Marquette University

e-Publications@Marquette

Economics Faculty Research and Publications

Economics, Department of

2013

The Impact of Work-Limiting Disabilities on Earnings and Income Mobility

Nicholas A. Jolly

Marquette University, nicholas.jolly@marquette.edu

Follow this and additional works at: https://epublications.marquette.edu/econ_fac

Part of the [Economics Commons](#)

Recommended Citation

Jolly, Nicholas A., "The Impact of Work-Limiting Disabilities on Earnings and Income Mobility" (2013).

Economics Faculty Research and Publications. 459.

https://epublications.marquette.edu/econ_fac/459

Marquette University

e-Publications@Marquette

***Economics Faculty Research and Publications/College of Business
Administration***

This paper is NOT THE PUBLISHED VERSION; but the author's final, peer-reviewed manuscript. The published version may be accessed by following the link in the citation below.

Applied Economics, Vol. 45, No. 36 (2013): 5104-5118. [DOI](#). This article is © Taylor & Francis and permission has been granted for this version to appear in [e-Publications@Marquette](#). Taylor & Francis does not grant permission for this article to be further copied/distributed or hosted elsewhere without the express permission from Taylor & Francis.

The Impact of Work-Limiting Disabilities on Earnings and Income Mobility

Nicholas A. Jolly

Department of Economics, College of Business Administration, Marquette University, Milwaukee, WI

Abstract

This article uses the 1968–2007 waves of the Panel Study of Income Dynamics (PSID) to examine how work-limiting disabilities influence the intragenerational earnings and income mobility of individuals. The results show that work-limiting disabilities increase the probability of downward mobility for several years after onset. Furthermore, the probability of being in the bottom portions of the distributions increases significantly, not only during the year of onset but also for at least 10 years afterwards. These results are more pronounced for those individuals suffering from a disability that is more chronic or severe in nature. Income from spousal earnings and government transfer payments offers some protection against disability's adverse effect, with more protection being provided to those who are more chronically disabled.

Keywords

work-limiting disabilities, earnings losses, income losses, intragenerational mobility

I. Introduction

Policy-makers have long been interested in the economic well-being of disabled individuals. Researchers have documented the negative impact that disability has on workers' earnings and income (Stephens, 2001; Charles, 2003; Meyer and Mok, 2006; Mok *et al.*, 2008). One area that has received little attention is how the onset of a work-limiting disability alters intragenerational earnings and income mobility. Many consider the disabled to be a disadvantaged group, and understanding their experiences helps in learning of the changing nature of inequality (Haveman and Wolfe, 1990). Given the disadvantaged nature of disabled individuals and the increasing enrolment in and spending on Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI) (Autor and Duggan, 2003, 2006), studying the relationship between disability and mobility is important.¹

Aside from long-term earnings/income losses, there are other reasons to expect that work-limiting disabilities should hinder movements within the distributions. Some researchers have found that the disabled experience wage discrimination (Johnson and Lambrinos, 1985; Baldwin and Johnson, 1994; DeLeire, 2001), suggesting that the onset of a disability should reduce a worker's ability to move up the distributions when compared to nondisabled individuals. Furthermore, the SSDI and SSI application process may hinder work-disabled individuals' mobility patterns. One of the main features of these programmes is that individuals must show that they are not capable of substantial gainful employment. As of January 2011, substantial gainful employment for those who are not blind meant earning \$1000 per month or more (Social Security Administration). Therefore, as individuals apply for benefits, await initial decisions or appeal rejected claims, they may work less than they otherwise would have, had they not been seeking benefits.²

While the above discussion implies a directional impact of disability on mobility, little research exists that calculates the magnitude of the effect. Nagi and Hadley (1972) show that after the onset of disability, the per cent of their sample with a monthly family income of \$500 or more fell by approximately 31.7% points. The per cent of their sample with a monthly family income of \$200 or less grew by 43.2% points. Bartley and Plewis (1997) show that men who move down socio-economic status groups are more likely, and those who move up socio-economic status groups are less likely, to report a long-term, limiting illness. The authors define socio-economic status by occupational classifications and examine mobility between three 10 year periods, 1971, 1981 and 1991.

Meyer and Mok (2006) show that not only are the disabled more likely to live in poverty when compared to their nondisabled counterparts, but also the poverty rate among disabled individuals rises during the year of onset and does not return to pre-disability levels even 10 years afterwards. Burkhauser *et al.* (2008) use data from the Current Population Survey (CPS) and kernel density estimates to show that the economic well-being of working-aged, disabled individuals has remained stagnant despite growth in the SSDI and SSI programmes and despite the increases in economic well-being of other disadvantaged groups, such as single mothers.

This study uses the 1968–2007 waves of the Panel Study of Income Dynamics (PSID) and begins by constructing transition probabilities and comparing the mobility patterns of disabled and nondisabled men. The study then uses interval regressions to calculate the long-term earnings and income losses associated with the onset of a work-limiting disability along with the probability that a disabled worker will be in one of the five quintiles of the earnings and income distributions relative to a nondisabled individual. Results from the analysis indicate that the onset of a work-limiting disability is associated with an increased probability of falling, and a decreased probability of rising, in the earnings and income distributions. This change occurs not only during the year of onset, but also lasts for at least 10 years. Disability hinders mobility in the earnings distribution more than that in the income distribution, providing evidence that other sources of income help mitigate disability's negative impact; the protection is larger for the more chronically disabled.

This article contributes to the existing literature by exploiting the panel-data nature of the PSID and tracking mobility patterns from a period of 3 years before disability onset to 10 years afterwards. The earlier literature used a two period transition matrix (Nagi and Hadley, 1972), three separate 10 year periods (Bartley and Plewis, 1997), or cross-sectional data from the CPS over multiple years (Burkhauser *et al.*, 2008). By focusing on a 14 year period, researchers can gain a better understanding as to the changing nature of how disability influences mobility. Furthermore, the earnings equation that is used in the analysis makes use of a comparison group of nondisabled individuals, is well known in the programme evaluation literature and is similar to that used by Stephens (2001), Charles (2003), Meyer and Mok (2006), and Mok *et al.* (2008). The articles in the previous literature on disability and mobility do not use a comparison group explicitly in their modelling.³ Using these evaluation techniques, researchers can have relatively more confidence that the onset of disability is changing mobility patterns.

The rest of this article proceeds by discussing the data and empirical methodology in Section II. Section III presents and discusses the empirical results, and Section IV concludes.

Fig. 1. Estimated earnings losses by level of chronicity

Fig. 2. Estimated income losses by level of chronicity

II. Data and Empirical Methodology

Data

This study uses the 1968–2007 waves of the PSID, which were conducted annually from 1968 to 1997, and biennially thereafter. The unit of analysis is the male household head.⁴ Each individual must report being a current household head at least once from 1968 to 2007. Once the individual reports being a current household head, he must maintain this status for at least three more consecutive waves. This restriction ensures each person in the sample has the ability to contribute observations for multiple years. The analysis excludes males who first report being a current household head in the 2003–2007 surveys since they do not meet this restriction. The estimation uses an individual's observation whenever he is between the ages of 20 and 62 and reports nonmissing annual labour earnings.

A work-limiting disability is identified from a survey question asking, ‘Do you have a physical or nervous condition that limits the type of work, or the amount of work you can do?’⁵ This question was asked consistently from 1972 to 2007. Between 1969 and 1971, this question came in two parts, one asking about the amount of work and the other asking about the type of work. If a respondent answers affirmatively, then he is identified as experiencing a work-limiting disability in the calendar year before the survey (Stephens, 2001). The date of disability onset is taken as the first affirmative answer given by the respondent. Each individual must be a current household head in the two surveys prior to onset (Charles, 2003; Meyer and Mok, 2006; Mok *et al.*, 2008). This requires all males first reporting a disability in 1968 and 1969 to be removed from the analysis.⁶

To ensure that disabled males can contribute observations after onset, they must maintain household head status for three consecutive surveys after onset. This requires all males reporting their first disability past the 2001 survey to be removed from the analysis. Those who are 18 years old or younger when they experience their first disability are removed from the sample (Charles, 2003; Meyer and Mok, 2006; Mok *et al.*, 2008). Since the analysis focuses on males between the ages of 20 and 62, and since disabled individuals must be in the sample for 3 years past the date of onset, all men older than 59 years at onset are removed from the sample.

