and human capital hc. χ represents utility derived from the consumption of health insurance and is assumed to be constant across agent types. For simplicity, we also assume that the value of χ is independent of the provider; that is, workers have no preference between employer-based or government-provided health insurance. But not all individuals in the model receive health insurance. For those individuals who do not receive health insurance either from their employer or the government, $\chi = 1$. For those individuals offered employer-based health benefits, or for those individuals receiving government-provided health insurance, $\chi > 1$. β is the subjective discount factor, and E is the expectation operator.

The momentary utility function has the form:

$$U(c_{j,hc}, \chi, l_{j,hc}) = \log(c_{j,hc}^{\alpha}\chi^{1-\alpha}) + \zeta_{j,hc}(l_{j,hc}) \tag{2}$$

where α represents the relative importance of consumption, and $\zeta_{j,hc}$ represents the utility gained from leisure time. Individuals are assumed to be endowed with one unit of time each period to be allocated between leisure and work. That is,

$$1 = l_{j,hc} + h_{j,hc} \tag{3}$$

where $h_{j,hc}$ represents the number of hours an individual of age j and human capital hc spends working. The utility derived from leisure is written as:

$$\zeta_{j,hc}(l_{j,hc}) = \gamma_{hc} \log(1 - h_{j,hc}) \tag{4}$$

where γ_{hc} is a human capital-dependent parameter representing an individual's preference for leisure.

3.2 Efficiency and Employment of Worker-Agents

The large number of *ex ante* heterogeneous agents differ with respect to their productivity or efficiency in the labor market. Efficiency is human capital dependent and is denoted ε_{hc}. The wage rate for each type of worker will be determined by simultaneously solving the first-order conditions from both the firm and the individual's choice problems and is denoted w_{hc}. An employed individual of human capital type hc receives the wage income w_{hc} for each hour worked. If an individual is in the unemployed state (denoted u), he receives unemployment insurance benefits. We denote the unemployment benefit by ν. Retirees receive the retirement benefit ω.

The demand for labor depends on human capital levels and is denoted n_{hc}, indicating the demand for labor of human capital level hc. During the working years, the probability of drawing the employed state (denoted e) is endogenously calibrated to match the demand for employment by firms and hence is also dependent upon the worker's human capital level.

3.3 Aggregate Technology

The production technology of this economy is given by a standard Cobb-Douglas function.

$$Y = f(K, N) = AK^{\theta}N^{(1-\theta)} \tag{5}$$

where $\theta \in (0,1)$ is capital's share of output, and K, N are the aggregate inputs of capital and labor, respectively. The parameter A represents total factor productivity and is assumed constant. The capital stock depreciates at the rate δ each period. Aggregate employment in the model, N, follows that of Fitzgerald (1997) and is defined as the measure of labor services of employed individuals of each human capital type, or:

$$N = \Pi_{hc=1}^{3}(h_{hc}^{\psi_{hc}}n_{hc})^{\varepsilon_{hc}} \tag{6}$$

where again ε_{hc} represents the relative efficiency of a type hc worker, n_{hc} is the number of type hc individuals employed by the firm, h_{hc} is the number of hours an employed type hc individual works, and $\sum_{hc=1}^{3}\varepsilon_{hc} = 1$. Following Fitzgerald (1997) and Fitzory and Hart (1985), we introduce the parameter ψ_{hc} to represent the elasticity of labor services with respect to hours for each human capital type. If $\psi_{hc} = 1$, this implies that labor services for agents of human capital type hc are proportional to hours worked, whereas if $\psi_{hc} < 1$ (as it is calibrated in our model) labor services increase less than proportionally with hours worked. The latter case is typical in the labor demand literature and can be interpreted as the decreasing returns to hours often resulting from worker fatigue or boredom. We define aggregate employment as multiplicative in efficiency units of workers in order to allow for complementarity across human capital types. For simplicity, we assume there are no productivity differences between workers that do and do not receive healthcare benefits from the firm.

Given a competitive environment, the profit-maximizing behavior of the firm gives rise to the first-order condition that determines the real (net) return to capital.

$$r(K, N, h) = \theta AK^{(\theta-1)}N^{(1-\theta)} - \delta. \tag{7}$$

3.4 Individuals' Decision Problem

An individual enters a period knowing their human capital level, employment opportunities, probability of obtaining healthcare, and asset position for the period. We let $a_j \in A$ represent the initial asset position of an individual. We restrict a_j to the discrete set of positive values $\{a_1, a_2, ..., a_A\}$. Each period, individuals choose the vector $\{c_j, h_j, a_{j+1}\}$ to maximize their utility. For each individual, the individual's state depends on their age, j, their human capital level, hc, asset position, a, and employment situation, s. Δ_s represents the probability that an individual will receive health insurance and is dependent upon an individual's employment status, s. For an employed individual ($s = e$) of working age, $\Delta_e < 1$ and is calibrated to match the percentage of workers who currently receive health insurance either from their employer or through the government (typically veterans' insurance or Medicaid). Since typically not all unemployed individuals receive health benefits through the government, $\Delta_u < 1$ as well, and is calibrated to match the percentage of unemployed individuals who receive Medicaid or some other type of government provided health insurance. Since all retirees are eligible to receive government provided healthcare through Medicare, the probability of receiving health insurance in the model when $j > jret$ is denoted Δ_r and is set equal to 1.

In addition, τ_u represents the unemployment tax rate. This tax is set so that the revenue collected exactly covers the total cost of unemployment benefits, ν, and is financed by equally taxing both workers and firms. Therefore, each individual's wage income is taxed at a rate of $0.5\tau_u$. Similarly, retirement benefits, ω, are paid to each individual past retirement age. These benefits are financed by equally taxing both workers and firms at the tax rate τ_r.

