

# Disability and Distress: The Effect of Disability Programs on Financial Outcomes\*

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September 2018

**Preliminary and Incomplete.  
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## Abstract

We present the first estimates of the effect of disability programs on markers of financial distress: bankruptcy, foreclosure, and the sale of a home. To estimate the causal effect of disability programs on these outcomes, we use an age-based eligibility rule to implement a regression discontinuity design. We find that disability allowance at the initial level reduces the likelihood of foreclosure by 2.8 percentage points (54 percent) and the likelihood of bankruptcy by 0.76 percentage points (29 percent) over the next 3 years. Initial allowance onto disability programs also increases home purchases by 1.0 percentage point (22 percent) and decreases home sales by 2.6 percentage points (20 percent). We present evidence that liquidity is the most likely channel for these effects, meaning that the results reflect a reduction in financial distress and an improvement in recipients' welfare.

\*We are grateful to Jeffrey Hemmeter, Magne Mogstad, Matthew Notowidigdo, Jialan Wang, and workshop participants at the University of Chicago for useful feedback. We thank John Phillips, Natalie Lu, Ted Horan, Lynn Fisher, and Linda Martin at the Social Security Administration for making this work possible and providing access to data. The authors are grateful to the Washington Center for Equitable Growth for financial support. This research was supported by the U.S. Social Security Administration through grant #5 DRC12000002-06 to the National Bureau of Economic Research as part of the SSA Disability Research Consortium. The findings and conclusions expressed are solely those of the authors and do not represent the views of the Social Security Administration, any agency of the Federal Government, or the NBER.

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# 1 Introduction

Over the past decades, disability programs have expanded rapidly, prompting a public debate about their costs and benefits. On the cost side, disability programs can distort decisions about work and human-capital investment through program rules and requirements. On the benefits side, disability programs can provide protection against the major consumption shocks associated with disability.

Research on disability programs has focused mostly on the costs of the programs, especially on the programs' labor-supply effects, often interpreted as moral-hazard costs. [Maestas et al. \(2013\)](#), for instance, find that Social Security Disability Insurance reduces labor force participation by 28 percentage points, and others arrive at roughly similar estimates.<sup>1</sup> All else equal, these sizable effects on labor supply suggest that disability-program benefits should be less generous.

Yet there is little evidence on the other side of the analysis, the benefits of disability programs.<sup>2</sup> To our knowledge, there are no studies assessing the effects of US disability programs in administrative data on outcomes other than labor supply and mortality. In the absence of such studies, evidence on how disability programs affect the quality of life, residential stability, and consumption of individuals with disabilities is mostly anecdotal. In *Evicted*, Matthew Desmond writes of a recipient of the Supplemental Security Income (SSI) program that “her \$754 monthly [SSI] check was more reliable than any job she could get” and explains that landlords seek out SSI recipients because their stable income makes them reliable tenants ([Desmond, 2016](#)). These hypotheses have yet to be tested in empirical

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<sup>1</sup>[Bound \(1989\)](#) uses the labor supply of denied disability-insurance applicants as an upper bound for allowed applicants, concluding that employment among disability-insurance recipients would be at most 30 percentage points higher had they been denied. Updating Bound's analysis, [von Wachter et al. \(2011\)](#) find similar effects for older cohorts and larger effects for younger cohorts. [Chen and van der Klaauw \(2008\)](#) find smaller employment effects for more-recent applicants. [Moore \(2015\)](#) estimates similar effects as [Maestas et al. \(2013\)](#) and [French and Song \(2014\)](#) for disability-insurance recipients whose eligibility based on drug and alcohol addiction was terminated as part of the 1996 welfare reform law.

<sup>2</sup>Two notable exceptions are [Autor et al. \(2017\)](#), who study the effects of disability receipt on consumption in Norway, and [Gelber et al. \(2018\)](#), who study the effect of disability insurance benefits on mortality.

research.

This paper presents the first evidence on the effect of disability programs on financial outcomes. We link administrative records from the Social Security Administration (SSA)'s SSDI and SSI programs to records on bankruptcy, foreclosure, eviction, home purchases, and home sales.<sup>3</sup> We first calculate sample statistics for this novel dataset and explore how the financial circumstances of disability-program applicants evolve around the date of application and the date of decision. We document three descriptive facts. First, rates of bankruptcy, foreclosure, and eviction among applicants are higher than in the general population, suggesting that disability applicants experience more financial distress. Second, rates of bankruptcy, foreclosure, and eviction increase among applicants until the application date and then fall, indicating that disability-program applicants apply for disability programs after a period of increasing financial distress. Third, these adverse financial events become less common after the disability decision, even for denied applicants, suggesting that applicants find other margins of adjustment.

This evidence of selection effects and time effects points to the need for causal identification of the effect of disability programs on financial outcomes and residential stability. To provide that evidence, we exploit a particular administrative rule that governs how the SSA evaluates applicants. During the fifth stage of the initial determination process, examiners decide whether an applicant can work in some capacity given his or her disability as well as vocational factors such as age, education, and experience. SSA guidelines require examiners to use more-lenient standards for older applicants: applicants who are older than age 55 are judged using more-lenient standards than applicants between ages 50 and 55, who in turn are judged more leniently than applicants younger than age 50. These age-based rules, first used by [Chen and van der Klaauw \(2008\)](#) to estimate the effect of disability insurance on

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<sup>3</sup>All of the data we use exist in the public domain. [Gross and Trenkamp \(2015\)](#) were the first to link bankruptcy data to SSA administrative data.

labor supply, allow us to isolate the causal effect of disability receipt on financial outcomes through a regression discontinuity (RD) design.

The results suggest that allowance onto SSA disability programs results in large declines in rates of bankruptcy, foreclosure, and home sale. Initial disability allowance reduces the likelihood of filing for bankruptcy by a statistically significant 0.76 percentage points, or 29 percent, in the next 3 years. For homeowners, the likelihood of experiencing foreclosure in the 3 years after initial decision falls by a statistically significant 2.8 percentage points, or 54 percent. Allowance onto disability programs also increases home purchases by 1.0 percentage point (22 percent) and decreases home sales by 2.6 percentage points (20 percent), both statistically significant.<sup>4</sup> Most of the change in housing transactions is driven by allowed applicants becoming homeowners or being less likely to sell their home overall, not by a change in the likelihood of moving from one home to another. These results suggest that disability recipients use their disability income to purchase homes or to stay in homes that they might otherwise have sold or lost to foreclosure.

Of course, these financial outcomes are not direct measures of consumption or well-being. We outline the assumptions required to interpret the declines in bankruptcy and foreclosure as true reductions in financial distress. We consider alternative mechanisms, such as changes in access to credit, and conclude, based on evidence from several sources, that they are unlikely to drive our results and, if anything, work in the opposite direction. In combination, the results suggest substantial benefits of disability programs in reducing financial distress.

We consider the welfare implications of these reductions in financial distress through the lens of which applicants receive disability benefits. We find that the likelihood of allowance and financial distress are negatively correlated: applicants who are more likely to be allowed onto the disability program experience less financial distress before they apply. This negative

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<sup>4</sup>We report estimates for eviction in Appendix Table A.11. As we show in Appendix A, the limited number of identifiers in the eviction data leads to attenuation bias in the causal estimates.

relationship implies that disability programs are not well-targeted on financial distress. If the marginal utility of consumption is increasing in financial distress, then this negative relationship further implies that, all else equal, disability programs create smaller welfare gains than they would if allowance rate and financial distress were positively correlated.

The paper proceeds as follows. Section 2 describes the datasets and data-merge procedures. Section 3 compares financial outcomes among disability applicants and recipients relative to the general population and presents an event-study analysis of financial outcomes around the dates of disability-program application and decision. Section 4 presents RD estimates of the effect of disability programs on financial outcomes and residential stability, and Section 5 discusses and tests the assumptions to interpret these effects normatively. Finally, Section 6 discusses the implications for social welfare and Section 7 concludes.

## 2 Institutional Background and Data

This section provides background on the disability programs we study and describes the various datasets and how we merge them. It then presents descriptive statistics on the financial distress of disability-program applicants.

### 2.1 Background on Disability Programs and the Financial Outcomes We Study

SSA administers the Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI) programs. SSDI and SSI have the same medical requirements but different non-medical requirements: SSDI requires a work history, while SSI requires low income and assets. Individuals can apply for and receive benefits from both programs concurrently if they meet both sets of requirements. If applicants are allowed onto both programs, the SSI benefit is reduced by the amount of the SSDI benefit.

In 2016, the average monthly benefit for SSDI was \$1,171 and the maximum monthly

benefit for SSI for an individual was \$733.<sup>5</sup> To be eligible for disability benefits, applicants cannot engage in substantial gainful activity (SGA). The SGA threshold for 2018 was \$1,180 per month, which means that applicants who earn more than this amount per month are denied benefits. Disability-program recipients cannot perform SGA and receive disability benefits at the same time.

Bankruptcy is a legal procedure available to debtors overwhelmed by their debts. Bankruptcy filers can either file for Chapter 7 and have their debts discharged entirely, or file for Chapter 13 and commit to a repayment plan. Before 2005, consumers could choose under which chapter they wanted to file. Filers faced a tradeoff: under Chapter 7, their “non-exempt” assets would be divided among their creditors, while under Chapter 13, they would not lose their assets. Since the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005, Bankruptcy filers must pass a means test in order to obtain a Chapter 7 discharge.<sup>6</sup> The number of bankruptcy filings plummeted after 2005 as a result of this reform. Filing for either type of bankruptcy is expensive; bankruptcy attorney fees typically cost at least \$1,000, and many households must thus “save up” for bankruptcy (Gross et al., 2016).

In contrast to bankruptcy, the foreclosure process is initiated by a lender in response to a borrower who has become delinquent on a secured loan. The mortgage lender first issues a precaution notification and only then may choose to pursue a forced home sale in order to recover the remaining mortgage debt. Depending on state law, the time required to complete a foreclosure process varies from six months to eighteen months.<sup>7</sup> In some cases, lenders and homeowners can reach an agreement or negotiate a settlement plan so that the debtors can keep the home.

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<sup>5</sup>Annual Statistical Report on the Social Security Disability Insurance Program, 2016, Table 2; and Fast Facts and Figures about Social Security, 2017.

<sup>6</sup>Social Security benefits are excluded from the means test, and so allowance onto a disability program does not mechanically affect the choice of bankruptcy chapter (Social Security Rulings 79–4).

<sup>7</sup>In judicial-foreclosure states, the process takes longer, because the foreclosure must be processed by the courts (Pence, 2006).

Eviction is a legal process that landlords use to remove tenants for failing to pay rent or breaking other terms of the lease. “Formal” eviction involves both removing the tenant and recovering back rent, while “summary” eviction involves only removing the tenant. Both processes involve legal filings with a court, but many landlords prefer summary eviction as it is relatively easy to file without the assistance of an attorney and the procedure is shorter.<sup>8</sup> Under both processes, after an initial grace period, a landlord can choose to file a request with the court and the tenant will be served. If the judge grants the landlords request, an order is placed with the Sheriff and the Sheriff evicts the tenant. Depending on jurisdiction and case backlogs, the entire eviction process varies from 30 days to more than six months.

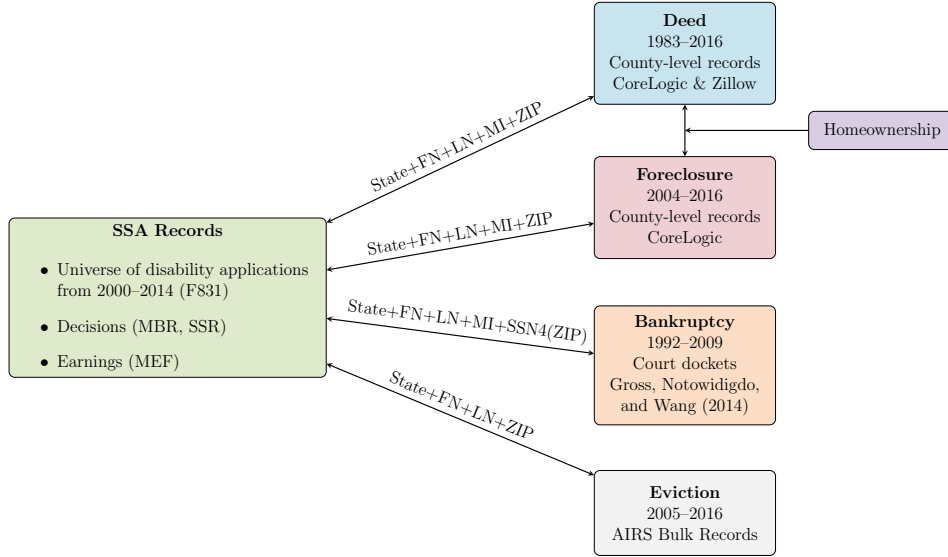
## 2.2 Merging Disability-Program Records to Financial Records

We link administrative records from the Social Security Administration to records on bankruptcies, foreclosures, and home transactions. Figure 1 summarizes the data merges. We start with an extract of the SSA 831 Disability File (F831) that includes the universe of disability-program applicants who received a disability decision between 2000 and 2014. The 831 files provide identifiers, including Social Security number (SSN), first name, last name, middle initial, and ZIP Code of residence; application history, including the dates of application and initial decision and the reason for the decision; and demographic information, including body system code, specific diagnosis, and, for those who are allowed, medical diary reason, which determines the frequency of continuing disability reviews. For the purposes of the RD analysis, we use the classification of regulation basis codes in the 831 files developed by [Wixon and Strand \(2013\)](#). We then link the 831 extract to extracts of several other SSA datasets. The Master Beneficiary Record (MBR) provides the final disability decision and decision date for SSDI applicants, and the Supplemental Security Record (SSR) provides

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<sup>8</sup>There are also “informal eviction cases where tenants are “forced” to end their lease due to difficulties, such as extravagant increase in rent, created by landlords. As these cases do not involve any court filing, we are not able to observe these cases in our data.

Figure 1: Data Merges



Notes: This figure describes the identifiers we use to link the the administrative records. We start with Social Security Administration records: disability applications from 2000–2014 from the 831 Disability File (F831), disability decisions from the Master Beneficiary Record (MBR) and Supplemental Security Record (SSR), and earnings from the Master Earnings File (MEF). We then link the SSA data to deeds records from CoreLogic and Zillow, to foreclosure records from CoreLogic, to bankruptcy records compiled by Gross et al. (2016), and to eviction records obtained from AIRS. We use the CoreLogic and Zillow data to establish a sample of homeowners for the foreclosure sample. “SSN4” indicates the last four digits of Social Security Number. “FN” indicates first name, “LN” indicates last name, and “MI” indicates middle initial.

these variables for SSI applicants. The Master Earnings File (MEF) provides annual earnings for all workers. The Structured Data Repository (SDR) provides applicant ZIP Codes after 2010.

We link these data to public records on several financial outcomes: bankruptcy, foreclosures, home deeds, and evictions. We summarize the merge procedures here and provide more detail in the Appendix A. Bankruptcy records, collected by Gross et al. (2016), consist of a near-census of personal bankruptcies for a majority of bankruptcy districts from the mid-1990s through 2009. The bankruptcy records list the names of the filers, date of filing, chapter, and address. We link SSA records to these bankruptcy records primarily using the last 4 digits of SSN, first name, last name, middle initial, and state.<sup>9</sup>

<sup>9</sup>To account for potential variations in the first name (such as “Tom” versus “Thomas”), we explore an



We combine records on home transactions from two sources, CoreLogic and Zillow, so as to ensure the coverage is as comprehensive as possible. The combined data covers home purchases and sales across the United States from 1983 to 2016.<sup>10</sup> These records include seller and buyer names, transaction dates and amounts, property ZIP Code, and characteristics of the house.<sup>11</sup> We remove blank entries, duplicate transaction records, and commercial properties and intra-family transfers.

The housing records do not include unique identifiers such as SSNs. For that reason, we merge the SSA records to housing transactions based on first name, last name, middle initial, and ZIP Code. These merge variables could be problematic if different residents of the same ZIP Code have the same name. For that reason, we drop individuals with more than six transactions associated with their names and ZIP Codes, which consist of less than 1 percent of the sample population for most states. We use this merge to identify homeowners, home sales, and home purchases.

We use CoreLogic foreclosure records from 2004 to 2016. We remove blank entries, duplicate records, commercial properties, records with missing or one-letter names, and records in which cases were settled without the properties being auctioned. In addition, we drop ZIP Codes from our initial record linkage process if defendant names are missing in more than 10 percent of the foreclosure records. Our main foreclosure sample comes from the population of homeowners identified in the CoreLogic-Zillow deeds data. As a validity check, we link the foreclosure records to the home deeds and find that 82 percent of the foreclosure

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alternative merge based on the last 4 digits of SSN, last name, ZIP Code, and state. Using this alternative merge leads to similar conclusions.

<sup>10</sup>Data provided by Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the Zillow data can be found at <http://www.zillow.com/ztrax>. Based on conversations with staff at CoreLogic and Zillow Research, the availability and quality of deeds varies across counties and time. To avoid analysis on small cells or areas with poor coverage, we keep ZIP Codes with an average of at least 15 home purchases or 15 home sales per year between 2000 and 2014.

<sup>11</sup>We observe sales dates in most cases and some other dates such as filing dates and signature dates. These dates are usually the same or within 10 days of each other. In our data harmonization process, we use the earliest dates as transaction dates. We provide more details on the construction of home transaction data in Appendix A.

records link to a deeds record. We link the SSA disability records to the foreclosure records using first name, last name, middle initial, and ZIP Code.

