Regression Discontinuity Analyses of the Disincentive Effects of Increasing Social Assistance

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Introduction

"The iron triangle of welfare reform" is a term used to describe the challenge to welfare policy of balancing three goals: providing sufficient standards of living, ensuring adequate work incentives, and keeping government costs low (Blundell, 2006). As suggested by the term, the three goals are often conflicting. Over the course of three chapters, this thesis provides a series of important results for assessing the consequences of diminished work incentives associated with improving standards of living.

The improvement in standards of living studied in this thesis is brought about by an increase in the level of social assistance. The higher level of social assistance has an obvious direct effect on government costs through an increase in the amount paid out to each recipient. However, the higher level of social assistance also has an indirect effect on government costs working through the effect of lower work incentives on the number of recipients.

The increase in the number of social assistance recipients caused by the higher level of benefits reflects an adverse behavioral consequence of improving standards of living. The increase in social assistance distorts incentives to work, making some individuals choose labor market inactivity over employment. Since this consequence is unintended and affects the goal of keeping government costs low, the size of the behavioral response is crucial for governments' assessment of the level of standard of living to pursue through policies affecting the level of social assistance.

The first chapter of the thesis, Chapter 1, estimates the size of the behavioral response to an increase in social assistance of 55 percent taking effect at the age of 25 in Denmark. The chapter estimates the disincentive effect on labor market participation for the unmarried youth with no children and low schooling, covering the period 1999-2006. The chapter finds that the higher

social assistance increases the number of recipients and decreases the number of economically self-supporting individuals. The effect on labor market participation is significantly estimated, yet "relatively modest" in size. Importantly, the estimated cost in terms of reduced labor market participation of increasing benefits also provides the estimate of the potential gain in terms of increased labor market participation of not letting benefits increase. The estimated effect thus implies a "relatively modest" gain from increased labor market participation of not increasing social assistance by 55 percent at the age of 25. Chapter 1 finds that the increase in social assistance is associated with a significant reduction of poverty.

Given the prospect of an only modest gain from labor market participation from a significant reduction in standards of living implied by not letting benefits increase, a relevant question is whether alternative policies exist, that improve work incentives, but without reducing standards of living. In-work benefits that subsidize employment among those with the lowest earnings stand out as an example of such an alternative way of increasing work incentives without reducing living standards among the unemployed. In-work benefits provide earnings subsidies for workers with low earning and thereby aims at supporting the "working poor".

This type of policy is especially relevant given the finding in Chapter 1 that the larger part of the estimated behavioral response comes from individuals in jobs, who chose labor market inactivity as the level of benefits increases. Only a smaller part of the estimated effect comes from more individuals staying on the social assistance program as the level of benefits increases (one third of the total disincentive effect). The finding that the larger part of the estimated labor market participation response (the remaining two thirds) comes from individuals in employment implies that a policy effectively aimed at retaining employment has the largest potential for countering the adverse behavioral effect of providing a high standards of living for social assistance recipients.

In-work benefits, of which the Earned Income Tax Credit in the US and the Working Tax Credit in the UK are well-known examples, improve work incentives by subsidizing earnings at the lower end of the earnings distribution. In evaluating the desirability of introducing an in-work benefit component in tax-benefit systems Immervoll et al. (2007) rely on government costs of providing earnings subsidies to be financed by higher taxes on those who do not receive the subsidies, i.e., those with higher earnings. The assessment of the efficiency of such a policy therefore depends crucially on how incentives affect those who gain from the program, those with low earnings, compared to those who bear the additional tax-burden, those with higher earnings. That is, efficiency depends

on how the response to incentives relates to earnings.

Chapter 2 of the thesis estimates the behavioral response to higher benefits over the distribution of earnings by applying a recently developed framework for applying the regression discontinuity approach for estimating heterogeneous treatment effects (see Becker et al. (2013)). The chapter finds the response to higher benefits at the age of 25 to be highly concentrated at the bottom of the earnings distribution. Although Chapter 2 does not necessarily advocate implementing an in-work benefits component in the Danish tax-benefit system, the finding of a strong concentration of the response among those with low earnings speak in favor of the efficiency of introducing such a component. Had the findings shown participation responses to be more uniformly distributed across earnings, the results would speak less favorable of the efficiency of such program. Chapter 2 is the first study relying on a quasi-experimental design for the estimation of the relationship between earnings and labor supply elasticities.

The findings of Chapter 2 are also important for the characterization of those who are affected by the disincentives of higher social assistance. The chapter estimates the effect of increasing social assistance among those who before benefits increase to the "high" level, have earnings of at least the "low" level of benefits prevailing at the age of 24. The chapter finds that only those with earnings of less than the "high" level of benefits respond, strongly supporting the view that participation responses are strongest for those with the lowest potential earnings (see e.g. Bargain and Doorley (2011)).

Given the high level of benefits by international standards, a concern regarding the Danish social assistance program is that the level of generosity to a large extent displaces employment characterized by relatively strong labor market attachment. Chapter 3 of the thesis builds on the evidence from Chapter 2 that responsiveness to increased benefits is in fact highly correlated with weak labor market attachment, as indicated by the high correlation between low earnings and the behavioral response at the age of 25. Chapter 3 finds that the entire response to higher benefits among those who are in the labor force at the age of 24 is explained by individuals with very weak labor market attachment. Half of the response is explained by those with the very lowest earnings, the other half by individuals in short-term part-time jobs.

The findings that the disincentive effect of higher social assistance is "relatively modest", yet associated with a significant reduction of poverty, and the finding that those who do respond are characterized by low earnings and weak labor market attachment, this thesis provides important

information for balancing the trade-off between providing sufficient standards of living, ensuring adequate work incentives, and keeping government costs low, in particular regarding the question of the extent to which the gains associated with lowering the level of social assistance, justifies the corresponding decrease in the standards of living.

Summary

An age-dependent rule in the Danish social assistance system significantly increases the level of social assistance at age 25 by 55 percent. The change in benefits corresponds to an increase from an average OECD level to the highest level in all OECD countries.

Chapter 1 of this thesis estimates the effect on labor market participation for both low-educated single men and women without children. It does so by applying a regression discontinuity approach on weekly observations on the full population of Denmark covering the period 1999-2006. The findings reveal significant participation elasticities with respect to the benefit level of similar magnitude for both sexes. The estimated effect is modest in size and very much in line with previous findings from Canada and France for less generous transfers, thereby suggesting that increases in benefit levels produce similar participation elasticities irrespective of the initial benefit level. Exploiting the detailed panel data to decompose the estimated effect into entries and exits, Chapter 1 finds that two thirds of the disincentive effect is due to new recipients entering the program. This findings suggest that a policy that is capable of retaining employment, for those at risk of responding to lower incentives, could effectively reduce the larger part of the adverse behavioral response.

Chapter 2 of this thesis estimates the treatment effect on labor market participation over the earnings distribution of the increase in social assistance. It does so by applying a recently developed framework for applying the regression discontinuity approach to estimate heterogenous treatment effects, termed HLATE. Chapter 2 finds that the labor market participation response to higher benefits is strongly concentrated at the bottom of the earnings distribution with significant treatment effects for earnings below the higher benefit level. The estimated treatment effect is zero for earnings in the higher end of the distribution. The chapter validates the empirical specification by showing that dividing the population into sub-groups according to earnings and applying the standard regression discontinuity approach yields very similar results. Finally, Chapter 2 proposes an alternative approach to estimating heterogenous treatment effects by applying the standard regression discontinuity framework to compute the local average treatment effect for a sequence of overlapping pairs of earnings groups. This new approach, which I term "the moving local average treatment effect" (MLATE), is arguably easier to specify and validate than the HLATE, yet useful for many empirical applications.

Given the high level of benefits by international standards, a concern regarding Danish social assistance is that the level of generosity to a larger extent displaces employment characterized by

strong labor market attachment. Building on the findings in Chapter 2 of a strong negative correlation between earnings and disincentive effects of increased social assistance among the unmarried youth with low schooling and without children, Chapter 3 analyses the interaction of the response to higher benefits with the components of earnings. By applying a regression discontinuity approach to the age-dependent rule in the Danish social assistance program, the chapter estimates the associated disincentive effects on labor market participation of the increase in social assistance at the age of 25 according to wages, weekly hours of work, and labor market participation during the year. Chapter 3 finds that half of the disincentive effect for individuals in the labor force at age 24 is explained by those with the lowest earnings and weakest labor market attachment. Individuals in short-term part-time jobs explain the other half. Jointly the two groups fully account for the total estimated treatment effect of eligibility to the higher benefit level. The participation decision among those in jobs of at least one year's duration is not affected by the lower work incentive taking effect upon turning 25 years old.

Chapter 3 finds that hourly wages are only weakly correlated with responsiveness to higher social assistance. Comparing this finding with the findings in Chapter 2 suggests that total earnings matter more for participation responses than hourly pay. As only those with low labor market attachment, indicated by low earnings or few hours of weekly work on a short-term basis, are affected by the associated lower incentives, the findings of this chapter suggest that the cost associated with providing the more generous benefits are lower than previously shown.

Finally, Chapter 3 addresses the role of demand for labor in explaining the large response of part-time jobs. By including information on changes in employment within the firm, the chapter presents suggestive evidence that low labor demand plays an important role in the explaining disincentive effects of higher social assistance, and deserves further attention in future research.

Resumé

Ydelsesniveauet i det danske kontanthjælpssystem afhænger af alder og stiger med 55 procent, når man fylder 25 år. Denne ændring i ydelsesniveauet svarer til et skift fra det gennemsnitlige OECD-niveau til det højeste niveau blandt alle OECD-lande.

Kapitel 1 i denne afhandling estimerer effekten af denne stigning i ydelsesniveau på antallet af kontanthjælpsmodtagere og på antallet af personer, der er selvforsørgende. Effekten estimeres for ugifte mænd og kvinder uden bøern, som kun har en grundskoleuddannelse, når de fylder 25. Effekten estimeres ved hjælp af et "regression discontinuity design", hvor der anvendes ugentlig observationer på hele den del af den danske befolkning, der fylder 25 år i perioden 1999-2006.

Den estimerede negative deltagelseselaticitet med hensyn til ydelseniveauet er signifikant, og af samme størrelse for begge køn. Effektens er af beskeden størrelse og fuldt ud sammenlignelig med størrelsen af den estimerede effekt i lignende studier fra Canada og Frankrig, hvor ydelseniveauet er lavere både før og efter stigningen. Dette indikerer, at stigninger i ydelsesniveau giver anledning til negative deltagelseseffekter af samme størrelse uanset størrelsen af ydelsesniveauet inden stigningen. Den estimerede effekt opdeles i den del der skyldes nye kontanthjælpsmodtagere og den del, der skyldes at flere kontanthjælpsmodtagere bliver i kontanthjælpssystemet foranlediget af stigningen i ydelsesniveauet. Dekomponeringen viser, at to tredjedele af den samlede effekt skyldes personer, der kommer til kontanthjælpssystemet fra beskæftigelse. Resultatet indikerer at beskæftigelsespoiltik, der fokuser på fastholdelse for dem, der er i "risiko" for at blive påvirket af det lavere incitament til arbejde, kunne være et effektivt redskab til reducere størstedelen af den utilsigtede negative beskæftigelseskonskvens af et højere ydelsesniveau.

Afhandlingens andet kapitel estimerer den negative deltagelseseffekt af det højere ydelsesniveau i forhold til arbejdsindkomstfordelingen. Effekten estimeres ved hjælp af en ny tilgang til estimation af heterogene effekter i anvendelse af et "regression discontinuity design". Den heterogene effekt kaldes HLATE. Resultatet viser, at den negative deltagelseseffekt af det højere ydelsniveau er størst i bunden af arbejdsindkomstfordelingen. Effekten er signifikant for arbejdsindkomster, der er lavere end det høje ydelsesniveau ved 25 år, men lig nul for arbejdsindkomster herover. I kapitlet valideres den empiriske specifikation ved at vise, at man ved at inddele befolkningen i mindre grupper i forhold til niveauet af arbejdsindkomsten, og derefter anvender den normale "regression discontinuity design"-tilgang til at estimere effekten, kan opnå meget lignende resultater. I Kapitel 2 introduceres også en alternativ tilgang til at estimere heterogene effekter. Den foreslåede metode

består i at estimere effekten på tværs af indkomstgrupper, som hvis man ville beregne et glidende gennemsnit. Jeg kalder den estimerede heterogene effekt for "the moving local average treatment effect" (MLATE). Denne tilgang kan være lettere at specificere og validere end estimation ved hjælp af HLATE, og kan vise sig anvendelig i mange forskellige sammenhænge.

Det at ydelsesniveauet er højt i det danske kontanthjælpssystem sammenlignet med andre landes kan give anledning til bekymring om hvorvidt det højere ydelseniveau i større udstrækning er med til at fortrænge beskæftigelse, blandt dem med en relativt stærk arbejdsmarkedstilknytning. I Kapitel 3 tages udgangspunkt i resultatet fra Kapitel 2, der på viste en stærk korrelation mellem den negativ deltagelseseffekt og arbejdsindkomst for ugifte med lavt uddannelsesniveau og uden børn. Kapitel 3 analyserer forbindelsen mellem de elementer, der udgør den samlede arbjedsindkomst og det at reagere på det højere ydelsniveau. Ved hjælp af "regression discontinuity designet" estimeres den negative deltageseseffekt af stigningen i ydelsesniveauet i forhold til timeløn, antallet af ugentlige arbejdstimer og den årlige arbejdsmarkedsdeltagelse. Resultaterne i Kapitel 3 viser, at halvdelen af den samlede negative incitamentseffekt kan forklares ved den del af befolkningen, der har den laveste arbejdsindkomst og arbejdsmarkedstilknytning. Den anden halvdel kan forklares ved at personer, der har været ansat i kortere tid i deltidsbeskæftigelse reagerer på det højere ydelsesniveau. Tilsammen forklarer disse to grupper hele den negative incitamentseffekt blandt personer, der er i arbejdsstyrken i slutningen af det år, hvor de fylder 24. De der har været i beskæftigelse hos den samme arbejdsgiver i mindst et år, reagerer ikke på stigningen i ydelsesniveauet ved de 25 år.

Kapitel 3 viser yderligere, at timelønsniveauet kun er svagt korreleret med det at reagere på det højere ydelsesniveau. Sammenlignet med resultatet fra Kapitel 2, der viste en stærk korrelation mellem arbejdsindkomst og det at reagere på det højere ydelsesniveau, indikerer resultatet, at den samlede arbejdsindkomst er et vigtigere parameter i beslutningen om arbejdsmarkedsdeltagelse end timelønnen er. Det at det er dem med den laveste arbejdsmarkestilknytning der reagere på det højere ydelseniveau indikerer yderligere, at omkostningerne ved et højere understøttelsesniveau kan være lavere end hidtil vist.

Til sidst i Kapitel 3 analyseres arbejdskraftefterspørgslens rolle i forklaringen på hvem der reagerer på det højere ydelsesniveau. Ved at inddrage information om ændringer i beskæftigelsesomfanget i virksomheden vises, at arbejdskraftefterspørgsel kan være en væsentlig del af forklaringen på motivationen for at reagere på stigningen i kontanthjælpsniveauet. Dette aspekt af negative incitamentseffekter er et oplagt emne for fremtidig forskning på område det.

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Regression Discontinuity Analyses of the Disincentive Effects of Increasing Social Assistance

Contents:

Chapter 1

Disincentive Effects of a Generous Social Assistance Program

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Abstract

An age-dependent rule in the social assistance system increases the level of social assistance significantly at the age of 25 in Denmark. This study estimates the effect of increasing social assistance on labor market participation for both low-educated single men and women without children. It does so by applying a regression discontinuity approach on weekly observations on the full population of Denmark over an eight-year period. The findings reveal an important negative labor market participation effect of similar magnitude for both sexes. Exploiting the detailed panel data to decompose the estimated effect into entries to and exits from social assistance, the paper finds that two thirds of the estimated disincentive effect is due to new recipients entering the program.

Keywords: Regression Discontinuity, Disincentive Effects, Social Assistance

1. Introduction

The benefit level of anti-poverty programs, such as social assistance, is directly related to minimum standards of living. This study provides new evidence on the classic topic in economics of determining the extent to which such public income transfers suppress labor market participation. It does so by estimating the work disincentive effect associated with increasing social assistance in Denmark, where the level of benefits, after the increase, is among the world's most generous.

A recent study of U.S. anti-poverty programs reports a major impact on poverty rates in general, an impact affected only negligibly by work incentives (Ben-Shalom et al., 2011). By far the highest poverty rates of any of the examined groups in the study are found among the non-elderly, non-disabled childless families with no continuously employed members. Accordingly, the study finds this demographic group to be the most under-served by the system. It therefore appears that, in

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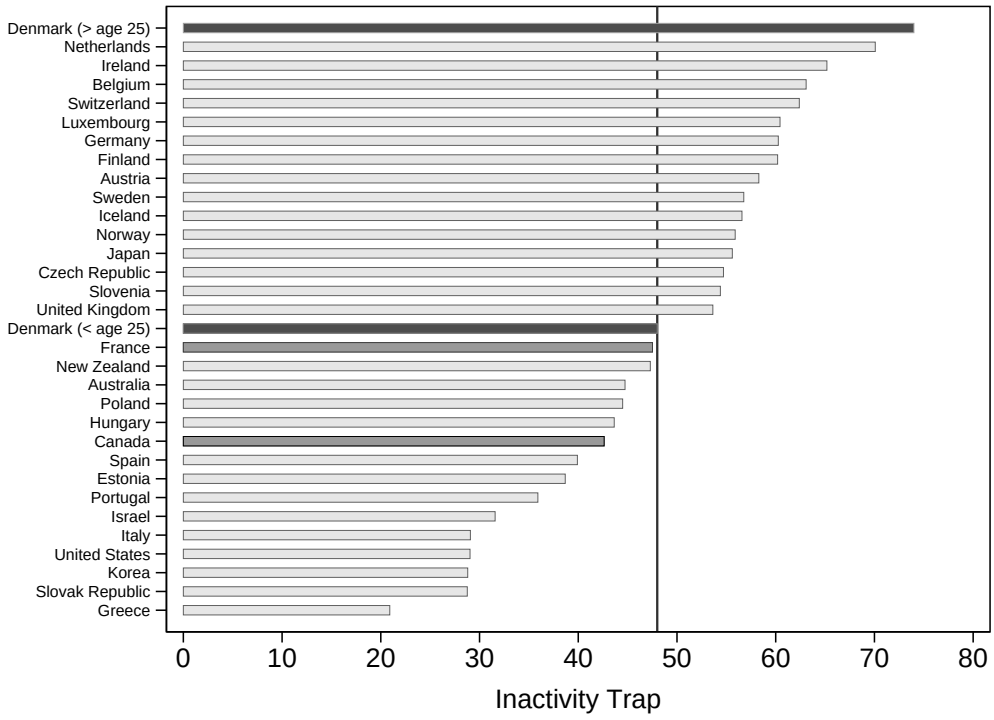
the U.S., not serving the childless youth with weak labor market attachment comes at the cost of substantial poverty.

But how large are the costs, in terms of labor market participation, of providing a higher minimum standard of living for the young without children? The literature on the labor supply responsiveness of the young, single and childless is scarce, but two recent studies relying on age-dependent rules in the Canadian and French social assistance programs suggest only a "relatively modest behavioral effect" of providing higher benefits for single men in this demographic group (Lemieux and Milligan, 2008; Bargain and Doorley, 2011).

Figure 1 shows the level of benefits relative to wages of OECD countries according to the "inactivity trap" for individuals without children, a measure stating the average effective tax rate of a transition from unemployment to employment for individuals who are eligible for social assistance but not entitled to unemployment insurance benefits (OECD, 2011b).[1] As indicated by Figure 1 the level of benefits relative to wages is around the OECD average in Canada and France, the two countries for which recent estimates of the labor supply responsiveness of the young, single and childless exist. Lemieux and Milligan (2008); Bargain and Doorley (2011) estimate the labor market participation response associated with increasing social assistance from a low level to around the OECD average indicated in Figure 1. The question remains, however, what the costs are of extending the generosity of social transfers further.

[1]The measure relates social assistance and other means-tested benefits to work income of an average worker of age 40, and states the average effective tax rate associated with a transition into full-time work (earning average wages) for a person with no children, without entitlement to unemployment insurance, but entitled to social assistance in 2010. The ranking in Figure 1 is based on work income of 100 percent of the average wage (OECD, 2011b).

Figure 1: Average Effective Tax Rates for a Transition into Full-time Work



Note: The "inactivity trap" states the average effective tax rate of a transition from unemployment to employment for individuals who are eligible for social assistance but not entitled to unemployment insurance benefits. The measure relates social assistance and other means-tested benefits to work income of an average worker of age 40, and states the average effective tax rate associated with a transition into full-time work (earning average wages) for a person with no children, without entitlement to unemployment insurance, but entitled to social assistance in 2010. The ranking in Figure 1 is based on work income of 100 percent of the average wage. However, the position of Denmark remains unaffected by varying shares of the average wage. The measure of "the inactivity trap" for Denmark for individuals below the age of 25 is the author's calculation.

Source: OECD (2011b)

Figure 1 shows Danish recipients receiving the highest social assistance benefits relative to wages in the OECD, suggesting that Danish social assistance recipients face strong work disincentives. This top position is partly a consequence of the benefit level increasing by 55 percent at age 25 in Denmark for individuals without children, corresponding to an increase of 11 percent of average monthly earnings.[2] Figure 1, while not taking into account taxes and other benefits, also plots the inactivity trap measure before the 55 percent increase in benefits, placing the Danish average effective tax rate for individuals below 25 at the OECD average.[3] That is, for the Danish population below 25, the social assistance benefit level relative to wages is comparable to the average OECD level. At age 25, however, the benefit level increases significantly. As a result, Danish social assistance recipients of age 25 receive the most generous transfers relative to wages among OECD countries. This paper estimates the associated additional participation response of increasing minimum income levels relative to wages from around the OECD average to the highest level among OECD countries for young individuals without children.

To summarize, the existing literature suggests no important disincentive effects of providing low levels of generosity to the young and childless with weak labor market attachment, as exemplified by the US anti-poverty programs (Ben-Shalom et al., 2011). Lemieux and Milligan (2008) and Bargain and Doorley (2011) provide estimates of the disincentive effects of moving from low levels to around the OECD average level of generosity of social assistance relative to wages. By applying regression discontinuity approaches both Lemieux and Milligan (2008) and Bargain and Doorley (2011) estimate a "relatively modest behavioral effect" of providing higher benefits for young, single, childless men. This paper fills an important gap in the literature by providing comparable estimates of the additional participation costs of moving from average to high levels of generosity of social assistance benefits. Importantly, the absolute increase in benefits as a share of average wages analysed in this study is similar to the increases studied in both Lemieux and Milligan (2008) and Bargain and Doorley (2011).[4]

[2] Author's calculations based on data on average annual wages from "OECD Employment and Labour Market Statistics (database)" (OECD, 2011a).

[3] Ignoring other benefits and taxes, 65 percent of the Danish average effective tax rate for a transition into full-time work, corresponds to benefits before the increase of 55 percent at 25, and a measure of the "inactivity trap" of around the OECD average (OECD, 2011b). Thus, the benefits to wage ratio in Denmark is approximately at the OECD average for people who have not yet turned 25.

