The Growth in Applications for Social Security Disability Insurance: A Spillover Effect from Workers' Compensation

by Xuguang (Steve) Guo and John F. Burton, Jr.*

We investigate the determinants of application for Social Security Disability Insurance (DI) benefits in approximately 45 jurisdictions between 1981 and 1999. We reproduce findings of previous studies of the determinants of DI application then test the additional influence of changes to workers' compensation program benefits and rules on DI application rates. Our findings indicate that the programs are interrelated: When workers' compensation benefits declined and eligibility rules tightened in the 1990s, the DI application rate increased.

Introduction

Social Security Disability Insurance (DI) is the largest income-replacement program for nonelderly Americans. The federal DI and Medicare programs provide cash benefits and health care coverage to disabled beneficiaries until they return to work, die, or qualify for Social Security old-age benefits. The number of DI beneficiaries dramatically increased in the late 1980s and 1990s, which drew considerable attention from policymakers and academics. As Chart 1 shows, only about 2.3 percent of adults aged 25–64 were DI recipients in the 1980s, but the figure grew to 3.5 percent by 1999.

Previous Studies

Studies investigating the rise of DI enrollment primarily focus on the incentives to apply. The factors that produce these incentives fall into three categories: (1) the supply of DI benefits, (2) the demand for DI benefits, and (3) the effects of alternative income replacement programs. DI supply is determined by program rules, including the stringency of the eligibility criteria and the generosity of benefits. The demand for DI benefits is largely determined by individuals' characteristics, including health status and financial needs. Alternative programs that also pay cash benefits or cover medical costs for disabled persons (or did so during the 1980s and 1990s) include Supplemental Security Income (SSI), Aid to Families with Dependent Children (AFDC), Temporary Assistance for Needy Families (TANF), and Medicaid.

Selected Abbreviations

ASB	*Annual Statistical Bulletin*
DI	Disability Insurance
NCCI	National Council on Compensation Insurance
PPD	permanent partial disability
PTD	permanent total disability
SSA	Social Security Administration
TTD	temporary total disability
WCPD	workers' compensation permanent disability

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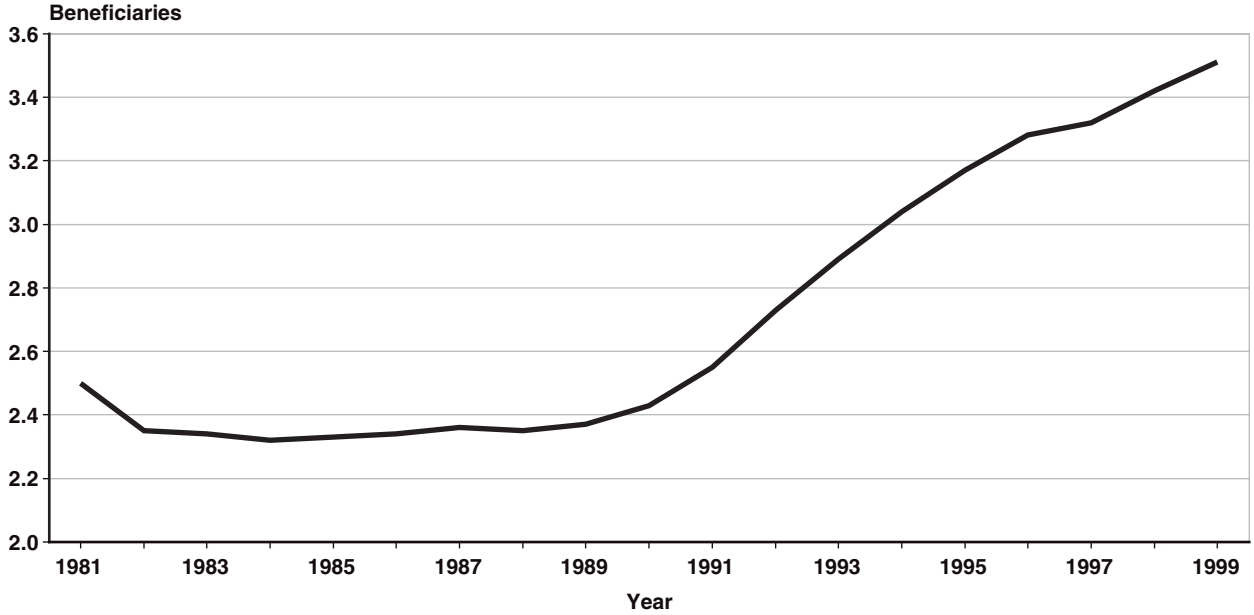
Autor and Duggan (2003) claim that liberalizing the application screening process has been a major cause of the growth in DI application since the early 1980s. Chart 2 shows that the application rate—measured as DI applicants per 100,000 workers—was generally higher in the 1990s than in the 1980s. According to Duggan and Autor (2006), the Social Security Disability Benefits Reform Act of 1984 significantly altered the DI eligibility criteria because it allowed relatively subjective evidence based on an applicant's reported pain and discomfort in lieu of strictly objective medical evidence. In addition, the Social Security Administration (SSA) was directed to relax its strict screening criteria for mental illness and to consider multiple nonsevere ailments in establishing eligibility. Mashaw and Reno (1996b) argued that the "liberalization" of the eligibility criteria in the 1984 legislation remedied overly zealous administrative retrenchment during 1979–1983. Moreover, they found that, despite the growth in DI enrollment in the 1990s, the DI allowance rate (after controlling for changes in the workforce's age and sex distributions) did not return to the peak reached in 1975. The authors concluded that disabled individuals had less access to DI benefits in the 1990s than in the 1970s. Chart 2 shows that the DI acceptance ratio—the number of benefit allowances divided by the number of denials—generally increased from 1981 to 1992, then dropped until the mid-1990s, before rising again after 1995.[1]

Individuals with disabilities are more likely to seek assistance from social insurance programs in an economic downturn than they are in a robust economy. Most empirical studies support this prediction (Autor and Duggan 2003; Kreider 1999; Rupp and Stapleton 1995). The unemployment rate is usually positively correlated with DI application. Soss and Keiser (2006) provide evidence that a state's disability prevalence rate is a factor in DI application rates. They find that as the disability prevalence rate increased by 1 percentage point between 1991 and 1993, the DI application rate increased by 15.4 per 10,000 residents. The disability prevalence rate increases substantially as the population ages. Rupp and Stapleton (1995) estimate that population growth and aging between 1988 and 1992 accounted for a 1.3 percent average annual increase in DI applications. Strand (2002) reveals that women are more likely to apply for DI benefits than men are.

Despite decades of studies, researchers have largely ignored one important aspect of DI: its relationship with workers' compensation. This lack of scholarly attention is particularly striking because the connection between the programs has long been of concern to policymakers in state legislatures and in Congress.

DI (in conjunction with Medicare) is the largest source of cash and medical benefits for workers with disabilities in the United States, and workers' compensation is the second largest source (Sengupta,

Chart 1.
DI beneficiaries as a percentage of adults aged 25–64, 1981–1999



SOURCE: Authors' calculations based on *Annual Statistical Supplement to the Social Security Bulletin* (various editions).

Reno, and Burton 2011, 2). Workers' compensation and DI serve overlapping, although not identical, populations.[2] Both programs provide medical and cash benefits to workers with chronic, severely disabling conditions.

Many workers' compensation claimants have persistent health problems that may eventually also qualify for DI benefit (Baldwin and Johnson 1998; Butler, Johnson, and Baldwin 1995; Mashaw and Reno 1996a). As of December 2010, 13.5 percent of DI beneficiaries had at some time also received workers' compensation (or public disability) benefits, and 7.1 percent were current recipients (Sengupta, Reno, and Burton 2011, Table 17).