We use eviction records from American Information Research Services (AIRS), which collects public-record eviction court filings covering nearly 40 percent of the U.S. residential areas for various time periods. In addition, we collect eviction court filings in Harris County, Texas, from the county court’s website. Each eviction court filing provides defendant names, filing date, and judgment information. We drop blank records and records with invalid names or ZIP Codes. In addition, we remove eviction filings that have been dismissed or settled. We merge eviction records from 2005 to 2016 into the SSA records based on first name, last name, ZIP Code, and middle initial when available.<sup>12</sup>

With the exception of the bankruptcy data, each of the merges between the disability records and financial outcome records requires using ZIP Code as a key linking variable. The disability records provide the applicant’s ZIP Code of residence at the time of application; if the applicant moved before or after applying, we do not observe the other ZIP Codes in which that applicant lived. Of course, not observing all ZIP Codes of residence will affect the number of financial events that we observe. In Appendix B, we show that the estimates of the causal effect of disability allowance on home purchases, eviction, and foreclosure most likely suffer only from attenuation bias. In particular, as long as disability allowance does not shift home purchases (or evictions or foreclosures) that would have occurred anyway (i.e., inframarginal home purchases) from the application ZIP Code to other ZIP Code, then this data issue will simply bias us against finding an effect. However, if disability allowance does shift inframarginal home purchases from within- to outside-ZIP (or vice versa), then the sign of the bias cannot always be determined.

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<sup>12</sup>The availability of middle names is relatively low in the eviction data.

## 2.3 Sample Statistics

Table 1 presents summary statistics for the bankruptcy, foreclosure, and eviction samples. The column for each outcome corresponds to the full sample, and the second column to the sample with which we estimate the RD in Section 4. The bankruptcy sample includes disability-program applicants who have an initial decision date between 2000 and 2009 and reside in a ZIP Code with an average of at least five recorded bankruptcies per year over the 1992–2009 period covered by the bankruptcy data. The average applicant in this sample has less than a high school education (11.5 years) and annual earnings of \$14,300 prior to the initial decision. Thirty-five percent of the sample is allowed at the initial level and 54 percent is eventually allowed after all appeals. Bankruptcy rates are high: 12 percent ever file for bankruptcy between 1992 and 2009, with 10 percent ever filing for Chapter 7 and 2.1 percent ever filing for Chapter 13.

The foreclosure sample consists of disability applicants who have an initial decision date between 2005 and 2014 and reside in a ZIP Code with an average of at least five recorded foreclosures over the 2005–2014 period covered by the foreclosure data. Because we condition the foreclosure sample on homeownership, the applicants in the foreclosure sample are more-educated and higher-income than the applicants in the bankruptcy sample. The average applicant in this sample is a high school graduate (12.2 years) and average annual pre-decision earnings are \$20,300. DI applicants are disproportionately represented relative to SSI applicants, and applicants are less likely to have mental conditions and more likely to have musculoskeletal conditions compared to the bankruptcy sample. Foreclosure rates among these home-owning applicants are high: 13 percent of the sample ever experience a foreclosure between 2004 and 2016. Appendix Table A.8 presents summary statistics for the foreclosure sample unconditional on homeownership. In that broader sample of applicants, roughly 3 percent ever experience foreclosure.

The eviction sample looks similar to the bankruptcy sample but includes only applicants from the 20 states for which we have eviction records. Five percent of applicants ever experience eviction over the 2005–2014 period covered by the eviction data.

Table 1: Summary Statistics for Bankruptcy, Foreclosure, and Eviction Samples

	Bankruptcy sample				Foreclosure sample				Eviction sample			
	Full Sample		RD Sample		Full Sample		RD Sample		Full Sample		RD Sample	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Fraction SSI adults	0.54	0.50	0.49	0.50	0.25	0.44	0.28	0.45	0.53	0.50	0.51	0.50
Fraction DI adults	0.60	0.49	0.65	0.48	0.72	0.45	0.70	0.46	0.59	0.49	0.63	0.48
Fraction reaching step 5	0.68	0.47	1.00	0.00	0.70	0.46	1.00	0.00	0.69	0.46	1.00	0.00
Fraction initially allowed	0.35	0.48	0.30	0.46	0.46	0.50	0.39	0.49	0.37	0.48	0.34	0.47
Fraction finally allowed	0.54	0.50	0.60	0.49	0.65	0.48	0.66	0.47	0.51	0.50	0.58	0.49
Mental condition	0.26	0.44	0.16	0.37	0.16	0.36	0.13	0.34	0.26	0.44	0.16	0.37
Musculoskeletal condition	0.30	0.46	0.43	0.49	0.37	0.48	0.48	0.50	0.31	0.46	0.45	0.50
Age	44.4	12.6	52.4	2.7	51.1	9.9	52.9	2.7	45.3	12.94	52.6	2.73
Male	0.52	0.50	0.51	0.50	0.53	0.50	0.51	0.50	0.54	0.50	0.52	0.50
Pre-decision annual earnings	\$14,349	\$18,334	\$16,791	\$19,542	\$20,328	\$20,743	\$19,762	\$19,865	\$12,424	\$16,785	\$13,835	\$17,062
Years of education	11.49	2.53	11.54	2.61	12.23	2.40	12.11	2.32	11.8	2.47	11.7	2.53
Ever experience financial event	0.12	0.32	0.15	0.36	0.13	0.34	0.14	0.34	0.05	0.22	0.05	0.23
Experience event before decision	0.09	0.28	0.11	0.31	0.07	0.25	0.08	0.26	0.02	0.14	0.02	0.15
Experience event after decision	0.04	0.19	0.04	0.20	0.07	0.26	0.07	0.26	0.03	0.18	0.03	0.18
Number of states	47		47		45		45		20		20	
Number of state-ZIPs	20,973		20,973		17,764		17,764		6828		6828	
Number of applicants (millions)	18.7		3.1		4.0		0.9		8.0		1.4	

Notes: Table presents summary statistics for the bankruptcy and foreclosure (conditional on homeownership) samples, and within each of these samples for the “full sample” and for the “RD sample” used in the analysis in Section 4. The “bankruptcy sample” consists of disability-program applicants who have an initial decision date in 2000–2009. The “foreclosure sample” consists of disability-program applicants who appear in the deeds records (homeowners) and who have an initial decision date in 2005–2014. The “eviction sample” consists of disability-program applicants with an initial decision in 2005–2014. Each sample excludes ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period. “Reaches stage 5” denotes reaching stage 5 of the disability determination process as depicted in Figure 4. “Pre-decision annual earnings” are average annual earnings in the three years before the decision date. “Ever experience financial event” and “experience event before/after decision” are indicators for filing for bankruptcy or experiencing foreclosure. “Number of states” includes the District of Columbia for the foreclosure sample.

Table 2 presents summary statistics for the home-sale and home-purchase samples. The home-sale sample is conditioned on homeownership and therefore looks similar to the foreclosure sample. Nearly one-half of applicants sell a home over the 2000–2015 period for which we have deeds data. The home-purchase sample consists of applicants who have an initial decision date between 2005 and 2014 and reside in a ZIP Code with at least 15 home purchases over the 2000–2015 period. This sample looks more similar to the bankruptcy

sample than the foreclosure sample, with relatively low incomes and low education levels. Of this sample, 18 percent of applicants ever purchase a home between 1983 and 2016.

Table 2: Summary Statistics for Home-Sale and Home-Purchase Samples

	Home-sale sample				Home-purchase sample			
	Full Sample		RD Sample		Full Sample		RD Sample	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Fraction SSI adults	0.25	0.44	0.26	0.44	0.44	0.50	0.42	0.49
Fraction DI adults	0.72	0.45	0.71	0.45	0.53	0.50	0.55	0.50
Fraction reaching step 5	0.69	0.46	1.00	0.00	0.69	0.46	1.00	0.00
Fraction initially allowed	0.45	0.50	0.38	0.48	0.38	0.49	0.35	0.48
Fraction finally allowed	0.65	0.48	0.67	0.47	0.54	0.50	0.61	0.49
Mental condition	0.16	0.37	0.13	0.34	0.25	0.44	0.16	0.37
Musculoskeletal condition	0.37	0.48	0.48	0.50	0.31	0.46	0.44	0.50
Age	50.5	10.1	52.9	2.7	45.0	12.6	52.6	2.7
Male	0.53	0.50	0.51	0.50	0.53	0.50	0.52	0.50
Pre-decision annual earnings	\$21,643	\$21,764	\$21,472	\$21,235	\$13,218	\$16,701	\$14,760	\$17,272
Years of education	12.11	2.44	12.02	2.38	11.66	2.40	11.66	2.44
Ever experience event	0.45	0.50	0.44	0.50	0.18	0.38	0.22	0.41
Experience event before decision	0.19	0.39	0.19	0.40	0.14	0.34	0.17	0.38
Experience event after decision	0.29	0.46	0.28	0.45	0.07	0.25	0.08	0.28
Number of states	45		45		49		49	
Number of state-ZIPs	22,073		22,073		24,093		24,093	
Number of applicants (millions)	6.8		1.5		31.7		5.6	

Notes: Table presents summary statistics for the home sale and purchase sample, and within this sample for the “full sample” and for the “RD sample” used in the analysis in Section 4. The “home sale” sample consist of disability-program applicants who appear in the deeds records (homeowners) and who have an initial decision date in 2000–2014. The “home purchase” sample consist of disability-program applicants who have an initial decision date in 2000–2014. Each sample excludes ZIP Code of residence at application that has an average of less than fifteen recorded events per year during 2000–2014. “Reaches stage 5” denotes reaching stage 5 of the disability determination process as depicted in Figure 4. “Pre-decision annual earnings” are average annual earnings in the three years before the decision date. “Ever experience event” and “experience event before/after decision” are indicator functions for home purchases or sales. “Number of states” includes the District of Columbia.

### 3 Financial Outcomes and Trends for Disability-Program Applicants

We first compare rates of financial events in the disability-program-applicant population and the general population. Figure 2 plots eviction rates, bankruptcy rates, and foreclosure (conditional on homeownership) rates for disability-program applicants and the general population. Eviction rates are about 50 percent larger for disability-program applicants than the general population, and they peak in the year of disability application. Similarly, bankruptcy rates are roughly twice as large for disability applicants than the general popula-

tion. Although bankruptcy rates also peak in the year of application, this pattern is dwarfed by the large peak and subsequent drop in overall bankruptcy rates in 2005, which are the result of the bankruptcy reform (BAPCPA) that made it harder to file for bankruptcy. Foreclosure rates conditional on homeownership are also higher for applicants than the general population and exhibit a stronger pattern of peaking in the year of disability application.<sup>13</sup>

If eviction, bankruptcy, and foreclosure are interpreted as measures of financial distress, then these plots suggest that financial distress is more common among disability applicants than the general population. They also indicate that applicants apply during times of elevated financial distress. It may be that applicants apply for benefits in response to financial distress. Alternatively, a health shock or employment shock may lead to both financial distress and application.

In order to explore how bankruptcy, foreclosure, and eviction evolve around application and decision, we estimate event-study regressions. Appendix Section C develops the following specification:

$$Y_{ct} = \alpha_c + \gamma_t + \sum_d \beta_d(\text{Allow}_{ct} \times D_d) + \sum_d \beta'_d D_d + \sum_a \mu_a(\text{Allow}_{ct} \times D_a) + \sum_a \mu'_a D_a + \varepsilon_{ct}. \quad (1)$$

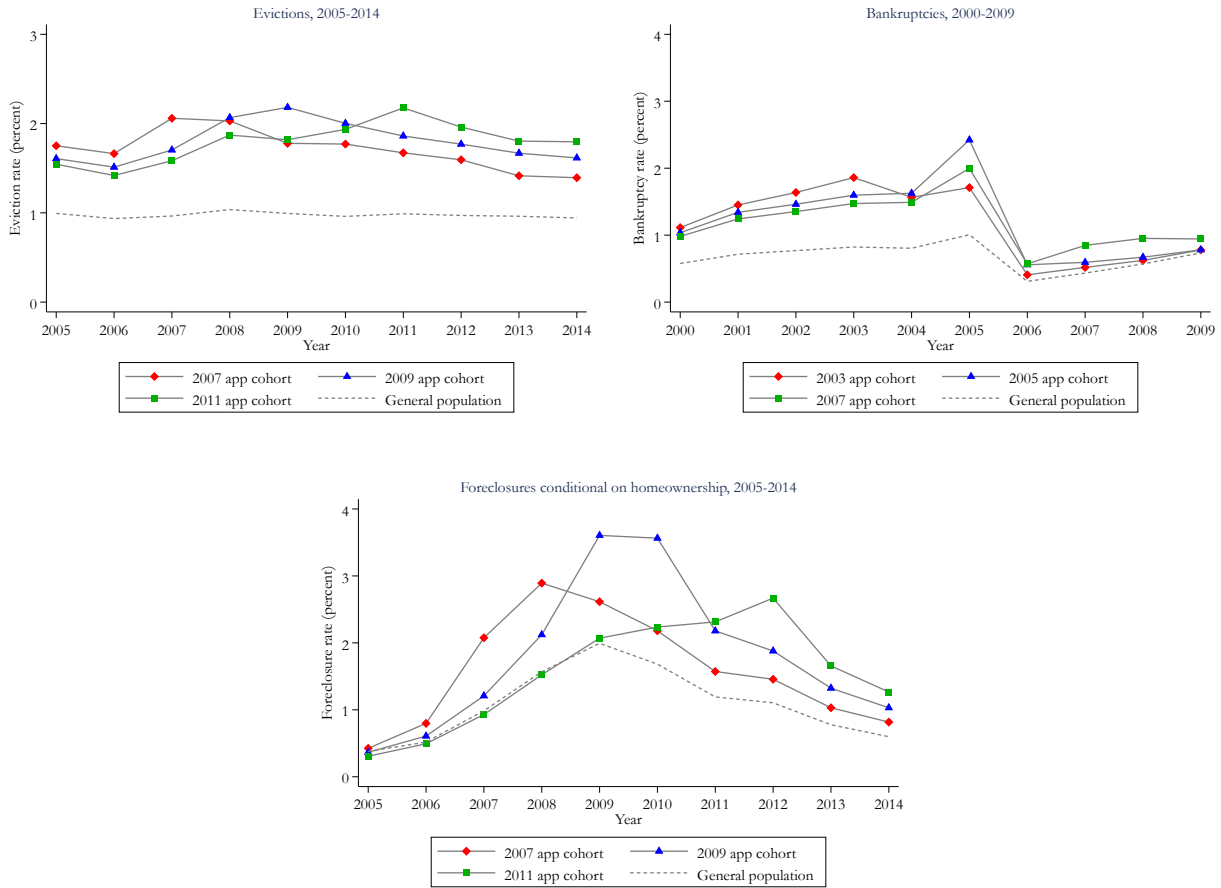
Here  $Y_{ct}$  is a financial outcome for cohort  $c$  in month  $t$ ;  $D_d$  and  $D_a$  are event-month indicator functions relative to initial decision date ( $d$ ) and application date ( $a$ ), respectively; and  $\text{Allow}_{ct}$  is an indicator for being approved for disability benefits at initial decision. The  $\beta'_d$  coefficients give the financial outcome in initial-decision event time for the denied, controlling for application event time; the sum  $\beta_d + \beta'_d$  give this value for the allowed. Similarly, the  $\mu'_a$  give the financial outcome in application event time for the denied and  $\mu_a + \mu'_a$  for the allowed, controlling for initial decision event time.

This specification, derived in the appendix, is a standard event study specification that we adapt to include both application event time and decision event time. Since the initial

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<sup>13</sup>Appendix Figure A.15 shows that foreclosure rates not conditional on homeownership are lower for disability applicants than for the general population since disability applicants are less likely to be homeowners.

Figure 2: Eviction, Bankruptcy, and Foreclosure Rates



Notes: Figures present eviction rates (left), bankruptcy rates (middle), and foreclosure rates conditional on homeownership (right) among the general population and the disability-program applicants across different application cohorts. The “eviction sample” consists of disability-program applicants with an initial decision in 2005–2014. The “bankruptcy sample” consists of disability-program applicants who have an initial decision date in 2000–2009. The “foreclosure sample” consists of disability-program applicants who appear in the deeds records (homeowners) and who have an initial decision date in 2005–2014. Each sample excludes ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period. The denominator of the eviction, bankruptcy, and foreclosure rates for the general population is calculated using the 2010 Census population for individuals 18 years or above.

decision usually occurs within a year of application, it is important to separate time trends around the two dates. If, for example, there is selection into the timing of application, we might mis-attribute a pattern that is associated with the application to the decision instead. This strategy exploits variation in examiner decision time to identify the patterns around application and decision separately.

Figure 3 presents the application-event-time coefficients and decision-event-time coefficients from equation (1). For all three adverse events, the application-event-time coefficients (left-hand side of Figure 3) suggest that financial distress peaks around the time of application and then falls, even after controlling for decision event time. In other words, applicants apply for disability benefits after a period of increasing financial distress. It could be that a deterioration in health increases financial distress and drives disability-program application, or that high financial distress drives application. The peak in bankruptcy filings is just after the application date while the peak in foreclosures is a few months later, likely because there are multiple steps between default and foreclosure.<sup>14</sup>

The decision-event-time coefficients (right-hand side of Figure 3) suggest a downward trend in bankruptcies, foreclosures, and evictions for both allowed and denied applicants preceding the decision, controlling for application date. After the initial decision, bankruptcy rates continue falling for the denied, but they decline further for the allowed. This is suggestive evidence that allowance onto disability programs reduces the risk of bankruptcy relative to denials. However, the graph also makes clear that studying only the trend for the allowed would lead to an overestimate of the decline in bankruptcies attributable to disability-program allowance, since bankruptcy risk also declines for the denied. Denied applicants may find other margins of adjustment that reduce their financial distress following their denial from the program. The decision-event-time coefficients for foreclosure and eviction exhibit a similar pattern, except that the difference between allowed and denied following the decision is less apparent.