[4] Lemieux and Milligan (2008) analyses a relative increase in benefits of 175 percent at the age of 30; Bargain and Doorley (2011) an increase of 162 percent at the age of 25. These large relative increases, however, are relative to a low initial level of benefits. As the initial level of benefits in the current study for those below age 25 are larger than

This paper applies a regression discontinuity approach to the age-dependent rule in the Danish social assistance program to estimate the disincentive effect on labor market participation associated with the significant increase in benefits at age 25. It does so for both unmarried men and women who neither have children before age 26 nor have any level of education beyond compulsory schooling at 25.[5] The regression discontinuity estimates for unmarried women are new to the literature. In addition to contributing to the limited literature on the static participation effects for the young and childless, the paper analyses the dynamics of the response to higher benefits. The paper provides details on the process of adjustment to the change in rules and a novel decomposition of the disincentive effects into entries to and exits from the program.

The paper is organized as follows. Section 2 presents the details of the Danish social assistance program and related programs. Section 3 describes and graphs the data. Section 4 outlines the empirical approach and reports the regression discontinuity results. Section 5 presents the decomposition of the estimated disincentive effect. Section 6 discusses the results, and section 7 concludes.

2. Institutional Setting

Social assistance in Denmark is means-tested. Any other sources of income are subtracted from the total social assistance amount received. Only for married couples do benefits depend on the income of a partner. Benefits are not related to previous income, and eligibility rules have remained unchanged in the period of observation, 1999 to 2006. Benefit levels depend on age, living arrangements, and parental status.

Social assistance recipients below the age of 25 are eligible for benefits of 6,660 Danish kroner (DKK) per month (USD 1,110).[6] At the age of 25, the benefit level increases to DKK 10,300 per month (USD 1,716), regardless of living arrangements.[7] Importantly, parents responsible for

in the two related studies, the relative increase is smaller (55 percent). As a share of average wages, however, Danish benefits increase by 11 percent, Canadian benefits by 13 percent (measured by 1990 wages), and French benefits increase by 16 percent of average wages (calculations based on the benefit levels stated in the respective studies and data on average annual wages from (OECD, 2011a).

[5] I look at individuals who did not have children before age 26 as not to capture the effects of fertility decisions at the threshold age of 25.

[6] All amounts are expressed in 2012 pre-tax levels.

[7] Before turning 25 those who live with their parents are eligible for around half of the amount of those who do not live with their parents. Toomet (2005) estimates the difference in pre-tax income of social assistance recipients before and after they turn 25 in the period 1999-2001 and confirms that income indeed increases at 25 for individuals without children. For the group of 21-to-29-year-olds, he finds that turning 25 is associated with an average increase

children receive higher benefits, irrespective of age.[8] I will use the feature of age-independence of benefit levels for parents to show that behavioral responses at the age of 25 among non-parents are indeed related to the change in benefit levels. As parents are "non-treated" in the sense that the level of social assistance does not change at the age of 25 we should expect no behavioral response at that age among individuals who are parents at the age of 25.

There is no limit on benefit duration. Recipients below the age of 30 must participate in an active labor market program after 13 weeks. Recipients found "ready for the labor market" are subject to job search requirements. Eligibility rules prohibit wealth beyond a maximum of DKK 10,000 (USD 1,666) and are contingent on a "social event", such as unemployment, which has made the applicant unable to maintain economic self-support or support of his or her family. Low income is not itself a sufficient condition for eligibility. Jonassen (2013) shows that too much wealth at the age of 24, in general, is not a concern for eligibility among those with compulsory schooling only at the age of 25.[9]

The main outcome in this paper is the ratio of social assistance recipients to the population. However, to confirm that an increase in the number of social assistance recipients at the age of 25 is related to labor market participation, and not simply due to individuals transitioning to social assistance from other programs, I use economic self-support as an additional outcome. Showing that a "jump" in social assistance is associated with a similar "drop" in self-support confirms that the increase in the number of social assistance recipients is related to labor market participation and not to a change in the composition of participants of different programs caused by the increase in social assistance at the age of 25.

In addition to social assistance, three programs are candidates for discontinuously influencing economic self-support around the age threshold of 25 and thus deserve some attention. The three programs are unemployment insurance, an adult apprenticeship program, and the Danish publicly

in income of 73 percent. The estimation in Toomet (2005) includes recipients below age 25 who live with their parents and who therefore are eligible for only around half of the level of benefits of those not living with parents. Upon turning 25, however, individuals living with their parents are eligible for the same higher benefits as individuals not living with their parents, meaning that they experience an increase in benefits of 222 percent at 25. This large increase explains why the pre-tax social assistance estimated in Toomet (2005) increases by more than 55 percent on average for individuals without children.

[8]The benefit levels for parents correspond to 130 percent of the benefit level of non-parents above 25.

[9]In addition, potential applicants for social assistance can arguably relatively easily exhaust any bank deposits above DKK 10,000 before applying for social assistance. Furthermore, less liquid assets are unlikely to pose an important barrier for eligibility in the demographic group in question, i.e., the unmarried youth without children and a low level of schooling (see 3).

provided educational support in the form of study grants. The first two programs, unemployment insurance and adult apprenticeship, are subject to age-dependent rules around the age of 25, making the programs more attractive or accessible at that age. The age-dependence of eligibility for these programs therefore entail the possibility that any observed "drop" in economic self-support could be caused by these rules of either the unemployment insurance scheme or the adult apprenticeship program rather than by the age-dependent rule of the social assistance program.

Eligibility for unemployment insurance benefits requires membership of an unemployment insurance fund. The change in eligibility rules of the unemployment insurance program around the age of 25 could therefore potentially affect the number of economic self-supporting individuals in the population, but not the number of social assistance recipients. However, Section 3 shows that the rules associated with the unemployment insurance program should not, and indeed do not, produce discontinuities in the number of unemployment insurance benefit recipients, and therefore do not discontinuously affect the number of self-supporting individuals at the age of 25.

The adult apprenticeship program entails a subsidy for firms when taking on an apprentice above the age of 25 who does not already have an education. The apprentice may enter the program from either employment or unemployment, but as the option exists only for individuals who have turned 25 years old, the program can only affect the self-support ratio after the age of 25. Without accounting for the existence of the program, one runs the risk of interpreting the associated decline in self-support as being due to the increase in social assistance benefits. To avoid overestimating the influence of the change in benefits on the ratio of self-support I, throughout the paper, control for the influence of the adult apprenticeship program on self-support by adding to the ratio of self-supporting individuals to the population the ratio of individuals on the adult apprenticeship program to the population. Section 3 provides further details.

The study grant program has no age-dependent rule around 25, but as social assistance benefits increase at the age of 25, these benefits come to exceed the study grants of the states educational support. Consequently, the disincentives created by a higher level of social assistance may include educational attainment. However, as the next section shows, the increase in social assistance benefits does not affect the number of individuals receiving study grants, and therefore does not discontinuously affect the number of self-supporting individuals at the age of 25.

3. Data

The main dataset is extracted from a database called DREAM, maintained by the Danish Labor Market Authority. The database contains weekly information on all public income transfers in Denmark.[10] The selected dataset consists of all Danish residents who turned 25 in the period 1999-2006, where the rules of eligibility for social assistance remained unchanged.[11] I observe each individual in each week from four years before turning 25 until four years after, comprising a dataset including information from the period 1995-2010. Each individuals is thus observed with weekly observations over an eight-year period, from age 21 through 28, implying 416 observation per individual.

To estimate the individual labor supply response to the increase in benefits at the age of 25 I restrict attention to individuals who where not married at the age of 25.[12] As the level of benefits increases for non-parents only, I further restrict attention to those who did not have children before the age of 26.[13] The population of individuals who did not have children before age 26 comprises 200,000 unmarried men and 160,000 unmarried women.[14] Potential benefits for the selected individuals are thus related to age (below or above the age of 25) but not conditional on the income of a partner at the age of 25.

Those who become parents before age 25, who are therefore not eligible for an increase in benefits at 25, consists of 17,000 unmarried men and 32,000 unmarried women. I use this group of "non-treated" individuals to confirm that behavioral responses at the age of 25 among non-parents are indeed related to the change in benefit levels. As parents are "non-treated" in the sense that the level of social assistance does not change at the age of 25 we should expect no behavioral response

[10] Additional information on individual educational attainment, marital status and children was obtained through registers maintained be Statistics Denmark.

[11] The age-dependent rule of increasing benefits at the age of 25 was introduced in 1998. In 2006 a new rule concerning eligibility for those below the age of 25 was introduced. According to this new rule the local labor market agency could refuse social assistance to applicants below the age of 25 with low schooling who were assessed capable of undertaking further schooling. The new rule was implemented during 2007, meaning that eligibility for social assistance from 2007 differed for those above and below the age of 25.

[12] As mentioned in the previous section, benefits of married couples depend on the spouses income in the Danish social assistance program. In the sample only 2 percent of individuals without children were married at the age of 25.

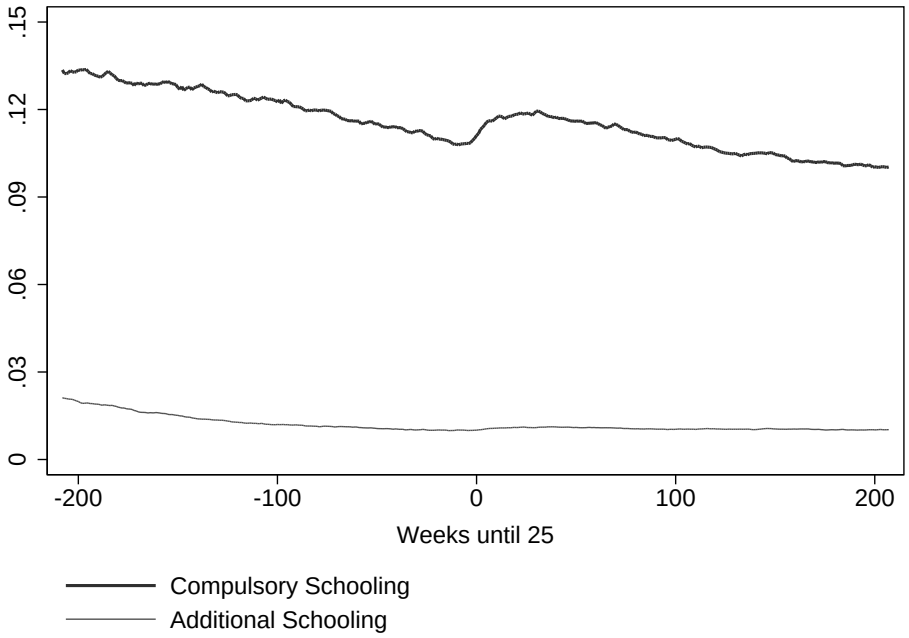
[13] I condition on not having children before the age of 26 to avoid fertility decisions affecting outcome in the period immediately after change in eligibility.

[14] I exclude immigrants and children of immigrants from the analysis due to different rules of eligibility and differences in living arrangement, both of which affect eligibility. Immigrants were eligible for a lower social assistance benefit level in the first seven years of residency in Denmark in the period of observation. The impact of the program of lower benefits for immigrants is studied in Rosholm and Vejlin (2010).

at the age of 25 in this group.

In the group of unmarried individuals with no children, by far the highest percentage of social assistance recipients is found among the part of the population that at the age of 25 had completed no more than compulsory schooling (9-10 years of schooling). The week before turning 25, around 11 percent of all individuals with only compulsory schooling were receiving social assistance, while the average for individuals with some additional schooling was 1 percent. Figure 2 shows the ratio of social assistance recipients to the population for those with compulsory schooling only and for those with some additional schooling at ages 21-28, i.e., 208 weeks prior to turning 25 and 208 weeks after. Week zero indicates the week of turning 25.

Figure 2: Social Assistance by Schooling, Ratio to the Population

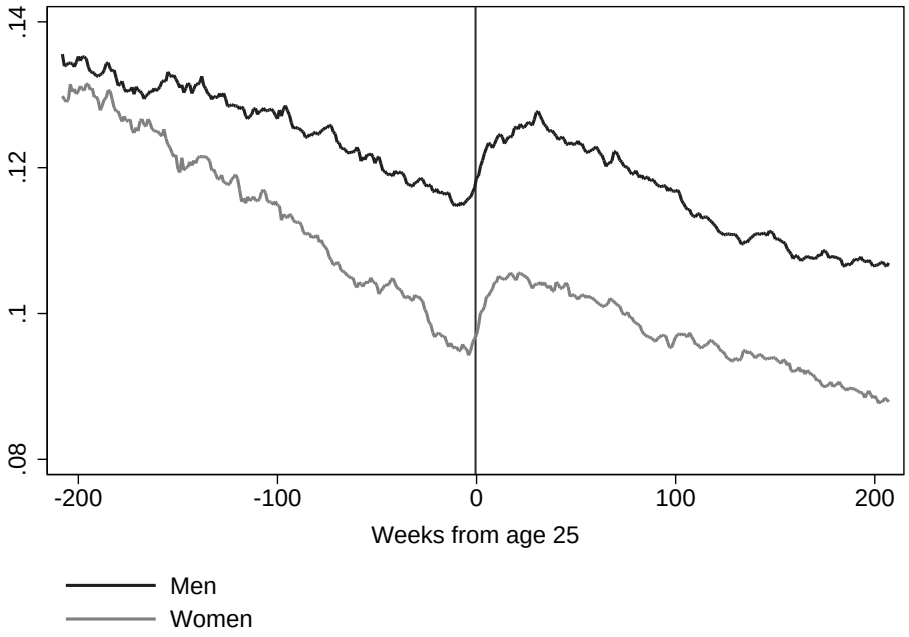


The group with only compulsory schooling at the age of 25 also constitutes the largest component of social assistance recipients by far, accounting for 72 percent of all recipients in the week of their 25th birthday, while comprising only 19 percent of the population. Consistent with the findings in Bargain and Doorley (2011), Figure 2 shows no evidence of any important adverse response to the

higher benefits at the age of 25 for those with some additional schooling beyond the compulsory level.[15] Due to their relative importance in the social assistance system I restrict attention to those with no more than compulsory schooling at age 25 throughout the rest of the paper.

The group with no more than compulsory schooling at the age of 25 consists of 44,000 men and 23,000 women. Figure 3 plots the ratio of social assistance recipients to the population for this group at ages 21 through 28, i.e., 208 weeks prior to turning 25 and 208 weeks after. Week zero indicates the week of turning 25. The figure shows a sharp increase in the share of social assistance recipients at week zero, i.e., in the week of turning 25. The size of the increases in social assistance at week zero is similar for men and women.

Figure 3: Social Assistance by Gender, Ratio to the Population



Given that treatment is determined by age, individuals are able to fully foresee the increase in income at 25 before turning 25, meaning that the adjustment of labour supply could be expected to

[15]This is also the conclusion when looking at different levels of additional schooling separately.

occur before age 25.[16] A key concern in recovering the causal effect of turning 25 on the likelihood of receiving social assistance, therefore, is whether individuals react to the age-dependent rule prior to turning 25. Such anticipation effects would bias the estimated effects towards zero.

Figure 3 reveals no important anticipation effects. The ratio of social assistance recipients to the population exhibits a steady decline with no indication of any important increase before week zero.[17] This apparent lack of important anticipation effect should not be surprising: Anticipation effects require consumption smoothing over time periods. Reacting prior to the increase in benefits is therefore unlikely among the group "at risk" of receiving social assistance, a group likely to be credit constrained.

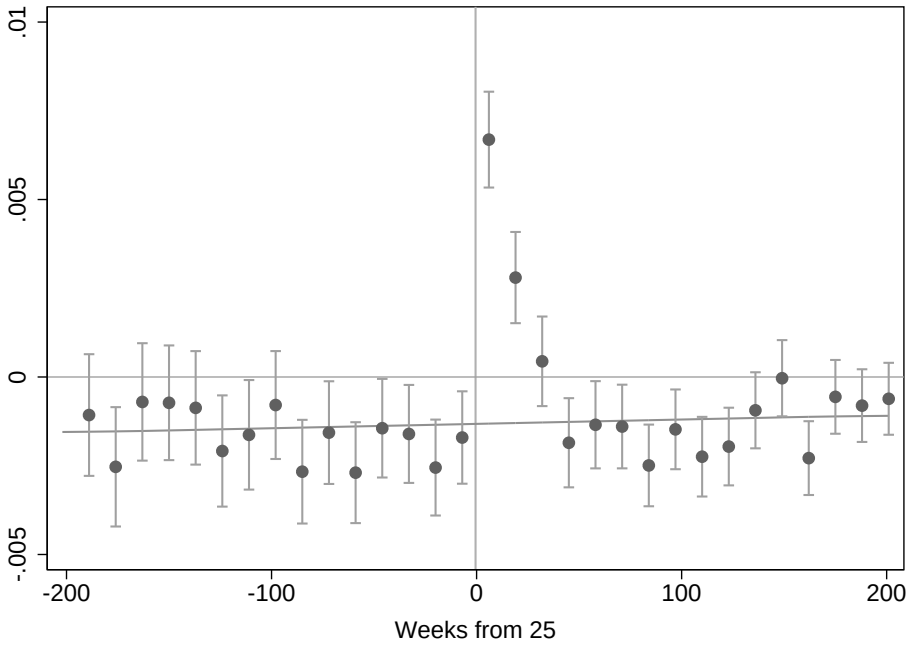
Figure 3 also suggests that adjustment to the change in the benefit level takes place within a short period immediately following week zero. After the response time of around six months (26 weeks), the social assistance rate starts to decline, and returns to a trend similar to a continuation of the one observed between ages 21 and 24. This pattern becomes even clearer in Figure 4, which plots the quarterly rate of change in the social assistance ratio to the population. That is, Figure 4 groups age by quarters and plots the change in the social assistance ratio from the previous quarter. For expositional convenience, I show men and women together in the graphs that follow.[18]

[16] Given the future prospect of increased benefits, some individuals may choose labor market inactivity over employment even if this implies receiving the lower level of benefits in a period before the age of 25. Such anticipation effects could arise from either job separation or diminished search efforts.

[17] This finding is consistent with that in Lemieux and Milligan (2008) showing that the last observation before the cutoff is on the regression line.

[18] All conclusions remain the same when analysing men and women separately.

Figure 4: Change in Social Assistance Ratio to the Population, Men and Women



Note: Figure 4 groups age by quarters and plots the change in the social assistance ratio from the previous quarter. Spikes indicate 95 percent confidence intervals.

Figure 4 indicates a steadily evolving relationship between age and the rate of change in the social assistance ratio from age 21 through 24, i.e., weeks -208 to 0. The first observation after the discontinuity at week zero is a notable exception to this pattern, showing a "jump" in the rate of change in the social assistance ratio to the population. In the second period after the cutoff, i.e., four to six months after the discontinuity, the change in the social assistance ratio continues to increase before returning to the trend in the rate of change before the change in benefit level.

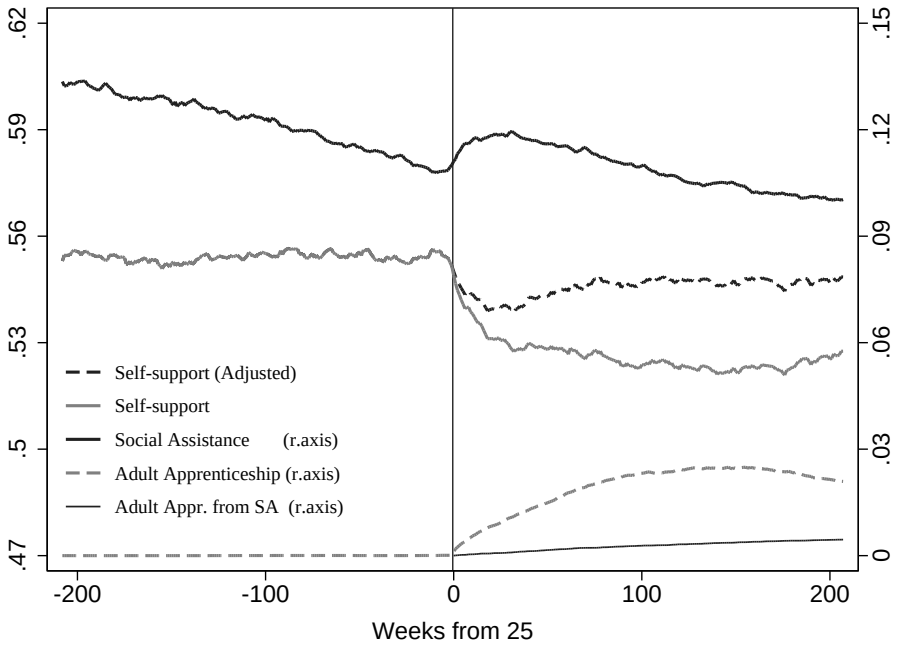
In the presence of any important anticipation effects the rate of change in the social assistance ratio in Figure 4 should exhibit an increase before the discontinuity. Figure 4 clearly shows no such increase prior to the increase in benefits at week zero.

As mentioned in Section 2, the increase in social assistance may not coincide with a corresponding drop in economic self-support if the change in social assistance is caused by individuals changing from one type of public income transfer program to social assistance in response to increased ben-

efits. In DREAM all individuals who receive a public income transfer are recorded along with the type of transfer they receive, but the DREAM database does not contain employment information for the period of observation.

Figure 5 shows five lines: the ratio of social assistance recipients to the population, the ratio of self-supporting individuals to the population, an adjusted ratio of self-supporting individuals to the population, participants of the adult apprenticeship program to the population, and the accumulated number of individuals transitioning from social assistance to the adult apprenticeship program as a ratio to the population.

Figure 5: Self-support and Adult Apprenticeship, Ratio to the Population



Note: "Self-support (Adjusted)" is calculated by adding to the ratio of self-supporting individuals the ratio of participants of the adult apprenticeship program. "Adult Appr. from SA" shows the accumulated number of individuals transitioning from social assistance to the adult apprenticeship program as a ratio to the population.

Figure 5 shows that the decline in self-support is much larger than the increase in social assistance just after the cutoff at week zero. The larger decline in self-support is due to the adult apprenticeship program taking effect at the age of 25 (see Section 2). The figure shows that the ratio of individuals

on the adult apprenticeship program to the population increases from zero to around 1 percent 26 weeks after week zero.

To avoid interpreting the large decline in self-support as being due to the increase in social assistance benefits, I add to the ratio of self-supporting individuals the ratio of participants of the adult apprenticeship program.[19] Figure 5 shows the resulting adjusted ratio of self-supporting individuals to the population. The decline in the adjusted self-support ratio just after the cutoff corresponds to the increase in social assistance. I use the adjusted ratio of self-supporting individuals to the population to define self-support throughout the rest of the paper.

Finally, Figure 5 also addresses the concern that the adult apprenticeship program affects the number of social assistance recipients to the population. If an important number of social assistance recipients transition from social assistance to the adult apprenticeship program immediately after turning 25, the number of social assistance recipients would arguably be significantly higher in the absence of the adult apprenticeship program. The existence of the adult apprenticeship program could then lead to an underestimation of the effect of higher benefits on the number of social assistance recipients.

