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ABSTRACT

Dynamic Modeling of the SSDI Application Timing Decision: The Importance of Policy Variables*

This paper analyzes the importance of policy variables in the context of Social Security Disability Insurance (SSDI) application timing decision. Previously, we explicitly modeled the optimal timing of SSDI application using dynamic structural models. We estimated these models using data from the Health and Retirement Study (HRS). This paper uses option value model estimates to simulate application timing under alternative SSDI policy formulations. We consider changes in three policy variables: benefit levels, acceptance rates, and employer accommodation. Our simulations suggest all these changes would have substantial effects on expected spell lengths until application and on lifetime application rates, and hence on SSDI caseloads.

JEL Classification: H31, H55

Keywords: Social Security Disability Insurance, Health and Retirement Survey, option value

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Introduction

How do workers make their decision about the timing of Social Security Disability Insurance (SSDI) application once they experience a work limiting health condition? In a previous paper (Burkhauser, Butler, and Gumus, 2003), we dealt with this question by explicitly modeling the optimal timing of SSDI application using option value and dynamic programming frameworks. In this paper, our question is "Do changes in policy variables affect this decision, and if so, how?" In order to answer this question, we use our dynamic structural model estimates and simulate application timing under alternative SSDI policy formulations. Previous studies have mostly attempted to use cross-section variation to identify the role that SSDI plays in the labor force (non)participation decision of older men. Although there is agreement on the direction of changes there is no consensus about the magnitudes of the effects, so there is a wide range of elasticities. Reduced form modeling is useful for analyzing past trends, however, we recognize the need for structural modeling of the timing of SSDI application. A behavioral model of individual's application decision is needed for analyzing the individuals' responses to policy reforms. We argue that more accurate predictions of policy changes can be obtained by modeling the underlying utility maximization problem of the individual.

Another problem with reduced form models is that they cannot be adapted to time intervals or periods on which they were not estimated. While these approaches are useful approximations of the impact of policy changes, one must model the *timing* of application over the entire lifetime. Here, we are able to look at exit rates over the entire lifetime, or at the distribution function of departures into SSDI application. We focus on the speed of transition from work to SSDI application and report the resulting changes in both the proportion of workers who apply over their lifetime and the expected spell lengths for each policy change. We estimate an elasticity of lifetime application rate and mean spell length with respect to changes in policy variables.

In what follows, we focus on spell length estimates from our option value model. Hence we focus on the length of the spell of "not applying for SSDI" after the onset of a work limiting health condition that affects the kind or amount of work that a currently employed person can do. Policy changes that both increase the proportion of workers who apply for benefits over their lifetime and decrease their expected spell length, will increase the SSDI caseload. Policy changes that decrease application over a lifetime and increase spell length will have the opposite effect. But policies that increase both applications over a lifetime and spell length may or may not increase caseload. We consider three types of disability policy reforms: changing the benefit amounts, changing program eligibility stringency by changing the acceptance rates, and extending employer accommodation to all individuals with work limiting health conditions. We find that these policy changes will substantially affect SSDI application timing. Both spell lengths and application rates are responsive to changes in these policies.

SSDI has evolved through a series of legislative and administrative reforms since its introduction in 1956.[1] These reforms introduced changes in the relative value of benefits and in eligibility criteria and these policy changes are highly correlated with fluctuations in SSDI benefit rolls. In addition, disability program growth also coincided with macroeconomic downturns. Between 1965 and 2000, SSDI applications and awards varied widely (see Figure 1). In the late 1950s, SSDI began to pay benefits to workers aged 50-64 with permanent disabilities – unable to perform substantial gainful activities. The program was extended to all ages in 1960. During the 1960s and early 1970s, SSDI eligibility criteria were relaxed and benefits were increased in real terms. The rapid growth in the number of beneficiaries and award rates during early 1970s also coincided with high unemployment rates. In the late 1970s, eligibility standards were tightened. As a result, between 1975 and 1980, there was a decline both in applications and in the initial state allowance rates (the percentage of awards at the initial state determination level). While appeals increased during this period, overall disability rolls declined. The administrative tightening that began in the late 1970s continued also in early 1980s. Congress enacted new legislation to further tighten disability eligibility criteria and improve the work incentives for those on SSDI. This further increased appeals and resistance from states. Finally, administrative reforms in 1984 reversed the retrenchment policies. However, economic growth and decreasing unemployment rates were followed by a parallel decrease in disability applications over the rest of the decade.

In 1990, the Americans with Disabilities Act (ADA) was enacted. The ADA requires employers, among other things, to make "reasonable accommodations" for workers with work limiting health conditions unless this would cause "undue hardship" to the operation of business. The recession of the early 1990s was followed by an increase in both applicants and awards. This growth coincided with a substantial increase in allowance rates. Aging baby boomers and state efforts to shift the beneficiaries to federal programs were also blamed for this trend (Fisher and Upp, 1996). Between 1988 and 1992, SSDI applications increased by 39 percent (Mashaw and Reno, 1996). Awards increased even more, by almost 10 percent a year (Rupp and Stapleton, 1995). As a result, disability rolls grew rapidly during the early 1990s and there was also a sharp increase in the number of appeals. However, application rates started to decline after 1993.

This brief review of the trends in SSDI applications and awards suggests that the generosity and availability of SSDI benefits affect these policy outcomes. This paper will use our option value model estimates to more explicitly quantify specific policy effects on SSDI application timing. In what follows, we first provide a discussion of the previous studies. Then, we give an outline the option value model and describe our data. Finally, we present the simulation results and conclude.

Literature review

There are numerous studies analyzing the effects of policy variables on SSDI applications and labor force participation. Econometric studies suggest that disability applications and labor force non-participation are sensitive to policy variables. Even though these studies agree on the direction of the policy variables' effects, they have produced a wide range of elasticities. This section briefly reviews previous studies and summarizes their main policy simulation results. Some of these results are summarized in Tables 1-3 below. For a more detailed review of this literature see Bound and Burkhauser (1999), Danzon (1993), Haveman and Wolfe (2000), and Leonard (1986).

Research has mainly focused on how much of the decline in labor force participation rates for older men can be attributed to the SSDI program expansion. Most of this research used one-period static models of labor supply in which individuals choose whether or not to work. Some studies of the 1970s trends found a relationship between benefit generosity and growth in SSDI program. Leonard (1979) analyzes the empirical relationship between benefit levels and SSDI beneficiaries, rather than focusing on labor force participation. His sample includes men aged 45-54 drawn from the 1972 Social Security Survey of Health and Work Characteristics who applied for SSDI between 1966 and 1970. In this study, he tries to distinguish the effects of cyclical forces in the economy and the changes in SSDI policy. However, he does not distinguish between the effect of the benefit levels and the acceptance rates. The estimated elasticity of the proportion of beneficiaries with respect to increases in the benefit level is 0.35 and he concludes that half of the decrease in participation is attributable to increases in expected benefits. Slade (1984) analyzes labor supply responses to SSDI benefits using a sample of men aged 58-63 in 1969 drawn from the Retirement History Survey. His model is a probit model of labor force participation based on static utility maximization. His estimated elasticity of non-participation with respect to replacement ratio is 0.81.

Parsons (1980a) argues that the sharp decline in labor force participation among men under 55 has coincided with the rapid expansion of the SSDI program. He draws a sample of men aged 45-59 from 1966 National Longitudinal Survey to estimate their labor force participation in 1969. He looks at labor force participation rates in an expected utility maximization model. Utility is a linear function of the replacement rate and the econometric framework is a probit model. His estimated elasticity of labor force non-participation is 0.63 and he finds a significant relationship between disability benefits and labor force non-participation. He claims that the increase in SSDI benefits can largely explain the decrease in male labor force participation rates. Later, however, Parsons himself finds elasticity estimates that differ substantially even though the results still suggest considerable disincentive effects of SSDI benefits. Parsons (1980b) forms a sample of men aged 48-62 from 1969 National Longitudinal Survey. Using this sample, he obtains an elasticity estimate of 1.80 which is much higher than his original estimate. Another Parsons (1984) study aims to correct for several factors reducing the elasticity figures to between 0.49 and 0.93.

All these models have basically ignored life-cycle effects and more recent studies have used different frameworks. Halpern and Hausman (1986) estimate a joint two-period model of labor supply and SSDI applications using data from the 1972 Survey of Disabled and Non-

Disabled Adults. Based on simulations of probability of applications with respect to benefit level changes, they calculate an elasticity of 1.1. On the other hand, Haveman and Wolfe (1984a) argue that while benefit generosity increases labor force non-participation, it is responsible for a much smaller part of the decrease in participation during the 1970s. They use Panel Study of Income Dynamics data to form a sample of men aged 45-62 in 1978. The estimation is a two-stage probit model. They find a significant but small coefficient on expected SSDI benefits and their estimated elasticity of labor force participation with respect to program generosity ranges from 0.006 to 0.021. Haveman and Wolfe (1984b) demonstrate that point estimates of an elasticity may be very misleading when analyzing a nonlinear response. They compute elasticities of labor force participation with respect to the expected benefit levels which range from 0.0003 to 0.58 depending on the method of computation. Corrected elasticities suggest that the SSDI benefits provide negligible work disincentives.

Bound (1989) uses the group of rejected applicants as a control group. He forms samples of men aged 45-64 from the 1972 Survey of Disabled and Non-Disabled Adults and the 1978 Survey of Disability and Work. He finds that the majority of these individuals do not return to work and those who choose to return usually end up with earnings that are substantially lower than those for the non-applicants. Therefore, he claims that the labor force participation rates of rejected applicants should be considered as an upper bound. He concludes that the growth in SSDI benefits can explain no more than 40 percent of the rise in older male non-participation. Haveman, De Jong, and Wolfe (1991) analyze the SSDI application decision based on a utility maximization model of work status and use a switching regression framework. A sample of men aged 45-62 in 1978 is drawn from Panel Study of Income Dynamics data matched to Social Security earnings records. They conclude that the increases in SSDI benefits can account for no more than 20 percent of the decrease in labor force participation of older men. Bound and Waidmann (1992) use historical data from National Health Interview Survey (NHIS) to look at the drop in labor force participation of men for the period between 1949 and 1987. They find that at most only half of the drop for men aged 45-54 and only about a third of the drop for men aged 55-64 is due to the expansion of the disability transfer programs. In a later paper, however, Bound and Waidmann (2002) study the effect of the expansion of the SSDI program in the 1990s on the employment rates of disabled individuals. They argue that this expansion accounts for much of the decline in employment of the disabled men and women during this period. Autor and Duggan (2003) have also argued that the much of the decline in labor force participation among people with disabilities during the 1990s is due to the growth of the SSDI program which began in 1984.

There are several studies which looked at the response of older workers to changes in the acceptance rates. Parsons (1991) modeled self-screening in SSDI applications to analyze the extent to which individuals predict their probability of acceptance in making application decisions. He finds that the elasticity of SSDI applications with respect to changes in the initial denial rates is 0.4. Halpern and Hausman (1986) find that a 50 percent decrease in the acceptance rates would reduce the proportion of applicants by about 13.7 percent, implying an elasticity estimate of 0.3. Thus, they conclude that the potential applicants are more sensitive to changes in benefit levels than to changes in their probability of acceptance. Gruber and Kubik (1997) also found significant effects for men aged 45-64. Using data from NHIS for the periods 1976-1978 and 1980-1982, they analyze the effect of changes in denial rates is over the years 1977-1980. They estimated an elasticity of labor force non-participation with respect to a change in the denial rates as 0.28.

Kreider (1999) uses 1978 Survey of Disability and Work data to estimate a structural model of applications, awards, and income. He forms samples of men aged 40-62 considered at risk of applying for SSDI benefits, who were not on the rolls in 1970, and estimates their probability of applying between 1970 and 1977. He finds an elasticity of SSDI applications with respect to benefit level of 0.70 and an elasticity of applications with respect to acceptance rates of 0.63 over this eight-year period. He also finds that groups with the lowest labor market productivity (e.g. those with high levels of disability, or low level of education, etc.) are the most responsive to changes in benefit levels. In a more recent study, Kreider and Riphahn (2000) approximate a dynamic optimization model of SSDI applications using semi-parametric techniques. Their model is based on a system of reduced-form logit equations. They draw a sample of men and women aged 50-61 with an activity limiting health condition from the 1992 Health and Retirement Study. They analyze any application decision (i.e. first application, re-application, and appeals) for those not on SSDI rolls in 1986 over the eight-year period from 1986 to 1993. They find an elasticity of SSDI applications with respect to benefit increases of around 0.51 for men and 0.75 for women. They also find considerable differences between women and men in their elasticity of SSDI application with respect to changes in acceptance rates. The acceptance rate elasticity is estimated to be 0.67 for men and 0.26 for women.

Burkhauser, Butler, and Kim (1995) suggest that trying to keep work limited individuals employed may be a more effective strategy than encouraging beneficiaries to return to work and explain the importance of employer accommodation in the context of reintegrating people with work limiting health conditions in the labor force. Therefore, they argue, policy reforms should target individuals before they begin their application process. Burkhauser, Butler, Kim, and Weathers (1999) model the decision of optimal timing of SSDI application using a continuous time hazard model. They use 1978 Survey of Disability and Work (SDW) and 1992 Health and Retirement Study (HRS) data to analyze the consequences of universal employer accommodation and the effect of benefit levels. They find that both benefit levels and accommodation at the onset of a condition affect the speed to application. Burkhauser, Butler, and Weathers (2002) model the timing of SSDI application once a work limiting health condition begins to bother. They use a hazard model and control for both observed and unobserved heterogeneity and estimate this model using data from the first wave of HRS. They find that the policy variables, such as state allowance rates, benefit levels, and employer accommodation, significantly influence the speed to application. Acemoglu and Angrist (2001) and DeLeire (2000) looked at the effects of employer accommodation enforcement by ADA and they claim that the ADA had an "unintended consequence" of reducing the employment of people with disabilities. They argue that even though ADA may have increased the duration on the job for those who are already employed, this effect was offset by the decline in the employment of working-age men and women with disabilities.[2]

This literature review shows that previous researchers have used various types of measures of the sensitivity of SSDI program outcomes to policy effects. However, few incorporate dynamic considerations into these measures. To date only Burkhauser *et al*. (1999) and Burkhauser *et al*. (2002) have measured program effects in this dynamic way. Rupp and Scott (1996) recognize that the duration on the program is essential to measure the SSDI caseloads and they study how program rules may affect this duration. They show that the decline in average age of SSDI beneficiaries has contributed to the growth in SSDI rolls as well as to longer duration of average benefit receipt of those on the rolls. Kreider (1999) and Kreider and Riphahn (2000) recognize the importance of modeling the timing of applications but did not do so. These studies measured application elasticity over an eight-year period for a group of health limited workers at risk. We argue that this is a useful approximation of one part of the impact of policy changes on caseload, but one must model the timing of application over the entire lifetime. Once people get on the SSDI rolls, they tend to stay, so the timing of application is an important factor in determining the SSDI caseload and program cost. The present work more precisely estimates these dynamic policy effects.

Option Value Model of SSDI Application Timing

In Burkhauser *et al*. (2003), we explicitly modeled the choice of timing of SSDI benefits application as the solution to a utility maximization problem. We estimated both an option value model and a dynamic programming model which are borrowed from the retirement literature (Stock and Wise, 1990; Lumsdaine, Stock, and Wise, 1992). In a recent paper, Samwick and Wise (2003) used HRS data to look at the effects of employer-provided pension incentives on the retirement timing. Rather than estimating the structural parameters in an option value framework, they calculate an option value variable for given parameter values. Using a probit specification they find that this variable is a significant predictor of retirement.[3]

The main difference between the two models is that the option value model makes a simplifying assumption which makes it easier to estimate. We introduce the option value model not only to avoid the computational complexity of the dynamic programming model but also because we think that option value may better approximate the individuals' decision-making process. In fact, our predictive power comparisons using both in-sample and out-of-sample data show that the option value model performs better than the dynamic programming model in terms of predictive power even though it may be less consistent with theoretical individual behavior.

As a result, policy simulations in this paper are based on the preferred option value model estimates only. In this section, we will present a brief overview of this model.

Time is discrete and the horizon is finite. The choice in each period is to continue to work or to apply for SSDI as long as one is eligible for these benefits. Thus, an eligible individual can either choose to apply for SSDI, or never apply. The consequence of an application is either rejection or acceptance and receipt of benefits until retirement or death. If rejected, one may either return to work or not work and live exclusively on non-labor income which is not explicitly modeled. We assume everyone who does not apply for SSDI by age 62, retires at age 62. We will specifically model the consequences of (1) continued work (no application), (2) application and acceptance, and (3) application and rejection.

Let the current period be t. One can apply for SSDI in period r, $r \geq t$. The end period is called d, 62 years of age in our case. The probability of surviving to period s given survival to period t, $s \geq t$, is $\pi(s \mid t)$. If one applies for SSDI, the probability of being approved is $\alpha(t)$, and $\pi(s \mid t)$ and $\alpha(t)$ are not estimated in the model. Earnings while still working is W_s, and expected income if one applies for SSDI is D_s. Note that, in our model, income in the SSDI acceptance state becomes OASI income at age 62. Income is Y_s if one is turned down for SSDI, and income is B_s if one is accepted. Hereafter, we will not write out all of these terms but use D_s to stand for the weighted average of B_s and Y_s where the weights are $\alpha(t)$ and $1-\alpha(t)$, respectively.

Let U_t denote the utility function and β denote the discount factor. We follow Stock and Wise (1990) in specifying that utility is a function of labor earnings and income in the SSDI acceptance state. In general, U_t includes a systematic predetermined portion and a stochastic, random portion. We assume that income may produce more or less utility after application for SSDI. Application timing decision depends on several incentives which consist of factors affecting individual preferences for consumption and leisure, labor earnings, SSDI benefits, health condition, socio-demographic characteristics, job characteristics and work conditions such as employer accommodation following onset, and institutional details of the SSDI program. In this context, at any given period, postponing application may provide higher current consumption and higher future potential benefits due to continued labor market activity, but may also lead to lower current leisure consumption and higher discomfort from work. Utility in the pre-application state is given by (1) and utility in the post-application state are given by (2):

$$U_W(W_s) = (W_s)^{\gamma} + \omega_s, \tag{1}$$

$$U_D(D_s) = \kappa^{\gamma}(D_s)^{\gamma} + \xi_s, \tag{2}$$

κ and γ are the utility function parameters which represent the relative value of income in the post-application state to income in the pre-application state and risk aversion relative to income variability, respectively. The disturbances are assumed to be independent over people and time. One can calculate the utility of applying for SSDI payments at various periods.

The utility value at time t of applying for SSDI at time $r \geq t$ is denoted as $V_t(r) = \sum_{s=t}^{r-1} \pi(s\,|\,t)\beta^{s-t} U_W(W_s) + \sum_{s=r}^{d} \pi(s\,|\,t)\beta^{s-t} U_D(D_s(r))$ and the problem is to maximize $E_t[V_t(r)]$ over r. The value of applying for SSDI now (period t) is $V_t(t) = \sum_{s=t}^{d} \pi(s\,|\,t)\beta^{s-t} U_D(D_s(t))$. To define the problem more conveniently, define the expected value of applying for SSDI in year r minus the expected value of doing so now as $G_t(r) = E_t(V_t(r)) - E_t(V_t(t))$. This is the gain, evaluated at period t, from postponing SSDI application until period r. It can be decomposed into two parts, a systematic term, the exogenous portion of utility associated with applying for SSDI in period r, and a stochastic portion of utility. If we define $r^* = \arg\max_r E_t[V_t(r)]$, then the person postpones SSDI application if $G_t(r^*) = E_t(V_t(r^*)) - E_t(V_t(t)) > 0$, i.e. if the option value $G_t(r^*)$ is positive. The next step is to find the maximum $g_i(j)$ over j, this is $g_i(j^*)$, where j^* is the year in which application for SSDI occurs.

Following Daula-Moffitt (1995), we add an observable variable vector $\underline{x}$ to the original utility functions described in equation (1) and we denote the effects of this vector by $\underline{\delta}$. Thus, the utility function in the work state takes the form $U_W = Y^\gamma + \underline{x}'\underline{\delta} + \varepsilon$. Here the idea is to include some fixed utility differences between the pre-application state and post-application state. These are different from the marginal utility differences we imposed originally, but they also reflect the relative valuations of the pre-application state and post-application state. The $\underline{x}$ vector includes years of education, dummies for race, marital status, employer accommodation, health conditions and for being a white collar worker.

