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University of Pennsylvania, Wharton

(David Autor, Jonathan Gruber, and NBER)

"Moral Hazard and Claims Deterrence in  
Private Disability Insurance"

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1:20 to 2:50pm

Location: HC 3B

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# **Moral Hazard and Claims Deterrence in Private Disability Insurance\***

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*Preliminary and Incomplete*

We provide a detailed analysis of the incidence, duration and determinants of claims made on private Long Term Disability (LTD) policies using a database of approximately 10,000 policies and 1 million workers from a major LTD insurer. We document that LTD claims rates are much lower than claims rates on the public analogue to LTD, the Social Security Disability Insurance program, yet LTD policies have a much higher return-to-work rate among initial claimants. Nevertheless, our analysis indicates that the impact of moral hazard on LTD claims is substantial. Using within firm, over time variation in plan parameters, we find that a higher replacement rate and a shorter waiting time to benefits receipt—also known as the Elimination Period or EP—significantly increase the likelihood that workers claim LTD. Only one-third of the effect of a longer EP is due to censoring of shorter claims, while the remainder is due to deterrence: workers facing a longer EP are less likely to claim benefits for impairments that would lead to a only a brief period of LTD receipt. This deterrence effect is equally large among high and low income workers, suggesting that moral hazard rather than liquidity underlies the behavioral response. Consistent with this interpretation, the response of LTD claims to plan parameters is driven primarily by the behavior of the healthiest disabled, those who would return to work after receiving LTD.

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One of the most significant threats to economic security facing working Americans is the risk of career ending disability. The U.S. Social Security Administration estimates that a 20-year-old U.S. worker has a three in ten chance of experiencing a disability that limits work for at least six months prior to reaching full retirement age.<sup>1</sup> Recent data from the Current Population Survey indicate that 6.4 percent of adults between the ages of 25 and 64 are out of the labor force because of a disability. An additional 4.0 percent of adults in this age range report that a disability limits the kind or amount of work that they can perform. These rates are similar for men and women and they increase steadily with age. For example, adults between the ages of 55 and 64 are four times as likely as adults ages 25 to 34 to be out of the labor force as a result of a disability.<sup>2</sup>

The U.S. government provides public insurance against disabilities that preclude gainful employment through its Social Security Disability Insurance (DI) and Supplemental Security Income (SSI) programs. These are very large programs, with the 12 million recipients of SSDI and SSI between the ages of 25 and 64 receiving total cash benefits of \$150 billion in 2010, as well as an equal amount of health insurance benefits through the Medicare and Medicaid programs. Yet these federal programs provide incomplete insurance because their acceptance rates are low (about one-half) and their replacement of pre-disability earnings is only partial. Average after-tax replacement rates are approximately 50 percent, with lower replacement rates for higher income workers. The Social Security claims administration process is slow and litigious. Although first round disability determinations are usually rendered within six months

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<sup>1</sup> U.S. Social Security Administration (2011)

<sup>2</sup> Results from authors' tabulations of March CPS

of application, almost half of all awards are made on appeal, which adds one to three years to the determination process. Applicants do not receive cash or medical benefits until their claim is awarded but they must remain out of the labor force for the duration of the application since substantial labor force participation would lead to summary denial of a disability award.

Due to the many limitations of the public disability programs—particularly for workers with high earnings as well as those who wish to remain employed despite work limitations—many private employers in the U.S. offer long term disability insurance (LTD). Approximately one-third of civilian workers are eligible for coverage through private LTD provided by their employers that supplement the public programs. Take-up rates for this coverage are close to 100 percent. These employer-provided LTD programs tend to have less stringent (although still quite rigorous) rules for qualification for benefits. They offer higher replacement rates than the public disability programs as well as much more intensive strategies for returning disabled workers to work. And, importantly, they appear to have better outcomes, both in terms of a lower incidence of claims and a higher rate of returning to work after claiming.<sup>3</sup>

Despite the importance of this private disability option, we know very little about the characteristics and impact of such plans. This paper begins to address this deficiency by analyzing for the first time in the economics literature a detailed database of private LTD claims. The data come from a major provider of private disability insurance coverage in the U.S. This firm provided to us a universe of wage records and claims data from a large component of their business that contains seven years of data (2000 through 2006) for a sample of more than forty-

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<sup>3</sup> Distinct from the federal disability programs, LTD policies provide rapid, in-work assistance to workers who develop work limitations, and these early interventions may reduce the rate at which work limitations become career-ending disabilities. Recognizing this potential, Autor and Duggan (2010) propose piloting a variant of the public SSDI program where private LTD is offered as a “transition state” for disabled workers in the hope that in-work assistance provided by LTD policies may obviate the need for some claimants to exit the labor force and enter the SSDI program.

thousand unique employers. Our database includes data on employment, earnings and LTD claims at the person-quarter level for workers in insured employment. After various sampling restrictions we have nearly eight million quarterly employment observations in our analysis sample.

We first use these data, along with nationally representative data from the Bureau of Labor Statistics (BLS) on civilian workers' private long-term disability coverage, to document some key facts about private LTD. We document that LTD claiming rates in our sample are much lower than claiming rates for SSDI and yet there is a much higher return-to-work rate among new LTD recipients than among those receiving benefits from the SSDI and/or SSI programs.

We next use these data to provide insight into the critical question of the moral hazard impacts of DI programs. We match individual LTD claims records to data on potential benefit generosity under the relevant LTD plans, and exploit variation both across and within firms in the LTD policy replacement rate, maximum monthly benefit and elimination period or EP (the amount of time that must elapse before benefits can commence). This setting allows us to estimate how plan parameters affect claims rates, claims durations and the composition of claims to provide an overall picture of how responsive LTD claims are to incentives and to explore some of the economic mechanisms behind these behavioral responses. While likely not perfectly predictive of behavioral responses to public disability insurance programs (due to the differing characteristics of LTD enrollees), these results offer some insights into the likely magnitude of such responses.

We find that a higher policy replacement rate significantly increases the likelihood that a person claims LTD benefits. This effect is driven by variation in the maximum monthly benefit, as workers whose benefits are capped are much less likely to claim LTD benefits than otherwise

similar workers with whose benefits are not capped by their policies. Our estimate of the elasticity of LTD claiming with respect to the replacement rate is sizable, equal to approximately 0.5 - 0.6. We also find that plans with higher replacement rates have lower exit rates from benefits receipt, but the relationship is not statistically significant. In addition, the impact of a higher replacement rate on the frequency of LTD claims is driven primarily by increases in the claims rate of the healthiest claimants, those who return to work after receiving LTD. This result is consistent with the theoretical predictions in Autor and Duggan (2003) that the health of the marginal disability insurance claimant is much higher than the health of the average claimant.

Our most striking results concern the impact of the elimination period (EP) on the frequency, composition and duration of LTD claims. A longer EP may affect both claims rates and claims durations through two channels. A first is censoring of shorter claims. For example, claims for impairments that last between 90 and 179 days will not be observed in plans with an 180 day EP but will be observed on plans with a 90 day EP. The second channel is deterrence: workers on plans with a longer EP may decline to claim benefits for impairments expected to have a modest duration—for example, those exceeding the EP by only one quarter—because the obligatory loss in earnings during the EP may make claiming unattractive relative to continuing to work.

Our analysis finds an economically large and statistically robust effect of the EP on the frequency of claims. A 90 day reduction in the elimination period, from 180 days (used by 34 percent of the firms in our sample) to 90 days (used by 63 percent of the firms in our sample), leads to a near doubling of the LTD claims rate. Only about one-third of this effect is due to censoring, while the remaining majority is due to deterrence.

This deterrence channel in turn affects the composition and duration of realized LTD claims. We estimate that the marginal claimants deterred by a longer EP are those who are most likely to

complete their disability spell within our five-year sample window and return to the workforce. By contrast, the incidence of LTD claims which ultimately lead to an SSDI award—generally the most severe disabilities—is unaffected by the length of the EP. This is consistent with the expectation that deterrence should primarily affect claims for less severe disabilities; for acute disabilities where labor force withdrawal is non-elective, deterrence should not (and does not appear to) play a role. Complementing this result, we find a striking *positive* relationship between the elimination period and the duration of LTD claims paid: plans with longer EPs have claims of substantially greater duration. We also show that the deterrence effect of the elimination period does not simply reflect liquidity constraints: the effect is present for both higher and lower income workers. Rather, it appears more consistent with “forward-looking” moral hazard behavior.

Our paper proceeds as follows. Section 1 provides background on private LTD in the U.S. and its interaction with publicly financed DI. Section 2 describes our data and empirical strategy. Section 3 presents our results for the incidence of claims, while Section 4 focuses on the interesting implications of the elimination period results, and Section 5 examines the duration of claims. We conclude in Section 6 with the implications of our findings for both LTD and DI policy.

## **1. Employer-Provided Long Term Disability Coverage**

Private employer-provided LTD coverage insures workers against the risk of long-term disability. In certain respects, the financial risk of long-term disability is even greater than the financial risk of death, as an individual would still incur housing, food, and related costs in the event of disability as well as substantial increases in healthcare costs. Since disability

substantially reduces labor income without reducing living costs, consumption declines by an average of more than 20 percent following the onset of disability (Meyer and Mok, 2008).

The typical LTD policy can be described with three parameters. The elimination period represents the number of days that must elapse between the onset of disability and the first day of benefit payment. The replacement rate is the ratio of LTD benefits to the worker's average earnings prior to the disability (though the period over which earnings are calculated can vary across policies).<sup>4</sup> Finally, the maximum monthly benefit places a cap on a policy's allowed benefit payments per month, which cause workers with higher earnings to face an effective replacement rate that is below their policy's nominal replacement. All else equal, plans with shorter elimination periods, higher replacement rates and higher maximum monthly benefits are more generous.<sup>5</sup> In contrast, all workers insured for disability through the public SSDI program face an identical elimination period (5 months), benefits formula, and maximum monthly benefit.