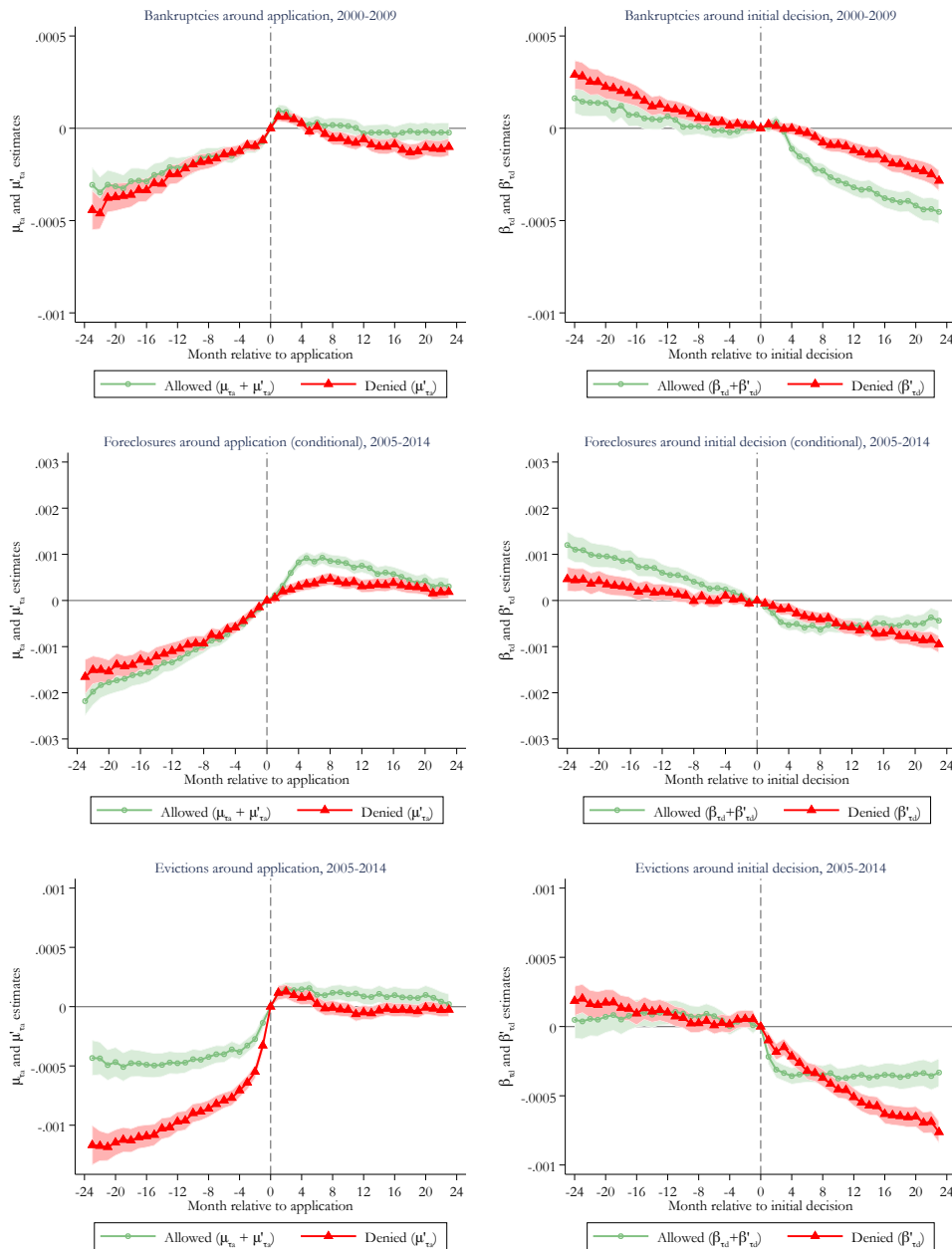
This event-study analysis provides suggestive evidence that disability programs might reduce financial distress. However, it also shows that application timing is non-random and that even denied applicants experience declines in financial distress following their initial

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<sup>14</sup>The fall in foreclosures, bankruptcies, and evictions after the application date could reflect households making other adjustments in consumption and saving. Or it could be a mechanical decline if most of the households at risk for these events have already experienced them.



Figure 3: Bankruptcies Foreclosures, Evictions Around Disability Application and Decision



Notes: Figures plot estimates from the event-study specification, equation (1). The upper-left panel plots application event indicator functions for bankruptcy relative to the month of application, for allowed applicants ( $\mu_{\tau_a} + \mu'_{\tau_a}$ ) and denied applicants ( $\mu'_{\tau_a}$ ). Upper-right panel plots initial-decision event indicator functions for bankruptcy relative to the month of decision, for allowed applicants ( $\beta_{\tau_d} + \beta'_{\tau_d}$ ) and denied applicants ( $\beta'_{\tau_d}$ ). Middle-left and middle-right panels are analogous for foreclosure, and bottom-left and bottom-right graphs for eviction. The “bankruptcy sample” consists of disability-program applicants who have an initial decision date in 2000–2009. The “foreclosure sample” consists of disability-program applicants who appear in the deeds records (homeowners), who have an initial decision date in 2005–2014. The “eviction sample” consists of disability-program applicants with an initial decision in 2005–2014. Each sample excludes ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period.

decision. Given this evidence of selection effects and time effects, we turn next to quasi-experimental variation in allowance onto disability programs.

## 4 Quasi-Experimental Estimates of the Effect of Disability Receipt on Financial Outcomes

To estimate the causal effect of disability programs on financial outcomes, we implement a regression discontinuity design that was originally introduced to the literature by [Chen and van der Klaauw \(2008\)](#). [Chen and van der Klaauw \(2008\)](#) use the Survey of Income and Program Participation (SIPP) linked to SSA application and award data to study the effect of receiving disability benefits on labor supply. SSA evaluates disability-program applicants with a five-stage process, described in [Figure 4](#). During the first two stages, examiners deny applicants if they have engaged in substantial gainful activity since onset of their disability (stage 1) or if their impairment is not severe (stage 2). During stage 3, applicants with listed medical impairments are allowed onto the program. During stage 4, applicants are denied if the examiner deems that they could still do the work that they had done before the disability onset.

Finally, during stage 5, examiners evaluate whether the applicants who cannot do past work can adjust to another type of work. Examiners divide applicants into cells based on age, education, previous work experience, and the nature of their past work.<sup>15</sup> We exploit SSA guidelines instructing disability examiners to use more-lenient standards for applicants who are above ages 50 and 55 relative to those below ages 50 and 55.<sup>16</sup>

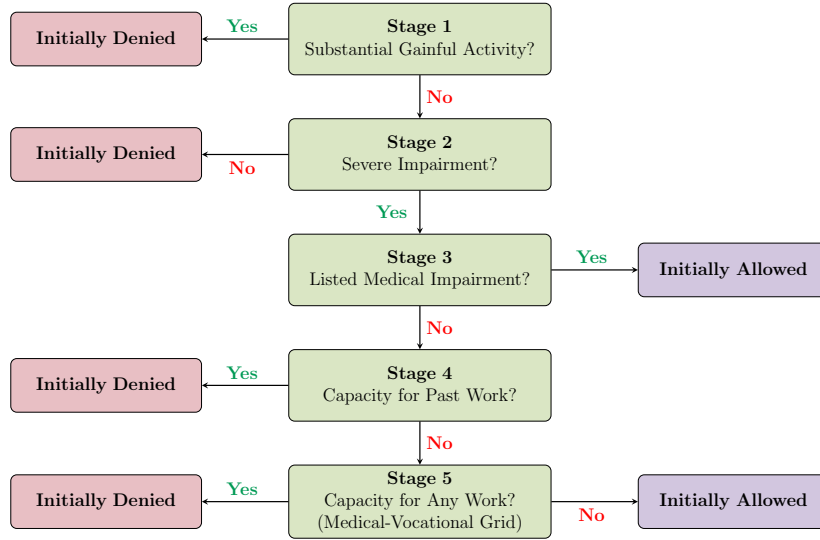
[Figure 5](#), which plots initial allowance rate by age at decision, demonstrates our basic empirical strategy. The initial allowance rate jumps at ages 50 and 55. We implement a

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<sup>15</sup>The full vocational grid used in this process is available here: <http://policy.ssa.gov/poms.nsf/lnx/0425025035>.

<sup>16</sup>We use the classification of [Wixon and Strand \(2013\)](#) to map the “regulation basis code” in the 831 files into stages.

Figure 4: Stages of the Disability Determination Process



Notes: Figure presents the stages of the Social Security Administration’s disability determination process. In stage 1, disability-program applicants who are earning at substantial gainful activity levels (\$1,180 per month in 2018) are denied. In stage 2, applicants who are determined to have a non-severe impairment are denied. In stage 3, applicants whose diagnosis meets the medical listings are allowed. In stage 4, applicants who are determined to have capacity for for past work are denied. In stage 5, applicants who are determined to have capacity for any work are denied, while those determined not to have capacity for any work are allowed.

regression discontinuity design in age at decision, comparing disability applicants just above and just below the age-50 or age-55 threshold.<sup>17</sup> Such a procedure amounts to a “fuzzy” regression discontinuity design: older applicants are more likely to be allowed onto the program, but the relationship between age and allowance is not deterministic. We combine applicants near the age-50 threshold with those near the age-55 threshold and implement an empirical strategy that treats the two thresholds identically, testing whether outcomes differ for those just above either threshold.<sup>18</sup>

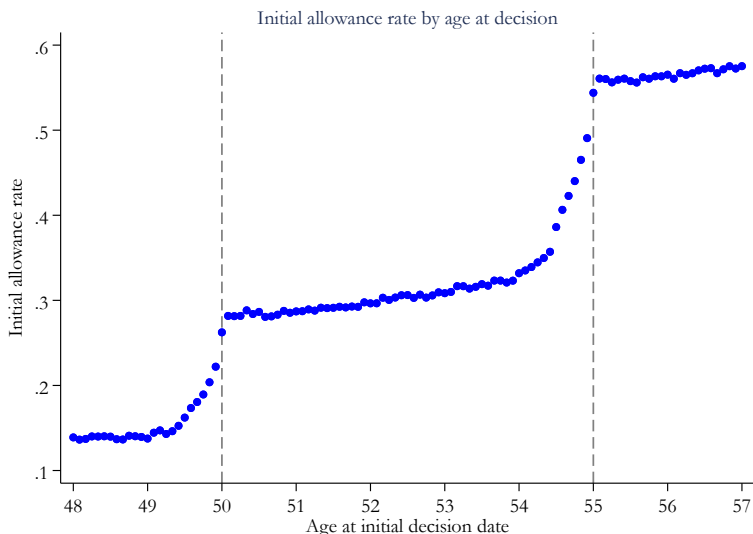
Notice that there is a trend break to the left of each discontinuity, with increasing initial allowance rates up to the threshold. This trend break is likely driven by the SSA’s “borderline age” rule, which instructs examiners to “consider” using the higher age category for

<sup>17</sup>There also exists a threshold at age 44, but in practice the jump in allowance rates at age 44 is close to zero.

<sup>18</sup>We obtain similar, less-precise estimates when we create separate samples for each threshold.

applicants approaching the age cutoff.<sup>19</sup>

Figure 5: Overall Initial Allowance Rate By Age



Notes: Figure plots initial allowance rate by disability-program applicant age. This figure is based on the home purchase sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least fifteen recorded home purchases per year during this period.

We use the following RD specification for the combined age-50 and age-55 samples:

$$Y_i = \alpha + \beta \text{Above Threshold}_i + \gamma \text{Age}_i + \delta (\text{Above Threshold}_i \times \text{Age}_i) + \epsilon_i, \quad (2)$$

where  $Y_i$  is a financial outcome for applicant  $i$ ,  $\text{Above Threshold}_i$  is an indicator for being older than 50 or 55 years at the decision date, and  $\text{Age}_i$  is the applicant’s age at decision. The coefficient of interest,  $\beta$ , gives the effect of being older than the relevant age threshold at the decision date on financial outcomes.

Who are the applicants included in this RD sample? Recall that the least-severe applicants are denied in earlier stages of the process and the most-severe applicants are allowed in earlier stages of the process. As a result, the applicants who make it to stage 5 have conditions that do not meet the medical listings but are still potentially severe and often

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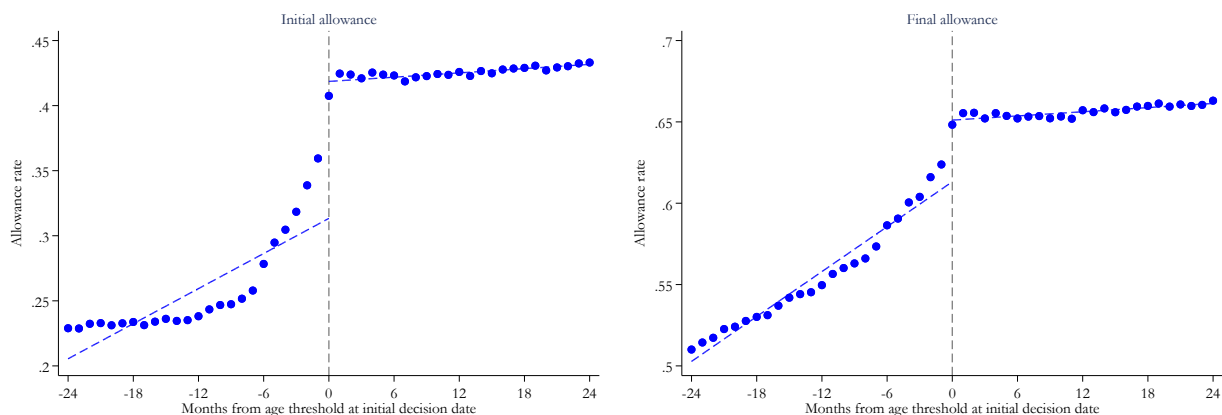
<sup>19</sup>“If a claimant is within a few days to a few months of reaching a higher age category and using the chronological age results in a denial, consider using the higher age category if it results in a favorable determination, after you evaluate *all* factors.” (DI 25015.006).

hard-to-verify. From Tables 1 and 2, we see that relative to the full samples, the RD samples have higher earnings and are more likely to have a musculoskeletal condition—for which vocational factors may be more important than for other conditions.

#### 4.1 First-Stage Effects of Age on Program Allowance

Figure 6 combines the age-50 and age-55 thresholds and plots the average initial-allowance rate and final-allowance rate against age in months relative to threshold, for the bankruptcy sample. The share of applicants initially allowed onto disability programs increases by 9.4 percentage points at the threshold, off of a base of 29 percentage points for those just below the cutoff. The final allowance rate after appeals increases by roughly 3.2 percentage points off of a base of 61 percentage points. The first-stage estimates for other samples are similar and presented in Table 3.

Figure 6: First Stage, Allowance Rate Relative to Applicant Age



Notes: Figures plot initial allowance rate (left-hand side) and final allowance rate after all appeals (right-hand side) relative to the disability-program applicant’s age at the initial decision date for applicants in the bankruptcy sample. Age is calculated as months from age 50 or age 55, whichever threshold is closer. This figure is based on the bankruptcy sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period.

The initial and final allowance estimates demonstrate that applicants just above the age thresholds are more likely to receive disability benefits. In addition to this extensive margin

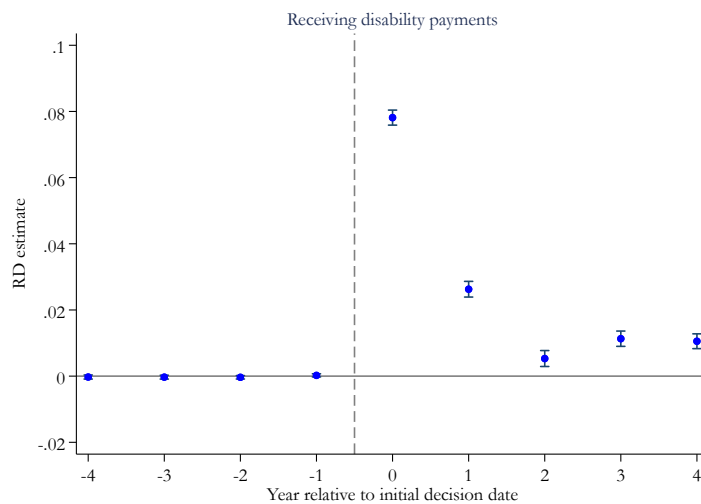
Table 3: RD Estimates of First Stage and Reduced-Form Effects

	First Stage		Reduced Form			<i>N</i> (in millions)
	Initial allowance	Final allowance	Within 1 year	Within 3 years	Within 5 years	
	Pt. Est.	Pt. Est.	Pt. Est.	Pt. Est.	Pt. Est.	
	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	
	[Cntrl. Mean]	[Cntrl. Mean]	[Cntrl. Mean]	[Cntrl. Mean]	[Cntrl. Mean]	
<i>Conditional on homeownership</i>						
Foreclosure	0.112*** (0.00200) [0.390]	0.0334*** (0.00197) [0.673]	-0.00214*** (0.000655) [0.026]	-0.00316*** (0.000923) [0.052]	-0.00295*** (0.00103) [0.065]	0.91
Home-sale	0.108*** (0.00154) [0.377]	0.0334*** (0.00152) [0.676]	-0.00153** (0.000716) [0.050]	-0.00280** (0.00109) [0.128]	-0.00218* (0.00126) [0.182]	1.51
Foreclosure or home-sale	0.108*** (0.00154) [0.377]	0.0334*** (0.00152) [0.676]	-0.00247*** (0.000779) [0.061]	-0.00386*** (0.00114) [0.144]	-0.00249* (0.00130) [0.200]	1.51
<i>Unconditional on homeownership</i>						
Home-purchase	0.104*** (0.000784) [0.346]	0.0377*** (0.000813) [0.619]	0.000894*** (0.000225) [0.018]	0.00105*** (0.000350) [0.045]	0.000837** (0.000404) [0.061]	5.64
Bankruptcy	0.0938*** (0.00103) [0.292]	0.0317*** (0.00111) [0.606]	-0.000443* (0.000251) [0.012]	-0.000717** (0.000362) [0.026]	-0.000595 (0.000411) [0.034]	3.07
Bankruptcy, foreclosure, or home sale	0.101*** (0.000926) [0.332]	0.0355*** (0.000957) [0.634]	-0.00113*** (0.000360) [0.034]	-0.00191*** (0.000532) [0.077]	-0.00132** (0.000610) [0.104]	4.02

Notes: Table reports RD estimates of the effect of being 50 years or older and 55 years or older at the initial decision date on the initial allowance rate, the final allowance rate after all appeals, and on reduced-form outcomes, specifically estimates of  $\beta$  from equation (2). The outcome “foreclosure” is based on the foreclosure sample: applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, and who have an initial decision date in 2005–2014. The outcome “home-sale” is based on the home-sale sample: applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, and who have an initial decision date in 2000–2014. The outcome “foreclosure or home-sale” is equal to one if the applicant experienced either of those outcomes and zero otherwise. The outcome “bankruptcy” is based on the bankruptcy sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009. The outcome “bankruptcy, foreclosure or home-sale” is defined similarly with the exception that home-sale events are not limited to applicants who appear in the deeds records (homeowners). The outcome “home-purchase” is based on the home-purchase sample: applicants who reach stage 5 of the disability determination process and who have an initial decision date in 2000–2014. Samples involve “foreclosure” or “bankruptcy” outcomes exclude ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period; samples involve “home-sale” and “home-purchase” outcomes exclude ZIP Code of residence at application that has an average of less than fifteen recorded corresponding events per year during 2000–2014. Standard errors in parentheses; control means in square brackets are the average value of the variable for applicants who are under age 50 or age 55 by 4 months or fewer. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

effect, the intensive margin—how many more months or years of disability benefits those applicants receive—is also relevant for interpreting our findings. Figure 7 plots the RD estimate of the likelihood of receiving disability benefits for each year relative to the initial decision year. As expected, there is no difference between control (below age threshold) and treatment (above age threshold) groups in the likelihood of receiving disability benefits before the initial decision. In the year of the decision, those above the age threshold are about 8 percentage points more likely to receive disability benefits than those below the threshold. The first stage then attenuates rapidly, falling to about 3 percentage points the year after the decision and then stabilizing at 1 percentage point. The effect on receiving disability benefits attenuates mostly because denied applicants reapply for benefits in later years, and are then allowed.<sup>20</sup>

Figure 7: First Stage: Allowance Rate RD Estimates Over Time



Notes: Figure plots the RD estimate and 95 percent confidence interval for disability receipt in each event year relative to the initial decision date in the home purchase sample. For each event year, we put an indicator for disability receipt in that year on the left-hand-side of the RD equation (2), estimate the equation, and plot  $\hat{\beta}$  for that year in this figure. Sample is individuals who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least fifteen recorded home purchases per year during this period. Since the disability receipt variable is available annually only for SSI applicants, we further restrict to SSI applicants to produce this figure.

