A Closer Look at the Employment Impact of the Americans with Disabilities Act

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Abstract

This paper replicates the recent findings that the employment rate among all disabled persons has declined since the ADA. A closer look at this decline, however, indicates that the source of this measured decline in employment is the result of a tremendous drop in the labor force participation rate among the disabled. While also of potential concern, further analysis indicates that this drop in the labor force participation rate was not the result of the disabled fleeing the labor market, but, rather, the more likely the result of re-classification of non-disabled, non-participants, as disabled. The unconditional employment probability among the disabled (taking selection into the labor market into account) has actually *not* declined, and may have in fact improved slightly for certain disability classifications. The results are consistent across two different data sets and mirrored by a state-level analysis. While the relative employment position of the disabled has not deteriorated, the lack of significant impact of the ADA does raise the issue of the merit of its labor market provisions.

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I. Introduction

One of the goals of the American's with Disabilities Act (ADA), which was passed in 1990 and phased-in over the next four years, was to improve the labor market experience of workers with disabilities. While a worker's labor market experience has multiple dimensions, employment levels have been by far the most popular way to measure the impact of the ADA on the labor market experience of the disabled. The conclusions of earlier analyses have not been good news for advocates of the ADA; employment levels among the disabled have steadily declined throughout the 1990s (for example, see DeLeire 2000 and Acemoglu and Angrist 2001). These Previous studies, however, have failed to control for selection into the labor market and have confounded conclusions about employment outcomes with labor supply issues. By confounding employment outcomes with labor supply decisions, these previous studies have not provided a complete, or even fair, assessment of the labor market provisions of the ADA.

The purpose of this paper is to look closer at the employment outcomes of the disabled and to fairly evaluate whether potential barriers to employment have been impacted by the passage and phase-in of the ADA. The analysis will make use of multiple strategies, evaluate whether the results are robust across data sets, and determine whether outcomes differ across disability type. The main conclusion is that the unconditional probability of employment (after controlling for selection into the labor market), for the disabled has not changed (and may have even increased slightly for the mentally disabled), post-ADA, relative to the employment probability of the non-disabled.

II. The ADA as Social Legislation

The United States has a history of enacting legislation with strong social content. These laws are driven by and are statements of society's ethics and morals. The ADA, child labor laws,

and other civil rights legislation fall into this category of social legislation. One could argue that these laws are grounded in economic concerns. For example, discrimination against workers with disabilities or against African Americans robs our economy of the efficient allocation and use of valuable resources. Also, by outlawing child labor, children have no other option but to attend school, encouraging human capital investment for which there are positive externalities. While these arguments have merit in fact, it is also true that as a society we support these laws from an emotional and moral level, as well. For example, the 1991 Harris poll on Public Attitudes Toward People with Disabilities demonstrated that while a minority of people were even aware that the Americans with Disabilities Act (ADA) had been passed (only 38%), there was overwhelmingly sentiment that "Given how many difficulties disabled people face in their daily lives, the least society can do is make an extra effort to improve things for them"; 95% of those polled agreed with this statement.[1] In addition, 81% of the people from the same survey thought there should be an affirmative action program for people with disabilities.

When a piece of legislation is strongly driven by an evolution of ethical and moral concerns, we must face the question of whether the legislation serves as a statement of where we (as a society) are rather than as a prediction of where we are going.[2] For example, the establishment of minimum age for employment (child labor laws) has been shown to have had little impact on the decline of child labor in the early part of the 20th century (Moehling 1999). The implication is that legislation of strong social content, rather than precipitate social change, is often actually a *response to* social change. In other words, does legislation, like the ADA, merely reflect a change in our moral and ethical beliefs that has already occurred, or does it serve as a tool with which to affect that change? This is the question that generally motivates the quest for a measured impact of any social legislation, including the ADA.

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[1]Data provided by The Roper Center for Public Opinion Research, University of Connecticut, Storrs, CT. By 1999, 67% of those surveyed by the same polling group *had* heard of the ADA.

[2]This issue has often been raised by historians. For example, see Landes and Solmon (1972).

III. Theoretical Background

Employment levels of the disabled are affected by both labor supply and labor demand issues. Individuals suffering from a functional disability will experience a greater cost to entering the labor market as greater effort or sacrifices must be made relative to non-disabled workers. As a result, the reservation wage for disabled individuals will be higher than for the non-disabled and fewer disabled people will choose to enter the labor market, *ceteris paribus*. In addition, a person's functional disability will be more likely to render him or her less productive than an otherwise identical non-disabled person. Consequently, a disabled labor force participant will be less likely to qualify for a given job and therefore less likely to be hired. Note that merely a *perception* of lower productivity, or greater difficulty predicting a disabled worker's productivity will make him or her less likely to be hired. So, for both supply and demand reasons, we would expect the employment levels of disabled people to be lower than non-disabled people. Figure 1 presents evidence from the Current Population Survey (CPS) from 1981 through 2000 consistent with this supposition.[3] The percent of disabled individuals employed in any given year is at least 44 percentage points lower than the percent of non-disabled individuals employed in that year. In addition, the employment percentage for the non-disabled has made a fairly steady climb over the entire period compared with the relatively stagnant, then declining, employment percentage of the disabled.

[Insert Figure 1 here]

Legislation that potentially affects the costs of either labor force participation or of hiring a group of workers can be expected to impact the employment levels of that group. The ADA, through its required accommodations, can be expected to reduce the cost to a disabled individual of entering the labor force, thus increasing labor force participation.[4] It might also be argued that greater accommodation of a disabled worker's limitations will result in increased productivity of that disabled worker, thus increasing the likelihood of employment. If those required accommodations, however, are "binding" in the sense that the employer would not undertake them

[3]Details of the data set construction are presented in the next section.

in the absence of the ADA, the employer must believe that the increased productivity of the disabled worker will not offset the cost of implementing those accommodations.[5] This may result in decreased employment probabilities of disabled workers, since the cost of hiring a disabled worker has increased. Referring back to Figure 1, there doesn't seem to be any noticeable, or permanent change in the employment percentages for disabled workers around the time of passage of the ADA, although there is a slight drop around the second phase-in period.

IV. Data Used for Analyses

In evaluating outcomes over time, it is important to distinguish any changes in outcomes that might have resulted from the enactment of the ADA from any long-term trend. In other words, as discussed in the introduction, changes in the labor market experiences of workers with disabilities may reflect a changing social awareness that *culminated in* the passage of the ADA, rather than the other way around. This highlights the importance of using as long a time period as possible in evaluating outcomes. The combined Current Population Survey (CPS) Annual Earnings files for the months of March, April, May, and June, for the years 1981 through 2000, are used to obtain demographic information, employment status, earnings, details related to the respondent's job, and location information to control for local labor market conditions. These CPS Annual Earnings files are matched with the March CPS survey for each year to obtain information on disability status, other sources of income, and labor market information available for the previous year.[6] This matching strategy results in a sample four times larger than any single month

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[4] See Stern (1996).

[5] It has also been suggested that persons with disabilities entering the labor force after ADA will have more severe disabilities than those employed prior to ADA, making the potential for "binding" accommodation requirements that much more likely and expensive (Chirikos 1991).

[6] While some have questioned whether self-reported disability status (as in the CPS) suffers from endogeneity (e.g., Parsons 1980, Haveman and Wolfe 1984), Stern (1989) finds that, "any bias due to potential endogeneity is small" (p. 363). Of course, endogeneity may be more of a concern since the passage of the ADA. And, as will be addressed later, endogeneity among the population as a whole may be more of a problem than among only labor force participants. Additional practical matters related to using the disability indicator in the CPS March income supplement are detailed by Hale (2001). These issues are further complicated by the matching undertaken to expand the number of observations. It is for these reasons that confirmatory evidence of the CPS results are sought from an additional data source, as described below.

of current labor market statistics, yielding greater confidence in the reliability of the results.[7] While the sample sizes vary somewhat from year to year, the proportion of disabled to non-disabled remains fairly constant and most analyses benefit from roughly 9,000 disabled individuals (1,000 disabled workers) and 80,000 non-disabled individuals (40,000 non-disabled workers).