To account for how chronic the disability is, an index is created following Stephens (2001): the total number of disability reports is added together and then divided by the total number of years the respondent is in the sample, starting with the year of onset. If the individual reports an index that is larger than or equal to 0.50, then he is labelled as most chronically disabled. If the index is lower than 0.50, then he is least chronically disabled. The equations presented below are estimated separately using different sets of disabled individuals – the entire sample, the most chronically disabled and the least chronically disabled. An obvious problem with this index is that if a disabled individual is in the sample for a short period, then he may be assigned a large weight, indicating that his disability is relatively chronic or severe even though it may only last for a brief time (Meyer and Mok, 2006). However, since all men reporting a disability must be in the sample for an additional 3 years, this bias should be mitigated.⁷

Empirical methodology

The analysis employs three methodologies, earnings equations, transition matrices and interval regressions. Jolly (2013) studies how job displacement impacts intragenerational mobility patterns using similar techniques. Therefore, the methodologies presented here on work-limiting disabilities build upon that earlier work focusing on job loss.

Earnings regressions.

To understand the impact of work-limiting disabilities on mobility, it is important to examine first how disabilities influence the earnings and income of individuals. To this end, the analysis begins with a fixed-effects earnings equation that is similar in style to that used by Stephens (2001), Meyer and Mok (2006), and Mok *et al.* (2008).⁸ The equation is

$$y_{it}^* = x_{it}\beta + \gamma_t + \sum_{k \geq -3} D_{is}^k \delta_k + \alpha_i + \varepsilon_{it}$$

(1)

Here, y_{it}^* equals annual labour earnings or total family income of person i in year t . Family income includes the taxable income and transfer income of all members in the family unit. It is adjusted for family size by dividing it by the square root of the number of members in the family unit.⁹ Family income, in addition to labour earnings, is used here since spousal earnings and government transfer payments may mitigate any negative impact disability has on the household head’s earnings. Earnings and income are converted to 2006 dollars using the appropriate year’s consumer price index for all urban consumers.¹⁰

The x_{it} contains a quartic in potential experience. Potential experience equals age minus education minus six.¹¹ If individuals have fewer than 12 years of education, then potential experience equals age minus 18. This ensures that they are not overcompensated by assigning them larger values of experience (Stephens, 2002). Education is defined to be the same throughout time by assigning each individual his reported education from the most recent observation in the sample (Jolly, 2013). The D_{is}^k are disability dummy variables that equal one if individual i reports disability onset in year s , and k indexes these variables starting 3 years before onset. The estimates of δ_k provide the estimates of the long-term earnings/income losses associated with the onset of a work-limiting disability. The γ_t are year dummy variables. The term α_i is a time-invariant, individual-specific, unobserved effect that is treated as a fixed as opposed to a random effect. Finally, ε_{it} is a time-varying error term, which is assumed to be distributed normally with mean zero and variance δ_ε^2 .

Transition matrices.

Transition matrices provide estimates of the probability of individuals moving throughout the distributions over relative time changes and provide evidence as to how persistent are shocks to earnings and income (Burkhauser *et al.*, 1997; Jolly, 2013). The probability of changing quintiles will be the same over a 1 year period as over a 3 year period if the shock is transitory. The probability of changing quintiles grows over time with persistent shocks.

The quintiles of the distributions are generated using data over the entire sample period, 1968–2007.¹² Once the quintiles have been determined, the sample is broken into two subsets, the first contains nondisabled men, and the second contains those individuals who report a work-limiting disability at some point between 1970 and 2000. Using the same methodology and similar notation as Burkhauser *et al.* (1997) and Jolly (2013), indicator variables are created for each individual. These variables are defined as $\rho_{l,q;l}^{t,t+r}$, and they equal one if individual i moves from quintile q to quintile l between periods t and $t + r$. Then, the sub-sample's probability of moving from quintile q to quintile l equals the following equation:

$$P = \frac{\sum_{i=1}^n w_i \rho_{l,q;l}^{t,t+r}}{\sum_{i=1}^n w_i}$$

(2)

where w_i is the sample weight assigned to individual i in period $t + r$.

The base period, time t , is different for each sub-sample. For the group of disabled workers, time t refers to the period of 3 years before onset. For the group of nondisabled males, the reference period is a randomly chosen starting year from among the number of years for which they are in the sample. The reason the reference period is different is that a disability can occur in any year from 1970 to 2000, which makes it difficult to align temporally disabled and nondisabled individuals. Therefore, a random reference period is chose for the nondisabled.

Interval regression.

The final methodology used is estimating interval regressions. This model begins with Equation 1 to estimate earnings and income losses as before, and then uses these estimates to calculate the probability that an individual will be in one of the five quintiles of the distributions.

Starting with Equation 1, define the following formula

$$y_{it} = \begin{cases} 1 & \text{if } y_{it}^* \leq \mu_1 \\ 2, \dots, 4 & \text{if } \mu_{j-1} < y_{it}^* \leq \mu_j \forall j = 2, \dots, 4 \\ 5 & \text{if } y_{it}^* > \mu_4 \end{cases}$$

(3)

Here, y_{it} equals one of the five quintiles of the distributions, with one being the lowest quintile and five being the highest. The μ_j s are the lower and upper bounds of each quintile, which are fixed. To save on notation, define $z_{it}\theta = x_{it}\beta + \gamma_t + \sum_{k \geq -3} D_{is}^k \delta_k$

and rewrite Equation 1 as

$$y_{it}^* = z_{it}\theta + \alpha_i + \varepsilon_{it}$$

(1')

By inserting Equation 1' into Equation 3, with rearranging, Equation 3 becomes

$$y_{it} = \begin{cases} 1 & \text{if } \varepsilon_{it} \leq \mu_1 - (z_{it}\theta + \alpha_i) \\ 2, \dots, 4 & \text{if } \mu_{j-1} - (z_{it}\theta + \alpha_i) < \varepsilon_{it} \leq \mu_j - (z_{it}\theta + \alpha_i) \forall j = 2, \dots, 4. \\ 5 & \text{if } \varepsilon_{it} > \mu_4 - (z_{it}\theta + \alpha_i) \end{cases}$$

Since ε_{it} is assumed to be normally distributed, then the probability that y_{it} equals one of the five quintiles of the distributions is given by

$$Pr(y_{it} = 1, \dots, 5 | z_{it}, \alpha_i) = \begin{cases} \Phi \left[\frac{\mu_1 - (z_{it}\theta + \alpha_i)}{\sigma_\varepsilon} \right], & j = 1 \\ \Phi \left[\frac{\mu_j - (z_{it}\theta + \alpha_i)}{\sigma_\varepsilon} \right] - \Phi \left[\frac{\mu_{j-1} - (z_{it}\theta + \alpha_i)}{\sigma_\varepsilon} \right], & \forall j = 2, \dots, 4 \\ 1 - \Phi \left[\frac{\mu_4 - (z_{it}\theta + \alpha_i)}{\sigma_\varepsilon} \right], & j = 5 \end{cases}$$

(4)

where $\Phi(\cdot)$ is the standard normal cumulative density function (CDF).

The interval regression's likelihood function is derived in the same manner as that of the ordered probit (Wooldridge, 2002). The only difference between the ordered probit and the interval regression is that with the former, the μ_j s are part of the estimation procedure, whereas with the interval regression, they are fixed, known parameters. The estimates from the likelihood function are used in Equation 4 to estimate the probability that a disabled individual will be in one of the five quintiles of the distributions relative to his nondisabled counterpart.

As before, α_i is treated as a fixed effect as opposed to a random effect. As in Jolly (2013), to account for fixed effects, the analysis follows Mundlak (1978) and parameterizes the relationship between α_i and z_{it} as $\alpha_i = \bar{z}_i\lambda + u_i$, where $\bar{z}_i$ is the observed variables' time average for individual i , and $u_i | z_i \sim N(0, \sigma_u^2)$. The coefficients associated with $\bar{z}_i$ provide the effect that unobserved heterogeneity has on an individual's earnings and income, whereas those associated with z_{it} are interpreted as the effect the variable has on earnings and income.

