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Prospects for Social Security Reform

Edited by Olivia S. Mitchell, Robert J. Myers, and
Howard Young

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The Wharton School of the University of Pennsylvania

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Frontispiece: Special Treasury securities, stored in a federal government filing cabinet in West Virginia, represent \$700 billion in Social Security Trust Fund assets. Photo: Jeff Baughan.

Chapter 11

Social Security and Employer Induced Retirement

Robert M. Hutchens

Northrop Grumman . . . recently offered early retirement incentives to long time employees like me. So I took them up on it and enjoyed all of January off. Never having had that much time to myself since High School (College vacations spent in an aeroplane factory) I really enjoyed it and recommend it to anyone else with that option. [My wife] is still too young however, so I am back as a contract employee for another 6 months and hoping to get them to let me work part time, the ideal situation. (<http://www.ddg.com/nemesis/95.MAR.html>)

Employers play an important role in the retirement behavior of older workers. When business deteriorates and workforce reductions are requisite, employers like Northrop Grumman often ask older workers to lead the exodus. More broadly, in setting wage levels and pension parameters, employers can influence a worker's attitude toward retirement. Since changes in social security policy can similarly affect attitudes toward retirement, one would think that changes in social security policy could influence employer behavior toward older workers. This chapter uses a simulation model to explore potential links between the social security program and employer efforts at encouraging workers to retire. The simulations are built on an implicit contract theory of unemployment insurance (Hutchens 1995, 1996). In essence I treat social security as a special form of unemployment insurance limited to people age 62 and older, one that is financed out of taxes with no experience rating.

A large economic literature argues that such a system will affect the way in which employers respond to periods of slack demand.¹ In a manner consistent with that literature, I first describe a simulation framework that allows a conventional unemployment insurance system to affect employers' propensity to initiate separations. Next I introduce a type of social security system into the model, and examine how separation probabilities change by age. Additional simulations show how changes in the parameters of the social

security system affect behavior. At the outset it is important to be clear about the limitations of this exercise. The simulations do not constitute empirical evidence, but are instead best viewed as rough estimates of the potential magnitude of anticipated economic effects. Also, the analysis is built on a simplified version of the social security system. As such, the results remain suggestive; they cannot be viewed as hard data in support of policy.

Theoretical Framework

This section introduces an implicit contract model of how government transfers influence employer behavior. We first sketch an implicit contract model of unemployment insurance and temporary layoffs, and then discuss links between social security and employer initiated separations.²

Consider an economy with many firms and homogeneous workers. Workers obtain income for consumption by entering into a one-period contract with a firm. Workers are assumed to be risk averse, so they seek contracts that minimize income fluctuations. When employed, each worker earns wage w and obtains utility $U(w(1-t))$, where t is a payroll tax.³ When not employed, the worker obtains utility $U(c + b + z)$, where c is government unemployment insurance, b is a private payment from the firm, and z is the consumption value of leisure and home production. Letting p represent the probability that the worker is employed, the worker's expected utility under the contract is:

$$EU = pU(w(1-t)) + (1-p)U(c + b + z).$$

For simplicity, the model assumes each firm employs a single worker. Firms compete for workers by offering contracts that maximize profit while economizing on income risk to workers. For a contract to be acceptable to workers, expected utility under the contract must be greater than or equal to that available in alternative jobs and activities. Letting EU^* represent this alternative expected utility, we have:

$$(1) \quad EU \geq EU^*$$

Firms also pay taxes. Like the workers, firms are assumed to pay a payroll tax equal to t . As developed below, the payroll tax can be used to finance social security. In addition, the firms pay taxes to finance unemployment insurance. Since unemployment insurance benefits are experience rated, the cost to the firm of providing unemployment insurance c is ec , where e is an experience rating tax rate with $0 \leq e \leq 1$. When e is less than one, the firm does not bear the full cost of the government-provided unemployment insurance, and experience rating is imperfect. In this case the subsidy per worker is $(1 - e)c$.

At the time the contract is negotiated, the employer is uncertain about

the future state of product demand and thereby the worker's marginal product, θ . The value of θ is only revealed after the contract is signed, but before work begins. When it is revealed, we assume it becomes public knowledge. (There is no asymmetric information in this model.) Assume that θ is distributed $f(\theta)$. As such, given the realized value of θ , the contract specifies $w(\theta)$, $b(\theta)$, and $p(\theta)$.

An employer's expected profit when negotiating the contract can then be written:

$$(2) \quad \Pi = \int_{-\infty}^{+\infty} \{(\theta - w(\theta)(1+t))p(\theta) - (b(\theta) + ec)(1-p(\theta))\}f(\theta) d\theta.$$

In other words, for a realized value of θ , the firm's profit is the sum of (i) the marginal product (θ) minus wage costs ($w(\theta)(1+t)$) multiplied by the probability of employment $p(\theta)$, and (ii) the private payments to non-workers ($b(\theta)$) and the cost of unemployment insurance (ec) multiplied by the probability of nonemployment ($1-p(\theta)$). Expected profit is the expected value of this sum (i plus ii) over all feasible values of θ . Given the profit function, the firm's problem is to offer a contract that maximizes the present value of expected profit (Π) subject to two constraints: $p(\theta)$ lies between zero and one, and expected utility under the contract is no less than that in jobs elsewhere in the market (EU^*).⁴ We write this problem as

$$\max_{w(\theta), b(\theta), p(\theta)} \Pi \text{ subject to } EU = EU^* \text{ and } 0 \leq p(\theta) \leq 1.$$

This problem is easily analyzed when the payroll tax t is zero.⁵ In this case, the resulting contract has two key features. First, the firm provides complete insurance. Wages paid to the employed and private payments to the non-employed are set so that marginal utilities are the same for all realized values of θ . Given the assumed utility function, and letting an asterisk denote optimal levels, this implies that for all values of θ :

$$(3) \quad w^* = b^* + c + z.$$

Second, the employment probability, $p^*(\theta)$, follows the following simple rule:

$$(4) \quad \begin{aligned} &\text{If } \theta \geq z + (1-e)c \text{ then } p^*(\theta) = 1, \\ &\text{If } \theta < z + (1-e)c \text{ then } p^*(\theta) = 0. \end{aligned}$$

In other words, the worker is employed (and receives wage w^*) if the revealed value of θ is greater than or equal to the value of "externally financed consumption" ($z + (1-e)c$). Otherwise, the worker is not employed and receives b^* from the firm and c from the government.

In this simple world without asymmetric information, workers are indifferent between employment and nonemployment. The contract insures that they have the same utility regardless of their work status. Moreover, an increase in government unemployment insurance (c) results in a dollar for dollar reduction in private payments to nonworkers (b^*). The firm makes these private payments in order to protect workers from income fluctuations. When the government provides this protection, then the firm cuts back, paying an experience rated tax of e for each dollar of government benefits.