The earliest year available in the CPS for analysis of outcomes of the disabled is 1981; prior to 1981, identification of a disability in the CPS was made only in the context of why a respondent was not working. In addition, since a major overhaul of the CPS questionnaire was undertaken in 1994, care is taken to differentiate any ADA impact from a potential statistical artifact.

Since the CPS simply identifies workers as disabled if they answer affirmatively to the question about whether they have a "work limiting disability," the Survey of Income and Program Participation (SIPP) is used to test robustness of the results across data source and to disaggregate the results by nature of disability. The SIPP topical modules on Work Disability History (Wave 2) allow for classification of type of disability (in addition to other labor market information), and are available for the years 1986 through 1997. While providing more detail related to the respondent's disability, the SIPP does not provide as long or as large a data set with which to study labor market experiences. The samples from the SIPP have been constructed to as closely match those from the

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Further considerations of a disability identifier are proffered by Kruse and Schur (2002). They find different labor market outcomes depending on the definition of disability used. While Kruse and Schur argue that the definition that includes "work limitation" (as used in this paper) may not be the definition most appropriate regarding ADA coverage, it is likely the group for which we will see the greatest impact of the legislation in the labor market.

[7]Details of the matching procedure, exact samples sizes, and demographic means are available from the author upon request. Due to the complicated matching across one to four months of the CPS, all analyses are performed un-weighted. According to Wooldridge (1999), "stratification based on exogenous variables does not cause any problems: estimators that ignore the stratification are consistent and asymptotically normal, and the usual variance matrix estimators are consistent" (p. 1386). Since stratification in the CPS sampling design is based on exogenous variables (geographic and demographic), and the attrition that results from the matching procedure is likely un-systematic, weights should be unnecessary (for further evidence on this point, also see DuMouchel and Duncan 1983 and Manski and McFadden 1981). In addition, any effect of stratification on the estimation can be accounted for by including indicator variables that correspond to the strata (Ginther and Hayes 2001), so the inclusion of demographic variables (including disability status) should control for any observable effect sampling based on those characteristics might have (either initially or through attrition of matching). It should also be noted that any

CPS as possible (e.g., regarding variable definitions, etc.).[8] Due to the sampling structure of the SIPP, the sample sizes in the SIPP vary from just over 16,000 to over 76,000 observations.

The nature of a person's disability is placed into one of 30 different categories. In order to be able to include controls for *type* of disability, these categories were combined to correspond to the groupings used by the Social Security Administration in their classifications of types of disabilities. Aggregation was necessary due to limitations in category representation; the final four categories are: (1) musculoskeletal systems and special senses, (2) internal systems, (3) neurological systems and mental disorders, and (4) other.[9] Figure 2 presents the distribution of all disabled individuals in the SIPP across these categorizations. The largest group by type of disability contains those with musculoskeletal and special senses disabilities, internal systems is the next largest group, neurological and mental disorders is (typically) the third largest, and "other" is the fourth largest category. One can observe a slight upward trend in the neurological and mental disorders classification, while internal systems has declined slightly, and musculoskeletal and special senses has remained fairly consistent over the time period. These four classifications will be used to determine whether employment experience varies across *type* of disability; an important consideration when trying to mold policy to impact those most affected.

[Insert Figure 2 here]

V. Unconditional and Joint Probabilities

The labor market provisions of the ADA were motivated by a desire to eliminate barriers to disabled individuals that might exist in the labor market. Consequently, an appropriate assessment of the success of the ADA in this endeavor would involve evaluation of unconditional employment outcomes. In other words, the question to be answered is whether there has been any progress in employment outcomes for a disabled person drawn from random, controlling for the likelihood that

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systematic attrition or sample loss due to *unobservables* will not be accounted for, but also can not be corrected using weights, either.

[8]Details of the construction are available from the author upon request.

he or she would be a labor force participant. The resulting probability of interest is an unconditional probability of employment. An alternative question, that has been the source of recent condemnation of the employment impacts of the ADA, is whether there has been any progress in employment among *all* disabled people. This second question involves evaluation of a joint outcome: what is the probability of entering the labor force *and* being employed? Consideration of this joint outcome (or, employment among all disabled people) confounds conclusions regarding the employment impact of the ADA with labor supply decisions. Clearly, however, any documented impact of the ADA on labor force participation must be taken seriously, as well.

When considering the unconditional probability, one must control for unobservable characteristics that might both affect the labor force participation decision and the employment outcome. If this potential self-selection is not controlled for, any differences measured in the employment probabilities may actually be confounded by differences between characteristics that affect the labor supply decision of disabled and non-disabled persons. And if these characteristics change in a systematic way over time, the problem is magnified. A bivariate probit model with selection is estimated in order to obtain information on unconditional employment outcomes and to be able to compare these with joint employment and labor force participation outcomes similar to those reported in other studies.

VI. Annual Cross-Sectional Analyses

The first analysis is designed to establish trends in unconditional employment and joint outcomes. A bivariate probit with selection model is estimated separately for each year of the data, 1981-2000, using the CPS. The following model defines the relationship assumed between labor force participation of person i (LFP_i), employment (EMP_i), and individual characteristics that are believed to affect the labor force participation decision (X_{1i}) and the employment outcome (X_{2i}):

[9]Details of the Social Security Administration's listing of impairments for disability status purposes can be found on the internet at <http://www.ssa.gov/OP_Home/cfr20/404/404-

$$LFP_i = \alpha_1 + \gamma_1' X_{1i} + \beta_1 DISABLE_i + \varepsilon_{1i} = \begin{cases} 1 \text{ if person i is in the labor force} \\ 0 \text{ otherwise} \end{cases} \quad (1)$$

$$EMP_i = \alpha_2 + \gamma_2' X_{2i} + \beta_2 DISABLE_i + \varepsilon_{2i} = \begin{cases} 1 \text{ if person i is employed} \\ 0 \text{ otherwise} \end{cases} \quad (2)$$

$DISABLE_i$ is equal to 1 if person i is disabled, 0 otherwise, ε_{1i} and ε_{2i} are distributed as a bivariate normal with means equal to zero, variances equal to one, and correlation equal to ρ. In addition, of course, EMP_i is only observed if LFP_i=1.[10] X_{1i} and X_{2i} both include age; age squared; state unemployment rate; female, nonwhite, education, regional dummies; and a disability dummy. The labor force participation equation regressors (X_{1i}) also include non-labor income, marital status, and a worked-last-year indicator. The employment equation regressors (X_{2i}) also included number of weeks worked last year. The impact of having a work limiting disability on employment, then, is determined by calculating the probability of interest for each person, varying the disability index between zero and one, then averaging the difference across the sample.[11] Separate specifications are estimated for each year and the marginal impact of having a work

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ap09.htm>.

[10]The bivariate probit model with selection gives rise to the following likelihood function:

$$\log L = \sum_{LFP=1,EMP=1} \log \Phi_2\left[\gamma_1' X_{1i}, \gamma_2' X_{2i}, \rho\right] + \sum_{LFP=1,EMP=0} \log \Phi_2\left[\gamma_1' X_{1i}, -\gamma_2' X_{2i}, \rho\right] + \sum_{LFP=0} \log \Phi\left[-\gamma_1' X_{1i}\right],$$

where Φ_2 is the bivariate normal cumulative distribution function and Φ is the univariate normal cumulative distribution function.

[11]This method of calculating the marginal effect of a change in a dummy variable is referred to as a measure of discrete change and is described in greater detail by Long (1997, 135-8). Specifically, the average marginal impact of having a disability on the joint labor force and employment outcome is calculated as:

$\frac{1}{N}\sum_{i=1}^{N}\left\{P_i\left[LFP=1, EMP=1 | X_i, DISABLE=1\right] - P_i\left[LFP=1, EMP=1 | X_i, DISABLE=0\right]\right\}$, and the average marginal impact of having a disability on the unconditional probability of employment is calculated as:

$\frac{1}{N}\sum_{i=1}^{N}\left\{P_i\left[EMP=1 | X_i, DISABLE=1\right] - P_i\left[EMP=1 | X_i, DISABLE=0\right]\right\}$. Both of these

limiting disability is calculated separately for each year. Note that this model specification allows a comparison of results with earlier studies through calculation of the joint probability.[12] Figure 3 reflects the impact of having a work limiting disability on the predicted joint participation and employment probability in each year.