III. Results

Table 1 presents summary statistics of the selected variables by disability status. For nondisabled men, the averages and proportions use each individual's observation. The statistics for the disabled are calculated using observations of the 3 years prior to onset. There are 5008 nondisabled and 1559 disabled men in the sample. Those who experience a work-limiting disability tend to be older, less educated and African-American when compared to the nondisabled. They also tend to come from blue-collar occupations, have less labour earnings,

lower family income and work fewer hours per year. Finally, the disabled tend to have more children under 18 years of age, and their wives tend to be older than the wives of the nondisabled. Aside from working in blue-collar occupations, these differences are more pronounced for the most chronically disabled. These statistics support what the previous literature (for example, Haveman and Wolfe, 1990) has shown and indicate that those individuals who do experience a work-limiting disability may be coming from economic groups that are relatively disadvantaged.

Table 1. Summary statistics by disability status

Variable	Non disabled	All disabled	Least chronic	Most chronic
Age*	35.60	37.16	35.44	39.45
Education*	13.23	11.93	12.31	11.42
Black*	28.27%	32.98%	31.04%	35.55%
Married	82.90%	82.31%	82.24%	82.42%
Number of children under 18*	1.22	1.42	1.41	1.43
Annual hours worked*	2188.18	2074.32	2152.51	1970.80
Labour earnings*	\$513 26.99	\$404 16.09	\$432 63.42	\$366 46.53
Family income ^a *	\$456 04.77	\$353 53.62	\$369 93.59	331 82.47
Wife's Age*	34.31	35.52	33.99	37.54
Blue collar ^b *	44.18%	54.11%	54.24%	53.95%
Manufacturing ^{b,c}	24.93%	24.93%	25.35%	24.37%
Sample size	5008	1559	886	673

Notes: ^aAdjusted for family size using the square-root equivalence scale.

^bData not available past the 2001 survey wave.

^cData not available until the 1971 survey wave.

* Indicates statistical significance between Non-Disabled and All Disabled at the 1% level using a two-tailed test. For variables Married and Manufacturing, the difference was statistically insignificant at any standard level. For disabled workers, averages are for the three years prior to the onset of the disability. For non-disabled workers, averages are for the entire time frame.

Source: Author's calculations from the 1968–2007 PSID.

Earnings and income losses of disabled workers

Table 2 presents the estimates from Equation 1, the fixed-effects earnings equation. Since the disability variables are the ones of interest, they are the ones displayed in the table. The rows in column one are labelled '3 Years Before' to '10 Years After,' and they indicate the number of years before or after the onset of the disability. The estimates are presented graphically in Figs 1 and 2. For all three samples of disabled men, earnings and income exhibit a slight downward trend during the 3 years before disability onset, which is consistent with the previous literature using the panel-data structure of the PSID (Stephens, 2001; Charles, 2003; Meyer and Mok, 2006; Mok *et al.*, 2008). Meyer and Mok (2006) mention that this could be caused by individuals experiencing health problems prior to their actual report of a work-limiting disability, especially for those who are chronically/severely disabled. Focusing on all disabled workers, the results indicate that, on average, those who experience a work-limiting disability suffer a drop in earnings, equalling \$1794, during the year of onset; this estimate is significant only at the 10% level. Labour earnings decrease by a larger amount, \$4189, the year after onset. When using average earnings from Table 1, this loss amounts to 10% of pre-onset earnings. Even 10 years after disability onset, earnings are still \$3822, or 9%, below where they would have been had the disability not occurred. Family income drops by \$2463 the year after onset; the income loss grows to \$3858 10 years afterwards. When taken as a percentage of pre-disability income, these losses amount to 7% and 11%, respectively.

Table 2. Earnings and income regressions by chronicity

	Labour earnings			Family income		
	All disabled	Least chronic	Most chronic	All disabled	Least chronic	Most chronic
3 years before	2044.56	2630.46	1318.69	1705.51	1829.44	1629.36
	(1.94)*	(1.57)	(1.29)	(1.61)	(1.07)	(1.65)*
2 years before	1067.70	1593.03	455.68	610.871	1085.27	109.121
	(1.15)	(1.11)	(0.43)	(0.74)	(0.85)	(0.11)
1 year before	954.992	1460.89	274.917	101.165	642.641	-594.708
	(0.88)	(0.85)	(0.25)	(0.12)	(0.50)	(0.65)
Year of	-1794.67	-415.857	-3846.44	-971.176	-517.565	-1698.95
	(1.82)*	(0.28)	(3.23)***	(1.15)	(0.43)	(1.44)
1 year after	-4189.47	-1112.62	-8682.58	-2462.71	-1563.33	-3889.66
	(3.41)***	(0.58)	(7.00)***	(2.62)***	(1.08)	(3.59)***
2 years after	-5491.12	-2486.19	-10 029.08	-3350.88	2309.10	-5138.35
	(5.44)***	(1.72)*	(7.52)***	(4.28)***	(2.19)**	(4.33)***
3 years after	-3828.76	-814.07	-8652.68	-2473.47	-1670.33	-4082.20
	(3.41)***	(0.49)	(6.60)***	(2.92)***	(1.43)	(3.42)***
4 years after	-5781.23	-2155.27	-11 644.20	-3295.69	-2829.64	-4616.02
	(5.25)***	(1.43)	(7.64)***	(3.40)***	(2.70)***	(2.57)**
5 years after	-4047.06	-45.939	-10 972.50	-2813.72	-869.919	-6499.53
	(3.03)***	(0.02)	(7.71)***	(2.90)***	(0.62)	(5.48)***
6 years after	-5243.86	-1081.65	-12 458.99	-4295.50	-2127.27	-8396.72
	(4.20)***	(0.67)	(6.56)***	(4.77)***	(1.82)*	(6.07)***
7 years after	-3511.89	439.572	-11 094.21	-1363.92	-682.565	-3404.35
	(2.51)**	(0.22)	(6.82)***	(0.90)	(0.47)	(1.06)
8 years after	-4785.89	-153.885	-13 456.46	-3718.18	-1353.56	-8591.51
	(4.48)***	(0.11)	(8.63)***	(3.87)***	(1.04)	(6.43)***
9 years after	-3322.01	53.389	-10 342.07	-3437.52	-1753.74	-7490.71
	(2.34)**	(0.03)	(5.12)***	(3.05)***	(1.30)	(3.82)***
10 years after	-3822.71	-354.433	-11 204.28	-3858.47	-1553.48	-9176.32
	(2.67)***	(0.18)	(6.06)***	(3.42)***	(1.00)	(6.31)***
Observations	93 494	80 396	75 219	93 494	80 396	75 219
Number of individuals	6567	5894	5681	6567	5894	5681

R ²	0.05	0.05	0.05	0.05	0.05	0.05
----------------	------	------	------	------	------	------

Notes: Robust *t* statistics in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

All regressions include a quartic in potential experience and year dummy variables.

Source: Author's calculations from the 1968–2007 PSID.

The estimated earnings and income losses for the least chronically disabled are smaller, in absolute value, when compared to those estimates for the entire, all-disabled sample. Furthermore, when focusing on earnings, the estimates are statistically insignificant starting 3 years after onset; for income, they are insignificant starting 7 years afterwards. On the other hand, for the most chronically disabled, earnings and income losses are larger, in absolute value, when compared to the entire sample. For example, earnings losses amount to \$8683 the year after onset and \$11 204 10 years afterwards. Income losses the year after onset equal approximately \$3890; 10 years afterwards, the losses amount to \$9176.

The estimates from Table 2 are quantitatively and qualitatively similar to those found in the previous literature. Around the year of onset, Stephens (2001), Charles (2003), Meyer and Mok (2006), and Mok *et al.* (2008) report earnings losses ranging from 9% to 49% depending upon the model and sample used. The authors find that losses are larger for the more chronically disabled. Stephens (2001) and Meyer and Mok (2006) show income losses equalling 7% and 13%, respectively. 10 years after disability onset, Charles (2003), Meyer and Mok (2006), and Mok *et al.* (2008) report earnings losses ranging from 1% to 61%. Stephens (2001) reports a summary measure for 6 years or more past disability onset, and he shows that earnings and after-tax family income losses equal 20% and 13%, respectively.