The choice problem for each individual can be expressed as:

$$V(j, a, hc, s) = \max[\Delta_s U(\cdot, \chi > 1) + (1 - \Delta_s)U(\cdot, \chi = 1)] + \beta \int V(j + 1, a^{'}, hc, s^{'})\ \Pi_i(s'|s)ds' \quad (8)$$

subject to

$$c + a^{'} \leq (1 - 0.5\tau_u - 0.5\tau_r)w_{hc}h_{j,hc} + (1 + r)a, \quad \text{if } j < jret, \text{ and } s = e \quad (9a)$$

$$c + a^{'} \leq \nu + (1 + r)a, \quad \text{if } j < jret, \text{ and } s = u \quad (9b)$$

$$c + a^{'} \leq \omega + (1 + r)a, \quad \text{if } j \geq jret \quad (9c)$$

$$a^{'} \geq 0$$

$$r = r(K, N, h)$$

$$w_{hc} = w_{hc}(K, N, h)$$

The decision rules for c, h and $a^{'}$ for individual i are $C_i(x)$, $H_i(x)$, and $A_i(x)$.

3.5 Firm's Decision Problem

Each homogeneous firm rents capital and employs workers. The firm incurs two types of costs that vary only with the level of employment, ϕ and ξ. Each of these costs represent a portion of the costs of hiring an additional employee. In particular, ϕ represents the cost of providing healthcare per worker, while ξ represents all other per worker costs, including training costs, search and paperwork costs, and other benefits (excluding healthcare). Note that since firms do not offer healthcare benefits to all workers, the parameter ρ is introduced to represent the percentage of workers who are provided healthcare through the firm. Currently, only 70.5% of all workers obtain their healthcare benefits through their employer.[3]

In addition, firms incur variable costs associated with worker hours in the form of payroll taxes. Each firm must pay a tax rate of τ_b for each worker-hour employed. That is, if a firm hires a type 1 worker to work 20% of their total time allotment, the effective cost of those hours to the firm is $(1+\tau_b)w_1 * 0.2$. The revenue from these payroll taxes goes into a government savings fund.[4] Firms must also pay a portion of the tax rates τ_u and τ_r to finance unemployment benefits and retirement benefits respectively. Since these benefits are financed by equally taxing both workers and firms, the effective tax rates for the firm are $0.5\tau_u$ and $0.5\tau_r$.

Each period firms must choose both the number of workers of each human capital type, n_{hc}, as well as the number of hours that each type of worker will work, h_{hc}, in order to maximize profits. The choice problem for each firm can be expressed as:

$$\max \left(y_t - r_t k_t - [(1 + 0.5\tau_u + 0.5\tau_r + \tau_b) \sum_{hc=1}^{3} w_{hc} n_{hc} h_{hc}] - (\rho\phi + \xi) \sum_{hc=1}^{3} n_{hc} \right). \tag{10}$$

As noted earlier, the first-order conditions of this maximization problem deliver the real return to capital as well as an equilibrium condition for hours worked for each type of worker.

[3] Current Population Survey, Annual Social and Economic Supplement, 2006.

[4] Note that the payroll tax in the benchmark model acts purely as an additional (variable) cost to firms and is an attempt to mimic the social security and other payroll taxes paid by employers in the U.S.

3.6 The Government

3.6.1 In the benchmark model

The government is constructed in such as way as to mimic the most salient features of the U.S. tax system, and allows us to analyze the effects of a change in healthcare costs to employers through taxes. In the benchmark economy the government provides unemployment benefits to non-working individuals, retirement benefits to all individuals past retirement age, and 'other programs' that are assumed to benefit each agent equally. We assume both the unemployment benefits program and the retirement benefits program are self-financed by equally taxing both workers and firms. The unemployment tax rate, τ_u, is set so that the revenue collected covers the cost of paying each unemployed individual the amount ν. Similarly, the retirement tax rate, τ_r, is set so that the revenue collected covers the cost of paying each retired individual the amount ω. Hence given the cross-sectional distribution measure $\lambda(j, a, hc, s)$,

$$\tau_u = \frac{\sum_{j=1}^{jret-1} \sum_{a=1}^{A} \sum_{hc=1}^{3} [\nu \mu_{j,hc} \lambda(j, a, hc, s = u)]}{\sum_{j=1}^{jret-1} \sum_{a=1}^{A} \sum_{hc=1}^{3} [w_{hc} h_{j,hc} \mu_{j,hc} \lambda(j, a, hc, s = e)]} \tag{11}$$

and

$$\tau_r = \frac{\sum_{j=jret}^{J} \sum_{a=1}^{A} \sum_{hc=1}^{3} [\omega \mu_{j,hc} \lambda(j, a, hc, s)]}{\sum_{j=1}^{jret-1} \sum_{a=1}^{A} \sum_{hc=1}^{3} [w_{hc} h_{j,hc} \mu_{j,hc} \lambda(j, a, hc, s = e)]} \tag{12}$$

The payroll taxes paid by firms in the benchmark model are set to replicate the legally-required wage related taxes (minus unemployment insurance) faced by firms. The revenue from these taxes, G, is assumed to finance other government programs which are assumed to benefit all agents equally. In addition, G also includes spending on government-provided health insurance. This includes an exogenously set fraction of unemployed workers and employed workers. Like EBHI, the benefits from government-provided health insurance enter the agents' utility function through χ. More specifically, the government budget constraint in the benchmark model can be defined as:

$$G = \tau_b * \sum_{j=1}^{jret-1} \sum_{hc=1}^{3} [n_{hc} h_{j,hc} w_{hc}]. \tag{13}$$

3.6.2 When healthcare costs are funded by a lump-sum tax

Since one of the main purposes of the paper is to measure the distortionary effects of EBHI, we estimate an alternative model where the firm's EBHI costs are instead replaced by a lump-sum tax, T, paid to the government. This alternative version allows us to compare the macroeconomic outcomes under EBHI with those generated under a non-distortionary, single-payer system. In addition to unemployment benefits and other programs, the government also provides health insurance to individuals. In this version, the firm's choice problem becomes

$$\max \left(y_t - r_t k_t - [(1 + 0.5\tau_u + 0.5\tau_r + \tau_b) \sum_{hc=1}^{3} w_{hc} n_{hc} h_{hc}] - \xi * \sum_{hc=1}^{3} n_{hc} - T \right). \tag{14}$$

Consequently, the new government budget constraint becomes

$$G = \tau_b * \sum_{j=1}^{jret-1} \sum_{hc=1}^{3} [n_{hc} h_{j,hc} w_{hc}] + T. \tag{15}$$

where $T = \rho\phi \sum_{hc=1}^{3} n_{hc}$ from equation (10) in the benchmark model. The reason for determining T this way is to avoid altering the relative burden of financing health insurance when comparing systems. Although this calibration of T does not estimate the lump-sum costs of moving to a *universal* healthcare system, maintaining constant relative costs allows us to isolate the pure distortion effects when we compare the benchmark to the lump-sum model.