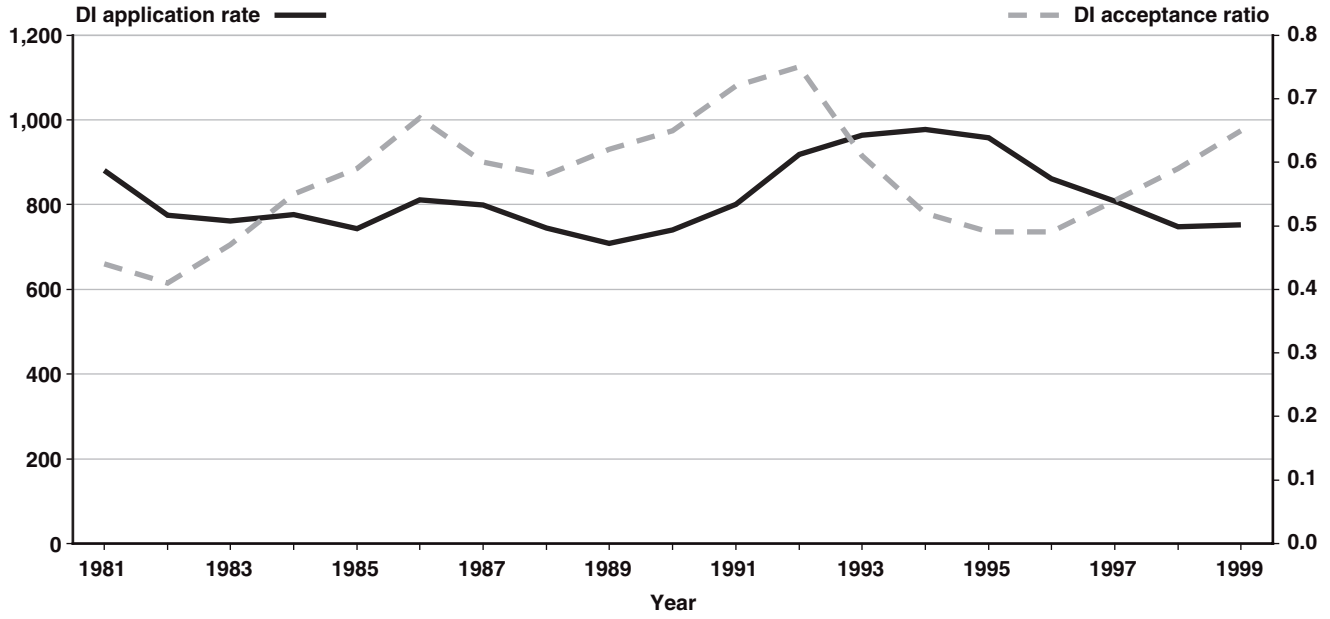
Workers' Compensation in the 1990s

This article examines the effects of workers' compensation program changes on the DI application rate during the 1990s. Each state has a workers' compensation program that provides cash benefits, medical care, and rehabilitation benefits to workers disabled by work-related injuries and diseases. There are no federal standards for workers' compensation and state rules differ considerably on level of benefits, coverage of employers and employees, and eligibility for benefits.[3] Workers' compensation is thus very different from DI, for which coverage rules for employers and workers, eligibility requirements, and benefit levels are determined at the national level.

Workers' compensation is the only significant civilian disability income program, either private or public, that pays benefits to partially or totally disabled workers.[4] However, the criteria used by state workers' compensation programs to determine whether a worker is totally disabled differ from those used by SSA for the DI program. Moreover, it is possible for an injured worker to be found partially disabled by a state workers' compensation program but totally disabled by SSA, and thus eligible for DI benefits. Furthermore, the criteria used to determine extent of disability vary among state workers' compensation programs (Burton 2005). We expect that these differences will systematically affect the DI application rates from state to state.

Reflecting Congressional concern about the relationship between the programs, the payment of DI and workers' compensation benefits has been coordinated since 1965. Specifically, if a person receives both DI and workers' compensation benefits, the combined benefits are limited to 80 percent of the claimant's preinjury wage. Federal law provides a DI benefit reduction or "offset" in order to achieve the 80 percent limit. Initially, states could enact "reverse offset" laws

Chart 2.
DI application rates and acceptance ratios, 1981–1999



SOURCE: Burkhauser and Houtenville (2006).

NOTE: Application rate reflects applicants per 100,000 adults aged 25–64; acceptance ratio equals the number of allowances divided by the number of denials.

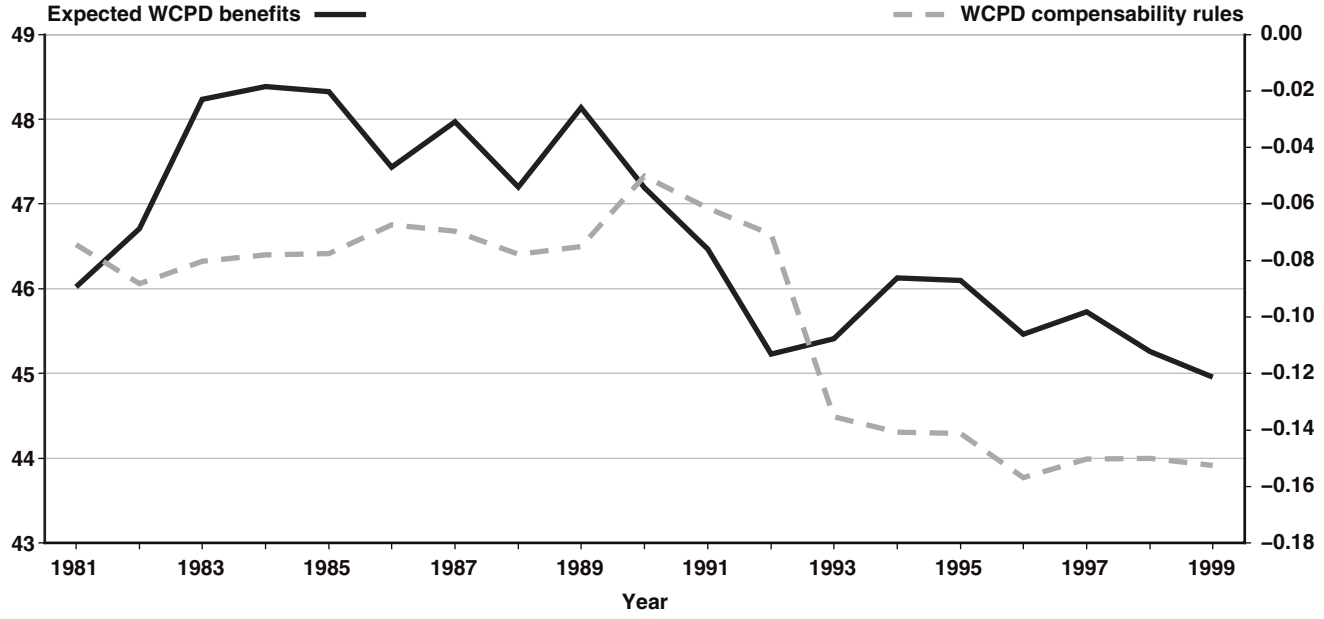
that reduced workers' compensation benefits rather than DI benefits, but in 1981 Congress eliminated that option for states that had not already enacted reverse offset legislation.[5]

Several institutional features of workers' compensation are likely to affect DI applications and awards. For example, many states limit the duration of workers' compensation benefit payments. Variation in the formulas used to calculate the weekly or monthly amounts of workers' compensation benefits may similarly be expected to affect the value of workers' compensation benefits relative to DI benefits, and thus influence the DI application rate. If, for example, a state has very generous workers' compensation benefits, workers may be less likely to apply for DI benefits. Chart 3 shows that the expected benefits for workers' compensation permanent disability (WCPD) claims generally declined in the 1990s.

In addition, workers are more likely to apply for DI benefits if they cannot qualify for workers' compensation benefits. A number of states changed their workers' compensation laws during the 1990s to restrict eligibility for permanent disability benefits (Spieler and Burton 1998). These provisions included limits on the compensability of particular medical diagnoses, such as stress and carpal tunnel syndrome; limits on coverage when the injury involved the aggravation of a preexisting condition; restrictions on the compensability of permanent total-disability cases; and changes in procedural rules and evidentiary standards, such as the requirement that medical conditions be documented by "objective medical" evidence. Burton and Spieler (2001, 2004) suggest that these changes are likely to have a disproportional effect on older workers, who are most likely to apply for DI benefits.

Research indicates that those legislative changes affected the workers' compensation benefits received by injured workers.[6] For example, in 1990, Oregon adopted legislation requiring the work injury to be the "major contributing cause" of disability for the claimant to qualify for workers' compensation benefits. Thomason and Burton (2005) estimate that this and similar changes had reduced the amount of benefits received by Oregon workers by about 25 percent by the mid-1990s. Guo and Burton (2010) find that changes in state compensability rules and increasingly stringent administrative practices were major contributors to the decline in workers' compensation cash benefits during the 1990s. Chart 3 shows the effect of tightening compensability rules for WCPD benefits.

Chart 3.
Estimated effects of workers' compensation program changes, 1981–1999



SOURCE: Authors' calculations.

NOTE: "Expected WCPD benefits" reflects the number of weeks that benefits would replace the average weekly wage in the beneficiary's state. "WCPD compensability rules" represents changes in eligibility rules resulting from legislation or court decisions, expressed as a cumulative index relative to rules in place in 1975; declining values indicate greater stringency.

This article examines whether the developments in WCPD benefits during the 1990s shown in Chart 3 explain a portion of the increase in DI applications shown in Chart 2.