Charles (2003) notes how a reduction in hours, as opposed to hourly earnings, is the driving factor behind the large losses to annual earnings. To investigate this issue here, Equation 1 was re-estimated twice using the entire sample of disabled and nondisabled men, once with annual hours worked as the dependent variable and again with average hourly earnings as the dependent variable. To conserve on space, the results are only discussed and available upon request. There is a statistically significant drop, equalling 136, in hours worked during the year of onset. 10 years afterwards, the loss in hours is 137. The decline in hourly earnings does not become statistically significant until 3 years after disability onset, and it never rises above \$3. When the sample is restricted to workers only, the loss in hourly earnings does not become significant until the 6th year after onset and never rises above \$2.50. As in Charles (2003) and Meyer and Mok (2006), the reduction in wages tends to grow over time. Therefore, it appears that the large losses to earnings and income observed here are driven more by reductions in hours as opposed to wages, which is consistent with the previous literature.

Recall that family income is used, in addition to labour earnings, since other income sources may mitigate the negative impact disability has on the household head's earnings. In other words, income losses should be smaller, in absolute value, than earnings losses. To this end, the difference between the income and earnings losses is presented in Table 3. The more positive the number, the more mitigation is being provided. For all disabled workers, the results indicate that other sources of income do provide some protection against this negative shock to earnings, particularly for the first 4 years after onset. The amount of mitigation differs depending upon how chronically disabled the person is. For the least chronically disabled, not only are the estimates smaller than those for the overall sample, but also none of the estimates is statistically different from zero. The opposite is true for those who are most chronically disabled. Almost all of the differences are larger than those for the overall sample, and each post-onset estimate is statistically significant until 10 years after onset. While not delineating by chronicity level, Stephens (2001) finds that income losses are smaller than earnings losses and notes how transfer payments increase permanently beginning with the year of onset, with social security and pension benefit receipts driving the increases. Meyer and Mok (2006) also find income losses are smaller than earnings losses and show that private and public transfers play a larger role in mitigating earnings losses for those who are most chronically/severely disabled.

Table 3. Difference between income and earnings losses

	All disabled	Least chronic	Most chronic
3 years before	−339.05	−801.02	310.68

2 years before	−456.82	−507.76	−346.56
1 year before	−853.83	−818.25	−869.63
Year of	823.50	−101.71	2147.50**
1 year after	1726.76**	−450.72	4792.92***
2 years after	2140.24***	177.09	4890.74***
3 years after	1355.29*	−856.26	4570.49***
4 years after	2485.54***	−674.37	7028.18***
5 years after	1233.34	−823.98	4472.98***
6 years after	948.35	−1,045.62	4062.27***
7 years after	2147.97	−1,122.14	7689.86**
8 years after	1067.70	−1,199.67	4864.95***
9 years after	−115.52	−1,807.13	2851.36*
10 years after	−35.76	−1,199.05	2027.96

Notes: *significant at 10%; **significant at 5%; ***significant at 1%.

Significance tests conducted using Wald test.

Source: Author's calculations from the 1968–2007 PSID.

Disability and inter-temporal mobility

Tables 4 and 5 present the transition probabilities by disability status for the labour earnings and family income distributions, respectively. The rows in each table show the associated movement within each distribution. For example, the row labelled 'Up 4' indicates an upward movement of four quintiles within the distribution. Each calculation comes from Equation 2, and it shows the proportion of men who make that particular movement in relation to the number of individuals capable of making the transition (Burkhauser *et al.*, 1997; Jolly, 2013). Therefore, column totals will not sum to 100%. The columns labelled $t = -3$ to r indicate the end period of the transition. For example, when focusing on all disabled men, the column $t = -3$ to -2 indicates the movement from 3 years before onset to 2 years before onset. The entries in bold indicate a statistical difference at the 10% level or better between that particular sample and the one immediately to the left of it.

Table 4. Transition probabilities by disability status – labour earnings distribution

	$t = -3$ to -2			$t = -3$ to -1			$t = -3$ to 0			$t = -3$ to 1		
Movement	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic
Up 4	1.91%	2.28%	4.20%	3.97%	5.52%	8.28%	7.34%	4.00%	5.61%	10.41%	3.07%	3.69%
Up 3	1.75%	2.76%	1.61%	5.63%	1.42%	2.10%	4.88%	2.69%	1.86%	7.54%	2.67%	1.63%
Up 2	4.53%	2.73%	3.34%	7.41%	7.28%	7.86%	11.17%	5.87%	5.85%	10.24%	7.51%	5.23%
Up 1	20.50%	18.77%	18.25%	23.25%	16.49%	10.38%	25.81%	18.99%	15.18%	27.39%	17.16%	10.82%
Immobile	64.82%	63.17%	59.60%	58.70%	55.67%	53.56%	53.08%	48.19%	45.19%	50.48%	45.01%	38.27%
Down 1	15.24%	17.45%	20.24%	14.37%	21.98%	27.82%	15.08%	24.08%	26.99%	15.36%	22.41%	31.19%
Down 2	3.45%	3.90%	5.86%	4.38%	6.84%	8.20%	5.73%	9.67%	12.85%	4.86%	11.37%	16.60%
Down 3	1.91%	3.10%	3.20%	3.03%	4.25%	4.42%	2.61%	8.08%	14.93%	4.53%	14.75%	25.82%
Down 4	0.34%	2.55%	3.20%	3.17%	4.48%	8.06%	2.87%	9.53%	11.09%	3.81%	15.49%	23.43%
	$t = -3$ to 2			$t = -3$ to 3			$t = -3$ to 4			$t = -3$ to 5		
Movement	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic
Up 4	9.50%	5.54%	6.23%	10.90%	3.34%	4.15%	19.84%	5.61%	3.43%	22.09%	5.17%	4.31%
Up 3	8.67%	3.93%	4.19%	10.87%	5.99%	5.74%	11.18%	4.19%	3.31%	8.81%	3.18%	1.91%
Up 2	12.24%	6.54%	3.68%	12.53%	9.84%	5.25%	15.95%	7.35%	5.45%	15.90%	10.37%	7.79%
Up 1	30.61%	17.41%	11.94%	29.86%	18.77%	14.51%	30.29%	19.89%	15.73%	29.70%	16.11%	9.91%
Immobile	46.45%	43.82%	40.67%	46.36%	41.13%	36.98%	42.47%	40.07%	34.94%	39.95%	44.12%	40.85%
Down 1	15.09%	22.72%	25.99%	13.22%	22.03%	26.24%	15.21%	21.25%	25.47%	15.59%	18.98%	20.06%
Down 2	6.26%	12.55%	19.27%	5.86%	11.90%	19.18%	5.91%	15.09%	22.08%	6.95%	14.96%	25.69%
Down 3	3.22%	13.53%	24.69%	5.19%	14.03%	23.78%	3.50%	16.66%	27.88%	6.36%	14.00%	26.39%
Down 4	4.29%	17.60%	20.19%	9.32%	16.79%	21.93%	6.99%	15.40%	23.56%	10.15%	19.25%	29.18%

Notes: Weighted transition probabilities by disability status. The all disabled columns indicate any male who reports a disability. The most chronic columns indicate an individual with a chronicity weight greater than or equal to 0.5. For the disabled group, time is relative to three years prior to onset. For the non-disabled, time is relative to a randomly chosen starting date. Entries in bold indicate a statistical difference between the group and the one in the column to the left at a 10% level when using a two-tailed test.

Source: 1968 through 2007 waves of the PSID.