One interesting result of equation 4 is that neither wages nor private payments enter into the employment decision. That is a fundamental difference between this model and a labor supply model. Wages and private payments (such as pensions) are endogenous transfer payments that have nothing to do with the employment decision. Employment is strictly a function of the worker's marginal product and externally financed consumption. Also, given equation 4, the probability that the worker is employed depends on both his realized marginal product and the level of externally financed consumption. Specifically, a higher government subsidy to nonemployment (a higher level of $(1-e)c$) results in more nonemployment. Consequently, when experience rating is complete ($e = 1$) and the subsidy is zero, the worker is employed if and only if the realized marginal product in the firm exceeds the consumption value of home production z .

The model becomes more complex with positive payroll taxes. We assume the payroll tax is shared between employer and employee, but it is not levied on private payments to the nonemployed. Hence, an increase in " t " has two effects. First, it raises employer wage costs, and thereby creates incentives to shift compensation away from earnings and toward those private payments. Second, the tax reduces a worker's utility when employed relative to utility when not employed. Both effects reduce the probability of employment.⁶

Now, what does this have to do with social security and older workers? We know that companies do make payments to nonemployed older workers in the form of pensions, early retirement window plans, and severance pay. Moreover, these payments are often made with an eye toward available government benefits; pensions are typically integrated with social security so that private benefits fall when a person becomes eligible for government benefits (see Gregory, this volume). That behavior is thoroughly consistent with the model.

The model also implies that social security should affect separations in a manner similar to unemployment insurance. We have strong evidence that imperfectly experience rated unemployment insurance increases the likelihood of temporary layoffs during periods of slack demand. Since social security benefits are not experience rated, they could similarly increase the likelihood of employer induced retirements during periods of slack demand.⁷

Evidence

This section provides partial support for the model just described. Specifically, we show that the U.S. social security program is used as a form of unemployment insurance, and that employer behavior is influenced by government assistance to older workers.

Unemployment Insurance Receipt at Age 62

One way to test the structure just described is to examine whether unemployment insurance receipt increases around the time that workers become eligible for social security benefits. In order to preserve worker utility in an implicit contract setting, the firm must compensate laid off workers. Unemployment insurance is likely to be a part of that compensation, especially when UI experience rating is imperfect. If social security tends to increase employer induced separations, then we should also observe an increase in unemployment insurance receipt around the time that workers become eligible for old age benefits. At that time, employers essentially compensate separated workers with a combination of social security, unemployment insurance, and, perhaps, pension benefits.

Hutchens (1996) used 1975 Current Population Survey data to show that the probability of UI receipt increased sharply around age 62, particularly for the lower skilled employee. In 1975 most workers in the U.S. could simultaneously receive both unemployment insurance and social security benefits. This evidence then suggests that social security does, in fact, increase employer induced separations.

Employer Behavior and Expansions of Government Assistance to Older Workers

Turning to international evidence, we find at least two cases where the payment of government transfers to older workers caused employers to reduce older workers' employment. One was the Austrian extension of unemployment benefit duration in 1988, and the second was the West German "59er" plan.

The Austrian case, documented in Winter-Ebmer (1996), arose from the 1998 extension of the duration of unemployment insurance benefits from 52 to 209 weeks. This extension only applied to workers over age 50 who lived in specific counties of Austria. Moreover, to be eligible, a worker had to be involuntarily unemployed: that is, the unemployment had to arise from a layoff and not be the result of a quit or a misconduct discharge. Comparing older affected workers with a "control group" consisting of both younger workers and older workers in non-selected counties, Winter-Ebmer demonstrates that this policy change not only increased the duration of unemploy-

ment receipt for older workers in the selected counties, but also increased the *incidence* of unemployment insurance receipt. Specifically, older workers eligible for the extended benefits entered the unemployment insurance program at a rate 11 percentage points higher than the controls. From the perspective of the above theory, what is particularly interesting is that the government transfers flowed to the workers, not the employers, yet it was the employers who changed behavior.

A similar phenomenon occurred in the West German "59er" program. Under this program, when an employer's economic prospects were sufficiently bleak, the West German government permitted workers to receive government supplied early retirement benefits (unemployment insurance and public pensions) at age 59, and more recently, at age 57. Workers could not simply apply for the benefits; rather, their employers had to seek coverage under the program and then designate specific workers for early retirement. And that is exactly what happened. Although the benefits flowed to the workers, case studies indicate that employers often used the program to shed older employees (Naschold et al. 1994; Casey 1989).

Some U.S. Workers Seem to Use Social Security as a Form of Unemployment Insurance

Additional evidence is offered by Rust (1990), who examines the lag between the age at which workers apply for benefits and the age at which they first receive OASI payments for six months or more. He finds a two-year delay among the set of applicants that eventually received OASI payments. Rust then goes on to say that

the majority of workers who apply for benefits at age 62 and continue working are either low-wage / income workers whose total annual earnings at ages after 62 are not significantly higher than the earnings test level or are a smaller group of workers who apparently initially intended to quit working at age 62 but experienced adverse financial problems or encountered a particularly attractive job opportunity that prompted them to return to work. (1970: 374)

From the perspective of the above theoretical framework, one would like to know how often these workers returned to work with their pre-application employer. Unfortunately, Rust does not address that question.

Evidence from several other countries also indicates that social security reciprocity rates trace a pattern similar to unemployment insurance over the business cycle. Specifically, old age program reciprocity rates increase during recessions and decrease during expansions (Rebick 1994).

Although the latter results on the business cycle as well as Rust's findings might be explained with a standard labor supply analysis (whereby workers choose their hours of work in order to maximize personal utility), the first two elements of evidence do not fit easily into that framework. Rather, the

evidence suggests that employers are actively involved in retirement decisions, a conclusion consistent with the implicit contract explanation discussed above.

Setting Up the Simulations

One might question whether the economic incentives inherent in the U.S. social security program are strong enough actually to induce workers and firms to use social security as a form of unemployment insurance. Moreover, one would like to know whether policy changes could have important behavioral effects. Simulation provides a useful tool for exploring such issues. This section expands the previous model in order to simulate the effects of a structure similar to the U.S. social security program. The simulations begin with a model of the unemployment insurance system that yields an incidence of layoffs that is consistent with that empirical evidence. The social security program is then introduced into the model, with social security treated as a form of unemployment insurance available after age 62. The simulations then indicate how the introduction of this social security plan affects the incidence of employer-initiated separations. Given that, one can go on to examine how changes in the social security program affect behavior.

This section begins with a description of the model used in the simulations. It then discusses how social security is parameterized, a discussion that includes a necessary but lengthy examination of actuarial adjustments. The section closes with a description of other parameters used in the simulations, as well as the initial "benchmark" runs.

The Model

To generalize our earlier discussion, we assume that workers live for several periods and thus enter into multiperiod contracts with a single firm. There is no mobility between firms in this model once the contract is signed; the worker either is employed by the contracting firm or spends time in "non-employment." To keep things relatively simple, all of the workers are assumed to reach their 65th birthday on January 1, 1995. To simplify survival rates, we also assume that all the workers in this cohort are males (obviously, similar simulations could be performed for women), and all financial variables abstract from inflation.