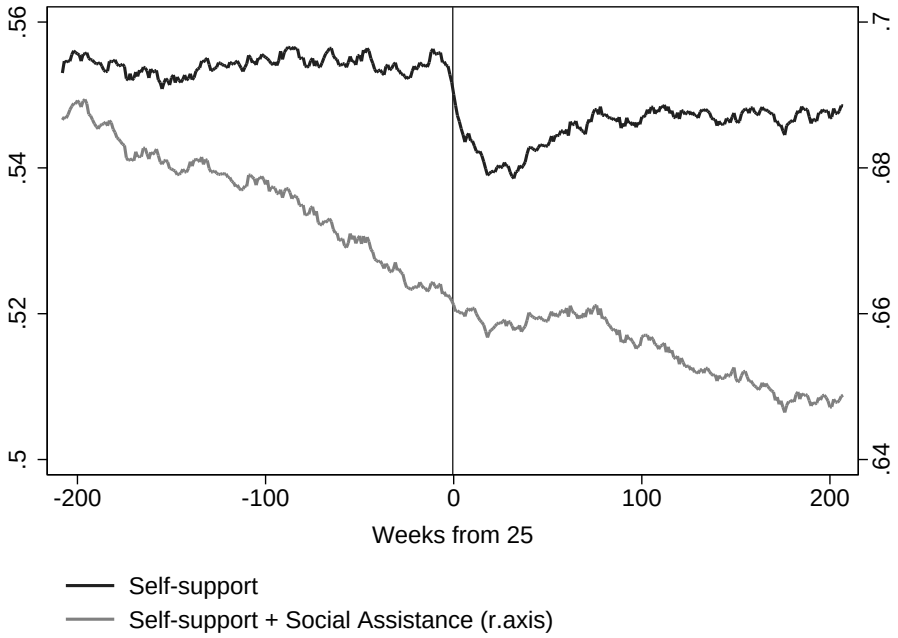
Figure 5 shows the accumulated number of individuals transitioning from social assistance to the adult apprenticeship program as a ratio to the population. The figure clearly shows that very few individuals make the transition from social assistance to the adult apprenticeship program just after the cutoff at week zero, implying at most a negligible potential influence on the social assistance ratio to the population.

Figure 6 plots the (adjusted) ratio of self-support to the population along with the sum of the ratio of (adjusted) self-support and the ratio of social assistance recipients to the population.

As indicated by Figure 5, Figure 6 shows that the ratio of self-support to the population "drops" by a similar magnitude to the observed increase in social assistance (see also Figure 3). Figure 6 also shows that the sum of the ratio of self-support and the ratio of social assistance recipients to the population does not exhibit any "drop" at week zero. Thus all variation leading to the observed drop in self-support is captured by the increase in social assistance. In other words, after controlling for the increase in social assistance there is no additional drop in self-support to be explained by potential changes in other programs. Moreover, the "jump" in social assistance is not greater than

[19] This corresponds to treating participation in the adult apprenticeship program as employment.

Figure 6: Self-support and Social Assistance, Ratio to the Population



Note: "Self-support + Social Assistance" shows the sum of the the ratio of self-supporting individuals to the population and the ratio of social assistance recipients to the population. Figure 6 shows that the ratio of self-support to the population "drops" by a similar magnitude to the observed increase in social assistance (see also Figure 3). Figure 6 also shows that the sum of the ratio of self-support and the ratio of social assistance recipients to the population does not exhibit any "drop" nor any "jump" at week zero.

the drop in self-support.

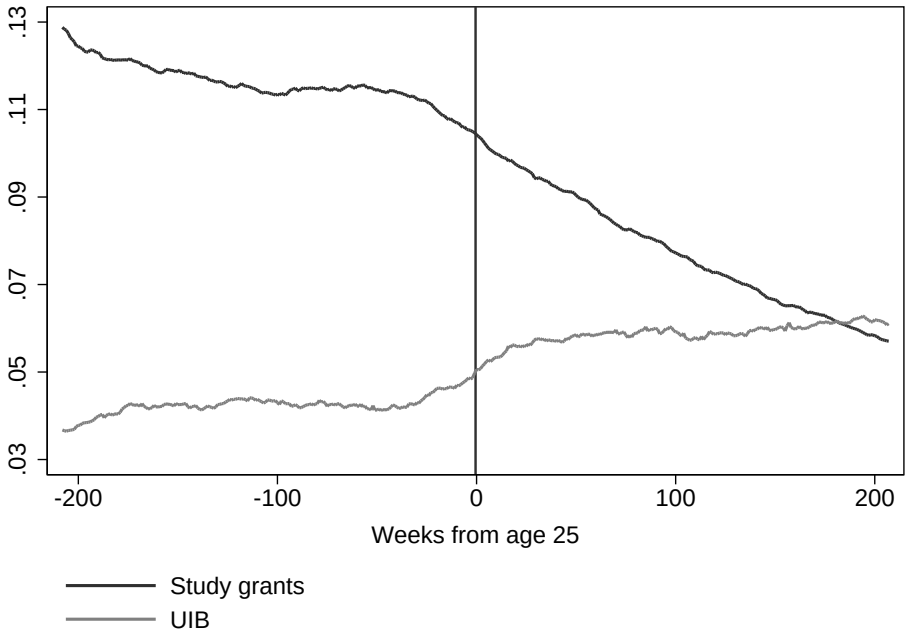
The question remains whether the observed change in self-support reflects an equivalent change in employment. As eligibility requirements are the same for ages 21-29, there is ex ante no reason for expecting that non-working eligible individuals would wait until reaching the age of 25 to collect social assistance.[20] That is, even if the number of economically self-supporting individuals does not correspond perfectly to the number of employed individuals in a given week, there is no reason to expect this discrepancy to be affected at the age of 25 as only the level of benefits and not the rules of eligibility changes upon turning 25 years old. I therefore argue that the change in self-support is closely related to the change in employment at the cutoff-age of 25.[21]

Unlike the simple rule of the social assistance program, the age-dependent rule in the unemployment insurance (UI) program (see Section 2) implies that individuals with UI who are below the age of 25 and without education (of more than 18 months duration) beyond higher secondary level, will have their UI benefits cut by 50 percent after 26 weeks of unemployment if they have not worked fulltime for two years within the past three. Therefore, individuals planning to exploit the more favorable eligibility conditions would gain from the change in rules by taking up unemployment 26 weeks before turning 25. The rules of the UI system should therefore not produce discontinuity in the share of recipients at 25. As eligibility for unemployment insurance benefits requires membership of an unemployment insurance fund, the change in eligibility rules of the unemployment insurance program around the age of 25 does not affect the number of social assistance recipients, but could potentially affect the number of economic self-supporting individuals in the population. Figure 7 addresses this potential concern, but shows no jump in UI recipients at week zero, meaning that the change in eligibility rules of the unemployment insurance program around the age of 25 does not affect the number of self-supporting individuals at the age of 25. The figure also plots the share of individuals receiving study grants from the State which also shows no discontinuity at age 25 (see Section 2).

[20] Moreover, as mentioned in Section 2, low income is in principal not a sufficient condition for eligibility, which requires some "event", such as unemployment.

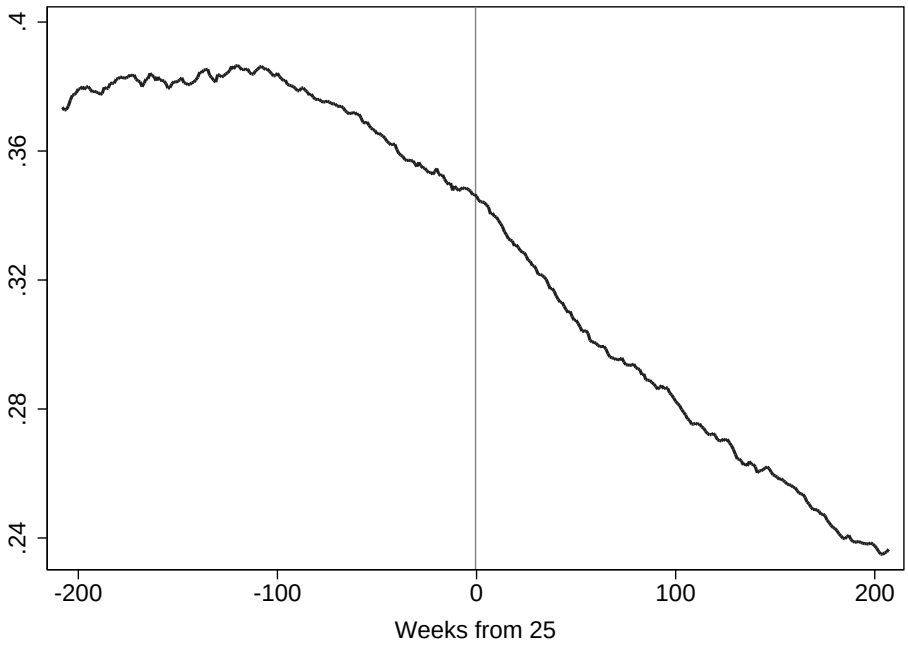
[21] Previous studies using DREAM data also assume a close relationship between employment and not receiving income transfers. Svarer (2011) estimates effects of sanctions, while Graversen and van Ours (2008), Rosholm and Svarer (2008) and Geerdsen (2006) use DREAM to estimate threat effects of active labor market programs for Danish unemployment insurance benefit recipients.

Figure 7: Study Grants and UI Benefits, Ratio to the Population



Before turning to the regression discontinuity estimation, Figure 8 shows the social assistance ratio to the population for individuals who were unmarried but had at least one child at the age of 25. Individuals in this group were not eligible for an increase in benefits, as those who became parents before age 25 were eligible for a higher benefit level before turning 25. I use this group of "non-treated" individuals to confirm that the behavioral response at the age of 25 among non-parents is indeed related to the change in benefit levels. That is, absence of a response at the age of 25 among parents is evidence in support of the assumption that no other factors than the change in benefit levels for non-parents affect labor market participation discontinuously at the age of 25. Conversely, a finding that the number of parents receiving social assistance changes discontinuously at the age of 25 would be evidence that other factors than the change in the level of benefits discontinuously affect the propensity of receiving social assistance at the age of 25. Figure 8 shows no sign of a "jump" in social assistance in the group of "non-treated" individuals at week zero, confirming that the "jump" in the group of "treated" non-parents, presented in Figure 3, is indeed related to the change in the social assistance benefit level at the age of 25.

Figure 8: Social Assistance, Parents at the age of 25, Ratio to the Population



4. Estimation

The regression discontinuity (RD) approach is attractive due to high internal validity and its close resemblance to randomized control trials (Imbens and Lemieux, 2008). Given the assumption of the RD design, variation in treatment is "as good as random" (Lee and Lemieux (2010). Nonetheless, we cannot view the current study as we would a randomized control trial. As the forcing variable is age, individuals can fully anticipate treatment (Lee and Lemieux, 2010). However, the previous section showed that the ability to anticipate treatment does not jeopardize inference in the current application as individuals do not respond prior to the change in eligibility to higher social assistance.

Applying an RD approach in this study requires a constant policy rule but does not rely on policy reform to recover a causal relationship. This study uses such a constant policy rule over the course of eight years. This large time-span reduces the influence on any particular periodical shift in economic conditions.

Using the change in eligibility at 25, I apply the RD approach to estimate the behavioral labor market participation response at that same cutoff. Treatment in this study consists of eligibility for a higher level of social assistance. For everyone eligible, the probability of treatment rises from 0 to 1 at age 25, making this a sharp regression discontinuity design.

The main identifying assumption of the RD approach is that of no discontinuities aside from that in treatment. If all other factors behave continuously around the cutoff, then any observed jump in outcome can be attributed to the change in the probability in treatment. The possibility of cheating with age is zero given the central registration of all individuals. As the forcing variable is age and time cannot be manipulated, manipulation of the forcing variable is not a concern (Lee and Lemieux, 2010).

Specifically, the identifying assumption is that factors affecting employment or educational decisions do not exhibit any "jumps" around the cutoff age of 25. That is, factors affecting outcome are allowed to depend on age, just not discontinuously so around the cutoff. Taking into account any smooth relationship between age and all other relevant characteristics, I thus assume that individuals just below age 25 are otherwise identical to individuals just above age 25. As I use panel data, individuals in the control group, i.e., those just below the age of 25, are identical to the individuals in the group of treated, i.e., those just above the age of 25. Identification does not require panel data, but the assumption of no discontinuity in individual characteristics on each side of the cutoff becomes all the more compelling when the individuals being compared are actually the same, merely observed at different points in time.

The empirical model to be estimated is:

$$Y_{ia} = \beta_1 TREAT_{ia} + \delta(a) + \varepsilon_{ia}$$

where $Y_i a$ is the outcome for individual i in week a, i.e., social assistance or self-support in one of 416 weeks running from -208 to 207. $TREAT_{ia}$ takes the value 1 for $a \geq 0$, meaning that individual i has turned 25 and is eligible for the higher benefit level, and 0 otherwise. $\delta(a)$ is a continuous function capturing the effect of age on the outcome variable. In all regressions I adjust standard errors to account for multiple observations per individual by clustering on the individual level. Furthermore, all regressions include individual fixed effects.

As previously mentioned, and illustrated by Figures 3 and 4, response times to the change in rules plays an important role when using weekly observations. The reaction to the higher benefit

level is quick but not instantaneous. As the observed increase in social assistance in response to the change in rules occurs from week zero to the peak after approximately six months (see Figure 3), failing to take into account this process of adjustment (i.e., assuming an instantaneous response at week 1) would lead to an underestimation of the true impact of the change in benefit levels.

Accordingly, I allow for response time in the empirical model. I do so by including a dummy for each week defined as being within the period of response.[22] An alternative approach could be that of grouping data into larger time periods to decrease the influence of the period of adjustment on the estimated regression line.[23] However, as the response time to a change in rules is an object of interest in itself, on which this study reveals new evidence through the detailed nature of the applied panel data, I present the results from not grouping observations on age.[24] I present the results with and without allowing for response time.

I estimate the increase in social assistance and corresponding drop in self-support by applying different polynomial specifications for $\delta(a)$. I use the linear spline, quadratic spline and cubic spline, thereby allowing for flexible specifications with different slopes on either side of the cutoff. Figure 9 presents the graphical representation of the empirical specification for men and women using the most flexible specification, the cubic spline, and allowing for no response time, 13 weeks of response, and 26 weeks of response time, respectively.

[22] I thank Professor Sascha O. Becker for suggesting this solution to dealing with response time.

[23] Lemieux and Milligan (2008) and Bargain and Doorley (2011) apply groupings on quarters and years, although for different reasons. Lemieux and Milligan (2008) have access to annual data, while Bargain and Doorley (2011) apply quarterly and yearly groupings to reduce noise in their sample.

[24] Applying groupings of 1 to 4 quarters produces very similar results to those from the more explicit modelling of response times through inclusion of response time dummies. Results are available from the author upon request.

Figure 9: RD, Cubic Spline, Response Time: 0, 13 and 26 Weeks

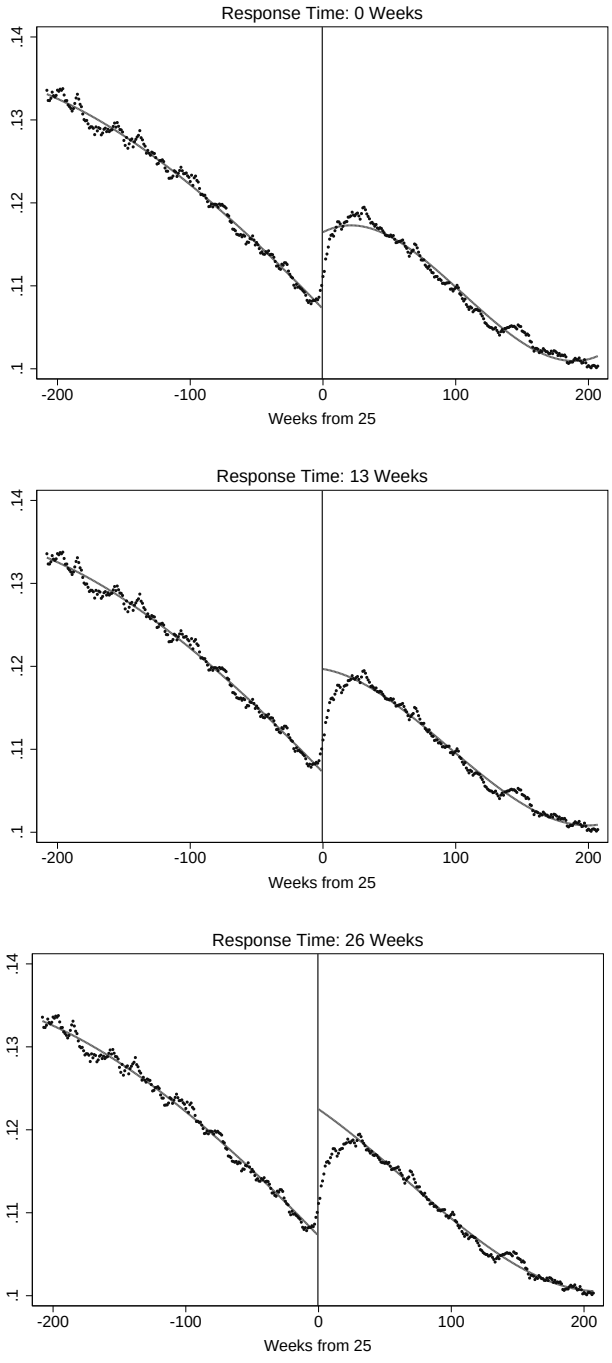


Table 1 presents the estimates of the labor market participation response in the period 1999-2006 to increased benefits at the age of 25 for all individuals who were unmarried at the age of 25 with no more than compulsory schooling at the age of 25 and without children before the age of 26. The table shows the work disincentive effect according to the main outcome, the ratio of social assistance recipients to the population, as well as according to the secondary outcome, the ratio of self-supporting individuals to the population, the latter confirming that the estimated "jump" in social assistance is associated with a corresponding "drop" in self-support.

Depending on polynomial specification and not allowing for any response time, the estimation results for the population of unmarried individuals with no children before 26 and with no more than compulsory schooling at 25, yields an estimated jump in the ratio of social assistance recipients in the range 0.9-1.3 percentage points of the population. The corresponding drop in self-support is estimated between -1.1 and -1.4 percentage points.

When allowing for response time of a single quarter, I estimate the jump in social assistance in the range 1.2-1.6 of the population, and the drop in self-support between -1.3 and -1.8 percentage points. When allowing for a response time of half a year, I estimate the jump in social assistance in the range 1.2-1.8 percentage points of the population and the drop in self-support in the range -1.2 to -2.2.

Overall, the estimation results show a highly significant "jump" in social assistance caused by the increase in the benefit level at the age of 25. The results from Table 1 further shows that the estimated "jump" in social assistance is associated with a "drop" of similar magnitude in self-support, showing that the estimated "jump" in social assistance is indeed at the expense of diminished labor market participation.

The estimated treatment effects are valid locally in the immediate neighbourhood of the cutoff. Table 2 shows the sensitivity of the results to different choices of bandwidth corresponding to 4, 3 and 2 years on each side of the cutoff using a linear spline specification. The effect of increasing benefits on the ratio of social assistance to the population is estimated in the range 1.1-1.5 percentage points of the population, suggesting very little sensitivity of the estimated effect to the choice of bandwidth.

Table 1: The Effect of Increased Benefits, Social Assistance and Self-support, Men and Women

	Linear	Quadratic	Cubic
No response time			
Social Assistance	0.011***	0.013***	0.009***
	(0.001)	(0.001)	(0.001)
Self-support	-0.012***	-0.014***	-0.011***
	(0.001)	(0.001)	(0.001)
Response time: 13 weeks			
Social Assistance	0.012***	0.016***	0.012***
	(0.001)	(0.001)	(0.002)
Self-support	-0.013***	-0.017***	-0.018***
	(0.002)	(0.002)	(0.002)
Response time: 26 weeks			
Social Assistance	0.012***	0.018***	0.015***
	(0.001)	(0.002)	(0.002)
Self-support	-0.012***	-0.017***	-0.022***
	(0.002)	(0.002)	(0.004)
No. of individuals	66,818	66,818	66,818
No. of time periods	416	416	416

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 2: The Effect of Increased Benefits with Different Bandwidths, Men and Women

	+/- 4 years	+/- 3 years	+/- 2 years
No response time			
Social Assistance	0.011***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)
Self-support	-0.012***	-0.013***	-0.013 ***
	(0.001)	(0.001)	(0.001)
Response time: 13 weeks			
Social Assistance	0.012***	0.014***	0.014***
	(0.001)	(0.001)	(0.001)
Self-support	-0.013***	-0.014***	-0.016***
	(0.002)	(0.002)	(0.002)
Response time: 26 weeks			
Social Assistance	0.012***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)
Self-support	-0.012***	-0.014***	-0.016***
	(0.002)	(0.002)	(0.002)
No. of individuals	66,818	66,818	66,818
No. of time periods	416	312	208

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

All estimates are from applying a linear spline specification with a rectangular kernel.

Table 3 presents the regression results for men and women, separately. Allowing for response time of 26 weeks, which appears to be the most appropriate according to analysis of the rate of change in the ratio of social assistance presented in Figure 4, yields estimates of the increase in social assistance of 1.3-2.0 percentage points of the population of the population for men, and 1.2 - 1.5 percentage points for women.

Given these results and the fraction of the at risk population that may respond to the change in eligibility, I calculate the participation elasticity with respect to the benefit level. The group at risk of responding is the share of the population not receiving public income transfers. This group consists of 60 percent of the men and 47 percent of the women. The size of the response divided by the group at risk gives the percentage of the population concerned by the disincentive effect at 25. The affected share of the population concerned with the disincentive of higher benefits is calculated at 2-3 percent of both the men and the women. The percentage of the population concerned by the disincentive effect relative to the size of the increase in benefits yields the participation elasticity with respect to the benefit level.

Allowing for response time of 26 weeks. the estimates for unmarried men without children translate into a participation elasticity with respect to the benefit level of -.06 to -.04. For comparison, Lemieux and Milligan (2008) estimates a very similar disincentive effect for men in the same demographic group corresponding to a participation elasticity in the range -.05 to -.03, while the comparable elasticities in Bargain and Doorley (2011) are found in the range -.06 to -.04 (Bargain and Doorley, 2011). Both Lemieux and Milligan (2008) and Bargain and Doorley (2011) also rely on similar age-dependent rules in the social assistance system and both papers also apply regression discontinuity approaches.

The estimates for the unmarried women without children translate into a participation elasticity with respect to the benefit level of -.06 to -.05, i.e., very similar to the participation elasticity of unmarried men without children. These participation elasticities based on regression discontinuity estimates for unmarried childless women (with low educational attainment) are new to the literature.

Figures 10 and 11 show the graphical representation of the empirical specifications yielding the medium sized estimates for men and women, respectively, i.e., the cubic spline for men and the quadratic spline for women (see Table 3).

Table 3: The Effect of Increased Benefits on Social Assistance by Gender

	Linear	Quadratic	Cubic
No response time			
Men	0.011***	0.013***	0.009***
	(0.001)	(0.001)	(0.001)
Women	0.011***	0.011***	0.010***
	(0.002)	(0.002)	(0.002)
Response time: 13 weeks			
Men	0.012***	0.017***	0.012***
	(0.001)	(0.002)	(0.002)
Women	0.012***	0.014***	0.014***
	(0.002)	(0.002)	(0.003)
Response time: 26 weeks			
Men	0.013***	0.020***	0.015***
	(0.001)	(0.002)	(0.003)
Women	0.012***	0.014***	0.015***
	(0.002)	(0.003)	(0.004)
No. of individuals			
Men	43,607	43,607	43,607
Women	23,211	23,211	23,211
No. of time periods	416	416	416

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Figure 10: Cubic Spline (Response Time: 26 Weeks), Men

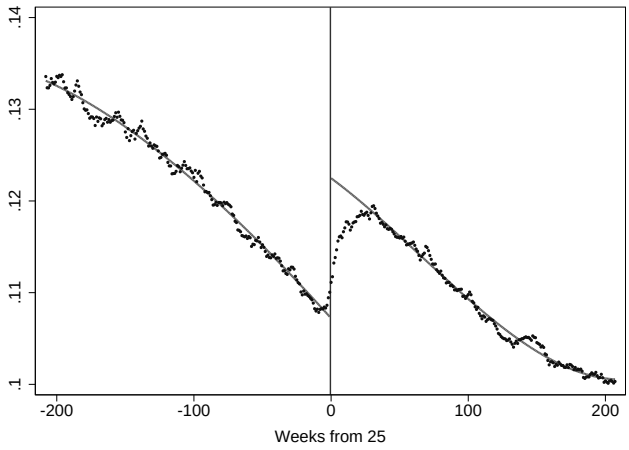
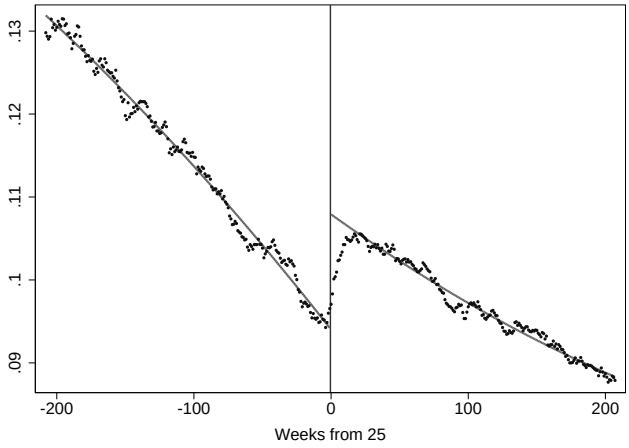


Figure 11: Quadratic Spline (Response Time: 26 Weeks), Women



5. Entries and Exits

Section 4 established the existence and size of the overall disincentive effect of increased social assistance benefits at the age of 25. However, both an increase in transitions into social assistance and a decrease in transitions out of social assistance will lead to an increase in the total number of social assistance recipients. Which of these factors is the dominant in explaining the estimated disincentive effect is arguably crucial for applying an appropriate policy for countering the adverse behavioral effect of increasing social assistance.