<sup>20</sup>Appendix Figure A.17 explores this pattern. Denied applicants become more likely to be allowed onto the programs one and two years after their initial denial from the program.

The pattern of attenuation in Figure 7 is important for interpreting the reduced-form RD results in this paper. The figure reveals that the “treatment” coming from this quasi-experiment is not the effect of receiving disability benefits indefinitely, but rather the effect of receiving disability benefits for some additional time. On average, including the zeros, applicants above the age cutoff receive disability benefits for 1.6 additional months relative to those just below the cutoff. The effect of receiving disability benefits indefinitely may be different from the effects that we estimate using the variation from this quasi-experiment.

## 4.2 Tests of Validity

The standard RD identifying assumptions require that assignment to treatment is as good as random around the threshold. This assumption could be violated if some applicants strategically wait until age 50 or 55 to apply, or if there is differential sorting for other reasons. [Chen and van der Klaauw \(2008\)](#) study a sample of 1,000 applicants from the 1990s and find that the standard RD assumptions are satisfied—they estimate no discontinuous change in the density of applicants or applicants’ covariates in their sample.

By contrast, we detect violations of the standard RD assumptions in our sample, which includes the several million applicants that reach stage 5 between 2000 and 2014. Figure 8 plots the number of applicants by age relative to the nearest age threshold: the number of applicants jumps by 6 percent at the threshold. Although this discontinuity in the density of applicants is not large relative to changes in the density at other ages, it is statistically significant and suggests that some applicants defer their application until they reach age 50 or 55. SSA publications, including the vocational grid, include the age thresholds and it is likely that some applicants understand that they are more likely to be allowed onto the program if they wait to apply until they are older.

How different are applicants on either side of the cutoff? Table 4 reports discontinu-

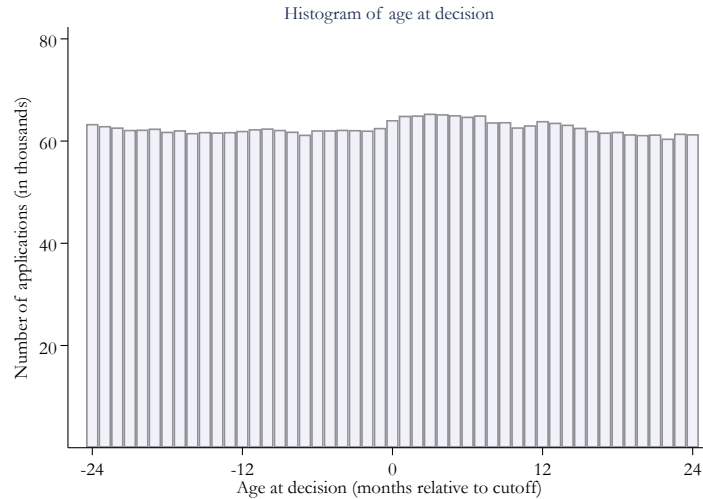


Table 4: Covariate Balance Test – Bankruptcy and Foreclosure Samples

	Bankruptcy sample			Foreclosure sample		
	Pt. Est. (Std. Err.)	Mean	% of mean	Pt. Est. (Std. Err.)	Mean	% of mean
Covariate						
Pre-application adverse financial event	-0.000623 (0.000716)	0.112	-0.6%	-0.00167 (0.00110)	0.079	-2.1%
Pre-app earnings	213.6*** (44.85)	\$16,539	1.3%	182.2** (83.51)	\$19,444	0.9%
Years of education	-0.0208*** (0.00622)	11.5	-0.2%	-0.00576 (0.00983)	12.089	0.0%
Musculoskeletal	0.00541*** (0.00113)	0.428	1.3%	0.0101*** (0.00209)	0.481	2.1%
Respiratory	0.00101** (0.000461)	0.042	2.4%	0.000916 (0.000802)	0.038	2.4%
Cardiovascular	0.000428 (0.000727)	0.114	0.4%	0.000294 (0.00123)	0.095	0.3%
Endocrine	-0.000951* (0.000514)	0.053	-1.8%	-0.00274*** (0.000829)	0.040	-6.8%
Neurological	0.000514 (0.000554)	0.063	0.8%	6.10e-05 (0.00110)	0.074	0.1%
Mental	-0.00485*** (0.000837)	0.162	-3.0%	-0.00687*** (0.00142)	0.136	-5.0%
Special/other	-0.00136*** (0.000497)	0.050	-2.7%	0.000216 (0.000844)	0.042	0.5%
p-value on joint F-test		0.000			0.000	
Predicted adverse financial event occurs	0.000214*** (6.29e-05)	0.111	0.2%	-9.85e-05* (5.20e-05)	0.075	-0.1%
$N$ (in millions)		3.07			0.91	

Notes: Table reports RD estimates for the listed covariates for the bankruptcy and foreclosure samples, where we put the covariate on the left-hand-side of the RD equation, equation (2), and report  $\beta$  with standard errors in parentheses. The table reports the  $p$ -value on the  $F$  test for the joint significance of all covariates. Pre-application earnings are average annual applicant earnings in the three years prior to the year of application, from the Master Earnings File. Years of education is self-reported years of education from the 831 Disability File. Body system codes (musculoskeletal, respiratory, cardiovascular, endocrine, neurological, mental, special/other) come from the 831 Disability File. “% of mean” denotes point estimate as a percent of control mean. For “predicted adverse financial outcome,” we first regress an indicator for having the adverse financial outcome prior to the initial decision date on a set of covariates (pre-application earnings, years of education, male, body system code dummies, and ZIP dummies). We then put “predicted adverse financial outcome” on the left-hand-side of the RD equation, equation (2), and report estimates of  $\beta$ . The “bankruptcy sample” consists of disability-program applicants who reach stage 5 of the disability determination process and who have an initial decision date in 2000–2009. The “foreclosure sample” consists of disability-program applicants who reach stage 5 of the disability determination process and who appear in the deeds records (homeowners), who have an initial decision date in 2005–2014. Each sample excludes ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period. Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Figure 8: Histogram of Age at Decision



Notes: Figure presents a histogram of age at decision for disability-program applicants. This figure is based on the bankruptcy sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period.

ities in applicant characteristics across the age-50 and age-55 cutoffs.<sup>21</sup> The discontinuities are economically small but statistically significant. Applicants above age 55 have annual earnings \$210 higher (1.3 percent) than those below age 55, have 0.02 fewer (0.2 percent) years of education, and are 0.5 percentage points (2 percent) more likely to apply with a musculoskeletal condition and 0.5 percentage points (2.7 percent) less likely to apply with a mental condition.

These results suggest that applicants who knowingly defer their applications until ages 50 or 55 are not a random sample, but differ slightly on these covariates and possibly on unobservable dimensions. This difference could bias RD estimates of the effect of disability benefits on financial outcomes. In particular, discontinuities in financial outcomes at the age thresholds might be driven not by disability benefits but by selection into which applicants defer their application past the age-55 threshold.

To probe the direction and magnitude of the potential bias, we predict bankruptcy and

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<sup>21</sup>Appendix Table A.9 presents covariate-balance tests for the combined “foreclosure or sale” and “home purchase” samples.

foreclosure for each applicant based on their pre-determined characteristics. We then test for a discontinuity in predicted bankruptcy and foreclosure at the age thresholds, with the results at the bottom of Table 4. For the foreclosure sample, we find no statistically significant (or economically meaningful) effect on predicted foreclosure. For the bankruptcy sample, we find a statistically significant *increase* in predicted bankruptcy, but this estimate goes in the opposite direction of the estimates of the effect on actual bankruptcy. As we demonstrate below, we find a *decrease* in actual bankruptcy and foreclosure at the age thresholds. The opposite sign suggests that, if anything, the change in demographics at ages 50 and 55 leads us to under-estimate the drop in bankruptcies and foreclosures.

### 4.3 Reduced-Form Effects on Financial Outcomes

We study the effect of the age-50 and age-55 thresholds on several financial outcomes, including foreclosures, home sales, home purchases, and bankruptcies.<sup>22</sup> Figure 9 presents RD plots for foreclosure conditional on homeownership in the top panel. The left-hand panel plots foreclosure rates for the three years after initial decision against age relative to the age-based thresholds. There is a striking decline in foreclosures at the threshold. From Table 3, the foreclosure rate falls by 0.3 percentage points across the threshold, off of a control mean of 5.2 percentage points. As a falsification check, we plot in the right-hand panel foreclosure rates for the three years *before* initial decision. Reassuringly, there exists no statistically significant discontinuity before the decision date.

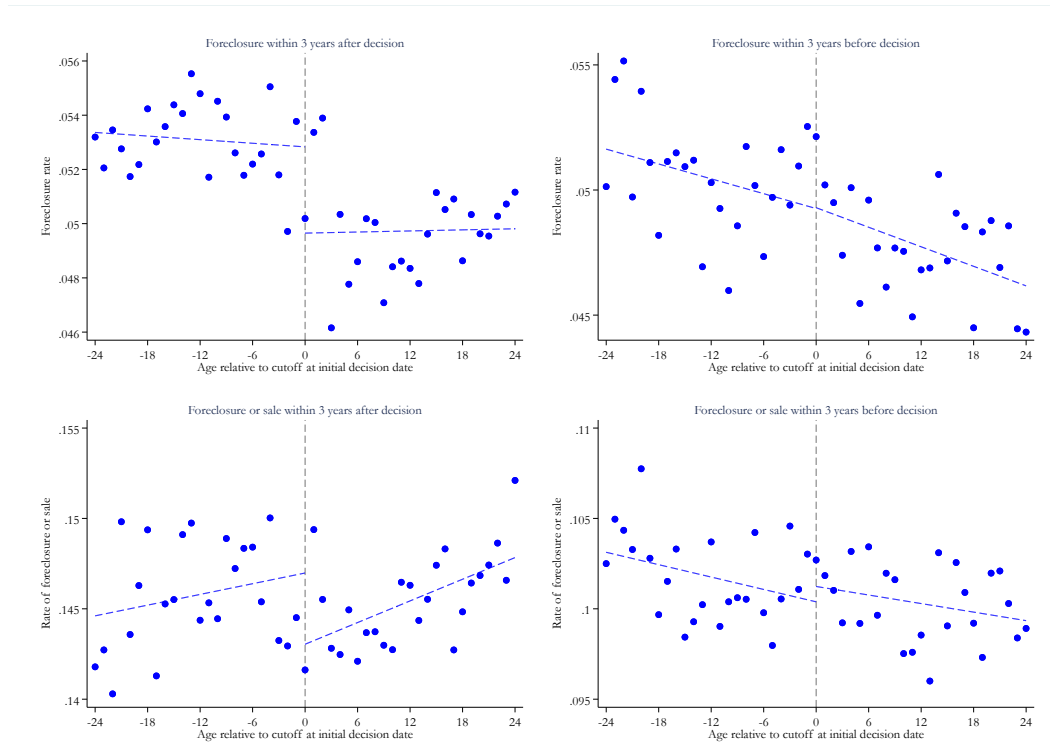
Although home sale has a less obvious normative interpretation than foreclosure, home sale may be another indicator of financial distress leading to the loss of a home. As described by Lusardi et al. (2011), the sale of a home is one of the first coping mechanisms to which

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<sup>22</sup>We present results for eviction in Appendix Figure A.19. Because the eviction data have fewer identifiers than the bankruptcy data or foreclosure data, the eviction merge is lower-quality than the other merges. In the Appendix, we demonstrate, based on simulations with the bankruptcy data, that using only the identifiers available in the eviction data leads to severe attenuation bias.

households turn when facing a financial shortfall. The bottom panel of Figure 9 plots the rate of either foreclosure and home sale across the age threshold and find a large discontinuity at the cutoff.

Figure 9: Foreclosure or Home Sales Rate Relative to Applicant Age



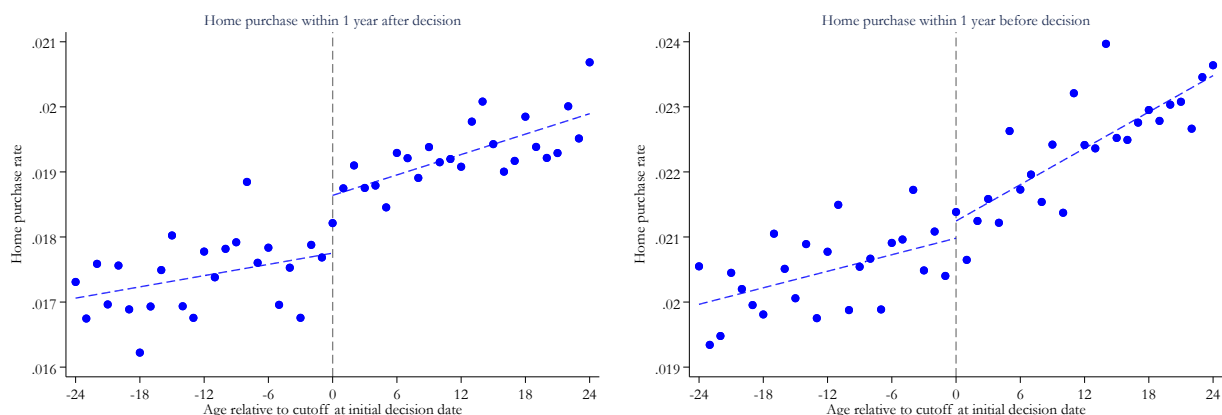
Notes: Figures plot the “foreclosure” and “foreclosure or home-sales” rates within three years after initial decision (left-hand side panel) and the “foreclosure” and “foreclosure or home-sales” rates within three years before initial decision (right-hand side panel) relative to the disability-program applicant’s age at the initial decision date. The “foreclosure sample” consists of disability-program applicants who appear in the deeds records (homeowners), who have an initial decision date in 2005–2014, and whose ZIP Code of residence at application has at least five recorded foreclosures during this period. The “foreclosure or home sale sample” consists of disability-program applicants who appear in the deeds records (homeowners) and experience either foreclosure or home sales, who have an initial decision date in 2005–2014, and whose ZIP Code of residence at application has at least five recorded foreclosures and at least fifteen home sales during this period. Age is calculated as months from age 50 or age 55, whichever threshold is closer.

The likelihood of experiencing either foreclosure or home sale falls by 0.4 percentage points across the cutoff, relative to the control mean of 14 percentage points. For home sale alone, the likelihood declines by 0.3 percentage points relative to the control mean of 13 percentage points. As shown in the right-hand-panel, there is no discontinuity in foreclosures or home

sales before initial decision.<sup>23</sup>

Conversely, Figure 10 presents an analogous pair of figures for the *purchase* of a home. The figures suggest an increase in home purchases for applicants above the age thresholds after the decision, but no discontinuity before the decision. The likelihood of purchasing a home increases by 0.09 percentage points in the year after the decision, relative to the control mean of 1.8 percentage points.

Figure 10: Home Purchase Rate Relative to Applicant Age



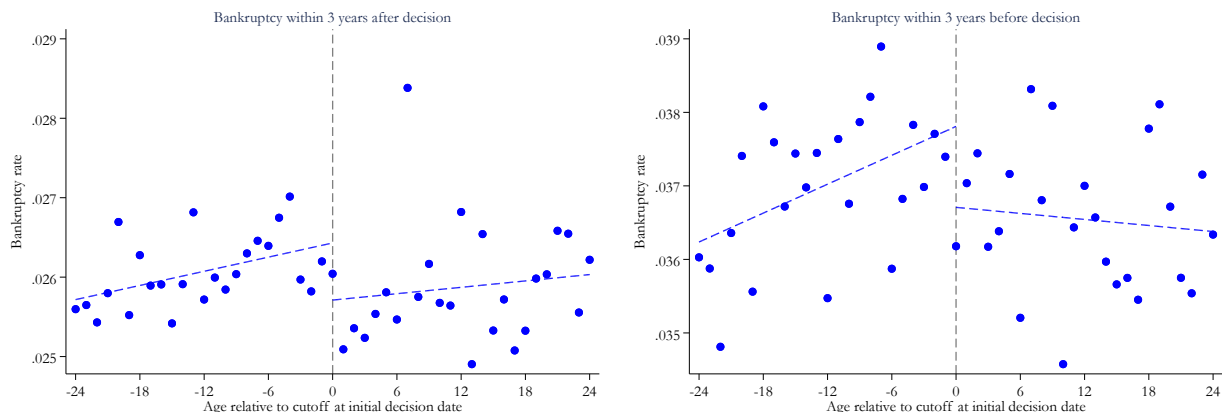
Notes: Figures plot the home-purchase rate within one year after initial decision (left-hand side) and the home-purchase rate within one year before initial decision (right-hand side) relative to the disability-program applicant’s age at the initial decision date. Age is calculated as months from age 50 or age 55, whichever threshold is closer. This figure is based on the home purchase sample, disability-program applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2014, and whose ZIP Code of residence at application has an average of at least fifteen home purchases per year during this period.