As before, workers are either employed or not employed, and they evaluate well-being with the utility function $U(\bullet)$ (where $U' > 0$, $U'' < 0$). In the multiperiod case expected utility in period j is specified as $EU_j = p_j(w_j(1-t)) + (1-p_j)U(b_j+g_j+z_j)$, where

p_j is the probability that the worker is employed in period j ,

w_j is the worker's wage in period j ,

t is the payroll tax,

b_j is the private payment from the firm to the worker in period j ,

g_j is either social security or unemployment insurance, and

z_j is the consumption value of leisure and home production in period j .

To simplify the exposition, we assume that a period lasts for one year and that period j is synonymous with age j . Workers live for a maximum of J periods (or years). On their 25th birthday they enter into employment contracts that stretch from that day until death. Mobility costs are such that once workers have accepted the contract, they remain with the firm until retirement. In consequence, viable contracts must yield lifetime utility that equals or exceeds that in alternative jobs and activities. We write this constraint as

$$(6) \quad \sum_{j=1}^J \beta^{j-1} \lambda_j EU_j = EU(S)^*,$$

where λ_j is the fraction of the birth cohort surviving to age j given that they have survived to age 25 (since no one lives past J , $\lambda_J = 0$),

β is the worker's discount rate, and

EU^* is the expected utility in alternative jobs and activities.

Government transfer payments in period j (g_j) take the form of either unemployment insurance or social security benefits. Unemployment insurance benefits (denoted c) can be received in all periods of the contract. Social security benefits (denoted v) can be received only after age 62. For the present analysis, social security benefits are set at the same value (v_0) for all people over 62 and are only available to nonworkers. Actuarial adjustments and rules governing simultaneous receipt of social security and unemployment insurance are dealt with below. Thus, $g_j = c + v_j$, where $v_j = 0$ for $j = 25-61$, and $v_j = v_0$ for $j = 62-J$. Government taxes are as before. Unemployment insurance benefits are in part financed through experience rating; the cost to the firm of an unemployment insurance benefit c is ec , where e is an "experience rating" tax rate, with $0 \leq e \leq 1$. The firm and the worker also each pay a payroll tax t on wage income.⁸

Once again the firm's goal is to maximize profits over the length of the contract. The firm's technology is, however, somewhat different. A worker with skill level S has two possible marginal products: $S \theta(H)$ or $S \theta(L)$, with $\theta(H) > \theta(L) \geq 0$. Let θ_j represent the state of demand for the firm's product in period j . At the time the worker and firm enter into the contract, they are uncertain about both the worker's skill level and future values of θ_j . Let the probability that $\theta_j = \theta(H)$ be $q_j(\theta(H))$ and the probability that $\theta_j = \theta(L)$ be $q_j(\theta(L)) = 1 - q_j(\theta(H))$. The state of demand (θ_j) is revealed at the beginning of period j , at which point it becomes public knowledge.

With regard to skill level, assume that the worker and firm only know the expected value of the worker's skill level at the time that the contract is

negotiated. The actual value of S is drawn from the distribution $f(S)$ in the first year of the contract, and remains at that level until age 70. One could think of S as similar to an index of the quality of the worker-firm match. Although outsiders cannot observe it, and neither the worker nor the firm knows its value when the contract is signed, match quality affects the worker's productivity in the firm. In order to simplify the simulations, we assume that worker's skill drops to zero after age 70 as does marginal product within the firm. While the firm maintains its contractual commitment to pay pensions to workers after age 70, it no longer employs these workers.⁹

Let $w(\theta_j)$, $b(\theta_j)$, $p(\theta_j)$ represent the value of the wage, the private payment, and the employment probability respectively for the two possible values of θ_j in year $j = 25, J$. Then the firm's expected profit in year j from a worker with skill S who has survived to year j can be written:

$$(7) \quad \Pi_j = \sum_{\theta_j=\theta(L)}^{\theta(H)} q(\theta_j) \{ (S\theta_j - w(\theta_j))p(\theta_j) - (b(\theta_j) + ec)(1 - p(\theta_j)) \}.$$

As before, the firm's problem is to offer a contract that maximizes the present value of expected profit subject to two constraints: $p(\theta_j)$ lies between zero and one, and expected utility under the contract is no less than that in jobs elsewhere in the market (EU^*). Now, however, the contract must be written over the J years of the worker's potential lifetime. The discount rate (β) used by the firm is assumed to be the same as that used by the worker. Thus, the optimal contract sets $w(\theta_j)$, $b(\theta_j)$, $p(\theta_j)$, $j = 25-69$, and b_j , $j = 60-J$ so as to solve the problem,

$$\max_S \left\{ \sum_{j=25}^{70} \lambda_j \beta^{j-25} \Pi_j \right\} f(S) dS + \sum_{j=70}^J \lambda_j \beta^{j-25} b_j,$$

subject to

$$\sum_{j=25}^J \lambda_j \beta^{j-25} EU_j = EU^* \quad \text{and} \quad 0 \leq p(\theta_j) \leq 1.$$

Although this looks daunting, it has essentially the same solution as the simpler model above. Once again, when $t = 0$ the firm provides complete insurance against income fluctuations, implying,

$$w_i^* = b_i^* + g_i + z_i = w_j^* = b_j^* + g_j + z_j, \text{ for } i, j = 25, J,$$

where $*$ denotes optimal levels. Thus, as above, consumption when employed (w_j^*) equals consumption when not employed ($b_j^* + g_j + z_j$). In this model, however, the equality holds both within and across all periods of the contract.

The probability of employment in this model is also quite similar to that developed previously. When $t = 0$, a worker is employed if the worker's

marginal product ($S\theta_j$) exceeds that worker's "externally financed consumption" when not employed ($v_j + (1-e)c + z_j$). As payroll taxes are raised, employment falls (because the marginal product is less likely to exceed $v_j + (1-e)c + z_j + 2w_j*dt$).

Social Security and Actuarial Reductions

For the purpose of our simulations, a simplified version of the U.S. Old Age Insurance (OAI) program is assumed. In the actual system, a worker's benefits are determined by four factors. The first factor is the Primary Insurance Amount (PIA). The PIA is a function of the worker's average indexed monthly earnings in covered employment. Roughly speaking, workers with higher lifetime earnings tend to have a higher PIA. For these simulations, it is assumed that all workers have a PIA of \$10,000 per year or \$833.33 per month. Recall that the workers are employed under an identical contract, and all receive the same wage when working. The second factor affecting real world social security benefits is the recipient's family. Workers with the same PIA may receive different social security benefits because of differences in marital status or number of dependents. To simplify matters, this is left out of the simulations. All the workers in this model are single with no dependents.