This section exploits the panel data to look at changes in the propensity to receive social assistance in a given week compared to the propensity of receiving social assistance in a week half a year earlier. I decompose the overall change into transitions into social assistance and transitions out of the program to determine the relative importance of the two components. Figure 12 illustrates the transition rates into and out of social assistance.

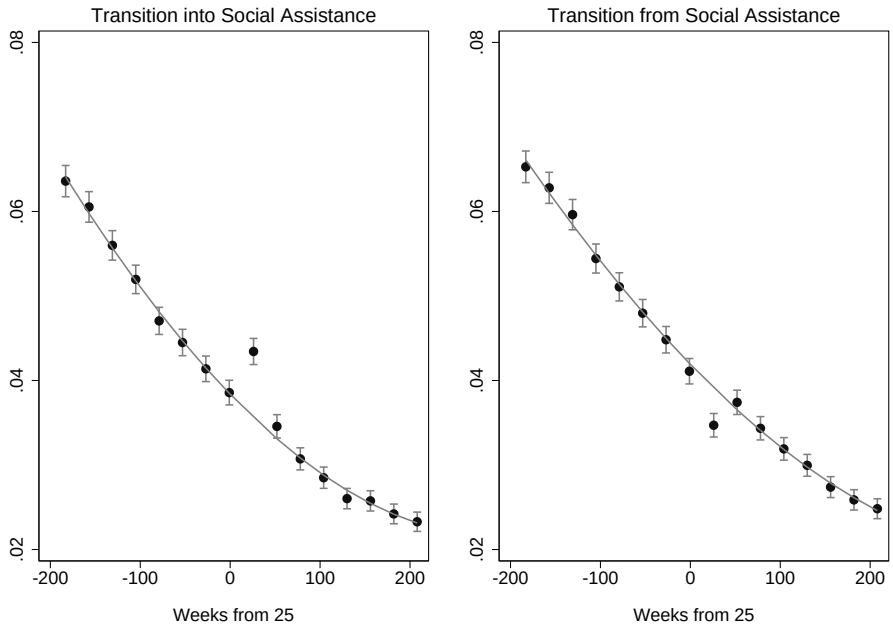
The figure suggests the striking conclusion that the change in benefit levels affects both transition rates only in the first six months after the new rule takes effect. That is, new participants enter the program during the first six months, but in the subsequent period the transition rate is no higher than expected in the absence of a change in eligibility. The same is true for transitions out of the social assistance program. Those individuals who are in the program and who experience the change in benefits leave the program at a slower pace than expected according to the trend leading up to the discontinuity at week zero. However, in the subsequent periods transitions occur at the same rate as expected according to the trend for ages below 25.

By fitting a third order polynomial to the transition rates and including a dummy for the first observation after the discontinuity at week zero, I estimate the distance of the first observation after the discontinuity from the trend. The increase in transitions into social assistance accounts for two thirds of the overall increase in the social assistance rate after 26 weeks. The decrease in transitions out of social assistance accounts for the remaining third.[25]

If transitions to and from the social assistance program are indeed affected in the six months following the change in benefit levels only, as suggested by Figure 12, then the effect of higher benefits would merely translate into an upward shift in the social assistance ratio curve. Figure 13

[25]The two components fully explain the size of the total change in the number of social assistance recipients.

Figure 12: Transitions into and from Social Assistance, Men and Women



Transition rates into social assistance are calculated as the number of individuals who received social assistance in a given weekend but did not receive social assistance 26 weeks earlier. Transition rates out of social assistance are calculated as the number of individuals who did not receive social assistance in a given weekend but did not receive social assistance 26 weeks earlier. The trend is estimated by a trird order polynomial.

shows a representation of this potential outcome based on the estimates from Section 4, allowing for six months of response time. The figure plots the social assistance rate along with three lines representing the social assistance rate subtracting the smallest, the largest, and the mean of the estimates of the disincentive effect, respectively. The three lines start after the allowed response time of 26 weeks. The figure is based on the assumption that all adjustment to the new rule occurs within the first six months after the higher benefit level comes into effect.

Figure 13: Potential Outcome

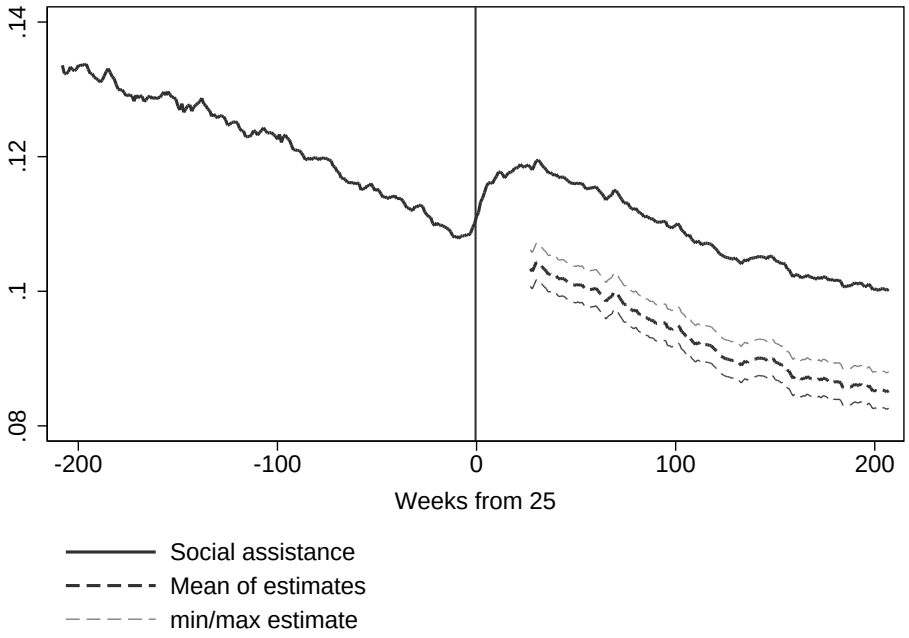


Figure 13 shows the social assistance ratio to the population for men and women. From this ratio I subtract the mean of the estimated effect effects from Table 1. I also subtract the largest and the smallest estimate, respectively.

The plot of the potential outcome in Figure 13 is, of course, not in itself evidence of the true social assistance rate in the absence of a change in benefit levels. The regression discontinuity estimate is valid only in the immediate neighborhood of the cutoff. However, given the stability of the relationship between age and outcome away from the cutoff and the use of panel data, the plot nicely complements the story told thus far of an upward shift in the social assistance ratio curve, which would otherwise have remained on an uninterrupted descending trend.[26]

[26]The pattern of the social assistance ratio to the population among parents (the "non-treated") in Figure 8 of Section 3 also exhibits an uninterrupted descending trend before the cutoff and throughout the remaining age range.

6. Discussion

The estimations in Section 4 showed that the increase in benefit levels in Denmark at the age of 25 in the period of observation gave rise to a significant adverse labor market participation response among unmarried individual without children and no more than compulsory schooling at the age of 25. The sizes of the corresponding participation elasticities are similar for men and women and also very much in line with the results for men from comparable studies from countries with similar age-dependent rules. Both Lemieux and Milligan (2008) and Bargain and Doorley (2011), in their studies, characterize the estimated behavioral response to increased benefits as a "relatively modest" one.

As described in Section 1 the benefit levels prior to the increase at the cutoff are significantly lower in the cases studied in Lemieux and Milligan (2008) and Bargain and Doorley (2011) (Canada and France respectively) than in the current study of Denmark. The effects of increasing social transfers to the level associated with countries providing the highest level of generosity are previously unknown. Ex ante, it is not clear whether to expect the disincentive effects on labor market participation to be lower or higher when extending generosity further than around the OECD average.

On the one hand, the effect on labor market participation could be expected to be lower if most individuals "at risk" of being affected by work disincentives had already been affected by the higher initial level of generosity, i.e., by the relatively high level of benefits prior to the increase at the cutoff. On the other hand, the effect could be expected to be higher if a proportionally larger part of the population are attracted by the improved standards of living associated with increasing the generosity of social assistance further.

However, the finding of almost identical participation elasticities across countries with different benefit levels before the increase at the age-threshold suggest that the relative size of the response to increasing social assistance does not depend on the initial benefit level. That is, the estimated response does not increase more than proportionally with the benefit level, nor does the higher initial benefit level mean that all individuals at risk of responding to work disincentives have already responded.

Even after assessing the size of the disincentive effect associated with higher benefits, and thereby assessing the scope for reducing the associated adverse behavior, the question remains of which kind of policy would be more effective in countering the adverse response. Specifically, the extent

to which policy should be targeted towards retaining employment or gaining employment is not immediately clear from the regression discontinuity results, as a rise in social assistance can be due to both more individuals joining the program or fewer individuals leaving the program. However, the decomposition of the effect, presented in Section 5 of this paper, concludes that two thirds of the adverse behavioral response is attributable to transitions from self-support to social assistance. This result, in turn, suggests that a policy targeted at retaining employment has the largest potential for directly affecting the adverse response to higher benefits.

Although "relatively modest" in size, the increase in the number of social assistance recipients caused by the higher benefit level leads to an associated increase in the direct costs to public funds of financing the social assistance program. Obviously, these additional costs increase with the level of generosity of social assistance. In the absence of any adverse behavioral response the direct cost to public transfers are proportional to the increase in the level of benefits. However, the estimated disincentive effect of around 1.5 percentage points of the population of unmarried and childless individuals with no more than compulsory schooling at the age of 25 is associated with an increase in the direct cost of transfers of an additional 14 percent compared to the case with no behavioral response to higher benefits.

As stated in the introduction to the paper, the benefit level of anti-poverty programs, such as social assistance, is directly related to minimum standards of living. As the purpose of increasing social assistance is that of elevating minimum standards of living, the cost of providing higher benefits should ultimately be weighed against the impact of higher benefits on standards of living. Figure 14 plots the share of the population of unmarried and childless individuals with no more than compulsory schooling at the age of 25 with annual disposable income of less than 50 percent of the median of disposable income in the population in a given year.[27] The hollow dots indicate weeks after turning 25 and before turning 26, where individuals have not yet been eligible for the higher social assistance for an entire year.

Figure 14 shows the share of the population below the applied poverty line of 50 percent of the median disposable income declining steadily for ages 22 through 24. At the age of 25 the share of individuals in the population below the 50 percent threshold declines sharply as eligibility for the

[27]The measure of the median is the median of annual non-equivalized disposable income for the population above the age of 16 in a given year.

higher benefit level comes into effect for an increasing part of the year (the hollow dots in Figure 14). Annual disposable income measured at the age of 26 reflects eligibility for the higher social assistance for the whole previous year. From ages 26 through 28 the share of the selected population below the poverty threshold continues to decline steadily.

The regression lines show the regression results from applying a linear spline specification to the observation reflecting annual disposable income, where individuals are eligible for the either the lower or higher benefit level for the entire year (the black dots). The regression result yields an estimated drop in the share below 50 percent of the median of 7 percentage points of the population at the age of 25.5.

Figure 14: Share of Individuals Below 50 Percent of Median Disposable Income

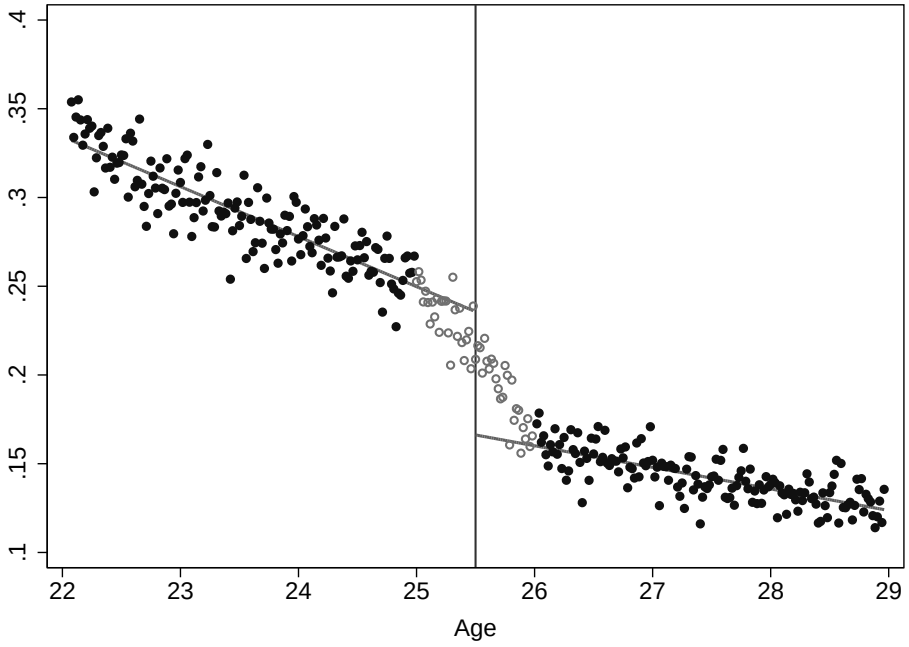


Figure 14 shows the share of individuals who at the age of 25 were unmarried, had completed no more than compulsory schooling, and did not have children before the age of 26, with annual disposable income below 50 percent of the median annual disposable income of the full population of individuals above the age of 16 in a given year for the period 1995-2010. The hollow dots indicate age at which individuals are eligible for the lower level of benefits for part of the past year for which annual disposable income is measured. The black dots indicate ages at which individuals are eligible for either the lower or the higher level of benefits for the past year for which annual disposable income is measured.

Figure 14 suggest a very substantial effect of the increase in social assistance on minimum living standards. The estimation results of a reduction in poverty of 7 percentage points of the population of interest implies that the impact on reduced poverty of increasing benefits by 55 percent is around five times the size of the adverse effect on labor market participation at the age of 25, estimated at around 1.5 percentage points of the population.

7. Conclusion

This paper estimates the effect on labor market participation for men and women of an increase in social assistance at the age of 25 in Denmark, where benefits increase by 55 percent from around the average OECD level to the highest level in all OECD countries. The effect is highly significantly estimated at around 1.5 percentage points of the population of unmarried individuals without children, who at the age of 25 had completed no more than compulsory schooling. The estimated disincentive effect for men is very much in line with previous findings from Canada and France for less generous transfers, and suggest that increases in benefit levels produce similar participation elasticities irrespective of the initial level of benefits. The estimated disincentive effect for women is new to the literature and very similar to the estimated effect for men. This study also decomposes the behavioral response at the age of 25 into entries onto the program and exits from the program (a smaller proportion). The result shows that transition rates are affected only just around the change in rules, and that two thirds of the observed rise in social assistance participants is due to an increase in transitions onto the program. This finding, in turn, suggests that a policy that is capable of retaining employment, for those at risk of responding to lower incentives has the largest potential for directly countering the adverse behavioral response. Finally, the paper finds that the increase in social assistance of 55 percent is associated with a decline in the share of the population below 50 percent of the population median of 7 percentage points.

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Chapter 2

Disincentive Effects of Social Assistance over the Distribution of Earnings

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Abstract

This paper estimates the treatment effect on labor market participation over the earnings distribution of an increase in social assistance at the age of 25 in Denmark. It does so by applying a recently developed framework for applying the regression discontinuity approach to estimate heterogenous treatment effects. The paper finds that the labor market participation response to higher benefits is strongly concentrated at the bottom of the earnings distribution with significant treatment effects for earnings below the higher benefit level. The paper validates the empirical specification by showing that dividing the population into sub-groups according to earnings and applying the standard regression discontinuity approach yields very similar results.

Keywords: Regression Discontinuity, Heterogeneous Treatment Effects, Disincentive Effects, Social Assistance, Labor Supply, Earnings Distribution

1. Introduction

This paper addresses the question of how the consequences for labor supply of social safety nets relate to earnings. The question is highly relevant on several accounts. The sensitivity of labor market participation decisions to earnings is important for understanding who is concerned with the disincentives imposed by benefits, and is therefore crucial for efficiently reforming tax-benefit systems or designing appropriate policies to counter adverse behavioral responses to safety nets in the form of labor market inactivity. Information on how participation elasticities vary across the distribution of earnings is also crucial for evaluating the effectiveness of tax reforms, such as

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introducing an in-work tax credit. Specifically, the optimality of policies targeted at the working poor, versus traditional "demogrant" policies targeted at the workless poor, depends fundamentally on the degree to which labor supply elasticities are concentrated at the lower part of the income distribution (Immervoll et al., 2007).[1] Even so, the existing evidence on how participation decisions vary with income is very scarce. Eissa et al. (2008) conclude that it is difficult to evaluate the empirical validity of an assumption of uniform participation elasticities "since empirical evidence on labor supply elasticities across the income distribution is limited and only suggestive at best".

This paper focuses on the extensive margin of the participation decision with respect to earnings of the young and childless unmarried individuals with low schooling in Denmark. Studies of the participation decisions of childless singles usually find low labor supply responsiveness of this group, yet several recent studies estimate significant labor supply responses among those with low educational attainment within the group of childless singles (Eissa and Liebman, 1996; Meghir and Phillips, 2008; Lemieux and Milligan, 2008; Bargain and Doorley, 2011). Bargain and Doorley (2011) take the responsiveness of the low-educated as suggestive evidence of disincentives affecting those with the lowest potential earnings. However, the finding could also be due to e.g. differences in preferences for leisure. If low work preferences also affect the probability of attaining an education, this could explain the higher response among the low-educated even if earnings were the same across educational levels. Educational attainment may also affect e.g. job search costs which makes it difficult to evaluate the influence of earnings on the response to higher benefits across different levels of schooling. This paper estimates the relationship between earnings and the response to higher benefits within the group with low schooling. The results therefore do not rely on differences in the response between groups with different educational attainment.

Aaberge et al. (2002) and Bargain et al. (2012) estimate participation elasticities across the whole income distribution and find a negative relationship between income and participation elasticities. Different from this study, Aaberge et al. (2002) and Bargain et al. (2012) rely on non-linearities in the tax-benefit codes for identification of structural models.[2] However, causal inference on the effects of policies preferably relies on strong identification strategies from e.g. randomized

[1] A demogrant policy refers to one that raises the tax rate on all labor income and returns the revenue as lump sum transfers (Immervoll et al., 2007).

[2] Aaberge et al. (2002) estimate a structural model for Italy and Bargain et al. (2012) for a range of European countries and the US.

experiments. My paper estimates the responsiveness to higher benefits according to earnings relying on an age-dependent increase in benefits at age 25 for identification. The paper applies a regression discontinuity design, popular due to the high internal validity of results based on this approach (Imbens and Lemieux, 2008). To estimate the response to higher benefits over the distribution of earnings, the paper applies a framework for estimating the "heterogeneous local average treatment effect" (HLATE), a regression discontinuity design with heterogeneous treatment effects recently developed in Becker et al. (2013).

This paper finds that participation responses are highly concentrated at the bottom of the earnings distribution within the group with low schooling. The results show that participation elasticities decrease with earnings and that important responses to higher benefits occur at annual earnings below the higher benefit level taking effect at age 25. The paper validates the empirical specification of the model estimating the heterogenous treatment effect by showing that dividing the population into sub-groups according to earnings and applying the standard regression discontinuity approach yields very similar results. Finally, the paper proposes an alternative approach to estimating heterogenous treatment effects by applying the standard regression discontinuity framework to compute the local average treatment effect for a sequence of overlapping pairs of earnings groups. This new approach, which I term "the moving local average treatment effect", is arguably easier to specify and validate than the HLATE, yet useful for many empirical applications.

The paper is organized as follows. Section 2 presents the details of the Danish social assistance program and related programs. Section 3 describes the data. Section 4 outlines the empirical approach and reports the results along with an extensive robustness check. Section 5 discusses the results, and section 6 concludes.

2. Institutional Setting

This paper estimates the response to higher benefits evaluated over different earnings groups in the period 1999-2006. The Danish social assistance system in this period is characterized by offering generous benefits by international standards (Jonassen, 2013). This is true not least for parents and individuals who have turned 25 years old. For those who have not yet reached their 25th birthday benefits are significantly lower. This age-dependent rule implies that social assistance increases by 55 percent as individuals turn 25. Jonassen (2013) uses this discontinuity in the level of benefits upon crossing the age-threshold of 25 to identify the disincentive effects of increasing

benefits for those without children and without education other than compulsory schooling.

Jonassen (2013) shows that no other programs conflicts with the age-dependent rule of the social assistance program. Among the candidates were the unemployment insurance system and the educational system. Both were shown not to be associated with any discontinuities in the behavior of their participants. A third program, an adult apprenticeship program, comes into effect at the age of 25 and consists of a subsidy to firms taking on apprentices above the age of 25. This program does not affect the estimation of disincentive effects measured by the increase in the primary outcome, social assistance participants, but does affect the estimation of the disincentive effect measured by the decrease in a secondary outcome measure, economic self-support. As in Jonassen (2013) I control for the influence of the adult apprenticeship program by defining participation in this program as regular employment.

Social assistance does not depend on previous income, although wealth above a maximum of DKK 10,000 (USD 1,700) is prohibited for eligibility. Social assistance is not time-limited, but activation and search requirements are enforced for the those assessed "ready to enter employment". For 24-year-olds and younger benefits amount to DKK 6,660 per month (USD 1,110).[3] Earnings are subtracted from benefits. At the age of 25 benefits increase by 55 percent to DKK 10,300 per month (USD 1,700). In the remainder of this paper I will refer to this higher level of benefits as the "high" benefits. Eligibility is contingent on an "event" such as becoming unemployed meaning that low income is not in itself sufficient for eligibility.

Parents are eligible for higher benefits before turning 25. As a consequence those who are parents before turning 25 are not eligible for an increase in benefits upon crossing the age threshold of 25. Parents are in this sense "immune to treatment". I will use this feature in the social assistance system of parents being "non-treated" to test for a "jump" at the age of 25 among parents even though a "jump" should not occur. I refer to Jonassen (2013) for further details of the institutional setting.

This paper evaluates the interaction of the response to higher benefits with earnings where both earnings and social assistance is stated in pre-tax levels. The data includes information on annual taxable income. Social assistance is treated as regular income in the Danish tax system and therefore subject to taxes in the same way as earnings, the main difference being a mandatory

[3] Amounts are expressed in 2012 pre-tax levels.

contribution of eight percent, which applies only to earnings.