3.6.3 When universal healthcare is financed through a payroll tax

The second question addressed in this paper concerns the macroeconomic consequences of adopting a single-payer, universal healthcare system. While the lump-sum model allows us to measure the size of the distortion effects that result from EBHI, it does not represent an administratively feasible policy alternative. Universal coverage financed through a payroll tax is quite realistic. In fact, this is essentially what is done in Germany.

In this alternative model, in addition to the legally-required wage related taxes firms face, they also incur an additional payroll tax, denoted τ_h. Obviously, this tax can be split between firms and individuals. We actually estimate two versions of the model: one where firms are required to pay 100 percent of the tax obligation, and a second where the tax is split equally between both workers and firms (similar to the unemployment tax). This new system is self-financing so that the revenue collected from this tax exactly covers the total cost of health expenditures for all individuals in the economy. That is:

$$\tau_h = \frac{\sum_{j=1}^{J} \sum_{a=1}^{A} \sum_{hc=1}^{3} [\phi \mu_{j,hc} \lambda(j, a, hc, s)]}{\sum_{j=1}^{jret-1} \sum_{hc=1}^{3} [n_{hc} h_{j,hc} w_{hc}]}. \tag{16}$$

In the experiment where the healthcare tax is split equally between both workers and firms, the individuals' choice problem now becomes:

$$V(j, a, hc, s) = \max U(\cdot, \chi > 1) + \beta \int V(j+1, a', hc, s') \; \Pi_i(s'|s) ds' \tag{17}$$

subject to

$$c + a^{'} \leq (1 - 0.5\tau_u - 0.5\tau_r - 0.5\tau_h) w_{hc} h_{j,hc} + (1+r)a, \qquad \text{if } j < jret, \text{ and } s = e \tag{18a}$$

$$c + a^{'} \leq \nu + (1+r)a, \qquad \text{if } j < jret, \text{ and } s = u \tag{18b}$$

$$c + a^{'} \leq \omega + (1+r)a, \qquad \text{if } j \geq jret. \tag{18c}$$

Similarly, the new firm's problem is:

$$\max \left(y_t - r_t k_t - [(1 + 0.5\tau_u + 0.5\tau_r + 0.5\tau_h + \tau_b) \sum_{hc=1}^{3} w_{hc} n_{hc} h_{hc}] - \xi * \sum_{hc=1}^{3} n_{hc} \right). \tag{19}$$

Note that in this version of the model, since healthcare costs are financed through a payroll tax which is dependent upon the level of employment, the cost burden may not be identical to the benchmark/lump-sum versions of the model. Whereas the lump-sum version of the model is cost-neutral, the same is not true when health insurance is financed through a payroll tax. This is due to the fact that when the firm decides to increase (decrease) employment as a result of the change in its cost structure, its tax burden will increase (decrease) accordingly.

Regardless, comparing the payroll tax model to the lump-sum model will provide us some measure of the distortion caused by this more feasible policy alternative relative to the no-distortion, (albeit unrealistic) lump-sum model. Comparing the universal model financed through payroll deductions to the benchmark model, of course, allows us to address one of the most fundamental questions of national health insurance reform.

3.7 Determination of Wages and Hours

The wage rate for each worker of human capital type hc is dependent on the equilibrium hours worked, and is determined by simultaneously solving both the individual's and the firm's choice problem. In particular, the individual's optimal choice for hours worked in the benchmark model gives rise to the following condition for wages:

$$w_{hc} = \frac{\gamma_{hc} c_{hc}}{\alpha(1 - h_{hc})(1 - 0.5\tau_u - 0.5\tau_r)} \tag{20}$$

where again, γ_{hc} is the leisure preference and c_{hc} is the level of consumption, each for an agent of human capital type hc.

The firm's optimal employment decisions also require the following equilibrium condition:

$$\frac{\frac{\partial Y}{\partial h_{hc}}}{\frac{\partial Y}{\partial n_{hc}}} = \frac{(1 + 0.5\tau_u + 0.5\tau_r + \tau_b) w_{hc} n_{hc}}{(1 + 0.5\tau_u + 0.5\tau_r + \tau_b) w_{hc} h_{hc} + (\rho\phi + \xi)}. \tag{21}$$

This condition states the familiar outcome that the ratio of the marginal products of the two inputs (i.e. hours per worker, and the number of workers) must equal the ratio of the marginal costs. In addition, since $\frac{\partial Y}{\partial h_{hc}} = \psi\varepsilon_{hc}(1-\theta)\frac{Y}{h_{hc}}$ and $\frac{\partial Y}{\partial n_{hc}} = \varepsilon_{hc}(1-\theta)\frac{Y}{n_{hc}}$, equation (21) yields a solution for equilibrium hours worked which is independent of employment. In particular, the firm's problem gives rise to the following solution for hours:

$$h_{hc} = \frac{\psi(\rho\phi+\xi)}{w_{hc}(1+0.5\tau_u+0.5\tau_r+\tau_b)(1-\psi)}. \tag{22}$$