[Insert Figure 3 here]

The impact of having a work limiting disability on the joint labor force and employment probability increases (becomes more negative) rather dramatically in 1994, corresponding to the second phase of the ADA. The marginal effect increases from an average of -15 percentage points prior to 1994 to an average of -19 percentage points between 1994 and 2000. In other words, having a work limiting disability decreased an individual's joint probability of being in the labor force and employed by four percentage points *more* after 1994 than it did prior to 1994. This dramatic relative decline in the joint probability for the disabled is the result on which both DeLeire (2000) and Acemoglu and Angrist (2001) base their warnings regarding the ADA.[13]

Breaking the joint probability into its employment and labor force participation components, however, it becomes clear that this dramatic drop in relative employment probability among the disabled in 1994 is driven by a decrease in the labor force participation rate. Figure 4 plots the predicted employment and predicted labor force participation probabilities for the disabled alone using the same parameter estimates from the bivariate probit estimation that generated Figure 3. After a fairly steady increase in the predicted labor force participation, it declines in 1994 and stays below 1985 levels. At the same time, and with the exception of the recession years between

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probabilities are calculated using the parameter estimates obtained from estimating the bivariate probit model with selection detailed in footnote 10.

[12] The comparison is not exact, of course, since earlier studies employ different estimation techniques and data. DeLeire (2000) estimates a univariate probit model to determine the impact of having a disability on the probability of employment for a sample of *all* disabled and non-disabled persons (including both labor force participants and non-participants). Acemoglu and Angrist (2001) estimate a linear model of weeks worked during the year among *all* disabled and non-disabled persons (there is no way to distinguish periods of labor force non-participation). Both of these analyses result in estimates comparable (at least in sign and significance) to the prediction of the joint probability presented here.

[13] Kruse and Schur (2002) also document this employment decline among those identified with a work limiting disability, although they show that these employment trends vary depending on one's definition of disability.

1991-1993, the predicted unconditional employment probability among the disabled has steadily increased.

[Insert Figure 4 here]

Again, in evaluating the *barriers* facing disabled workers, change in the unconditional employment probability is a more appropriate measure than the change in the joint labor force and employment outcome. Consequently, the condemnation of the employment impact of the ADA by DeLeire (2000) and Acemoglu and Angrist (2001) is misplaced, since both of these analyses confound their evaluation of employment changes with changes in labor supply decisions. The results in Figure 3 show that the decline in employment levels among all disabled people is labor supply driven and does not reflect an increase in employment *barriers* for individuals with disabilities. One may argue that the disabled have decreased their labor supply in response to a real or perceived change in employment probabilities (demonstrating a potential "feedback effect"), but the fairly encouraging predicted unconditional employment probabilities are not consistent with this view.[14]

It may be the case, however, that the condemnation of the ADA by earlier studies should potentially be aimed at its apparent impact on labor force participation. For example, if the ADA resulted in lower wages for the disabled (their employment has now become more costly due to required accommodations), it is possible that the wage will fall below the reservation wage of a significant number of disabled labor force participants, causing them to drop out of the labor market. The next section will explore this possibility more fully.

VII. Explaining the Decline in Labor Force Participation Rates

Even if the ADA has not had a negative employment impact, but it has inadvertently discouraged the disabled from seeking employment, this could be a concern worthy of further consideration.

[14]In addition, Stern (1996) presents empirical evidence that labor supply decision of disabled people are driven more by labor supply factors than by labor demand factors.

In an exhaustive fashion, the disabled and non-disabled populations can be represented in the following chart:

	In the Labor Force	Not In the Labor Force
Non-Disabled	A	B
Disabled	C	D

Cells A through D contain a given number of people at any given time period. A decrease in the disabled labor force participation rate ($LFPR_d$) corresponds to a decline in the ratio C/(C+D). This ratio can decline if C decreases and/or if D increases.[15] If C falls, these people must go somewhere; it is most likely that they either go to A (stay in the labor force but change their identification to non-disabled), or go to D (keep their identification as disabled, but leave the labor force). It is this later possibility that is of potential concern. Although the ADA was not designed as a policy to necessarily increase the labor force participation rate among the disabled, a precipitous drop in the labor force participation rate among the disabled, even remotely attributable to the ADA, is considered by many as undesirable.[16]

The $LFPR_d$ may also fall, however, as a result of an increase in D. Again, the increase in D must come from somewhere; the most likely candidates are C (disabled leaving the labor force) or B (non-disabled, non-labor force participants change their identity to disabled). The later (movement from B to D) is what might result, for example, from (non-participant) welfare recipients changing their identification from non-disabled to disabled in order to move off of welfare programs and into disability programs; this movement following the reform of welfare has been documented by the Lewin Group (1999). Greater effort to be classified (and identified) as

[15] One can easily show that for $LFPR_d = C/(C+D)$, $\partial LFPR_d/\partial D<0$ and $\partial LFPR_d/\partial C>0$ (for $C>0$).

[16] An alternative, non-ADA reason for why the disabled might be leaving the labor force has been offered by Kaye (2001). He claims that the severity of disabilities has been growing among the disabled through the 1990s.

disabled might also result from increased generosity of the disability programs themselves (see Autor and Duggan 2001 and Bound and Waidmann 2001).[17]

So, the question is, which is it? Are the disabled moving out of the labor force (from C to D) or are more non-participants identifying themselves as disabled (from B to D). One way to get an indication of the movement across these cells is to evaluate the trends in the percents represented in each cell. These trend results are depicted in the chart below. The percent in each cell represents the growth, or decline, experienced within that cell between 1990 and 2000. The cells exhaust the population, so the changes will sum to 100 percent.[18]

	In the Labor Force	Not In the Labor Force
Non-Disabled	+0.1504** (A)	-0.2309** (B)
Disabled	-0.0225** (C)	+0.1030* (D)

The largest net change in the cells was movement of non-disabled out of the non-participant category (cell B). The coefficient indicates that the non-disabled, non-participant percent declined an average of 0.23 percentage points per year between 1990 and 2000. Even if the entire increase in cell A (non-disabled labor force participants) came from cell B, that still means the overwhelming bulk of the increase in cell D (disabled non-participants) came from cell B as well, not cell C. In fact, the smallest net cell change was among the disable labor force participants. This result provides strong evidence that the observed decline in the $LFPR_d$ was not the result of

[17] Acemoglu and Angrist (2001) dismiss this theory by showing that controlling for receipt of disability benefits only marginally impacts their results. They fail to point out, however, that actual receipt of benefits will reflect only a fraction of the actual desire to receive benefits (see Kubik 1999). Consequently, the actual impact of growing program generosity on the disability status change for non-participants could be much larger than that measured by growing recipiency.

[18] These trend coefficient estimates for each cell were obtained from simple linear regressions of the percent of people represented in that cell as a function of a time trend corresponding to the period 1990-2000, in order to focus on post-ADA changes. Each estimate is significantly different from zero at least at the 95 percent confidence level, except for cell (D), which is significant at the 90 percent confidence level.

the disabled fleeing the labor force, but mostly the result of re-identification of some non-labor force participants from non-disabled to disabled (movement from B to D). While providing an explanation for the decline in $LFPR_d$, this movement from cell B to cell D is a reminder of the criticism of using self-reported disability status in statistical analyses. This also suggests that focusing on labor fore participants in evaluating the labor market experience of the disabled (using a self-reported measure of disability) will be less contaminated by endogeneity issues than focusing on the entire self-declared disabled population. In addition, these results indicate that the observed decline in the $LFPR_d$ should not be considered as casting a shadow on the measured impacts of the ADA on employment.