Many firms that offer LTD coverage also offer short-term disability (STD) coverage. STD benefits are paid if a worker is out of work due to illness or disability for a period that exceeds the number of sick days available to her. A firm offering both STD and LTD might pay benefits initially through STD and then subsequently to LTD to the same worker. And of course, the generosity of benefits between the two plans need not be the same.

The 32 percent coverage rate among civilian workers in employer-provided LTD policies is lower than for employer-provided health insurance (56 percent), life insurance (60 percent), or

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<sup>4</sup> The vast majority (93 percent) of employer-provided LTD policies have a constant replacement rate (unless the worker reaches the maximum monthly benefit) as opposed to a progressive schedule like the SSDI program.

<sup>5</sup> LTD plans can also differ with respect to their medical eligibility criteria, primarily in terms of their treatment of so-called subjective and non-verifiable disorders, which may include mental health disorders and soft tissue pain. Notably, even within the SSDI program, which has nominally uniform eligibility criteria nationwide, there is substantial variation across disability examiners and administrative law judges in their interpretation of the program's eligibility criteria (Maestas et al, 2011; French and Song, 2011).

retiree benefits (57 percent) but substantially higher than for employer-provided long-term care insurance (16 percent) or retiree health benefits (26 percent). Employer-provided LTD coverage is also somewhat less common than employer-provided dental insurance (38 percent) but more common than comparable vision coverage (22 percent). According to the most recent BLS data, employers pay the full premium for the vast majority (90 percent) of the 40 million civilian workers with LTD coverage (U.S. Department of Labor, 2009).

#### *Characteristics of Workers Covered by Employer-Provided LTD*

Rates of employer-provided LTD coverage vary significantly with worker characteristics, as illustrated in Table 1 from BLS (U.S. DOL, 2009). For example, full-time workers are six times as likely as part-time workers (41 percent versus 7 percent) to be covered by an employer's LTD policy while those in "Management, business, and financial" occupations are twice as likely as those in production jobs to have LTD coverage. Interestingly, there is almost no difference between workers covered by a union (34 percent) and their counterparts without union coverage (31 percent). Workers in the top ten percent of the wage distribution are eleven times as likely as those in the bottom tenth to be covered (57 percent versus 5 percent), while workers in firms with 500 or more workers are more than twice as likely to be covered as those in firms with fewer than 50 employees. Measured at the level of the census region, there is relatively little geographic variation in employer-provided LTD coverage, with the highest region (East North Central) at 36 percent and the lowest (Pacific) at 28 percent. This pattern is generally consistent with the findings from Levy (2004), who used individual-level data from a supplement to the Current Population Survey in 1993 to investigate the characteristics of those with employer-provided LTD coverage.

### *Characteristics of LTD Policies*

There is substantial cross-employer variation in the generosity of LTD policies. This variation is most apparent in the maximum monthly LTD benefit. As shown in Table 2, among those LTD policies with a maximum monthly benefit, the 90<sup>th</sup> percentile monthly maximum is \$15,000 versus a 10<sup>th</sup> percentile of just \$3,000 per month.<sup>6</sup> This latter amount, at the lower end of the LTD generosity distribution, actually exceeds the maximum benefit possible from today's SSDI program and thus suggests that potential private LTD benefits are substantially higher than potential SSDI benefits for many workers, especially those with high incomes.<sup>7</sup>

The lower panel of Table 2 highlights the substantial variation in replacement rates across LTD policies, though this variation is much less pronounced than for maximum benefits. Approximately two-thirds (59 percent) of workers face a policy replacement rate of 60 percent, and an additional 19 percent are in policies with replacement rates of 61 to 67 percent. Just 2 percent of policies have a replacement rate of more than 67 percent while approximately one-in-five (21 percent) are below 60 percent. Further examination of the BLS data (not tabulated) reveals that the average replacement rate is almost identical across demographic groups. For example, the average replacement rate is 59 percent for both full-time and part-time workers and is also 59 percent for workers in the first, second, third, and fourth quintiles of the earnings distribution.<sup>8</sup>

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<sup>6</sup> Approximately one-fifth (22 percent) of those surveyed in this BLS report do not report a maximum monthly benefit. A firm with few high-wage workers might not need to have a maximum monthly benefit given that benefits would effectively be capped at 60 to 67 percent of earnings for the highest-paid worker.

<sup>7</sup> Social security taxes are paid on only the first \$106,800 in earnings. Due to the progressive 90-32-15 formula, even a person above this threshold in all earnings years would have a potential SSDI benefit of less than \$3,000 per month.

<sup>8</sup> The BLS data unfortunately do not have comparable information on the elimination period.

### *Comparison with SSDI*

There are several key contrasts between private LTD insurance and its public sector counterpart, the Social Security Disability Insurance program (SSDI).<sup>9</sup> SSDI is one of the nation's largest social insurance programs, with cash expenditures of \$128 billion in 2010 and an additional \$80 billion in Medicare expenditures. SSDI provides disability compensation to those with previous labor force attachment who are no longer able to engage in "substantial gainful activity." After a waiting period (equivalent to an elimination period) of five months since disability, individuals may apply to a local Social Security Administration (SSA) field office for SSDI benefits. If approved, the individual receives a monthly Social Security disabled worker benefit until reaching the full retirement age. SSDI recipients also qualify for health insurance coverage through Medicare two years after the onset of the disability.<sup>10</sup> If an SSDI applicant is denied, he or she can appeal the case through both administrative and judicial channels. Among those applying for SSDI disabled worker benefits in 2006, approximately one-third (34 percent) were approved initially. Of those rejected, more than half (53 percent) appealed with the majority (64 percent) of those appealing awarded benefits at a subsequent stage. Thus 56 percent of SSDI applicants ultimately qualify for the program (SSA, 2010).

Although SSDI is a public program, workers pay for it directly through their payroll taxes. For example, a worker with median earnings (approximately \$32,000 in 2009) pays an effective

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<sup>9</sup> We compare LTD to SSDI rather than SSI because SSDI, like LTD, is an insurance program that workers become eligible for through employment. By contrast, SSI is an entitlement that does not depend on employment history and primarily serves those with limited labor force experience.

<sup>10</sup> After reaching full retirement age, the SSDI beneficiary transitions onto standard Social Security retirement. The beneficiary's cash and Medicare benefits remain unchanged at the transition.

premium of approximately close to \$600 for SSDI coverage.<sup>11</sup> Notably, annual premiums for LTD coverage—which average approximately \$250—are substantially lower than the effective premium that workers pay for SSDI coverage.<sup>12</sup> Moreover, the true disparity is likely even larger because workers with LTD coverage tend to have above average incomes, meaning that their effective SSDI premiums are higher than for the median worker. However, it is important to recognize that LTD is an add-on rather than a replacement for SSDI. If an individual obtains an SSDI award while also receiving LTD—which occurs in 41 percent of the claims in our sample—the LTD policy offsets these SSDI benefits one-for-one.

A second important contrast between LTD and SSDI plans is the earnings information used to calculate benefits. The cash benefit under an LTD policy is almost determined using only the worker's most recent earnings. SSDI, in contrast, uses a worker's average indexed monthly earnings (AIME) during her working years when calculating her benefit. SSA then uses a progressive benefit formula to calculate the worker's Primary Insurance Amount (PIA), which is her monthly benefit in the first year of benefit receipt. This PIA is then adjusted for inflation in each subsequent year.

Figure 1 compares potential SSDI benefits with potential benefits for the average employer-provided LTD policy (60 percent replacement rate and maximum monthly benefit of \$7,000). For simplicity, we abstract from the difference between recent monthly income and a worker's AIME by assuming that they are equal. As this figure shows, workers with relatively lower incomes of \$1500 per month or less can receive a higher benefit from SSDI than from private

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<sup>11</sup> The SSDI portion of Social Security's 12.4 percent payroll tax rate is 1.8 percent, which would imply \$576 in annual SSDI taxes for this worker. The SSDI program is currently running a large deficit, however, with SSDI benefits 31 percent greater than tax revenues received. Multiplying \$576 by 1.31 yields \$755, a number that is much closer to an actuarially fair premium (though private LTD policies are likely somewhat higher than actuarially fair, reflecting the insurer's load).

<sup>12</sup> Author tabulations from BLS (2010) data.

LTD coverage. However, for incomes above this amount, the LTD benefit is larger with this gap growing with income. For example, a worker with income of \$30,000 per year has a replacement rate of 52 percent with SSDI versus 60 percent with employer-provided LTD. The corresponding difference for a worker with income of \$100,000 per year is 25 percent versus 60 percent. It is therefore not surprising that high-income workers are much more likely to receive private LTD coverage.

Appendix Table 1 compares the characteristics of disabled workers receiving LTD benefits (both long term and short term) and those receiving SSDI, using data from the March CPS in 2009 and 2010.<sup>13</sup> The age distributions of the two populations are similar, but those receiving LTD have significantly higher education and also higher family incomes than those receiving SSDI alone.

While there is little academic work on LTD, there is a large academic literature on SSDI (see Autor and Duggan 2006 for an overview). The general consensus of this literature is that applications to SSDI and labor force decisions are sensitive to both program parameters (benefits and especially medical eligibility criteria) and outside opportunities (economic conditions and potential earnings). Gruber (2010) concludes, however, that the elasticity of labor supply with respect to SSDI benefits appears lower than is true of other social insurance programs such as Unemployment Insurance or Workers Compensation. This lower elasticity is logical given that workers who take-up SSDI benefits must exit the labor force on a long term (typically permanent) basis whereas these other benefits programs provide immediate access to short-term income replacement.

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<sup>13</sup> While eligibility for LTD has not been asked by the CPS since 1993, each March's supplement includes information on LTD receipt.