Do these home purchases and sales represent moves, in which the applicant sells their home and then buys another? Or, alternatively, do the transactions indicate “standalone” or “net” purchases and sales, in which renters become homeowners or homeowners become renters? We can infer from the pattern of transactions that they cannot be moves exclusively, because moves would imply an increase in both home purchases and home sales, whereas we find an increase in home purchases and a decrease in home sales. To further explore this issue, we categorize purchases and sales in the data as “net” purchases and sales if we

<sup>23</sup>Appendix Figure A.18 shows the RD graph for home sale alone.

observe no additional transaction within six months.<sup>24</sup> We calculate RD estimates for net sales and net purchases and find very similar estimates to the ones described above. This suggests that most of the increase in purchases is driven by allowed applicants becoming homeowners. Likewise, the decrease in sales is likely driven by allowed applicants becoming less likely to transition into renting.

Figure 11: Bankruptcy Rate Relative to Applicant Age



Notes: Figures plot bankruptcy rate within three years after initial decision (left-hand side) and the bankruptcy rate within five years before initial decision (right-hand side) relative to the disability-program applicant’s age at the initial decision date for applicants in the bankruptcy sample. Age is calculated as months from age 50 or age 55, whichever threshold is closer. This figure is based on the bankruptcy sample, disability-program applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period.

Finally, we study the effect of the age threshold on bankruptcy rates in Figure 11. As with foreclosure, we find a substantial and statistically significant drop in bankruptcy rates at the age thresholds 3 years after the initial decision, but not before the initial decision. The bankruptcy rate falls by 0.07 percentage point across the threshold, off of a control mean of 2.6 percentage points. Table 3 also combines the three adverse financial outcomes—bankruptcy, foreclosure, and home sale—without conditioning on homeownership. The likelihood of experiencing any of these adverse financial outcomes falls by 0.2 percentage points

<sup>24</sup>A drawback to this approach is that “net” sales and purchases are more prone to bias than other outcomes as a result of unobserved transactions in ZIP Codes other than the application ZIP Code. Appendix B discusses this bias.

at the thresholds, relative to a control mean of 7.2 percentage points.

The effects on financial outcomes are driven by particular subgroups, though not necessarily the same subgroups for all outcomes. Table 5 suggests that the bankruptcy effects are largely driven by women and, to a lesser extent, applicants with less than a high school education. By contrast, the foreclosure and house-sale effects are strongest for men and strong for applicants of all education levels. The effect on home purchases is strongest for men and applicants with a high school degree or more. When we compare effects for SSDI applicants versus SSI applicants, we find that the bankruptcy and home purchase effects are stronger for SSDI applicants, but the foreclosure and home sale effects are equally strong for both types of applicants.

#### 4.4 Scaling the Reduced-Form Estimates

We scale the reduced-form estimates by the first-stage effect on disability allowance to obtain IV estimates of the effect of disability allowance on financial outcomes. In Table 6, we report IV estimates using initial disability allowance as our measure of the first stage. However, there are other reasonable ways to measure the first stage, including final allowance and amount of time receiving disability benefits. The advantage of using initial disability allowance is that it captures not only the allowance itself but also the timing of allowance. From Figure 3, we know that the financial distress of disability applicants peaks around the date of application. For applicants in severe financial distress, receiving a disability award at the initial level, rather than several months or even years later at the appeals level, could matter for financial distress. Indeed, Table 3 suggests that most of the effect on financial outcomes occurs in the year after the initial decision. On the other hand, using final allowance as the measure of the first stage is more valid if only the allowance itself matters for financial outcomes, since it is final allowance that determines actual receipt of disability benefits. Note that scaling the reduced-form estimates by final allowance would result in

Table 5: RD Estimates of First Stage and Reduced-Form Effects by Subgroup

	First Stage				Reduced Form		$N$ (in millions)
	Initial allowance		Final allowance		Within 3 years		
	Pt. Est. (Std. Err.)	Cntrl. Mean	Pt. Est. (Std. Err.)	Cntrl. Mean	Pt. Est. (Std. Err.)	Cntrl. Mean	
<b>Bankruptcy</b>							
All	0.0938*** (0.00103)	0.292	0.0317*** (0.00111)	0.606	-0.000717** (0.000362)	0.026	3.07
Less than high school education	0.104*** (0.00194)	0.306	0.0395*** (0.00210)	0.591	-0.000773 (0.000591)	0.020	0.86
High school or more	0.0889*** (0.00129)	0.284	0.0269*** (0.00139)	0.615	-0.000317 (0.000476)	0.028	1.94
Male	0.106*** (0.00149)	0.305	0.0384*** (0.00159)	0.613	0.000423 (0.000504)	0.024	1.49
Female	0.0805*** (0.00148)	0.276	0.0240*** (0.00162)	0.599	-0.00188*** (0.000548)	0.029	1.45
SSDI adult	0.0924*** (0.00129)	0.297	0.0198*** (0.00131)	0.685	-0.000823* (0.000491)	0.032	2.00
SSI adult	0.0937*** (0.00142)	0.262	0.0461*** (0.00162)	0.524	-0.000218 (0.000443)	0.018	1.49
<b>Foreclosure or home sale</b>							
All	0.108*** (0.00154)	0.377	0.0334*** (0.00152)	0.676	-0.00386*** (0.00114)	0.144	1.51
Less than high school education	0.117*** (0.00335)	0.394	0.0307*** (0.00332)	0.673	-0.00457* (0.00236)	0.127	0.32
High school or more	0.106*** (0.00180)	0.372	0.0337*** (0.00177)	0.677	-0.00400*** (0.00135)	0.148	1.11
Male	0.124*** (0.00222)	0.411	0.0411*** (0.00212)	0.698	-0.00487*** (0.00161)	0.141	0.75
Female	0.0915*** (0.00220)	0.342	0.0239*** (0.00224)	0.655	-0.00487*** (0.00161)	0.141	0.72
SSDI adult	0.109*** (0.00185)	0.386	0.0239*** (0.00172)	0.732	-0.00401*** (0.00137)	0.146	1.07
SSI adult	0.111*** (0.00292)	0.348	0.0589*** (0.00311)	0.557	-0.00398* (0.00218)	0.139	0.40
<b>Home purchase</b>							
All	0.104*** (0.000784)	0.346	0.0377*** (0.000813)	0.619	0.00105*** (0.000350)	0.045	5.64
Less than high school education	0.113*** (0.00149)	0.364	0.0422*** (0.00154)	0.618	0.000569 (0.000554)	0.031	1.56
High school or more	0.101*** (0.000955)	0.338	0.0351*** (0.000994)	0.619	0.00128*** (0.000450)	0.050	3.78
Male	0.118*** (0.00112)	0.366	0.0457*** (0.00115)	0.627	0.00170*** (0.000493)	0.044	2.80
Female	0.0897*** (0.00114)	0.324	0.0283*** (0.00120)	0.610	0.000446 (0.000527)	0.047	2.61
SSDI adult	0.102*** (0.00107)	0.356	0.0247*** (0.00105)	0.686	0.00153*** (0.000552)	0.062	3.11
SSI adult	0.108*** (0.00118)	0.331	0.0541*** (0.00127)	0.546	0.000215 (0.000384)	0.023	2.38

Notes: Table reports RD estimates of the effect of being 50 years or older and 55 years or older at the initial decision date on the initial allowance rate, the final allowance rate after all appeals, and on reduced-form outcomes, estimates of  $\beta$  from equation (2). Standard errors are in parentheses. The reduced-form outcomes reported here are having an adverse financial event and purchasing a home within three years of the initial decision. Control means are the average value of the variable for applicants who are under age 50 or 55 by 4 months or fewer. The “bankruptcy” sample consist of disability-program applicants who reach stage 5 of the disability determination process and who have an initial decision date in 2000–2009. The “foreclosure or home-sale” sample consists of disability-program applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, and experience either foreclosure or home-sales and who have an initial decision date in 2005–2014. The “home-purchase” sample consist of disability-program applicants who reach stage 5 of the disability determination process and who have an initial decision date in 2000–2014. Samples involve “foreclosure” or “bankruptcy” outcomes exclude ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period; samples involve “home-purchase” or “home-sales” outcomes exclude ZIP Code of residence at application that has an average of less than fifteen recorded corresponding events per year during 2000–2014. Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .



IV estimates that are often larger than the control mean, though the confidence intervals include reductions smaller than the control mean.

In Table 6, we find that initial disability allowance reduces the likelihood of experiencing bankruptcy in the next 3 years by a statistically significant 0.76 percentage points. This represents a reduction of 29 percent relative to the control mean of 2.6 percent. The risk of foreclosure falls by 2.8 percentage points, or a 54 percent drop relative to the control mean of 5.2 percent. Similarly, initial allowance reduces the likelihood of selling a home by 2.6 percentage points (20 percent) and increases the likelihood of purchasing a home by 1.0 percentage point (22 percent).

Why does disability allowance have such a large effect on financial outcomes? One reason is that disability-program applicants are in severe financial distress at the time of application. We know from Figure 2 that their risk of bankruptcy and foreclosure is much higher than the general population, and from Figure 3 that financial risk peaks just after they apply for benefits. For this population, it is perhaps unsurprising that a monthly disability check and health insurance has a large effect on financial outcomes. Moreover, that monthly disability check represents a large increase in income for applicants. In Appendix Table A.10, we estimate the RD for earnings and income. Scaling up by final allowance, the estimates indicate that disability allowance causes earnings to decline by \$1,700 and total observed income—earnings plus disability income—to increase by \$4,900 in the year after the decision. This represents more than a doubling of income for the average recipient. These estimates are consistent with the original [Chen and van der Klaauw \(2008\)](#) estimates.

Our results are consistent with previous studies showing that the social safety net can have a large effect on these same outcomes. [Hsu et al. \(2018\)](#) study unemployment insurance and foreclosure and find that increases in benefits drastically reduce foreclosures. Their estimates suggest that a one-standard-deviation increase in unemployment-insurance benefits

Table 6: Instrumental Variable (IV) Estimation

	Within 1 year Pt. Est. (Std. Err.) [Cntrl. Mean]	Within 3 years Pt. Est. (Std. Err.) [Cntrl. Mean]	Within 5 years Pt. Est. (Std. Err.) [Cntrl. Mean]	<i>N</i> (in millions)
Bankruptcy	-0.00473* (0.00268) [0.012]	-0.00765** (0.00387) [0.026]	-0.00635 (0.00438) [0.034]	3.07
Foreclosure (conditional on homeownership)	-0.0192*** (0.00587) [0.026]	-0.0283*** (0.00828) [0.052]	-0.0265*** (0.00920) [0.065]	0.91
Home sale (conditional on homeownership)	-0.0141** (0.00661) [0.050]	-0.0258** (0.0101) [0.128]	-0.0201* (0.0116) [0.182]	1.50
Foreclosure or home sale (conditional on homeownership)	-0.0228*** (0.00719) [0.061]	-0.0357*** (0.0106) [0.144]	-0.0230* (0.0120) [0.200]	1.50
Home purchase	0.00856*** (0.00216) [0.018]	0.0101*** (0.00335) [0.045]	0.00801** (0.00387) [0.061]	5.64

Notes: Table reports instrumental variable estimates of the effect of disability benefits on financial outcomes. The outcome “bankruptcy” is based on the bankruptcy sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009. The outcome “foreclosure” is based on the foreclosure sample: applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, and who have an initial decision date in 2005–2014. The outcome “home-sale” is based on the home-sale sample: applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, and who have an initial decision date in 2000–2014. The outcome “foreclosure or home sale” is equal to one if the applicant experienced either of those outcomes and zero otherwise. The outcome “home-purchase” is based on the home-purchase sample: applicants who reach stage 5 of the disability determination process and who have an initial decision date in 2000–2014. Samples involve “foreclosure” or “bankruptcy” outcomes exclude ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period; samples involve “home-sale” or “home-purchase” outcomes exclude ZIP Code of residence at application that has an average of less than fifteen recorded corresponding events per year during 2000–2014. Standard errors in parentheses; control means in square brackets are the average value of the variable for applicants who are under age 50 or 55 by 4 months or fewer. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

cuts a layoff-related increase in foreclosures by more than half.<sup>25</sup> Similarly, in studying the Oregon Health Insurance Lottery, [Baicker et al. \(2013\)](#) find that Medicaid “nearly eliminates” catastrophic medical debt, reducing its incidence by 81 percent.

## 5 Interpreting the Reduced-Form Estimates

We find that allowance onto disability programs reduces bankruptcy rates, foreclosure rates, and the home sales. In order to assess the welfare implications of those findings, we must consider the mechanism through which disability benefits affect those outcomes. One possible channel is liquidity: disability programs relax liquidity constraints by increasing beneficiaries’ income, reducing income volatility, and providing access to health insurance. If the reduced-form results reflect primarily a liquidity channel, then we can interpret the reductions in bankruptcy and foreclosure as reductions in financial distress and therefore as improvements in welfare.<sup>26</sup>

However, there are alternative mechanisms through which disability benefits might affect financial outcomes, and those mechanisms have more ambiguous welfare implications. For example, if disability benefits change access to credit or demand for credit, then benefits could affect bankruptcy rates and foreclosure rates mechanically by changing either the number of disability-program recipients who use credit or the amount of credit they use. We discuss these alternative mechanisms and the expected direction and magnitude of their effects. A combination of empirical evidence and institutional details suggests that liquidity is the most likely channel through which disability benefits affect financial outcomes. If so, we can interpret the reduced-form results as a reduction in financial distress and an improvement

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<sup>25</sup>Households grappling with unemployment are especially at risk of bankruptcy. [Keys \(2018\)](#) finds that 1,000 additional layoffs more than doubles the bankruptcy rate.

<sup>26</sup>In the short term, the liquidity channel could actually increase bankruptcy filings by providing households with enough money to pay bankruptcy fees. Bankruptcy attorney fees typically cost at least \$1,000, and many households must thus “save up” for bankruptcy ([Gross et al., 2016](#)), filing only when they have the funds to do so. If so, this would make our reduced-form estimates an under-estimate of the liquidity effect operating through lower financial distress.

in recipients' welfare.

**Access to credit.** Disability benefits could affect either the supply of credit or demand for credit. On the supply side, benefits could increase access to credit, prompting lenders to offer more credit cards, bank loans, and mortgages in response to the higher incomes of disability recipients. That increase in access to credit could have two potential effects. First, it could mechanically increase bankruptcy and foreclosure rates since individuals can only default if they have access to credit. Indeed, we find that benefits increase home purchases, which likely means they increase mortgage underwriting. But overall we find that disability benefits lead to a *decline* in bankruptcies and foreclosures, so such an “access to credit” effect would lead us to under-estimate the liquidity effect.

Second, greater access to credit could lead households to roll over debt onto credit cards or other new products and thus avoid default. If this were the case, we would expect the additional loans to postpone bankruptcy but not to eliminate it entirely. Yet the 5-year estimates in Table 3 do not suggest a reversal in the effects on bankruptcy, foreclosure, or home sale in later years. Although we cannot rule out a later increase in adverse financial events entirely, we think it is unlikely based on our long-term estimates.

**Demand for credit.** Disability benefits could also affect demand for credit through an income effect. If credit is a normal good, then disability benefits will increase demand for credit, which could mechanically increase bankruptcies and foreclosures. However, as with greater credit access, this mechanical increase would lead us to under-estimate the liquidity effect.

On the other hand, if credit is an inferior good, then disability benefits will decrease demand for credit, which could mechanically reduce bankruptcies and foreclosures. Although this is possible, we think it is unlikely that demand for credit is decreasing in income for

households with such low levels of income—recall that average annual pre-decision earnings are less than \$20,000. Our calculations from the Survey of Consumer Finances indicate that for the lower part of the income distribution, income is positively associated with applications for credit.<sup>27</sup>

**Incentive Effects.** Another way that disability benefits could mechanically affect financial outcomes is by changing the incentive to file for bankruptcy or repay debts. Suppose, for instance, that disability program rules (e.g., income or asset tests) either impose restrictions on or encourage recipients to file for bankruptcy, default on a mortgage, or buy or sell a home. Or suppose that the bankruptcy process (or foreclosure or home-transaction process) treats disability-program recipients differently than other individuals. In either case, disability benefits would then affect the rates of these financial events.

We rely on institutional details to discuss the expected direction and magnitude of such possible incentive effects. To the best of our knowledge, disability program rules do not affect the incentives to file for bankruptcy or default on a mortgage. Disability benefits are not contingent on bankruptcy or foreclosure status and adjudicators at the SSA are not supposed to consider financial markers like bankruptcy or foreclosure when considering whether to continue a recipient's benefits.<sup>28</sup> In terms of home transactions, the SSI asset test exempts one home, so in principle it is possible that some recipients purchase homes to shift assets from non-exempt to exempt categories in order to maintain eligibility. In practice, however, we find effects on home purchases only for the DI population, not for the SSI population.

Turning to bankruptcy rules, Social Security benefits are exempt from the Chapter 7

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<sup>27</sup>Authors' calculations based on the 2016 Survey of Consumer Finances.