VIII. Pooled, Cross-sectional Analysis

In addition to examining trends from annual cross-sectional analyses, an analysis across time is performed to help quantify the potential difference in predicted probabilities of employment between disabled and non-disabled after the ADA relative to before the ADA. The strategy used to accomplish this is to estimate a cross-section, time-series bivariate probit model with dummy variables representing whether the observation shows up in the data pre-ADA or post-ADA and whether the observation is a disabled or non-disabled person. These dummy variables are also interacted to determine whether being disabled had any greater impact on employment after the ADA than before the ADA, relative to the experience of a non-disabled person.[19] While this type of pooled, cross-sectional analysis has been applied by many researchers (for example, Card 1992, Gruber 1994 and 1996, and Hamermesh and Trejo 2000), the technique also has its critics (for example, Heckman 1996). The primary criticism of this approach is that it is impossible to control for unobserved changes in the environment that occurred at the same time as the event of interest. For example, the second phase of the ADA occurred in 1994. This was also the time when the CPS underwent a major overhaul and there is no way to disentangle these two events. In

[19] The strategy described here can be likened to the popular "differences-in-differences" (DD) methodology, but is applied to a non-linear statistical model.

addition, the economy began its longest running expansion in recent history at the same time that the ADA was being phased in, an event that could potentially confound any measurable impact of the ADA through this estimation strategy. One advantage of the analysis here is that the CPS survey changes should not have a differential impact on the disabled and non-disabled (as the changes did not affect measurement or classification by disability)[20], and general business cycle activity should essentially impact the disabled and non-disabled in relatively the same proportions.[21] Nonetheless, the state unemployment rate is included as a regressor in order to capture any general business cycle influences.

The empirical model looks just like the bivariate probit with selection estimated separately for each year, except with the additional time-period dummy variables:

$$LFP_i = \alpha_1 + \gamma_1' X_{1i} + \beta_1 DISABLE_i + \phi_1 POST_i + \theta_1 DISABLE_i * POST_i + \varepsilon_{1i} \quad (3)$$

$$EMP_i = \alpha_2 + \gamma_2' X_{2i} + \beta_2 DISABLE_i + \phi_2 POST_i + \theta_2 DISABLE_i * POST_i + \varepsilon_{2i} \quad (4)$$

Again, LFP_i=1 if person i is in the labor force, 0 otherwise, and EMP_i is not observed unless LFP_i=1. $DISABLE_i$ is equal to 1 if person i is disabled, 0 otherwise; $POST_i$ is equal to 1 if person i is observed in 1992 or later; X_{1i} and X_{2i} include individual demographic characteristics; ε_{1i} and ε_{2i} are distributed as a bivariate normal with means equal to zero, variances equal to one, and correlation equal to ρ.

In this framework, the affected group (the disabled) is controlled for by a dummy variable indicating whether the individual has a work limiting disability, and the time period is controlled for by a dummy variable indicating whether the ADA had been implemented yet or not. Given the non-linearity of the bivariate probit estimation procedure, a single parameter coefficient does not

[20] Acemoglu and Angrist (2001, Appendix A) show that results are fairly consistent across a variety of sample restrictions based on differences between the 1993 and 1994 samples (crossing the survey modification time period). Consequently, it is not expected that the results reported here are significantly biased by changes in the CPS survey design.

[21] The cyclicality of employment of disabled and non-disabled employment is explored by Burkhauser, et al. 2001, although, like Acemoglu and Angrist (2001) and DeLeire (2000), their analysis also confounds employment outcomes with labor supply effects.

tell us the additional impact the ADA had on the difference in employment probabilities between the disabled and non-disabled. The difference in the impact of having a work limiting disability on employment across the two time periods can be calculated by evaluating the probabilities of interest for each person, varying the *DISABLE* and *POST* dummy variables, then taking the difference between these probabilities, and averaging this difference across the sample.[22]

The decision of when one would expect the ADA to have its strongest impact (i.e., how to define *POST*) is debatable. One might expect some impact when the ADA was enacted (1990). However, employers were not required to respond until 1992 (for employers with 25 or more employees) and 1994 (for employers with 15 or more employees). The year 1992 was chosen for defining post since that is the first year of enforcement of the ADA. Table 1 reports the estimation results.

[Insert Table 1 here]

The results presented in Table 1 are consistent with the conclusions drawn from Figure 3. Namely, labor force participation among the disabled declined significantly after implementation of the ADA relative to labor force participation among the non-disabled (the coefficient on *DISABLE*POST* in the labor force participation equation is significantly negative). In addition, while all other regressors contribute significantly to explaining employment (all at the 99 percent confidence level), being disabled after ADA implementation is not one of them; the disabled are no more or less likely to be employed than the non-disabled, post-ADA relative to pre-ADA. In other words, the ADA has not changed the relative employment probability between disabled and non-disabled workers.

Table 2 translates the parameter coefficients from Table 1 into marginal effects. These marginal effects indicate that the expected employment probability among the disabled, relative to the non-disabled, declines *at most* 0.6 of a percentage point post-ADA (see column 2); but note that this effect is not significantly different from zero (based on the lack of significance of the parameter

[22] Footnote 11 provides a general idea of this strategy, although an additional variable (*POST*) is varied between zero and one here, as well.

coefficient). On the other hand, the labor force participation rate declined significantly by 4 percentage points more for the disabled than the non-disabled, post-ADA.[23]

[Insert Table 2 here]

IX. Evidence from the SIPP

In order to test the robustness of the CPS results, the analysis detailed in equations (3) and (4) is re-estimated using the sample obtained from the SIPP for the years 1986 through 1997. Table 3 reports the coefficients of interest from estimating the bivariate probit model with selection using the SIPP data. The results reported in Table 3 mirror those in Table 1, with one difference: employment among the disabled *increased more* post- versus pre-ADA than did the employment of the non-disabled. This positive 0.0768 coefficient on *DISABLE*POST* translates into 0.8 of a percentage point higher employment probability for the disabled relative to the non-disabled. In addition, the relative decline in labor force participation among those classified as disabled is found using the SIPP data, as well.

[Insert Table 3 here]

In addition to the re-estimation of equations (3) and (4) an additional specification is estimated in which the impact of having a disability post-ADA is allowed to vary by *type* of disability:[24]

[23] The marginal effect on the joint probability outcome was -3 percentage points (column 3). While not directly comparable, DeLeire (2000) estimates a 7.2 percentage point drop in employment among all disabled men and Acemoglu and Angrist (2001) estimate a 10-15 percentage point drop in number of weeks worked by the disabled. Again, these estimates are analogous to the joint probability calculated here, although not surprisingly of slightly different magnitude given the differences in data used (DeLeire) and differences in estimation procedure and model specification (DeLeire and Acemoglu and Angrist).

[24] See footnote 9 for the source of classification of disability.

$$LFP_i = \alpha_1 + \gamma_1' X_{1i} + \beta_1^S \ MUSCULOSKELETAL_i + \beta_1^I \ INTERNAL_i + \beta_1^M \ MENTAL_i + \phi_1 POST_i + \theta_1^S \ MUSCULOSKELETAL_i * POST_i + \theta_1^I \ INTERNAL_i * POST_i + \theta_1^M \ MENTAL_i * POST_i + \varepsilon_{1i} \quad (5)$$

$$EMP_i = \alpha_2 + \gamma_2' X_{2i} + \beta_2^S \ MUSCULOSKELETAL_i + \beta_2^I \ INTERNAL_i + \beta_2^M \ MENTAL_i + \phi_2 POST_i + \theta_2^S \ MUSCULOSKELETAL_i * POST_i + \theta_2^I \ INTERNAL_i * POST_i + \theta_2^M \ MENTAL_i * POST_i + \varepsilon_{2i} \quad (6)$$

where LFP_i is equal to 1 if person i is in the labor force, 0 otherwise
EMP_i is equal to 1 if person i is employed, 0 otherwise
X_i is a set of covariates for each person (individual demographic characteristics)
$MUSCULOSKELETAL_i$ is equal to 1 if person i has a musculoskeletal disability
$INTERNAL_i$ is equal to 1 if person i has a disability involving the internal systems
$MENTAL_i$ is equal to 1 if person i has a mental disability
$POST_i$ is equal to one if person i is observed in 1992 or later

And, again, these equations are estimated via maximum likelihood as a bivariate probit with selection, where EMP_i is only observed if LFP_i=1. In this framework, the type of disability is controlled for by dummy variables indicating whether the individual has a musculoskeletal, internal systems, mental, or other disability; and the time period is controlled for by a dummy variable indicating whether the ADA had been implemented yet or not. The coefficients of interest (θ_2^j , j=S,I,M), therefore, allow us to calculate the employment change among disabled workers post- versus pre-ADA relative to the change for non-disabled workers. Table 4 provides selected estimated coefficients.