Data and Variables

Three previous studies (Rupp and Stapleton 1995; Autor and Duggan 2003; Soss and Keiser 2006) used state-level data to estimate the extent to which selected DI program and population characteristics determined DI application rates. We employ most of the variables they used, and add two workers' compensation variables.

The previous studies employed different measures of the DI application rate. Rupp and Stapleton used DI applications per insured person, Autor and Duggan used the DI application rate among nonelderly adults, and Soss and Keiser used DI applications per 10,000 residents. Presumably, Rupp and Stapleton's measure is the most accurate, because only insured individuals can apply for DI. However, because we do not have access to state data on the DI-insured population, we turn to the second-best measure, Autor and Duggan's DI applications per 100,000 adults aged 25–64. That measure excludes children and persons aged 65 or older from the application pool. Disabled children or students cannot file independent applications for DI benefits without sufficient working experience. Eligibility for DI benefits is restricted to the insured population younger than the Social Security full retirement age, which was 65 throughout the study's observation period.[7] We obtain the data on 1981–2001 DI applications by state from Burkhauser and Houtenville (2006). In calculating the DI application rate, we account both for those who applied only for DI benefits and those who applied concurrently for DI and Supplemental Security Income payments.

We use two variables to measure the possible effects of workers' compensation programs on DI application rates: expected benefits and compensability rules for WCPD. We describe expected WCPD benefits, a measure of statutory benefits, in detail in Appendix A. Previous users of this variable include Krueger and Burton (1990); Thomason, Schmidle, and Burton (2001); and Guo and Burton (2010). Those studies use an actuarial procedure to calculate the expected cash payments for four types of workers' compensation benefits: temporary total disability (TTD), permanent partial disability (PPD), permanent total disability (PTD), and fatality. The procedure uses information on state workers' compensation laws, federal and state income taxes, Social Security taxes, and state average wages to produce expected workers' compensation cash benefits for each state in each year from 1972 through 1999. The methods of calculating expected benefits assume identical injury composition, life expectancy distribution, and family status in order to insure that interstate variations are due solely to differences in wages and workers' compensation statutory provisions.

Expected WCPD benefits values are expressed as the weighted average of expected benefits for PPD and PTD claims divided by the state's average weekly wage.[8] For example, the value of expected WCPD benefits for New York in 1981 is 61, which means the expected benefits per claim in 1981 were equal to 61 weeks of the state's average weekly wage. The expected benefits variable measures the generosity of a state's workers' compensation benefits. We expect a negative relationship between expected WCPD benefits and the DI application rate because more generous workers' compensation benefits should reduce the incentives to seek other sources of support.

Year-to-year changes in expected WCPD benefits capture statutory changes to the duration and amount of cash benefits, but do not account for changes in eligibility standards or major court decisions that affect eligibility. The second variable, WCPD compensability rules, captures such changes in state rules since 1975. For each state, the National Council on Compensation Insurance (NCCI) estimates the total effects of changes in workers' compensation expected benefits and in statutes or court decisions that affect compensability rules. The difference between these NCCI estimates and our estimates of the effects of changes in expected WCPD benefits reflects the estimated effect of changes in WCPD compensability rules. Appendix B describes WCPD compensability rules in detail.

We calculate accumulated changes in the compensability rules for PPD and PTD benefits using 1975 as the baseline. For example, if a state liberalized its compensability rules by 10 percent in 1989 and 10 percent in 1992, the value of its compensability change is 0 from 1975 through 1988, + 0.1 from 1989 through 1991, and + 0.2 after 1991. We expect a negative relationship between WCPD compensability rules and DI application because workers who qualify for workers' compensation benefits are less likely to apply for benefits from other programs for disabled persons.

As shown in Chart 3, the WCPD compensability rules tightened between 1981 and 1999, which should have resulted in more applications for DI benefits.

We also adopt six independent variables from the previous studies to explain the DI application rate: DI acceptance ratio, DI replacement rate, population median age, disability prevalence, women's share of employment, and unemployment rate. The DI acceptance ratio is equal to the number of DI allowances divided by the number of DI denials. Chart 2 shows national average DI acceptance ratios. In our regressions, we use each state's DI acceptance ratio with a 1-year lag. A higher acceptance ratio may encourage more DI applications in subsequent years. However, more DI applications may result in more stringent acceptance decisions. Although the federal government establishes the general standards for DI eligibility, state agencies make the initial administrative decisions and if DI applications increase, the agency may informally tighten the acceptance criteria to keep the number of awards from increasing too rapidly. As a result, the expected sign of the DI acceptance ratio is uncertain.[9]

The DI replacement rate equals the average monthly DI benefit per disabled worker divided by the state average monthly wage. Median age is self-explanatory. Disability prevalence data are self-reported characteristics from Census Bureau's Current Population Surveys. We could not find a source of nonself-reported information covering our study period. However, most previous studies confirm that self-reported work limitations are strong predictors of DI participation (Burkhauser, Butler, and Weathers 2001/2002; Daly 1998; Rupp and Davies 2004). Women's share of employment is also self-explanatory, as is unemployment rate. Based on previous studies, we expect these last five variables to correlate positively with DI applications.

Two previous studies examine the relationship between workers' compensation and DI. In the first, Guo and Burton (2008) find that the DI application rate increased from 1985 through 1999 as the statutory level of workers' compensation benefits declined and eligibility rules tightened. The authors calculate workers' compensation variables using the weighted average of TTD, PPD, PTD, and fatality benefits. However, most workers' compensation beneficiaries receive only TTD benefits and are unlikely to qualify for DI benefits (which are not provided for temporary disabilities). Thus, the workers' compensation variables used in Guo and Burton (2008) do not provide the best measures of cases that could potentially result in DI applications. By contrast, the variables in the current analysis consider only PPD and PTD claims, which should provide a more precise estimate of the spillover effect to DI. The present analysis also extends the period of coverage to 1981–1999 and reformulates the model to minimize some statistical problems.

In the second study, McInerney and Simon (2012) conclude "it is unlikely that state workers' compensation changes were a meaningful factor in explaining the rise in DI during our study period of 1986 to 2001." One major difference between that study and this article is that we use different variables to measure important features of state programs. McInerney and Simon, for example, use state PPD maximum weekly benefits as a measure of workers' compensation generosity in their regression models. However, PPD maximum weekly benefits are only one of the factors determining the generosity of PPD benefits. Some states base PPD benefits on the degree of injury, while others base them on the extent of lost earning capacity. Most states impose maximum durations or dollar amounts on PPD benefits (unlike PTD benefits, which in many states can continue for life), and these limits vary among states. For example, losing an arm is compensated for 312 weeks in the District of Columbia, but for 224 weeks in Georgia. The eligibility rules for PPD benefits also vary across states. The findings from McInerney and Simon's study may be misleading because using maximum weekly benefits as the sole measurement of generosity is limiting.

This article's two independent variables provide more refined measurements of state workers' compensation programs. The first, expected benefits, relies on actuarial evaluations of state laws for both PPD and PTD benefits. "Expected benefits" considers not only maximum weekly benefits but also minimum weekly benefits, nominal replacement rates (weekly benefit relative to the worker's previous earnings), and the durations of two or more types of PPD benefits (such as scheduled and unscheduled) used in each state.[10] We add the second variable, compensability rules, to capture changes to eligibility rules in state workers' compensation programs. Guo and Burton (2010) find that expected benefits and compensability rules are both statistically significant variables that help explain the decline of workers' compensation benefits in the 1990s. We expect those two variables to estimate the impact of workers' compensation program changes on DI application rates in the 1990s more accurately than the variables used by McInerney and Simon (2012).

Regression Results

We examine the determinants of DI application in three steps. First, we try to replicate the findings from previous studies for the six independent variables: DI acceptance ratio, DI replacement rate, median age, disability prevalence, women's share of employment, and unemployment rate. Second, we add the two WCPD variables (expected benefits and compensability rules) to examine whether changes in program laws and rules also help determine DI application rates. Third, we estimate the extent to which workers' compensation program changes spilled over into higher DI application rates during the 1990s. The first two steps employ fixed-effects regression models. The third step uses a simulation model based on the regression results from the second step.

The investigation covers 46 states from 1981 through 1999.[11] Table 1 shows descriptive statistics for the study variables. Most variables have 969 observations; for WCPD compensability rules, missing values reduce the number of observations to 855.[12] To be consistent across models, we use 855 observations for all variables.[13] A major potential problem for a panel data set is the unobserved variances of the missing variables. Many factors, such as differences in the political environment across states or changes in national attitudes towards disabled persons over time, are difficult or impossible to measure. Those unobserved variances, if correlated with the dependent variable or independent variables, will bias the results of an ordinary least square regression model. Econometricians usually employ one of two techniques to control for the unobserved variables in the panel data: fixed effects or random effects. When the unobserved variances are correlated with the independent variables, a random-effect model is preferred; otherwise, a fixed model is more appropriate (Greene 2011). We ran Hausman tests for our panel data that indicated a fixed-effect model should be more efficient for our regressions.