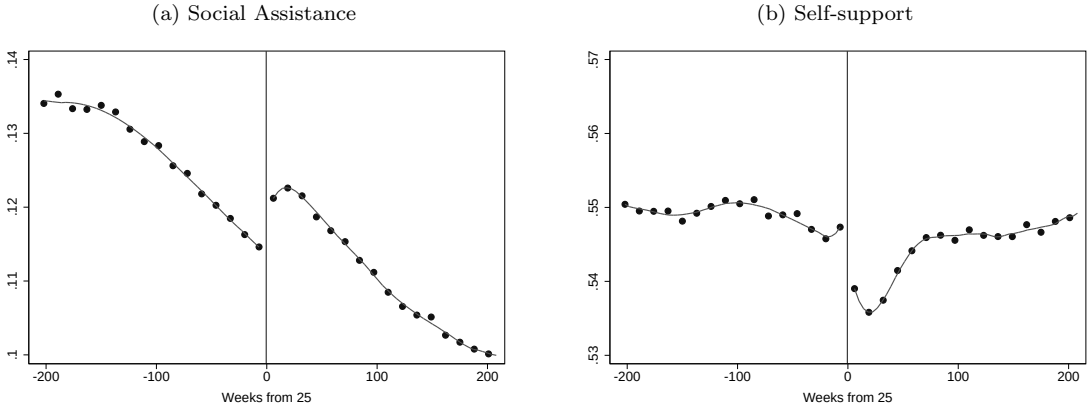
3. Data

Jonassen (2013) estimates the response to higher benefits for individuals who at the age of 25 had not attained more than compulsory schooling and were not married. In Jonassen (2013) as here I focus on individuals who did not have children before age 26, as parents are eligible for a higher level of benefits regardless of age, and therefore are not entitled to an increase in benefits at the age of 25.[4] Data includes all Danish born citizens who turned 25 in the period 1999-2006, where eligibility rules for those above and below the age of 25 have remained unchanged (Jonassen, 2013). I follow every individual on a weekly basis from four years prior to the 25th birthday until four years after. The entire data range include observations in the period 1995 to 2010 with 416 observations per individual.

For the selected population Figure 1(a) shows the social assistance ratio-to-the-population if information on annual earnings at the age of 24 is registered in the administrative data. The sample consists of 57,700 individuals each with weekly observations on public income transfers for every week from the age of 21 through the age of 28. The dataset is extracted from a database called DREAM, maintained by the Danish National Labor Market Authorities. Figure 1(a) shows social assistance transfers for the selected population in the age range 21 through 28, i.e., weeks -208 to 208 in the figure. Figure 1(b) shows the ratio of economically self-supporting individuals to the population. Both outcome variables, social assistance and self-support are binary. Self-support is defined as not receiving a public income transfer. Data does not contain information on employment. However, even if the number of economically self-supporting individuals does not correspond perfectly to the number of employed individuals in a given week, there is no reason to expect this discrepancy to be affected at the age of 25 as only the level of benefits and not the rules of eligibility changes upon turning 25 years old. I therefore argue that the change in self-support is closely related to the change in employment at the cutoff-age of 25. The figures show a clear "jump" in social assistance along with a corresponding "drop" in self-support at the week of turning 25, i.e., at week zero in the figures.

[4] I look at individuals who did not have children before the age of 26 as not to capture the effects of fertility decisions at the threshold age of 25.

Figure 1: Social Assistance and Self-support (Ratio to Population), Non-parents

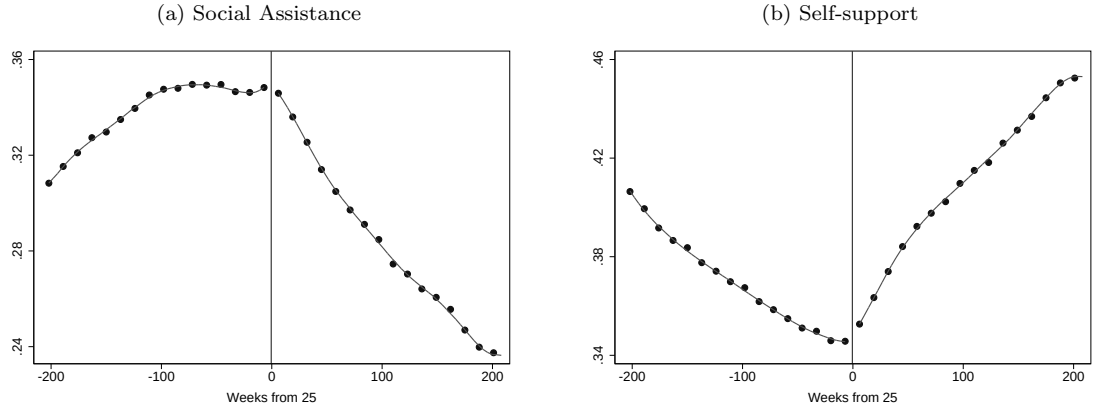


Note: Self-support is defined as not receiving a public income transfer. Self-support includes participants of the adult apprenticeship program mentioned in Section 2. Observations are grouped on quarters. Local polynomial smoothing is applied on weekly data points.

Figure 2 plots social assistance and self-support for the 19,000 individuals who had at least one child at the age of 25. The absence of a "jump" or "drop" at the age of 25 for the group of parents in Figures 2(a) and 2(b), respectively, confirms that the observed "jump" among non-parents in Figure 1(a) is due to the increase in benefits as parents are entitled to a higher benefit level before turning 25 and therefore are not subject to changes in benefit levels.[5]

[5]Figure A.1(a) of the appendix shows that the notable decrease in the social assistance ratio to the population in Figure 2(a) is not related to the change in benefits at the age of 25. Figure A.1(a) differs from Figure 2(a) by moving the cutoff to one year earlier, i.e., conditioning on having children no later than at the age of 24 and being registered with earnings at the age of 23. Figure A.1(b) shows the same for self-support corresponding to Figure 2(b). The patterns in Figures A.1(a) and A.1(b) correspond exactly to the pattern observed in Figure 2.

Figure 2: Social Assistance and Self-support (Ratio to Population), Parents



Note: Self-support is defined as not receiving a public income transfer. Self-support includes participants of the adult apprenticeship program mentioned in Section 2. Age is presented in quarters. Local polynomial smoothing is applied on weekly data points. Figure A.1(a) of the appendix shows that the notable decrease in the social assistance ratio to the population in Figure 2(a) is not related to the change in benefits at the age of 25.

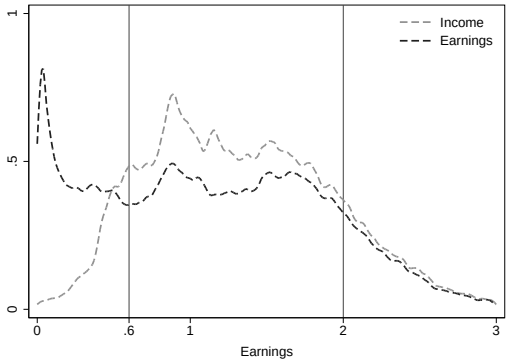
This paper estimates the extent to which the response to increased benefits in Figure 1(a) varies over the earnings distribution. For the sample of non-parents Figure 3(a) shows the distributions of annual earnings and annual income at the age of 24. Earnings and income are stated relative to the prevailing annual "high" benefit level at the age of 25, meaning that e.g. earnings of 1 correspond to earnings at the age of 24 equal to receiving the "high" benefit level for the full year. Earnings of 0.6 correspond to 60 percent of receiving benefits full-time, and earnings of 2 correspond to twice the level of receiving the "high" benefits full-time during the year.

The figure shows that earnings at the age of 24 to a larger extent than income are concentrated at the bottom of the distribution indicating that those with the lowest earnings rely on other sources of income than work income. The prevailing benefit level at the age of 24 corresponds to 60 percent of the higher benefit level taking effect at the age of 25. The estimations in the following section will restrict attention to the population with annual earnings of 60 percent or more of the high benefit level. That is, the selected population includes those who at the age of 24 earn more than the lower benefit level, but less than the higher benefit level taking effect at the age of 25. The selected population also includes those with annual earnings above the higher benefit level, but not those earning less than the lower benefit level.

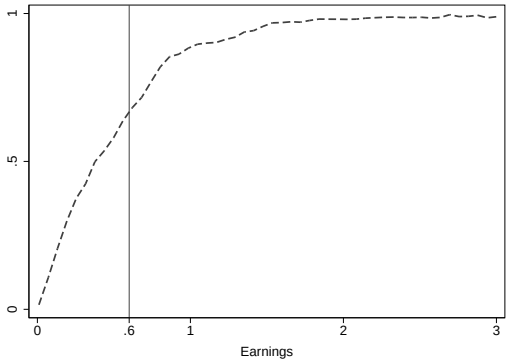
Figure 3(b) plots annual earnings as a share of total annual income and confirms that low earnings are on average associated with earnings that make up a low percentage of total income.

Figure 3: Annual Income and Earnings at the Age of 24

(a) Distributions of Income and Earnings



(b) Earnings as a Share of Income



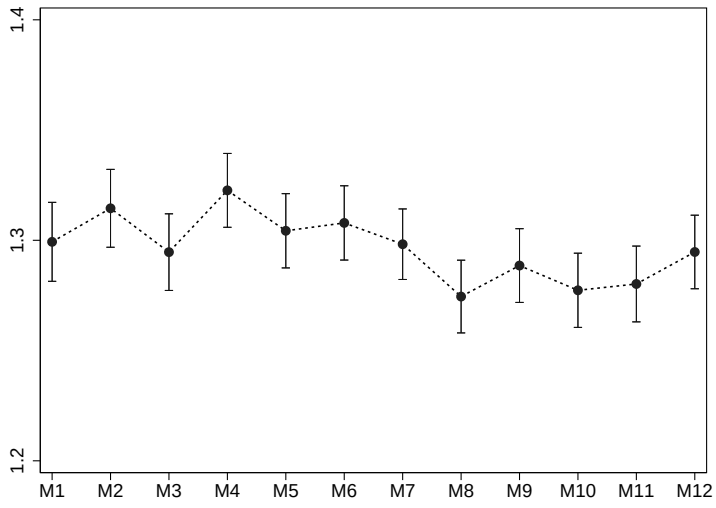
Note: Calculations are based on income and earnings for those with positive earnings of no more than three times the high benefit level. Figure 3(a) shows kernel density estimations of income and earnings. Figure 3(b) shows a local polynomial smoothing of earnings relative to total income.

For those with annual earnings corresponding to 60 percent of the high benefit level, earnings constitute two thirds of total income. As mentioned in Section 2 eligibility for social assistance prohibits wealth beyond a maximum of DKK 10,000 (USD 1.700). In the part of the population with no more than compulsory schooling wealth is in general not a barrier to eligibility. Figure A.2 of the appendix graphs box plots of the distributions of net wealth according to annual earnings, where earnings groups are defined by rounding to nearest decimal. I apply this grouping on earnings in the remainder of the paper. Figure A.2 shows that the 3rd quartile of net wealth is below DKK 10,000 at most earnings levels. However, at higher income levels the upper part of the distribution of net wealth exceeds DKK 10,000. As indicated by the vertical lines in Figure 3(a) I restrict attention to the population with annual earnings of no more than twice the high benefit level. The selected population who at the age of 24 had annuals earnings of between 60 and 200 percent of the high benefit level constitutes 28,000 individuals. This group will be the focus of the estimations in the following section and I will refer to the 15 earnings groups with earnings between .6 and 2 times the "high" benefit level as the "initial earnings groups". Individuals are distributed evenly across the 15 earnings groups with each group accounting for between 5 and 8 percent of the sample, corresponding to almost 2,000 observations in each earnings cell.

I use annual earnings to capture earnings capacity over a longer period of time as to allow for factors such as frequent job changes and periods of joblessness, that both constitute components

of the amount of earnings that an individual is capable of generating, but will not necessarily be captured by e.g. looking at earnings in a job held in a given week. However, a potential problem with the use of annual earnings, measure at the end of the year of turning 24, is that the period from the time of measurement to an individual turns 25 will differ across individuals according to their date of birth. Annual earnings of those born in January is measured just before turning 25, while earnings of those born in December is measured almost a year before turning 25. If annual earnings in the selected population increases sharply during the year, differences in the timing of measurement could mean that annual earnings imprecisely captures earnings capacity for those born late in a given year. Figure 4 addresses this concern by showing the average annual earnings relative to the "high" benefits according to month of birth for earnings groups 0.6 to 2. The figure shows no clear trend and only little variation in average earnings groups according to month of birth, indicating that annual earnings do not increase sharply with age in the selected population in the year before the cutoff.[6]

Figure 4: Mean of Annual Earnings by Month of Birth



Note: Figure 4 shows the average annual earnings relative to the "high" benefits in the year of turning 24 according to month of birth for earnings groups 0.6 to 2. Spikes indicate the 95 percent confidence interval.

[6]I have also performed the main regressions of Section 4 with the inclusion of dummy variables for month of birth. As to be expected from Figure 4, the inclusion of month-of-birth-dummies only affects the results marginally. Results are available from the author on request

4. Estimation

Estimation of the response to higher benefits over the earnings distribution using the standard regression discontinuity approach would require estimation on small sample sizes in order to get estimates at each earnings interval, making reliable inference difficult for small enough intervals. In a recent paper Becker et al. (2013) develop a framework for the regression discontinuity design with heterogenous treatment effects. Their framework consists of a generalization of the standard approach to include estimation of a treatment effect which is allowed to vary according to a variable of interest. This framework therefore makes it possible to evaluate the treatment effect of higher social assistance in detail over the range of earnings at the age of 24. Becker et al. (2013) use the framework to estimate heterogeneity in the effects of regional transfers from the European Commission on growth and investment according to the concept of "absorptive capacity" intended to capture the degree of different European regions' ability to apply the transfers productively. In this paper I use the framework to estimate the degree to which the response to higher benefits relies on individuals' capacity for generating earnings, that is, the treatment interacted with earnings at the age of 24.

The empirical model to be estimated regresses social assistance, y_i, on a smooth polynomial function, $f(\cdot)$, of age, x_i, and on a smooth polynomial function, $h(\cdot)$, of earnings, the interaction variable z_i. It does so on both sides of the cutoff, x_0. The treatment indicator, T_i, takes the value one if $x_i \geq x_0$, that is, if individual i has turned 25, and zero otherwise.

$$y_i = \alpha + f(x_i)\alpha_1 + h(z_i)\alpha_2 + T_i(\beta + x_i\beta_1 + z_i\beta_2) + \varepsilon_i$$

The Heterogenous Local Average Treatment Effect (HLATE) is defined as $(\beta + x_i\beta_1 + z_i\beta_2)$.

The model is identified under the assumption that factors affecting employment or educational decisions behave continuously around the cutoff age of 25. That is, factors affecting outcome are allowed to depend on age, just not discontinuously so around the cutoff. Taking into account any smooth relationship between age and all other relevant characteristics, I thus assume that individuals just below the age of 25 are otherwise identical to individuals just above the age of 25. The interacting variable, earnings, can render treatment more or less effective, but may not affect assignment to treatment. In this respect the main concern for this application would be that those with earnings above some minimum would have too much wealth to be eligible for social assistance.

Section 3 addressed this concern and concluded that the distribution of net wealth over earnings groups did not give rise to concern regarding eligibility.[7]

Given the potentially high variability in propensities of receiving benefits at different ages and in different earnings groups, a flexible model is necessary to capture the full interaction between these variables before and after the cutoff at the age of 25. Introducing the full set of interaction terms between earnings and age generates a high number of different potential specifications of the empirical model. In this paper I present the results from applying a very flexible specification of the empirical model and validate this specification through an extensive robustness check. The applied empirical model consists of a third order polynomial specification to capture the relationship between social assistance and age, $f(x_i)$. To capture all interactions with earnings, $h(z_i)$, I apply fourth order polynomial specifications. I apply separate regressions on each side of the cutoff at week zero (age 25). The robustness check of this specification (generating the HLATE) includes bootstrapping the estimated heterogenous treatment effect and a comparison with the results from applying the standard regression discontinuity approach (generating the LATE) over sub-samples of earnings groups. Although the LATE is not expected to perform consistently in very small samples, which is why I estimate the HLATE, a "reasonable" estimate of the HLATE should correspond to the LATE for large enough sub-sample sizes.

As shown in detail in Jonassen (2013) not allowing for response time to the change in benefits may bias the estimates towards zero when regressing on weekly data points. As the response to higher benefits is quick but not instantaneous regressions lines are affected by the period of adjustment to higher benefits when using the very detailed weekly information. Jonassen (2013) showed that including dummies for the weeks defined as being within the period of response effectively adjusted for such bias. In this paper I also allow for a response time of 13 weeks in all the estimations of social assistance. I also show the results from not allowing for response time.[8]

The overall treatment effect is estimated at 2.6 percentage points of the population.[9] Figure

[7] As mentioned in Section 3 Figure A.2 of the appendix shows that the third quartile of all earnings groups in the selected population (those with earnings below twice the "high" benefit level) is below the maximum wealth allowed for eligibility for social assistance, confirming that too much wealth is not a problem for identification.

[8] Figure A.3 of the appendix shows social assistance along with regression lines from allowing a response time of 13 weeks and not doing so. Figure A.4 plots the results from first-differencing the social assistance ratio, showing that the response indeed occurs within the first 13 weeks after turning 25, which is the only quarter significantly differing from the neighboring quarters throughout the observed age range.

[9] The treatment effect on the whole sample of 57,000 individuals is estimated in the range of 1.0-1.5 percentage points of the population depending on the specification. I apply both a quadratic, a cubic and a quartic spline, and

5 plots the graphical representation of the estimation. The figure shows two planes representing social assistance as a function of the interaction between age and earnings (at the age of 24) for those below and above the age of 25, respectively. The figure shows a wedge between the two planes at week zero indicating a "jump". The wedge shows a difference in the level of the two planes starting for the earnings group with earnings at the age of 24 of 10-20 percent more than the "high" benefit level (Earnings equal 1.1-1.2 in the figure). This size of this small "jump" increases with lower earnings, with the largest "jump" of around 3 percentage points for the group with the lowest earnings. The wedge is the heterogeneous local average treatment effect, HLATE.

Figure 5: HLATE, Social Assistance (3D)

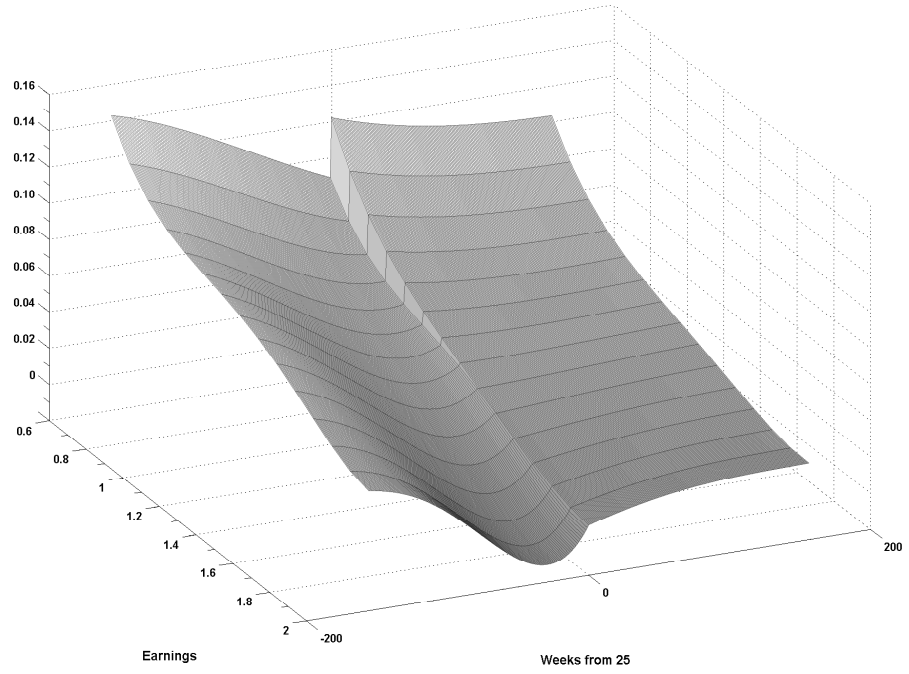
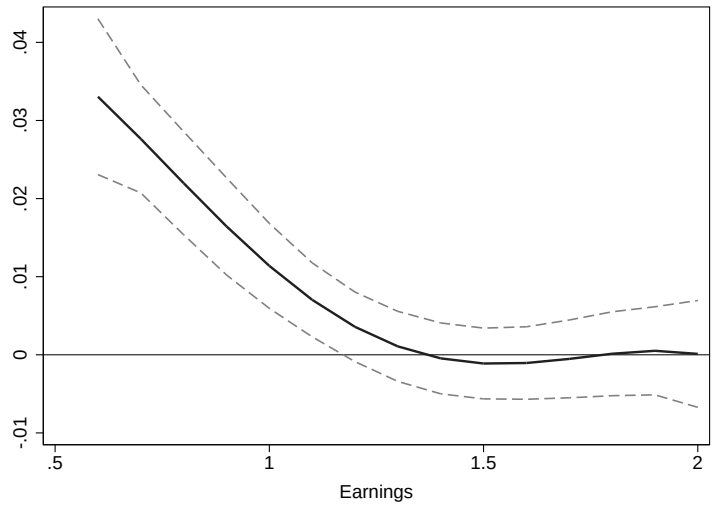


Figure 6 shows the estimated HLATE over the range of earnings along with a 95 percent confidence interval. The figure suggests that the treatment effect is zero for the high earnings. The

allow for response time of a quarter by including dummies for the first 13 weeks after the cutoff. The graphical representation of these estimations are presented in Figure A.5 of the appendix. Those with annual earnings between 60 and 200 percent of the high benefit level constitute 28,000 individuals (half the population size).

confidence interval shows that the treatment effect turns significant at earnings around one and lower, i.e., at earnings around the "high" benefit level and lower.

Figure 6: HLATE, Social Assistance (2D)



Note: The 95 percent confidence interval is obtained by bootstrapping, using 200 replications.

Table 1 presents the regression results from estimating the HLATE on the 28,421 individuals with earnings between 60 and 200 percent of the "high" benefits level. Each individual is observed with 416 observations, corresponding to 208 weeks before turning 25 and 208 weeks after. All regressions include individual fixed effects. I adjust standard errors to account for repeated observations per individual by clustering at the individual level.

The first two columns present the results from estimating the model with all interaction terms to capture the heterogenous treatment effect, but without a dummy variable, T, to capture the average treatment effect. The first column shows the estimates when allowing for a response time of 13 weeks, the second when not allowing for response time. All the included interaction terms with earnings are highly significant. The third and fourth columns show the results from including a dummy for the average treatment effect also. Including the average treatment dummy does not change the point estimates substantially, but the dummy along with the main interactions between treatment and earnings becomes highly insignificant. These results combined suggest that the empirical specification captures very well the heterogeneity in treatment with respect to earnings, so well in fact that no variation is left to be captured by including an additional term to capture the

average treatment effect also. Confirming this finding Figure 7 shows the estimated heterogeneous treatment effect with and without including the dummy for the average treatment effect (ATE). The figure clearly shows how the estimated treatment effect is only negligibly affected by including the dummy.