Combining the equilibrium conditions from both the individual's and the firm's optimization problems (equations 20 and 22 respectively) yields the solution for equilibrium hours worked:

$$h^*_{hc} = \frac{\psi\alpha(\rho\phi+\xi)(1-0.5\tau_u-0.5\tau_r)}{\gamma_{hc}c_{hc}(1+0.5\tau_u+0.5\tau_r+\tau_b)(1-\psi)+\psi\alpha(\rho\phi+\xi)(1-0.5\tau_u-0.5\tau_r)}. \tag{23}$$

While these equilibrium conditions hold for the benchmark model, equilibrium conditions for the two alternative models will differ slightly. Under lump-sum financing of health insurance $\rho = 0$ in equations 22 and 23. Under payroll-tax financing where τ_h is split evenly between firms and individuals equilibrium hours worked becomes:

$$h^{*\prime}_{hc} = \frac{\psi\alpha\xi(1-0.5\tau_u-0.5\tau_r-0.5\tau_h)}{\gamma_{hc}c_{hc}(1+0.5\tau_u+0.5\tau_r+0.5\tau_h+\tau_b)(1-\psi)+\psi\alpha\xi(1-0.5\tau_u-0.5\tau_r-0.5\tau_h)}. \tag{24}$$

3.8 Equilibrium

Given a set of fiscal policy arrangements $\{\nu, \omega, \tau_u, , \tau_r, \tau_b, \tau_h\}$, a stationary equilibrium includes: the value function $V_i(x)$; a set of individual decision rules $C_i(x)$, $A_i(x)$, and $H_i(x)$; and prices for both labor and capital, $\{w_1, w_2, w_3, r\}$. Each of these are determined in an environment where: individuals and firms maximize utility subject to budget constraints as expressed in equations (8) - (10); the government budget constraint is satisfied; the various markets clear; and the cross-sectional distribution measure, $\lambda(x)$, is time invariant. Formally, the following conditions must be satisfied in equilibrium.

(i) Aggregate variables result from the choices of individual agents:

$$K = \sum_{j=1}^{J}\sum_{hc=1}^{3}\mu_{j,hc}\int_x A(x)d\lambda(j,hc,\cdot)$$

$$K' = \sum_{j=1}^{J}\sum_{hc=1}^{3}\mu_{j,hc}\int_x A'(x)d\lambda(j,hc,\cdot).$$

(ii) Employment rates are endogenously determined by the choices of firms.

(iii) The relative prices $\{w_1, w_2, w_3, r\}$ solve both the individual's as well as the firm's profit-maximization problem by satisfying equations (8) through (10).

(iv) Given the time-invariant government policy variables, the relative wage rate, interest rate and employment rate yield individual policy rules $C_i(x)$, $A(x)$ and $H_i(x)$ which solve the programming problem of the individual as defined in (8).

(v) The various markets clear at the prices $\{w_1, w_2, w_3, r\}$.

The commodity market clearing equation is:

$$\sum_{j=1}^{J} \sum_{hc=1}^{3} \mu_{j,hc} C(x) d\lambda(x) + [K' - (1-\delta)K] + G = f(K, N, h). \tag{25}$$

The market clearing equations for worker-hours, by type of worker, are:

$$h_1 = \sum_{j=1}^{jret-1} \mu_{j,1} H_1(x) d\lambda(j, hc = 1, \cdot) \tag{26}$$

$$h_2 = \sum_{j=1}^{jret-1} \mu_{j,2} H_2(x) d\lambda(j, hc = 2, \cdot) \tag{27}$$

$$h_3 = \sum_{j=1}^{jret-1} \mu_{j,3} H_3(x) d\lambda(j, hc = 3, \cdot) \tag{28}$$

where the left-hand side of each market clearing equation represents the total demand of type hc worker-hours determined by the firms' profit-maximizing first-order conditions, and the right-hand side represents the total supply of type hc hours determined from the individuals' utility-maximizing first-order conditions.

(vii) The government's budget constraint equation is satisfied.

4 Calibration

The model is calibrated to mimic steady-state data for the United States. These involve production technology, labor-related costs and consumer preferences. The parameters that describe steady-state production come from calibration targets consistent with recent data from the Bureau of Labor Statistics (2005, 2006a, 2006b) and existing literature.

4.1 Targets

All of the key parameters that drive the model's most important results have been calibrated using empirical targets. These include the relative efficiencies, leisure preferences, the marginal product of hours worked, and most employment-related costs. The benefit of using these calibration targets is that it allows us to endogenously calibrate certain parameters so that our benchmark model correctly mimics certain characteristics consistent with the U.S. economy.

Targets for employment and hours worked come from the *Current Population Survey* (Bureau of Labor Statistics 2006b). Type 1 workers are those with a high school diploma or less; type 2 workers are those with some post-high school education; type 3 workers are those with a four-year college degree or higher. Targets for relative wages are determined by the median usual weekly earnings for full time workers by education level (Bureau of Labor Statistics 2006a). Note that one cannot simply divide this by the average hours worked per week to obtain an estimate of the average hourly wages, since the hours worked figures also include part-time employees. Nevertheless, the earnings estimates for full time workers provide a reasonable target for establishing the relative wages for each type of worker (1.000, 1.242 and 1.896, respectively). Targets for employment, hours worked and relative wages are summarized in Table 1.