Table 4 indicates that there are two general patterns exhibited by both disabled and nondisabled men. First, the proportion of men who are immobile within the earnings distribution decreases over time. For example, the proportion of nondisabled, immobile individuals in column $t = -3$ to -2 is 65%. In column $t = -3$ to 5 , the proportion is approximately 40%. The analogous numbers for all disabled men are 63% and 44%, respectively. The most chronically disabled have proportions of 59% and 41%, respectively. The second pattern is that the probability of changing quintiles grows over time. The percentage of nondisabled men who move up four quintiles in column $t = -3$ to -2 is approximately 2%. In column $t = -3$ to 5 , the proportion equals 22%. The percentages are 2% and 5% for all work-disabled individuals. Since the probability of changing quintiles increases as time progresses, earnings shocks tend to persist for all groups.

Despite these similarities, Table 4 shows that the number of statistical differences between all disabled and nondisabled men increases substantially starting in column $t = -3$ to 0 . Recall that for the disabled, column $t = -3$ to 0 represents the transition from 3 years before onset to the year of onset. During the year of onset, disabled men have significantly lower probabilities of rising in the labour earnings distribution and significantly higher probabilities of falling in the distribution. For example, the proportion of all disabled men who fall three quintiles in the earnings distribution is 8%; the proportion of nondisabled individuals is only 3%. The proportion of all disabled men moving up three quintiles is 3%, and the same for the nondisabled is approximately 5%. Furthermore, these differences remain throughout the rest of the table. This indicates that even 5 years after the onset of the disability, individuals' intragenerational mobility is worse when compared to their nondisabled counterparts.¹³

Table 4 also indicates that the most chronically disabled have worse mobility patterns than the disabled sample as a whole starting in column $t = -3$ to 1 . Specifically, the proportion of most chronically disabled men falling three quintiles equals approximately 26%, while for the entire disabled sample, the proportion is only 15%. The percentages for moving up one quintile are 11% and 17% for the most chronically disabled and the entire disabled sample, respectively.

The results in Table 5 have many similarities to those presented in Table 4. Specifically, the two general mobility patterns are present: all three subgroups have declining probabilities of immobility and growing probabilities of changing quintiles. Additionally, the number of statistical differences between the all disabled/nondisabled and the most chronically disabled/all-disabled sample increase in column $t = -3$ to 1 . Again, disabled men have lower probabilities of rising, and larger probabilities of falling, in the family income distribution. Further, the most chronically disabled have slightly lower probabilities of rising, and larger probabilities of falling, in the distribution when compared to the entire sample of disabled workers.

Table 5. Transition probabilities by disability status – family income distribution

	<i>t</i> = –3 to –2			<i>t</i> = –3 to –1			<i>t</i> = –3 to 0			<i>t</i> = –3 to 1		
Movement	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic
Up 4	1.34%	0.78%	0.00%	4.20%	1.47%	1.11%	7.24%	0.45%	0.99%	6.26%	0.14%	0.00%
Up 3	3.21%	1.61%	3.29%	4.31%	3.48%	4.60%	5.03%	3.62%	1.99%	7.33%	5.33%	4.58%
Up 2	5.31%	5.08%	5.01%	9.74%	6.46%	5.74%	14.09%	10.23%	12.29%	13.61%	10.48%	11.18%
Up 1	21.78%	22.09%	20.41%	24.52%	24.30%	22.36%	27.14%	24.96%	22.69%	29.96%	21.52%	14.86%
Immobile	59.81%	59.12%	58.58%	53.88%	53.11%	51.99%	47.53%	48.16%	44.80%	47.74%	45.10%	44.84%
Down 1	17.62%	17.23%	19.03%	18.38%	17.87%	20.20%	18.97%	20.44%	24.82%	16.12%	23.25%	26.74%
Down 2	5.31%	6.62%	6.90%	5.68%	8.11%	10.86%	5.97%	7.55%	7.53%	6.69%	10.38%	14.32%
Down 3	1.59%	2.05%	1.32%	2.13%	4.14%	2.00%	2.23%	5.45%	8.50%	2.77%	7.27%	9.07%
Down 4	0.45%	0.00%	0.00%	1.60%	0.51%	0.00%	0.27%	1.09%	0.00%	0.90%	1.22%	0.10%
	<i>t</i> = –3 to 2			<i>t</i> = –3 to 3			<i>t</i> = –3 to 4			<i>t</i> = –3 to 5		
Movement	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic	Non disabled	All disabled	Most chronic
Up 4	6.43%	3.51%	5.03%	8.05%	5.52%	5.08%	11.97%	4.50%	5.26%	19.35%	3.71%	2.79%
Up 3	5.56%	4.59%	2.49%	12.06%	3.43%	3.69%	7.42%	5.44%	3.94%	10.77%	4.97%	3.84%
Up 2	16.86%	9.76%	9.84%	17.15%	11.53%	9.03%	21.87%	15.51%	17.53%	21.00%	16.03%	12.57%
Up 1	32.34%	30.01%	24.36%	32.29%	27.75%	23.62%	30.53%	29.74%	24.95%	31.92%	28.10%	24.24%
Immobile	44.83%	39.98%	39.88%	43.19%	39.51%	37.00%	40.90%	34.34%	32.08%	38.53%	37.65%	36.52%
Down 1	15.09%	20.15%	23.07%	15.61%	20.89%	23.71%	16.09%	20.53%	21.78%	15.53%	19.38%	22.34%
Down 2	5.64%	12.51%	15.70%	6.07%	13.73%	19.23%	5.70%	12.40%	17.50%	6.51%	12.82%	21.70%
Down 3	2.71%	5.43%	7.72%	2.40%	6.52%	12.16%	2.57%	8.08%	12.55%	4.40%	5.10%	2.95%
Down 4	1.23%	4.04%	6.84%	2.94%	1.07%	0.00%	2.98%	5.75%	7.11%	2.17%	5.07%	8.70%

Notes: Weighted transition probabilities by disability status. The all disabled columns indicate any male who reports a disability. The most chronic columns indicate an individual with a chronicity weight greater than or equal to 0.5. For the disabled group, time is relative to three years prior to onset. For the non-disabled, time is relative to a randomly chosen starting date. Entries in bold indicate a statistical difference between the group and the one in the column to the left at a 10% level when using a two-tailed test.

Source: 1968 through 2007 waves of the PSID.

Despite the similarities between Tables 4 and 5, there are some differences worth noting. First, the number of statistical differences between the disabled and nondisabled does not increase in Table 5 as much as it does in Table 4. Thus, while the onset of a work-limiting disability does hinder a worker's intragenerational income mobility, the shock does not appear to be as severe as it is for labour earnings. This provides some evidence that spousal labour earnings and government transfer payments provide partial mitigation of the disability's adverse mobility effects.

Second, even though the chronically disabled tend to have higher probabilities of falling, and lower probabilities of rising, in the income distribution when compared to the entire disabled sample, the number of statistical differences is not as numerous in Table 5 when compared to Table 4. This could be caused by the fact that men who are more chronically disabled work less than the sample, on average. In fact, during the 5 years after onset, the most chronically disabled average 1304 annual hours of work, whereas the entire disabled sample works 1734 annual hours. Therefore, the chronically disabled may qualify for more transfer programmes or larger payouts when compared to the rest of the disabled sample. This would cause fewer statistical differences to be present between the two groups.

Placement in the earnings and income distributions

Table 6 shows the results from estimating the likelihood function of the interval regression. Tables 2 and 6 are interpreted similarly. In other words, the estimates presented in Table 6 show the impact a work-limiting disability has on an individual's earnings and income. There are times when the results in Tables 2 and 6 differ. This is particularly true for the most chronically disabled and the post-onset years four and above. Generally, the results in Table 2 are larger during the pre-onset years and smaller during the post-onset years when compared to Table 6. Differences between the estimates are expected since the models employed for each table are different. Recall that the results in Table 2 come from a standard, linear fixed-effects model. The results in Table 6 come from an interval regression, which uses a different methodology to account for individual fixed effects. Furthermore, the linear regression uses the actual observation for earnings and income, whereas interval regression uses interval-coded earnings and income data. What is more important, however, is that both sets of estimates present the same qualitative findings, not only in terms of trend, but also in regards to statistical significance. Additionally, both sets of estimates are similar to those found in the previous literature (Stephens, 2001; Charles, 2003; Meyer and Mok, 2006; Mok *et al.*, 2008).

Table 6. Interval regressions by chronicity

	Labour earnings			Family income		
	All disabled	Least chronic	Most chronic	All disabled	Least chronic	Most chronic
3 years before	1509.22	1480.12	1633.92	904.134	373.671	1687.22
	(2.71)***	(2.11)**	(1.81)*	(1.93)*	(0.62)	(2.30)**
2 years before	1051.38	893.543	1487.16	199.421	-268.908	976.909
	(1.85)*	(1.22)	(1.68)*	(0.44)	(0.46)	(1.35)
1 year before	-18.369	67.724	15.007	165.316	-55.899	529.97
	(0.03)	(0.09)	(0.02)	(0.35)	(0.09)	(0.74)
Year of	-2333.31	-1390.25	-3604.68	-1042.54	-980.721	-1127.45
	(3.88)***	(1.84)*	(3.72)***	(2.27)**	(1.63)	(1.60)
1 year after	-4855.33	-2183.41	-8985.85	-2523.96	-1970.28	-3431.70
	(7.19)***	(2.63)***	(8.02)***	(4.93)***	(2.98)***	(4.28)***
2 years after	-4815.36	-2399.77	-8703.04	-2702.69	-1858.65	-4080.05

	(7.25)***	(2.93)***	(7.82)***	(5.44)***	(2.90)***	(5.19)***
3 years after	−3747.52	−932.633	−8591.96	−2098.41	−1317.11	−3572.16
	(5.34)***	(1.09)	(7.19)***	(3.95)***	(1.95)*	(4.17)***
4 years after	−4636.85	−1616.92	−10 032.00	−2095.08	−1167.75	−3796.55
	(6.49)***	(1.85)*	(8.29)***	(3.92)***	(1.76)*	(4.30)***
5 years after	−4324.30	−1625.72	−9798.57	−2407.96	−1423.53	−4475.17
	(5.79)***	(1.83)*	(7.38)***	(4.26)***	(1.99)**	(4.90)***
6 years after	−4009.84	−975.336	−9893.54	−2444.62	−1235.06	−4875.71
	(5.32)***	(1.10)	(7.39)***	(4.30)***	(1.73)*	(5.19)***
7 years after	−3398.04	79.148	−10 967.36	−1095.01	116.208	−3777.22
	(4.16)***	(0.08)	(7.29)***	(1.82)*	(0.15)	(3.87)***
8 years after	−3509.07	879.839	−12 731.02	−1723.78	−8.175	−5301.84
	(4.45)***	(0.95)	(8.84)***	(2.83)***	(0.01)	(5.34)***
9 years after	−3037.28	37.187	−10 255.14	−1900.33	−116.669	−5689.00
	(3.62)***	(0.04)	(6.56)***	(3.15)***	(0.15)	(5.72)***
10 years after	−2901.30	7.677	−9943.00	−1958.68	−193.847	−6023.96
	(3.45)***	(0.01)	(6.41)***	(3.23)***	(0.25)	(6.05)***
Observations	93 494	80 396	75 219	93 494	80 396	75 219
Number of individuals	6567	5894	5681	6567	5894	5681

Notes: Robust z statistics in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

All regressions include a quartic in potential experience, year dummy variables, and time averages of the experience, time, and disability variables.

Source: Author's calculations from the 1968–2007 PSID.

Focusing on all disabled men, the results in Table 6 indicate that both earnings and income drop significantly during the year of disability onset. Labour earnings drop by \$2333, and family income declines by \$1043. The earnings and income losses tend to grow slightly. 10 years after onset, earnings losses are \$2901 and lost income amounts to \$1959. The earnings and income losses for the least chronically disabled are much smaller in absolute value when compared to the entire sample. Furthermore, the estimates are statistically insignificant starting 6 years after onset with labour earnings and 7 years after onset with family income. Those individuals who are most chronically disabled tend to have larger earnings and income losses when compared to the entire sample. The income losses tend to be smaller than the earnings losses for all three samples, which indicates that other sources of income tend to mitigate any adverse effect disability has on labour earnings. Additionally, the gap between income and earnings losses is largest for the most chronically disabled. Again, this provides evidence that other sources of income offer more protection against disability's adverse impact for those who experience more chronic disabilities as noted in Meyer and Mok (2006).

The point of the interval regressions is to use the estimates in Equation 4 to calculate the marginal effect the onset of a disability has on being in any one of the five quintiles of the distributions. Tables 7 and 8 provide those estimated marginal effects. Table 7 shows the calculations for the labour earnings distribution, and Table 8 presents the estimates for the family income distribution. Each table contains three panels. Panel A shows the marginal effects for all of the disabled, Panel B presents the estimates for the least chronically disabled, and Panel C shows the estimates for the most chronically disabled.

Concentrating on Panel A of Table 7, the results show that a disabled worker's probability of being in the bottom quintile of the labour earnings distribution is 5% points higher than that of a nondisabled worker during the year after onset. 10 years afterwards, the probability is almost 3% points higher. When looking at the top quintile, the results are of similar size, but opposite sign. The magnitude of the effect decreases when moving from the tails to the centre of the distribution. The year after onset, disabled workers are 0.38% points more likely to be in the third quintile when compared to their nondisabled counterparts. The cumulative effect that disability has on being in particular portions of the distribution is obtained by horizontally summing the rows. The year after onset, disabled workers are 7% points more likely to be in the bottom two quintiles of the labour earnings distribution. 10 years afterwards, the increased probability is 4% points.

Table 7. Marginal effects on probability of placement in earnings distribution

Quintile	1	2	3	4	5
Panel A: all disabled					
3 years before	-1.41%***	-0.72%***	-0.26%**	0.61%***	1.78%***
2 years before	-0.99%*	-0.50%*	-0.18%*	0.43%*	1.23%*
1 year before	0.02%	0.01%	0.00%	-0.01%	-0.02%
Year of	2.35%***	1.05%***	0.27%***	-1.09%***	-2.58%***
1 year after	5.11%***	2.08%***	0.38%***	-2.43%***	-5.15%***
2 years after	5.07%***	2.07%***	0.38%***	-2.41%***	-5.11%***
3 years after	3.87%***	1.64%***	0.36%***	-1.82%***	-4.05%***
4 years after	4.87%***	2.00%***	0.38%***	-2.31%***	-4.93%***
5 years after	4.51%***	1.87%***	0.37%***	-2.13%***	-4.63%***
6 years after	4.16%***	1.75%***	0.37%***	-1.96%***	-4.31%***
7 years after	3.49%***	1.50%***	0.34%***	-1.63%***	-3.70%***
8 years after	3.61%***	1.55%***	0.35%***	-1.69%***	-3.81%***
9 years after	3.10%***	1.35%***	0.32%***	-1.44%***	-3.32%***
10 years after	2.95%***	1.29%***	0.31%***	-1.37%***	-3.18%***
Panel B: least chronic					
3 years before	-1.38%**	-0.73%**	-0.27%*	0.63%**	1.75%**
2 years before	-0.84%	-0.44%	-0.15%	0.39%	1.05%
1 year before	-0.07%	-0.03%	-0.01%	0.03%	0.08%
Year of	1.38%*	0.66%*	0.19%**	-0.66%*	-1.57%*
1 year after	2.20%**	1.03%***	0.27%***	-1.06%**	-2.43%***
2 years after	2.42%***	1.12%***	0.29%***	-1.17%***	-2.66%***
3 years after	0.91%	0.45%	0.13%	-0.43%	-1.06%
4 years after	1.61%*	0.77%*	0.22%*	-0.77%*	-1.82%*
5 years after	1.62%*	0.77%*	0.22%*	-0.78%*	-1.83%*
6 years after	0.96%	0.47%	0.14%	-0.46%	-1.11%
7 years after	-0.08%	-0.04%	-0.01%	0.04%	0.09%
8 years after	-0.83%	-0.43%	-0.15%	0.38%	1.03%
9 years after	-0.04%	-0.02%	-0.01%	0.02%	0.04%
10 years after	-0.01%	0.00%	0.00%	0.00%	0.01%
Panel C: most chronic					
3 years before	-1.54%*	-0.79%*	-0.28%	0.69%*	1.92%*
2 years before	-1.40%*	-0.72%*	-0.25%	0.63%*	1.74%
1 year before	-0.01%	-0.01%	0.00%	0.01%	0.02%