[Insert Table 4 here]

The estimation results presented in Table 4 from the SIPP data set are also consistent with the conclusions drawn using the CPS data: labor force participation declined more for all classifications of disability, relative to non-disabled, post- versus pre-ADA. However, employment probabilities (controlling for labor force participation) *increased* significantly more for the disability classifications of *MENTAL* and *OTHER* than for the non-disabled, post- versus pre-ADA. Relative employment probabilities did not change significantly for those with musculoskeletal or internal disabilities.

While it is difficult to interpret the employment impact for those with disabilities classified as "*OTHER*," the major role that those with mental disorders play in explaining the overall relative employment improvement is not surprising given the attention paid to and policies developed for those with mental disabilities in recent years.[25] In addition, if we expect costs of accommodation to influence employment outcomes of the disabled, these results might suggest that accommodating workers with mental disabilities (say, through flexible work scheduling) has been relatively less costly for employers than accommodating workers with musculoskeletal or internal disabilities (say, through physical modification of the work environment).

X. Evidence from State Level Analysis

Finding that the ADA did not have much (if any) impact on employment of the disabled may not come as a surprise to those familiar with the fact that by the time the ADA was passed, all states had passed some form of legislation addressing discrimination against the disabled (see Table 5).[26] In other words, the environment in which the ADA was passed was arguably already a post-ADA environment. Given this, one might suggest that the ADA was redundant; the states were already addressing the problem of discrimination against the disabled and there was no need for federal legislation. And this may be why there is no impact of the legislation measured at the national level. On the other hand, each of the states had different definitions, regulations, and coverage in their legislation; the ADA, like other federal civil rights legislation, served to bring the issue to national prominence and provide for consistency in provisions. In addition, the state legislation may not have been having the intended effect; there may be some difference in how seriously employers take state versus federal legislation. Alternatively, it might be the case that

[25] The President's Committee on Employment of People with Disabilities had placed an emphasis in the late 1990s on people with mental disabilities. This committee has more recently been replaced by the Presidential Task Force on Employment of Adults with Disabilities. Information about the activities of this Task Force can be found on the Department of Labor web site, <http://www.dol.gov/_sec/programs/ptfead/>.

[26] Also see Advisory Commission on Intergovernmental Relations (1989) for additional information.

social legislation at the state level also merely serves as a statement of ethical beliefs that have already been integrated into the economy.

[Insert Table 5 here]

To determine whether protective legislation "crowded out" an impact of the federal ADA or whether there was any impact at the state level at all, the bivariate probit with selection estimation procedure detailed in equations (3) and (4) is repeated but only on a sub-sample of states that enacted disability legislation between 1981 (the beginning of available data) and 1991 (the last year before implementation of the federal legislation). The condition for being included in the sub-sample was whether the worker resided in a state that adopted protection for the disabled during this period, so that each state would have some pre- and post-legislation observations.[27] To coincide with the provisions of the ADA, the date in which legislation covering both public and private employers was used to distinguish pre- and post-time periods. Some additional regressors, such as log population and real gross state product, were added to the specification to control for nuances of the states.

Table 6 contains the parameter estimates from the bivariate probit with selection estimation of labor force participation and employment probabilities. The first thing to notice from this table is that the parameter estimates on the vast majority of regressors are of the same sign and the same magnitude as those in Table 1 which correspond to the national sample. The only exception to this are the college and advanced degree dummy variables (the signs across the tables are the same, but the magnitudes differ slightly) and the Midwest dummy variable (less significant in the state analysis). The implication of the similarity across the national and state-level analyses is that the observations in this sub-set of states are not at all far from the norm and that the results on the regressors of interest (those related to disability status) should be considered generalizable beyond these states.

[Insert Table 6 here]

[27] Methodologies that take advantage of differing legislative statuses across states (or, more generally, across observations) have often been referred to as "natural experiments," and have been applied by a number of researchers. For example, see Chay (1996) and Carrington, *et al.* (2000).

Two important results stand-out from the state-level analysis. The non-impact of the ADA at the national level could either have been the result of the state-level legislation crowding out any potential effect of the legislation, in which case we should see an impact of enactment of disability legislation at the state-level. Or, it may be the case, as has been pointed out with other social legislation, that the legislation itself merely is the culmination of changes that have already been incorporated into the labor market experience of the affected group. In this case, we should see no effect of enactment of such legislation at the state level either. This later scenario is what we observe. While, overall, the disabled have a lower probability of unconditional employment, there is no relative change in that employment probability post-legislation versus pre-legislation (the coefficient on *DISABLE*POST* is insignificantly different from zero. And, like the national analysis, in a regression where nearly all other regressors are significant at the 99 percent confidence level, this is notable.

The second result of particular interest is related to the determination of labor force participation. Recall that in the national analysis there was a dramatic decline in labor force participation rate among the disabled, post-ADA. If indeed the ADA legislation caused the disabled to flee the labor market, similar legislation at the state level should result in the same behavior. The results in Table 6, however, indicate that the state-level disability legislation had no such impact on the labor force participation among the disabled; the coefficient on *DISABLE*POST* in the labor force participation equation is not significantly different from zero. And, again, in an estimation where nearly all the other regressors are significant at the 99 percent confidence level, this stands out. This result supports the earlier contention that the drop in the labor force participation rate that occurred in 1994 at the national level can not be attributable to the ADA and is likely the result of some other confounding factor (e.g., modifications in the welfare and social security administration policies).

XI. Conclusions and Policy Implications

The purpose of this paper was to evaluate the relative employment experiences of disabled and non-disabled individuals. A pooled, cross-sectional analysis determined that the joint labor force and employment probability of the disabled decreased by three percentage points more after implementation of the ADA relative to a non-disabled person's joint probability. This joint outcome probability of employment, however, is influenced by both supply and demand factors and therefore confounds the employment experience of the disabled with labor supply influences. It is found that the unconditional employment probability of the disabled, relative to the non-disabled, did not change after implementation of the ADA. This lack of deterioration in the employment condition facing the disabled suggests that the rather dramatic declines in the labor supply of the disabled is not likely the result of feedback effects or fear of negative outcomes. In fact, evidence is provided to indicate that the reduction in the labor force participation rate among the disabled is *not* the result of the disabled leaving the labor force, but, rather, a reclassification of non-disabled labor force non-participants as disabled. This phenomenon likely occurred as a result of more stringent welfare reform requirements and more generous federal disability benefits. The fact that there was no parallel decline in the labor force participation rate among the disabled in states that had enacted disability legislation prior to 1991 provides additional evidence that the ADA was not the source of the labor force participation rate decline post-1994.

Analysis of the SIPP data provided confirmatory evidence of the CPS results and allowed a closer evaluation of employment probabilities by *type* of disability. It was found that those with mental disorders and those with disabilities classified as "other" experienced a *positive* employment impact of the ADA. Workers with musculoskeletal and internal system disabilities did not experience any different employment probability growth than those without disabilities.

To return to the question that motivated the analyses in this paper, "Does the ADA merely reflect a change in our moral and ethical beliefs that has already occurred, or does it serve as a tool with which to affect that change?," the state-level analysis helps to provide an answer. Prior to the ADA, all states had passed some form of legislation addressing discrimination against the disabled.

This state-level legislation could have crowded out any impact of the ADA. Finding no impact of such legislation at the state level, as well, however, provides fairly strong evidence that such legislation is the culmination of changes that had already been incorporated into the labor market.

Does this mean that the labor market provisions of the ADA serves no *practical* purpose? Does it mean that there is no call for further action to improve the employment experience of the disabled? It may be the case (for all social legislation) that public acknowledgment of a collective moral foundation serves an important purpose, one beyond quantification in economic terms. These laws strongly proclaim our social values and provide a legal mechanism with which to arrest the activities of those who have not yet adopted those values. If this is the case, then the ADA has served a purpose. In addition, the overall employment outcomes of disabled and non-disabled workers are still not equivalent. If this is a goal of policy makers, then further evaluation of the sources of the differences in these outcomes is clearly called for.

References

Acemoglu, Daron and Joshua Angrist. "Consequences of Employment Protection? The Case of the Americans with Disabilities Act." *Journal of Political Economy* 109 (October 2001): 915-957.

Advisory Commission on Intergovernmental Relations. *Disability Rights Mandates: Federal and State Compliance with Employment Protections and Architectural Barrier Removal* A-111. Washington, D.C.: Advisory Commission on Intergovernmental Relations, April 1989.