Table 1: Calibration Targets for Employment

Variable	BLS data	Target
Employment		
Type 1 worker	0.5456	0.5456
Type 2 worker	0.6860	0.6860
Type 3 worker	0.7597	0.7597
Hours Worked		
Type 1 worker	37.34 hrs/wk	0.2220
Type 2 worker	39.17 hrs/wk	0.2330
Type 3 worker	42.45 hrs/wk	0.2530
Relative Wages		
Type 1 worker	$543 week	1.0000
Type 2 worker	$674 week	1.2420
Type 3 worker	$817 week	1.8960

Targets for production costs come from a recent Bureau of Labor Statistics' (2005) report on *Employer costs for employee compensation*. There are three key costs that affect firm's optimal decisions in our model: (1) the per-worker cost of health insurance; (2) legally-required wage-related taxes (e.g., FICA); and (3) other costs related to the level of employment (e.g., search costs, other benefits, etc.). The Bureau of Labor Statistics (2005) estimates that costs for employee health insurance per hour worked accounts for 7.5 percent of total worker compensation; legally-required benefits per hour worked (not including unemployment insurance) account for another 7.5 percent of total worker compensations; and other costs of employment such as paid leave, vacation, sick and holiday leave per hour worked account for another 7.2 percent of total worker compensation. Unfortunately, this 7.2 percent does not include other non-compensation costs associated with hiring. For example, Fitzgerald (1996) cites costs like training, search, and paperwork costs. While there are few direct estimates of these costs, the seminal paper by Oi (1962) finds these hiring costs are equivalent to about 5 percent of total compensation costs. But that estimate was based on data from the 1950s, a time when most jobs tended to be concentrated in lower-skilled manufacturing jobs where the training and/or search costs tend to be lower. Since we have reason to expect these costs to be far higher in the 21st century, we assume 5 percent represents a lower bound. More recent research supports these presumptions. Using data on Italian firms, Del Boca and Rota (1998) estimates hiring costs to range between 16 to 22 percent of total compensation. As they note, there is reason to believe that, due to more stringent government regulations, Italian firms' hiring costs are probably among the highest in the world.

Given these data, we assume search and hiring costs to be 10 percent of total worker compensation in our benchmark model. As a result, we calibrate all employment-related costs that are not related to health insurance to be 17.2 percent (7.2 percent + 10 percent) of total worker compensation costs. As will become evident in the results that follow, the calibration of these parameter largely determines the magnitude of the responses to the counterfactual experiments. In the final section, we report results of sensitivity analysis of our experiments to the estimate of these hiring costs.

4.2 Benchmark Model

Given the targets discussed above, the benchmark model is calibrated using the parameters listed in Table 2. The marginal product of capital (and employment) comes from recent work by Cassou and Lansing (2004). In their analysis of the output effects of a flat tax, they assume that the marginal product of capital (θ) is 0.36 and the marginal product of labor services ($1 - \theta$) is 0.64. The relative efficiency of workers at each age is estimated using data from the Bureau of Labor Statistics on average income by age (Platania and Schlagenhauf 2004). The proportion (π) of each type of worker is obtained from data on average weekly earnings of full time workers by education level (Bureau of Labor Statistics 2006a). Recall that type 1 workers are defined to be those with a high-school education or less; type 2 workers have some college education, but do not posses a degree from a four-year college; type 3 workers are those with at least a college degree.

The level of human capital (hc), marginal product of hours (ψ) and the leisure preferences (γ) for each of the three types of workers are calibrated to hit the targets set for employment, hours worked and relative wages given in Table 1. The values for the cost of healthcare per worker (ϕ), legally-required wage-related benefits (τ_b) and other costs of employment (ξ) are chosen to match the actual employer costs reported by the Bureau of Labor Statistics (2005) discussed above. The percent of income that is paid to unemployed workers (ν) is based on the average wages weekly benefits paid and the average duration of unemployment as of 2003 (U.S. Department of Labor 2004), while the percent of income that is paid to retirees (ω) is based on the average social security retirement benefit paid to workers. Finally, the rate of time preference (β) is from Altig, *et al* (2001).

Table 2: Benchmark Parameters

Symbol	Description	Value
	Production Technology	
A	Technology Scalar	1.0000
θ	Marginal product of capital	0.3600
η	Relative efficiency of workers at each age	*see appendix*
μ	Relative size of age cohorts	*see appendix*
π_1	Proportion of type 1 workers	0.3887
π_2	Proportion of type 2 workers	0.2782
π_3	Proportion of type 3 workers	0.3331
ε_1	Relative efficiency of type 1 workers	0.2340
ε_2	Relative efficiency of type 2 workers	0.2640
ε_3	Relative efficiency of type 3 workers	0.5020
ψ_1	Marginal product of hours for type 1 workers	0.7186
ψ_2	Marginal product of hours for type 2 workers	0.7756
ψ_3	Marginal product of hours for type 3 workers	0.8440
	Employment and Wage Costs	
ϕ	Cost related to provision of health insurance	0.0193
τ_b	Legally required wage-related costs	0.0880
ξ	Other employment-related costs	0.0313
ρ	Percentage of workers who receive EBHI	0.7050
υ	Percent of wages paid to unemployed workers	0.1170
ω	Percent of wages paid to retired workers	0.4200
	Utility Function	
β	Time preference	0.9960
γ_1	Leisure preference for type 1 workers	5.6330
γ_2	Leisure preference for type 2 workers	4.5480
γ_3	Leisure preference for type 3 workers	3.8160
Δ_e	Proportion of employed workers with insurance	0.8272
Δ_u	Proportion of unemployed workers with insurance	0.7382

5 Results

5.1 Benchmark Model

Using the parameters in Table 2 we simulate a benchmark model that targets the most important features of the employment/hours decision in the U.S. The results of this benchmark model - matching all the targeted values for employment, hours, and relative wages defined in Table 1 - generate the results shown in Table 3 for wages, consumption, capital stock and output.

Table 3: Benchmark Results

Variable	Simulated value
Wages	
Type 1 worker	0.4544
Type 2 worker	0.5858
Type 3 worker	0.8438
Average Consumption	
Type 1 worker	0.0508
Type 2 worker	0.0798
Type 3 worker	0.1335
Capital Stock	1.7108
Output	0.2265

5.2 Counterfactual Experiments

With a benchmark economy in place, we are now able to address our two questions: (1) what are the distortionary costs of the U.S.'s existing EBHI system? and (2) what would be the consequences of adopting a single-payer, universal healthcare system? In addition to analyzing the effects of these alternative systems on the demand for both worker-hours and employment, the output and distributional effects of EBHI can also be estimated.

5.2.1 Current coverage funded by a lump-sum tax

In this version of the model, the per-worker cost of providing health insurance is removed. Instead, health insurance is now provided by a single payer, the government. In this experiment the relative burden remains unchanged; firms will pay the same amount in the form of a new lump-sum tax as they paid in total health insurance costs in the benchmark model ($T = \rho\phi \sum_{hc=1}^{3} n_{hc}$). All this does is transform the cost of providing health insurance into a fixed cost rather than a marginal cost per worker. Based on the results from this model, we can directly measure the size of the distortion caused by EBHI.

Results from this counterfactual experiment are given in Table 4. As expected, the experiment shows a significant increase in employment rates across the distribution of agent-types. Moreover, this labor-demand effect is strongest for workers with lower levels of human capital. The distribution of hours worked also shifts in favor of the low-productivity workers. While hours worked decreases for all workers, it declines most for type 1 workers. Recall that in the benchmark economy the costs associated with hiring workers gives firms a greater incentive to hire the most productive workers and work them for longer hours. Under the lump-sum tax, firms now have a greater incentive to hire additional workers. This is because the marginal productivity of workers is greater than the marginal productivity of hours for all levels of human capital. In the benchmark model, any increase in productivity gained when hiring additional workers is offset by the higher costs associated with hiring, a large part of which were driven by health insurance. Hence, under the lump-sum tax, hours worked decreases substantially for each type of worker and employment increases.

Just as important as the employment results are the implications for inequality. Even though absolute wages for all workers decrease due to the significant decrease in hours worked, wages decline the most for type 2 and 3 workers. Therefore, as can be seen in Table 4, overall wage inequality between the higher and lower-skilled workers declines significantly under the lump-sum alternative. This improvement in relative equality is also seen in the change in consumption rates. Type 1 workers experience an improvement in their total consumption levels while consumption declines slightly for types 2 and 3 workers. Overall, consumption increases for the lower-skilled workers relative to their higher-skilled counterparts.

Table 4: Lump-Sum Tax Results

Variable	Benchmark	Lump Sum	% Change
Employment			
Type 1 worker	0.5463	0.8722	46.78%
Type 2 worker	0.6867	0.9999	37.59%
Type 3 worker	0.7594	0.9999	27.52%
Hours Worked			
Type 1 worker	0.2221	0.1584	-33.80%
Type 2 worker	0.2332	0.1767	-27.74%
Type 3 worker	0.2534	0.2045	-21.44%
Wages			
Type 1 worker	0.4544	0.4498	-1.03%
Type 2 worker	0.5858	0.5459	-7.06%
Type 3 worker	0.8438	0.7383	-13.36%
Relative Consumption			
Type 1 worker	1.0000	1.0783	7.54%
Type 2 worker	1.5718	1.6012	1.86%
Type 3 worker	2.6303	2.4883	-5.55%
Capital Stock	1.7108	1.7828	4.12%
Output	0.2265	0.2519	10.64%

Finally, overall output levels in the economy are significantly higher under the lump-sum tax. Again, this is driven by the substantial change in the structure of employment. Our experiment shows that changing the cost of health insurance from one in which firms pay on a per-worker basis to a lump-sum tax generates an increase in steady-state output of 10.64 percent. Thus, the distortion caused by the existing system of EBHI costs the U.S. economy about $1.3 trillion (in 2006 dollars).

5.2.2 Universal coverage funded by a payroll tax

In this version of the model the per-worker cost of providing heath insurance is again removed and replaced with a system whereby health insurance is financed through a payroll tax. This version of the model allows us to analyze a more realistic alternative for policy makers. In addition, financing health insurance costs through a payroll tax also allows us to examine the effects of moving to a healthcare system in which all individuals receive coverage. Note that unlike the lump-sum experiment, the total cost burden to the economy increases in this model as compared to the benchmark.

We estimate two tax schemes within this version of the model; one in which firms are required to pay 100 percent of the payroll tax obligation, and a second where the tax is split equally between both workers and firms. Results from these experiments are given in Table 5.

Table 5: Payroll Tax Results

		When firms pay ...		When firms pay ...	
Variable	Benchmark	100% of tax	% Change	50% of tax	% Change
Employment					
Type 1 worker	0.5463	0.8045	38.71%	0.7970	37.77%
Type 2 worker	0.6867	0.9999	37.59%	0.9999	37.59%
Type 3 worker	0.7594	0.9999	27.52	0.9999	27.52%
Hours Worked					
Type 1 worker	0.2221	0.1609	-32.18%	0.1603	-32.58%
Type 2 worker	0.2332	0.1689	-32.24%	0.1685	-32.51%
Type 3 worker	0.2534	0.1962	-25.60%	0.1957	-25.84%
Wages					
Type 1 worker	0.454446	0.3520	-25.53%	0.3983	-13.19%
Type 2 worker	0.585800	0.4541	-25.47%	0.5130	-13.26%
Type 3 worker	0.843802	0.6122	-32.09%	0.6914	-19.92%
Relative Consumption					
Type 1 worker	1.0000	0.8403	-17.40%	0.8269	-19.01%
Type 2 worker	1.5718	1.3322	-16.53%	1.3084	-18.34%
Type 3 worker	2.6303	2.0712	-23.90%	2.0328	-25.77%
Capital Stock	1.7108	1.5263	-11.41%	1.4996	-13.17%
Output	0.2265	0.2299	1.49%	0.2320	2.40%

As was the case under lump-sum financing, there is an increase in employment and a decrease in hours worked across all workers as compared to the benchmark EBHI model. Again, this is to be expected since removing the large fixed cost currently associated with employment (i.e. EBHI) gives firms the incentive to hire additional workers at less hours. The effect is greatest for the low-skilled workers, resulting in a more equal distribution of both employment and wages. In addition, given the diminishing returns to hours in the production function, the increase in employment and decrease in hours worked leads to an increase in productivity and overall output. By moving to a universal healthcare system and financing this system by a payroll tax, steady state output could increase by 2.4 percent.

The increase in output is significantly smaller in the payroll-tax model than in the lump-sum model. There are two primary reasons why the output growth is lower in this case. First, the universal scheme financed through a payroll tax does not eliminate the employment distortion completely; the lump-sum model does. Second, since all workers now receive health insurance, the total costs to the economy have increased. Given this, it is not surprising to see a more modest increase in output.

The distributional effects under the payroll tax are similar to that of the lump-sum model, though considerably more modest in magnitude. From the results presented in Table 5 we can see that moving to a system of universal healthcare financed by a payroll tax not only leads to an increase in overall output, but an improvement in the relative equality of both wage and consumption levels across all types of workers.[5]

6 Sensitivity Analysis

As discussed in the calibration section, estimates for search and hiring costs differ substantially across the literature. Low estimates are in the neighborhood of 5 percent of total compensation costs, while upper bound estimates are approximately 20 percent of total compensation. The benchmark model in this paper is calibrated with non-compensation costs of employment equal to 10 percent. If the cost of hiring workers is in fact higher (or lower), then this will affect firms' employment/hours worked decisions, and hence wages and output. The following section explores the sensitivity of our benchmark results to the calibration of hiring costs. We consider three possible levels of hiring costs: 5 percent, 15 percent and 20 percent.

Table 6 shows the impact of the lump-sum- and payroll-tax model experiments when search and hiring costs equal 5 percent of total compensation (note that the payroll tax results are from the model where the payroll tax burden is split equally between workers and firms). Compared to the benchmark results, low hiring costs give firms an incentive to hire relatively more workers for fewer hours. As a result, wages decrease, leading to both lower savings and consumption levels across all worker types. The decrease in savings leads directly to a

[5] Another interesting result of the payroll tax financing scheme is that the the distribution of the tax burden itself does seem to impact the aggregate employment, hours worked, and savings decision in the economy. This result seems to differ from the traditional, well-known result that it does not matter which side of the market is taxed, the incidence of the tax will remain the same (Dalton's' Law). Research beginning with a seminal article by Harberger (1962) however shows that in general equilibrium frameworks, effects in markets other than those in which the tax is introduced are often very important. This clearly seems to be the case here as changes in the distributuion of the payroll tax burden have significant effects on savings, the capital-labor ratio, and hence on overall output. Additional research on who bears the ultimate burden of this additional tax is left for future work.

decrease in the overall capital stock. In fact, given almost a 33 percent average decline in hours worked across all workers, payroll-tax financing of a universal heathcare may actually lead to a small decrease in overall output in this case.

Table 6: Lump-Sum and Payroll Tax Results (with 5% hiring costs)

Variable	Benchmark	Lump Sum	% Change	Payroll Tax	% Change
Employment					
Type 1 worker	0.5485	0.9565	55.61%	0.8684	45.95%
Type 2 worker	0.6856	0.9999	37.75%	0.9999	37.74%
Type 3 worker	0.7592	0.9999	27.55%	0.9999	27.54%
Hours Worked					
Type 1 worker	0.2221	0.1484	-40.32%	0.1497	-39.45%
Type 2 worker	0.2328	0.1730	-29.69%	0.1658	-33.94%
Type 3 worker	0.2524	0.2019	-22.32%	0.1932	-26.73%
Wages					
Type 1 worker	0.4649	0.4379	-5.99%	0.3846	-18.96%
Type 2 worker	0.5948	0.5035	-16.66%	0.4657	-24.46%
Type 3 worker	0.8385	0.6595	-24.02%	0.6109	-31.67%
Relative Consumption					
Type 1 worker	1.0000	1.0548	5.34%	0.8307	-18.55%
Type 2 worker	1.5572	1.4763	-7.36%	1.1552	-29.86%
Type 3 worker	2.5547	2.4220	-15.33%	1.7507	-37.79%
Capital Stock	1.6758	1.6538	-1.32%	1.3632	-20.65%
Output	0.2178	0.2360	8.04%	0.2132	-2.13%

But the majority of the recent data (and almost any conversation with business executives) supports the fact that search and hiring costs are indeed significantly higher than this lower bound estimate. Table 7 shows the impact of changing to both a lump-sum and payroll-tax scheme when search and hiring costs equal 15 percent of total compensation. Compared with Table 6, the higher costs in this version leads to lower employment rates and more hours worked in both models. This leads to relatively higher wages, consumption levels and savings across all worker types. Given the higher level of wages and savings, the larger hiring costs lead to a larger increase in output than in the benchmark (10 percent) case. Specifically, output increases by as much as 12.43 percent and 2.68 percent in the lump-sum and payroll models, respectively.

Table 7: Lump-Sum and Payroll Tax Results (with 15% hiring costs)

Variable	Benchmark	Lump Sum	% Change	Payroll Tax	% Change
Employment					
Type 1 worker	0.5464	0.8296	41.76%	0.7519	31.93%
Type 2 worker	0.6867	0.9999	37.59%	0.9449	31.92%
Type 3 worker	0.7594	0.9999	27.52%	1.0000	27.52%
Hours Worked					
Type 1 worker	0.2223	0.1662	-29.08%	0.1687	-27.59%
Type 2 worker	0.2332	0.1766	-27.80%	0.1752	-28.60%
Type 3 worker	0.2533	0.2057	-20.82%	0.1971	-25.09%
Wages					
Type 1 worker	0.4412	0.4461	1.10%	0.3954	-10.96%
Type 2 worker	0.5783	0.5773	-0.18%	0.5235	-9.96%
Type 3 worker	0.8478	0.7892	-7.16%	0.7412	-13.44%
Relative Consumption					
Type 1 worker	1.0000	1.0984	9.39%	0.8441	-16.95%
Type 2 worker	1.5908	1.7318	8.49%	1.3650	-15.31%
Type 3 worker	2.7108	2.7220	0.41%	2.2400	-19.08%
Capital Stock	1.7342	1.8787	8.01%	1.5761	-9.56%
Output	0.2343	0.2653	12.43%	0.2407	2.68%

Finally, at the upper-end of the empirical estimates (Del Boca and Rota 1998), hiring costs could be as much as even 20 percent of total compensation. These results are summarized in Table 8. Again, as expected, the higher costs lead to lower employment levels, increased hours and wages, and hence increased savings and output in the economy.

Table 8: Lump-Sum and Payroll Tax Results (with 20% hiring costs)

Variable	Benchmark	Lump Sum	% Change	Payroll Tax	% Change
Employment					
Type 1 worker	0.5471	0.8020	38.25%	0.7255	28.22%
Type 2 worker	0.6854	0.9999	37.77%	0.9098	28.32%
Type 3 worker	0.7595	1.0000	27.51%	1.0000	27.51%
Hours Worked					
Type 1 worker	0.2220	0.1712	-25.98%	0.1752	-23.67%
Type 2 worker	0.2330	0.1773	-27.32%	0.1818	-24.81%
Type 3 worker	0.2531	0.2071	-20.06^	0.1996	-23.75%
Wages					
Type 1 worker	0.4279	0.4399	2.77%	0.3877	-9.87%
Type 2 worker	0.5375	0.5978	10.63%	0.5256	-2.24%
Type 3 worker	0.8507	0.8242	-3.16%	0.7709	-9.85%
Relative Consumption					
Type 1 worker	1.00	1.1043	9.92%	0.8510	-16.14%
Type 2 worker	1.6064	1.8156	12.24%	1.3921	-14.32%
Type 3 worker	2.7756	2.9098	4.72%	2.4035	-14.39%
Capital Stock	1.7615	1.9546	10.40%	1.6355	-7.42%
Output	0.2420	0.2784	14.01%	0.2516	3.89%

Comparing the results generated from the four different estimates of search and hiring costs (5, 10, 15 and 20 percent) reveals some interesting macroeconomic consequences of healthcare reform. Ultimately, the effects of healthcare reform on output and inequality are uncertain. Most of the models show that steady state output would increase. The results also demonstrate that a move to a single-payer, universal system can simultaneously increase output and decrease inequality. This occurred in both the 10- and 15-percent cases. But there also appears to be a trade-off between the size of output growth and the change in wage/comsumption inequality. The larger the output increase, the smaller the decline in the wage/consumption gap between workers with different levels of human capital.

7 Conclusion

This paper has addressed the macroeconomic consequences of the way the United States finances health insurance. In the process we have addressed to two fundamental questions: what are the macroeconomic costs of the U.S.'s reliance on employer-based health insurance? and what would be the result of changing to a universal system financed through a payroll tax? The answers we have uncovered should have a significant impact on the future theoretical work in this area as well as policy discussions.

First, this study makes clear that the current system results in a relatively inefficient allocation of labor resources. Since the costs associated with the provision of insurance vary by employment, firms respond by hiring fewer workers at more hours. By changing the way health insurance is financed it is possible to permanently increase output and employment while reducing the average hours worked. Employer-based systems also exacerbate wage inequality. When the costs of insurance are assumed to be equal across worker-types, employer-based systems increase the incentive for firms to raise the hours worked by higher-skilled workers before hiring lower-skilled workers. But when these costs are paid through either a lump-sum or payroll tax, employment increases relatively more for the least-skilled workers. Theoretically, if the U.S. was able to eliminate these labor-demand distortions, the resulting increase in steady state output could be substantial.

Second, a single-payer, universal system financed through a payroll tax represents a feasible alternative to the present system. Payroll taxes are easy to implement and the resulting labor market distortions are minimal. Moreover, under reasonable assumptions about labor costs, such a system is likely to stimulate output and reduce inequality at the same time.

While the results of this study seem to have clear, albeit controversial, implications for long-term healthcare and economic policy in the United States, caution must be taken in interpreting their significance. First and foremost, the estimates generated from this experiment only account for the demand-side distortions. Because we assume all workers are willing to accept a job if offered, many of the benefits of universal healthcare coverage may be obscured. As a result, a number of extensions to the model itself should be considered before strong policy recommendations are made. For example, there is evidence that poor women are less likely to enter the workforce under employer-based systems for fear of losing government-sponsored services such as Medicaid (Yelowitz 1995). More careful modeling of the complexity of the labor supply decisions that exist under employer-based systems is likely to be one of the more important avenues for future work in this area. Future work may also wish to consider a wider array of alternative policy reforms than has been investigated here, as this would allow for the discovery of the socially optimal tax financing scheme.

8 Appendix

Age and Efficiency Distribution

Age	Distribution	Efficiency	Age	Distribution	Efficiency
18	0.0241	0.3151	41	0.0258	1.0141
19	0.0241	0.3524	42	0.0258	1.0290
20	0.0235	0.3896	43	0.0258	1.0377
21	0.0235	0.4269	44	0.0258	1.0464
22	0.0235	0.4641	45	0.0221	1.0550
23	0.0235	0.5014	46	0.0221	1.0637
24	0.0235	0.5387	47	0.0221	1.0724
25	0.0243	0.5759	48	0.0221	1.0615
26	0.0243	0.6132	49	0.0221	1.0507
27	0.0243	0.6504	50	0.0171	1.0398
28	0.0243	0.6778	51	0.0171	1.0290
29	0.0243	0.7052	52	0.0171	1.0181
30	0.0280	0.7326	53	0.0171	1.0135
31	0.0280	0.7600	54	0.0171	1.0089
32	0.0280	0.7874	55	0.0137	1.0043
33	0.0280	0.8209	56	0.0137	0.9998
34	0.0280	0.8543	57	0.0137	0.9952
35	0.0286	0.8878	58	0.0137	0.9859
36	0.0286	0.9212	59	0.0137	0.9766
37	0.0286	0.9547	60	0.0122	0.9673
38	0.0286	0.9695	61	0.0122	0.9580
39	0.0286	0.9844	62	0.0122	0.9487
40	0.0258	0.9993			

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