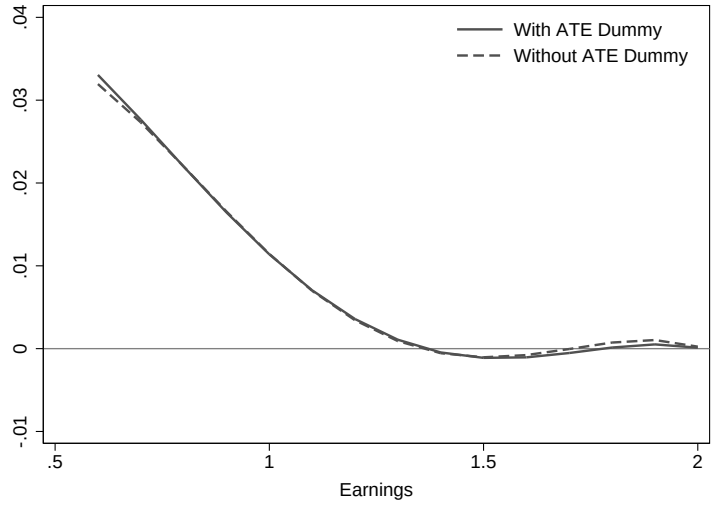
Table 1: Heterogenous Treatment Effect

	No ATE Dummy (Resp. Time)	No ATE Dummy (No Resp. Time)	ATE Dummy (Resp. Time)	ATE Dummy (No Resp. Time)
T			0.026	0.027
			(0.100)	(0.100)
Earnings	-1.169***	-1.171***	-1.125***	-1.125***
	(0.269)	(0.269)	(0.290)	(0.290)
Earnings^2	1.315***	1.317***	1.261***	1.261***
	(0.329)	(0.329)	(0.354)	(0.354)
Earnings^3	-0.659***	-0.660***	-0.630***	-0.630***
	(0.171)	(0.171)	(0.184)	(0.184)
Earnings^4	0.119***	0.120***	0.114***	0.114***
	(0.032)	(0.032)	(0.034)	(0.034)
T x Earnings	0.210***	0.203***	0.122	0.112
	(0.033)	(0.033)	(0.345)	(0.345)
T x Earnings^2	-0.383***	-0.376***	-0.274	-0.264
	(0.073)	(0.073)	(0.424)	(0.424)
T x Earnings^3	0.229***	0.226***	0.172	0.167
	(0.052)	(0.052)	(0.221)	(0.221)
T x Earnings^4	-0.045***	-0.044***	-0.035	-0.033
	(0.012)	(0.012)	(0.041)	(0.041)
Age x Earnings	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Age x Earnings^2	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Age x Earnings^3	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Age x Earnings^4	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
T x Age x Earnings	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
T x Age x Earnings^2	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
T x Age x Earnings^3	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
T x Age x Earnings^4	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Age, Age^2 Age^3	Yes	Yes	Yes	Yes
T x (Age, Age^2 Age^3)	Yes	Yes	Yes	Yes
Response Time	Yes	No	Yes	No

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Age is measured in weeks.

Figure 7: HLATE, With/Without ATE Dummy



4.1. Robustness Check

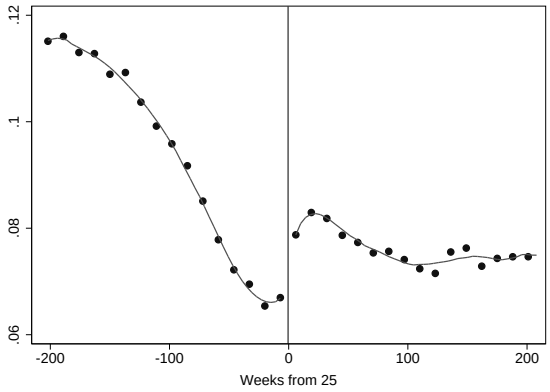
As an initial check of the above results Figure 8 shows six graphs. The top figures, Figures 8(a) and 8(b), show the raw plots of social assistance with local polynomial smoothing for earnings less than or equal to one, and for earnings greater than one, respectively. The figures show a clear "jump" for the low earnings groups but no such "jump" on average for those with earnings greater than the "high" benefit level, which is consistent with the estimation results. Figures 8(c) and 8(d) show social assistance for the same two groups with fitted regression lines from 3rd and 4th order polynomials (cubic and quartic splines). These graphs show that both the cubic and the quartic spline are very reasonable specifications, especially for the group with the lowest earnings (Figure 8(c)), but also for those with earnings above one (Figure 8(d)). The next set of graphs at the bottom of Figure 8 show how conditioning on positive earnings at the age of 24 creates a U-shaped pattern in the social assistance ratio to the population, which is particularly pronounced in the group of parents. To capture this, a flexible model is needed. Figure 8(e) shows the fitted regression line from the quartic spline, which captures well the pattern in social assistance prior to turning 25. As expected, there is no "jump" at week zero in the group of parents, the "non-treated", with earnings below or equal to the high benefit level.

The previous section mentioned the necessity of including terms to capture the interaction

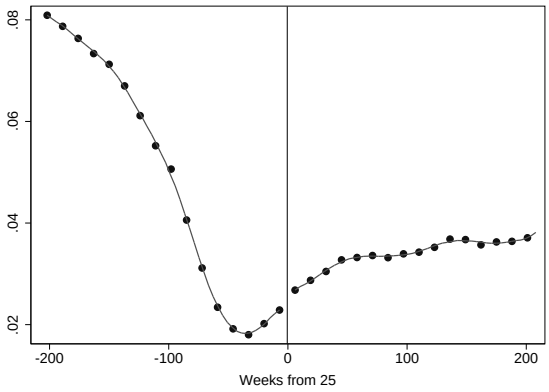
between age and earnings. As Figures 8(c) and 8(d) show the functional form of the relationship between age and social assistance is very different for those with earnings above and below the "high" benefits level. Not accounting for this difference would lead to important bias in the estimated treatment effect. Averaging the functional form of the relationship would lead to an overestimation of the effect for those with the higher earnings and the opposite for those with the lower earnings.

Figure 8: Social Assistance, Sub-groups

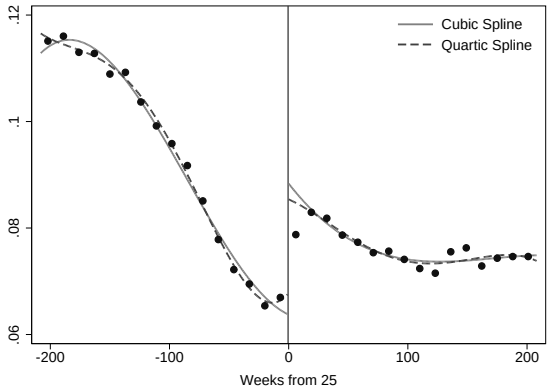
(a) Earnings <= 1



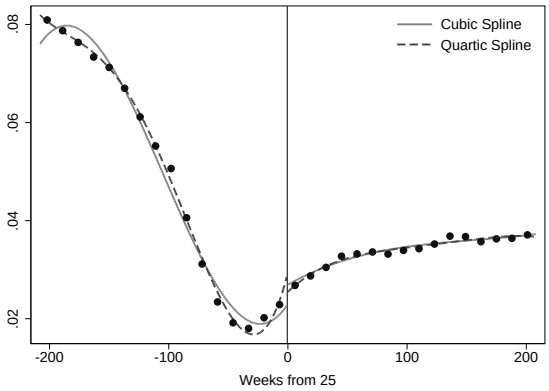
(b) Earnings >1



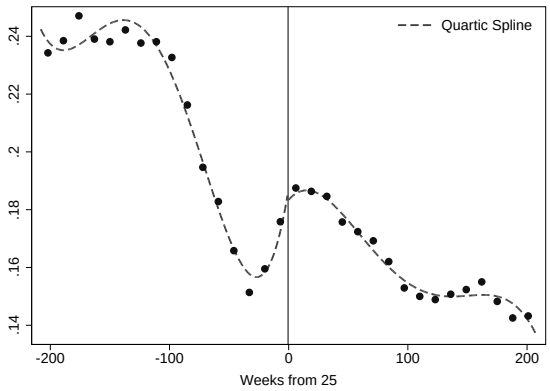
(c) Earnings <= 1



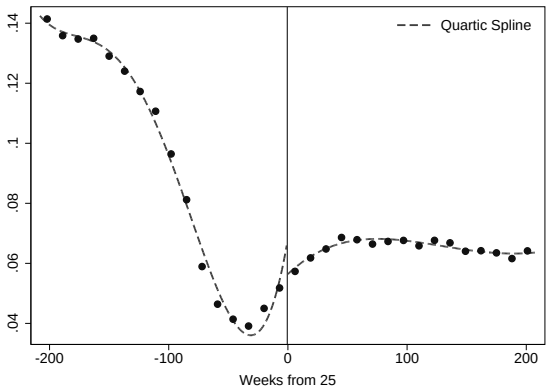
(d) Earnings >1



(e) Earnings <= 1, Parents



(f) Earnings >1, Parents



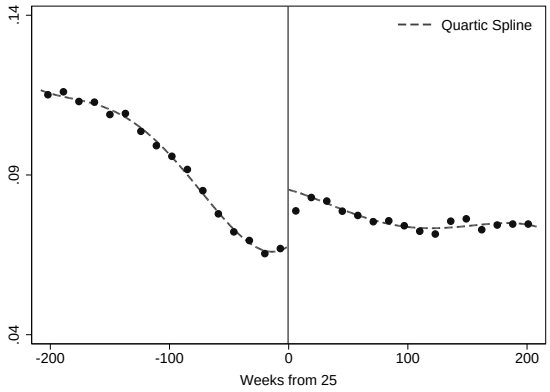
Note: Age in quarters. Polynomial smoothing and regression lines estimated on weekly data points.

In the next set of graphs I compare the "jump" in the primary outcome, social assistance recipients, with the "drop" in the secondary outcome, self-support, for three subgroups of earnings. Figures 9(a) and 9(b) show fitted regression lines for those with earnings of 1 or less.[10] A "drop" in self-support of a similar magnitude to an observed "jump" in social assistance confirms that the change in social assistance is indeed related to labor market participation and not due to a changing composition of participants of different public income transfer programs (Jonassen, 2013). Figures 9(c) and 9(d) show the same for those with income in the range of 1.1 to 1.5. Figures 9(e) and 9(f) show the same graphs for those with earnings above 1.5. As the scales used to present social assistance and self-support differ for both groups with earnings greater than one, Figures A.7(a) and A.7(b) of the appendix show self-support measured on the same scale as used for social assistance in Figure 9 by focusing on observations one year before and one year after the cutoff. All graphs show discontinuities for the lowest earnings group and no discontinuity in the groups with earnings higher than 1.

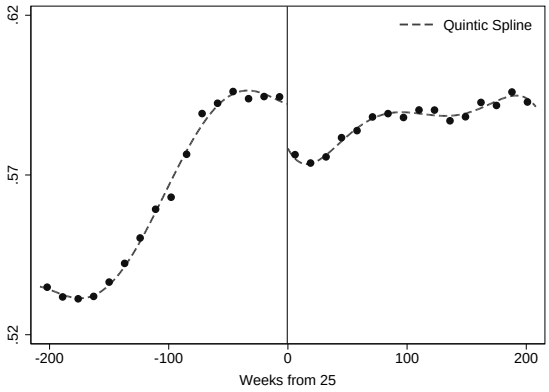
[10] As Figure A.6 of the appendix shows, the inclusion of dummies to capture response time works well in the case of social assistance only, and not for self-support. The reason is the more monotonic trend in social assistance after the cutoff compared to self-support. However, the figure also shows that the estimates for self-support for the same reason are less affected by response time compared to social assistance in Figure A.3. In order to capture the less monotonic trend in self-support compared to social assistance, I will allow for extra flexibility in the specifications relating to self-support applying a fifth-order polynomial specification in Figure 9. The less monotonic trend in self-support compared to social assistance can be explained by self-support interacting with other programs, although not discontinuously so.

Figure 9: Social Assistance and Self-support, Sub-groups

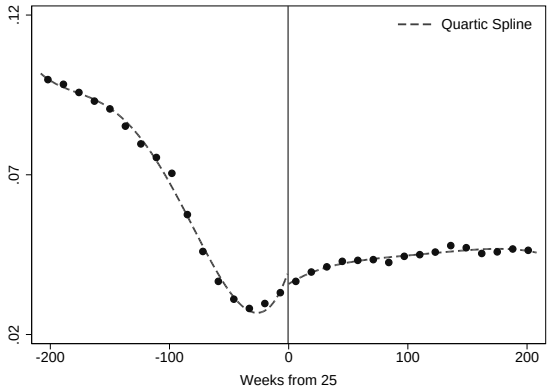
(a) Social Assistance, Earnings <= 1



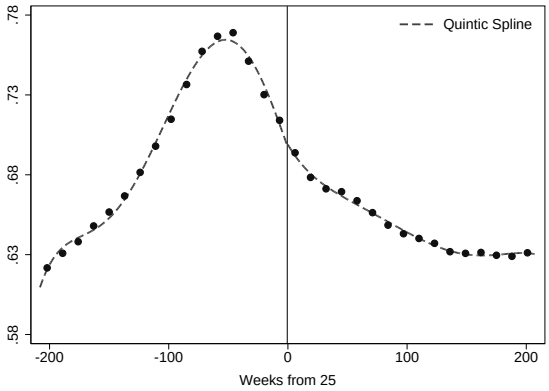
(b) Self-support, Earnings <= 1



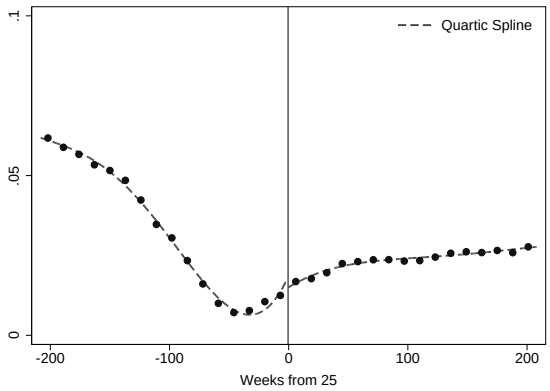
(c) Social Assistance, Earnings >1 and <= 1.5



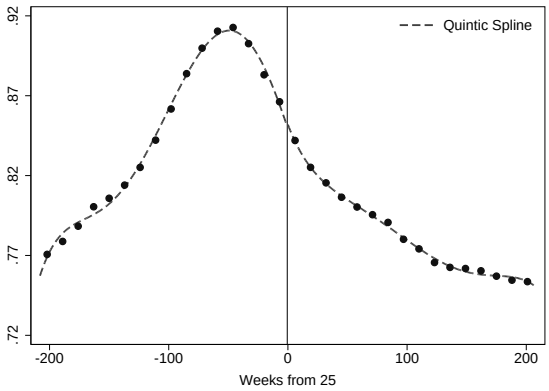
(d) Self-support, Earnings >1 and <= 1.5



(e) Social Assistance, Earnings >1.5 and <= 2



(f) Self-support, Earnings >1.5 and <= 2



Note: Age in quarters. Regression lines estimated on weekly data points.

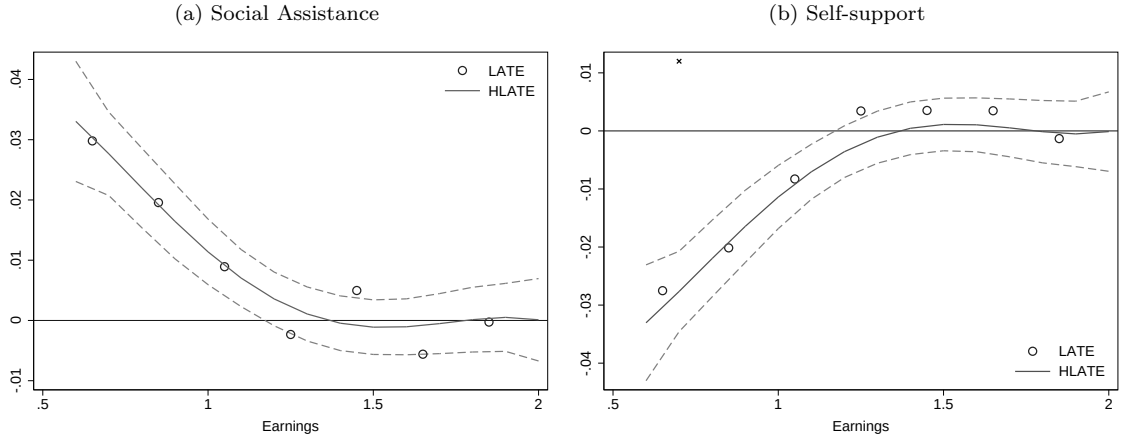
4.2. Comparing HLATE and LATE

Section 4.1 showed that the estimated HLATE was qualitative consistent with the findings from dividing the sample into three subgroups of earnings and applying a standard regression discontinuity approach to these groups. The findings suggested that the response to higher benefits occurs in the part of the population with earnings below the high benefit level. In this section I further explore the robustness of the estimation results by comparing the size of the estimated HLATE with estimates of the LATE on smaller sub-samples of the population. Figure 10 plots the HLATE together with the LATE when grouping on the following earnings brackets: 0.6-0.7, 0.8-0.9, 1.0-1.1, etcetera. Figure 10(a) shows the results for social assistance, while 10(b) shows the regression discontinuity estimates for self-support together with the same HLATE as in Figure 10(a), but with reversed sign. The circles indicate the middle of the range of estimates from applying the cubic and quartic spline specifications for social assistance. For self-support circles indicate the mean of the estimates from applying also the quintic spline to allow for additional flexibility for self-support as discussed earlier (see footnote 10). The HLATE performs very much in accordance with the LATE estimates for social assistance. Figure 10(a) shows that the heterogeneous treatment effect estimated on social assistance also provides a good description of the response when measured on self-support. Tables with the estimation results for the LATE are available from the author on request.

Increasing group sizes conflicts with the initial aim of describing in more detail the treatment effect over the range of the variable of interest. Increasing sample sizes may therefore not be an option in many applications as the required group sizes render too few groups. Figure 11, explores how the LATE estimated on different groupings on earnings compares to the HLATE. The three figures on the left-hand side in Figure 11, Figures 11(a), 11(c) and 11(e), show the midpoint of the range of the estimated LATE obtained by applying the cubic and the quartic polynomial splines. The figures on the right-hand side of Figure 11, Figures 11(b), 11(d) and 11(f), show the range of the estimates along with an indication of whether the estimated LATE is statistically significant at the 5 percent level.

Figure 11(a), shows the LATE from applying the standard regression discontinuity approach when grouping earnings according to small earnings brackets: 0.6, 0.7, 0.8, etcetera. The figure shows that the midpoints of the two coefficients estimated for each earnings group are broadly consistent with the estimated HLATE. However, Figure 11(b) shows the challenge of estimating

Figure 10: LATE and HLATE



Note: Figure (a) shows the estimated LATE from applying the cubic and quartic spline specifications. Circles indicate the midpoint of the range of the two estimates. Figure (b) shows the estimated LATE from applying the cubic, quartic and quintic spline specifications. Circles indicate the mean of the three estimates. The estimates do not include those with earnings of 0.7. The estimate for this group is clearly an outlier. The point estimate for this group is indicated by an X in Figure (b). The HLATE in Figure (b) is the HLATE of Figure (a) multiplied by -1.

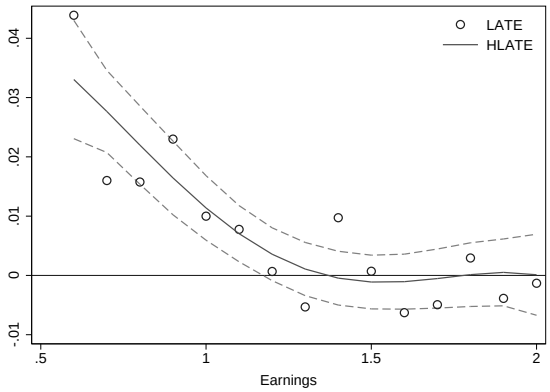
heterogenous effects in the standard framework, as sample sizes in the current application are too small to get sufficient reliable estimates over the range of earnings to get a clear sense of the interacting relationship.

Figure 10(a) shows one solution to this problem, which is increasing sample sizes. Doubling the group sizes yield estimates very close to those obtained through the HLATE model. As Figure 11(d) shows, this approach also suggests a more smooth relationship between earnings and the reaction to higher benefits.

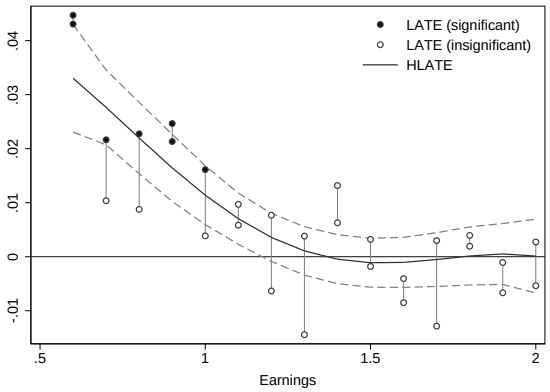
Figure 11(e) presents an intermediate case where the LATE is estimated on two earnings groups, as in Figure 11(c), but where the groups are included and excluded successively over the range of incomes as if calculating a moving average. In Figure 11(e) I therefore term the estimated effect the "moving local average treatment effect" (MLATE). The MLATE is computed by estimating a LATE for a sequence of overlapping pairs of earnings groups. The first data point in 11(e) is estimated based on earnings groups 0.6 and 0.7, the second data point is based on earnings groups 0.7 and 0.8, the third data point based on earnings groups 0.8 and 0.9, etcetera. This approach is also consistent with the estimated HLATE, but, as Figure 11(f) shows, generates more data points to draw a detailed relationship between earnings and treatment effect from than obtained from applying the broader earnings groups in Figure 11(c).