Year of	3.76%***	1.61%***	0.33%***	-1.82%***	-3.88%***
1 year after	10.27%***	3.52%***	0.05%	-5.11%***	-8.73%***
2 years after	9.90%***	3.44%***	0.09%	-4.93%***	-8.50%***
3 years after	9.76%***	3.40%***	0.10%	-4.85%***	-8.41%***
4 years after	11.66%***	3.81%***	-0.11%	-5.80%***	-9.54%***
5 years after	11.34%***	3.74%***	-0.07%	-5.65%***	-9.37%***
6 years after	11.47%***	3.77%***	-0.09%	-5.71%***	-9.44%***
7 years after	12.92%***	4.03%***	-0.28%	-6.43%***	-10.24%***
8 years after	15.38%***	4.39%***	-0.68%*	-7.64%***	-11.46%***
9 years after	11.95%***	3.86%***	-0.15%	-5.95%***	-9.71%***
10 years after	11.54%***	3.78%***	-0.10%	-5.74%***	-9.48%***

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.

The estimates are calculated using the parameter estimates from the interval regressions. All variables are set to their mean levels except for the disability variables. Those are set to zero when calculating the marginal effects.

Panel B of Table 7 indicates that the negative impact disability has on the least chronically disabled is much smaller than that for the entire sample. The opposite is true for those who are most chronically disabled. Overall, the results in Table 7 indicate that a disability not only increases the probability of downward earnings mobility during the year of onset, but it also decreases the probability of upward mobility for at least 10 years after the onset occurs. This finding is more pronounced for those who are most chronically disabled.

Table 8 presents the marginal effects for the family income distribution. Qualitatively, the results are similar to those in Table 7. Specifically, the onset of a disability is associated with an increased probability of being in the bottom of the distribution and a decreased probability of being in the top of the distribution. The magnitude of the effects decreases when moving from the tails to the centre of the distribution, and the impact of a disability is larger for the most chronically disabled. The difference between Tables 7 and 8 is that the magnitude of the estimates is generally smaller in Table 8. For example, a disabled worker (Panel A) is 4% points more likely to be in the bottom two quintiles of the family income distribution the year after onset when compared to a nondisabled worker. 10 years after onset, the increased probability is 3% points. Again, this provides some evidence that other income sources offer protection against the negative impact that disability has on an individual's placement within the distribution.

Table 8. Marginal effects on probability of placement in the income distribution

Quintile	1	2	3	4	5
Panel A: all disabled					
3 years before	-1.07%**	-0.43%*	-0.20%*	0.49%**	1.20%*
2 years before	-0.24%	-0.09%	-0.04%	0.11%	0.26%
1 year before	-0.20%	-0.08%	-0.03%	0.09%	0.22%
Year of	1.28%**	0.47%**	0.18%**	-0.61%**	-1.33%**
1 year after	3.21%***	1.11%***	0.37%***	-1.57%***	-3.12%***
2 years after	3.44%***	1.19%***	0.38%***	-1.69%***	-3.33%***
3 years after	2.64%***	0.93%***	0.32%***	-1.28%***	-2.62%***
4 years after	2.64%***	0.93%***	0.32%***	-1.28%***	-2.61%***
5 years after	3.05%***	1.07%***	0.36%***	-1.49%***	-2.98%***
6 years after	3.10%***	1.08%***	0.36%***	-1.51%***	-3.03%***
7 years after	1.35%*	0.50%*	0.19%**	-0.64%*	-1.39%*

8 years after	2.15%***	0.77%***	0.28%***	-1.04%***	-2.17%***
9 years after	2.38%***	0.85%***	0.30%***	-1.15%***	-2.38%***
10 years after	2.46%***	0.88%***	0.31%***	-1.19%***	-2.45%***
Panel B: least chronic					
3 years before	-0.44%	-0.18%	-0.08%	0.21%	0.49%
2 years before	0.32%	0.13%	0.05%	-0.16%	-0.35%
1 year before	0.07%	0.03%	0.01%	-0.03%	-0.07%
Year of	1.20%	0.46%*	0.18%*	-0.59%	-1.26%*
1 year after	2.47%***	0.91%***	0.33%***	-1.23%***	-2.48%***
2 years after	2.32%***	0.86%***	0.31%***	-1.15%***	-2.34%***
3 years after	1.63%*	0.62%**	0.24%**	-0.80%*	-1.68%**
4 years after	1.44%*	0.55%*	0.21%**	-0.71%*	-1.49%*
5 years after	1.76%*	0.66%**	0.25%**	-0.87%*	-1.81%**
6 years after	1.52%*	0.58%*	0.23%**	-0.75%*	-1.58%*
7 years after	-0.14%	-0.06%	-0.02%	0.07%	0.15%
8 years after	0.01%	0.00%	0.00%	0.00%	-0.01%
9 years after	0.14%	0.06%	0.02%	-0.07%	-0.15%
10 years after	0.23%	0.09%	0.04%	-0.11%	-0.25%
Panel C: most chronic					
3 years before	-1.97%**	-0.81%**	-0.39%**	0.90%**	2.26%**
2 years before	-1.16%	-0.46%	-0.21%	0.54%	1.29%
1 year before	-0.63%	-0.25%	-0.11%	0.30%	0.70%
Year of	1.40%	0.52%	0.19%*	-0.68%	-1.43%
1 year after	4.46%***	1.49%***	0.42%***	-2.24%***	-4.14%***
2 years after	5.38%***	1.75%***	0.45%***	-2.71%***	-4.86%***
3 years after	4.66%***	1.55%***	0.43%***	-2.34%***	-4.30%***
4 years after	4.97%***	1.64%***	0.44%***	-2.50%***	-4.55%***
5 years after	5.94%***	1.90%***	0.45%***	-3.01%***	-5.28%***
6 years after	6.52%***	2.04%***	0.45%***	-3.31%***	-5.70%***
7 years after	4.95%***	1.63%***	0.44%***	-2.49%***	-4.53%***
8 years after	7.15%***	2.19%***	0.44%***	-3.64%***	-6.14%***
9 years after	7.73%***	2.33%***	0.42%***	-3.95%***	-6.53%***
10 years after	8.23%***	2.44%***	0.40%***	-4.22%***	-6.86%***

Notes: *significant at 10%; ** significant at 5%; *** significant at 1%.

The estimates are calculated using the parameter estimates from the interval regressions. All variables are set to their mean levels except for the disability variables. Those are set to zero when calculating the marginal effects.

The results from this and the previous subsection help advance the literature on how work-limiting disabilities influence intragenerational mobility. The results here are not directly comparable to those found in the earlier literature because of differences in data and methodology. This article uses the panel structure of the PSID and traces mobility patterns over a 14 year period. The earnings equations and interval regressions explicitly use a comparison group of nondisabled individuals. Nagi and Hadley (1972) use data from applicants for disability benefits, two period transition matrices and no comparison group. Bartley and Plewis (1997) use data from England and Wales, focus on socio-economic status defined by occupational classifications and examine mobility over three separate 10 year periods. Meyer and Mok (2006) use the PSID; however, they calculate poverty rates.

Burkhauser *et al.* (2008) use data from the CPS, kernel density estimates, and, while the authors compare different groups of individuals, they do not explicitly use comparison groups in their econometric modelling. While the results here are not directly comparable, they do support the results, mentioned in the introduction, of the previous literature. Additionally, they show what DeLeire (2000), among many others, notes: people with disabilities tend to work and earn less than their nondisabled counterparts. They also tend to be older, less educated and come from blue-collar occupations and they may be less productive and/or face substantial barriers in the labour market.

IV. Conclusions

This article uses the 1968–2007 waves of the PSID to investigate the effect a work-limiting disability has on an individual's intragenerational earnings and income mobility. Results from the analysis indicate that disabled men tend to be relatively disadvantaged when compared to their nondisabled counterparts. They are older, less educated, African-American and come from blue-collar occupations. Disabled individuals also tend to work and earn less. Furthermore, the analysis shows that the onset of a work-limiting disability is associated with a large drop in labour earnings and family income. These earnings and income losses barely recover even after 10 years following the onset of the disability and are larger for the most chronically disabled.

The analysis is extended to show that the deep earnings and income losses associated with a work-limiting disability negatively influence a worker's mobility through the distributions. During the year of onset, workers have significantly higher probabilities of falling and lower probabilities of rising in the distribution. This change in probabilities lasts for several years after onset. Additionally, disabled individuals have much larger probabilities of being in the bottom two quintiles of the earnings and income distributions relative to the nondisabled, with results being more pronounced for the most chronically disabled individuals.

Overall, the results indicate that work-disabled men are substantially worse off than their nondisabled counterparts are. This is particularly the case for those with more chronic or severe disabilities. Other sources of income do offer some protection against disability's negative impacts, with more protection being offered for the more chronically disabled. However, those individuals experiencing a work-limiting disability still have a difficult time climbing through the income distribution. This occurs despite the substantial growth of enrolment in and payments from transfer programmes such as SSDI and SSI. This provides evidence that existing safety nets are not filling enough of the gap that is left by lost labour earnings associated with the onset of a work-limiting disability.

Notes

- 1 Meyer and Mok (2006) note that in 2005, SSDI benefits amounted to \$85.4 billion and SSI expenditures for the blind and disabled amounted to \$34.4 billion.
- 2 An analysis of the effect that disability insurance has on labour force participation decisions is beyond the scope of this article. For thorough discussions, see Autor and Duggan (2003).
- 3 While Meyer and Mok (2006) do use a similar earnings equation when estimating earnings and income losses, they do not use such a technique in their discussion on poverty rates. Instead, the authors calculate poverty rates for individuals over time and around the date of disability onset.
- 4 Females are removed to avoid potential labour market adjustments such as child rearing, marriage or divorce (Jolly, 2013).
- 5 There are potential issues when using a binary, self-report of disability status in regards to the nature of the disability and potential biases. A large amount of literature exists that details these issues, and so they are not described here. For thorough discussions, see Stern (1989), Stephens (2001), Charles (2003), and Benitez-Silva *et al.* (2004).

- 6 The PSID contains a question asking how long an individual has been limited by his health, which could be used to time the disability's onset. This length of limitation question is only available from 1969 to 1975 and again in 1978. Stephens (2001) identifies disability onset in a manner that is similar to this article; however, he requires individuals to be in the survey 1 year prior to the first report. Charles (2003) uses the length of limitation question when available and the same 2 year window when it is not. The results in Stephens (2001) and Charles (2003) are very similar. Therefore, to be consistent with identifying onset dates here, the limiting question is not used.
- 7 Charles (2003) defines chronicity in a similar manner. However, instead of creating a weight, he counts the number of post-onset reports. Charles (2003) finds that men who report a work-limiting disability in every subsequent year are more likely to receive worker's compensation and have relatively severe functional limitations, such as problems bathing and dressing. Therefore, even though this index accounts for how chronic the disability is, it is reasonable to expect that the larger is the index, the more severe is the disability.
- 8 Charles (2003) uses a similar equation where he includes an additional term to account for individual-specific trends in earnings.
- 9 From 1968 to 1993, the PSID bottom-coded family income so that negative values were not reported. Starting in 1994, the bottom-coding was removed and negative values of family income were recorded. To maintain consistency, all negative reports of family income were bottom-coded at \$1.
- 10 The reason nominal figures are converted to 2006 dollars is that earnings and income in the PSID refer to the previous calendar year. Since 2007 is the latest survey used, the earnings and income from that year refer to the calendar year 2006.
- 11 Additional control variables used include the number of children under 18 in the household, a dummy variable for marital status, the wife's age and dummy variables for workers in the manufacturing industry and those working in blue-collar occupations. The quantitative results are only slightly changed with these additional variables and are available upon request.
- 12 This is similar to Jolly (2013). The analysis here focuses on changing quintiles, whereas in Jolly (2013), the focus was on changing deciles in the distributions.
- 13 To conserve on space, mobility patterns are only tracked until the 5th year after onset for the three groups presented. Tables showing mobility patterns for all groups until the 10th year after onset are available upon request.

References

- Autor, D. H. and Duggan, M. G. (2003) The rise in the disability rolls and the decline in unemployment, *The Quarterly Journal of Economics*, 118, 157–205.
- Autor, D. H. and Duggan, M. G. (2006) The growth in the social security disability rolls: a fiscal crisis unfolding, *The Journal of Economic Perspectives*, 20, 71–96.
- Baldwin, M. and Johnson, W. G. (1994) Labor market discrimination against men with disabilities, *The Journal of Human Resources*, 29, 1–19.
- Bartley, M. and Plewis, I. (1997) Does health-selective mobility account for socioeconomic differences in health? Evidence from England and Wales, 1971 to 1991, *Journal of Health and Social Behavior*, 38, 376–86.
- Benitez-Silva, H., Buchinsky, M., Chan, H. M. *et al.* (2004) How large is the bias in self-reported disability?, *Journal of Applied Econometrics*, 19, 649–70.
- Burkhauser, R. V., Daly, M. C., Larrimore, J. *et al.* (2008) The transformation in who is expected to work in the United States and how it changed the lives of single mothers and people with disabilities, Working Paper #2008–187, University of Michigan Retirement Research Center, Ann Arbor, MI.
- Burkhauser, R. V., Holtz-Eakin, D. and Rhody, S. E. (1997) Labor earnings mobility and inequality in the United States and Germany during the growth years of the 1980s, *International Economic Review*, 38, 775–94.
- Charles, K. K. (2003) The longitudinal structure of earnings losses among work-limited disabled workers, *The Journal of Human Resources*, 38, 618–46.

- DeLeire, T. (2000) The wage and employment effects of the Americans with disabilities act, *The Journal of Human Resources*, 35, 693–715.
- DeLeire, T. (2001) Changes in the wage discrimination against people with disabilities: 1984–1993, *The Journal of Human Resources*, 36, 144–58.
- Haveman, R. and Wolfe, B. (1990) The economic well-being of the disabled: 1962–1984, *The Journal of Human Resources*, 25, 32–54.
- Johnson, W. G. and Lambrinos, J. (1985) Wage discrimination against handicapped men and women, *The Journal of Human Resources*, 20, 264–77.
- Jolly, N. A. (2013) Job displacement and the inter-temporal movement of workers through the earnings and income distributions, *Contemporary Economic Policy*, 31, 392–406.
- Meyer, B. D. and Mok, W. K. C. (2006) Disability, earnings, income, and consumption, Harris School Working Paper, Series 06.10, University of Chicago, Chicago, IL.
- Mok, W. K., Bruce, C., Meyer, D. *et al.* (2008) A note on ‘the longitudinal structure of earnings losses among work-limited disabled workers’, *The Journal of Human Resources*, 43, 721–28.
- Mundlak, Y. (1978) On the pooling of time series and cross section data, *Econometrica*, 46, 69–85.
- Nagi, S. Z. and Hadley, L. W. (1972) Disability behavior: income change and motivation to work, *Industrial and Labor Relations Review*, 25, 223–33.
- Panel Study of Income Dynamics, Packaged Core Data, Documentation, and Questionnaires. (1968–2007) Produced and distributed by the University of Michigan with primary funding from the National Science Foundation, the National Institute of Aging, and the National Institute of Child Health and Human Development, Ann Arbor, MI.
- Social Security Administration. (2011) Substantial Gainful Activity. Available at <http://www.ssa.gov/oact/cola/sga.html> (accessed 10 July 2013).
- Stephens, M. (2001) The long-run consumption effects of earnings shocks, *The Review of Economics and Statistics*, 83, 28–36.
- Stephens, M. (2002) Worker displacement and the added worker effect, *Journal of Labor Economics*, 20, 504–37.
- Stern, S. (1989) Measuring the effect of disability on labor force participation, *The Journal of Human Resources*, 24, 361–95.
- Wooldridge, J. M. (2002) *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, MA