<sup>28</sup>Initial examiners do not interact with the recipient in person during a continuing disability review. Administrative law judges do interact with disability applicants and recipients in person, and we cannot be sure that considerations of financial distress never enter the decision-making process, despite agency guidance to use only medical and vocational criteria.

means test, meaning that allowance onto the programs does not reduce eligibility for Chapter 7. For Chapter 13, Social Security benefits may help recipients create a debt repayment plan that a court is more likely to approve, but we would consider this a liquidity effect rather than an incentive effect. SSDI benefits are protected in bankruptcy, which might increase the incentive to take on debt and file for bankruptcy, but this incentive effect would work in the opposite direction of the reduced-form results.<sup>29</sup> Considering foreclosure, regulations prohibit lenders from garnishing disability benefits to cover mortgage debt not covered by the foreclosure sale, which could increase the incentive to default on a mortgage. But this too would lead to an *increase* foreclosure rates after allowance, which would lead us to under-estimate the liquidity effect.<sup>30</sup>

Finally, turning to home transactions, we are aware of some public lending programs that treat disability recipients differently than other potential homeowners. For example, Connecticut’s “Home of Your Own Program” offers better terms to recipients with disabilities and accepts SSI allowance as proof of disability.<sup>31</sup> This could mean that SSI recipients get better loan terms and therefore are more likely to purchase a house than disability-program applicants who are denied.

Although we cannot rule out these alternative mechanisms, we conclude from the evidence and institutional details that, for the most part, they either work in the opposite direction of our results or would likely be small in magnitude. The most likely channel then is the liquidity channel: disability receipt increases applicants’ liquidity, so they become solvent. Newly allowed applicants can repay their debts rather than default, and this liquidity leads to a decrease in bankruptcies, foreclosures, and home sales for allowed applicants.

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<sup>29</sup>See, e.g., “Bankruptcy Can Help Seniors Protect Assets,” *New York Times*, May 13, 2015.

<sup>30</sup>Section 207 of the Social Security Act, 42 U.S.C. §407.

<sup>31</sup>See <https://mymortgageinsider.com/qualify-mortgage-disability-income>

## 6 Welfare Implications

### 6.1 Direct effects and targeting on financial distress

The results above suggest that disability programs benefit recipients financially in ways that have previously not been studied. Assuming that reductions in bankruptcy and foreclosure translate into reductions in financial distress, as we argue in Section 5, then we can conclude that these results represent increases in the welfare of recipients.

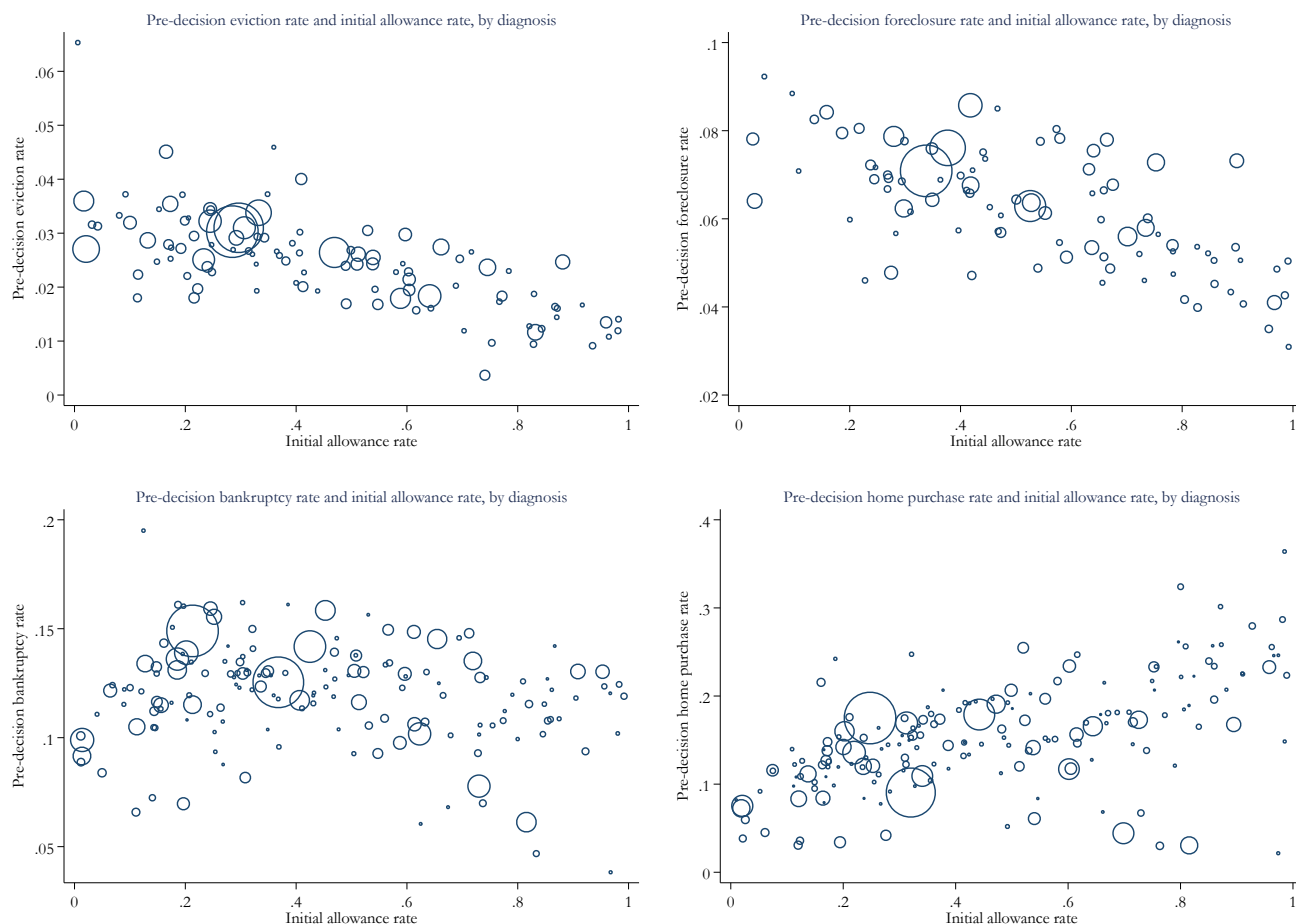
In this section, we assess the magnitude of this welfare gain by studying whether disability benefits go to applicants who are in more or less financial distress. Under the assumptions that we outline, the welfare gain created by disability programs through reductions in financial distress will be larger, all else equal, if disability recipients are in more financial distress when they apply. In effect, we assess how well “targeted” disability programs are in terms of financial distress: are applicants in greater financial distress more or less likely to be allowed onto disability programs? Note that “targeting” on financial distress does not have to be intentional: even if disability allowance decisions are made only on the basis of disability severity, disability programs could be either well-targeted or poorly targeted on financial distress depending on how financial distress is correlated with severity.

We make two main assumptions in this analysis. First, we assume that the marginal utility of consumption is increasing in financial distress. This assumption implies that, all else equal, providing disability benefits to applicants who are in more financial distress produces larger welfare gains than providing disability benefits to applicants who are in less financial distress. Note that this assumption still allows for the marginal utility of consumption to be increasing in the severity of the disability. Second, we assume that the likelihood of initial allowance is based only on disability severity. This assumption allows us to use the likelihood of initial allowance as a proxy for disability severity.<sup>32</sup>

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<sup>32</sup>We think this assumption is reasonable for initial allowance, in which the disability examiner does not see or speak directly to the applicant and does not have information about financial distress. In contrast,

Figure 12: Disability Allowance Rate vs. Pre-Application Financial Event Rate, by Diagnosis



Notes: Figures plot the fraction of applicants allowed at the initial level against the rate of pre-application financial outcome, by diagnosis code. Upper-left graph plots likelihood of allowance against pre-application eviction rate. Upper-right graph plots likelihood of allowance against pre-application foreclosure rate conditional on homeownership. Bottom-left graph plots likelihood of allowance against pre-application bankruptcy rate. Bottom-right graph plots likelihood of allowance against pre-application home purchase rate. The “eviction sample” consists of disability-program applicants with an initial decision in 2005–2014. The “bankruptcy sample” consists of disability-program applicants who have an initial decision date in 2000–2009. The “foreclosure sample” consists of disability-program applicants who appear in the deeds records (homeowners), who have an initial decision date in 2005–2014. The “home purchase” sample consist of disability-program applicants who have an initial decision date in 2000–2014. Samples involve “eviction”, “foreclosure” or “bankruptcy” outcomes exclude ZIP Code of residence at application that has an average of less than five recorded events per year during the corresponding period; samples involve “home sale” and “home purchase” outcomes exclude ZIP Code of residence at application that has an average of less than fifteen recorded corresponding events per year during 2000–2014.

Figure 12 visually depicts the relationship between financial distress and the likelihood of

adjudicators at the appeals levels see and interact with applicant and may have information about financial distress through these interactions.



initial allowance. The figure plots pre-application financial outcomes against the likelihood of initial allowance for each diagnosis group, with the size of the bubble indicating the size of the diagnosis group.<sup>33</sup> The figure suggests that pre-application financial distress is *negatively* correlated with allowance onto the programs. Eviction, foreclosure, and home sales are more common among diagnosis groups that are least likely to be allowed. Conversely, home purchases are positively correlated with the likelihood of allowance.

What are the welfare implications of the negative relationship between allowance likelihood and financial distress? On the one hand, this negative relationship suggests that the welfare gains created by disability programs through reductions in financial distress are not as large as they would be if the likelihood of allowance and financial distress were positively correlated. To see this, consider a counterfactual world in which disability programs were *more* likely to allow applicants in greater financial distress. Then disability programs would have larger welfare gains, all else equal, under our assumption that the marginal utility of consumption is increasing in financial distress.

On the other hand, there is a more optimistic implication of the negative relationship between the likelihood of allowance and financial distress. It means that “mistakes” in the disability determination process are less problematic than they would be in the case of a positive relationship. Suppose that a non-severe applicant is mistakenly judged to have a severe condition and is allowed onto the program, and recall the assumption above that the likelihood of initial allowance is based only on disability severity. If disability severity and financial distress were *positively* correlated, then this mistake would have major welfare consequences. Disability benefits would mistakenly go to an applicant who, on average, has both low financial distress and low severity. But Figure 12 suggests that disability severity and financial distress are *negatively* correlated in reality. This means that the applicant who is mistakenly allowed has (on average) high financial distress despite having low severity.

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<sup>33</sup>Diagnosis groups are based on SSA diagnosis codes, which are a modified version of 3-digit ICD-9 codes.

Since the marginal utility of consumption is increasing in financial distress, disability benefits can still increase the welfare of this applicant substantially. As such, the allowance of less-severe applicants is less problematic for the overall welfare impact of disability programs.

## 6.2 Spillover effects

In addition to disability recipients themselves, the effects of disability programs on bankruptcy and foreclosure may also benefit a diffuse group of third parties. These positive externalities arise because bankruptcy and foreclosure are expensive financial events for other parties. For instance, foreclosure involves a direct cost to local government agencies that have to handle an increase in crime, fires, lower property tax receipts, and have to administer the process of foreclosure. [Apgar et al. \(2005\)](#) estimate that each foreclosure costs local government agencies \$34,000. Each foreclosure also lowers nearby property values ([Campbell et al., 2011](#); [Anenberg and Kung, 2014](#)). [Campbell et al. \(2011\)](#) extrapolate from their difference-in-difference estimates to calculate that each foreclosure lowers neighborhood property values from \$148,000 to \$477,000.

Bankruptcies may also involve a negative externality, though few studies have sought to quantify it. On average, \$167,576 of debt is discharged in each bankruptcy, which could result in lower credit supply and higher interest rates.<sup>34</sup> In addition, each bankruptcy requires oversight and resources on the part of the bankruptcy court and the filer's creditors have to monitor the case.

As a rough back-of-the-envelope calculation, suppose that each foreclosure imposes a social cost of \$145,000, 80 percent of the lower estimate from [Campbell et al. \(2011\)](#) and the public-sector cost estimated by [Apgar et al. \(2005\)](#). It is unclear what analogous number to use for bankruptcy. As a benchmark we consider \$40,000 as the social cost of each

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<sup>34</sup>Authors' calculations based on data from the Federal Judicial Center covering all consumer bankruptcy in the United States in 2008.

bankruptcy, a quarter of the average debt discharged. Simply multiplying these numbers by the estimates above suggests that each disability allowance reduces social costs by \$4,394 through lower foreclosures and bankruptcies. This estimate of social costs prevented by disability allowance is larger than previous estimates of the effect of disability insurance on earnings—for instance, [Maestas et al. \(2013\)](#) estimate that allowance onto SSDI lowers earnings by \$3,781. As another point of comparison, the decrease in social costs amounts to 30 percent of the average annual SSDI benefit amount. This back-of-the-envelope calculation is speculative, but most likely a conservative estimate since we ignore other potential externalities that are beyond the scope of this paper and we use lower bounds from the literature.

## 7 Conclusions

This paper provides the first evidence of the effect of disability programs on financial outcomes. We merge the universe of Social Security disability-program applicants to nationwide records on bankruptcies, foreclosures, and home transactions to create the first-ever national sample of disability applicants linked to financial records. We produce three descriptive findings. First, rates of bankruptcy, foreclosure, and eviction are higher in the disability applicant population than in the general population. Second, rates of bankruptcy, foreclosure, and eviction increase until the month of application, suggesting that disability applicants apply for the program after a period of increasing financial distress. Third, these financial events become less common, even for denied applicants, after the disability decision, suggesting that applicants find other margins of adjustment.

We use this data linkage in combination with a quasi-experiment created by the disability determination process to identify the impact of disability receipt on bankruptcy, foreclosure, and home transactions. We find that disability receipt leads to large reductions

in bankruptcies, foreclosures, and home sales, and increases in home purchases. We consider the mechanisms through which disability benefits can affect financial outcomes, including liquidity, credit access, credit demand, and program rules. We conclude that most of the reduction in bankruptcies and foreclosures reflects a true reduction in financial distress and an increase in recipient welfare.

Our findings lead to two substantive conclusions. First, disability programs reduce the financial distress of their recipients substantially. This evidence on the benefits of disability programs must be considered in the optimal design of disability programs, alongside the moral-hazard costs of the program documented by the previous literature. Second, these estimates imply substantial direct welfare gains and positive externalities from disability receipt. Given that bankruptcies and especially foreclosures have social costs, the programs benefit not only millions of recipients but also third parties. The presence of those externalities warrants further research and investigation, since standard models of social insurance need not apply in the presence of externalities.

Future research should directly measure the effect of disability programs on credit access and credit use. Studying credit outcomes would allow researchers to decompose the effects on bankruptcy and foreclosure into liquidity effects and credit-access effects for a more-accurate assessment of social welfare. It would also provide direct evidence on the hypothesis that landlords and creditors favor disability income for its reliability, and allow researchers to measure the importance of access to credit as another potential benefit of disability programs.

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## A Appendix: Data Sources and Record Linkage

**Home Transactions Data.** In order to match disability-program applicants to home purchases or sales, we combine four separate datasets from two sources: CoreLogic Deeds records, CoreLogic Deeds History records, Zillow Transaction Data, and Zillow Assessment Data. CoreLogic provides extensive coverage of home deeds prior 2000, though buyer and seller names are often missing in many counties. By contrast, buyer and seller names are rarely missing in the Zillow data, but the dataset contains few transactions prior to 1993.<sup>35</sup> Given these data limitations, we “harmonize” the data collected by CoreLogic and Zillow, combining both datasets into one file that we merge to records on disability-program applicants. The CoreLogic datasets provide seller and buyer names, transaction dates and amounts, each property’s address, and the latitude and longitude coordinates of property centroids. If the property’s ZIP Code is missing in the CoreLogic record, we use GIS software and the 2017 ZIP Code boundaries shapefiles from the United States Postal Service (USPS) to impute ZIP Codes.<sup>36</sup> Zillow Transaction Data provides similar information as CoreLogic except that the Zillow data does not include latitude-longitude coordinates for property centroids. In the cases where ZIP Code is missing, we link the property with Zillow Assessment Data and use the ZIP Code associated with the most-recent county record. As a last attempt to impute missing ZIP Codes, we use the property mailing ZIP Codes.

**Administrative Record Linkage.** The bankruptcy data we use was originally compiled by Gross et al. (2016), and is described in their paper. The data consist of names, addresses, the last four digits of each bankruptcy filers’ SSN, and dates of bankruptcy for a majority

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<sup>35</sup>According to our conversations with staff at CoreLogic and Zillow Research, the heterogeneity across counties and years is usually driven by different data-collection protocols and changes in the information-release policies of each county’s assessor’s office.

<sup>36</sup>We obtain 2017 USPS ZIP Code shapefiles from [www.arcgis.com](http://www.arcgis.com). We validate the imputation procedure using CoreLogic records with non-missing ZIP Codes and find that ArcGis boundary shapfiles outperform the 2010 Census ZCTA boundary shapefiles.

of the bankruptcy courts in the United States, Bankruptcy chapter, from the late 1990s through 2010.<sup>37</sup> Since the data include both the last 4 digits of SSNs and filers' ZIP Codes, we perform the record linkage in the following five steps for each state. These steps are meant to address potential recording errors and name variations in administrative datasets. First, we link individuals in the bankruptcy records with SSA disability records using first name, last name, middle initial, ZIP Code, and the last 4 digits of SSN. Second, to account for the possibility that people might apply for disability benefits in a different ZIP Code than the one they used for bankruptcy filings, we use first name, last name, middle initial, and the last 4 digits of SSN as the merge identifier. Third, we use first name, last name, and the last 4 digits of SSN as the merge identifiers to account for potential misreported middle names and location variations. Fourth, we use last name, middle initial, and the last 4 digits of SSN as the merge identifiers to account for potential variations in the first name (e.g., "Tom" versus "Thomas") and allow flexibility in location. In the end, we use last name, the last 4 digits of SSN, and ZIP Code to allow the maximum flexibility in both first name and middle name. Existing successful matches will not be carried over to the next round of merge, and we use at least three merge identifiers to maintain the quality of the record linkage while take potential recording errors into consideration.