Given that more than 40 million workers in the U.S. are covered by employer-provided LTD policies, and that these policies may potentially affect labor supply and SSDI receipt, the absence of economic analysis of LTD is a noteworthy omission in the literature—most likely explained by the absence of public use data on LTD policies, insured, and claimants. We begin to address this knowledge gap in the analyses that follows.

## **2. Construction of the Analytic Sample**

Our analysis exploits a unique administrative database containing LTD policies and claims for a major provider of private disability insurance in the U.S. This dataset includes the universe of LTD policies offered by this insurer over the 2000 through 2006 period to firms that are “list billed,” that is billed separately for each employee, rather than receiving one aggregate bill for all employees. List-billed firms tend to be somewhat smaller firms than average among the set of firms covered the insurer.<sup>14</sup> Our data are quarterly; since many of key independent variables will depend on lagged earnings (as described below), our final sample period is 2000:Q3 to 2006:Q4. This analysis never made use of individual identifiers in the data other than to link records over time.

We begin with a sample of 21.91 million person-quarters of private LTD enrollment or benefit receipt during this 6.5-year period in list-billed LTD plans that have non-missing data. Because our initial focus is on claims incidence rather than claims durations, we drop observations for an individual after his/her first quarter of benefit receipt (100,136 observations),

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<sup>14</sup> Our baseline sample of list-billed enrollees accounts for less than one-fifth of the insurer’s enrollees. Non list-billed firms, which are typically large firms, do not report detailed data age and salary data for each insured worker to the insurer but instead report a count of insured workers. Because the insurer obtains detailed data on only the workers at these firms who file claims, these data unsuitable for our analysis.

though we conduct a separate duration analysis in the final empirical section. We next drop observations that are missing wage data. Given that we control for wages using the preceding two quarters of earnings, this leads us to drop all employees in the first two quarters that a firm appears in the data and new employees for their first two quarters of coverage. This reduces our sample size from 21.81 million person-quarters to 15.62 million person-quarters.

There are 42,844 unique firms represented in this sample and 55,802 unique combinations of firm, division, and class, which represent the unit at which group private LTD policies are typically purchased from this insurer. Within a particular firm, there may be multiple divisions if there are two or more facilities in different locations. Similarly, within a firm-division, there may be different classes if, for example, there are both full-time workers and part-time workers who are covered by different policies.

We make four further restrictions in constructing the final analytic sample. First, we drop those firm-division-class combinations with fewer than 25 enrollees at some point during the sample period since, for very small firms, there is likely to be a greater vulnerability to endogenous changes in plan parameters. Consider the extreme case: an employer with just one enrollee. In this case, the employer might acquire more generous coverage in response to a recent (or predictable) change in health status. This criterion reduces our sample size to 8.91 million observations.

We next drop observations for those firm-division-class combinations that provide their employees with a choice between multiple plans at some point during our sample period. We do this because workers will likely sort across policies in response to their own perceived probability of claiming. This reduces our sample size to 8.30 million observations. We restrict attention to non-elderly adults between the ages of 18 and 64. And finally, we drop individuals in

the top 1 percent or bottom 1 percent of the year-specific earnings distribution, thereby excluding workers with annual earnings of less than 12 thousand dollars or more than 250 thousand dollars in the typical year. This leaves us with a final sample of 7.99 million person-quarter observations representing 9,580 unique firm-division-class combinations and 1.02 million unique workers.

Summary statistics for the sample (Table 3) show that the average worker in our sample is 41.6 years old, 52.9 percent are males, and mean and median monthly salaries are \$4,014 and \$2,691 respectively. More than half (53.5 percent) of workers are in services, with the next most common industries being manufacturing (15.2 percent), finance, insurance, and real estate (10.2 percent), and wholesale trade (8.9 percent).<sup>15</sup> The sample is quite geographically dispersed, with all fifty states represented and the two most common states being California and New York (not tabulated).

One particularly noteworthy fact revealed by the table is that the incidence of LTD claims quite low at 0.09 percent per quarter—that is, less than 1 tenth of 1 percentage point.<sup>16</sup> This is 40 percent lower than the average SSDI award rate of approximately 0.15 percent per quarter for insured workers.<sup>17</sup> As we show in our duration analyses below, the difference in exit rates between SSDI and private LTD recipients is even greater than this entry rate difference. For example, while the quarterly exit rate from SSDI (excluding deaths and conversions to retired

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<sup>15</sup> Although LTD coverage rates are comparable in service and manufacturing sectors (Table 1), services is a numerically larger sector.

<sup>16</sup> All data reported here refer to successful LTD claims. We do not analyze rejected claims.

<sup>17</sup> In 2003, which is the midpoint of our sample period, SSDI awards averaged 5.5 per 1,000 insured annually, or 1.4 per 1,000 insured quarterly (<http://www.ssa.gov/OACT/STATS/table6c7.html>, accessed 11/15/2011).

worker benefits) is just 0.2 percent, for those receiving LTD benefits in our sample it is almost 10 percent.<sup>18</sup>

The most common medical conditions with which individuals qualify for LTD benefits are accidents (16.3 percent) and cancer (15.8 percent), with chronic fatigue, back problems, and heart and circulatory conditions each accounting for more than 10 percent of claimants. Perhaps the most striking difference between the distribution of diagnoses in our sample and the corresponding distribution for SSDI lies in the category of mental disorders, which account for about 25 percent of SSDI awards (SSA, 2010) during this period versus just 7.0 percent of private LTD claims. One factor that may be partly responsible for this difference is that most LTD policies stipulate a fairly stringent standard for awarding benefits for so-called “subjective and non-verifiable disorders,” a category that includes many mental disorders as well as soft-tissue pain. These plan features may make it relatively more difficult for workers with mental disorders in particular to access LTD benefits.

An examination of our data reveals that the incidence of LTD claims varies substantially with worker characteristics. For example, workers in the top five percent of the year-specific salary distribution have a claiming probability of just 0.04 percent per quarter whereas those in the bottom 5 percent have a claiming probability that is three times as high at 0.13 percent per quarter. Age is also a strong predictor of LTD claims, with those in their early sixties almost five times as likely to claim LTD benefits as are young adults (0.23 percent for those 60 to 64 versus 0.05 percent both for those 18 to 24 and for those 25 to 29). Women are also more likely than men to claim LTD benefits, with probabilities of 0.10 percent and 0.08 percent, respectively.

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<sup>18</sup> The LTD exit rate measured in our data is likely to include a small number of deaths, though we cannot distinguish these from other causes of exit. If one includes deaths in the SSDI exit count, the SSDI quarterly exit rate increases from 0.2 to 0.9 percent, which is still an order of magnitude smaller than for LTD.

Excluding maternity claims, however, eliminates this gender difference. Given the substantial differences in claims rates by age, sex and salary, we control for demographic characteristics, when exploring the effect of plan parameters on claiming probabilities and other outcomes of interest.

Table 4 provides information on the policy parameters of the LTD plans in our sample, weighting by plan enrollment.<sup>19</sup> Consistent with the representative data summarized in Table 2, the most common replacement rate in our sample is 60 percent, which is in effect for 82.6 percent of person-quarters in our data. The next most common replacement rates are 66.7 percent (12.7 percent) and 50 percent (3.8 percent). The distribution of elimination periods is dominated by a small number of values, with 97.3 percent of the sample having either a 90-day or 180 day elimination period.

The final panel of Table 4 provides comparable data for the maximum monthly benefit in LTD plans. The sample from this insurer is quite comparable to the national data on this dimension as well. The most common maximum monthly benefit levels are \$5,000 (33.2 percent), \$6,000 (18.0 percent) and \$10,000 (17.1 percent). The 95<sup>th</sup> percentile maximum benefit is \$12,500 versus a 5<sup>th</sup> percentile of just \$3,000. Due to the substantial variation in benefits caps, workers on different policies earning the same incomes and facing the same nominal LTD replacement rates may nevertheless face different effective replacements due to cross-policy differences in the monthly benefits cap. The fraction of person-quarters in our sample whose potential LTD benefit is capped at the maximum level provided by their LTD plan is 4.0 percent, and this is substantially higher for workers with high incomes. The average effective replacement

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<sup>19</sup> More precisely, we weight by the number of worker-quarter observations available for each plan. Thus, these statistics correspond to the plan attributes faced by the average worker in our sample.

rate among those who are capped is 43.0 percent versus 60.5 percent for those who are uncapped.

### *Empirical Strategy*

Our basic empirical approach to estimate the relationship between claims and policy parameters is to fit models of the following form:

$$(1) \quad \Pr(CLAIM_{ijq}) = f(\alpha + \beta EP_{jg} + \eta RR_{ijg} + \mu X_{ijk} + \theta_j + \delta_q)$$

In this equation,  $i$  indexes individual workers,  $j$  indexes their firm-division-class category, and  $q$  indexes year-by-quarter interactions.  $CLAIM$  is an indicator variable equal to one if worker  $i$  makes a claim in year-quarter pair  $q$ . The variable  $EP$  measures the elimination period (in days), and  $RR$  is the replacement rate for worker  $i$ . Notice that unlike  $EP$ , which varies only at the firm-division-class level, the replacement rate measure varies at the individual level because workers who are capped by the monthly benefit limit face an effective replacement rate that is below the nominal policy replacement rate.<sup>20</sup> We will also consider specifications where we include an indicator for whether the individual's potential LTD benefit is capped at the maximum monthly benefit. The vector  $X$  contains a set of demographic controls, including indicators for gender, age and, critically, monthly earnings, which is likely to be highly correlated with the incidence of disability. In our initial specifications, we control for earnings with twenty salary bin indicators that capture each person's position in the sample's annual earnings distribution.<sup>21</sup> We also

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<sup>20</sup> To avoid the concern that the individual-specific replacement rate may be endogenous to a worker's health, we calculate the replacement rate using workers' average earnings during months six through twelve *prior* to the current observation. See Bound (1989) and Parsons (1991) for discussion of the drawback of the contemporaneous replacement rate as a measure of potential benefits.