The parameters of the option value model to be estimated are: κ and γ (utility function parameters), β (discount factor), and $\underline{\delta}$ (Daula-Moffitt parameters). We assume that the random component of the utility function is normally distributed. We provide a brief report of the estimation results in Table 6. Option value model produces mostly significant and economically meaningful parameter estimates. Utility function parameter estimates we obtain are in line with results from previous studies and Daula-Moffitt parameter estimates are consistent with reduced form model findings. Additional education or accommodation by employers increases the utility of earnings relative to SSDI, discouraging application and being African-American leads to shorter duration to SSDI application. There is evidence some health conditions lead to more rapid application than others. Musculoskeletal conditions, such as back, neck and spine problems, or arthritis lead to a relatively longer duration until SSDI application since these conditions tend to be chronic compared to cardiovascular conditions, such as stroke or heart attack, which tend to be acute.

To summarize, our results show that while the severity of a work limiting health condition significantly affects the timing of SSDI applications, so do policy variables such as employer accommodation and the relative value of income in the application state to income in the work state. We then test the fitted distribution resulting from both the option value and the dynamic programming model versus the distribution estimated using life table methods in the original data. Our predictive power comparisons using both in-sample and out-of-sample data, we show that the option value model performs better than the dynamic programming model in terms of predictive power even though it may be less consistent with theoretical individual behavior. We also find that our option value model provides a better fit out-of-sample than in-sample. This point is very important in the context of policy analysis, since policy simulations require models that are able to predict actual responses to future policy changes. Thus, we conclude that our option value model provides a powerful tool for simulating policy changes. In what follows, we first present our data and then carry out simulations to see how effective the policy variables are and to obtain measures of policy effects on SSDI application behavior.

Data

Our data come from the first three waves of the Health and Retirement Study (HRS). The HRS is a longitudinal study of the health, wealth, income, and employment of primary respondents aged 51-61 in 1992 and secondary respondents (spouses or partners of these primary respondents) who were interviewed regardless of their age. Individuals were interviewed biennially, and five waves of data are currently available, three in final form. HRS data can be linked to restricted access SSA administrative data.[4] Three restricted access files are used in this study: The HRS Covered Earnings File, The Summary of Earnings and Projected Benefits (SEPB) File, and The Wage and Self-Employment Income in Covered and Non-Covered Jobs File. HRS includes a module on disability with detailed questions about SSDI applications and awards. Data on individuals' demographic characteristics, labor force participation, employment, and health status are also available in separately designed sections. The income section provides data on benefits, income, and wealth holdings. We also use additional sources of data. The Lewin Group created a Public Use File which includes state level data on SSDI and Supplemental Security Income (SSI) programs as well as state level descriptive variables for the years 1974 through 1993. The data contain initial SSDI allowance rates for each state computed as the number of people awarded SSDI benefits at the initial state level screening process divided by the total number of initial applications in that state. These data are used to form the probabilities of acceptance.[5]

We draw our sample from persons who reported a work limiting health problem in Wave 1 (1992) or Wave 2 (1994) of the HRS as defined by a positive response to the question "Do you have an impairment or health problem that limits the kind or amount of paid work you can do?" Of these individuals, we kept those with permanent conditions (impairments expected to last for more than three months) who were working for someone else (not self-employed) at the onset of their work limiting health condition. Individuals were asked when their condition first began to bother them, and this date is used as the onset of the health problem. They were also asked if they applied for SSDI benefits. For those who applied, their spell ends at the year of application. SSDI benefit award status can be obtained using the income section of the survey. Our final sample consisted of 1,085 individuals (592 men and 493 women).[6] Table 4 provides descriptive statistics of the key variables used in our analysis.[7]

The time unit in our analysis is a biennial period since the date on SSDI award status and income during the survey period are known over biennial periods. We calculate utility from the stream of labor earnings in different states and the potential SSDI benefits which would result from application for each period of potential application. We construct other inputs which are assumed to be exogenous to the model. We include all of these measurements and predictions in our option value model in order to analyze the decision to apply for SSDI.

Table 5 is a life table that describes the distribution of spell length from onset to application by gender for our sample. The first column shows the number of periods since the first period of eligibility after the onset of a work limiting health condition. The next four columns show the number of men who apply within the period; who are censored within the period; their hazard rate; and their probability of surviving to the beginning of the period. The next four columns show these same values for women. The hazard rate is greatest in the first period both for men and for women. Nonetheless, only about a quarter of the sample apply for SSDI in the first period (first two years following onset). The vast majority of workers who experience the onset of a work limiting health condition do not apply for SSDI in the first two years but wait to apply. The hazard rate declines after the first period, and the longest observed spell is 16 periods (32 years) for men and 15 periods (30 years) for women. These life tables establish that there is substantial variation in spell lengths from onset to application.

Policy Variables

We consider three types of disability policy reforms: changing the benefit amounts, changing program eligibility stringency by changing the acceptance rates, and extending employer accommodation to all individuals with work limiting health conditions. We construct these three policy variables from HRS and Lewin data. Using actual earnings histories (and predictions of them when histories are not available), we compute potential PIAs following SSDI program rules.[8] We need to project SSDI benefit rules for years after 2000, and for this purpose we assumed that the institutional details of the SSDI program do not change except as described by statute in 2000. We assume potential SSDI recipients know and act on this information. Annual SSDI benefits are then converted into real dollars. We include the initial SSDI allowance rates in our computation of expected income in the application state. In our econometric model, Y_s is the labor earnings in the no application state, and D_s is the weighted average of the applied and accepted state income (B_s) and the applied and rejected state labor earnings (W_s). The weights are given by the initial allowance rates. These rates are available at the state level. Higher benefit levels and allowance rates are expected to increase the application rates as well as the speed at which individuals apply for SSDI benefits. Employer accommodation is based on a question to the individual asking "if the employer did anything special for the individual at onset so that she or he could remain at work". Accommodation by employers is expected to decrease the application rates and increase the length of time during which an employee stays on a job and does not apply for SSDI (see Burkhauser *et al*., 1999 and Burkhauser *et al*., 2002 for evidence).

Results

Policy analysis is straightforward within the framework of dynamic structural models. After we estimate the unknown structural parameters using the observed data under the current policy regime, we predict behavior under a different policy regime by computing new exit rates. Because we do not model federal or state policy making or the employers' behavior concerning the accommodation decision, our estimates will be upward biased to the extent this potential endogeneity problem affects our simulations.

Using our option value model estimates, we simulate the effects of these policies holding all else constant. Then, for each policy scenario, the estimated parameter value is used to simulate application probabilities at each possible spell length. In other words, we re-evaluate each person's application probability in our sample at each time period using the estimation results from the option value model. The predicted application probabilities implied by the new policy provide a new distribution function for the probability of application by spell length. We then compare them with the baseline application probabilities under the current system from the Normal version of option value model estimates. In the baseline case, which is not shown in our tables, 19 percent of men and 14 percent of women apply for SSDI benefits within the first two years following the onset of a work limiting health condition. These figures go up to 54 percent for men and 50 percent for women when we consider the first ten years after the onset. Twenty years after the onset 67 percent of both men and women will apply, and finally when we consider all the period over the lifetime 72 percent of individuals will apply. The estimated spell length is 15.42 years for men and 15.90 years for women.

The simulation results based on the option value model are presented separately for women and men. In Tables 7-9, we summarize the comparison of the baseline policy with the simulated policy change in terms of the speed of application. We report in the first row the estimated percentage of the population who exit within the first two, ten, and twenty years and any number of years since the onset of a health condition under each change in policy. Then, in the second row, we present the percentage change in these proportions of applicants relative to the baseline case. In the third and the fourth rows, we present the new expected spell length due to the policy change and the change in expected spell length relative to the baseline case, respectively. Here the spell length refers to the time to application once a work limiting health condition is experienced. Hence, an increase in spell length implies smaller program costs since application is delayed to older ages. As the application is delayed, the time on SSDI rolls will be shorter, and the burden on SSDI caseloads will be lower. For reference, we present the baseline values for each of these percentage changes together with the corresponding elasticities for the benefit and acceptance rate changes. Simulation results are also presented in Figures 2-6. Each figure shows the effect of a policy change as a comparison of the cumulative baseline probabilities, predicted under the current SSDI policy in our sample period, with the predicted cumulative probabilities under the hypothetical simulated policy based on option value estimates.[9]

Benefit levels

To simulate the effects of changes in the generosity of the disability program on applications, each worker's expected SSDI benefit level is altered up or down by 10 percent. A change in the benefit level is assumed to have no influence on income available from other sources. Using the original set of coefficient estimates, a new distribution of exit rates is re-calculated using the estimated parameters of the model. The distribution after the hypothetical policy change is compared to the original distribution.

Tables 7a and 7b consider a 10 percent increase and a 10 percent decrease in benefit levels, respectively. Since the same percentage increase or decrease in a variable may have asymmetric effects, it is necessary to look at both increases and decreases. Figures 2a (men) and 2b (women) show that increasing the benefit levels by 10 percent shifts the predicted cumulative application rates up for both men and women. The simulation for men predicts an increase in the proportion of applicants by 5.33 percent within the first two years following the onset of a condition (column 1), implying an estimated application elasticity of 0.533 with respect to the benefit levels (see Table 7a). This elasticity is estimated to be 0.334 when we consider a period of ten years. Our elasticity estimate falls to 0.190 when we consider the effect over the lifetime (column 4). However, this does not imply smaller policy impact. We find that this policy change also decreases average spell length for men by 3.22 percent, i.e. individuals are induced to apply sooner when their expected benefits are increased by 10 percent holding all else constant including expected earnings. These two effects together imply an increase in the SSDI caseloads that is much greater than the one implied by looking at application rates.

If the benefit levels were decreased by 10 percent, then the cumulative application rates would be lower than under the current system as shown in Figures 3a and 3b. The application rates for men are reduced by 5.31 percent within the first two periods, and by 2 percent over all periods (see Table 7b). A 10 percent decrease in benefit levels also increases the mean spell length by 3.32 percent and decreases the average duration on the SSDI rolls. Therefore, the caseloads would decrease with this policy change. Results for women are similar even though women seem to be less sensitive to changes in benefit levels. The estimated application elasticity within the first two years is 0.459 with respect to benefit level increases and 0.403 with respect to benefit level decreases. Finally, note that for both men and women, percentage increases and decreases in benefit levels have symmetric effects.