Americans with Disabilities Act of 1990 (July 26 1990) 42 US Code 12101, Sec (2). Also see <http://www.eeoc.gov/laws/ada.html>.

Autor, David H. and Mark Duggan. "The Rise in Disability Recipiency and the Decline in Unemployment." Massachusetts Institute of Technology Department of Economics Working Paper No. 01-15 (May 2001).

Bound, John and Timothy Waidmann. "Accounting for Recent Declines in Employment Rates Among the Working-Aged Disabled." *NBER Working Paper #7975* (October 2002).

Burkhauser, Richard V.; Mary C. Daly; Andrew J. Houtenville; and Nigar Nargis. "Economic Outcomes of Working-Age People with Disabilities over the Business Cycle: An Examination of the 1980s and 1990s." Mimeo, Cornell University (March 2001).

Card, David. "The Effects of Minimum Wage Legislation: A Case Study of California, 1987-89." *Industrial and Labor Relations Review* 46 (1992): 38-54.

Carrington, William J.; Kristin McCue; and Brooks Pierce. "Using Establishment Size to Measure the Impact of title VII and Affirmative Action." *Journal of Human Resources* 35 (Summer 2000: 503-23.

Chay, Kenneth Young. *An Empirical Analysis of black Economic Progress Over Time*. Ph.D. Dissertation, Princeton University, 1996.

Chirikos, Thomas N. "The Economics of Employment." In *The Americans with Disabilities Act: From Policy to Practice*, ed. Jane West, 150-79. New York: Milbank Memorial Fund, 1991.

DeLeire, Thomas Charles. "The Wage and Employment Effects of the Americans with Disabilities Act." *Journal of Human Resources* 35 (Fall 2000): 693-715.

DuMouchel, W.H. and G.J. Duncan. "Using Sample Survey Weights in Multiple Regression Analysis of Stratified Samples." *Journal of the America Statistical Association* 78 (1983): 535-43.

Ginther, Donna K. and Kathy J. Hayes. "Gender Differences in Salary and Promotion for Faculty in the Humanities, 1977-95." Federal Reserve Bank of Atlanta Working Paper 2001-7 (April 2001).

Gruber, Jonathan. "Disability Insurance Benefits and Labor Supply." *NBER Working Paper No. 5866* (December 1996).

Gruber, Jonathan. "The Incidence of Mandated Maternity Benefits." *American Economic Review* 84 (June 1994): 622-41.

Hale, Thomas W. "The Lack of a Disability Measure in Today's Current Population Survey." *Monthly Labor Review* (June 2001): 38-40.

Hamermesh, Daniel S. and Stephen J. Trejo. "The Demand for Hours of Labor: Direct Evidence from California." *Review of Economics and Statistics* 82 (February 2000): 38-47.

Haveman, Robert and Barbara Wolfe. "The Decline in Male Labor Force Participation: Comment." *Journal of Political Economy* 92 (1984): 532-41.

Heckman, James. Comment. In James M. Poterba, ed. *Tax Policy and The Economy*, 32-8. Cambridge: MIT Press, 1996.

Kaye, H. Stephen. "Improved Employment Opportunities for People with Disabilities." Paper presented at the conference on the Persistence of Low Employment Rates for People with Disabilities: Causes and Policy Implications, Washington D.C. (October 2001).

Kruse, Douglas and Lisa Schur. "Employment of People with Disabilities Following the ADA." Rutgers University, School of Management and Labor Relations (New Brunswick) mimeo (January 2002).

Kubik, Jeffrey D. "Incentives for the Identification and Treatment of Children with Disabilities: The Supplemental Security Income Program." *Journal of Public Economics* 73 (August 1999): 187-215.

Landes, W.M. and L.C. Solmon. "Compulsory Schooling Legislation: An Economic Analysis of Law and Social Change in the Nineteenth Century." *Journal of Economic History* 22 (1972): 54-91.

Lewin Group, The. *Policy Evaluation of the Overall Effects of Welfare Reform on SSA Programs: Final Report* (prepared for the Social Security Administration, 23 April 1999).

Long, J. Scott. *Regression Models for Categorical and Limited Dependent Variables.* Thousand Oaks, CA: Sage Publications, 1997.

Manski, C.F. and D. McFadden. *Structural Analysis of discrete Data with Econometric Applications*. Cambridge, MA: MIT Press (1981).

Moehling, Carolyn M. "State Child Labor Laws and the Decline of Child Labor." *Explorations in Economic History* 36 (January 1999): 72-106.

Parsons, Donald. "The Decline in Male Labor Force Participation." *Journal of Political Economy* 88 (1980): 117-34.

Stern, Steven. "Measuring the Effect of Disability on Labor Force Participation." *The Journal of Human Resources* 24 (Spring 1989): 361-95.

Stern, Steven. "Semiparametric Estimates of the Supply and Demand Effects of Disability on Labor Force Participation." *Journal of Econometrics* 71 (1996): 49-70.

Wooldridge, Jeffrey M. "Asymptotic Properties of Weighted M-Estimators for Variable Probability Samples." *Econometrica* 67 (November 1999): 1385-1406.

Figure 1: Percent Employed of Disabled and Non-disabled Individuals, CPS 1981-2000

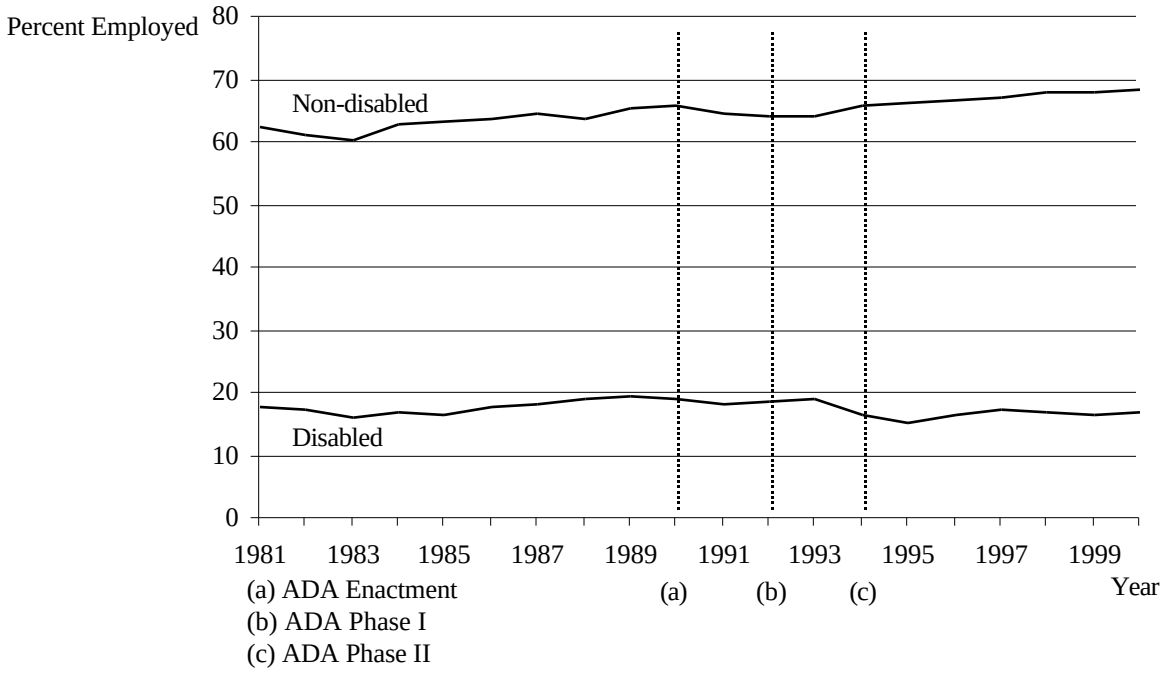

Figure 2: Distribution of Disabled Individuals across Disability Type, SIPP 1986-1997

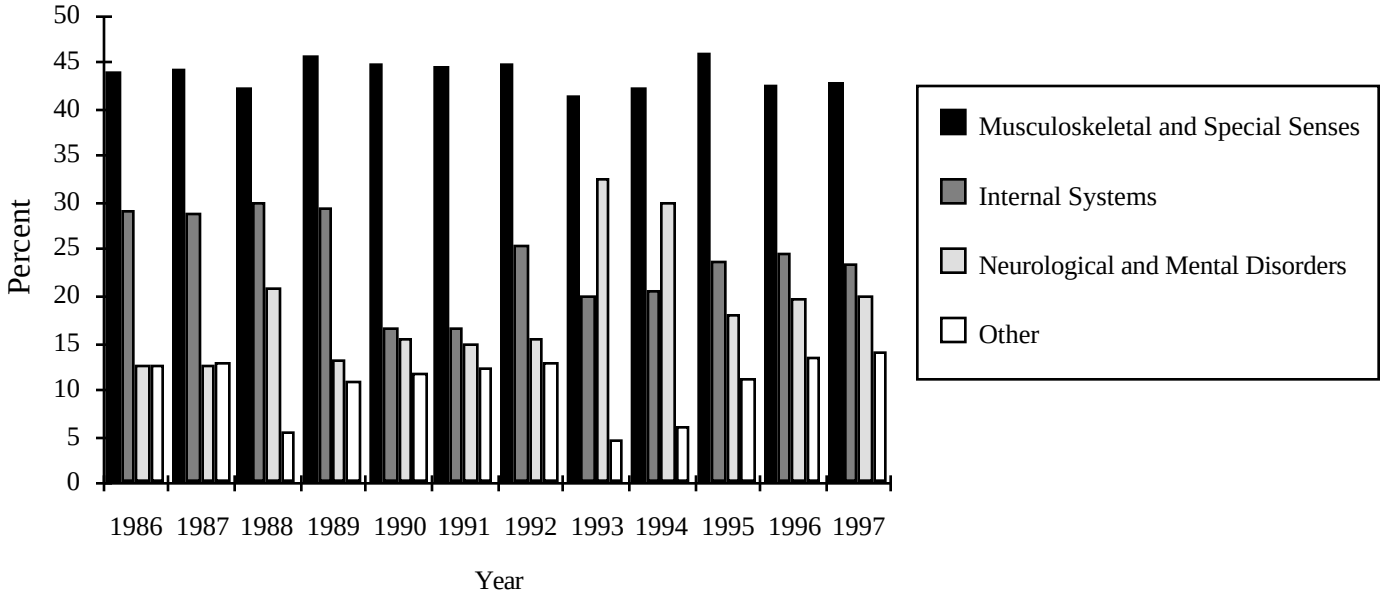

Figure 3: Impact of Disability on the Joint Labor Force Participation and Employment Probabilities, CPS 1981-2000

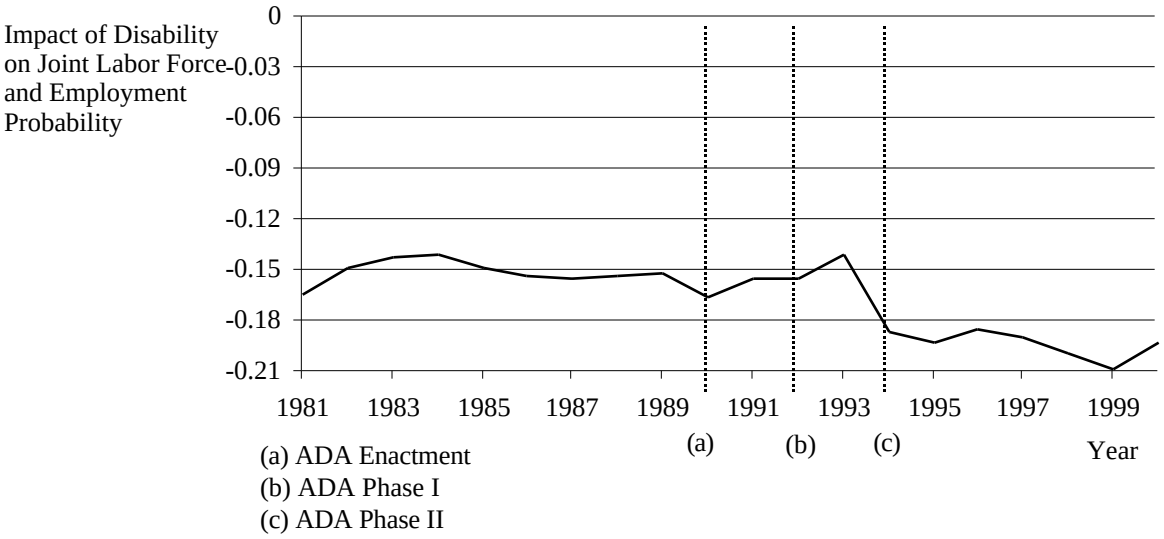

Figure 4: Separate Predictions of Employment and Labor Force Participation Probabilities for the Disabled, CPS 1987-2000

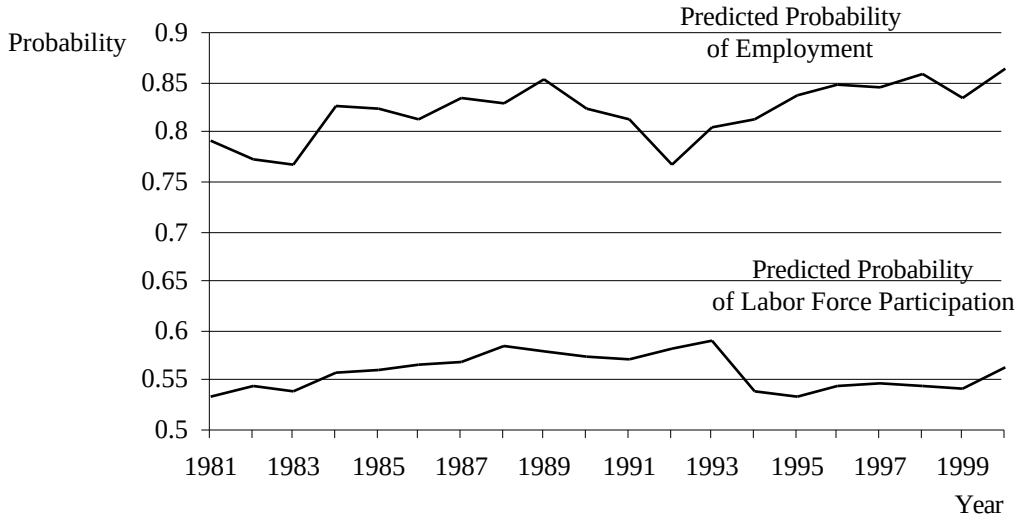

Table 1: Labor Force Participation and Employment Bivariate Probit with Selection Results, CPS Combined Years 1981-2000

Regressor	Labor Force Participation Equation	Employment Equation
Intercept	-2.9988*	0.6421*
	(0.0152)	(0.0215)
Age (00)	13.3928*	-1.3265*
	(0.0742)	(0.1176)
Age Squared (0000)	-16.6844*	2.2159*
	(0.0905)	(0.1544)
Female = 1	-0.4651*	0.1811*
	(0.0032)	(0.0047)
Nonwhite = 1	-0.0176*	-0.2393*
	(0.0045)	(0.0058)
High School Grad = 1	0.2094*	0.0762*
	(0.0041)	(0.0061)
Some College = 1	0.1127*	0.2076*
	(0.0046)	(0.0067)
College Grad = 1	0.2754*	0.3730*
	(0.0053)	(0.0083)
Advanced Degree = 1	0.3378*	0.3479*
	(0.0082)	(0.0134)
Central City = 1	0.0398*	-0.0321*
	(0.0051)	(0.0070)
Midwest = 1	0.0530*	0.0337*
	(0.0045)	(0.0065)
South = 1	0.0196*	0.0813*
	(0.0042)	(0.0064)
West = 1	-0.0233*	0.0218*
	(0.0046)	(0.0067)
Single Household = 1	0.2148*	--
	(0.0036)	
Non-labor Income (000000)	-16.6473*	--
	(0.2922)	
Worked Last Year = 1	2.0763*	--
	(0.0035)	
Weeks Worked Last Year (00)	--	3.2187*
		(0.0151)
State Unemployment Rate (0)	-0.0901*	-0.6357*
	(0.0076)	(0.0103)
DISABLE = 1	-0.7624*	-0.2012*
	(0.0080)	(0.0143)
POST (year≥1992) = 1	0.0677*	-0.0139*
	(0.0035)	(0.0051)
DISABLE*POST = 1	-0.1706*	-0.0298
	(0.0120)	(0.0225)
Rho	0.0371*	
	(0.0065)	
Log-likelihood	-596,816	
Number of Observations	1,359,885	

Notes: Standard errors are in parentheses. * => significant at the 99 percent confidence level.