For other merges between the disability records and financial outcome records, ZIP Code serves as a key linking variable in the absence of the last 4 digits of SSN<sup>38</sup>. For foreclosure record linkage, we first link individuals in the foreclosure records who have middle names to the disability records using first name, last name, middle initial, and ZIP Code. We then link individuals in the foreclosure records who do not have middle names to the disability records using first name, last name, and ZIP Code. The later step leaves flexibility in middle names.

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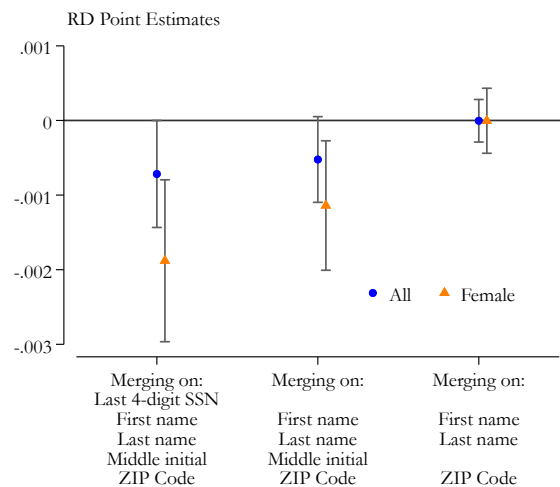
<sup>37</sup>Depending on the bankruptcy district, other information is also included, such as the disposition of the case, the judge, the bankruptcy trustee, whether the filing was *pro se*, and so on. Since those variables are often missing, we do not explore how they relate to disability programs.

<sup>38</sup>Our data vendors do not have the redistribution rights of sensitive information, such as SSN, as part of the public records, and SSN might not be recorded at the time these transactions occurred.



In the cases where we observe the complete middle names in both housing and SSA disability records, we exclude false matched cases based on identical middle initials but different full middle names. To address the name ambiguity, we exclude individuals with more than six events associated under the same first name, last name, middle initial, and ZIP Code<sup>39</sup>. We use the same protocol to merge the disability records with eviction and home transaction records.

Figure A.13: Bankruptcy Record Merge Stimulation with Different Identifiers



Notes: Figure presents a comparison of RD estimates of reduced-form effects based on bankruptcy records linkages using three sets of merge identifiers with different strength. The “all” sample include disability-program applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period. The “female” sub-sample estimates are based on female applicants only, where the reduced form effect is concentrated.

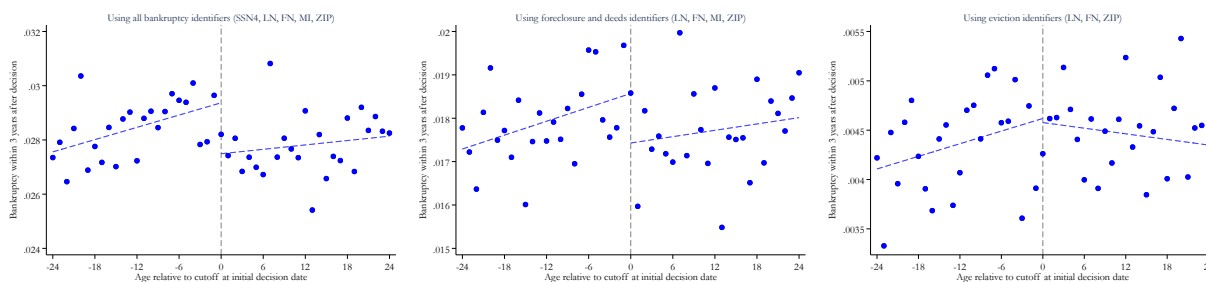
One natural question is that whether ZIP Code can serve as a key identifier. Recent press coverage reveals that many marketing and data analytic companies including FICO has been using consumer names and ZIP Code to track their shopping behaviors.<sup>40</sup>, which suggests that the combinations of name and ZIP Code are quite unique. We probe the validity of this merge strategy with stimulation exercises with bankruptcy records. We first merge the bankruptcy records to disability-program records using first name, middle initial, last name,

<sup>39</sup>For most states, this step will drop less than 1 percent of the total records.

<sup>40</sup>See, e.g., <https://www.forbes.com/sites/adamtanner/2013/06/19/theres-a-billion-reasons-not-to-give-stores-your-zip-code-ever>

last four digits of SSN, and ZIP Code. The resulting RD point estimate for bankruptcy within 3 years of initial decision is -0.000717 for the full sample and -0.00188 for females, described in Figure A.13. We then “coarsen” the merge, ignoring SSNs in performing the merge. The resulting RD point estimate is similar, but with less statistical power. When we solely use first name, last name, and ZIP Code, the point estimate attenuated dramatically and the statistical precision is no longer preserved. Figure TK also demonstrates that the discontinuity in the bankruptcy rate within three years after initial decision gradually disappears when the number of required merge variables decreases.

Figure A.14: Bankruptcy Rate Relative to Applicant Age with Merge Stimulation



Notes: Figure presents a comparison of discontinuities in bankruptcy rates within three year after initial decision based on record linkages with three sets of merge identifiers: using all bankruptcy identifiers (left) – “SSN4, LN, FN, MI, ZIP”, using all foreclosure and deeds identifiers (middle) – “LN, FN, MI, ZIP”, and using eviction identifiers (right) – “LN, FN, ZIP”. These figures are based on the “female bankruptcy sample” which consists disability-program female applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period. “SSN4” indicates the last four digits of Social Security Number. “FN” indicates first name, “LN” indicates last name, and “MI” indicates middle initial.

The stimulation exercise above probes the validity of our merge strategy using names and ZIP Code, especially when the middle name field is well populated for people with middle names. We observe roughly 60 percent of the individuals have middle names associated with their records in the foreclosure and home transactions sample, whereas we only observe about 10 percent eviction records with middle names. As a result, our reduced form results for eviction outcome are too imprecise to be informative. In addition, one might concern the merge strategy using names and ZIP Code will lose flexibility of the applicants residence

location. Although we do not observe the other ZIP Codes in which that applicant lived if the applicant moved before or after applying, we show that the estimates of the causal effect of disability allowance on home purchases, eviction, and foreclosure most likely suffer only from attenuation bias in Appendix B.

## B Appendix: Bias of Unobserved Events

We observe the ZIP Code from which each disability-program applicant applies. As a result, we can observe whether that applicant purchased or sold a home in that ZIP Code in the years after their application. However, if the applicant were to purchase a home in a different ZIP Code, then we would not observe that purchase, having merged the applications to housing transactions by name and ZIP Code. We want to understand how failing to observe purchases, sales, foreclosures, and evictions that occur in ZIP Codes other than the ZIP Code of on the disability application will bias our results.

We consider here the event of a home purchase, but the same analysis applies to foreclosure and eviction. Suppose that, in the absence of disability allowance, the share of applicants who would purchase a home is  $x \in [0, 1]$  and the share who would not purchase a home is  $1 - x$ . Suppose further that a share  $z \in [0, x]$  of the applicants purchase a home outside of their disability-application ZIP Code and the remaining share  $x - z$  purchase a home in their disability-application ZIP Code. In this case, the true fraction of applicants who purchase a home is  $x$ , but the econometrician observes this fraction to be only  $x - z$  since the econometrician observes only the purchases that occur within the applicants disability-application ZIP Code.

**Assumption 1.** *Disability allowance does not shift the location of applicants' inframarginal home purchase decision (or eviction or foreclosure) from within the disability-application ZIP to outside the disability-application ZIP, or vice versa.*

Under Assumption **A1**, disability allowance can affect the decision to purchase a home, but it cannot alter the ZIP Code in which the home is purchased *conditional on the decision to purchase a home* (i.e., inframarginal home purchase). This assumption will be violated if, e.g., the applicant would have purchased a house regardless of disability allowance, but because of the disability allowance purchases the home in a wealthier neighborhood in a different ZIP Code instead of his disability-application ZIP Code.

**Proposition 1.** *Under **A1**, the only bias in estimates of the causal effect of disability allowance on home purchases (or evictions or foreclosures) will be attenuation bias.*

Proposition **A1** states that under the assumption that disability allowance does not alter the location (within-ZIP vs. outside-ZIP) of inframarginal home purchases, the econometrician will be biased against finding a causal effect of disability allowance on home purchases. Any estimated effect, then, will be an underestimate (in magnitude) of the true causal effect of disability allowance on home purchases.

*Proof.* Suppose that allowance onto a disability program increases the probability of home purchase by a fraction  $y \in [0, 1 - x]$ . Suppose that a fraction  $ay$  of the new home purchases occur within the disability-application ZIP Code and the remaining fraction  $(1 - a)y$  occur outside of the disability-application ZIP Code, where  $a \in [0, 1]$ . By Assumption **A1**, the disability allowance does not change the likelihood that inframarginal home purchases occur within the disability-application ZIP instead of outside the disability-application ZIP, or vice versa. The econometrician observes a fraction of applicants  $x - z + ay$  purchasing a home, compared to  $x - z$  under the baseline assumption above. The *observed* effect of disability allowance on home purchases is therefore  $ay$ , which is attenuated relative to the true effect  $y$  since  $0 \leq ay \leq y$  under  $a \in [0, 1]$ . This case corresponds to Scenario 1 in Table **A.7**.

Analogously, if disability allowance *decreases* the probability of home purchase by  $y \in [0, x]$ , then the observed fraction of applicants purchasing a home is  $x - z - ay$  and the

observed effect is  $-ay$ . Again, the observed effect is attenuated since  $-y \leq -ay \leq 0$  under  $a \in [0, 1]$ . This case corresponds to Scenario 2 in Table A.7.  $\square$

Table A.7: Bias of Unobserved Home Purchase Events

Scenario	Effect on home purchase decision	Effect on home purchase outside ZIP	Purchased Home? No	Purchased Home? Yes	Purchased within ZIP	Purc outside ZIP	Ture effect	Observed effect
Control			$1 - x$	$x$	$x - z$	$z$		
1	Positive	No effect	$1 - x - y$	$x + y$	$x - z + ay$	$z + (1 - a)y$	$y$	$ay$
2	Negative	No effect	$1 - x + y$	$x - y$	$x - z - ay$	$z - (1 - a)y$	$-y$	$-ay$
3	No effect	Positive	$1 - x$	$x$	$x - z - b$	$z + b$	$0$	$-b$
4	No effect	Negative	$1 - x$	$x$	$x - z + b$	$z - b$	$0$	$b$
5	Positive	Positive	$1 - x - y$	$x + y$	$x - z + ay - b$	$z + (1 - a)y + b$	$y$	$ay - b$
6	Negative	Negative	$1 - x + y$	$x - y$	$x - z - ay + b$	$z - (1 - a)y - b$	$-y$	$-ay + b$
7	Positive	Negative	$1 - x - y$	$x + y$	$x - z + ay + b$	$z + (1 - a)y - b$	$y$	$ay + b$
8	Negative	Positive	$1 - x + y$	$x - y$	$x - z - ay - b$	$z - (1 - a)y + b$	$-y$	$-ay - b$

Notes: Table summarizes an exhaustive list of scenarios that lead to bias in the causal effect of disability allowance on home purchases. Assumption A1 is satisfied in Scenario 1 and 2, whereas is violated in Scenario 3–8. “Effect on home purchase decision” means the effect of disability allowance on the probability of home purchase. “Effect on home purchase outside ZIP” means the effect of disability allowance on the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP). “(Not) purchase home” indicates the fraction of people who decide (not) to purchase homes with the disability allowance. “Purchase within (outside) ZIP” indicates the fraction of people who decide to purchase homes within (outside) the disability-application ZIP Code.

We discuss below the bias in the causal estimates when Assumption A1 is violated. We conclude that the direction of the bias varies based on the direction of the true causal effect and the direction of the shift of inframarginal home purchases between “within” and “outside” the disability-application ZIP Code.

- I. Suppose that disability allowance has no effect on overall home purchases, but increases the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by a fraction  $b \in [0, x - z]$ . As shown in Table A.7, Scenario 3,  $x - z - b$  of home purchases occur within the disability-application ZIP and  $z + b$  occur outside the disability-application ZIP. Then the observed effect is  $-b$ , which is smaller than the true effect of zero.

If instead disability allowance *decreases* the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by  $b \in [0, z]$ , then  $x - z + b$  home purchases occur within the disability-application ZIP and  $z - b$  occur outside the disability-application ZIP. Then the observed effect is  $b$ , which is larger than the true effect of zero. This case corresponds to Scenario 4 in Table A.7.

- II. Suppose that disability allowance *increases* the likelihood of home purchases by  $y$ , where  $y \in [0, 1 - x]$ , and also *increases* the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by  $b \in [0, x - z]$ . As shown in Table A.7, Scenario 5,  $x - z + ay - b$  of home purchases occur within the disability-application ZIP and  $z + (1 - a)y + b$  occur outside of the disability-application ZIP. Then the observed effect of disability allowance is  $ay - b$ , which is less than the true effect  $y$  since  $(ay - b) - y = -(1 - a)y - b \leq 0$ . However, without additional assumptions, the relationship between  $ay$  and  $b$  is unknown and the observed effect could have the wrong sign if  $ay < b$ .

Analogously, suppose that disability allowance *decreases* the likelihood of home purchases by  $y \in [0, x]$  and also *decreases* the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by  $b \in [0, z]$ . Then the observed effect  $-ay + b$  is greater than the true effect  $-y$  as  $(-ay + b) - (-y) = (1 - a)y + b \geq 0$ , and might have the wrong sign if  $ay < b$ . This case corresponds to Scenario 6 in Table A.7.

- III. Suppose that disability allowance *increases* the likelihood of home purchases by  $y \in [0, 1 - x]$ , but *decreases* the the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by  $b \in [0, z]$ . As shown in Table A.7, Scenario 7,  $x - z + ay + b$  of home purchases within the disability-application ZIP Code and  $z + (1 - a)y - b$  occur outside of the disability-application

ZIP. The relationship between true effect  $y$  and observed effect  $ay + b$  is indeterminate without further assumptions about the values of  $a$ ,  $b$  and  $y$ .

Analogously, suppose that disability allowance *decreases* the likelihood of home purchases by  $y \in [0, x]$ , but *increases* the fraction of inframarginal home purchases made outside of the disability-application ZIP (rather than within-ZIP) by  $b \in [0, x - z]$ . The observed effect is then  $-ay - b$ , and the relationship between  $-ay - b$  and true effect  $-y$  is again indeterminate. This case corresponds to Scenario 8 in Table A.7.

In general, home purchases (or evictions or foreclosures) that occur in other ZIP Codes will bias the econometrician against finding an effect if Assumption A1 holds. The likelihood that these events occur in other ZIP Codes may vary by event. For example, in a given amount of time, it is more likely that a disability applicant purchases a home in another ZIP Code than that a disability applicant purchases a home in another ZIP Code and experiences foreclosure in that home.

With respect to home sales, we assume disability applicants sell only their primary home. In this case, there is little or no bias in the estimate of the causal effect of disability allowance on home sale in the initial years after the disability decision because all home sales must be in the disability-application ZIP Code. In future years, applicants may purchase and then sell homes outside of the disability-application ZIP, and the bias will be the same as in Proposition 1.

In contrast to "gross" home purchases and "gross" home sales, the bias for "net" home purchases (i.e., purchases not immediately followed or preceded by a sale) and "net" home sales is indeterminate even with Assumption A1. The reason is that some purchases (sales) that are part of a move (purchase followed by sale, or vice versa) will be misclassified as "net" purchases (sales) because the other transaction occurs in another ZIP Code and is unobserved. The attenuation bias will bias the estimate toward zero, but the misclassification

bias will bias the estimate away from zero, making the net bias indeterminate.

## C Explanation of Event Study

Figure 3 shows that the risk of financial distress peaks during the year of application and then declines. To develop a more nuanced picture of how financial outcomes evolve around the date of disability application and disability decision, we use an event study design at the month level. We define a cohort of applicants,  $c$ , by the month in which they apply for disability programs. We define event-time,  $d$ , as months until a cohort’s initial decision date. We start with a simple event study design around the date of disability decision, similar to that used by DFKN to study the effect of hospitalizations on financial outcomes:

$$Y_{ct} = \alpha_c + \gamma_t + \sum_d \beta_d D_d + \varepsilon_{ct}.$$

Here,  $D_d$  is an indicator function equal to one if cohort  $c$  reaches event-time  $d$  on month  $t$ . Such a regression specification allows us to capture the average change in financial distress as it evolves before and after initial decision date. This simple regression includes a fixed effect for each cohort,  $\alpha_c$ ; and a fixed effect for each calendar month,  $\gamma_t$ . The coefficients  $\beta_d$  capture how the financial outcome  $Y$  evolves around the date of disability decision.

However, by focusing only on the initial decision date, this simple event study design ignores applicants’ decision of when to apply for disability benefits. If there is selection into the timing of disability application, then the event study design might mis-attribute trends that are associated with the timing of the application to the initial decision instead. Since disability examiners vary in how long they take to decide a case, there is substantial variation in the time between application and decision. Because the application and decision dates are not perfectly co-linear, this variation helps us to separately identify trends associated with the application date vs. decision date. We add a second set of event-time indicators



into the regression specification as follows:

$$Y_{ct} = \alpha_c + \gamma_t + \sum_a \beta_a D_a + \sum_d \beta_d D_d + \varepsilon_{ct}.$$

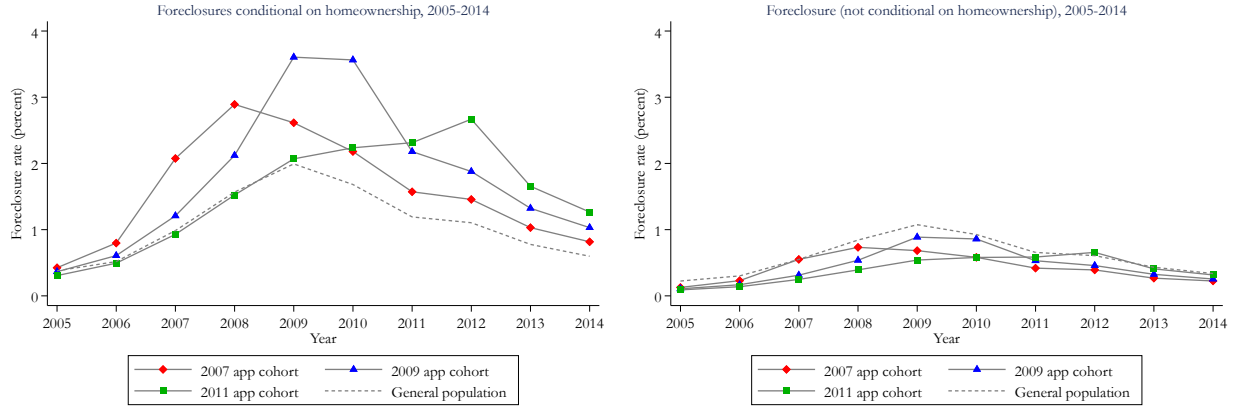
This regression now models financial distress as a function of time since application date and time since decision date, in addition to the effect of calendar time.