In the five studies discussed above, Rupp and Stapleton (1995) and Soss and Keiser (2006) use only time fixed-effects models; Autor and Duggan (2003) employ a combination of first-difference observations (which is similar to time fixed-effects) and state fixed-effects; and Guo and Burton (2008) and McInerney and Simon (2012) use both time and state fixed-effects models.

To demonstrate the differences generated by the time and state fixed effects, we present four models for our regression results: model 1 includes neither year

Table 1.
Definitions and descriptive statistics for study variables

Variable	Mean	Standard deviation	Minimum	Maximum
DI application rate [a]	832.00	219.07	343.60	1,765.34
Workers' compensation variables				
Expected WCPD benefits [b]	53.35	32.74	15.61	377.72
WCPD compensability rules [c]	-0.14	0.31	-1.30	0.90
Independent variables				
Prior-year DI acceptance ratio [d]	0.59	0.18	0.24	1.30
DI replacement rate [e]	0.32	0.04	0.18	0.42
Median age (years)	32.75	2.40	24.40	38.70
Disability prevalence	0.08	0.02	0.04	0.15
Women's share of employment	0.46	0.02	0.39	0.52
Unemployment rate	0.06	0.02	0.02	0.16

SOURCES: Burkhauser and Houtenville (2006); SSA; Bureau of Labor Statistics; authors' calculations; Cornell University Rehabilitation Research and Training Center on Disability Demographics and Statistics; and Census Bureau.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999, except as noted.

a. Applications per 100,000 adults aged 25–64; includes DI-only and concurrent DI and SSI applications.

b. Actuarial value (in 1982–1984 dollars) of PPD and PTD benefits under state workers' compensation statute divided by state average weekly wage.

c. Effective cumulative change since 1975 as a result of statutory changes to and court decisions affecting PPD and PTD benefits.

d. DI claims accepted divided by claims denied in previous year.

e. Average monthly DI benefit divided by average monthly wage.

dummies nor state dummies, model 2 includes year dummies only, model 3 includes state dummies only, and model 4 includes both state and year dummies.[14] Model 4 is our preferred model, because it controls for unobserved variations across states and years. To correct for heteroskedasticity, we employ weighted least-square regressions (using state employment as weights) and robust standard errors for all regression models.

Regressions Excluding Workers' Compensation Variables

Table 2 reports that the DI replacement rate, disability prevalence, and unemployment rate are positively and significantly associated with DI application in all four models. (In model 4, the coefficient on the DI replacement rate is significant at the 0.05 confidence level, the coefficient on disability prevalence is significant at the 0.10 confidence level, and the coefficient on the unemployment rate is significant at the 0.01 confidence level.) The coefficients for women's share of employment are positive and statistically significant in three models (including model 4, where the coefficient is significant at the 0.10 confidence level). The coefficient on median age is not statistically significant at the 0.10 confidence level in the first two models, but is positive and significant in models 3 and 4 at the 0.01 confidence level.

Model 4 replicates the findings in previous studies. The results for the DI acceptance ratio are paradoxical because they are inconsistent across models and the coefficient is not significant at the 0.10 confidence level in our preferred model 4. Guo and Burton (2008) find a significant and negative relationship between state stringency for DI awards and the DI application rate but, as discussed in note 9, that result was probably biased. None of the other four studies investigate the impact of state administrative stringency for DI awards on the number of DI applications. The nature of the relationship between higher acceptance ratios and the DI application rate remains murky despite our best effort.

According to model 4, the coefficient on DI replacement rate is 583.98, meaning that when the DI replacement rate increased by 10 percentage points, 58.4 more individuals per 100,000 nonelderly adults applied for DI benefits. (The mean value for DI applications in our

Table 2.
Alternative regressions examining determinants of DI application during 1981–1999, excluding workers' compensation variables

Variables	Model 1	Model 2	Model 3	Model 4
Prior-year DI acceptance ratio	3.70	-136.14***	153.61***	(42.66)
	(33.15)	(33.20)	(33.01)	(29.88)
DI replacement rate	1,097.15***	1,083.73***	1,660.79***	583.98**
	(159.53)	(148.56)	(341.24)	(247.73)
Median age	4.02	1.19	35.31***	21.38***
	(2.90)	(2.82)	(4.62)	(6.81)
Disability prevalence	6,205.44***	5,409.19***	1,798.05***	515.81*
	(381.72)	(333.30)	(396.00)	(275.16)
Women's share of employment	3,218.80***	2,805.43***	858.15	634.11*
	(452.64)	(407.06)	(537.66)	(350.44)
Unemployment rate	3,000.05***	2,884.85***	3,433.24***	2,632.96***
	(335.71)	(360.75)	(290.43)	(244.80)
Year dummies	No	Yes	No	Yes
State dummies	No	No	Yes	Yes
R-square	0.52	0.65	0.79	0.91

SOURCE: Authors' calculations.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999.

Data are weighted least-square regressions using state employment as the weight.

The dependent variable is DI applicants per 100,000 nonelderly adults.

Robust standard errors are shown in parentheses.

* = significant at the 0.10 level; ** = significant at the 0.05 level; *** = significant at the 0.01 level.

sample was 832 per 100,000 nonelderly adults.) This result is lower than Autor and Duggan's (2003) finding; however, their examination of the DI replacement rate focuses on low-wage workers, while our measure is the state average replacement rate applicable to all workers. We are not surprised that low-income workers are more likely to apply for DI benefits than are workers overall. Our results also suggest that a 10 percentage point growth in disability prevalence induces 51.6 more applications per 100,000 nonelderly adults, a finding similar to that of Soss and Keiser (2006). Model 4 also indicates that if the median age increases by 1 year, 21.4 more persons of every 100,000 nonelderly adults apply for DI benefits. For every 10 percentage point difference between states in the share of female workers, the state with the higher share receives 63.4 more applications for every 100,000 nonelderly adults. Finally, a 10 percentage point increase in the unemployment rate leads to 263.3 additional DI applications per 100,000 nonelderly adults; that result falls in the range of findings reviewed by Rupp and Stapleton (1995, Chart 4).

Regressions Including Workers' Compensation Variables

In the regressions in Table 3 we include the expected WCPD benefits and WCPD compensability rules variables. The coefficient for expected WCPD benefits is consistently negative and significant (at the 0.01 confidence level in models 1, 3, and 4, and at the 0.05 confidence level in model 2), as expected. Model 4 suggests that when expected WCPD benefits are reduced by an amount equal to 1 week of a state's average weekly wage, DI applications increase by 0.51 per 100,000 nonelderly adults. This means that a state with expected WCPD benefits that were one standard deviation below the national average (as shown in Table 1) had about 33 more DI applications per

Table 3.
Alternative regressions examining determinants of DI application during 1981–1999, including workers' compensation variables

Variables	Model 1	Model 2	Model 3	Model 4
Expected WCPD benefits	-0.73***	-0.37**	-0.82***	-0.51***
	(0.19)	(0.18)	(0.25)	(0.15)
WCPD compensability rules	38.51**	57.06***	-46.98*	-30.95**
	(17.75)	(13.65)	(26.44)	(13.67)
Prior-year DI acceptance ratio	6.61	-151.77***	160.11***	-35.95
	(33.57)	(34.37)	(32.99)	(29.77)
DI replacement rate	1,287.25***	1,312.30***	1,638.04***	597.80**
	(165.67)	(151.57)	(346.86)	(256.49)
Median age	4.88*	1.50	32.35***	17.54***
	(2.88)	(2.83)	(4.71)	(7.02)
Disability prevalence	6,242.58***	5,435.56***	1,764.78***	507.62*
	(380.97)	(334.64)	(391.30)	(272.62)
Women's share of employment	3,339.72***	2,882.38***	1,051.92**	765.88**
	(460.34)	(411.25)	(530.79)	(355.82)
Unemployment rate	2,924.86***	2,737.95***	3,407.37	2,605.93***
	(334.52)	(358.60)	(287.53)	(248.59)
Year dummies	No	Yes	No	Yes
State dummies	No	No	Yes	Yes
R-square	0.53	0.66	0.79	0.92

SOURCE: Authors' calculations.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999.

Data are weighted least-square regressions using state employment as the weight.

The dependent variable is DI applicants per 100,000 nonelderly adults.

Robust standard errors are shown in parentheses.

* = significant at the 0.10 level; ** = significant at the 0.05 level; *** = significant at the 0.01 level.

100,000 nonelderly adults than a state with benefits that were one standard deviation above the national average.[15] Because the mean DI application rate in our sample was 832 per 100,000 nonelderly adults, the effect of expected WCPD benefits on DI applications is statistically significant but small.

The WCPD compensability rules variable is positively correlated with DI applications in models 1 and 2, contrary to our expectations. However, its coefficient becomes negative when we include state dummies in model 3 (significant at the 0.10 level of confidence) and model 4 (significant at the 0.05 level of confidence). Workers' compensation is a state program and many factors, such as the availability of lawyers who can handle both workers' compensation and DI cases, probably are important to the prevalence of DI applications, but are not measured in any data set. The differences in results among the four models for compensability rules confirm that using state fixed-effect models to control for unobserved state-specific variances is critical for avoiding biased estimates. In our preferred formulation (model 4), the results suggest that the liberalization of state compensability rules by 10 percent relative to 1975 decreases DI applications by 3.1 per 100,000 nonelderly adults. This means that a state with a WCPD compensability rules value that was one standard deviation below the national average had about 19 more DI applications per 100,000 nonelderly adults than a state with a value that was one standard deviation above the national average—again, a relatively small effect.[16]

The results for the nonworkers' compensation variables in Table 3 are similar in significance and magnitude to the coefficients in Table 2. Including workers' compensation variables thus does not affect the results of the six independent variables used in previous studies of the determinants of DI application.

The Spillover from Workers' Compensation Reforms

During the 1990s, the values of the expected WCPD benefits and WCPD compensability rules variables both declined, as shown in Chart 3. These changes, in combination with the coefficients for these two variables (Table 3, model 4), confirm that developments within the workers' compensation program explain a modest portion of the increase in the DI application rate during that decade.

From the 1980s to the 1990s, the national average annual DI application rate increased from 775 to 853 claims per 100,000 nonelderly adults (Table 4), a 10 percent increase. To what extent did workers' compensation reforms spill over into the growth of the DI application rate during that period? In Table 4, we use the regression results from model 4 in Table 3 to estimate each variable's contribution toward the growth of the DI application rate. Table 4's first two columns

Table 4.
Extent of changes in national average DI application rates from the 1980s to the 1990s explained by each variable

Variable	National annual average		Difference between 1980s and 1990s	Coefficient from model 4	Predicted change [a]	Explained change [b] (%)
	1981–1989	1990–1999				
DI application rate	775.09	852.54	77.44	…	77.44	…
Expected WCPD benefits	48.29	45.64	-2.65	-0.51	1.35	1.75
WCPD compensability rules	-0.08	-0.12	-0.05	-30.95	1.46	1.89
Prior-year DI acceptance ratio	0.54	0.59	0.05	-35.95	1.81	-2.34
DI replacement rate	0.31	0.30	-0.01	597.81	-6.39	-8.25
Median age	31.55	34.24	2.70	17.54	47.30	61.08
Disability prevalence	0.08	0.08	c	507.62	1.53	1.98
Women's share of employment	0.44	0.46	0.02	765.88	13.43	17.34
Unemployment rate	0.07	0.06	-0.01	2,605.93	-35.09	-45.31

SOURCE: Authors' calculations.

NOTE: … = not applicable.

a. Product of "difference between 1980s and 1990s" and "coefficient from model 4."

b. Equals predicted change in value of variable divided by predicted change in DI application rate (77.44).

c. Less than 0.005.

present the national annual average for each variable during the 1980s and 1990s, respectively. The third column shows the change in value for each variable between the two decades. The fourth column presents the coefficients from model 4 in Table 3. We multiply columns 3 and 4 to obtain the values in column 5, the predicted changes in the DI application rate based on our regression results. Column 6 shows the percentages of the change in DI application rates from the 1980s to the 1990s explained by each variable.

Our results indicate that the aging of the population was the largest contributor to the growth in DI application, and that it accounted for more than one-half the growth of the DI application rate in the 1990s. Women's share of employment was another important factor, associated with about 17 percent of the change in DI application rates between the decades. The DI replacement rate and the unemployment rate generally declined across those two decades, which would have resulted in a lower DI application rate if the values of other independent variables had not changed. The change in the disability prevalence rate was minimal during the period. Thus, the latter three factors were not sources of the higher DI application rates in the 1990s.

Our results suggest that workers' compensation program reforms during the 1990s combined to contribute 3–4 percent of the growth of the DI application rate during that period. Specifically, changes in expected WCPD benefits and WCPD compensability rules respectively explained 1.75 percent and 1.89 percent of the growth of the DI application rate between the 1980s and 1990s.

Conclusions

In this article we attempted to replicate the results of earlier studies of the determinants of interstate differences in DI benefit application rates. Those studies did not include variables measuring aspects of state workers' compensation programs. Our results in Tables 2 and 3 basically confirm the previous findings.

Another purpose of this article was to investigate whether the growth of DI application in the 1990s could be partially explained by changes in state workers' compensation programs. The findings in Table 3 suggest that both expected WCPD benefits and WCPD compensability rules modestly affect the DI application rate. Because the values of both variables declined in the 1990s, the statistical results help explain the increase in the DI application rate during the decade. Our results are consistent with those of Guo and Burton (2008), but differ from those in McInerney and Simon (2012) because we find a small effect of state workers' compensation program changes on DI application, while McInerney and Simon concluded that program changes were unlikely to cause the rise in DI applications. We believe that the results differ because this study relies on better measures of state workers' compensation programs.

Policy Implications

Our findings raise potential concerns about the financial status of the DI Trust Fund. Those concerns stem from the assumption that some of the increased application for DI benefits due to changes in workers' compensation programs during the 1990s resulted in additional DI awards. Although we believe this assumption is reasonable, we have not yet tested the transfer of costs from workers' compensation to DI. Nevertheless, to the extent that increased application for DI benefits results in more DI awards, the changes in the workers' compensation program have contributed modestly to the financial problems of the DI Trust Fund.[17]

Further concerns involve the potential reduction in incentives to improve workplace safety.[18] Workers' compensation programs promote safety by using two types of experience rating to determine employer premiums. The industry-level experience rating establishes a premium rate based largely on prior benefit payments by the industry. The resulting differences in labor costs and prices between industries should shift the composition of national consumption towards safer products. The firm-level experience rating determines the workers' compensation premium for each firm (above a minimum size) by comparing its prior benefit payments with those of other firms in the industry. Firms thus have an incentive to improve safety in order to reduce premiums and remain competitive.

Scholars have debated the safety effects of the workers' compensation program in general and of firm-level experience rating in particular. A survey of the literature by Boden (1995) concludes, "research on the safety impacts has not provided a clear answer to whether workers' compensation improves workplace safety" (p. 285). By contrast, Thomason (2005) asserts that most of the studies he surveyed (11 of 14) found that experience rating improves safety and health and that studies failing to detect the relationship did so because of methodological weaknesses. Thomason concludes that "taken as a whole, the evidence is quite compelling: experience rating works" (p. 26). Guo

and Burton (2010) find that the national average of incurred workers' compensation cash benefits declined by 41.6 percent during the 1990s, and over 30 percent of this decline was due to changes in the state workers' compensation programs, such as tightening compensability rules. To the extent that the costs of workplace injuries shift from workers' compensation to workers and their families or to other programs for disabled workers, the safety incentives provided by the workers' compensation program are diluted. Safety incentives have probably also been diluted—to the extent that costs have been shifted from workers' compensation to the DI program—because the former relies on a firm-level experience rating and the latter does not experience-rate the DI payroll tax.[19]

Placing our Results in Context

First, some determinants of DI application are inexorable and are largely beyond the purview of public policy. Population aging and women's increasing workforce participation are examples, which together explain over 70 percent of the increase in the DI application rate during the period we studied.

Second, some determinants of DI application are significantly affected by public policies that are largely based on factors external to the DI program. Examples are policies addressing the unemployment rate, including fiscal and monetary policy. Our results suggest that declining unemployment rates reduced the DI application rate by about 45 percent between the 1980s and 1990s.

Third, the determinants of DI application that are directly affected by public policies at the federal level are largely based on factors internal to the DI program. An example we examined was the DI replacement rate, which essentially measures how adequately DI benefits replace disabled workers' lost earnings. Our results suggest that the decline in the DI replacement rate between the 1980s and 1990s reduced the DI application rate by about 8 percent. Other federal policy tools that can increase or decrease the application rate include changing the stringency of DI benefit eligibility standards.

Fourth, the determinants of DI application affected by state-level public policies include changes in workers' compensation programs. Although the primary purpose of those changes is not to affect DI application rates, they nonetheless have consequences for the DI program. The effects of workers' compensation policy changes on DI application are limited when compared with socioeconomic developments such as the aging workforce and unemployment, and are less important than policy decisions made at the federal level, such as the level of the DI replacement rate. Nonetheless, our findings suggest that changes in the state workers' compensation programs during the 1990s resulted in a modest increase in applications for DI benefits during that period.

Further Research

Several avenues offer promise for further research. One such avenue is to extend the study period. This article limits its examination to the period between 1981 and 1999 because the data for workers' compensation expected benefits and compensability rules for more recent years are not yet available. Another reason we selected that period is that it largely overlaps the 1986–2001 study period of McInerney and Simon (2012), which allows a comparison of the two studies' methodologies, variables, and findings. Nonetheless, the types of changes in workers' compensation programs that affected DI application rates in the 1990s continued into the current century and may have had a greater impact recently. Most of the reforms in the 1990s were in smaller states and thus had a limited effect on the national DI application rate.[20] Since 2000, some states have increased permanent disability benefits; however, many of the workers' compensation reforms that reduced benefits occurred in larger states. California, Florida, and New York accounted for almost one-third of workers' compensation benefit payments as of 2005 (Sengupta, Reno, and Burton 2011, Table 7). Between 2000 and 2009, California reduced PPD benefits by over 60 percent, Florida by almost 20 percent, and New York by about 20 percent (NCCI 2011, Exhibit III). We will study the effects of these changes on DI application rates as soon as the data for the expected WCPD benefits and WCPD compensability rules variables are updated.

Research could also consider aspects of the DI program besides applications. We only examined the effects of workers' compensation program changes on DI application rates because much of the DI program research focuses on the determinants of application. However, workers' compensation program changes can lead to adverse DI program outcomes in addition to higher application rates. Recall that in 2010, 13.5 percent of workers receiving DI benefits were also current or former recipients of workers' compensation or public disability benefits; and for some, DI benefits were reduced by the offset rules (Sengupta, Reno, and Burton 2011, Table 17). For most workers whose DI

benefits are limited by the offset rule, a $100 reduction in workers' compensation benefits results in a $100 increase in DI benefits. Our research to date has not considered this type of cost shifting from state workers' compensation programs to the DI program.

Appendix A: Calculating Expected WCPD Benefits

The methodology used to construct the expected WCPD benefits variable is adapted from an actuarial procedure used by the NCCI to evaluate how changes in state workers' compensation laws affect program costs, as measured by benefit payments.[21] The NCCI procedure evaluates statutory changes affecting medical benefits and four types of cash benefits: TTD, PPD, PTD, and fatality. For each type of cash benefits, expected benefits are equal to the product of the average weekly benefit paid to claimants and the average duration of benefit payments in weeks. The NCCI then combines the separate estimates for the four types of expected cash benefits and uses a national distribution of claims by type to estimate an overall average expected cash benefit for all disabling injury and illness claims in each state. For this study, we have calculated expected WCPD benefits based only on PPD and PTD claims because these relatively serious injuries are the types most likely to qualify for DI benefits.

The weekly amount for each type of benefit is calculated based on the state's average weekly wage, the percentage of preinjury wages replaced by the benefit (nominal replacement rate), and the minimum and maximum benefit amounts (which will affect the actual replacement rate for some workers). In addition, we account for the distribution of wages around the state's average weekly wage, which will indicate how many workers are affected by the minimum or maximum weekly benefits. Adjustments are made to the weekly benefit in those states that coordinate workers' compensation benefits with other programs, including DI and Old-Age and Survivors Insurance, and in those few states that index the weekly benefit to the cost of living or the state's average weekly wage.

PTD Duration and Expected Benefits

Some jurisdictions limit the duration or the total dollar amount of PTD benefits. Unless such a limit was specified, we assumed that benefits are payable for life. In either case, we determined the duration of benefits using an age distribution of PTD claimants and mortality information provided by the NCCI. We calculated expected benefit duration for every claimant in the age distribution and then multiplied it by the average weekly benefit amount to obtain total expected PTD benefits.

For states where PTD benefits are offset by DI benefits, we divided the total benefit period into four subperiods. The first is a 6-month waiting period during which we assumed the claimant received no DI benefits. The second is a period during which the DI benefit includes dependent benefits (for those claimants with dependent children). The third is a period after the children have reached majority and during which only the basic DI benefit is paid. The fourth is a period, beginning at age 65, when DI benefits are no longer paid. Benefit durations are calculated for each of these periods, adjusted for mortality and discounted to the present at 3.5 percent. The duration value for each component is then multiplied by the applicable weekly PTD benefit for that period to estimate the present value of lifetime benefits.

For those states in which workers' compensation benefits are reduced ("offset") if the worker receives Old-Age Insurance benefits, we make one benefit duration calculation for a beneficiary through age 64 and another for ages 65 and older. Both benefit duration calculations are adjusted for mortality and discounted at 3.5 percent, and then multiplied by the appropriate weekly benefit (whether offset or not) to obtain the expected total amount of PTD benefits in the state.

PPD Duration and Expected Benefits

Most states recognize two different types of PPDs for workers' compensation: those affecting a particular body part included on a list (or *schedule*) of injuries contained in the statute and those that do not. These injury types are thus called scheduled and nonscheduled PPDs.[22] The maximum duration of scheduled benefits for the physical loss or loss of use of a particular body part is specified by statute. For example, in New York, a worker who loses the use of a leg is entitled to 288 weeks of benefits, while a worker who loses an arm is entitled to 312 weeks of benefits. In the event of a partial physical loss or loss of use of a scheduled body part, benefits are prorated based on the amount specified for the entire loss, so that a New York worker who has suffered a 25 percent loss of an arm is entitled to 78 weeks of benefits.

The basis for nonscheduled PPD benefits—that is, those involving a body part not specifically mentioned in the statute—varies widely among states. Some

states base nonscheduled benefits on the permanent-impairment approach, which essentially evaluates the medical consequences of a workplace injury or disease. Other states base nonscheduled benefits on an evaluation of the workplace injury's consequences on the worker's earning capacity. Still other states base nonscheduled benefits on the extent of the worker's actual loss of wages from the workplace injury or diseases. Some states place the same duration limit on all nonscheduled PPD benefits, while the limits vary in other states, depending on the severity of the consequences of the injury (for example, the loss of wage-earning capacity).

For scheduled PPD benefits, and for nonscheduled PPD benefits based on the permanent-impairment or the loss-of-earning-capacity approach, we use a national distribution of PPD claims by body part and degree of permanent impairment provided by the NCCI. For states using the actual-wage-loss approach, we use a distribution based on Berkowitz and Burton (1987) to determine the extent of wage loss associated with a given degree of permanent impairment. This information is then linked to the NCCI's PPD distribution to create a wage-loss distribution for PPD claimants.

Each state's workers' compensation statutory information is then combined with the resulting PPD distribution (wage loss, earning capacity, or permanent impairment) to determine average disability duration. PPD benefit durations are adjusted for mortality and discounted at 3.5 percent. The adjusted average benefit durations are then multiplied by the average weekly benefit to obtain the expected total amount of PPD benefits in the state.

In order to provide consistent estimates across years and states, we use this distribution of cases (based on NCCI data): fatal (0.002357), PTD (0.003162), major PPD (0.085293), minor PPD (0.240863), and TTD (0.668324). Because this study focuses on the more serious injuries, it uses only the PTD, major PPD, and minor PPD weights.

Previous Use of the Expected Benefits Variable

For more than 55 years, the NCCI has used an actuarial procedure to estimate the effect of changes in workers' compensation statutes on the amount of benefits paid.[23] As described in NCCI (2011), the procedure involves calculating the ratio of benefit amounts for a representative group of accidents under the new law to the amounts for the same group of accidents under the old law. The ratios are calculated for seven benefit categories: fatal, PTD, major PPD, minor PPD, TTD, total indemnity (a weighted average of the previous categories), medical, and total (a weighted average of total indemnity and medical). NCCI has published ratios for 1965 and later in Exhibit III of *Annual Statistical Bulletin* (ASB) editions dating from 1982.

There are several limitations to the ratios of benefit level changes published in the ASB. First, the ratios are only calculated when a statute changes. Thus, because New York made no statutory changes between 1998 and 2006, the value shown for those years in the ASB is zero. However, the state's average weekly wage increased during those years, resulting in higher cash benefit payments for many workers. Second, the ratios are calculated each time a state changes its statute. New York changed its cash or medical benefits on three different dates during 2007. Third, ASB only publishes ratios for states with private insurance carriers, and not for those, such as Ohio and Washington, with exclusive state funds. Fourth, the ratios are useful for tracing developments in individual states, but interstate differences in the amounts of benefits cannot be determined. State A may have increased benefits by 15 percent during the 1990s and state B by 5 percent during that decade, but because we do not know how generous the benefits were in each state as of 1990, we do not know whether the difference in total benefits between the states widened or narrowed during the 1990s.

The expected benefits variable is first used for research purposes in Burton (1965). Under the tutelage of Roy Kallop, the NCCI Actuary, Burton adapted the NCCI procedure and prepared Statutory Benefit Indexes (expected benefits) for 25 states (including Ohio and West Virginia, which had exclusive state workers' compensation funds) for 1958 and 1962. Results for 1962 in Burton's "Over-all Benefit Index, Including Medical Benefits" vary from .742 in Alabama to 1.541 in Connecticut. Burton uses the "Over-all Benefit Index, Including Medical Benefits" and the "Over-all Benefit Index, Excluding Medical Benefits" as independent variables (together with other variables, such as an "Index of Legal Generosity") in regressions in which the dependent variable is a measure of the employers' costs of workers' compensation insurance for a uniform set of insurance classes. With observations from all 25 states, the "Over-all Benefit Index, Excluding Medical Benefits" has a regression coefficient of 0.5099 with a standard error of 0.1224, which is significant at the .01 probability level (Burton 1965, Table 47).

Expanding Burton's earlier work on interstate differences in employers' costs of workers' compensation, Krueger and Burton (1990) examine the determinants of two measures of the employers' costs in 29 states for 1972, 1975, 1978, and 1983. The coefficients on the log of expected benefits are positive and highly significant in all 12 regressions, which contain a variety of other independent variables. The authors note: "The results indicate that for either measure of workers' compensation costs we cannot reject the null hypothesis that there is a unit elasticity between costs and benefits, regardless of the set of included regressors" (p. 236).

Thomason, Schmidle, and Burton (2001) examine several topics, including the effects of insurance regulation on the employers' costs of workers' compensation and on workplace safety. The authors calculate expected benefits for each year from 1975 through 1995 for as many as 48 jurisdictions, then compare the results for this expanded data set with Krueger and Burton's 1990 results. The new results produce coefficients for the benefits variable that, in general, are significantly less than 1.0. The authors suggest that the benefit coefficient estimates may be subject to omitted-variable bias and measurement error; however, taken at face value, "the result suggests that a 10 percent increase in benefits results in a 4 percent increase in costs" (p. 108).

Thomason and Burton (2004) discuss several ways to compare the benefits in state workers' compensation programs, including maximum weekly TTD benefits, average weekly TTD benefits, and expected (statutory) benefits. The authors explain the expected benefits methodology and present data on expected benefits over time, among jurisdictions, and relative to the Model Workers' Compensation Act. For example, expected benefits by state in 1998 "ranged from a little more than $30,000 for the average injured worker in the District of Columbia to less than $5,000 for (hypothetically) identical injured workers in Louisiana, a sixfold difference" (p. 81).

Guo and Burton (2010) examine the determinants of interstate differences in workers' compensation cash benefits per 100,000 workers for each year from 1975 to 1999 for 46 jurisdictions (fewer in some years). One of the independent variables is expected benefits for the combination of four types of cash benefits. Among other conclusions, the authors find that "the benefit elasticity (the association between expected benefits and actual benefits payments) was significantly less than 1.0 in both our study periods (1975-89 and 1990-99). One interpretation of these results is that the monitoring and rehabilitation effects for employers are stronger than the reporting effect and duration effects for workers" (p. 353).

Appendix B: Calculating WCPD Compensability Rules

As mentioned earlier, NCCI publishes data on benefit level changes in Exhibit III of the ASB. The exhibit provides estimated increases or decreases in benefits resulting from changes in workers' compensation statutes, medical fee schedules, and significant court decisions. Over the years, the ASB has given separate estimates for these benefit types: fatal, permanent total, major permanent partial (until 2009), minor permanent partial (until 2009), combined permanent partial (since 2000), temporary total, all indemnity (cash) benefits, medical, and total (cash plus medical).

The estimated change in benefits paid combines the effects of three components:

- **Objective changes in benefits,** which consist of changes in weekly benefit amounts or duration of benefits that can be evaluated using the actuarial procedures described in Appendix A.
- **Utilization effect,** which consists of a 10 percent increase in the objective changes in benefits, based on the assumption that higher statutory benefits induce workers to increase the frequency or duration of their claims.
- **Subjective changes in benefits,** which consist of the NCCI's assessment of the effect of court decisions or statutory changes (other than objective changes) on benefits paid. Examples of these subjective changes are given in the methodology section below.

The benefit level changes published in the ASB sometimes reflect the sum of the first two components, sometimes consist of only the third component, and sometimes combine all three. All of the expected-benefits figures discussed in Appendix A consist solely of objective changes in benefits, which we estimated independently but used, to the best of our ability, the NCCI procedure.

Methodology for WCPD Compensability Rules

We offer two examples of the calculation of a compensability rules value for a given state. The examples respectively describe an increase and a decrease in the compensability rules value. Table B-1 presents supporting data.

Montana 1983. The first example involves an increase in the value of compensability rules variable. The court decision mentioned in Table B-1 is *Wight v. Hughes Livestock Co. Inc.,* 664 P.2d 303 (Mont. 1983), which held that when an insurer denies compensability or partially denies benefits and is subsequently found liable for benefits or additional benefits, the insurer is liable for at least a portion of the applicant's attorney's fee. In a separate development, the maximum weekly benefit for PPD increased from $120.50 to $131.50 and the maximum weekly benefits for PTD and TTD increased from $241.00 to $263.00 on July 1, 1983. (TTD benefits are paid to some workers who receive PPD benefits and thus affect the estimates of benefits paid for PPD claims.)

The weighted average of NCCI estimates of the effect of the 1983 Montana changes on PTD, major PPD, and minor PPD benefits paid is a 28.9 percent increase. This increase combines all three benefit change components: objective changes in benefits, the utilization effect, and subjective changes in benefits (the court decision).

We calculate the expected benefits for the workers who received PTD benefits, major PPD benefits, and minor PPD benefits as of January 1, 1983, and January 1, 1984, using the procedure described in Appendix A. We first calculate the percentage increases in these three types of permanent disability benefits between January 1, 1983 and January 1, 1984. We then combine these percentage increases using the weights for the three types of permanent disability cases and estimate that permanent disability benefits in Montana increased by 3.1 percent during 1983. This increase is due solely to objective changes in benefits.

The WCPD compensability rules variable reflects the subjective changes in benefits. We use the term "subjective" because compensability rules values do not rely on a standardized actuarial procedure (such as that used by NCCI to estimate the objective changes in benefits) or a uniform adjustment (such as the 10 percent utilization effect added to the objective changes). Instead, the compensability rules value represents an NCCI judgment about additional factors in a particular state that are likely to affect workers' compensation benefit payments.

To calculate the compensability rules variable, we take the value of benefit level changes published in the ASB and subtract the values of both the objective changes in benefits and the utilization effect. Thus, the WCPD compensability rules value for Montana for 1983 is 28.9 percent (ASB value) minus 3.1 percent (our estimates of objective changes) minus 0.31 percent (utilization effect) = 25.5 percent.

We assume that a change in the compensability rules value reflects a permanent change in the factors that affect workers' compensation benefit payments in a state. We therefore created a data series for each state that begins in 1975 (the first year in our database for most workers' compensation variables) with a compensability rules value of 0. Any changes in the compensability rules after 1975 accumulate. The 25.5 percent increase in the WCPD compensability rules for Montana in 1983 is equivalent to a 0.255 increase in the compensability rules value used in our regressions.

Table B-1.
NCCI estimates of workers' compensation benefit level changes (in percent), by permanent injury type: Two examples

Date	PTD	Major PPD	Minor PPD	Explanation
			Montana 1983	
May 16	26.9	26.9	26.9	Court decision
July 1	6.1	1.8	1.1	Increase in flexible maximum [a]
Total	33.0	28.7	28.0	
			Oregon 1990	
July 1	1.0	0.3	0.3	Increase in flexible maximum [a]
July 1	-5.9	4.9	4.9	Legislation (S.B. 1197)
Total	-4.9	5.2	5.2	

SOURCE: NCCI (1995, Exhibit III).

a. The flexible maximum is a provision in the state's workers' compensation statute that increases or decreases the maximum weekly benefit in proportion to changes in the state's average weekly wage.

Oregon 1990. The second example involves a decrease in the compensability rules value. Table B-1 refers to S.B. 1197, which provided that (1) claims were compensable under the Oregon workers' compensation statute only if work was the "major cause" of the permanent disability or need for treatment—this is known as the major contributing cause requirement—and (2) the worker must provide medical evidence based on "objective findings" in order to establish compensability. Concurrent with these changes in the eligibility requirements for PPD benefits, Oregon increased the maximum weekly benefit for PPD from $145.00 to $305.00 and the maximum weekly benefits for PTD and TTD from $388.99 to $406.54 on July 1, 1990. (As in Montana, TTD benefits are paid to some workers who receive PPD benefits and thus affect the estimates of benefits paid for PPD claims.)

In calculating the WCPD compensability rules for Oregon, we follow the same steps as those described above for Montana. The weighted average of the NCCI estimates of the effects of the 1990 Oregon changes on PTD, major PPD, and minor PPD benefit payments is a 3.9 percent increase. We calculate the expected benefits as of January 1, 1990 and January 1, 1991 using the procedure described in Appendix A. We then calculate the percentage increases in these three types of permanent disability benefits between January 1, 1990 and January 1, 1991. We combine these percentage increases using the weights for the three types of permanent disability cases and estimate that permanent disability benefits in Oregon increased by 39 percent during 1990. This increase is solely due to objective changes in benefits and in particular, the more than doubling of the maximum weekly benefit for PPD benefits.

The WCPD compensability rules value for Oregon for 1990 is 3.9 percent (the ASB value) minus 39 percent (our estimates of objective changes) minus 3.9 percent (utilization effect) = -39.0 percent. The 39.0 percent decrease in the WCPD compensability rules for Oregon in 1990 is equivalent to a 0.39 decline in the compensability rules value used in our regressions.

Compensability Rules Threshold

To avoid measurement errors, we treat an annual change in WCPD compensability rules as zero if the calculated value is less than 2 percent. One reason we use the 2 percent threshold is that we calculate expected benefits for every type of benefit for every state each January 1, while the NCCI calculates the changes in benefits only when the workers' compensation statute has changed or the courts make a significant decision. This means that for New York, we show an increase in PTD benefits every year between 1994 and 1999 because the state average weekly wage, one of the determinants of expected PTD benefits, increased every year. By contrast, the NCCI reported 0.0 percent increases in PTD benefits in New York for every year between 1994 and 1999. We do not consider the difference between our estimates of the change in expected benefits and the NCCI data on changes in benefits during this period in calculating the compensability rules.

The Utilization Effect

As previously explained, we subtract the utilization effect (along with the objective changes in benefits) from the NCCI estimates of the changes in benefit levels published in the ASB to calculate the compensability rules. The evidence on the relationship between expected benefits and employers' workers' compensation costs in the studies surveyed in Appendix A suggests that a utilization effect should not be used to estimate the total effects of changes in state laws on total benefits paid. Krueger and Burton (1990) could not reject the null hypothesis of a unitary elasticity between costs and benefits, and all other previous studies using expected benefits found that actual benefit payments did not increase proportionately with increases in expected benefits.

Previous Use of the Compensability Rules Variable

Guo and Burton (2008) study the determinants of DI applications per 100,000 persons in 45 jurisdictions from 1985 to 1999. In addition to expected benefits, the authors use compensability rules as another independent variable for the combination of four types of cash benefits, which is significant at the .01 level in both regressions explaining the DI application rates.

Guo and Burton (2010) examine the determinants of interstate differences in workers' compensation cash benefits per 100,000 workers for each year from 1975 to 1999 for up to 46 jurisdictions. In addition to expected benefits, the authors use compensability rules as another independent variable for the combination of four types of cash benefits, which is significant at the .05 level in one regression and significant at the .01 level in the other regression explaining changes in incurred workers' compensation cash benefits during the 1990s. Incurred workers' compensation benefits

per 100,000 workers declined by 41.6 percent in real terms between 1990 and 1999, and the decline in compensability rules accounted for 6.25 percent of the incurred benefit decline.

Notes

[1] Although one might expect the DI acceptance ratio to be expressed as accepted DI claims divided by total applications, we divide acceptances by denials to avoid statistical biases. See note 9.

[2] Workers' compensation benefits are limited to persons whose disabilities are work-related, while DI pays benefits for both work- and nonwork-related disabilities. However, DI only pays benefits to permanently and totally disabled persons, while workers' compensation programs provide benefits for both totally and partially disabled workers, for both temporary and permanent disabilities, and for fatalities.

[3] The workers' compensation program is elective for employers in Texas.

[4] Accidental death and dismemberment insurance provides benefits if an accident results in an employee's death or certain dismemberments enumerated in the insurance contract.

[5] The type of offset in a state affects the employers' incentives to encourage disabled workers to apply for DI benefits. Both DI and workers' compensation are funded by payroll taxes. The DI tax (part of the Social Security payroll tax) is uniform for all employers. However, workers' compensation premiums for large and medium employers who purchase insurance are linked to the cost of workers' compensation benefits paid to the firms' employees by "experience rating," so that as benefit payments increase, so do the employers' costs. Program costs and benefit payments to workers are also closely related for employers who self-insure. The link between benefits and costs provides an incentive for employers (or their insurance carriers) in reverse offset states to encourage their work-disabled employees to apply for DI benefits. Employers in states with the standard offset rule have less incentive to encourage their workers to apply for DI benefits, because DI awards do not lower workers' compensation benefits and employers' costs.

[6] Research also indicates that the legislative changes in workers' compensation eligibility rules may partially account for the recent decline in reported occupational injury rates (Boden and Ruser 2003).

[7] DI beneficiaries can elect to receive old-age benefits instead of disability benefits beginning at age 62. Conversion to old-age benefits occurs automatically when the beneficiary attains full retirement age.

[8] We focus on PPD and PTD claims because they are more likely to result in applications for DI benefits than are TTD and fatality benefits.

[9] Guo and Burton (2008) is the only study of DI application rates in our survey that includes an independent variable that measures administrative stringency, namely DI acceptance rate (the proportion of applications that were approved), which had a negative coefficient. However, that estimate was biased because the numerator of the dependent variable (DI applications per 100,000 persons) and the denominator of the independent variable (DI acceptances) were the same. To avoid that bias in this study, we use the ratio of DI acceptances to DI denials to measure administrative stringency.

[10] We briefly summarize types of PPD benefits in Appendix A; Burton (2005) discusses them in detail.

[11] The earliest year with data by state for disability prevalence and the DI acceptance ratio (lagged 1 year) is 1981. The latest year with data for expected WCPD benefits and WCPD compensability rules is 1999.

[12] We do not have observations for WCPD compensability rules in six states (Nevada, North Dakota, Ohio, Washington, West Virginia, and Wyoming), which had exclusive state workers' compensation insurance funds during the study period.

[13] To determine if the decline in sample size substantially changes our results, we repeated the regressions shown in Table 2 with the full sample of 969 observations. The pattern and magnitude of most variables are very similar in the two sets of regressions, and a Chow test comparing the coefficients found no significant differences. Thus, reducing sample size does not result in statistically significant changes in our results, indicating that our regressions using 855 observations should be reliable.

[14] We cannot include a dummy variable indicating which states have reverse offset rules (see note 5) because our preferred statistical approach—a fixed-effect model with state and year dummies—cannot include two dummy variables that are invariant in value over all years.

[15] The standard deviation for expected WCPD benefits is 32.74 (Table 1). The difference in DI applications per 100,000 nonelderly adults between states one standard deviation above and below the average is

$$32.74 \times 2 \times 0.51 = 33.39.$$

[16] The standard deviation for WCPD compensability rules is 0.31 (Table 1). The difference in DI applications per 100,000 nonelderly adults between states one standard deviation above and below the average is

$$0.31 \times 2 \times 30.95 = 19.19.$$

[17] The 2012 report of the Social Security Trust Funds states, "the DI Trust Fund fails the Trustees' short-term test of financial adequacy. The Trustees project that the DI trust fund ratio will fall below 100 percent by the beginning of 2013. After 2013, the projected DI trust fund ratio continues to decline until the trust fund is exhausted in 2016" (Board of Trustees 2012, 9).

[18] Burton (2009) provides an extended discussion of the effects of workers' compensation on safety, such as the relationship between risk premiums included in the wages of workers in unsafe firms and workers' compensation premiums. He also examines the moral hazard resulting from workers' compensation's effective reduction in adverse consequences for the employer.

[19] Burkhauser and Daly (2011, 109–113) propose experience rating for DI.

[20] Between the 1980s and 1990s, the weighted national average of expected WCPD benefits declined by 5.4 percent (Table 4), and the unweighted average declined by 8.7 percent (not shown). Likewise, the weighted national average of WCPD compensability rules declined by 4 percentage points and the unweighted national average declined by 8 percentage points during the period.

[21] Thomason, Schmidle, and Burton (2001, Appendix D) and Thomason and Burton (2004, 75–84) describe the methodology in detail.

[22] Burton (2005, 88–95) identifies six distinct systems of PPD benefits used in various states.

[23] Fratello (1955) details the basic procedure.

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