<sup>21</sup> We include 9 age indicators for age 18 to 24 and then eight five-year age groups from 25 to 29 through 60 to 64. Monthly earnings are equal to the average monthly earnings in the six preceding months. The earnings indicators code being below the 5<sup>th</sup> percentile, between the 5<sup>th</sup> and 10<sup>th</sup> percentile, and so forth. Because we exclude individuals

include in all specifications a set of firm-division-class fixed effects. We use a linear probability model for our main estimates of (1).

There are a number of potential limitations with specification (1). First, the dependent variable is dichotomous and, moreover, is equal to zero for the vast majority of observations (99.9 percent), which suggests that a linear probability model may not provide the appropriate specification. We face the problem, however, that many policies contribute a relatively small number of observations, which cautions that we are likely to face an incidental parameters problem in estimating equation (1) via maximum likelihood. To explore whether our results are sensitive to the linearity assumption, we have estimated a companion set of models with probit specifications using the subset of policies that contribute a large number of observations to the data set. These models yield very similar results to those below.<sup>22</sup>

A second concern is that while we have millions of observations, the variation that we analyze in our key policy variables exists only at the firm-division-class-quarter (FDC) level. We therefore cluster our standard errors by FDC.

A final concern is that the policy parameters that workers face may be endogenous to their tastes or other correlates of claiming behavior. For example, firms whose employees are more likely to claim LTD benefits may have systematically higher or lower replacement rates. We attempt to address this concern in our main specification by including both FDC fixed effects (to

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in the top 1 percent and bottom 1 percent of the earnings distribution in each year, the top and bottom categories each contain four percent of the sample.

<sup>22</sup> An alternative to our linear regression estimation approach for this analysis would be to apply a “regression kink” design that exploits kinks in the deterministic relationship between regressors of interest—here, policy parameters—and observed continuous endogenous variables. One such kink, for example, is the relationship between a policy’s nominal replacement rate and a worker’s effective replacement rate, which kinks downward at the point when the maximum monthly benefit level binds (i.e., for high salary workers). In preliminary explorations with the regression kink design, we determined that these kinks affect a sufficiently small fraction of our sample that we lack statistical power to obtain meaningful inference with the regression kink design. See Card, Lee and Pei (2009) for discussion of the regression kink design.

capture the preferences of covered workers) and detailed wage category controls. In these specifications, the effect of policy parameters is identified by over-time changes in these parameters within a firm. Similarly, the effect of replacement rates on claims rates is identified by the interactions between policy parameters and worker earnings.

It remains possible, of course, that even changes in plan parameters are affected by worker preferences and demographics; for example, a firm that has an aging work force may choose to lower its benefits to reduce the incidence or cost of claims. While our detailed demographic and income variables should control for such changes, to the extent that there are unobserved changes in claiming propensity that are correlated with changes in plan parameters, it could bias our estimates. To address this concern, in our most general specification we also include FDC by quarter interactions, which allow us to fully control for any changes in FDC characteristics that may be associated with changing plan parameters. In this specification, we cannot identify the effect of the elimination period (since it only varies at the FDC by quarter level). But we can still identify benefit effects by using variation in the effective replacement rate across workers within a given FDC by quarter.<sup>23</sup>

It is worth noting that it would not be possible to obtain a credible estimate of key causal parameters using an equation similar to (1) for the federal SSDI program. This is because under the federal program, all workers face the same benefit formula and elimination period. Under the SSDI program, cross-claimant variation in replacement rates is driven by differences in earnings histories, which would themselves be strongly related with claiming propensities (Bound, 1989).

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<sup>23</sup> Consider, for example, two hypothetical workers at firm A with monthly incomes of \$4,000 and \$10,000 (\$48,000 and \$120,000 per year), respectively, and compare them with two workers at firm B with identical incomes. Suppose that both employers have LTD policies with a replacement rate of 60 percent but that the maximum monthly benefit for firm A is just \$3,000 versus \$10,000 for firm B. In this example, both of the workers with lower wages would have a replacement rate of 60 percent. In contrast, the high-income worker at firm A would have a replacement rate of just 30 percent while his counterpart at firm B would have a replacement rate of 60 percent.

### 3. The Impact of Plan Parameters on Claims Incidence

The upper panel of Table 5 presents initial results. The first column shows the result of estimating equation (1). For readability of the coefficients, the elimination period coefficient shows the effect per 1,000 days of EP while the replacement rate measure is divided by 1,000 (so that the mean replacement rate is 0.00061). Column (1) of the table finds a highly significant negative coefficient on the elimination period on claims rate. The point estimate of -0.011 (se 0.0027) implies that an increment of 90 days to an LTD's policy elimination period lowers the LTD claims rate by 0.09 percentage points, which is equal to 100 percent of the average baseline rate. This finding suggests that claiming behavior is quite responsive to the 'deductible' that workers face when making claims—a point that we analyze in detail below.

The column (1) estimate also finds a marginally significant impact of the replacement rate on LTD claims. A 10 percentage point rise in the replacement rate is estimated to increase the claims rate by 0.007 percentage points, or about 8 percent of the sample mean. This implies an elasticity of claims with respect to the replacement rate of 0.47 at the sample mean replacement rate and claiming rate (60.5 percent and 0.09 percent respectively). This elasticity is similar to that found by the literature on disability insurance (Gruber, 2000).

In the second column, we add an indicator for whether the worker is capped by the maximum monthly benefit if she were to make an LTD claim. For capped workers, the effective replacement rate is lower than the nominal rate stipulated by the policy. The replacement rate retains its positive sign in this specification—that is, higher replacement rates induce more claims—but it is substantially smaller in magnitude than in the prior column and is statistically insignificant. Conversely, the coefficient on the capped indicator is negative and significant; workers whose effective replacement rate is curtailed by the monthly benefit cap are less likely

to make an LTD claim. The point estimate implies that if a worker is capped, she is 0.014 percentage points less likely to make an LTD claim, which is approximately a 15.5 percent reduction in the base claims rate. Using the fact that capped workers on average face a replacement rate that is 27.5 percent below the nominal replacement rates offered by their policies, we estimate an elasticity of claiming with respect to the replacement rate of 0.56, which is slightly larger than in the first column.

The variation that identifies this point estimate deserves discussion. Because the model includes detailed wage category controls, the coefficient on the capped variable is not simply identified by comparisons across workers with different earnings.<sup>24</sup> Nor is it driven by workers with the same earnings in firms with different replacement rates, since our FDC indicators absorb this source variation. Instead, the estimated effect is identified by the interaction of each worker's wage with FDC-specific policy parameters, specifically the policy replacement rate and the benefits cap. The results indicate that the claims rate of high versus low-income workers is relatively lower at firms with lower monthly maximum benefit caps because the replacement rate of high versus low-income workers is relatively lower at these firms.

To test the robustness of our estimates, we include in the model as well a series of wage category-specific splines, or linear wage terms that vary freely across categories (column 3). We do this because, as a worker's wage increases within one of the twenty salary bins, she will on average be less likely to claim (because of the negative relationship between claiming and income) but also more likely to be constrained by the benefits cap. This richer set of wage controls does not appreciably impact our estimates. In the fourth column, we drop the actual

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<sup>24</sup> As above, this specification controls for FDC-specific claim rates by the inclusion of FDC fixed effects, and it flexibly controls for the relationship between income and claims rates using 20 salary indicator variables.

replacement rate from the specification given its small magnitude and statistical insignificance. This has virtually no impact on the estimated effect of the elimination period or of the worker's potential benefits being capped at the plan's maximum monthly benefit. It does, however, increase the precision of the capped indicator, which is significant at the 5 percent level in this specification.

The final specification in the first panel of Table 5 additionally includes FDC by quarter interactions. These remove all cross-sectional and over-time variation in policy parameters between and across firms and thus identify the model solely from interactions between workers' wage levels and policy parameters (specifically, the interaction between the policy replacement rate, the workers wage, and the benefits cap). In this specification, the main effect of the elimination period is absorbed—since it varies only at the FDC by quarter level—while the coefficient on the capped measure remains virtually unchanged. The estimate implies that capped workers are 16.1 percent less likely to claim benefits, yielding an implied elasticity of claiming of 0.62.

Thus, our basic finding is that LTD claims are fairly sensitive to plan parameters. Lengthening the period of time that workers have to wait to claim their LTD benefits significantly reduces workers' propensity to claim, while raising the benefits for which they are eligible through higher maximum monthly benefits encourages claiming.

#### *How severely disabled are the marginal claimants?*

Given the evidence that LTD claims are elastic to policy parameters, a key question that we explore next is how severe are the health conditions that constitute the marginal LTD claims induced or deterred by variation in policy generosity. In general, we would expect marginal claims to comprise cases where claimants have some discretion about whether or not to continue

working versus claiming benefits, implying that these disabilities will be relatively non-severe. Conversely, the most severe disabilities are likely to require labor force and so will be relatively unaffected by financial incentives.

To test these hypotheses, we use the longer-term outcomes of LTD claimants as a measure of the ‘revealed’ severity of impairments. We divide the sample of claimants into three groups: those who return to work (at the original employer) following receipt of LTD benefits; those who ultimately receive SSDI in addition to LTD, and are therefore unlikely to return to work; and those who remain as LTD recipients for the duration of our sample but do not receive SSDI.<sup>25</sup> While we do not directly observe the health of LTD recipients, we infer that those who return to work are most healthy, those who receive SSDI are least healthy, and those who remain on LTD but do not receive SSDI comprise an intermediate case. We are able to observe outcomes for the individuals in our sample through December of 2007 and thus can follow all claimants for at least one year after their initial LTD claim. We may not however see the ultimate resolution of some claims, particularly those that are most recent. Undoubtedly, some of these claimants will return to work and others will receive SSDI.<sup>26</sup>

Table 6 reports specifications analogous to the fourth and fifth columns of Table 5, where in this case the dependent variables are dummies for claims in each of three categories: claim leading to return to work (the “most healthy” claimants); claim leading to SSDI (the “least healthy” claimants); claim leading to neither return to work nor SSDI. Note that these three

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<sup>25</sup> Like all LTD policies of which we are aware, this insurer offsets LTD benefits dollar-for-dollar against SSDI benefits. Thus, receipt of SSDI does not affect the replacement rate of LTD beneficiaries, though it may extend the duration of their benefits.

<sup>26</sup> Of 7,397 LTD awards in our data, 29.4 percent are observed to lead to an SSDI award in our sample. Among LTD claimants awarded SSDI, 96.2 98 percent do *not* return to work. Among LTD claimants who do not receive SSDI, the return to work rate is 54.4 47 percent.

categorical outcomes sum to the total claims rate, so this set of models decomposes the effect of policy parameters on claims into these three constituent components.<sup>27</sup>

We find that there is a strong effect of the elimination period on the most healthy and intermediate groups, but has no effect on the least healthy, those who ultimately move to SSDI. Reinforcing this pattern, we find that bulk of the effect of the binding benefits cap on the claims rate is *also* due to its effect on the least severe category, i.e., claimants who ultimately return to work. Our results are therefore broadly consistent with the hypothesis that the most healthy potential LTD recipients are the most responsive to plan parameters. This is consistent with the logic of the simple model in Autor and Duggan (2003), which implies that marginal disability benefits claimants are likely to be those with greatest work capacity.

#### **4. Why Does a Longer EP Deter Claims? Censoring, Forward-Looking Moral Hazard and Liquidity Constraints**

While it is self-evident that a lower replacement rate will serve to reduce workers' propensity to claim LTD benefits, the robust negative effect of a longer elimination period on LTD claims deserves further scrutiny. A longer EP may reduce claims through two channels: censoring of LTD claims for disability spells that are resolved during the elimination period and deterrence of claims that might require the claimant to accept an extended period of earnings loss to obtain a brief period of benefits receipt. A simple means to isolate the deterrence from the censoring component of the EP-claims relationship is to eliminate the claims that *would have been*

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<sup>27</sup> There is a small amount of slippage because 85 of the 7,397 claims are coded as both "return-to-work" and "claim SSDI." This occurs when a claimant receives SSDI and also returns to work at his/her employer. We do not observe whether the SSDI award was made before or after the claimant returned to work. It is likely that some of the claims coded as "claim PDI, no RTW and no SSDI" will garner an SSDI award outside of our sample window.

censored on a longer EP plan relative to a shorter EP plan—thus, in effect, imposing comparable censoring on shorter EP plans to what is mandated by longer EP plan. Our analysis thus then asks what of the initial EP-claims relationship remains net of censoring. This remaining component (if present) is the deterrent effect of a longer EP.

We implement this test as follows. Since more than 97 percent of the observations in our data are from plans with either a 90 or 180 day EP (Table 4), we focus on the 90/180 distinction. For plans with a 90 day EP, we disregard (treat as non-claims) any claim that last fewer than 91 days, since such claims would be paid on a 90 day EP plan but would not be filed on a 180 day EP plan. As an additional conservative step to excise any mechanical effect that the EP may have on claims rates, we also disregard maternity-related claims, which for obvious reasons are substantially (three times) more prevalent on 90 than 180 day EP plans..

The censoring-adjusted estimates, which are found in Panel B of Table 5, can be summarized very simply: after eliminating the pure censoring effect from the comparison, plans with a higher EP still have substantially lower claims rates. Across all columns, we find that the coefficient on the EP variable is almost exactly 65 percent as large as in the companion specification above (panel A) that does not make the censoring adjustment. By implication, only one third of the claims rate differential between shorter and longer EP plans is due to censoring. The majority is due to deterrence.

This finding raises another question: why are workers deterred from applying by a longer elimination period? There are two competing explanations for this finding. The first is what Aron-Dine et al. (2012) refer to as “forward-looking moral hazard.” This phrase describes a scenario where insured individuals consider the expected duration of an impairment at its onset and choose between two courses of action: temporarily discontinuing work to treat their health

conditions, thereby forfeiting earnings during the elimination period then receiving LTD benefits until treatment is completed; or alternatively, remaining on the job during the course of the impairment despite any heightened disutility of work, thereby foregoing LTD benefits but also avoiding income loss during the EP. Logically, all else equal, a longer EP makes discontinuing work less attractive relative to remaining on the job.<sup>28</sup> An alternative mechanism consistent with the same behaviors is liquidity constraints: some insured individuals who would prefer to discontinue work while treating their health conditions lack adequate savings to meet expenses during the EP and hence are deterred from claiming (see Chetty 2008 for discussion). Had liquidity constraints not been binding, however, these workers would have preferred to exit the labor force while seeking treatment despite having to forego wage income during the EP.<sup>29</sup>

An empirical implication that distinguishes these mechanisms is the role that income plays in deterrence. If liquidity constraints are the primary reason that plans with a longer EP experience fewer claims, we should expect this deterrence effect should be greatest for lower-income workers, i.e., those for whom cash flow concerns will be most constraining. If forward-looking moral hazard is the main explanation, however, we would not expect the deterrence effect of a longer EP to depend substantially on claimants' income.

We provide a simple test of these competing explanations in Table 7 by re-estimating the Table 5 models separately for workers whose monthly incomes are above and below the sample median. The deterrence effect of a higher EP is sizable and robustly significant for both groups

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<sup>28</sup> Cabral (2011) studies a related phenomenon, patients' strategic delay of treatment to maximize their insurer's share of treatment costs. Such behavior is relevant for policies where the patient's marginal out of pocket treatment costs vary over the year (e.g., if there is an initial annual out of pocket deductible or a cap on benefits paid within a year). For the policies we study, there is little incentive for strategic retiming because claimants' out of pocket costs depend almost entirely on salary (through foregone income) and do not vary discreetly over time.

<sup>29</sup> Both the forward-looking moral hazard and liquidity constraint scenarios apply to settings where the impairment is not so severe that exiting the labor force is compulsory rather than elective. For severe impairments, this will not be the case.

of workers. While in absolute terms, it is larger for below-median earners (compare the coefficient of -0.014 in column 2 to the coefficient of -0.008 in column 3), it is also the case that quarterly claims rates are substantially higher for workers with below relative to those with above-median incomes: 0.10 percent versus 0.07 percent, respectively. Dividing the point estimate through by the base claims rate, we find that the elasticity of claims with respect to the EP is closely comparable for low versus high-income workers. We reach a similar conclusion when we perform this same analysis on the censoring-adjusted sample in Panel B of Table 7. Indeed, the point estimates in the lower panel suggest that the deterrence elasticity is somewhat higher for high than low-income workers, which is strongly at odds with a liquidity interpretation of the deterrence results in Table 5.<sup>30</sup>

On net, we find a substantial effect of plan parameters on the incidence of claims—not surprisingly, more generous policies receive more claims. In the case of the elimination period in particular, we are further able to establish that two-thirds of the effect of a longer waiting period on claims rate is due to claims deterrence rather than simple censoring. Moreover, this deterrence effect appears to reflect pure moral hazard rather than the operation of binding liquidity constraints. As we show next, these behavioral relationships also have important implications for claims durations.

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<sup>30</sup> When we further subdivide the sample into the terciles by wage income, we find that deterrence is smallest in proportional terms for the lowest earnings tercile and largest proportionately for the highest earnings tercile (not tabulated).

## 4. Impacts of LTD Parameters on Claims Durations

A key difference between private LTD and SSDI noted above is the higher rate of exit from the program. While the quarterly exit rate from SSDI is just 0.2 percent (0.9 percent if deaths are included), the exit rate from our sample is more than an order of magnitude higher at 9.8 percent. Though some of this difference likely reflects differences in the underlying health of LTD and DI enrollees (i.e. there are no maternity claims in SSDI), it is plausible that some is also attributable to differences in the incentives created by the two programs.

In this final set of analyses, we focus on the exit rate from claims status for individuals in our sample who claimed LTD benefits at some point during our study period. For each LTD spell, we define an indicator for each quarter of LTD receipt that is equal to one if the beneficiary leaves LTD in the quarter and is equal to zero otherwise. We estimated an OLS model for LTD claims exits analogous to equation (1) above. In addition to controls for plan parameters, demographics, income, and year by quarter, we also introduce 26 indicators variables corresponding to the number of quarters that the individual has been receiving LTD benefits. These control flexibly for the relationship between duration and exit rates that has been demonstrated for other programs such as welfare and unemployment insurance. For individuals with a 180-day elimination period, we treat their first quarter of receipt as if it is their second quarter so that when we compare with those who have a 90-day elimination period we are controlling for the same time since disability onset.

Our analysis sample for these specifications includes 7,397 unique individuals and 44,967 quarterly observations, and thus the average number of quarterly observations for each person is slightly less than 6. Since there are 3,497 unique firm-division-class combinations accounted for by these claimants, we begin by estimating specifications that do not include FDC fixed effects.

We focus first on the variables that affect worker replacement rates (both the direct replacement rate measure and the binding cap measure). While our findings above suggest that a higher replacement rate induces a healthier set of workers to claim LTD benefits, it does not necessarily follow that the exit rate conditional on claiming will be higher for claimants from plans with higher replacement rates.. On the one hand, one would expect more generous LTD policies to have lower exit rates from receipt of benefits. However, to the extent that healthier enrollees are more likely to claim LTD when benefits are more generous, one might expect them to have higher exit rates once enrolled.

The estimates in Table 8 rate bears out this ambiguity. Both the replacement rate and the benefit cap variable are negative in all estimates: workers with lower effective replacement rates are less likely to exit LTD once benefits are awarded. In combination with our earlier results, this suggests that the incentive and composition effects of a higher replacement rate work in offsetting directions: those with less generous benefits have a stronger incentive to exit LTD and return to work, but this appears to be more than offset by the fact that those who claim benefits when facing a lower replacement rate are less healthy. However, the point estimates for both the replacement rate and benefits cap measures vary substantially across specifications and are in almost all cases statistically insignificant. These results should therefore be viewed as suggestive but far from definitive.<sup>31</sup>

This ambiguity does not carry over to the effect of the elimination period on claims durations. Rather, our results so far imply that we should find an unambiguously negative relationship between the LTD exit rate and the plan elimination period—that is, plans with a

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<sup>31</sup> In terms of the magnitudes of the effects, the estimate of -.017 for benefits-cap-binding indicator in the third specification suggests an exit rate that is approximately 17 percent lower for those who are maxed given a mean of 9.8 percent. The estimate of -56.1 for the replacement rate in that same specification suggests that increasing the replacement rate by 10 percentage points would reduce the exit rate by 0.6 percent.

longer EP should have longer claims durations. This prediction follows from the finding that a longer EP deters a substantial share of claims (net of its mechanical censoring effect). Presuming that primarily shorter claims are deterred, this force will shift the composition of LTD claims towards those with longer duration.

Why should deterrence primarily be relevant for shorter claims? One reason is that shorter claims are more likely to stem from non-severe impairments for which labor force withdrawal is elective. Longer claims, by contrast, are more likely to be brought on by severe impairments for which labor force exit is non-elective and hence deterrence is not relevant. Thus, if less severe impairments generally give rise to shorter claims, then deterrence will shift the composition of claims towards longer spells.

A second reason that deterrence will likely lead to longer LTD spells is that the incentive effect of the EP has greater ‘leverage’ for shorter versus longer claims. To see this point, consider a worker who expects to be out of the labor force for 22 quarters due to a disability. If the worker’s plan has a 90 day EP, she will receive 21 quarters of LTD payments. If instead her plan has a 180 day EP, she will receive 20 quarters of benefits. Hence, a 180 day EP reduces her LTD benefits by only 5 percent relative to a 90 day EP. Now consider a worker who expects to be out of the labor force for four quarters due to a disability. For this worker, a 180 day EP reduces her LTD benefits by *50 percent* (one of two quarters) relative to a 90 day EP. This again suggests that a longer EP will tend to defer shorter claims.<sup>32</sup>

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<sup>32</sup> Analogously, consider the effect of raising the deductible on an automobile insurance policy from \$250 to \$500. This increase will censor all claims on the interval \$251 through \$500 and will likely reduce claims on the interval \$501 through \$1,000 by raising the consumer’s out of pocket cost on small repairs. It is unlikely, however, to effect the rate of claims above, say, \$20,000, where the marginal increment to out of pocket costs from a higher deductible is negligible relative to the insurance benefit.

The estimates in Table 8 provide strong confirmation of these expectations. Across all specifications, we find that the exit rate from LTD beneficiary status is substantially lower for claimants from plans with longer elimination periods. The point estimate of -0.624 in the first column of Table 9 (panel A), for example, suggests that a 90-day increase in the elimination period generates a quarterly exit rate that is 5.6 percentage points (60 percent) lower than baseline. Adding firm-division-class dummies to the estimates (columns 4 through 6) increases the magnitude of these point estimates, though standard errors grow considerably in these specifications such that we generally cannot reject the hypothesis that the point estimates are comparable across columns.

To ensure that these results on LTD exit are indeed driven by deterrence rather than censoring, we re-estimate the models in the lower panel of Table 8 using the censoring-adjusted sample that excludes claims of under 2 quarters from plans with a 90 day EP as well as all maternity claims. This censoring adjustment reduces the absolute magnitude of the EP-duration relationship by approximately 10 percent. Thus, claims are substantially less frequent on plans with a longer day EP but those claims ultimately paid have longer durations.

Figure 2 provides a clear view into the operation of the deterrence effect by plotting the distribution of disability durations for claims from plans with relatively brief ( $\leq 100$  days) versus relatively long ( $> 100$  days) EPs. In this figure, spell durations denote *quarters since disability onset*—thus, an impairment lasting 181 days would be coded as having duration of three quarters regardless of the plan’s elimination period.<sup>33</sup> If the only effect of a longer EP were to censor

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<sup>33</sup> This plot is constructed using the censoring-adjusted sample, which excludes all maternity claims and claims of fewer than two quarters from plans with a relatively brief EP. Notably, only 9.0 percent of claims on plans with a 90 day EP are of duration one quarter. This likely reflects a similar deterrence phenomenon as found in Figure 2: workers are unlikely to claim LTD benefits for impairments where the likely period of benefits receipt is large relative to the elimination period.

disability spells that conclude prior to the end of the EP, we would expect the distribution of spell lengths to be comparable between 90 and 180 day plans for spells lasting beyond 180 days. This is not the case. The entire distribution of claims durations appears substantially right-shifted for plans with a 180 versus 90 day elimination periods. There is substantial “missing mass” in the frequency of LTD claims for impairments lasting fewer than 5 quarters for plans with a 180 day EP and, conversely, substantial excess mass for claims of 5 quarters or longer. Clearly, a longer EP deters a significant number of workers from claiming disability benefits for impairments that would lead to only a brief period of LTD receipt. Instead, as implied by the estimates in Table 5, these workers choose to remain on the job.

## **5. Conclusions and Implications**

The possibility of long term disability is one of the most significant income risks facing U.S. workers. Work limiting disability can lead to income loss that exceeds the savings of most workers and, absent disability insurance, it seems likely that the consumption of disabled workers would fall significantly more than is observed for individuals who enter SSDI (Meyer and Mok, 2008). At the same time, disability is in many cases difficult to medically verify, and the benefits for disabled workers can be high relative to their previous income. This leads to a potential moral hazard problem that offsets some of the welfare gains generated by the consumption smoothing benefits of disability insurance.

These moral hazard problems have been explored in the context of public disability insurance, but the estimation of their impacts has been limited by the lack of exogenous individual variation in SSDI benefits in the U.S. In this paper, we have explored a different and largely unstudied source of disability insurance: private disability insurance provided by

employers. Using a new data set on private LTD claims, as well as variation across and within firms in benefit parameters, we are able to convincingly document behavioral responses to LTD insurance generosity. We find both that individuals are much less likely to claim benefits if the period of time they have to wait to claim is longer, and if they receive smaller benefits, particularly through the maximum benefit caps in place in most policies. Furthermore, we find that these responses are largest among those claims that appear to be most discretionary, and for those workers who are ultimately most likely to return to work. This is consistent with the notion advanced in Autor and Duggan (2003) that the marginal disability claimants are the healthiest claimants.

Notably, the length of the policy elimination period also has a first order effect on the composition of claimants; workers who claim LTD benefits after a longer wait period are substantially less likely to exit beneficiary status than those who enter after a shorter elimination period, indicating that a longer elimination period likely discourages claims from individuals with less severe disabilities. An important question that follows is whether the deterrence effect of the EP on shorter claims ultimately causes would-be claimants to suffer longer-term adverse health consequences that would have been averted had they obtained treatment earlier. Our data do not unfortunately provide the detail or power to answer this question. They do however suggest that it is worthy of careful study.

There are two important caveats to drawing strong policy conclusions from our findings. The first is that our estimates may not exclusively represent pure moral hazard effects, as there may be income effects of program generosity on claiming behavior. That is, for a given response of labor supply, individuals may be more or less likely to claim benefits as benefit generosity changes. This income effect response is simply a transfer from insurers to insured and has no

efficiency cost; indeed, if individuals are liquidity constrained, there could be a welfare improvement from such transfers. In the case of the elimination period, our analysis suggests that liquidity constraints are not the primary channel affecting claiming behavior since the deterrence elasticity is comparable for high and low-income workers. But it is possible that liquidity is nevertheless relevant for a subset of the workers in the LTD-insured population.

Second, we present no evidence here on the psychic benefits that disability insurance provides to insured workers and their families, or the total social welfare gains that may accrue from defraying the financial risks of work-limiting disability. Gruber (2000) and Bound et al. (2004) discuss the tradeoff between the consumption smoothing benefits and moral hazard costs of DI. Future work could usefully document the benefits associated with this consumption smoothing in order to more fully evaluate the optimal level of program generosity.

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U.S. Social Security Administration, “Disability Benefits,” SSA Publication No. 05-10029, July 2011.

Figure 1: Comparison of Private LTD and SSDI Benefits

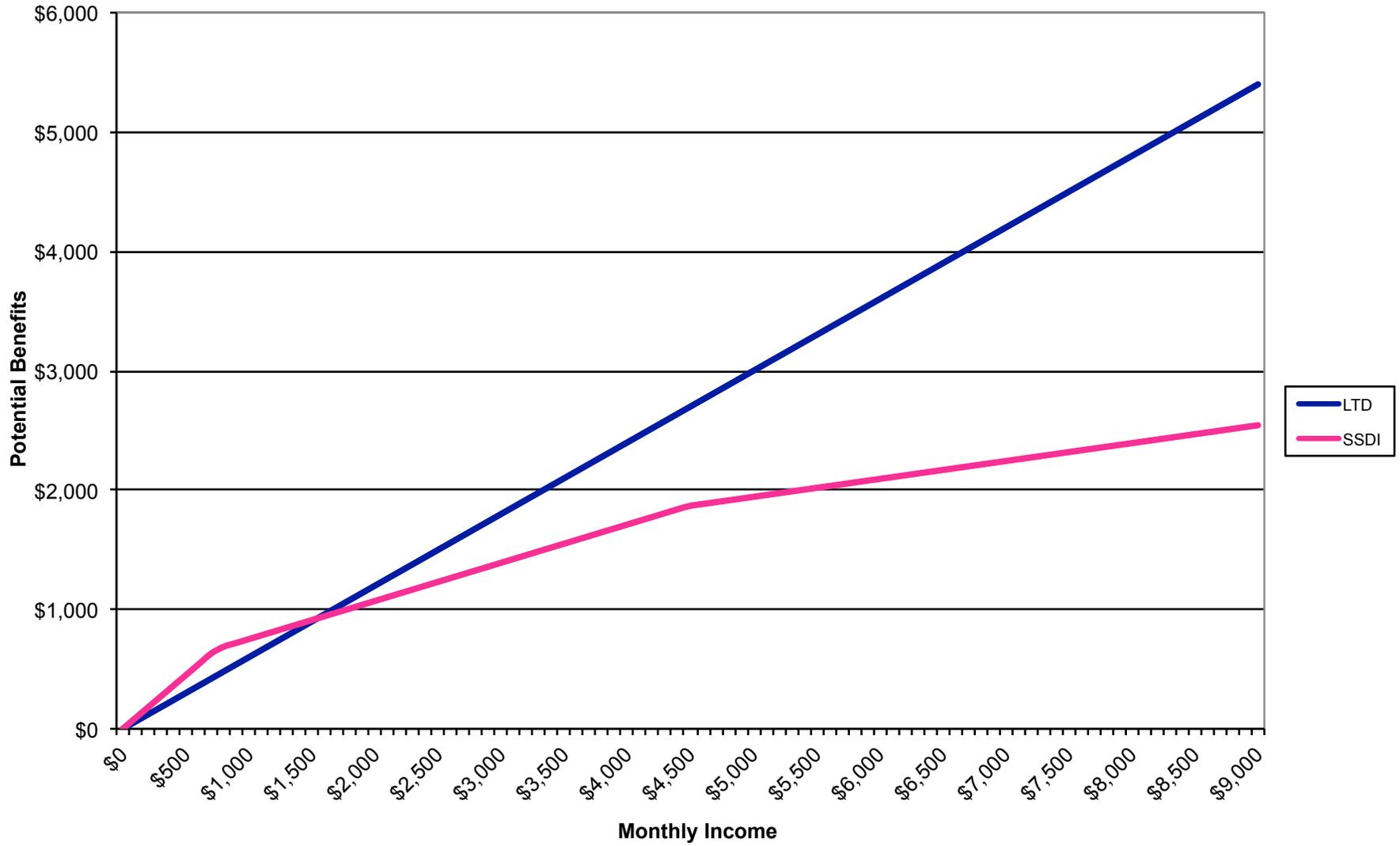


Table 1: Percent of Workers with Access to Employer Provided LTD Coverage, Overall and by Subgroup: Bureau of Labor Statistics Data

All workers	33%	All workers	33%
<i>Worker characteristics</i>		<i>Establishment characteristics</i>	
Management, professional, and related	52%	Goods-producing industries	33%
Service	15%	Service-producing industries	33%
Sales and office	33%	1-49 workers	18%
Natural resources, construction, and maintenance	25%	50-99 workers	29%
Production, transportation, and material moving	28%	100-499 workers	36%
Full-time	41%	500+ workers	51%
Part-time	7%		
Union	35%	<i>Geographic areas</i>	
Nonunion	33%	New England	33%
		Middle Atlantic	29%
		East North Central	38%
		West North Central	35%
		South Atlantic	35%
		East South Central	33%
		West South Central	31%
		Mountain	33%
		Pacific	30%
<i>Wage percentiles:</i>			
Lowest 10 percent	5%		
Lowest 25 percent	10%		
Second 25 percent	30%		
Third 25 percent	40%		
Highest 25 percent	55%		
Highest 10 percent	57%		

Table provides information on the share of civilian workers (private and state and local government) offered employer-provided long-term disability insurance coverage in March 2009. Average takeup rate is 96 percent so for most groups enrollment is approximately equal to this access rate. Data were obtained from U.S. Department of Labor's National Compensation Survey, Employee Benefits in the U.S., March 2009 publication at: <http://www.bls.gov/ncs/ebs/benefits/2009/ebbl0044.pdf>.

Table 2: Distribution of Maximum Benefit Amounts and Replacement Rates in Employer-Provided LTD Policies: Bureau of Labor Statistics Data

A. Maximum Monthly Benefit Payment

Maximum Reported	No Max Reported	Percentiles				
		10th	25th	50th	75th	90th
78%	22%	\$3,000	\$5,000	\$7,000	\$10,000	\$15,000

B. Distribution of replacement rates

Mean	Median	<60%	60%	61-66%	67%	>67%
59.1%	60.0%	21%	59%	12%	7%	2%

Table provides information on the maximum monthly benefit and replacement rate of employer-provided LTD plans among civilian workers (private and state and local government) in March 2009. Data were obtained from U.S. Department of Labor's National Compensation Survey, Employee Benefits in the U.S., March 2009 publication at: <http://www.bls.gov/ncs/ebs/benefits/2009/ebb10044.pdf>.

Table 3: Summary Statistics for LTD Analysis Sample

	Mean	Std Dev
<i>Enrollee Characteristics (n=7,992,005)</i>		
LTD Claims per Quarter	0.091%	0.0301
Age	41.6	10.5
Age 18-24	3.5%	18.4%
Age 25-29	11.4%	31.8%
Age 30-34	14.4%	35.1%
Age 35-39	15.0%	35.7%
Age 40-44	15.6%	36.2%
Age 45-49	14.6%	35.3%
Age 50-54	12.2%	32.7%
Age 55-59	8.8%	28.4%
Age 60-64	4.6%	20.9%
Female	47.1%	49.9%
Monthly Salary	\$4,014	\$2,691
<i>Industry of Employer (n=7,992,005)</i>		
Services	53.5%	49.9%
Manufacturing	15.2%	35.9%
Finance, Insurance, Real Estate	10.2%	30.3%
Wholesale Trade	8.9%	28.4%
Missing Industry	1.5%	12.0%
All Other	10.9%	31.1%
<i>LTD Claim Diagnosis (n=7,267)</i>		
Accidents	16.3%	36.9%
Cancer	15.9%	36.5%
Sickness / Fatigue	13.8%	34.5%
Back / Musculoskeletal	12.5%	33.1%
Heart / Circulatory	11.4%	31.8%
Maternity	9.0%	28.6%
Mental	7.0%	25.6%
Arthritis / Respiratory	6.9%	25.3%
All Other	7.3%	25.9%
<i>LTD Plan Parameters (n=7,992,005)</i>		
Elimination Period	122.6	48.3
Replacement Rate	0.605	0.033
Maximum Monthly Benefit	\$6,746	\$3,207
Benefit Cap Binding	4.01%	19.62%

Table contains summary statistics for the analysis sample with 7.99 million observations described in Section 2 of the paper. The LTD Claim Diagnosis panel refers to just the 7,267 LTD claims among workers in this sample. The unit of observation for all of the other variables is the person-quarter and there are 1.02 million unique workers contained in this sample. Salary represents the worker's average monthly salary in the six preceding months.

Table 4: Replacement Rate, Elimination Period, and Max Monthly Benefit Distributions

Replacement Rate		Elimination Period		Max Monthly Benefit	
	% of Obs		% of Obs		% of Obs
				<\$3,000	4.0%
40.0%	0.2%	30	0.3%	\$3,000	4.8%
50.0%	3.8%	60	1.0%	>\$3,000 to <\$5,000	3.6%
60.0%	82.6%	90	63.3%	\$5,000	33.3%
63.0%	0.1%	120	0.4%	> \$5,000 to <\$6,000	0.3%
65.0%	0.1%	150	0.2%	\$6,000	18.0%
66.7%	12.7%	180	34.0%	>\$6,000 to <\$10,000	12.7%
70.0%	0.6%	360	0.8%	\$10,000	17.2%
All other	0.0%			>\$10,000	6.1%
Total	100.0%	Total	100.0%	Total	100.0%

Table summarizes the distribution of the replacement rate, elimination period, and maximum monthly benefit in the LTD plans among enrollees in the analysis sample. Maximum monthly benefit is in nominal dollars, elimination period is in days, and replacement rate is the ratio of potential monthly benefits to average monthly earnings (assuming the worker is not reaching the maximum monthly benefit). Statistics are weighted by plan enrollment.

Table 5: The Impact of Policy Parameters on LTD Claiming: Ages 18-64 in the One Plan Sample

	(1)	(2)	(3)	(4)	(5)	(6)
<u>A. All Claims</u>						
Elimination Period (/ 1,000)	-.0109*** (.0027)	-.0109*** (.0027)	-.0109*** (.0027)	-.0109*** (.0027)		
Actual Replacement Rate	.706* (.379)	.176 (.496)	.049 (.506)			.404 (.399)
Benefit Cap Binding		-1.45E-4* (8.05E-5)	-1.49-4* (8.10E-5)	-1.54E-4** (6.27E-5)	-1.46E-4** (6.38E-5)	
# Observations	7,992,005	7,992,005	7,992,005	7,992,005	7,992,005	7,992,005
<u>B. Dropping Maternity Claims and Claims &lt; 2 Quarters from Plans with 90 Day EP</u>						
Elimination Period (/ 1,000)	-.0069*** (.0015)	-.0070*** (.0015)	-.0070*** (.0015)	-.0070*** (.0015)		
Actual Replacement Rate	.656* (.364)	.302 (.480)	.165 (.491)			.330 (.385)
Benefit Cap Binding		-9.64E-5 (7.75E-5)	-9.27E-5 (7.80E-5)	-1.11E-4* (5.99E-5)	-1.07E-4* (6.11E-5)	
# Observations	7,991,185	7,991,185	7,991,185	7,991,185	7,991,185	7,991,185
Salary Bin Linear Terms?	No	No	Yes	Yes	Yes	Yes
FDC*Quarter Effects?	No	No	No	No	Yes	Yes

Table summarizes the results from six linear probability model specifications in which the outcome variable is equal to 1 if the person has an LTD claim this quarter and is otherwise equal to zero. The analysis sample described in section 2 is used in each specification and thus the number of observations in all six specifications is 7,992,005. Each specification includes indicator variables for each possible firm-division-class combination and each year\*quarter combination. Nine age bin indicators are also included for ages 18-24 and each five year age group from 25-29 through 60-64. Twenty salary bin indicators are included for each 5% of the year-specific salary distribution. Standard errors are clustered by firm-division-class and the mean of the dependent variable is .0909 percent. Lower panel excludes claims for maternity related reasons and claims lasting only 1 quarter from plans with a 90 day elimination period.

Table 6: The Impact of LTD Parameters on Benefit Claiming: Differentiating by SSDI and Return-to-Work Status

	Claim PDI and RTW		Claim PDI, no RTW and no SSDI		Claim PDI and receive SSDI	
	(1)	(2)	(3)	(4)	(5)	(6)
Elimination Period (/ 1,000)	-0.0059*** (.0020)	-0.0034*** (.0010)	-0.0048*** (.0012)	-0.0035*** (.0009)	-.0005 (.0009)	-.0004 (.0009)
Actual Replacement Rate	-.327 (.264)	-.258 (.240)	.391 (.275)	.443 (.273)	.134 (.247)	.129 (.247)
Benefit Cap Binding	-1.14E-4*** (4.11E-5)	-8.64E-5** (3.65E-5)	1.56E-5 (5.29E-5)	3.28E-5 (5.22E-5)	-4.30E-5 (4.02E-5)	-4.32E-5 (4.02E-5)
Salary Bin Linear Terms?	7,992,005	7,991,210	7,992,005	7,991,210	7,992,005	7,991,210
FDC*Quarter Effects?	No	Yes	No	Yes	No	Yes
Mean of Dependent Variable	3.6E-4		2.9E-4		2.7E-4	

Table summarizes the results from six linear probability model specifications. The outcome variable in the first two specifications is equal to one if the person claims LTD and returns to work and zero otherwise. The outcome variable in the next two specifications equals one if the person claims LTD and neither returns to work nor enrolls in SSDI. The outcome variable in the final two specifications equals one if the person claims LTD and later claims SSDI and is otherwise equal to zero. The analysis sample described in section 2 is used in specifications 1, 3, and 5 and thus the number of observations is 7,992,005. Specifications 2, 4, and 6 drop maternity claims or claims with an EP of 100 days or less with j one quarter of benefit receipt and thus have slightly fewer observations. Each specification includes indicator variables for each possible firm-division-class combination and each year\*quarter combination. Nine age bin indicators are also included for ages 18-24 and each five year age group from 25-29 through 60-64. Twenty salary bin indicators are included for each 5% of the year-specific salary distribution. Standard errors are clustered by firm-division-class.

Table 7: The Impact of Policy Parameters on LTD Claiming: High vs. Low Income Individuals

	All (1)	Low Income (2)	High Income (3)
<u>A. All Claims</u>			
Elimination Period (/ 1,000)	-0.0109*** (.0027)	-0.0137*** (.0050)	-0.0080*** (.0019)
Actual Replacement Rate	.176 (.496)	3.274 (2.469)	.338 (.512)
Benefit Cap Binding	-1.45E-4* (8.05E-5)	9.50E-5 (3.65E-4)	-1.44E-4* (8.59E-5)
# Observations	7,992,005	3,996,000	3,996,005
Average Claiming Probability	0.091	0.114	0.068
<u>B. Dropping Maternity Claims and Claims &lt; 2 Quarters from Plans with 90 Day EP</u>			
Elimination Period (/ 1,000)	-0.0070*** (.0015)	-0.0069*** (.0022)	-0.0066*** (.0018)
Actual Replacement Rate	.302 (.480)	3.424 (2.450)	.493 (.489)
Benefit Cap Binding	-9.64E-5 (7.75E-5)	2.03E-4 (3.42E-4)	-9.38E-5 (8.16E-5)
# Observations	7,991,185	3,995,431	3,995,754
Average Claiming Probability	0.081	0.103	0.059

Variables and specifications are identical to Table 5. Sample is subdivided into worker-quarter observations in which salary is below (column 2) or above (column 3) the median of all salary observations in the full sample.

Table 8: Duration Analyses: Quarterly Probability of Exiting LTD Recipient Status

	(1)	(2)	(3)	(4)	(5)	(6)
<i>A. All Claims</i>						
Elimination Period (/ 1,000)	-0.624*** (0.045)	-0.625*** (0.045)	-0.626*** (0.045)	-1.120*** (0.418)	-1.102*** (0.421)	-1.133*** (0.412)
Actual Replacement Rate	-20.6 (35.6)		-56.1 (45.4)	-157.3 (176.4)		-393.9 (250.6)
Benefit Cap Binding		-0.007 (.012)	-0.017 (.013)		-0.029 (.027)	-0.068* (.039)
# Observations	44,149	44,149	44,149	44,149	44,149	44,149
Firm-Division-Class Effects?	No	No	No	Yes	Yes	Yes
<i>B. Dropping Maternity Claims and Claims &lt; 2 Quarters from Plans with 90 Day EP</i>						
Elimination Period (/ 1,000)	-0.572*** (0.038)	-0.572*** (0.038)	-0.572*** (0.038)	-0.898*** (0.379)	-0.884*** (0.383)	-0.908*** (0.376)
Actual Replacement Rate	-49.9 (30.8)		-68.8 (39.6)	-146.4 (175.6)		-305.4 (233.7)
Benefit Cap Binding		0.004 (0.010)	-0.009 (0.010)		-0.018 (0.027)	-0.047 (0.036)
# Observations	42,840	42,840	42,840	42,840	42,840	42,840
Firm-Division-Class Effects?	No	No	No	Yes	Yes	Yes

Specifications summarized in this table include those who claimed LTD benefits. The unit of observation is the person-quarter and each quarter that the person receives LTD benefits during our study period is included. Table summarizes the results from linear probability model specifications in which outcome variable is equal to 1 if the claimant exits LTD in the next quarter and is otherwise zero. The 7,267 claimants in the original analysis sample of 7,992,005 are used in Panel A and the number of observations there is 44,149. Panel B drops maternity claims and claims that last just one quarter if the EP is 100 days or less and thus 42,840 observations. Each specification includes indicator variables for each year\*quarter combination and indicators for the number of quarters that the claimant has been receiving benefits. Nine age bin indicators are also included for ages 18-24 and each five year age group from 25-29 through 60-64. Twenty salary bin indicators are included for each 5% of the year-specific salary distribution and nine indicator variables for diagnosis of the claimant. Standard errors are clustered by firm-division-class and the mean of the dependent variable is .098.

Appendix Table 1: Characteristics of Private LTD and SSDI Recipients

	LTD	SSDI	Full Population
Male	52.3%	49.6%	49.3%
Black	15.2%	19.0%	12.9%
Hispanic	11.1%	8.5%	15.1%
Less than HSG	13.4%	23.4%	12.4%
High School Grad	34.7%	40.5%	30.0%
Some College	34.6%	25.4%	29.6%
College Grad	17.3%	10.2%	28.0%
Family Income < FPL	4.9%	22.1%	12.3%
Family Income < 2*FPL	26.9%	55.6%	28.4%
Average Age	51.1	50.1	40.5
Aged 18-24	1.0%	3.4%	15.3%
Aged 25-29	2.8%	3.8%	11.1%
Aged 30-34	4.8%	3.5%	10.3%
Aged 35-39	7.2%	6.0%	10.6%
Aged 40-44	8.9%	8.3%	10.9%
Aged 45-49	10.7%	13.3%	11.9%
Aged 50-54	19.3%	16.7%	11.5%
Aged 55-59	22.0%	21.1%	10.0%
Aged 60-64	23.3%	23.5%	8.5%
Married	55.1%	41.7%	54.8%
Divorced or Separated	26.8%	25.3%	12.9%
Total Obs	490	5083	166773

Source: March 2009 and March 2010 supplements to the Current Population Survey from BLS. Data summarizes non-elderly adults from each survey and weights 2009 and 2010 responses by the number of observations in each year. Individuals are coded as receiving LTD if they reporting receiving disability income from a company or union policy or from a disability or accident policy. Individuals are coded as receiving SSDI if they report receiving Social Security due to a disability.

Appendix Table 2: Characteristics of PDI Claimants by EP Length

	≤100days	>100 days
<i>Plan Attributes</i>		
Elimination Period	87.8	181.9
Replacement Rate	59.8%	59.8%
Monthly Salary	3266	3282
Benefit Cap Binding	2.8%	3.5%
Quarterly Claims Rate	0.010%	0.068%
<i>Claimant Demographics</i>		
Female	60.0%	48.7%
Age 18-24	2.3%	0.6%
Age 25-29	7.1%	3.2%
Age 30-34	10.6%	5.4%
Age 35-39	10.3%	8.8%
Age 40-44	12.6%	11.4%
Age 45-49	15.2%	16.8%
Age 50-54	15.7%	18.6%
Age 55-59	15.5%	20.1%
Age 60-64	10.7%	15.1%
<i>LTD Claim Diagnosis</i>		
Stats excluding maternity claims in parentheses		
Accident	16.7% (18.8%)	15.0% (15.4%)
Fatigue	13.8% (15.6%)	14.1% (14.5%)
Heart / Circulatory	10.3% (11.6%)	14.4% (14.8%)
Mental	7.1% (8.0%)	6.9% (7.1%)
Cancer	14.9% (16.8%)	18.4% (18.9%)
Arthritis / Respiratory	6.7% (7.6%)	7.4% (7.6%)
Back	11.9% (13.4%)	14.2% (14.6%)
All Other	7.3% (8.2%)	7.0% (7.2%)
Maternity	11.3%	2.6%
<b># Observations</b>	<b>5,351</b>	<b>1,916</b>

Table contains summary statistics for the 7,267 LTD claims among workers in this sample. Claims are divided into those originating on plans with elimination periods of ≤100 (left-hand panel) or >100 days (right-hand panel).