Acceptance rates

Next, we consider the effect of changing the acceptance rates by 10 percent. These simulation results are presented in Tables 8a and 8b as well as in Figures 4 and 5. Cumulative application rates at each period go up with a 10 percent increase in acceptance rates. This policy change implies much higher rates of application than the policy change of increasing the benefit levels by 10 percent, hence much lower labor force participation rates. The fraction of applicants in the sample of men goes up by 15.67 percent within the first two years and within the first ten years 4.73 percent more men are induced to apply for SSDI. The elasticity goes down to 0.322 when we extend the period to all the years. Overall, this policy change leads to a decrease in the mean spell length by 7.03 percent increasing average time on the SSDI rolls substantially. The effects for women are again smaller than the effects for men. The proportion of women applying rises by 10.77 percent within the first two years and by 2.10 percent over all periods. The mean spell length for women goes down by 4.14 percent. These results suggest a considerable increase in SSDI caseloads for both men and women if the requirements to get on SSDI are relaxed by increasing the acceptance rates by 10 percent.

We then consider a restriction of benefit eligibility by decreasing the acceptance rates by 10 percent. This simulation suggests a downward shift in the time profile of application, so people are induced to apply later (see Figures 5a and 5b). Estimated elasticity of applications with respect to the decreases in acceptance rates is 1.155 for men and 0.353 for women within the first two periods. Over all periods, these elasticities are reduced to 0.29 and 0.11 for men and women, respectively. The mean spell length for men would be 5.86 percent higher than what it is under the current system, whereas it would be only 1.93 percent higher for women. In contrary to the case of benefit changes, increases and decreases in acceptance rates produce asymmetric effects for both men and women; individuals are more sensitive to increases in the acceptance rate than to decreases. Another point to note is that the difference between men and women is more pronounced in the case of changes in acceptance rates than in benefit levels.

Employer accommodation

Another policy measure to consider in addition to changing the SSDI program rules is employer accommodation at the onset of a health condition. Above we established that the majority of individuals who experience a health condition stay in the workforce for a significant period following the onset. Employer accommodation, in this context, emphasizes that individuals with work limiting health conditions can work. In order to see to what extent accommodation facilitates delayed application, we simulate the effect of universal employer accommodation. For this purpose, we set this dummy variable equal to one so that everyone in our sample is accommodated by their employer at the onset of a work limiting health condition. The results are reported in Table 9 and presented graphically in Figures 6a and 6b. We find that this policy change decreases the fraction of male applicants by 20.62 percent within the first two years. When we consider all periods, there is still 7.77 percent decrease in the application rates and the mean spell length is extended by 12.89 percent. The effect of employer accommodation is smaller for women than for men. Proportion of women who apply for SSDI benefits within the first two years following the onset is reduced by only 13.83 percent. As a result of this policy change, the mean spell length for women increases by 7.15 percent. Since the application rates go down and mean spell lengths go up, we can conclude that extending employer accommodation would lead to reductions in SSDI caseloads.

Are these estimates too high or too low? First, we compare our results to those reported in Burkhauser *et al*. (1999) and Burkhauser *et al*. (2002). In Table 10a, we summarize these results and compare them to the ones in this paper (last column). These papers only focused on the percentage increase in the first period benefit levels and acceptance rates. Here, we look at a hypothetical percentage increase in all periods. In addition, this past work did not explicitly model the application decision. Therefore, one needs to keep in mind that the elasticities are not identical and the empirical models do not allow for direct comparison. When we consider the elasticities within the first 5, 10, and 15 years, our elasticity of proportion of applicants with respect to expected benefit increases are smaller than the ones in Burkhauser *et al*. (1999) and in Burkhauser *et al*. (2002). Our acceptance rate elasticities, on the other hand, are almost always higher when compared to the Burkhauser *et al*. (2002) findings. Our elasticity for men over all periods is 0.32 which is within the range of Parsons (1991) and Halpern and Hausman (1986) estimates of 0.4 and 0.3, respectively. In the case of employer accommodation, we predict 17 percent decrease in applications for men and 10 percent decrease in applications for women within the first 5 years after onset. These are again smaller compared to the Burkhauser *et al*. (1999) and Burkhauser *et al*. (2002) estimates. Also for longer spell lengths, our option value model predicts smaller changes in the proportion of applicants due to universal employer accommodation than the earlier hazard model.

In Table 10b, we use figures reported in Kreider (1999) and Kreider and Riphahn (2000) as benchmark and compare them to our estimates for an eight-year period (last column). Both of these studies consider any application while we analyze first application decision only.

Moreover, the Kreider and Riphahn (2000) study does not differentiate between applications for SSDI and SSI programs. While not directly comparable, our policy impact estimates suggest smaller responsiveness of applications to benefit changes but greater responsiveness in the case of acceptance rate changes. This may be due to differences between re-application and first application decisions. Changes in benefit levels and acceptance rates may influence first application decision differently than it influences reapplication and appeal decisions.

Finally, we find that women are less sensitive to any kind of policy change we consider, whereas Burkhauser *et al*. (2002) results suggest the opposite. Kreider and Riphahn (2000) results indicate that women are more sensitive to benefit level changes whereas men are more sensitive to acceptance rate changes. In addition, both Kreider and Riphahn (2000) and our findings support that individuals respond more to increases than to decreases regarding the changes in benefit levels or acceptance rates.

Conclusion

In this paper, we carry out policy simulations based on the option value model of optimal timing of disability application in Burkhauser *et al*. (2003). We explore which policy measures are relevant for influencing the SSDI application timing and how they actually affect workers' behavior. For this, we use our option value model parameter estimates to predict application timing under hypothetical SSDI policy reforms. Three separate policy changes are considered: changes in the benefit levels, changes in acceptance rates, and universal employer accommodation. Our main contribution is to study the effects of policy changes on the speed of application. We claim that, from a policy analysis perspective, it is more relevant to focus on how the policy variables affect the distribution of spell length rather than the proportion of applicants.

In general, our simulation results provide evidence that application timing can substantially be affected by policy variables. We look at policy effects on application rates as well as on expected spell lengths. Our results show that time to application varies inversely with benefit levels and acceptance rates and that these policy changes will have substantial effects on SSDI caseloads. Higher benefit levels or acceptance rates lead to earlier applications. Employer accommodations appear to create a substantial delay in applications. The estimates for changes in benefit levels are generally small in relation to estimates reported in previous studies, while we predict larger effects of changes in acceptance rates. Moreover, our simulations provide evidence that men and women respond to variations in policy measures in different ways. In particular, women are less sensitive to policy reforms, and therefore, we would expect that the policy changes would have weaker effects on female participation rates.

The simulations in this paper offer a partial picture of the potential effects of reforms. First, because we do not control for possible endogeneity, our estimates of elasticities should be viewed as upper bounds. Second, we abstract from modeling decisions about returning to work, applying for retirement or other programs such as SSI, SSDI appeals, saving and labor supply choices. Third, we do not consider changes in labor market conditions due to different macroeconomic scenarios. A more complete model would incorporate actual macroeconomic cycles to refine the predictions of specific historical policy changes. Finally, we assume rational expectations, as there is no uncertainty about the future conditions in the economy even though we are analyzing a long time period. However, there is certainly a trade-off between the degree of reality of theoretical assumptions and computational tractability. Adoption of more detailed and complex models would capture the reality better compared to a partial analysis, but they pose other problems, as they require better micro data and computing resources.

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TABLES

Table 1: Literature review, simulation of changes in benefit levels

	Analysis	Elasticity
Leonard (1979)	Men aged 45-54 drawn from the 1972 Social Security Survey of Health and Work Characteristics.	elasticity of the proportion of beneficiaries with respect to the benefit levels = 0.35 - 0.44.
Parsons (1980a)	Men aged 45-59 drawn from 1966 National Longitudinal Survey. Probit model of 1969 labor force participation.	elasticity of non-participation with respect to replacement ratio = 0.63
Parsons (1980b)	Men aged 48-62 drawn from 1969 National Longitudinal Survey. Probit model of 1966 labor force participation.	elasticity of non-participation with respect to replacement ratio = 1.80
Haveman and Wolfe (1984a)	Men aged 45-62 drawn from 1978 Panel Study of Income Dynamics.	elasticity of labor force participation with respect to expected SSDI benefits = 0.006 to 0.021
Halpern and Hausman (1986)	Working age men and women drawn from 1972 Survey of Disabled and Non-Disabled Adults. SSDI application and labor supply estimated jointly.	elasticity of applications with respect to benefit levels = 1.1
Bound (1989)	Men aged 45-64 drawn from 1972 Survey of Disabled and Non-Disabled Adults and 1978 Survey of Disability and Work.	elasticity of non-participation with respect to replacement rates = 0.24 to 0.72
Burkhauser, *et al*. (1999)	Men drawn from 1978 Survey of Disability and Work (SDW) and 1992 Health and Retirement Study (HRS). SSDI application timing as a continuous time hazard model.	elasticity of proportion of applicants (SDW/HRS) 0.4/0.7 (5 years) 0.3/0.6 (10 years) 0.2/0.5 (15 years)
Kreider (1999)	Men aged 40-62 drawn from the Survey of Disability and Work. Application decisions are analyzed over the years 1970-1977.	elasticity of SSDI applications = 0.70
Kreider and Riphahn (2000)	Men and women from the 1992 Health and Retirement Survey. Application decisions are analyzed over the years 1986-1993.	elasticity of SSDI applications = 0.51 for men and 0.75 for women
Burkhauser *et al*. (2002)	Men and women drawn from the 1992 Health and Retirement Survey. Hazard model to estimate the duration to SSDI application.	elasticity of proportion of applicants (men/women) 0.9/1.5 (5 years) 0.7/1.2 (10 years) 0.6/0.9 (15 years)