Finally, we consider the possibility that allowed and denied applicants differ in how their financial outcomes evolve around the application and decision dates. We allow for this possibility by interacting an indicator for allowed applicants with the application-event-time indicators and the decision-event-time indicators:

$$Y_{ct} = \alpha_c + \gamma_t + \sum_d \beta_d (\text{Allow}_{ct} \times D_d) + \sum_d \beta'_d D_d + \sum_a \mu_a (\text{Allow}_{ct} \times D_a) + \sum_a \mu'_a D_a + \varepsilon_{ct}.$$

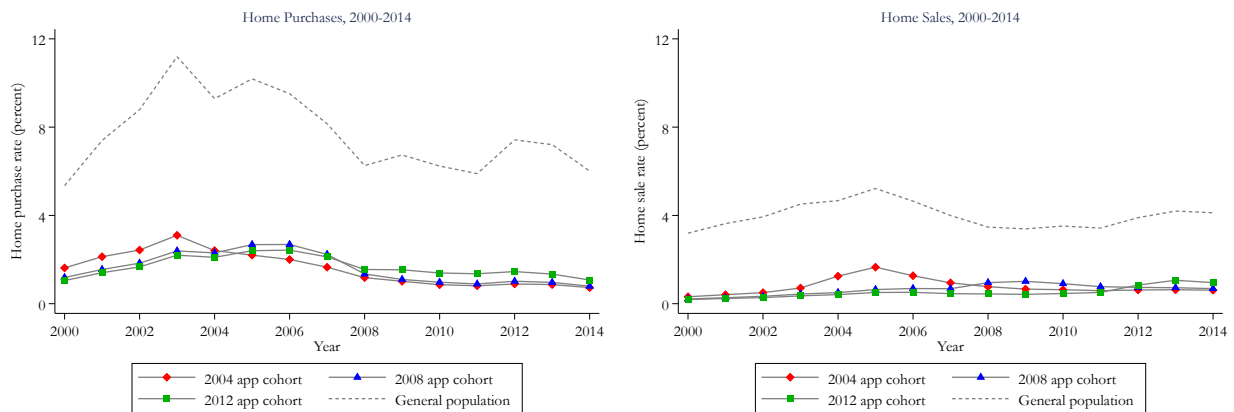
## D Appendix Tables and Figures

Figure A.15: Foreclosure Rates, Conditional on Homeownership and Unconditional



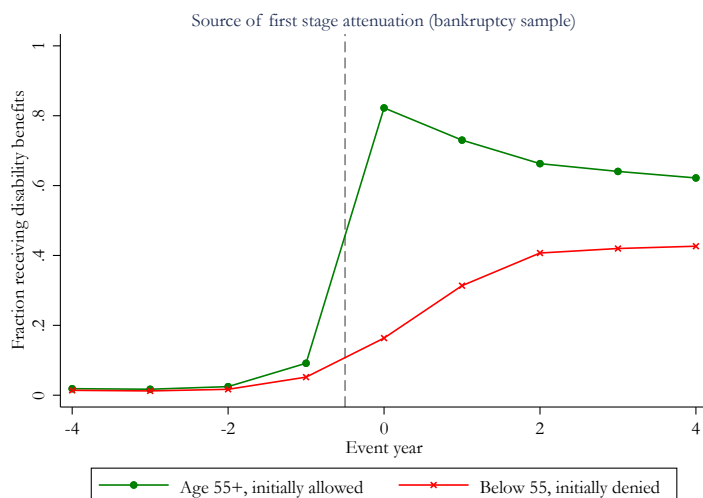
Notes: Figures plot foreclosure rates for disability applicants of different cohorts and for the general population. The left-hand figure plots foreclosure rates for applicants who appear in the deeds records (homeowners), and the right-hand figure plots foreclosure rates for all applicants. Both samples consist of disability applicants with an initial decision date in 2005–2014 whose ZIP code of residence at application has an average of at least five recorded foreclosures per year during this period. The denominator for foreclosure rates for the general population is calculated using the 2010 Census for individuals 18 years or above.

Figure A.16: Home Transaction Rates



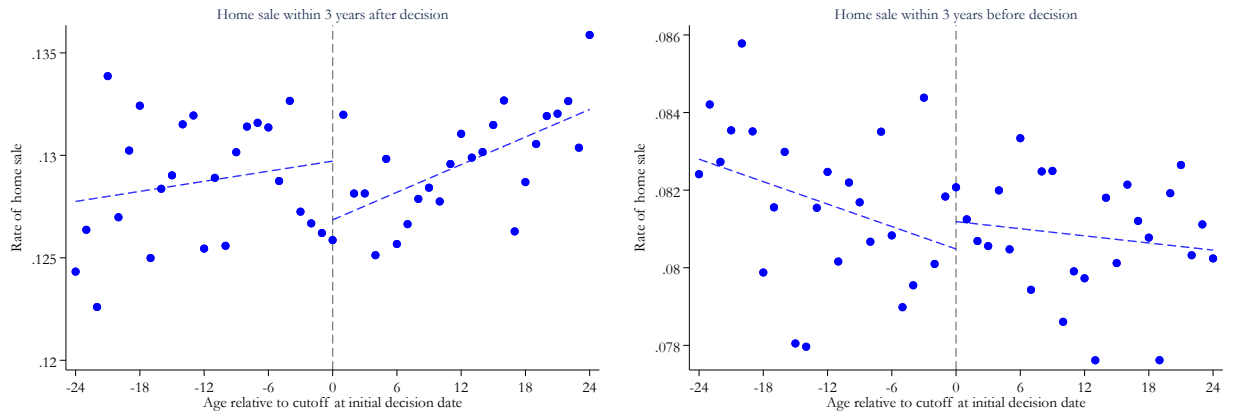
Notes: Figures plot home purchase rates (left-hand-side) and home sale rates (right-hand-side) for the general population. Both samples consist disability applicants with an initial decision date in 2000–2014 whose ZIP Code of residence at application has at least fifteen home purchases (sales) during this period. The denominator for home transaction rates for the general population is calculated using the 2010 Census for individuals 18 years or above.

Figure A.17: Source of First Stage Attenuation



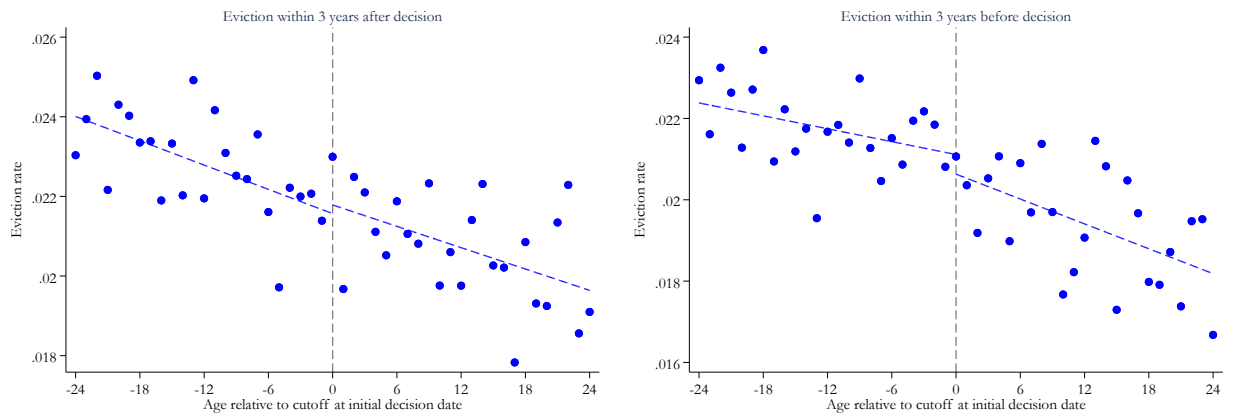
Notes: Figure plots fraction receiving disability benefits relative to the initial decision date for the bankruptcy sample. Green series with circles plots fraction receiving disability benefits in each event year for individuals who are 55 years or older at the initial decision date and have a favorable initial decision. Red series with Xs plots fraction receiving disability benefits in each event year for individuals who are under 55 years at the initial decision date and have an unfavorable decision. Sample is applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application has an average of at least five recorded bankruptcies per year during this period.

Figure A.18: Home-sale Rate Relative to Applicant Age



Notes: Figures plot the home-sale rate within three years after initial decision (left-hand side) and the home-sale rate within three years before initial decision (right-hand side) relative to the disability-program applicant's age at the initial decision date. Age is calculated as months from age 50 or age 55, whichever threshold is closer. This figure is based on the home purchase sample, disability-program applicants who appear in the deeds records (homeowners), who reach stage 5 of the disability determination process, who have an initial decision date in 2000–2014, and whose ZIP Code of residence at application has an average of at least 15 home sales per year during this period.

Figure A.19: Eviction Rate Relative to Applicant Age



Notes: Figures plot the eviction rate within three years after initial decision (left-hand side) and the eviction rate within three years before initial decision (right-hand side) relative to the disability-program applicant's age at the initial decision date for applicants in the eviction sample. Age is calculated as months from age 50 or age 55, whichever threshold is closer. This figure is based on the eviction sample, disability-program applicants who reach stage 5 of the disability determination process, who we identify as homeowners, have an initial decision date in 2005–2014, and whose ZIP Code of residence at application has an average of at least five recorded evictions per year during this period.

Table A.8: Summary Statistics for Foreclosure Sample Unconditional on Homeownership

	Foreclosure sample			
	Full Sample		RD Sample	
	Mean	Std. Dev.	Mean	Std. Dev.
Fraction SSI adults	0.44	0.50	0.44	0.50
Fraction DI adults	0.53	0.50	0.54	0.50
Fraction reaching step 5	0.70	0.46	1.00	0.00
Fraction initially allowed	0.38	0.48	0.35	0.48
Fraction finally allowed	0.53	0.50	0.60	0.49
Mental condition	0.25	0.43	0.16	0.37
Musculoskeletal condition	0.31	0.46	0.44	0.50
Age	45.4	12.6	52.6	2.7
Male	0.53	0.50	0.52	0.50
Pre-decision annual earnings	\$12,237	\$15,787	\$13,489	\$16,053
Years of education	11.8	2.4	11.7	2.4
Ever experience financial event	0.03	0.18	0.04	0.20
Experience event before decision	0.02	0.13	0.02	0.15
Experience event after decision	0.02	0.14	0.02	0.15
Number of states (include D.C.)		45		45
Number of state-ZIPs		18,105		18,105
Number of applicants (millions)		19.3		3.6

Notes: Table presents summary statistics for the foreclosure sample not conditional on homeownership, and within this sample for the “full sample” and for the “RD sample” used in the analysis in Section 4. “Foreclosure sample” is disability applicants who have an initial decision date in 2005–2014 and whose ZIP Code of residence at application has an average of at least five recorded foreclosures per year during this period. “Reaches stage 5” denotes reaching stage 5 of the disability determination process as depicted in Figure 4. “Pre-decision annual earnings” are average annual earnings in the three years before the decision date. “Ever experience financial event” and “experience event before/after decision” is an indicator for filing for experiencing foreclosure. “Number of states” includes the District of Columbia.

Table A.9: Covariate Balance Test

	Foreclosure or home-sale sample			Home-purchase sample		
	Pt. Est. (Std. Err.)	Mean	% of mean	Pt. Est. (Std. Err.)	Mean	% of mean
Covariate						
Pre-application adverse financial event	0.000230 (0.00126)	0.188	0.1%	0.00181*** (0.000634)	0.171	0.1%
Pre-app earnings	257.4*** (69.34)	\$21,179	1.2%	146.8*** (29.08)	\$14,502	0.9%
Years of education	-0.0057 (0.00796)	12.0	0.0%	-0.0183*** (0.00419)	11.7	-0.2%
Musculoskeletal	0.00677*** (0.00162)	0.480	1.4%	0.00850*** (0.000832)	0.441	1.7%
Respiratory	0.000621 (0.000621)	0.037	1.7%	0.000681** (0.000345)	0.044	1.6%
Cardiovascular	0.000796 (0.000981)	0.101	0.8%	0.000983* (0.000518)	0.105	0.6%
Endocrine	-0.00246*** (0.000665)	0.043	-5.7%	-0.00119*** (0.000355)	0.047	-2.6%
Neurological	0.000610 (0.000846)	0.073	0.8%	0.000260 (0.000412)	0.064	0.8%
Mental	-0.00510*** (0.00111)	0.135	-3.8%	-0.00589*** (0.000614)	0.161	-3.6%
Special/other	0.000424 (0.000632)	0.039	1.1%	-0.000791** (0.000355)	0.047	-1.8%
p-value on joint F-test		0.000			0.000	
Predicted adverse financial event occurs	0.000230 (0.00126)	0.188	0.1%	0.000735*** (0.000130)	0.171	0.40%
$N$ (in millions)		1.51			5.64	

Notes: Table reports RD estimates for the listed covariates for foreclosure or sale financial event sample and home-purchase sample, where we put the covariate on the left-hand-side of the RD equation (equation 2) and report  $\beta$ . Table reports the  $p$ -value on the  $F$  test for the joint significance of all covariates. Pre-application earnings are average annual applicant earnings in the three years prior to the year of application, from the Master Earnings File. Years of education is self-reported years of education from the 831 Disability File. Body system codes (musculoskeletal, respiratory, cardiovascular, endocrine, neurological, mental, special/other) come from the 831 Disability File. “% of mean” denotes point estimate as a percent of control mean. For “predicted adverse financial outcome,” we first regress an indicator for having the adverse financial outcome prior to the initial decision date on a set of covariates (pre-application earnings, years of education, male, body system code dummies, and ZIP Code dummies). We then put “predicted adverse financial outcome” on the left-hand-side of the RD equation (equation 2) and report estimates of  $\beta$ . The “foreclosure or home-sale sample” is disability-program applicants who reach stage 5 of the disability determination process, who appear in the deeds records (homeowners), and who have an initial decision date in 2005–2014. The “home-purchase sample” consist of disability-program applicants who reach stage 5 of the disability determination process, and who have an initial decision date in 2000–2014. Sample involves “foreclosure” outcome excludes ZIP Code of residence at application that has an average of less than five recorded foreclosures per year during 2005–2014; samples involve “home-purchase” or “home-sale” outcomes exclude ZIP Code of residence at application that has an average of less than fifteen recorded corresponding events per year during 2000–2014. Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table A.10: RD Estimates of Reduced-Form Effects on Earnings

	First Stage		Reduced Form		<i>N</i> (in millions)
	Initial allowance	Final allowance	Within 1 year	Within 3 years	
	Pt. Est.	Pt. Est.	Pt. Est.	Pt. Est.	
	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	
	[Cntrl. Mean]	[Cntrl. Mean]	[Cntrl. Mean]	[Cntrl. Mean]	
Earnings	0.0939*** (0.00142) [0.262]	0.0463*** (0.00162) [0.524]	-54.13*** (17.74) [\$2,247]	-88.45*** (17.46) [\$2,144]	1.49
Earnings and disability benefit	0.0939*** (0.00142) [0.262]	0.0463*** (0.00162) [0.524]	155.4*** (17.24) [\$3,338]	23.22 (16.78) [\$3,798]	1.49

Notes: Table reports RD estimates of the effect of being 50 years or older and 55 years or older at the initial decision date on the initial allowance rate, the final allowance rate after all appeals, and on the reduced form outcomes, specifically estimates of  $\beta$  from equation (2). The reduced form outcomes reported here are average annual earnings after the initial decision and average annual earnings including disability benefit. Control means are the average value of the variable for applicants who are under age 55 by 4 months or fewer. Estimates here are based on the “bankruptcy sample”: disability applicants who reach stage 5 in the disability determination process, who have an initial decision date in 2000–2009, and whose ZIP Code of residence at application that has an average of at least five recorded bankruptcies per year during this period. Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table A.11: RD Estimates of First Stage and Reduced-Form Effects

	First Stage		Reduced Form			<i>N</i> (in millions)
	Initial allowance	Final allowance	Within 1 year	Within 3 years	Within 5 years	
	Pt. Est. (Std. Err.) [Cntrl. Mean]	Pt. Est. (Std. Err.) [Cntrl. Mean]	Pt. Est. (Std. Err.) [Cntrl. Mean]	Pt. Est. (Std. Err.) [Cntrl. Mean]	Pt. Est. (Std. Err.) [Cntrl. Mean]	
Eviction	0.112*** (0.00179) [0.354]	0.0410*** (0.00187) [0.581]	0.000235 (0.000383) [0.036]	0.000230 (0.000555) [0.010]	0.000157 (0.000636) [0.022]	1.09

Notes: This table reports RD estimates of the effect of being 50 years or older and 55 years or older at the initial decision date on the initial allowance rate, the final allowance rate after all appeals, and on reduced-form outcomes, specifically estimates of  $\beta$  from equation (2). The outcome “eviction” is based on the eviction sample: applicants who reach stage 5 of the disability determination process, who have an initial decision date in 2005–2014, and whose ZIP Code of residence at application has an average of at least five recorded evictions per year during this period. Standard errors in parentheses; control means in square brackets are the average value of the variable for applicants who are under age 50 or 55 by 4 months or fewer. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .