The Output Effects of Employer-Based Health Insurance

Stephen B. DeLoach
Department of Economics
Elon University
Elon, NC 27244
deloach@elon.edu

Jennifer M. Platania
Department of Economics
Elon University
Elon, NC 27244
jplatania@elon.edu

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Abstract

Unlike most developed countries, the United States' health insurance system has long been provided primarily through employers. Since such costs vary only with employment rather than hours worked, firms have an incentive to increase worker hours rather than employment. Given that the returns to employment exceed the returns to hours worked, it is possible that moving away from a system of employer-provided health insurance could increase employment and economic growth. 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 post-war US economy, we generate steady state effects of changing from an employer-based health insurance system. In particular, we generate estimates for its effects on output, employment, hours worked and wealth across individuals. The results of this paper should have important implications for ongoing policy debates over healthcare reform in the United States.

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1 Introduction

Unlike most developed countries, the United States' health insurance system has long been provided primarily through employers. de Navas-Walt, Proctor and Mills (2004) report that about 60 percent of Americans obtain health insurance through their 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. In fact, Cutler and Madrian (1998) found that rising healthcare costs accounted for up to a 3 percent increase in hours worked in the US during the 1980s alone.

Setting aside the vast complexities of how and why the US health insurance system evolved into one in which most of the costs are born by employers, one aspect that has received virtually no attention over the years pertains to the possible output effects of employer-based health insurance (EBHI) systems. Is it possible that moving away from a system of employer-provided health insurance could increase employment and economic output? And if so, what are the implications for inequality?

In this paper we investigate the possible macroeconomic benefits that could be generated by moving away from an employer-based to a single-payer system. 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 model where healthccare is provided at the national level through a lump sum tax on employers. The results of this paper could have important implications for influencing 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 employer's

[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

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 firm's choice regarding its optimal levels of employment and the number of hours worked.

In thinking about the demand for labor, the first issue is the extent to which 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 tradeoff. However, this does not appear to be the case. As Currie and Madrian (1999) conclude, there is little empirical evidence to suggest that a tradeoff between insurance costs and wages exists[3]. In fact if anything, the relationship may be positive. For example, based on the RAND Health Insurance Study, Leibowitz (1983) estimates a positive relationship between health expenditures and wages. The reason is that wages and productivity are correlated. But Currie and Madrian (1999) note that even when this omitted variable bias is taken into account, there is little evidence of a tradeoff (Smith and Ehrenberg 1983). Overall, the literature indicates that EBHI systems like that of the United States do in fact raise the costs of production.

Exactly how are production costs affected by the current U.S. health insurance system? The salient feature of EBHI systems is that insurance varies only 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. In other words, do firms hire fewer workers to work more hours to reduce the costs of providing insurance? The existing literature appears to support just such a tradeoff (Ehrenberg 1971, Ehrenberg and Schumann 1982, Beaulieu 1995, and Cutler and Madrian 1998). The evidence strongly indicates that firms facing higher benefit costs utilize more overtime. In fact, Cutler and Madrian (1998) found that rising healthcare costs accounted for a 3 percent increase in hours worked in the US during the 1980s alone.

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 for workers would increase and the hours worked would decrease. Furthermore,

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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.

[3] There are, however, a few studies that find evidence that employers are able to shift particular parts of the cost of health insurance benefits to those worker groups most expensive to insure. Gruber (1994) finds that when forced by law to cover certain benefits (e.g., pregnancy, birth), the wages for those groups most likely to be affected by the law (women) fell in response to the benefit cost. Sheiner (1997) finds that wages of older workers in high-cost areas are lower than wages of the same workers in low-cost areas.

if the returns to employment exceed the returns to hours worked, such a reform would have important ramifications 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 non-trivial “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 output effects of EBHI by constructing a simple, yet realistic model of the US economy. Since the primary purpose of this paper is to estimate the output 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. For simplicity, we assume that all workers prefer to work full time and that all employers have to provide full health insurance benefits for their workers regardless of the number of hours they work. Consideration of any of these effects would require not only a labor supply decision, but the modeling of multiple, complex matching process beyond the scope of this paper.

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 $hc \in HC = \{hc_1, hc_2, hc_3\}$, 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. Individuals ages are indexed by $j \in \{1, 2, ..., J\}$. The fraction of age j and human capital hc individuals is given by $\mu_{j,hc}$ where $\sum_{j=1}^{J} \sum_{hc=1}^{HC} \mu_{j,hc} = 1$.

Each period, individuals choose the set $\{c_j, h_j, a_{j+1}\}$ in order to maximize their 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:

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

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. β is the subjective discount factor, and E is the expectation operator.

The momentary utility function has the form:

$$U(c_{j,hc}, l_{j,hc}) = \log(c_{j,hc}) + \zeta_{j,hc}(l_{j,hc}) \tag{2}$$

where $\zeta_{j,hc}$ represents the utility gained from leisure time. Individuals are assumed to have an endowment of one unit of time each period which is 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. We specify the utility from leisure associated with working h hours 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 both age and human capital dependent. Age-indexed efficiency is denoted η_j, while the human capital dependent efficiencies are 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 age j and human capital type hc receives the wage income $w_{hc}\eta_j$. If an individual is in the unemployed state (denoted u), he receives unemployment insurance benefits. We denote the unemployment benefit by ν.

The probability of drawing the employed state (denoted e) is endogenously determined by the demand for employment by firms. The demand for labor will vary depending on the human capital level of agents, and thus is denoted n_{hc}, indicating the demand for labor of human capital level hc. Aggregate employment, N, is therefore the sum over the measure of employed individuals by each age and human capital type, or

$$N = n_1 + n_2 + n_3 = \sum_{j=1}^{J} \sum_{hc=1}^{HC} \mu_{j,hc} n_{hc}. \tag{5}$$

3.3 Aggregate Technology

The production technology of this economy is given by a constant returns to scale Cobb-Douglas function that is multiplicatively separable in the number of hours employed, h, and the type of worker, hc.

$$Y = f(K, N, h) = AK^{\theta}[h_1^{\psi} n_1^{1-\theta}]^{\varepsilon_1} [h_2^{\psi} n_2^{1-\theta}]^{\varepsilon_2} [h_3^{\psi} n_3^{1-\theta}]^{\varepsilon_3} \tag{6}$$

where $\theta \in$ (0,1) is capital's share of output, K, N are the aggregate inputs of capital and labor respectively, and n_{hc} is the employment level of each type of workers. The parameter A represents total factor productivity and is assumed constant. The capital stock depreciates at the rate δ each period. This production function allows for increasing returns to both labor and hours but at a decreasing rate. A stable equilibrium solution requires that the marginal return to production from additional worker-hours must be less than the marginal return to production from additional workers. As will be seen however, the presence of EBHI significantly increases the marginal cost of employing additional workers and thus biases this marginal substitution towards worker-hours.

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

$$r(K,N,h) = \theta A K^{\theta-1} h_1^{\psi\varepsilon_1} n_1^{(1-\theta)\varepsilon_1} h_2^{\psi\varepsilon_2} n_2^{(1-\theta)\varepsilon_2} h_3^{\psi\varepsilon_3} n_3^{(1-\theta)\varepsilon_3} - \delta. \quad (7)$$

3.4 Individuals' Decision Problem

An individual enters a period knowing their human capital level, employment opportunities, 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 $\{a_1, a_2, ..., a_M\}$. Each period, individuals choose the set $\{c_j, h_j, a_{j+1}\}$ in order 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.

The choice problem for each individual can be expressed as:

$$\begin{aligned} V(j,a,hc,s) &= \max U(\cdot) + \\ &\quad \beta \int V(j+1, a', hc, s')\ \Pi_i(s'|s) ds' \end{aligned} \quad (8)$$

subject to

$$c + a' \leq (1-0.5\tau_u) w_{hc} \eta_j h_{j,hc} + (1+r-\delta)a, \qquad \text{if } s = e \quad (9)$$

$$c + a' \leq \nu + (1+r-\delta)a, \qquad \text{if } s = u \quad (10)$$

$$a' \geq 0$$

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

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

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

Firms are homogeneous but with allowances for variations in both worker healthcare costs and training costs. 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). 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 2 total hours, the effective cost of those hours to the firm is $(1+\tau_b)w_1 * 2$. The revenue from these payroll taxes goes into a government savings fund.[4]

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:

$$\max \left(y_t - r_t k_t - [(1+0.5\tau_u+\tau_b)(\sum_{hc=1}^{3} w_{hc} n_{hc} h_{hc})] - (\phi+\xi) * N \right). \quad (11)$$

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.

3.6 The Government

The government is constructed in such as way as to mimic the current US 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 and "other programs" that are assumed to benefit each agent equally. We assume the unemployment benefits program is self-financed by equally taxing both workers and firms. The tax rate, τ_u, is set so that the revenue collected covers the cost of paying each unemployed individual the amount ν. Hence given the cross-sectional distribution measure $\lambda(j, a, hc, s)$,

$$\tau_u = \frac{\sum_{j=1}^{J} \sum_{a=1}^{A} \sum_{hc=1}^{HC} [\nu \mu_{j,hc} \lambda(j, a, hc, s=u)]}{\sum_{j=1}^{J} \sum_{a=1}^{A} \sum_{hc=1}^{HC} [w_{hc} \eta_j h_{j,hc} \mu_{j,hc} \lambda(j, a, hc, s=e)]}. \quad (12)$$

The payroll taxes paid by firms in the benchmark model is set to replicate FICA. The revenue from these taxes, G, is assumed to finance other government

[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.

programs, such as Social Security, Medicare, etc. Benefits from these programs are assumed to benefit all agents equally although do not specifically enter into the agents' utility function.

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

In a subsequent variation of the model, in addition to unemployment benefits and other government programs, the government also provides healthcare for all individuals. This version models a move away from the EBHI system to a single-payer system of health insurance. Again, each of these programs is assumed to be self-financed. In the alternative model the wage earnings of employed individuals and firms remain taxed as defined in equation (12), and (13). The difference in this variation of the model lies in the funding of the government-provided healthcare. Funding for this program comes from a lump-sum tax imposed on the firm, denoted by T. Given the self-financing nature of the program, the lump-sum tax, T, collected by the government must exactly equal the cost of providing healthcare to all individuals. Since the parameter ϕ represents the cost of providing healthcare to a single individual,

$$T = \sum_{j=1}^{J} \sum_{hc=1}^{HC} \phi \mu_{j,hc} \lambda(j, a, hc, s). \tag{14}$$

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 gives rise to the following condition for wages:

$$w_{hc} = \frac{\gamma_{hc} c_{hc}}{(1 - h_{hc})(1 - 0.5\tau_u)} \tag{15}$$

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:

$$\frac{\frac{\partial Y}{\partial h_{hc}}}{\frac{\partial Y}{\partial n_{hc}}} = \frac{(1 + 0.5\tau_u + \tau_b) w_{hc} n_{hc}}{(1 + 0.5\tau_u + \tau_b) w_{hc} h_{hc} + (\phi + \xi)}. \tag{16}$$

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 $\frac{\partial Y}{\partial h_{hc}} = \psi \frac{Y}{h_{hc}}$ and $\frac{\partial Y}{\partial n_{hc}} = (1 - \theta) \frac{Y}{n_{hc}}$, equation (16) 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:

$$h_{hc} = \frac{\psi(\phi+\xi)}{w_{hc}(1+0.5\tau_u+\tau_b)(1-\theta-\psi)}. \tag{17}$$

Since both ϕ and ξ are positive parameters representing various employee costs to the firm, a stable solution requires that $(1-\theta-\psi) > 0$. In other words, the marginal product of each worker must be greater than the marginal product of worker hours.

Combining the equilibrium conditions from both the individual's and the firm's optimization problems (equations (15) and (17) respectively) yields the solution for equilibrium hours worked:

$$h^*_{hc} = \frac{\psi(\phi+\xi)(1-0.5\tau_u)}{\gamma_{hc}c_{hc}(1+0.5\tau_u+\tau_b)(1-\theta-\psi)+\psi(\phi+\xi)(1-0.5\tau_u)}. \tag{18}$$

3.8 Equilibrium

Given a set of fiscal policy arrangements $\{\nu, \tau_u, \tau_b\}$, 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) - (11); 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:

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

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

(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 (11).

(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:

$$\sum_{j=1}^{J}\sum_{hc=1}^{HC}\mu_{j,hc}C(x)d\lambda(x) + [K' - (1-\delta)K] + G = f(K,N,h). \tag{19}$$

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

$$h_1 = \sum_{j=1}^{J} \mu_{j,1} H_i(x) d\lambda(j, hc = 1, \cdot) \tag{20}$$

$$h_2 = \sum_{j=1}^{J} \mu_{j,2} H_i(x) d\lambda(j, hc = 2, \cdot) \tag{21}$$

$$h_3 = \sum_{j=1}^{J} \mu_{j,3} H_i(x) d\lambda(j, hc = 3, \cdot) \tag{22}$$

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 US economic data. 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 other key parameters 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 US economy.

Targets for employment, hours worked and relative wages come from the Current Population Survey (Bureau of Labor Statistics 2006b). Targets for relative wages are given by the median usual weekly earnings for full time workers by education level. Note that one cannot simply divide this by the average hours worked per week to obtain an estimate of the average hourly wages. This is because the hours worked figures are not for "full time" workers only. Nevertheless, the earnings estimates for full time workers provides a reasonable target for establishing the relative wages for each type of worker (1.000, 1.242 and

1.896, respectively). Employment rates by type are given by the number of employed persons divided by the those either in the labor force or who are classified by the BLS as discouraged workers. These are summarized in Table 1.

Table 1: Calibration Targets for Employment

Variable	Worker Type	BLS data	Target
Employment			
	Type 1 worker	0.8806	0.8806
	Type 2 worker	0.9452	0.9452
	Type 3 worker	0.9726	0.9726
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 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). The Bureau of Labor Statistics (2005) estimates that employee health insurance accounts for 7.5 percent of total worker compensation; legally-required benefits (not including unemployment insurance) that vary by hours worked account for another 7.5 percent of total compensation costs; and other per-worker benefits such as paid leave, vacation, sick and holiday leave alone account for 7.2 percent of total compensation. Unfortunately, this measure does not include many costs associated with employment. For example, Fitzgerald (1996) cites costs like training, search, and paperwork costs.[5] If these costs account for 2 percent of compensation costs, then it is reasonable to calibrate all employment-related costs that are not related to health insurance to be 9.2 percent of total worker compensation 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 employment ($1-\theta$) 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

[5] Fitzgerald (1996) calibrates total costs per worker to be 0.05.

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 (US Department of Labor 2004) . This is set to 0.117. Note that since we have no retirees in our benchmark model, we calibrate Ω=0.00. Finally, the rate of time preference (β) is from Altig, et al (2001).

Table 2: 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	0.2650
ε_2	Relative efficiency of type 2 workers	0.2650
ε_3	Relative efficiency of type 3 workers	0.4700
ψ_1	Marginal product of hours for type 1 workers	0.4910
ψ_2	Marginal product of hours for type 2 workers	0.5261
ψ_3	Marginal product of hours for type 3 workers	0.5615
	Employment and Wage Costs	
ϕ	Cost related to provision of health insurance	0.0166
τ_b	Legally required wage-related costs	0.0155
ξ	Other employment-related costs	0.0204
υ	Percent of wages paid to unemployed workers	0.1170
Ω	Percent of wages paid to retired workers	0.0000
	Consumer Preferences	
β	Time preference	0.9960
γ_1	Leisure preference for type 1 workers	2.7000
γ_2	Leisure preference for type 2 workers	2.3000
γ_3	Leisure preference for type 3 workers	2.1000

Finally we are ready to judge the quality of the benchmark model calibrated with the parameters in Table 2. Evaluation of the benchmark economy is based on the four key areas of interest: employment, hours worked, relative wages and production costs. As can be seen in Table 3, the parameters used from Table 2 generate strikingly accurate results.

Table 3: Benchmark Results

Variable	Simulated	Actual
Employment		
Type 1 worker	0.8977	0.8806
Type 2 worker	0.9499	0.9452
Type 3 worker	0.9699	0.9726
Hours Worked		
Type 1 worker	0.2239	0.2220
Type 2 worker	0.2382	0.2330
Type 3 worker	0.2531	0.2530
Relative Wages		
Type 1 worker	1.0000	1.0000
Type 2 worker	1.3175	1.2420
Type 3 worker	1.9203	1.8960
Production Costs		
Healthcare costs	0.0747	0.0750
Employment-related costs	0.0918	0.0920
Wage-related costs	0.0748	0.0750

5 Single-Payer Reform Simulation

With a reasonable benchmark economy in place, we are now able to analyze the effects of moving from an employer-based healthcare system to a single-payer system. In addition to its effects on the demand for both worker-hours and employment, the output and distributional effects of healthcare reform will be estimated.

In this version of the model, we remove the cost to firms of hiring workers that results from the provision of healthcare. Instead, the cost of providing healthcare is now imposed on a single payer, namely, the government. The revenues for this single-payer healthcare system come from firms. In particular, we assume that the relative burden remains unchanged; firms will pay the same amount in new lump sum taxes that they did in healthcare costs for employees in the benchmark model (0.0154822). Essentially, this reform simply transforms the cost of providing health insurance into a fixed cost rather than a marginal cost per worker.

The results of healthcare reform are given in Table 4. As expected, the simulation shows a significant increase in employment rates across the distribution of agent-types. This effect is strongest for workers with lower levels of human capital. The distribution of hours worked also shifts in favor of the lower 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 provides firms a greater incentive to hire the most productive workers available and work them for longer hours. Under a single-payer system, firms have a greater incentive instead to hire additional workers since the marginal productivity of workers is greater than the marginal productivity of hours. Previously, this increase in productivity was offset by the higher cost of hiring additional workers. Following reform, however, hours worked decreases for each type of worker to an average of 41.4, 38.5, 34.4 hours per week, respectively.

Just as important as the employment results are the implications for inequality. Under this reform, wages increase for type 1 and 2 workers and decline minimally for type 3 workers. The growth in wages for type 1 and 2 workers is 6.4% and 1%, respectively. The highest skilled workers, however, experience a 2 percent drop in wages. Wage inequality between the highest and lowest-skilled workers declines by 6.2 percent. This effect is magnified if we look instead at consumption. In this case all workers, regardless of type, experience an improvement in their total consumption levels following the reform. However, as seen in Table 4, relative consumption increases for the low-skilled workers with consumption inequality between the highest and lowest-skilled workers declining by nearly 8 percent.

Table 4: Single Payer Results

Variable	Benchmark	Single Payer	% Change
Employment			
Type 1 worker	0.8977	0.9916	10.5%
Type 2 worker	0.9499	0.9985	5.1%
Type 3 worker	0.9699	0.9994	3.0%
Hours Worked			
Type 1 worker	0.2239	0.2048	-8.5%
Type 2 worker	0.2382	0.2294	-3.7%
Type 3 worker	0.2531	0.2468	-2.5%
Relative Wages			
Type 1 worker	1.0000	1.0000	
Type 2 worker	1.3175	1.2514	-5.0%
Type 3 worker	1.9203	1.8018	-6.2%
Relative Consumption			
Type 1 worker	1.0000	1.0000	
Type 2 worker	1.5135	1.4211	-6.1%
Type 3 worker	2.3655	2.1819	-7.8%
Output	0.3234	0.3315	2.5%

Finally, the single-payer system leads to a significant increase in overall output levels in the economy. Our model predicts that simply shifting the cost of healthcare from a fixed cost per-worker to a lump-sum tax results in an increase in steady-state output of 2.5 percent. To put this in perspective, this increase in output is a little less than half of that generated by moving to a flat tax (Altig, et al, 2001). But unlike flat-tax reforms, this simple healthcare reform does not exacerbate wage inequality. In fact, it reduces it.

6 Conclusion

This paper investigates the macroeconomic implications of two alternative systems for financing healthcare in the United States. The current system whereby health insurance is provided primarily through employers results in a relatively inefficient allocation of labor resources. Since insurance represents a cost of employment, firms respond by hiring fewer workers at more hours. By changing the way health insurance is financed in the United States it is possible to permanently increase output and employment while reducing the average hours worked by Americans. Moving to a single-payer system may result in an increase in steady state output by as much as 2.5 percent.

Unlike other reforms such as flat-tax proposals that have recently garnished attention for their ability to increase output, reforming healthcare financing is likely to benefit the poorest citizens most. Since the lowest-skilled workers are the least productive, the existing system is biased against hiring these workers. Instead, firms prefer to increase the hours worked by higher-skilled workers. But when the costs of healthcare paid by firms is collected through a lump-sum tax, employment increases relatively more for lower-skilled workers. This reform results in a substantial reduction in both wage and consumption inequality across workers.

The results of this study have clear and controversial implications for long term healthcare and economic policy in the United States. While our estimates are promising, caution must be taken. First, because the labor supply in our model is exogenous, many of the benefits of universal healthcare coverage may be obscured. For example, Yelowitz (1995) found that poor women are less likely to enter the workforce under the employer-based system for fear of losing government-sponsored services. Modeling labor supply represents one of the more fruitful areas for future work on this topic. Second, we have not studied the transitional dynamics of this policy reform. Modeling such dynamics would allow researchers to better understand the short-run distributional effects of various policy options.

7 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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