Table 2: Change in Marginal Effect of Disability on
Labor Force Participation and Employment

	Prob(LFP=1)		Prob(EMP=1)		Prob(EMP=1,LFP=1)	
	Before ADA	After ADA	Before ADA	After ADA	Before ADA	After ADA
Non-disabled	0.7284	0.7397	0.8592	0.8569	0.6718	0.6798
Disabled	0.5693	0.5431	0.8233	0.8148	0.5202	0.4942
Marginal Effect	-0.1591	-0.1966	-0.0359	-0.0421	-0.1516	-0.1856
Change in Marginal Effect	-0.0375		-0.0062		-0.0340	

Note: Probabilities calculated using parameter coefficients from Table 1.

Table 3: Labor Force Participation and Employment Bivariate Probit with Selection Results,
SIPP Combined Years 1986-1997

Regressor	Labor Force Participation Equation	Employment Equation
DISABLE = 1	-0.9404*	-0.2435*
	(0.0105)	(0.0211)
POST (year≥1992) = 1	0.0293*	-0.0348*
	(0.0048)	(0.0077)
DISABLE*POST = 1	-0.1360*	0.0768*
	(0.0129)	(0.0250)
Rho	-0.4811*	
	(0.0204)	
Log-likelihood	-292,341	
Number of Observations	500,560	

Notes: Standard errors are in parentheses. Additional regressors included age; age squared; state unemployment rate; female, nonwhite, education, regional dummy variables; an indicator for SMSA residence (employment); and non-labor income and marital status (labor force participation). * => significant at the 99 percent confidence level.

Table 4: Labor Force Participation and Employment Bivariate Probit with Selection Results by Type of Disability, SIPP Combined Years 1986-1997

Regressor	Labor Force Participation Equation	Employment Equation
MUSCULOSKELETAL = 1	-0.8253*	-0.2798*
	(0.0150)	(0.0281)
INTERNAL SYSTEMS = 1	-0.9597*	-0.1660*
	(0.0192)	(0.0409)
MENTAL = 1	-1.2722*	-0.1599*
	(0.0237)	(0.0487)
OTHER = 1	-0.8396*	-0.3429*
	(0.0280)	(0.0508)
POST (year≥1992) = 1	0.0305*	-0.0348*
	(0.0048)	(0.0077)
MUSCULOSKELETAL*POST = 1	-0.1416*	0.0542
	(0.0187)	(0.0348)
INTERNAL*POST = 1	-0.1137*	0.1693
	(0.0247)	(0.0532)
MENTAL*POST = 1	-0.0850*	0.1187+
	(0.0282)	(0.0573)
OTHER*POST =1	-0.0829+	0.1484+
	(0.0360)	(0.0675)
Rho	-0.4799***	
	(0.0205)	
Log-likelihood	-292,164	
Number of Observations	500,560	

Notes: Standard errors are in parentheses. See notes to Table 3 regarding additional regressors. * => significant at the 99 percent confidence level, + => significant at the 95 percent confidence level

Table 5: Summary of State Level Disability Legislation

STATE	First year disability legisla-tion is in place	Public/ Private Coverage	STATE	First year disability legisla-tion is in place	Public/ Private Coverage
Alabama	1975	public	Montana	1974	pub/prvt
Alaska	1987	pub/prvt*	Nebraska	1971	public
Arizona	1985	pub/prvt		1973	pub/prvt
Arkansas	1973	public	Nevada	1971	pub/prvt
	1993	pub/prvt	New Hampshire	1975	pub/prvt
California	1980	pub/prvt*	New Jersey	1978	pub/prvt
Colorado	1979	pub/prvt	New Mexico	1973	pub/prvt
Connecticut	1973	pub/prvt	New York	1974	pub/prvt*
Delaware	< 1988	public	North Carolina	1985	pub/prvt
	1988	pub/prvt	North Dakota	1983	pub/prvt
Florida	1977	pub/prvt	Ohio	1976	pub/prvt*
Georgia	1978	public	Oklahoma	1981	pub/prvt
	1981	pub/prvt	Oregon	1973	pub/prvt
Hawaii	1981	pub/prvt	Pennsylvania	1974	pub/prvt
Idaho	1969	public	Rhode Island	1973	pub/prvt
	1988	pub/prvt	South Carolina	1972	public
Illinois	1980	pub/prvt		1996	pub/prvt
Indiana	1975	pub/prvt	South Dakota	1973	public
Iowa	<1971	public		1984	pub/prvt*
	1972	pub/prvt*	Tennessee	1976	pub/prvt
Kansas	1974	pub/prvt	Texas	1989	pub/prvt
Kentucky	1976	pub/prvt	Utah	1979	pub/prvt
Louisiana	1975	public	Vermont	1981	pub/prvt
	1980	pub/prvt	Virginia	1972	public
Maine	1973	pub/prvt*	Washington	1973	pub/prvt*
Maryland	1974	pub/prvt	Washington, DC	<1972	public
Massachusetts	1983	pub/prvt		1994	pub/prvt
Michigan	1976	pub/prvt	West Virginia	1981	pub/prvt
Minnesota	1973	pub/prvt	Wisconsin	1965	pub/prvt
Mississippi	1974	public	Wyoming	1985	pub/prvt*
Missouri	1978	pub/prvt			

Source: Author's determination from original legislative sources for each state.
*Exact original coverage not available; classification based on current coverage definitions.

Table 6: Labor Force Participation and Employment Bivariate Probit with Selection Results, State Analysis 1981-1991

Regressor	Labor Force Participation Equation	Employment Equation
Intercept	-2.9613*	0.8355*
	(0.0492)	(0.2396)
Age (00)	13.3187*	-1.2545*
	(0.2278)	(0.3533)
Age Squared (0000)	-16.4768*	2.3317*
	(0.2828)	(0.4673)
Female = 1	-0.5123*	0.2041
	(0.010)	(0.0143)
Nonwhite = 1	-0.0340+	-0.2871*
	(0.0148)	(0.0194)
High School Grad = 1	0.2689*	0.0614*
	(0.0127)	(0.0180)
Some College = 1	0.1187*	0.1680*
	(0.0135)	(0.0198)
College Grad = 1	0.3347*	0.3606*
	(0.1784)	(0.0262)
Advanced Degree = 1	0.1836*	0.1843*
	(0.0310)	(0.0463)
Central City = 1	0.0781*	-0.0040
	(0.0150)	(0.0216)
Midwest = 1	-0.0406+	0.0010
	(0.0175)	(0.0336)
South = 1	0.0108	0.0771*
	(0.0142)	(0.0222)
West = 1	-0.1120*	0.0788*
	(0.0166)	(0.0298)
Single Household = 1	0.2345*	--
	(0.0117)	
Non-labor Income (000000)	-21.2445*	--
	(0.8830)	
Worked Last Year = 1	1.9908*	--
	(0.0110)	
Weeks Worked Last Year (00)	--	3.0181*
		(0.0457)
State Unemployment Rate (0)	-0.0389	-0.8264*
	(0.0334)	(0.0483)
Real Gross State Product (000000)	--	0.0593
		(0.1539)
Log Population	--	-0.0042
		(0.0159)
DISABLE = 1	-0.7197*	-0.2095*
	(0.0301)	(0.0514)
POST Legislation = 1	0.0442*	-0.0273
	(0.0127)	(0.0185)
DISABLE*POST = 1	-0.0523	0.0057
	(0.0377)	(0.0663)
Rho	0.0403*	
	(0.0065)	
Log-likelihood	-65,190	
Number of Observations	140,707	

Notes: Standard errors are in parentheses. * => significant at the 99 percent confidence level; + => significant at the 95 percent confidence level. States included in the analysis are Alaska, Arizona, Delaware, Idaho, Massachusetts, North Carolina, North Dakota, South Dakota, Texas, and Wyoming.