Table 2: Literature review, simulation of changes in acceptance rates

	Analysis	Elasticity
Halpern and Hausman (1986)	Working age men and women drawn from 1972 Survey of Disabled and Non-Disabled Adults. SSDI application and labor supply estimated jointly.	elasticity of applications with respect to acceptance rates = 0.3
Parsons (1991)	Unpublished SSA data on initial state denial rates.	elasticity of SSDI applications with respect to changes in the initial denial rates = 0.4
Gruber and Kubik (1997)	Men aged 45-64 drawn from the National Health Interview Survey 1976-1978 and 1980-1982. The effect of changes in denial rates is analyzed over the years 1977-1980.	elasticity of non-participation with respect to changes in the denial rates = 0.28
Kreider (1999)	Men aged 40-62 drawn from the Survey of Disability and Work. Application decisions are analyzed over the years 1970-1977.	elasticity of SSDI applications = 0.63
Kreider and Riphahn (2000)	Men and women from the 1992 Health and Retirement Survey. Application decisions are analyzed over the years 1986-1993.	elasticity of SSDI applications = 0.67 for men and 0.26 for women
Burkhauser *et al*. (2002)	Men and women drawn from the 1992 Health and Retirement Survey. Hazard model to estimate the duration to SSDI application.	elasticity of proportion of applicants (men/women) 0.6/1.3 (5 years) 0.6/1.0 (10 years) 0.5/0.7 (15 years)

Table 3: Literature review, simulation of employer accommodation

	Analysis	Elasticity
Burkhauser *et al*. (1999)	Men drawn from 1978 Survey of Disability and Work (SDW) and 1992 Health and Retirement Study (HRS). SSDI application timing as a continuous time hazard model.	percentage decrease in the proportion of applicants = (SDW/HRS) 27%/33% (5 years) 18%/27% (10 years) 14%/23% (15 years)
Burkhauser *et al*. (2002)	Men and women drawn from the 1992 Health and Retirement Survey. Hazard model to estimate the duration to SSDI application.	percentage decrease in the proportion of applicants = (men/women) 62%/63% (5 years) 52%/51% (10 years) 43%/39% (15 years)

Table 4: Descriptive Statistics, by Gender

Variables		Men		Women	
		Mean	St.Dev.	Mean	St.Dev.
Spell length		4.035	3.751	3.469	2.905
Age at onset		45.326	9.624	45.201	8.905
SSA records available		0.833	0.373	0.805	0.396
Marital status		0.829	0.376	0.673	0.469
White		0.708	0.455	0.692	0.462
Black		0.194	0.396	0.221	0.415
Other Race		0.098	0.298	0.087	0.282
Education		11.059	3.467	11.487	2.580
White collar		0.149	0.356	0.134	0.341
Employer accommodation		0.270	0.444	0.266	0.442
Two Conditions		0.289	0.454	0.314	0.465
Three Conditions		0.177	0.382	0.191	0.393
Arthritis		0.084	0.278	0.172	0.378
Cardiovascular		0.287	0.453	0.105	0.307
Musculoskeletal		0.395	0.489	0.424	0.495
Other health condition		0.233	0.423	0.298	0.458
SSDI Allowance Rate[a]					
	Period 1	0.375	0.065	0.369	0.063
	Period 5	0.378	0.066	0.373	0.063
	Period 10	0.371	0.059	0.375	0.063
	Period 15	0.368	0.061	0.371	0.049
Expected Earnings[a,b]					
No application					
	Period 1	4.182	3.381	1.816	1.900
	Period 5	3.626	2.908	1.789	1.822
	Period 10	3.230	2.578	1.713	1.740
	Period 15	2.713	2.175	1.591	1.582
Applied and Rejected					
	Period 1	2.005	1.515	1.033	1.045
	Period 5	1.675	1.236	1.024	0.995
	Period 10	1.538	1.128	0.963	0.936
	Period 15	1.381	1.037	0.893	0.840
Applied and Accepted					
	Period 1	0.797	0.852	0.533	0.865
	Period 5	0.672	0.719	0.476	0.677
	Period 10	0.611	0.708	0.385	0.552
	Period 15	0.508	0.634	0.337	0.398
Expected Benefits[a,b]					
	Period 1	2.071	0.708	1.154	0.491
	Period 5	2.132	0.699	1.198	0.509
	Period 10	2.204	0.691	1.309	0.493
	Period 15	2.082	0.718	1.221	0.533
Number of Observations		592		493	

[a] Number of periods elapsed since the first period of eligibility after the onset of a work limiting health condition.

[b]All monetary values are in $1,000 (1967 dollars).

Source: Authors' calculations using HRS data.

Table 5: Distribution of Spell Length

	Men (N=592)				Women (N=493)			
Spell length	Apply	Censor	Hazard rate	Survival rate	Apply	Censor	Hazard rate	Survival rate
1	159	47	0.280	1.000	123	46	0.262	1.000
2	61	34	0.165	0.720	50	35	0.163	0.738
3	30	21	0.107	0.601	22	30	0.098	0.618
4	24	33	0.107	0.537	18	29	0.104	0.557
5	13	15	0.074	0.479	12	25	0.094	0.499
6	16	13	0.108	0.444	11	17	0.116	0.452
7	11	11	0.091	0.396	10	15	0.148	0.399
8	7	11	0.071	0.360	3	12	0.068	0.340
9	6	11	0.075	0.334	8	5	0.246	0.317
10	6	10	0.094	0.309	1	5	0.051	0.239
11	4	10	0.083	0.280	4	2	0.267	0.227
12	4	7	0.113	0.257	0	1	0.000	0.166
13	1	5	0.039	0.228	1	3	0.133	0.166
14	2	9	0.114	0.219	0	3	0.000	0.144
15	3	4	0.333	0.194	0	2	0.000	0.144
16	0	4	0.000	0.129	0	0	0.000	0.144
Total	347	245			263	230		

Source: Authors' calculations using HRS data.
Note: The hazard and survival rates correspond to Kaplan-Meier estimates of the time to application for SSDI.

Table 6: Option Value Estimation Results

Parameter	Men	Women
κ	1.509	2.007
	(12.145)	(25.598)
β	0.850*	0.850*
γ	0.456	1.678
	(9.045)	(22.708)
Education	0.238	0.114
	(11.408)	(4.047)
Married[a]	0.035	0.024
	(1.908)	(1.266)
Black[b]	-0.102	-0.080
	(-5.331)	(-3.842)
Accommodation	0.100	0.042
	(5.522)	(2.194)
White Collar	0.004	0.067
	(0.169)	(2.398)
Arthritis[c]	0.167	0.042
	(5.665)	(1.748)
Cardiovascular[c]	-0.086	0.016
	(-4.089)	(0.538)
Musculoskeletal[c]	0.057	0.091
	(3.082)	(4.551)
- log Likelihood	-1,108.966	-854.105
Sample size	592	493

Note: κ is the relative value of income in the non-work state to income in the work state, γ is risk aversion parameter of the utility function (with respect to income variability) where the coefficient of relative risk aversion=-(1-γ), and β is the discount factor.
* denotes the parameters that are set outside the model. T-values are in parentheses. All monetary values are in $1,000 (1967 dollars).
[a] The reference category is single.
[b] The reference category is all other races including white race.
[c] The reference category is all other health conditions.
Source: Authors' calculations using HRS data.

Table 7a: Simulated effects of increasing the benefit level by 10 percent

	Men				Women			
	Within 2 years	Within 10 years	Within 20 years	All periods	Within 2 years	Within 10 years	Within 20 years	All Periods
Proportion of applicants who exit	0.20	0.56	0.68	0.73	0.15	0.52	0.68	0.73
Percentage change	5.33%	3.34%	2.33%	1.90%	4.59%	2.72%	1.76%	1.37%
Expected spell length (years)				14.93				15.54
Percentage change				-3.22%				-2.30%

Source: Authors' calculations based on HRS data.

Table 7b: Simulated effects of decreasing the benefit level by 10 percent

	Men				Women			
	Within 2 years	Within 10 years	Within 20 years	All periods	Within 2 years	Within 10 years	Within 20 years	All periods
Proportion of applicants who exit	0.18	0.52	0.65	0.70	0.13	0.49	0.66	0.71
Percentage change	-5.31%	-3.44%	-2.42%	-2.00%	-4.03%	-2.51%	-1.67%	-1.31%
Expected spell length (years)				15.94				16.24
Percentage change				3.32%				2.15%

Source: Authors' calculations based on HRS data.

Table 8a: Simulated effects of increasing the acceptance rates by 10 percent

	Men				Women			
	Within 2 years	Within 10 years	Within 20 years	All periods	Within 2 years	Within 10 years	Within 20 years	All periods
Proportion of applicants who exit	0.22	0.58	0.70	0.74	0.16	0.53	0.69	0.74
Percentage change	15.67%	7.94%	4.73%	3.22%	10.77%	5.12%	3.00%	2.10%
Expected spell length (years)				14.34				15.24
Percentage change				-7.03%				-4.14%

Source: Authors' calculations based on HRS data.

Table 8b: Simulated effects of decreasing the acceptance rates by 10 percent

	Men				Women			
	Within 2 years	Within 10 years	Within 20 years	All periods	Within 2 years	Within 10 years	Within 20 years	All periods
Proportion of applicants who exit	0.17	0.50	0.64	0.70	0.14	0.49	0.66	0.72
Percentage change	-11.55%	-6.62%	-3.99%	-2.90%	-3.53%	-2.33%	-1.50%	-1.10%
Expected spell length (years)				16.33				16.21
Percentage change				5.86%				1.93%

Source: Authors' calculations based on HRS data.

Table 9: Simulated effects of universal employer accommodation

	Men				Women			
	Within 2 years	Within 10 years	Within 20 years	All periods	Within 2 years	Within 10 years	Within 20 years	All periods
Proportion of applicants who exit	0.15	0.47	0.60	0.66	0.12	0.46	0.63	0.69
Percentage change	-20.62%	-13.32%	-9.29%	-7.77%	-13.83%	-8.17%	-5.52%	-4.43%
Expected spell length (years)				17.41				17.04
Percentage change				12.89%				7.15%

Source: Authors' calculations based on HRS data.

Table 10a: Comparison with previous studies, proportion of applicants who exit

	Burkhauser *et al*. (1999)	Burkhauser, *et al*. (2002)	
	Men (SDW / HRS)	Men / Women	Men / Women
Benefit levels[a]			
within 5 years	0.43 / 0.71	0.88 / 1.48	0.42 / 0.34
within 10 years	0.32 / 0.58	0.74 / 1.18	0.33 / 0.27
within 15 years	0.23 / 0.48	0.60 / 0.86	0.28 / 0.22
Acceptance rates[a]			
within 5 years		0.59 / 1.30	1.09 / 0.71
within 10 years		0.56 / 0.98	0.79 / 0.51
within 15 years		0.45 / 0.71	0.62 / 0.41
Employer accommodation[b]			
Within 5 years	27% / 33%	62% / 63%	17% / 10%
Within 10 years	18% / 27%	52% / 51%	13% / 8%
Within 15 years	14% / 23%	43% / 39%	11% / 7%

[a] Elasticity of proportion of applicants who exit.
[b] Percentage change in the proportion of applicants who exit.