A third factor influencing benefits is the beneficiary's current earnings. At present, an age 62 beneficiary with annual earnings about a certain exempt amount has benefits reduced by \$1 for each \$2 in earnings. These numbers change with age, and beneficiaries who are age 70 and older are exempt from the earnings test. For purposes of the simulations, it is assumed that nonemployed workers receive their full social security benefit, and that employed workers earn too much to receive benefits; all of the employed workers' benefits are taxed away by the earnings test. Current earnings can also alter the worker's average indexed monthly earnings, and thereby both the PIA and the level of benefits. Since our model assumes that workers receive the same annual wage each year they work, this effect is ignored here.¹⁰

Finally, social security benefit levels depend on the age at which the worker begins receiving benefits. Currently workers obtain benefits equal to the full PIA if they elect to receive social security at age 65. Workers who elect to receive social security benefits prior to age 65 receive reduced benefits. By returning to work, however, early retirees can increase their monthly benefit due to benefit recomputation. Consider, for example, a male who receives social security benefits for one year following his sixty-second birthday, returns to work, and fully retires at age 65. If his earnings at age 63 and 64 are above the earnings test, then his benefit at age 65 will be 93.4 percent ($100\% - 12 \text{ months} \times \frac{5}{6} \text{ of } 1\%$) of the full social security benefit. Another adjustment is made for people who elect to receive benefits after their 65th birthday, called the delayed retirement credit.

TABLE 1. Social Security Benefits Are Not Actuarially Neutral for Workers Who Expect to Work After They Become Beneficiaries

	Annual Social Security Benefit at Selected Ages					Present Value of Benefits at Age 62
	62	63	65	70	75	
<i>Person A</i>						
Expects to receive benefits after age 63 and:						
Receives benefits at age 62	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$117,951
Does not receive at age 62	\$0	\$8,667	\$8,667	\$8,667	\$8,667	\$119,114
<i>Person B</i>						
Expects to not receive benefits from age 63 through 69 and:						
Receives benefits at age 62	\$8,000	\$0	\$0	\$11,433	\$11,433	\$97,115
Does not receive at age 62	\$0	\$0	\$0	\$12,250	\$12,250	\$95,480

Source: Author's calculations.

As a result of these rules, expected work behavior plays a fundamental role in any assessment of the effect of actuarial adjustments. Alternatively stated, as a result of these rules, the penalty for receipt of social security benefits in year j depends crucially on expected work behavior in year $j+1$, $j+2$, and so forth. A worker who is laid off at age 62 and receives social security early retirement benefits pays a penalty in the form of lower future benefits. If, however, that individual returns to work, this penalty can be effectively postponed until age 70. And in the present context, because of discounting and the probability of death, a postponed penalty is a reduced penalty.

Table 1 illustrates this point; it shows that by returning to work, a worker can effectively postpone and thereby reduce the penalty associated with early retirement. At age 62, workers A and B are observationally identical males with the same social security earnings record and the same benefit entitlement. Moreover, both experience a layoff on their 62nd birthday, and both contemplate receipt of social security benefits at age 62. The only difference between the two is that worker B expects to return to work while worker A does not. More precisely, regardless of what happens at age 62, worker A expects not to work and to receive social security benefits from age 63 to death. In contrast, worker B expects to work from age 63 through age 69, and then fully retire on his 70th birthday.

Now, consider the social security benefits received by worker A. If he initiated receipt at age 62, worker A would receive \$8,000 in social security

benefits in that year and annually for the rest of his life. At a 2 percent real discount rate and given the survival rates of males born in 1930, the present value of this stream of benefits is \$117,951. However, if he postponed receipt to age 63, due to actuarial adjustments his annual benefit would rise to \$8,667, yielding a present value of \$119,114. In other words, by retiring at 62 instead of 63, the worker loses \$1,163 (= \$119,114 - \$117,951). Had he foregone receipt at age 62, he would have obtained higher expected lifetime social security benefits.

Next, consider the social security benefits received by worker B, who like worker A would receive \$8,000 in social security benefits if he initiates receipt at age 62. Unlike worker A, worker B expects to return to work and not receive social security benefits from age 63 through 69; in consequence, his annual social security benefit at age 70 will be \$11,433. If worker B receives benefits at age 62, receives no benefits from 63 through 69 and then receives benefits again from 70 until death, the present value of his benefits at age 62 (computed with the same assumptions applied to worker A) is \$97,115. If, however, worker B decided to not receive benefits at age 62, he would raise his social security at age 70 to \$12,250. This higher benefit at age 70 and zero benefit at age 62 translates into a present value at age 62 of \$95,480. Thus, worker B gains money by collecting social security benefits at age 62. He gains \$1,635 (= \$97,115 - \$95,480). In contrast to worker A, had worker B forgone receipt at age 62, he would have obtained lower expected lifetime social security benefits.

Note that like worker A, worker B pays a penalty for receiving benefits at age 62. For both people the penalty takes the form of lower annual benefits. The key difference between A and B is that B works from age 63 to 70 and thereby postpones the penalty until age 70. Due to discounting and survival probabilities, a penalty postponed is a penalty reduced. Thus, it would be thoroughly rational for worker B to use social security as a form of unemployment insurance. Since he expects to be reemployed, person B increases his lifetime benefits if he receives social security during his age 62 hiatus from work. The gains from current receipt are well in excess of the cost of future penalties from actuarial reductions.¹¹

It follows that for purposes of the simulations, the cost of actuarial reduction must be evaluated as a function of the worker's expected future employment. That is possible in this model. We can determine the probability of a high or low realization of θ for future periods, and from that derive the future employment probabilities. This derivation is not, however, a simple matter. The appendix lays out the details of how the cost of actuarial reductions is programmed into the simulations.

Why does the firm in this paper care about actuarial reductions? After all, the firm is maximizing profits. If receipt of social security benefits at age 62 implies lower benefits for a worker at age 80, why does the firm care? The answer is that the firm is maximizing profits subject to a worker's lifetime

expected utility constraint. If actions taken at age 62 reduce the worker's expected social security benefits at age 80, then those actions affect the firm's profit, since the contract will require offsetting private pension payments at age 80. Thus, in this model firms fully internalize the effect of social security actuarial adjustments when they make their separation decisions. There is no opportunistic behavior by firms.

Other Parameters in the Model

Table 2 presents the parameter values assumed for the first set of simulations. Most of these parameters are explained above, but e , c , and β deserve further discussion. The UI program parameters e and c are set at .7 and \$3,500 respectively. The value for e comes from Table 10 of Topel (1985). Since c is an annual benefit, it is computed as the product of \$250 (the approximate average state maximum weekly benefit in 1995) and 14 weeks (the approximate average weeks of unemployment insurance receipt for UI recipients over the 1980s and early 1990s).¹²

The discount rate, β , is set at .04. Since this is the discount rate that both firms and workers use in evaluating the future, one could reasonably argue that the rate should be set at the level used by firms for purposes of capital budgeting. When the firms in this paper place older workers into non-employment, they bear risk. Due to actuarial adjustments in the social security system, they are gambling that future demand shocks (which affect the worker's future employment) and mortality outcomes are such that the

TABLE 2. Parameters Used When Calibrating the Model

<i>Variable</i>	<i>Symbol</i>	<i>Assumed Value</i>
Value of θ at its high realization	$\theta (H)$	1.3
Value of θ at its low realization	$\theta (L)$.7
Consumption value of home production	z	\$16,000
Unemployment insurance benefit	c	\$3,500
Social security benefit at age 65	v_0	\$10,000
Serial correlation parameter in the error equation $q_j(H) = (1 - \alpha)u_j + \alpha q_{j-1}(H)$	α	0
Experience rating parameter	e	.7
Payroll tax rate	t	.075
Earnings	w	\$26,000
Fraction of birth cohort surviving to age j given survived to age 25	λ_j	Derived from Felicitie Bell et al. (1992), Table 6
Distribution of skills	$f(S)$	Uniform from \$23,900 to \$38,900.
Discount rate for both worker and firm.	β	.04

Source: Author's calculations.

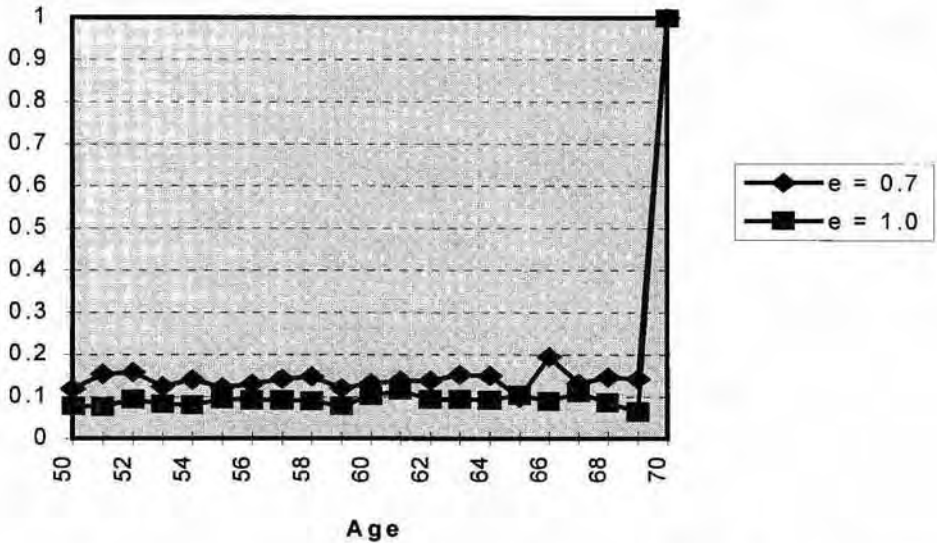


Figure 1. Percent not employed by age: calibrating the model with two values of the experience rating parameter. Source: Author's calculations.

money saved by sending the worker home today will not result in losses in the future. Given that, they would arguably evaluate these decisions using the discount rate applied to other risky ventures. Surveys of corporate capital budgeting practices find that firms use real annual discount rates that range from zero to 13 percent (Boudreau 1983: 566).

The simulations are calibrated to yield results for unemployment insurance that are similar to Topel's results on the effects of experience rating.¹³ Specifically, the model is calibrated so that raising the experience rating parameter from .7 to 1.0 (and thereby eliminating the subsidy due to imperfect experience rating) reduces the annual rate of nonemployment from .14 to .10.

Figure 1 illustrates the results of the "benchmark" simulations.¹⁴ This is a graph of the nonemployed as a percent of the population by age for ten runs of the simulation model. Each run involves drawing new random variables for the ten firms (each of which employs five workers). Note that in the absence of social security, the simulations yield roughly the same percentage of nonemployed people from age 50 to 70. That is as expected, since both home production (z) and skill (S) are the same for all ages. Note also that at age 70, all workers become nonemployed. That is because by construction, skill levels equal zero from age 70 until death.

Simulation Results

Figures 2–5 introduce a social security program into the calibrated model. In a program with no actuarial adjustment, Figure 2 shows that early retirees receive the same annual benefit as late retirees. As expected, the model produces an abrupt jump in nonemployed workers at age 62; the nonemployment rate rises from .14 to .50 for workers age 62 or older. Since social security is not experience rated, it acts like a particularly generous form of unemployment insurance. The simulations indicate that this type of unemployment insurance would have dramatic effects on employer behavior.

We introduce actuarial adjustments to social security benefits in Figure 3. The higher line indicates the effect of imposing an early retirement penalty of $\frac{1}{3}$ of 1 percent per month and a delayed retirement credit of $\frac{1}{3}$ of 1 percent per month. Roughly speaking, this is the contemporary system. Clearly such adjustments matter at ages 62 and 63, dramatically reducing nonemployment at these ages. After age 65, however, they have little effect (compare Figure 3 with Figure 2), and despite these adjustments, nonemployment rates from age 62 on are well above those in the absence of social security (Figure 1).

The lower line in Figure 3 indicates the effect of the benefit adjustment scheduled to be implemented in the year 2008. Here the normal retirement age is 66, the annual penalty for early retirement from age 62 to 65 is .0625 percent per year, and the delayed retirement credit is 8 percent per year. The simulations again indicate that these changes could significantly alter the level of nonemployment. Indeed, the level of nonemployment at ages 62–65 is almost at the same level as with no program. The simulations imply major shifts in employer behavior.

Figure 4 presents a simulation of the effect of reducing the payroll tax for people over 62 from .15 to .10. A lower payroll tax should raise employment by reducing the propensity for employers to move workers from employment to nonemployment. The higher line indicates the effects of the contemporary system; this is identical to the higher line in Figure 3. The lower line indicates the effect of the reduced payroll tax. While the reduced tax succeeds in raising employment at ages 62–65, it also decreases employment at older ages. That decrease is due to actuarial adjustments in the social security program. An increase in the probability of work at ages 62–65 translates into higher social security benefits between ages 66 and 69, which then reduces the probability of work at these later ages.

The effect of financing social security out of a consumption tax rather than a payroll tax is shown in Figure 5. Such a tax places a smaller burden on earned income (payments made when people are working), and a larger burden on nonearned income like social security benefits, unemployment insurance benefits, and pensions. In order to raise the same revenues as the 15 percent payroll tax, consumption would have to be taxed at a rate of

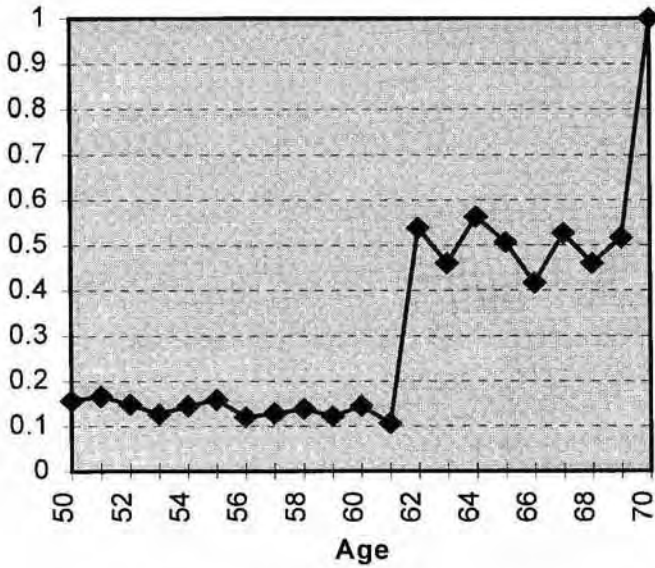


Figure 2. Percent not employed by age: social security with no actuarial adjustment. Source: Author's calculations.