Table 10b: Comparison with previous studies, proportion of applicants who exit

	Kreider (1999)	Kreider and Riphahn (2000)	
	Men	Men / Women	Men / Women
Benefit levels[a]			
% increase within 8 years	0.70	0.51 / 0.75	0.37 / 0.30
% decrease within 8 years	-0.86	-0.46 / -0.64	-0.38 / -0.28
Acceptance rates[a]			
% increase within 8 years	0.63	0.67 / 0.26	0.92 / 0.58
% decrease within 8 years	-0.71	-0.60 / -0.14	-0.76 / -0.25

[a] Elasticity of proportion of applicants who exit.

FIGURES

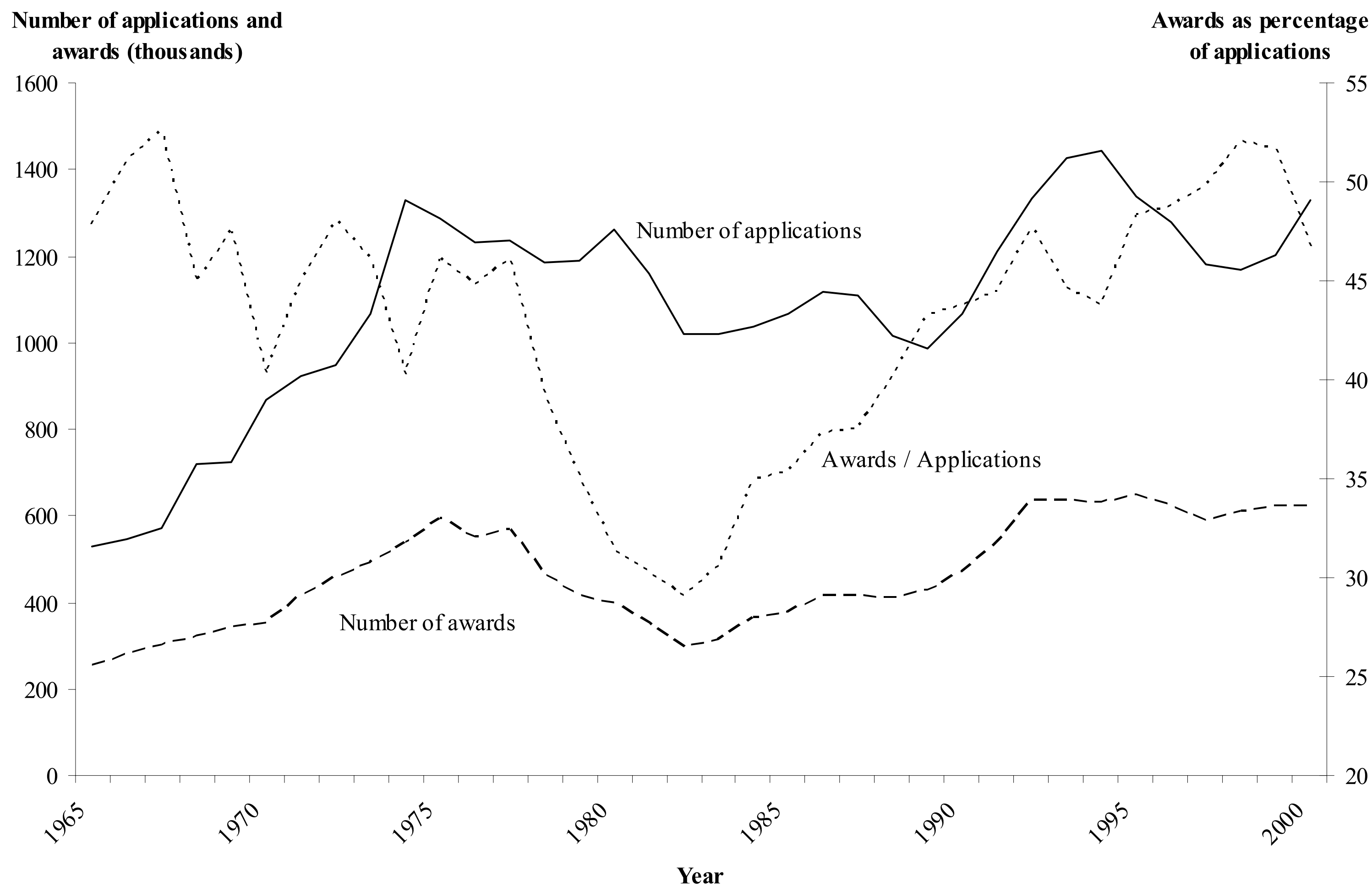

Figure 1: SSDI Program 1965-2000, number of applications and awards, and awards per applications.
Source: Office of the Actuary, SSA.

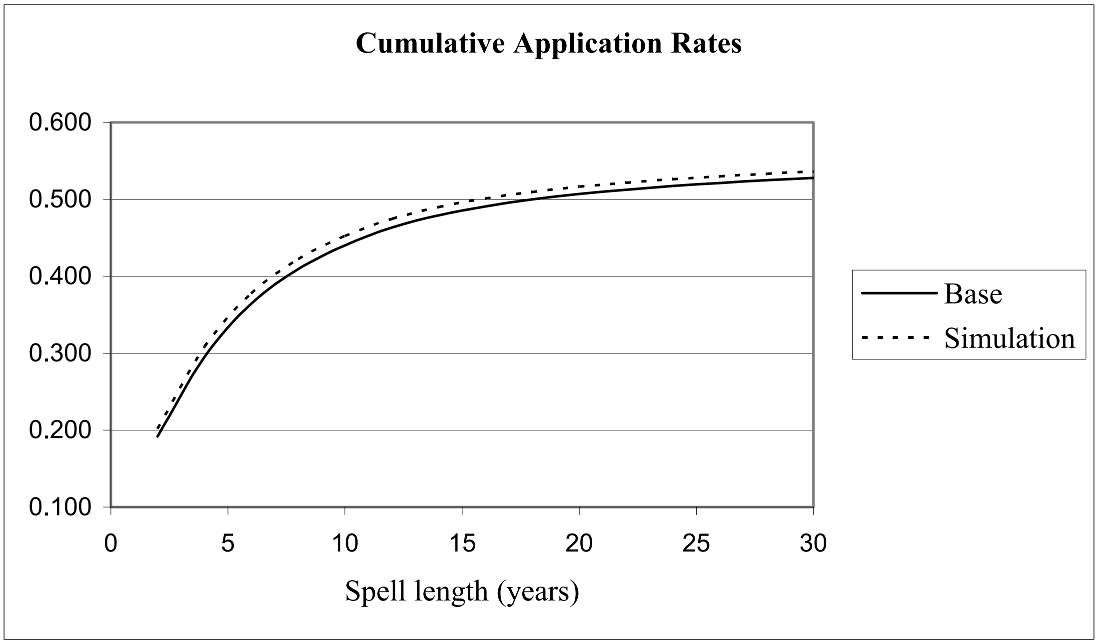

Figure 2a: Simulated effects of increasing the benefit level by 10 percent, Men

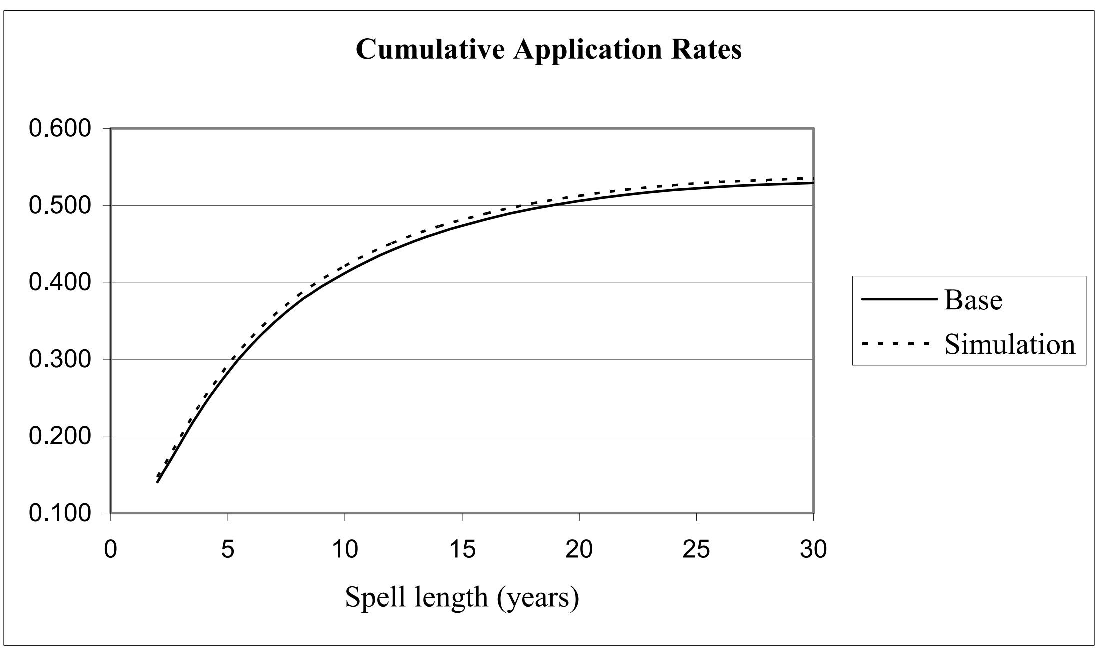

Figure 2b: Simulated effects of increasing the benefit level by 10 percent, Women

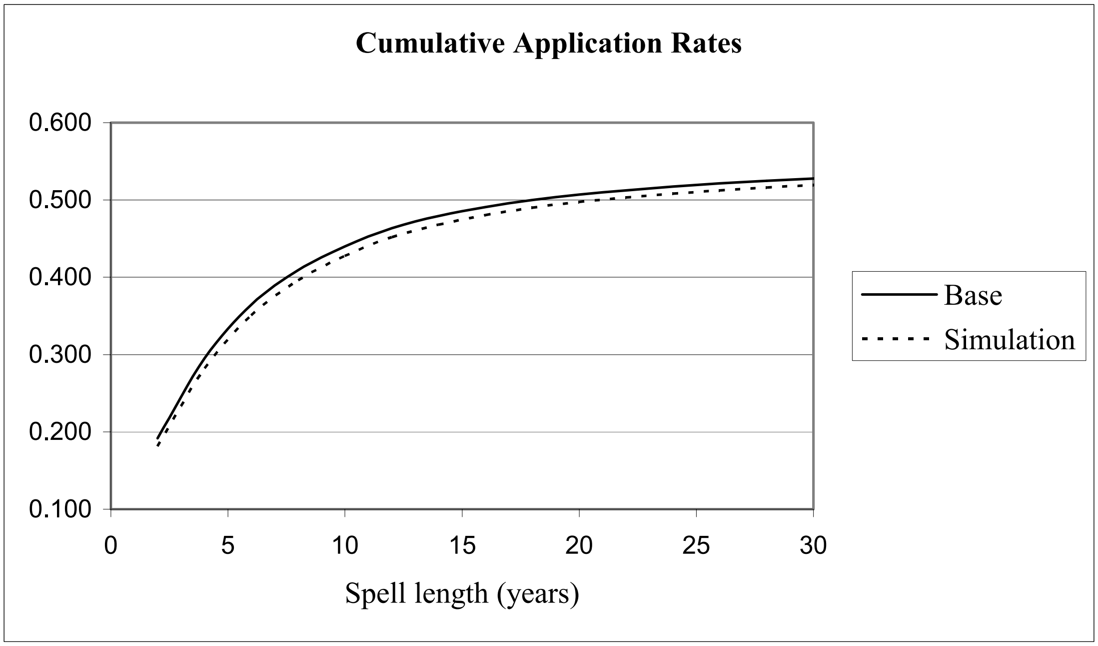

Figure 3a: Simulated effects of decreasing the benefit level by 10 percent, Men

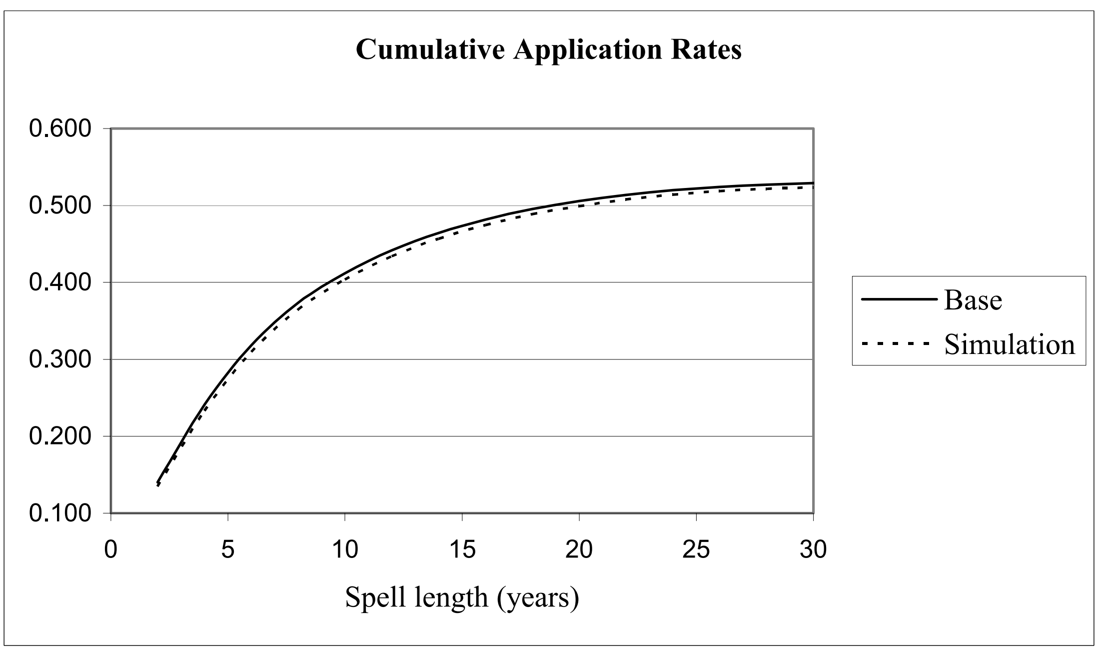

Figure 3b: Simulated effects of decreasing the benefit level by 10 percent, Women

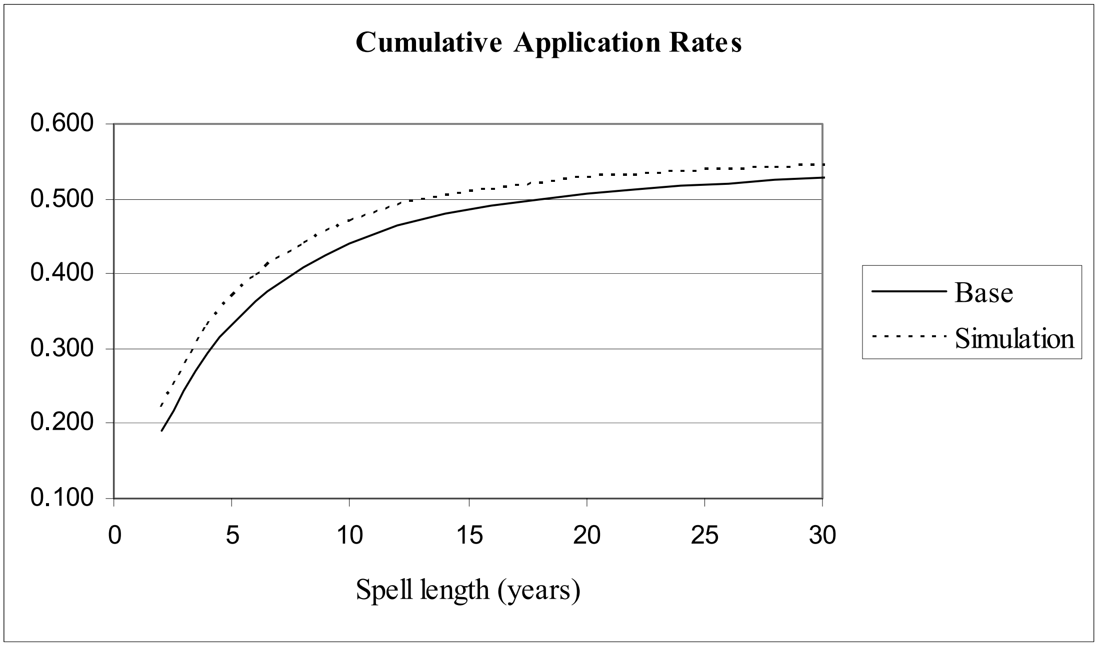

Figure 4a: Simulated effects of increasing the acceptance rates by 10 percent, Men

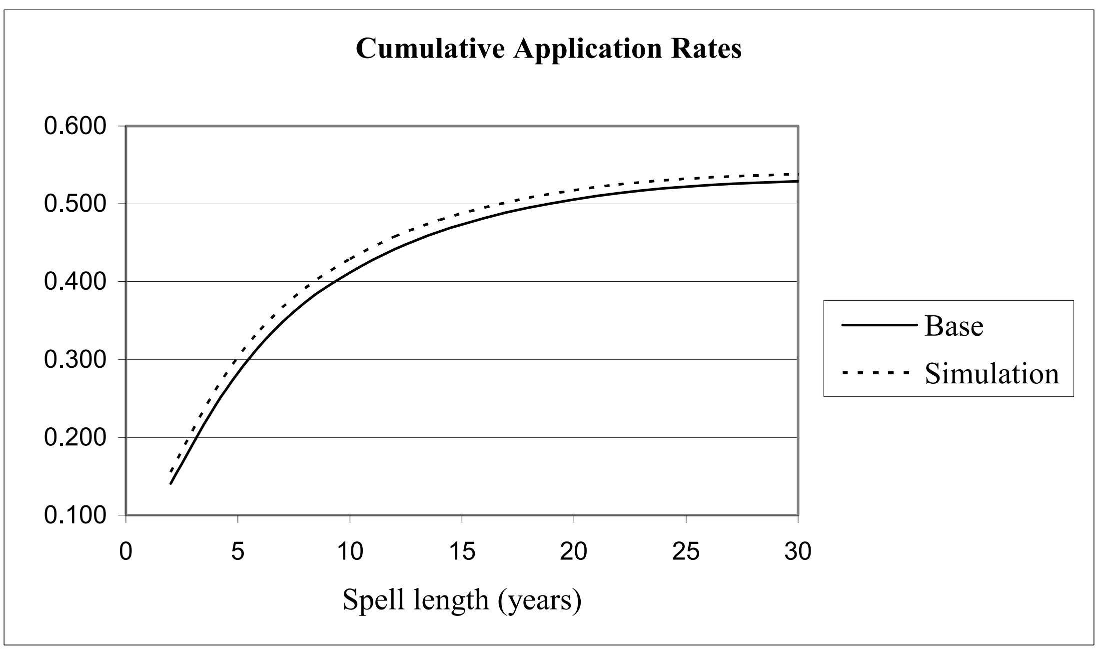

Figure 4b: Simulated effects of increasing the acceptance rates by 10 percent, Women