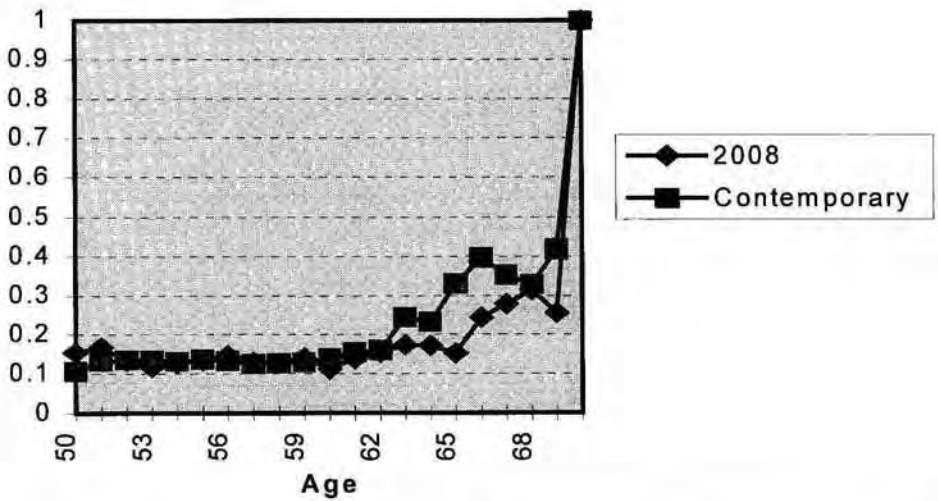


Figure 3. Percent not employed by age: social security with contemporary and 2008 actuarial adjustment. Source: Author's calculations.

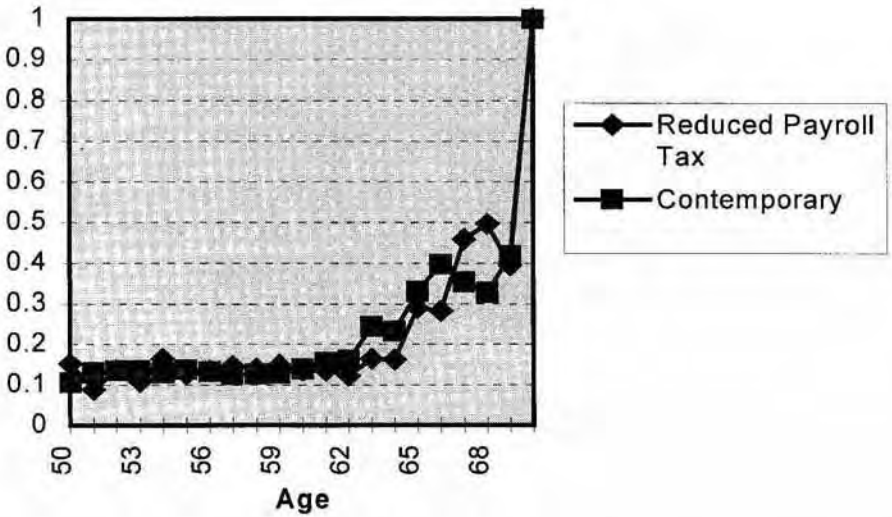


Figure 4. Percent not employed by age: reduced payroll tax for workers over age 62. Source: Author's calculations.

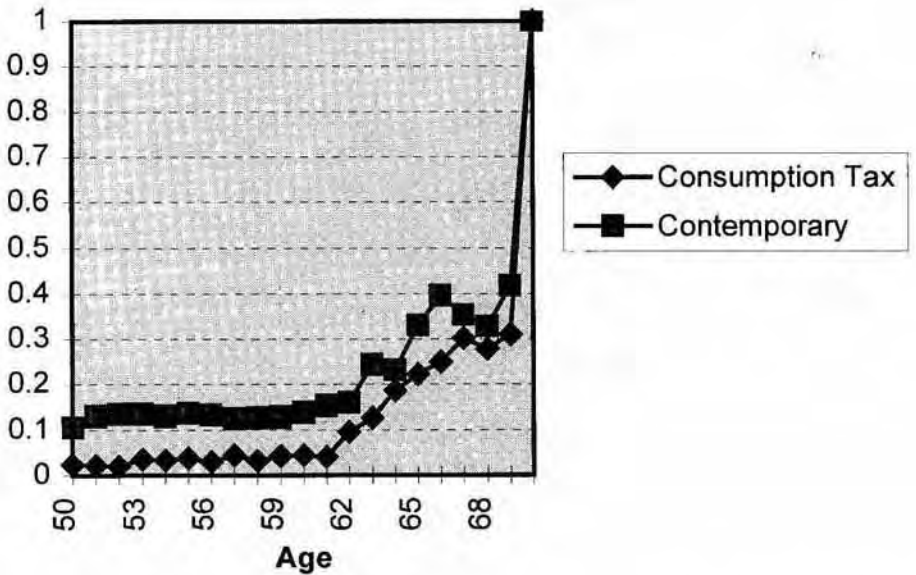


Figure 5. Percent not employed by age: replacing payroll tax with consumption tax. Source: Author's calculations.

approximately 9.2 percent.¹⁵ For purposes of the simulation, that is translated into a tax of 9 percent on all forms of income; thus the consumption tax reduces the tax on earnings from 15% to 9% and raises the tax on nonearned income from 0% to 9%. In Figure 5 the higher line once again represents the 1995 social security system. The lower line represents the effect of the consumption tax. The change in financing does, indeed, lead to an increase in employment at all ages.

Conclusion

Previous research shows that firms respond to adverse demand shocks by laying off the young and encouraging retirement of the old, and the unemployment insurance program influences these employer responses. Our research has suggested that social security may have a similar effect on employer efforts at inducing early retirement.

Our simulation model explores the potential magnitude of this social security effect. The simulations assume that employers make all retirement decisions, and that their response to social security is similar to their previously documented response to unemployment insurance. The main result is that social security could well have a significant effect on employer behavior. Moreover, the pattern of results is sensitive to changes in actuarial adjustments and alternative financing mechanisms.

Interesting policy questions arise if we view social security as a form of unemployment insurance. In particular, this perspective leads one to question the use of payroll taxes that fall exclusively on earnings. In the implicit contract model used here, a payroll tax causes the employer to both shift compensation from earned to nonearned income (e.g., pensions), and to increase the probability of nonemployment. This effect could be particularly important for older workers, and it may be useful to consider policies that reduce such incentives.

A consumption tax is one salient alternative to the payroll tax. Since it falls on all forms of income, a consumption tax (such as a value added tax) would not cause employers to shift compensation from earned to non-earned income. It follows that one way to increase the employment of older workers would be to introduce a small consumption tax on the full population, and simultaneously reduce payroll taxes for workers over 62. Revenues from the consumption tax could be assigned to the social security Trust Fund and thereby offset losses from the reduced payroll tax. Indeed, the consumption tax could be set so as to increase total revenues and thereby address the long run financial problems of the social security system.

The debate within the recent Advisory Council on Social Security provides another way to think about this paper's policy implications. As described in Chapter 1 of this volume, the Council examined three alternative proposals for keeping the system in long-run actuarial balance while im-

proving money's worth ratios for younger cohorts. It is interesting to ask how viewing the current social security program as a form of unemployment insurance fits into the debate over these three alternatives.

All three alternatives might be used by workers as a form of old-age unemployment insurance. For example, under the MB alternative, if benefits and taxes were structured so that the program effectively subsidized early receipt, then firms might seek to use the program as a form of unemployment insurance. One might argue that this is less likely for the IA and PSA option. If the individually controlled accounts essentially paid a lump sum benefit (or an actuarially fair annuity) once a person reached a certain age, then — at least in the above model — these accounts would not affect an employer's propensity to induce early retirement. However, both options IA and PSA have components that differ from simple IRA-type accounts (e.g., both provide a minimum benefit to retirees). If such benefits are actuarially unfair (and that seems quite likely in a minimum benefit program), then the incentives examined in this paper could persist for some groups of workers. Thus, under all three alternatives, social security could still be used as a form of unemployment insurance.

It is possible that by reducing incentives to use social security as a form of unemployment insurance, the government could both increase work in the older population and reduce the long-run government budget deficit. Indeed, to the extent that these incentives cause socially inefficient separations, there may exist tax and benefit changes that reduce deadweight losses and shrink the long run deficit without affecting the well-being of either workers or retirees. But a complete discussion of optimal changes and resulting effects on the long run deficit requires additional empirical information on how the social security system influences employer behavior. The simulations presented here suggest that these behavioral effects may be important.

Appendix

This appendix provides details on how actuarial adjustments were analyzed in the simulation model. As noted in the text, people who elect to receive social security benefits before their 65th birthday receive reduced benefits, while people who elect to receive benefits after their 65th birthday receive a delayed retirement credit.

For purposes of the simulation, these rules are operationalized as follows. Let, the annual social security benefit for an individual age A who has worked N years after his 62nd birthday be written as $G(A, N)$, where both A and N are integers. Thus, people who take "normal" retirement at age 65 after working all three years between age 62 and 65 have an annual social security benefit of $G(65, 3)$. Given this, for all $62 \leq A \leq 70$ and $0 \leq N \leq A - 62$, let

$$G(A,N) = \beta G(65,3)$$

where

$$\beta = (1 + .06666*(N-3)) \text{ if } N \leq 3,$$

$$\beta = (1 + .04500*(N-3)) \text{ if } N > 3.$$

Thus, people who begin receiving social security retirement benefits at age 62 receive a benefit equal to 80 percent of their age 65 "normal retirement" benefit ($G(62,0) = .8G(65,3)$). If they work one year between their 62nd and 65th birthdays (with earnings such that they get zero benefits due to the retirement test), their benefit at age 65 is $G(65,1) = .866*G(65,3)$. Alternatively, if they work four years between their 62nd and 68th birthdays, their benefit at age 68 is $G(68,4) = 1.045*G(65,3)$. A minor complication in this is that if a worker begins receipt at age 62 (say) and then works prior to age 65, benefits are not recalculated until age 65. This too was incorporated into the simulations.

When firms in these simulations decide whether to employ a worker who is age 62 or older, their calculations must include an assessment of expected social security benefits. Employment in the current period not only means forgone social security benefits in the current period, but also higher social security benefits in the future. For purposes of these simulations it is necessary to develop an algorithm for calculating the present value of those future benefits.

Since the workers in this model are no longer employed after their 70th birthday, it is straightforward to compute the present value of social security benefits after that point in time. Consider a worker who, at the time of his 70th birthday, has worked $N(70)$ of the eight years between his 62nd and 70th birthday, where $N(70)$ is an integer between 0 and 8. From that day forward the worker receives a social security benefit of $G\{70,N(70)\}$. Let $B\{70, N(70)\}$ denote the present value of those benefits:

$$(A.1) \quad B\{70, N(70)\} = \sum_{i=70}^{110} (1/(1+r))^{i-70} (l_i/l_{70}) G\{70,N(70)\}$$

where

l_i is the fraction of the birth cohort surviving to exact age i , l_i/l_{70} is the probability of surviving to age i given survival to age 70, and r is the rate at which the firm discounts future costs and benefits.

Now, consider a worker who just celebrated his 69th birthday, having worked $N(69)$ years since turning 62, where $N(69)$ is an integer between 0 and 7. If he is employed over the next year (and does not, in consequence,

receive social security benefits) the present value of his social security benefits is

$$((l_{70}/l_{69})/(1+r))*B\{70, N(69)+1\}.$$

If he is not employed over the next year (and consequently receives social security benefits) the present value of his social security benefits is

$$G\{69, N(69)\} + ((l_{70}/l_{69})/(1+r))*B\{70, N(69)\}.$$

Of course, in deciding whether to employ the worker, the firm must take into account this difference in the expected present value of social security benefits. The firm's decision rule on the 69th birthday (after θ is revealed) would be to employ the worker if his value of marginal product exceeds the value of his externally financed consumption, where the value of externally financed consumption is,

$$(A.2) \quad z + G\{69, N(69)\} - ((l_{70}/l_{69})/(1+r))*(B\{70, N(69)+1\} - B\{70, N(69)\})$$

The final term in this sum is the expected present value of additional social security benefits that result from an additional year of work at age 69 and $N(69)$. This is subtracted from the age 69 social security benefit ($G\{69, N(69)\}$) because the worker essentially forgoes these additional benefits if he does not work at age 69.

At this point it is useful to compute $B\{69, N(69)\}$, the expected present value of social security benefits at age 69 and $N(69)$ before θ is revealed. To do this, one must determine the probability that the worker is employed at age 69 and $N(69)$. But this is just the probability that $S\theta(69)$ exceeds the sum in (A.2). Let $p(\theta(69))$ represent that probability. Since $\theta(69) = \theta(H)$ if $q_{69}(H) \geq .5$ and $\theta(L)$ with if $q_{69}(H) < .5$, and the distribution of q is generated from a uniform distribution, that probability can be computed. Then

$$B\{69, N(69)\} = p(\theta(69))((l_{70}/l_{69})/(1+r))B\{70, N(69)+1\} \\ - (1-p(\theta(69)))(G\{69, N(69)\} + ((l_{70}/l_{69})/(1+r))B\{70, N(69)\}).$$

Now, consider a worker who just celebrated his 68th birthday, having worked $N(68)$ years since turning 62, where $N(68)$ is an integer between 0 and 6. If he is employed over the next year (and does not, in consequence, receive social security benefits) the present value of his social security benefits is

$$((l_{69}/l_{68})/(1+r))*B\{69, N(68)+1\}.$$

If he is not employed over the next year (and consequently receives social security benefits) the present value of his social security benefits is

$$G\{68, N(68)\} + ((l_{69}/l_{68})/(1+r))*B\{69, N(68)\}.$$

The firm's decision rule on the 68th birthday (after θ is revealed) would be to employ the worker if his value of marginal product exceeds the value of his externally financed consumption, where the value of externally financed consumption is

$$(A.3) \quad z + G\{68, N(68)\} - ((l_{69}/l_{68})/(1+r))*(B\{69, N(68)+1\} - B\{69, N(68)\}).$$

This is obviously similar to (A.2). One can then follow the above algorithm to compute $B\{68, N(68)\}, \dots, B\{62, 0\}$.

Given an individual who is age A_0 with years of work N_0 , the simulation program first computes $B\{70, N(70)\}$ for all feasible values of $N(70)$. Given that it computes $B\{69, N(69)\}$ for all feasible values of $N(69)$, and so forth back to $B\{A_0, N_0\}$. The worker is then employed if his value of marginal product exceeds $z + G\{A_0, N_0\} - ((l_{A_0+1}/l_{A_0})/(1+r))*(B\{A_0+1, N(A_0)+1\} - B\{A_0+1, N(A_0)\})$.

The author wishes to thank without implicating Gary Fields, Michael Leonasio, Olivia Mitchell, and Steven Sandell for helpful comments and discussions about this chapter.

Notes

1. See for example, Feldstein (1976) and Topel (1983, 1984, 1985).
2. This model has antecedents in Feldstein (1976), Topel (1984), Wright and Hotchkiss (1988), and Burdett and Wright (1989), and is related to the models in Hutchens (1995, 1996).
3. Assume that $U' > 0$ and $U'' < 0$.
4. No constraints are placed on the range of wages or pensions, thereby permitting contracts where workers make payments to firms.
5. The Lagrangian for this problem is

$$L = \Pi + \int_0^1 [\lambda \{EU - EU^*\} + \{\alpha(\theta)(1 - p(\theta)) + \beta(\theta)p(\theta)\}] f(\theta) d\theta$$

where λ , $\alpha(\theta)$, and $\beta(\theta)$ are Lagrange multipliers with $p(\theta) < 1$ implying $\alpha(\theta) = 0$ and $p(\theta) > 0$ implying $\beta(\theta) = 0$. The resulting first order conditions are

$$L_{w(\theta)} = -(1+t)p(\theta) + \lambda(1-t)U'(w(\theta)(1-t))p(\theta) = 0,$$

$$L_{b(\theta)} = -(1-p(\theta)) + \lambda U'(b(\theta)+c+z)(1-p(\theta)) = 0,$$

$$L_{p(\theta)} = \theta - w(\theta)(1+t) + b(\theta) + ec + \lambda[U(w(\theta)(1-t)) - U(b(\theta)+c+z)] - \alpha(\theta) + \beta(\theta) = 0.$$

These equations must be satisfied for each θ . A similar problem is analyzed in Hutchens (1995).

6. More rigorously, an expansion of the first order condition for the employment

probability around the point $t = 0$ yields the following modification of the employment rule in equation 4:

$$\text{If } \theta \geq z + (1 - e)c + 2w^*dt \text{ then } p^*(\theta) = 1,$$

$$\text{If } \theta < z + (1 - e)c + 2w^*dt \text{ then } p^*(\theta) = 0.$$

Thus, an increase in the payroll tax ($dt > 0$) results in a lower employment probability.

7. Of course, these ideas do not apply to all jobs. Implicit contracts are most likely to arise in situations where a firm and its workers are engaged in repeated interactions over a long period of time, and, in consequence, an implicit contract model of layoffs (or retirements) can only apply to a subset of jobs. Also, the model assumes that employers make all separation decisions, ignoring the reality of employee-initiated separations. Future research should integrate the complex reality of employer-initiated and employee-initiated retirements into a single framework.

8. There is no guarantee that these taxes yield a balanced budget. Any shortfall is made up through a head tax that is assessed when the cohort is born.

9. Of course, age 70 is arbitrary; alternatives would be age 80 or 90. The more interesting and realistic case of gradually diminishing skill is beyond the scope of the present analysis.

10. Recomputation involves nominal earnings (as opposed to indexed earnings) after age 60. Thus, the effect of recomputation is complicated. At least one source argues that this effect is in reality usually small. See Steuerle and Bakija (1994: 218).

11. See Rust (1990: 374) for a similar analysis.

12. Note also that α equals zero in the table. Since $q_j(H)$ is the probability of a high realization of θ , and $q_j(L)$ is the probability of a low realization, where $q_j(L) = 1 - q_j(H)$, let $q_j(H) = (1 - \alpha)u_j + \alpha q_{j-1}(H)$, where u_j is a uniformly distributed error on the unit interval, and $0 \leq \alpha \leq 1$. This specification permits simulations with serially correlated demand shocks. If $\alpha = 0$, $q_j(H)$ is simply a uniformly distributed error term that is independent across periods. If, however, α is greater than zero, $q_j(H)$ is a uniformly distributed error term that exhibits serial correlation. That is useful; it allows one to simulate the effect of demand shocks that influence behavior over more than one period. Since $\alpha = 0$ in all simulations, sensitivity to serial correlation is not explored here.

13. Using CPS data from 1977-81, Topel (1985) finds that elimination of the subsidy due to imperfect experience rating would reduce the monthly unemployment rate from .0516 to .0376. Since the annual rate of unemployment in the March 1978 Current Population Survey was .158, and since the average monthly rate in 1978 was .060, for purposes of the simulation I multiply these numbers by $2.63 = 15.8/6.0$. Leon and Rones (1980), Table 1 indicate that the average monthly unemployment rate in 1978 was 6.0. Young (1980), Table 5 indicates that the incidence of unemployment in calendar 1978 was 15.8.

14. Since all workers are born on the same day and have the same expected skill level, the simulations proceed as follows.

1. Just before the workers' 25th birthday, the firm enters into identical lifetime contracts with five workers. Once the ink is dry on the contracts, skill level is revealed. As indicated in Table 2, this is operationalized by drawing five random numbers from a uniform distribution with a lower bound of \$23,900 and an upper bound of \$38,900.

2. Each year the firm draws an error term from a uniform distribution. As discussed above, the distribution of the error is of the form, $q_j(H) = (1 - \alpha)u_j +$

$\alpha q_{j-1}(H)$, where u_j is a uniformly distributed error on the unit interval, and $0 \leq \alpha \leq 1$. If $q_j(H) > .5$ then $\theta_j = \theta(H)$. Otherwise $\theta_j = \theta(L)$.

3. Letting S_i , $i = 1, 5$ denote the skill level of the five workers, the firm employs a worker if the value of the worker's marginal product ($S \theta_j$) exceeds the worker's "externally financed consumption" when not employed ($v_j + (1 - e) c + z_j + 2w dt$).

4. Workers who are not employed receive unemployment insurance if under age 62, social security benefits if over 62, and private payments. Note that workers who receive social security benefits do not receive unemployment insurance benefits.

15. Payroll tax collections for OASDHI in 1994 were \$446.3 billion, and personal outlays (disposable income minus savings) were \$4,826.5 billion. To raise \$446.3 billion, a consumption tax would have to tax personal outlays at a rate of $446.3/4,826.5 = .092$.

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