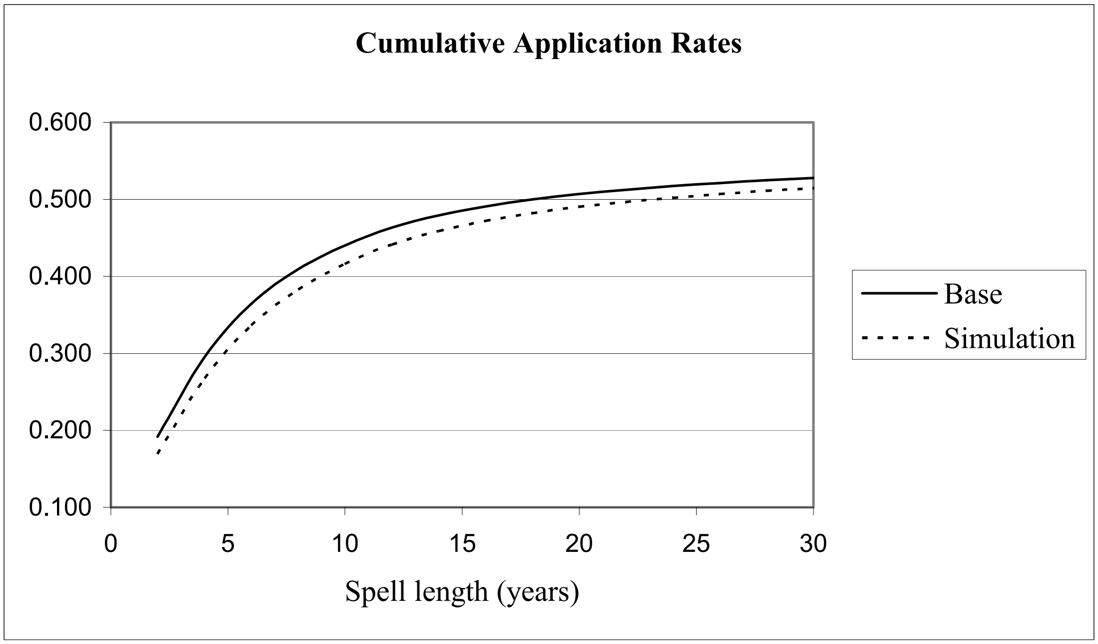

Figure 5a: Simulated effects of decreasing the acceptance rates by 10 percent, Men

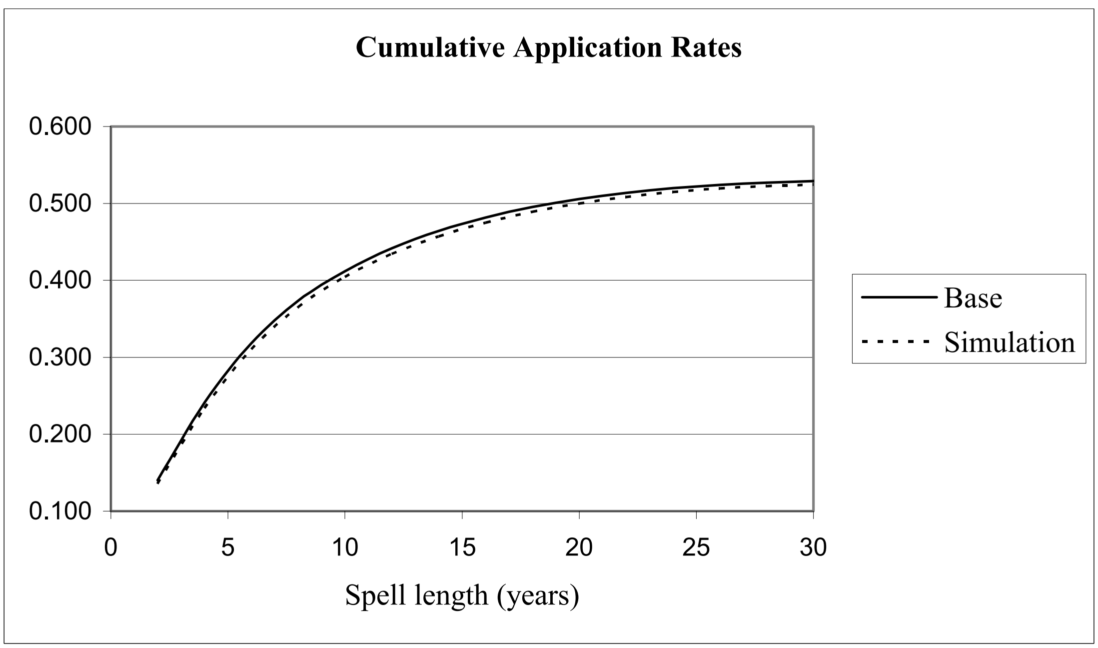

Figure 5b: Simulated effects of decreasing the acceptance rates by 10 percent, Women

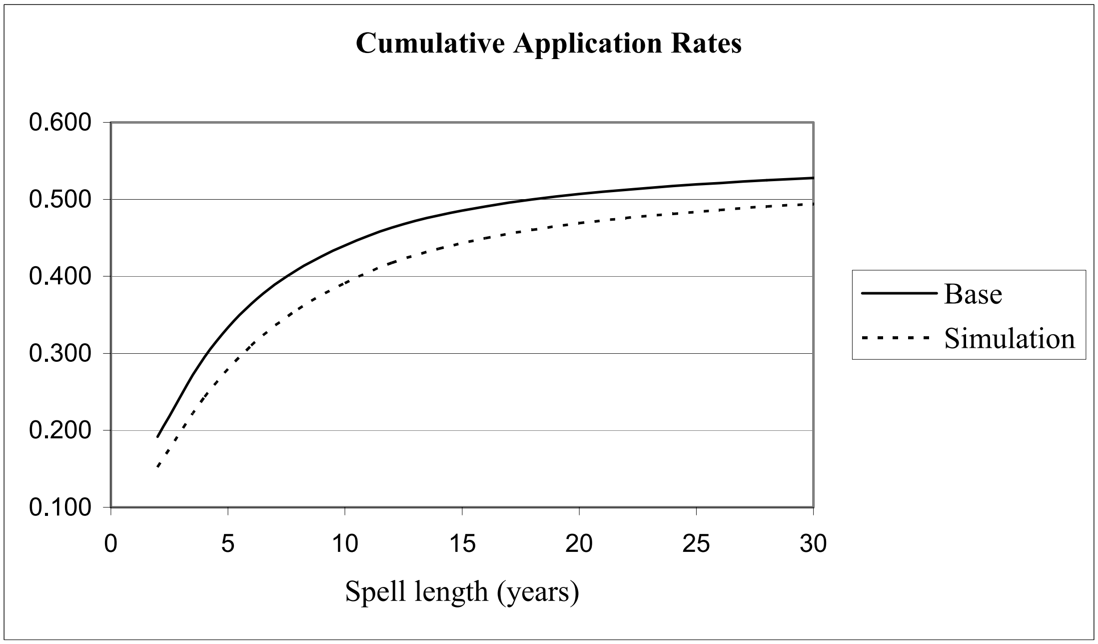

Figure 6a: Simulated effects of universal employer accommodation, Men

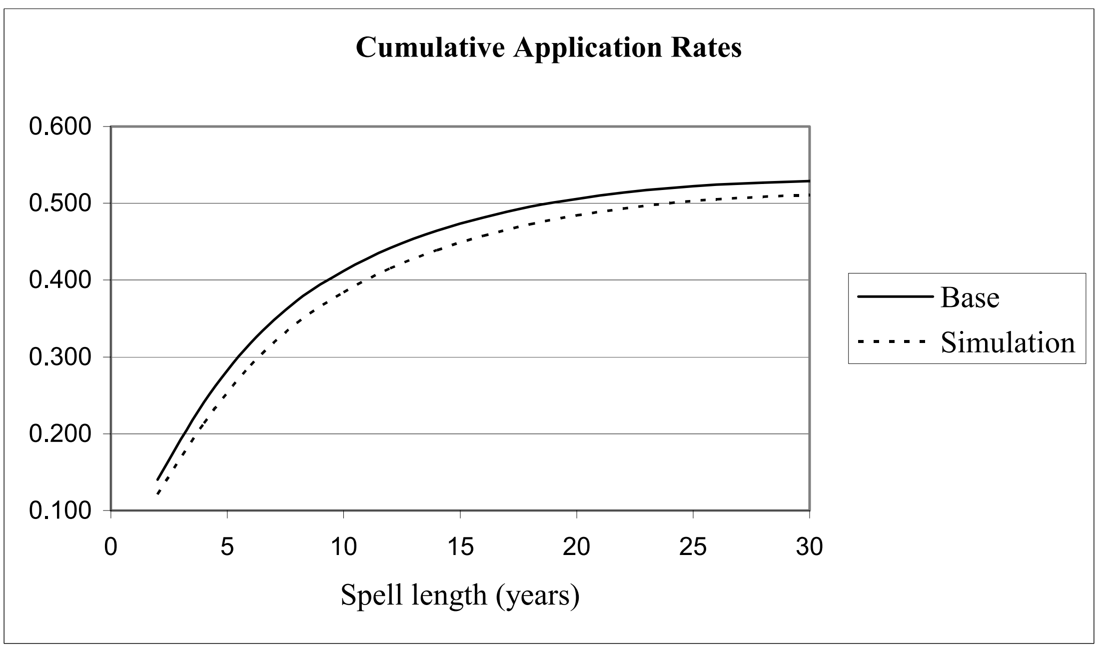

Figure 6b: Simulated effects of universal employer accommodation, Women

Endnotes

[1] For a detailed discussion of these historical trends, see Bound and Burkhauser (1999), Mashaw and Reno (1996), Rupp and Stapleton (1995), and Stapleton and Burkhauser (2003).

[2] In our modeling, we do not consider this "unintended consequence" of the ADA. See Stapleton and Burkhauser (2003) for a review of this literature and further discussion.

[3] See also Samwick (1998) which focuses on the effect of Social Security benefits as well as pension plans on the retirement timing using again an option value model.

[4] These restricted access records can be obtained under certain conditions from the HRS staff at the Institute for Social Research (ISR) at the University of Michigan. See http://www.umich.edu/~hrswww/ for more information.

[5] The restricted HRS data set Wave 1 Geographic Indicators Version 1.0 file provides state geographic identifier variables from HRS Wave 1, including information on Wave 1 state of residence and state or country of birth. These variables are masked in the public HRS files. We obtained special permission from the HRS staff at the ISR at the University of Michigan to be able to merge the geographic state identifier variables with the Lewin Group Public Use File on allowance rates.

[6] We excluded individuals with a missing onset or SSDI application date, or with missing SSDI application or award status information. We kept those with an onset date after 1950 and before age 61. Finally, only those who were eligible for SSDI benefits in at least one period following onset were kept in the final sample. Those who became eligible after 1993 were also dropped from the analysis since it was not possible to observe them applying for SSDI.

[7] For a detailed description of the entire list of variables included in the analysis, see Burkhauser *et al*. (2003).

[8] Details of the PIA computation rules can be found in the Annual Statistical Supplement to the Social Security Bulletin. The benefit computation is described in detail in an unpublished data appendix (see Gumus, 2002).

[9] Additional simulation results for combinations of policy changes are available upon request.

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