Figure 11: LATE and HLATE

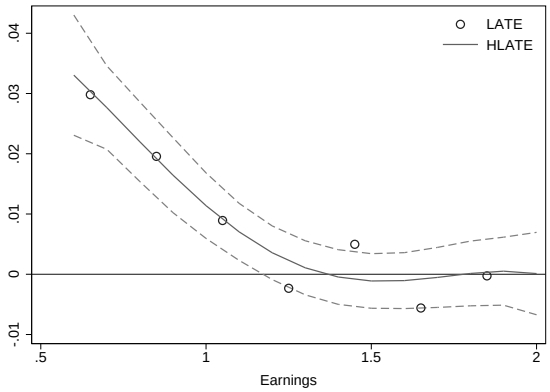
(a) Initial Grouping



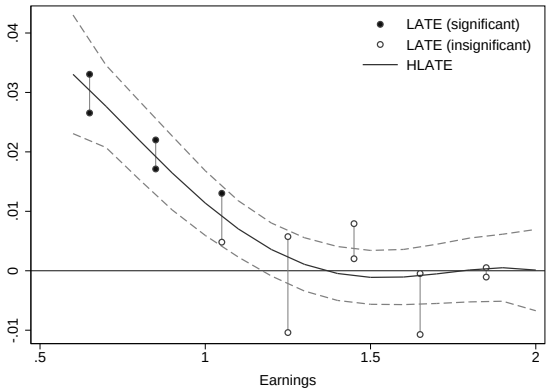
(b) Initial Grouping, Range and Significance



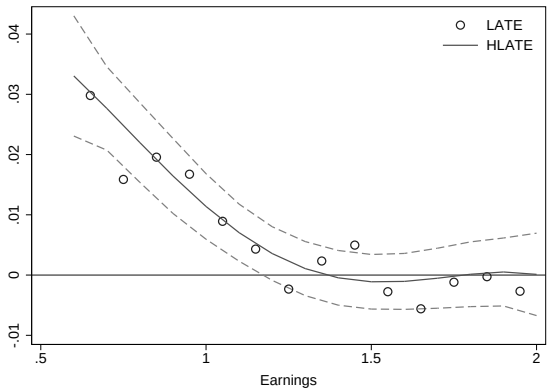
(c) Double Group Size



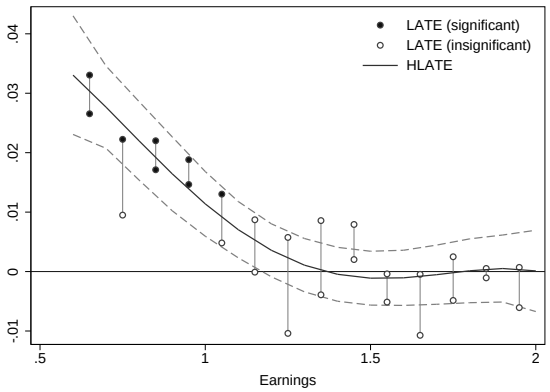
(d) Double Group Size, Range and Significance



(e) MLATE



(f) MLATE, Range and Significance



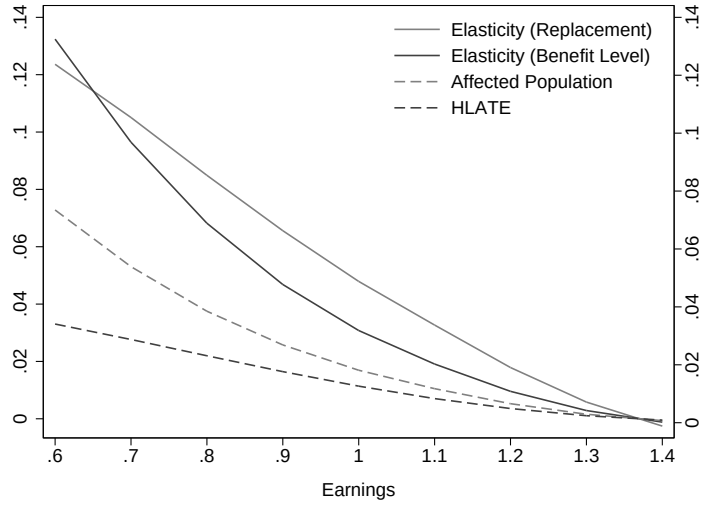
Note: In the three figures on the left circles indicate the middle of the interval from applying the cubic and the quartic spline specification. In the three figures on the right spikes indicate the interval between highest and lowest estimates from applying the cubic and quartic spline specifications. Filled circles indicate significance at the 5 percent level. Hollow circles indicate insignificance at the 5 percent level.

4.3. Elasticities

The previous section performed an extensive robustness check of the estimation results of the preferred empirical specification. The analysis showed that the results from applying the chosen specification to estimate the HLATE were very much in accordance with estimates obtained by applying the standard regression discontinuity approach on earnings subgroups. This section presents the associated participation elasticities. Figure 12 shows the estimated HLATE, i.e. the size of the "jump" at the age of 25 in percentage points of the population, along with the affected part of the population, calculated as the HLATE divided by the group at "risk" of responding to higher benefits, i.e., the economically self-supporting individuals just prior to turning 25. The figure also shows the participation elasticity with respect to the benefit level, calculated by dividing the affected population by the relative increase in benefits, i.e., 55 percent. Finally, to take into account that those with the lowest earnings also have the largest incentive to respond to higher benefits, I calculate the participation elasticity with respect to the replacement ratio by dividing the affected population by the change in benefits relative to earnings. All the metrics are stated with a positive sign to show them in the same graph.

Figure 12 shows that both the participation elasticity with respect to the benefit level and the participation elasticity with respect to the replacement ratio increase with lower earnings. The latter increases almost linearly. Both participation elasticities increase to around 0.12, corresponding to a participation elasticities of -0.12. For comparison Lemieux and Milligan (2008), Bargain and Doorley (2011) and Jonassen (2013) all find average participation elasticities with respect to the benefit level in the range -0.06 to -0.03 for unmarried and low-educated childless men when not taking earnings into account.

Figure 12: Elasticities



5. Discussion

This paper supports the idea that low potential earnings explain responsiveness among uneducated single individuals. It does so by showing that the disincentive effect brought into effect by a significant increase in social assistance at the age of 25 is higher the lower the level of earnings at the age of 24 within the group with low schooling. The results suggest that the response to higher benefits occurs mainly among those with earnings below the "high" benefit level. Jonassen (2013) shows that the increase in benefit levels at the age of 25 places Denmark as the country with the most generous social assistance relative to wages among all OECD countries. Jonassen (2013) also shows that the main part of the disincentive effect is caused by an increase in individuals transitioning into the social assistance program rather than fewer individuals leaving the program in response to higher benefits.

These results combined raise the question of whether the introduction of an in-work tax credit could be an efficient policy response to counter the adverse behavioral consequences of offering a high level of benefits by increasing the gains from work at the bottom of the earnings distribution. Highly relevant for this discussion Immervoll et al. (2007) using microsimulations find that the efficiency gains from a tax reform that implies moving from policies supporting the "workless poor" to policies supporting the "working poor" would be higher in Denmark than in any of the other

European countries in their study. This finding is due to the relatively high taxation of earnings in the lower part of the income distribution.

Immervoll et al. (2007) show that larger participation elasticities in general speak in favor of policies supporting the "working poor" compared to the traditional "demogrant" policies. However, in the case of participation elasticities of zero the "demogrant" policy produces the preferable equity-efficiency trade-off of the two policy types. As participation elsticities are generally found to be small (Bargain et al., 2012), the question of the extent to which participation responses are concentrated at the bottom of the earnings distribution becomes crucial for evaluating the potential gains from a tax-benefit reform. The more participation responses are concentrated at the bottom of the earnings distribution, the higher is the equity-efficiency gain from policies supporting the "workless poor" compared to a policy supporting the "working poor". In this respect, the finding of this paper is evidence suggesting higher equity-efficiency gains from moving from a "demogrant" policy to a "working poor" policy than implied in the case of uniform participation elsticities across the earnings distribution.

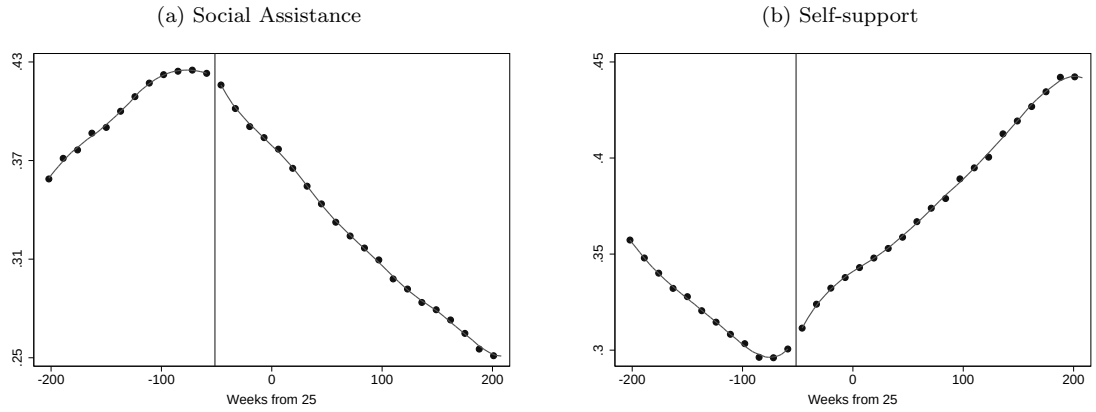
6. Conclusion

This paper estimates the heterogeneous treatment effect of increasing social assistance across the earnings distribution and finds that the response to higher benefits is strongly concentrated in the bottom of the distribution. Lower annual earnings at the age of 24 imply a stronger response to higher benefits. The treatment effect becomes significant for earnings around the higher benefit level taking effect at the age of 25 and zero for earnings in the higher end of the distribution. The results are obtained by applying a regression discontinuity design allowing for heterogenous treatment effects. The results are validated by applying a traditional regression discontinuity approach on sub-samples of the population according to earnings and showing that the two approaches yield very similar estimates.

Appendix A.

Figure A.1(a) shows that the notable decrease in the social assistance ratio to the population in Figure 2(a) is not related to the change in benefits at the age of 25. Figure A.1(a) differs from Figure 2(a) by moving the cutoff to one year earlier, i.e., conditioning on having children no later than age 24 and being registered with earnings at the age of 23. Figure A.1(b) shows the same for self-support corresponding to Figure 2(b). The patterns in Figures A.1(a) and A.1(b) correspond exactly to the patterns observed in Figure 2.

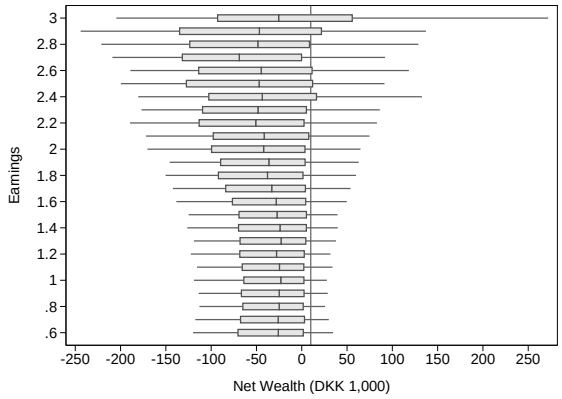
Figure A.1: Social Assistance and Self-support (Ratio to Population), Parents



Note: Self-support is defined as not receiving a public income transfer. Self-support includes participants of the adult apprenticeship program mentioned in Section 2. Age is presented in quarters. Local polynomial smoothing is applied on weekly data points.

Figure A.2 graphs box plots of the distributions of net wealth according to annual earnings, where earnings groups are defined by rounding to nearest decimal. The figure shows that the 3rd quartile of net wealth is below DKK 10,000 at most earnings levels. At higher income levels the 3rd quartile exceeds DKK 10,000.

Figure A.2: Net Wealth

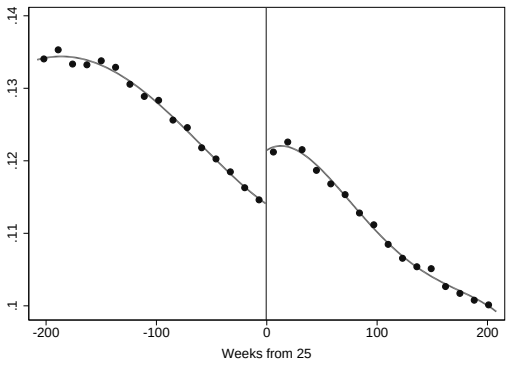


Note: The vertical line indicates a net wealth of DKK 10,000. Boxes indicate 1st, 2nd and 3rd quartiles. Spikes indicate 10th and 90th percentile.

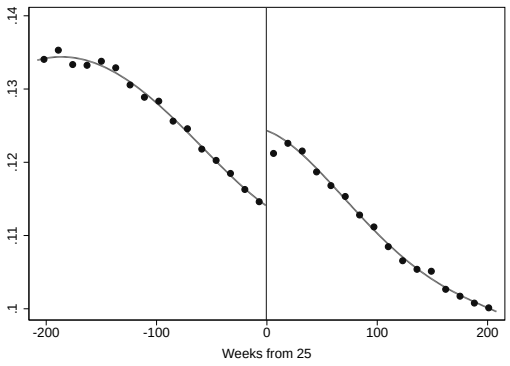
Figure A.3 shows the social assistance along with regression lines from allowing a response time of 13 weeks and not doing so. Figure A.4 plots the results from first-differencing the social assistance ratio, showing that the response indeed occurs within the first 13 weeks after turning 25, which is the only quarter significantly differing from the neighboring quarters throughout the observed age range.

Figure A.3: Social Assistance with/without Response Time (Ratio to Population)

(a) No Response Time

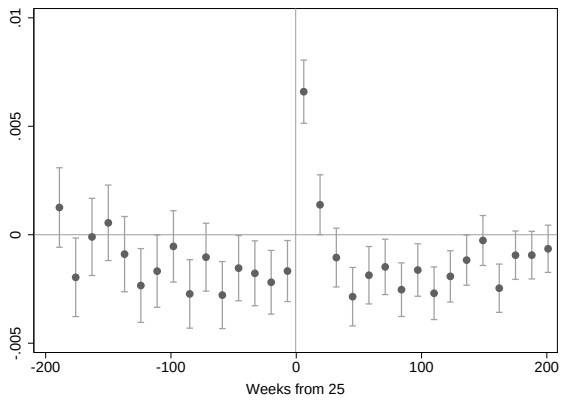


(b) Response Time



Note: Fourth order polynomial spline applied.

Figure A.4: First-difference



Note: Change in one quarter compared to the previous one. Spikes indicate 95 percent confidence intervals.

Figure A.5 shows graphical representation of estimations on social assistance for the whole sample of 57,000 individuals by applying both a quadratic, a cubic and a quartic spline, and allowing for response time of a quarter by including dummies for the first 13 weeks after the cutoff.

Figure A.5: RD Specifications, Full Sample

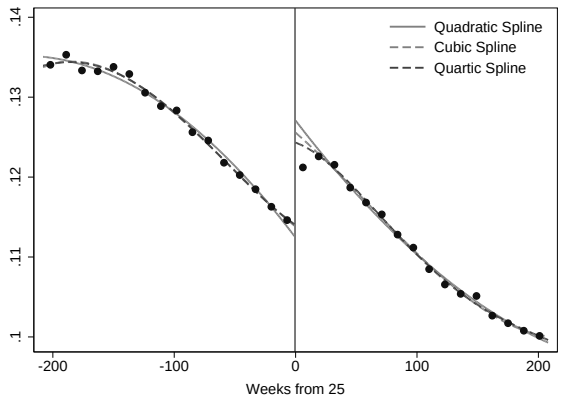
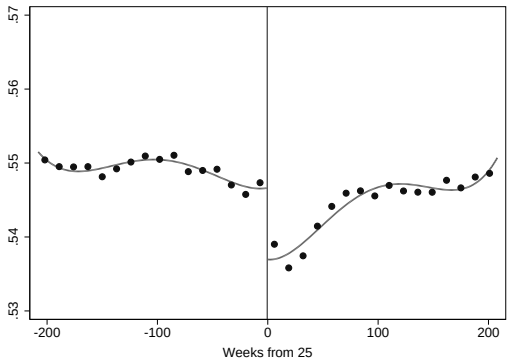


Figure A.6 shows that the inclusion of dummies to capture response time works well in the case of social assistance only, and not for self-support. The reason is the more monotonic trend in social assistance after the cutoff compared to self-support. The figure also shows that the estimates for self-support for the same reason are less affected by response time compared to social assistance in

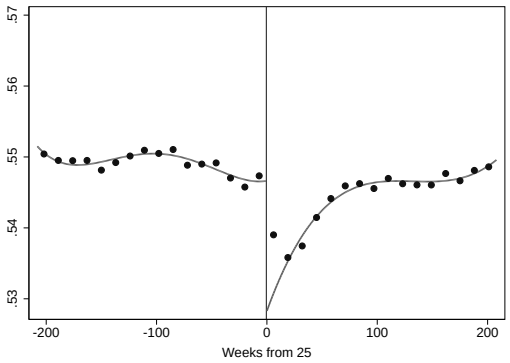
Figure A.3.

Figure A.6: Self-support with/without Response Time (Ratio to Population)

(a) No Response Time



(b) Response Time

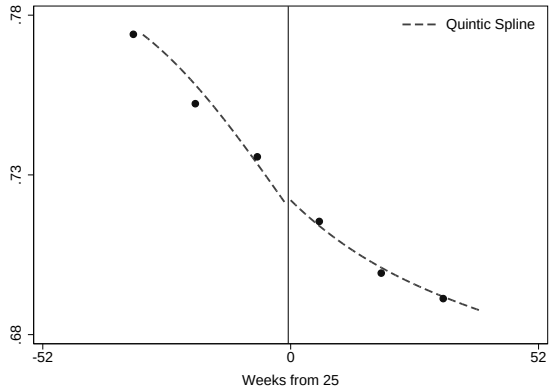


Note: Fourth order polynomial spline applied.

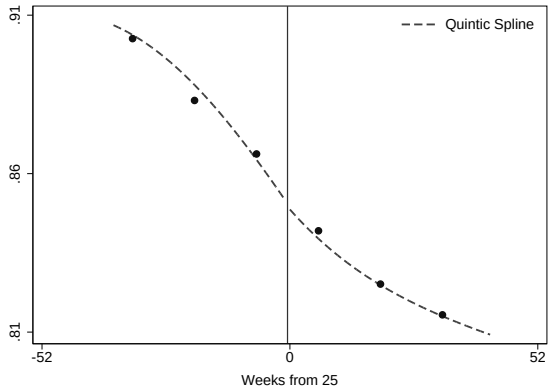
Figures A.7(a) and A.7(b) show self-support measured on the same scale as used for social assistance in Figure 9 by focusing on observations one year before and one year after the cutoff. The graphs show no discontinuity in the groups with earnings higher than 1.

Figure A.7: Self-support, Sub-groups

(a) Earnings >1 and <= 1.5



(b) Earnings >1.5 and <= 2



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Chapter 3

On the Interaction of Disincentive Effects of Social Assistance with Labor Market Attachment and Wages

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Abstract

Building on the previous findings of a strong negative correlation between labor market earnings and disincentive effects of increased social assistance among the unmarried youth with low schooling and without children, this paper analyses the interaction of the response to higher benefits with the components of earnings. By applying a regression discontinuity approach to an age-dependent rule in the Danish social assistance program, the paper estimates the associated disincentive effects on labor market participation of a significant increase in social assistance at the age of 25 according to wages, weekly hours of work, and labor market participation during the year. The paper finds that half of the disincentive effect for individuals in the labor force at age 24 is explained by those with the lowest earnings and weakest labor market attachment. Individuals in short-term part-time jobs explain the other half. Jointly the two groups fully account for the total estimated treatment effect of eligibility to a higher benefit level. The paper finds that hourly wages are only weakly correlated with responsiveness to higher social assistance.

Keywords: Regression Discontinuity, Heterogeneous Treatment Effects, Disincentive Effects, Social Assistance, Wages, Labor Supply, Hours of Work, Labor Market Attachment

1. Introduction

Three recent papers estimate almost identical labor market participation elasticities with respect to social assistance benefit levels for the unmarried young with no children (Lemieux and Milligan, 2008; Bargain and Doorley, 2011; Jonassen, 2013a). For three different countries the three papers rely on the same type of age-dependent rule in the social assistance programs of Canada (1989),

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France (1999) and Denmark (1999-2006), respectively, where benefits increase substantially upon crossing a certain age-threshold.[1] All three papers apply regression discontinuity approaches to estimate the associated disincentive effect on labor supply. This remarkable consistency of estimates across countries and time, arising from applying the same methodology on similar discontinuities in rules for identification, inspires confidence in the estimated size of the adverse behavioral responses from increasing benefits for the unmarried young without children.

However, little is still known about who is responsive to disincentives and the background for such responsiveness. A common finding of the three aforementioned papers is the high responsiveness of those with low schooling.[2] Isolating the adverse behavioral response from higher benefits to those with low educational attainment is certainly important for understanding the consequences of the level of generosity provided by social safety nets for labor supply. However, establishing the appropriate policy response to counter the unintended consequences of increasing income security requires more information than simply the level of educational attainment.

Jonassen (2013a) shows that the larger part of the negative labor supply response to higher benefits in Denmark is explained by new entrants to the social assistance program from employment. Individuals transitioning from economic self-support to the social assistance program account for two thirds of the size of the estimated disincentive effect, while the remaining third is due to a prolonged duration on social assistance among existing participants. This finding suggests that policy would be most efficiently aimed at retaining employment for those "at risk" of a transition into social assistance, but tells us nothing about the specifics of whom in this group to target.

Jonassen (2013b) shows that the response to higher benefits, taking effect upon turning 25 years old in Denmark, is strongly negatively correlated with annual earnings at age 24. The disincentive effect is highest for those with the lowest earnings and decreases to zero for those with earnings above the higher benefit level at age 25. However, annual earnings might be low for several reasons: a low number of hours worked per week, a low number of weeks worked per year, or a low hourly wage. Building on the finding that responsiveness to higher benefits is strongly correlated with earnings, this paper analyses the response to higher benefits in relation to each of these components

[1] Even the increase in benefits relative to average wages is similar across studies (Jonassen, 2013a).

[2] Bargain and Doorley (2011) and Jonassen (2013a) both find that the response to higher benefits is confined to those with no more than compulsory schooling, while Lemieux and Milligan (2008) find evidence of some responsiveness among those with additional vocational training also.

of earnings. The appropriateness of different policy responses to counter the adverse consequences of higher benefits depends crucially on the motivation for choosing labor market inactivity over employment. Information on how the components of earnings interact with the response to higher benefits in turn is important for understanding such motivation.

Furthermore, by showing how higher benefits affect people with particular types of jobs this paper also provides new information on which value to ascribe to the employment being crowded-out by public income support. The greater the extent to which a higher level of benefits displaces full-time employment among individuals not relying on public income transfers, the higher the costs of increased generosity. Conversely, the forgone value of lost production, earnings and taxes is lower the greater the extent to which the higher benefits attract people with weak labor market attachment. This paper provides a characterisation of the type of job affected by disincentives, necessary for an improved assessment of the true cost of increasing the generosity of benefits.

The paper finds that the response to higher benefits is highly correlated with weak labor market attachment. Three quarters of the response to higher benefits is attributable to individuals in short-term part-time jobs and those with very low earnings alone. The paper finds that wages are not a strong predictor of responsiveness to higher benefits.

The paper is organized as follows: Section 2 presents the social assistance program and related programs. Section 3 describes the data, and Section 4 the empirical approach. Section 5 analyses the response according to hourly wages, while Section 6 analyses the response to higher benefits according to three aspects of labor market attachment: very low earings, weekly hours of work, and job permanency. Section 7 discusses the results and extends the analysis of Section 6 by addressing the role of demand for labor in explaining disincentive effects. Section 8 concludes.

2. Background and Institutional Setting

The level of social assistance in Denmark is among the highest in the World. Jonassen (2013a) shows that the average effective tax-rate for a transition from social assistance to employment is the highest among all OECD countries for individuals with no children above age 25. As in Jonassen (2013a) and Jonassen (2013b) this paper analyses the consequences of an age-dependent rule in the Danish social assistance system covering the period 1999 to 2006. At age 25 the level of benefits increases by 55 percent. The generosity of social assistance is an important component of the Danish welfare state model which combines a high level of income support with low costs to firms

of hiring and firing workers. While income security is high, job security is low.

This paper addresses the question of which type of worker is affected by the higher generosity of social assistance benefits. As mentioned in the introduction, Jonassen (2013a) finds a response to higher benefits in Denmark, measured by the participation elasticity with respect to the benefit level, of the same magnitude as Lemieux and Milligan (2008) do for Canada in 1989 and as Bargain and Doorley (2011) do for France in 1999. However, given the higher initial level of benefits in Denmark, i.e., prior to the increase at age 25, the resulting level of benefits is substantially higher. A concern regarding the Danish social assistance scheme may therefore be that the higher level of benefits relative to wages to a larger extent displaces jobs with a stronger labor market attachment.

In this paper I address the question of which value to ascribe to the employment lost due to higher benefits. What are the costs of increased benefits in terms of the type of jobs being displaced by the higher level of generosity? And by analogy, what type of employment would be gained by not increasing benefits?

To help answer these questions this paper analyses the response to higher benefits according to different aspects of labor market attachment and wages. The Danish Parliament very recently passed a new law reducing income security for individuals of age 25 to 30 by lowering social assistance to the same level as for those below age 25. The new law will come into effect in January 2014, making the findings of this paper particularly pertinent.

Individuals below age 25 without children are eligible for social assistance of 6,660 Danish kroner (DKK, Pre-tax, 2012) per month (USD 1,110) conditional on wealth not exceeding 10,000 DKK (USD 1,700). Jonassen (2013b) shows that too much wealth is generally not a concern among those with no more than compulsory schooling at age 25, the group of interest in this paper. Social assistance does not depend on previous income and is time-unlimited. Eligibility requires an "event" such as unemployment, meaning that low income, in principle, is not a sufficient condition. Search requirements are imposed on those who are assessed "ready to enter employment".

Upon turning 25 years old the level of social assistance increases to DKK 10,300 per month (USD 1,700). This paper relies on this age-dependent rule where benefits increase by 55 percent as individuals turn 25 to estimate the treatment effect of eligibility to a higher level of social assistance. For married couples benefits depend on the income of a partner. I therefore restrict attention to those who were not married at the age of 25. I focus on those with no more than compulsory schooling at age 25, as this is the only group exhibiting responsiveness to the higher

benefits. Throughout the paper I will refer to the higher level of benefits taking effect at the age of 25 as the "high" benefit level, in contrast to the lower prevailing level at age 24.

Importantly, Jonassen (2013a) shows that only one other program conflicts with the age-dependent rule of the social assistance program. An adult apprenticeship program offers a subsidy to firms taking on apprentices above age 25. This program does not affect the estimation of disincentive effects measured by an increase in the number of social assistance recipients, but affects estimation of the disincentive effect measured by a decrease in self-support, as participants of the adult apprenticeship program can move from being registered as not receiving benefits to participating in a publicly subsidized program. As in Jonassen (2013a) I control for the influence of the adult apprenticeship program, which could lead to an overestimation of the "drop" in self-support, by defining participation in this program as regular employment.

The paper makes use of another important institutional feature of the Danish social assistance scheme relating to those who have children before turning 25 years old. Parents are eligible for higher benefits before turning 25. As a consequence those who are parents before turning 25 are not eligible for an increase in benefits at age 25, and therefore constitute a control group for the results for those without children. To avoid the influence of fertility decisions in the estimated treatment effect, I condition on not having children before age 26. The next section provides the details of the data used for estimating the treatment effect of gaining eligibility for a higher level of social assistance according to different aspects of labor market attachment and wages.

3. Data

This section presents the data used for the subsequent analysis of the response to the increase in social assistance at age 25 according to job and employment characteristics and wages. The main data set entails weekly information on public income transfers for the population of Danish born citizens who in the period 1999 to 2006 turned 25 years old. From 1999 to 2006 eligibility rules for social assistance remained unchanged for individuals of ages 21-29. I observe every individual in every week in the age range 21 through 28 yielding 416 observations per individual. Data covers the periods 1995 to 2010, and is extracted from a database, called DREAM, maintained by the Danish National Labor Market Authorities, entailing weekly information on all public income transfers. Both the main outcome variable, social assistance, and the secondary, self-support, are binary. In addition to the main dataset, I include administrative data with information for all ages on parental

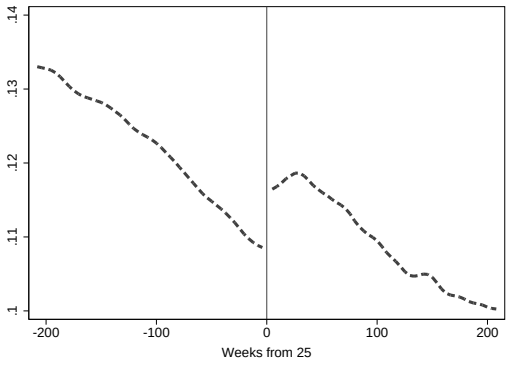
status, marital status and educational attainment.

Figure 1(a) shows the number of unmarried individuals with no more than compulsory schooling at the age of 25, without children before age 26, who receive social assistance in a given week relative to the size of the whole population of unmarried individuals without children. This part of the population comprises 67,000 individuals. The figure shows a steady decrease in the number of recipients in the population at ages 21 through 24. In week zero, indicating the week of turning 25 years old, the ratio of recipients to the population increases sharply before turning to a new steady trend throughout the observed age range.

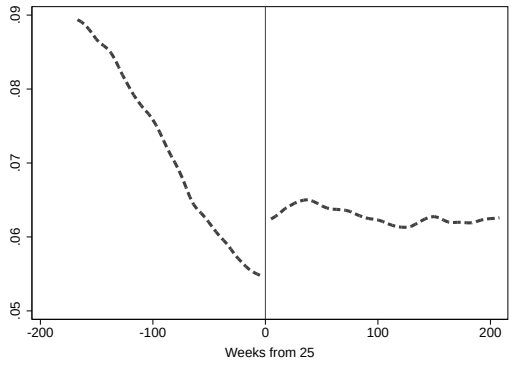
Figure 1(b) shows the ratio of social assistance recipients to the population when further conditioning on being in the labor force at the end of the year in which the person turns 24 years. This additional information is administrative data extracted from a database called IDA, maintained by Statistics Denmark. Data on labor market status, job, employment and employer characteristics is related to a given week at the end of each year.[3] As Figure 1(a), Figure 1(b) shows a sharp increase at week zero in the ratio of social assistance recipients to the population in the labor force. Labor force participants in the population of interest at the end of the year of turning 24 comprises 49,000 individuals.

Figure 1: Social Assistance (Ratio to Population)

(a) Social Assistance, All



(b) Social Assistance, Labor Force age 24



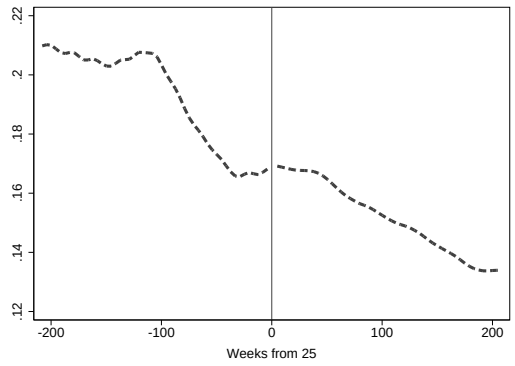
[3]The reference week is the last week of November in a given year.

As mentioned in the previous section, parents are eligible for a higher level of benefits than those without children before turning 25. The group of parents at age 25 therefore is not exposed to a change in benefit levels at age 25, and thus constitute a group of "non-treated" individuals. Figure 2(a) shows social assistance among participants in the labor force at age 24 for the part of the population who at age 25 had at least one child. The figure shows no increase in the number of participants at week zero, confirming that the "jump" observed in Figure 1(b) is indeed related to the change in eligibility. To capture the entire age range Figure 2(a) is measured on a larger scale than Figure 1(b). Figure A.1 of the appendix shows Figure 2(a) on a comparable scale by only maintaining data points two years before and after the cutoff at week zero. The group of parents consists of 13,500 individuals.

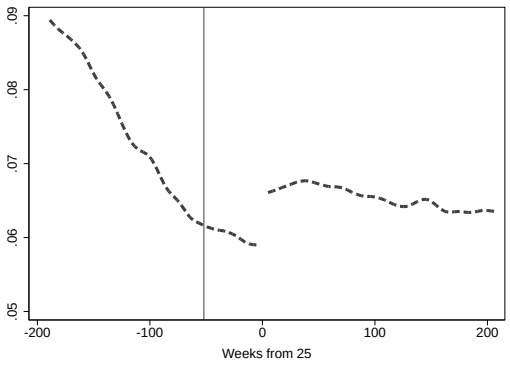
As a second test for spurious "jumps" where non should occur, Figure 2(b) shows social assistance among the 48,000 childless and unmarried individuals who were participants in the labor force at age 23, i.e., one year earlier than in Figure 1(b). If the "jump" at week zero in Figure 1(b) were produced by conditioning on labor force participation at age 24, we would expect a "jump" in the number of recipients in the population at week -52, i.e., the week of turning age 24, when conditioning on labor force participation at age 23. Reassuringly, this placebo test, shown in Figure 2(b), exhibits no "jump" at week -52, but still a noticeable response at week zero. The absence of a "jump" at age 24 shows that conditioning on labor force participation does not mechanically produce a discontinuity at the end of that year.

Figure 2: Social Assistance, Control Group and Placebo

(a) Parents ("non-treated")



(b) Labor Force age 23 (Placebo)



The main variables for the analysis of the role of labor market attachment for the behavioral response at the age of 25 relate to the number of hours of work in the job held at the end of the year of turning 24. The Danish unemployment insurance (UI) scheme offers the possibility of full-time and part-time insurance. Full-time insurance requires an average of minimum 30 hours of work per week. Throughout the paper I will term jobs of at least 30 hours "full-time" and jobs of less "part-time". The IDA database hold information on the number of hours in the job corresponding to this distinction. The variable aims at describing the average hours of the job supplied by the employer.[4] Employment refers to the main job held at the end of November in the year of turning 24.

A different variable aims at capturing the continuity and duration of employment in the specific job. I use this variable to separate out stable employment. I define the category "long-term" employees to describe those who have been continuously with the same employer for at least one year. "Short-term" employees refer to those who have not been continuously with the same employer for at least a year. This category includes job duration of less than one year, but may also include individuals who have been with the same employer for over a year, but in interrupted employment spells.[5] Employment refers to the main job held at the end of November in the year of turning 24.

The applied measure of hourly wages also refers to the main job held at the end of November in the year of turning 24.[6] The quality of the measure of hourly wages is not equally high for all observations. In this paper I only include those characterized by Statistics Denmark as being of a sufficiently high quality.[7]

As all variables on job characteristics and labor market attachment refer to the end of November in the year of turning 24, a concern in using these variables to capture a certain "type" of employment is whether the time of measurement for some individuals is too distant in time from the week of turning 25 years old to accurately describe the "type" of employee at the time of the change in eligibility to the higher benefits. For those born at the beginning of the year the measures of employment characteristics will be measured precisely as the time of measurement is close to

[4]The name of the variable is "jobkat". The "full-time" and "part-time" distinctions are based on information on average weekly hours of work, tax payments, unemployment insurance category, periods of unemployment, sickness, and employment

[5]The variable is called "tilknyt" and is based on information on employment, weekly hours of work, unemployment insurance category, and tax payments.

[6]The variable is called "timelon"

[7]The variable indicating the quality of the calculated hourly wage is called "tlonkval".

the time of the change in eligibility. For those born later in the year the distance from time of measurement to the change in eligibility upon turning 25 years old gradually increases, implying that the "type" of employment could since then, but before the change in eligibility, have changed. However, conditioning on labor market status e.g. a month immediately before the change in eligibility is not desirable as this would create a "dip" in the social assistance ratio to the population by construction. Contrarily, applying a measure of a "type" of employee measured at different distances from the cutoff creates a smoothing of the social assistance ratio. The robustness check of the results in Section 6 shows that the main results are not sensitive to the timing of measurement.

Before addressing the interaction of labor market attachment with the response to the increase in social assistance, Section 4 describes the empirical approach, while Section 5 estimates the interaction of the response at the age of 25 with hourly wages.

4. Empirical Specification

I apply the regression discontinuity approach to estimate the treatment effect of gaining eligibility to a higher level of social assistance upon turning 25 year old. Given the assumption of the RD design, variation in treatment is as good as random (Lee and Lemieux (2010). Importantly for the validity of the estimated treatment effects, Figure 1(b) shows no sign of any important anticipation effects. I apply the regression discontinuity approach to the constant policy rule in place in the period 1999-2006, as described in Section 3. I use the change in eligibility at 25 to estimate the behavioral response at that same cutoff. The probability of treatment rises from 0 to 1 at age 25 for everyone eligible, making this a sharp regression discontinuity design. The main identifying assumption of the approach is that only the discontinuity in eligibility affects outcome at the cutoff. Jonassen (2013a) carefully examines the potential candidates for violating the design, and finds that an adult apprenticeship program comes into effect at the age of 25. As mentioned in Jonassen (2013a), this program does not affect the estimation of the effect on social assistance recipients. As mentioned in Section 2, I deal with the risk of overestimating the effect on economic self-support by defining participation in the program as regular employment.

In terms of estimation strategy, this study differs from Jonassen (2013a) and Jonassen (2013b) in two important aspects. I "move closer" to the cutoff and I allow for a shorter "response time" to the change in rules. Both Jonassen (2013a) and Jonassen (2013b) highlight the importance of allowing for response time in the empirical specification, when estimating on weekly observations,

to avoid underestimating the treatment effect. However, this paper aims at explaining the size of a total treatment effect according to different components of labor market attachment. These components are associated with different groups on the labor market, each of which may exhibit different response times to the change in rules. To be able to compare estimates directly, I therefore focus on the immediate response at the cutoff, allowing for a "response time" of up to five weeks only. I allow for response time by including dummies for those weeks I define as being in the period of response to the new rules just after the cutoff. Jonassen (2013a) shows how different response times affect the estimation results.

The purpose of moving closer to the cutoff is also to improve comparability. Different from Jonassen (2013a) and Jonassen (2013b), estimation in this study uses data points only two years before and two years after the cutoff, where the previous studies used four. That is, I restrict attention to the age range 23 to 26, leaving 208 weeks of observations on each individual. By moving closer to the cutoff, the applied polynomial specifications are less affected by observations farther away from the threshold-age of interest. This may be important if the relationship between age and social assistance or self-support differs in important ways between groups. The lower sensitivity to observations far away from the cutoff is particularly relevant in estimation on smaller samples exhibiting less stable trends in the relationships between outcome and age. In all empirical specifications I allow for different trends before and after the age of 25 by estimating separate regressions on each side of the cutoff and applying flexible polynomial specifications. I include individual fixed effects and cluster at the individual level.

Before moving to the estimation of the response to higher benefits according to differences labor market attachment in Section 6, the next section addresses the response according to hourly wages.

5. Wages

This section addresses the role of hourly wages in the response to higher benefits at age 25. Hourly wages are unlikely to drive low annual earnings alone, but may nevertheless be an important component in the response to higher benefits. The increase in benefits at age 25 may affect reservation wages, leaving the wage required to still accept the current job higher than the actual wage (Rogerson et al., 2005). If the response to higher benefits is highly correlated with low wages, the increase in benefits may produce an increase in observed average wages among those who remain in work. This section explores how wages interact with the behavioral response to higher benefits

at age 25.

As mentioned in the introduction, only those with no more than compulsory schooling at age 25 are responsive to the increase in benefits at age 25. Before turning to the question of whether differences in hourly wages play a role in predicting responses to higher benefits within the group with compulsory schooling only, Figure 3 addresses the question of whether higher hourly wages may explain why those with some additional schooling do not respond to the increase in social assistance.

Figure 3(a) shows the distribution of earnings at the end of the year of turning 24 for those with compulsory schooling only at the age of 25, and for those with some additional schooling at the age of 25. The distributions of hourly wages show that pay per hour of work among those with some additional schooling only slightly exceeds that of those with compulsory schooling only. Hourly wages are stated relative to the median of the whole distribution of wages at age 24. The median hourly wage of those with some additional schooling exceeds that of those with compulsory schooling by 5 percent. The spikes in the distribution of wages around half of the median, that is, around .5 in Figure 3(a), reflect individuals in apprenticeships.[8]

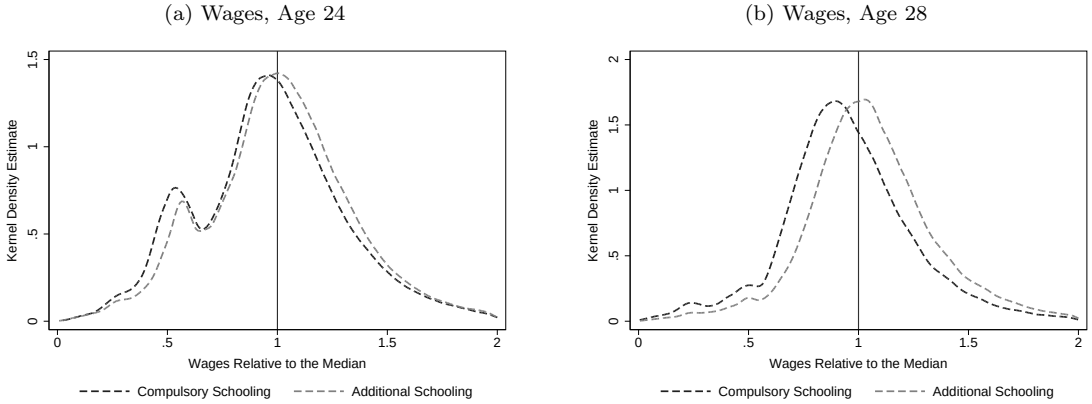
Although the immediate gain from work is not substantially lower for those with low schooling, the prospect of low future wage growth may be a discouraging factor in labor market participation decisions. Figure 3(b) shows the distribution of earnings at the end of the year of turning 28 for the same two groups as in Figure 3(a). Educational attainment everywhere refers to the level of schooling at the age of 25. At the end of the year of turning 28, the difference in median wages between the two groups is 12 percent. The increase in the difference in hourly wages between the two groups with different levels of schooling at 25, may indicate some merit to the argument that low wage growth prospects contribute to responsiveness in one group and not the other. [9]

Figure 4 shows the response to the increase in benefits at age 25 according to hourly wages in the job held at the end of the year of turning 24. Included wages range from just above the tenth percentile to just below the ninetieth. To get a smooth estimate of the response to higher benefits across wage levels on sufficiently large sub-samples for reliable inference, I estimate the moving local

[8]Apprentices receiving on-job-training are registered as employees and in the labor force. Those who complete their training before turning 25 end up in the group of individual with additional schooling, those who do not are categorized as having no more than compulsory schooling at the age of 25.

[9]Differences in first-quartile wages are a little higher at both age 24 and age 28, but the difference increases by roughly the same as the difference in median wages, i.e., 7 percentage points.

Figure 3: Wage Distribution, Conditional on Level of Schooling at Age 25



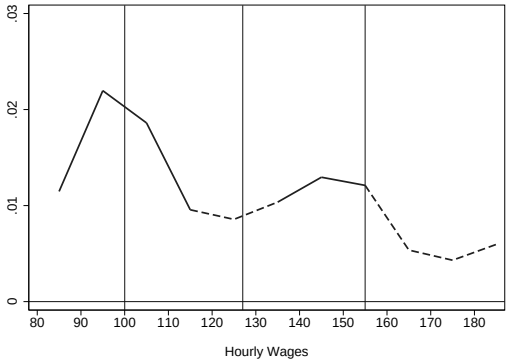
Note: The distribution of wages at age 24 is stated relative to the median wage at age 24, the distribution of wages at age 28 relative to the median wage at age 28.

average treatment effect (MLATE), introduced in Jonassen (2013b). The MLATE estimates the local average treatment effect (LATE) by applying a standard regression discontinuity approach on a sequence of overlapping wage brackets, as if calculating a moving average. I use the cubic and quartic specifications to capture the underlying trend in the relationship between social assistance and age. The first data point in Figures 4(a) and 4(b) is the regression discontinuity estimate for those with wages between DKK 80 and 90. The second data point is the estimate for those with wages between DKK 90 and 100, and so on.

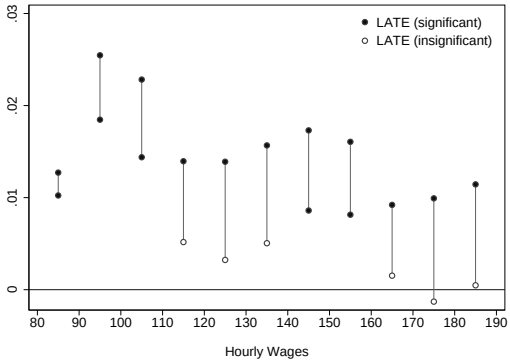
Figure 4(a) shows the midpoint of the interval of estimates, that is, the average of the estimates from applying the MLATE for the cubic and quartic specification, respectively, with two overlapping wage brackets. The first, second and third quartiles are indicated by vertical lines in Figure 4(a). Figure 4(b) shows the point estimates of applying the cubic and quartic specification, respectively, and whether they are statistically significant at the five percent level. Figure 4(a) clearly shows a decreasing relationship between hourly wages and the estimated treatment effect. However, the relationship is far from perfect. As shown in Figure 4(b), and indicated by the dashed parts of the line in Figure 4(a), the treatment effect is not significantly estimated by the quartic specification just below and just above the median. Figure 4 also shows that the estimated treatment effect is significantly estimated by both polynomial specifications at wages well above the median, making hourly wages in the job held at age 24 a poor predictor of the subsequent response to the increase in benefits at age 25.

Figure 4: MLATE, Cubic and Quartic Specifications

(a) MLATE, Average



(b) MLATE, Point Estimates and Significance



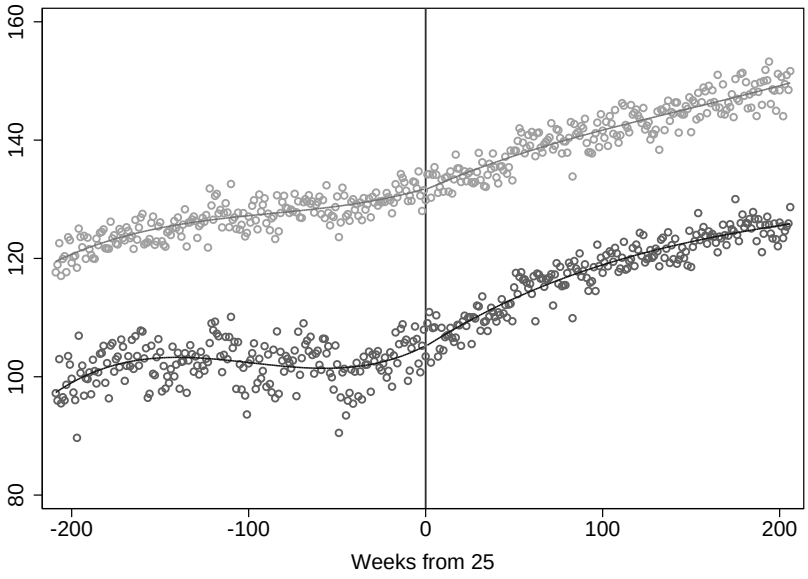
Note: Figure 4(a) shows the average of the estimates from applying the MLATE for the cubic and quartic specification with two overlapping wage brackets. The dashed parts of the line indicate that at least one of the estimates is not significant at the five percent level. The first, second and third quartiles are indicated by vertical lines. Figure 4(b) shows the point estimates of applying the cubic and quartic specification, and whether they are statistically significant at the five percent level.

If the response to higher benefits had e.g. occurred among those with the lowest wages only, this could produce a "jump" in the general wage level due to the sudden absence of many low-wage earners just after the cutoff at week zero. Figure 5 shows the first and second quartile of hourly wages in a given week according to age. The figure includes regression lines from a regression discontinuity approach with a 3rd order polynomial specification on both sides of the cutoff for both first and second quartile wages. The figure shows that no "jump" occurs at the cutoff age of 25, i.e., week zero in the figure. The finding that the general wage level is not affected at the cutoff by the increase in benefits supports the finding that wages, per se, are not a strong predictor of the response to higher benefits.

The median wage, in the top of Figure 5, follow an almost linear trend throughout the observed age range, ages 21 through 28. The 25th percentile, in the bottom of Figure 5, exhibits a flat trend until age 24, week -52 in the figure, where wages start increasing. The first quartile of hourly wages increases by more than the median from age 24 through age 25. From age 26 first quartile wages follow the same trend as the median wage. The shift in trends starting around age 24 is likely to be explained by individuals completing apprenticeship. As noted in connection to Figure 3(a) above, the group of individuals with no more than compulsory schooling at age 25 includes a number of apprentices with low hourly wages at age 24. Figure 6 shows the same graph as Figure 5 for those

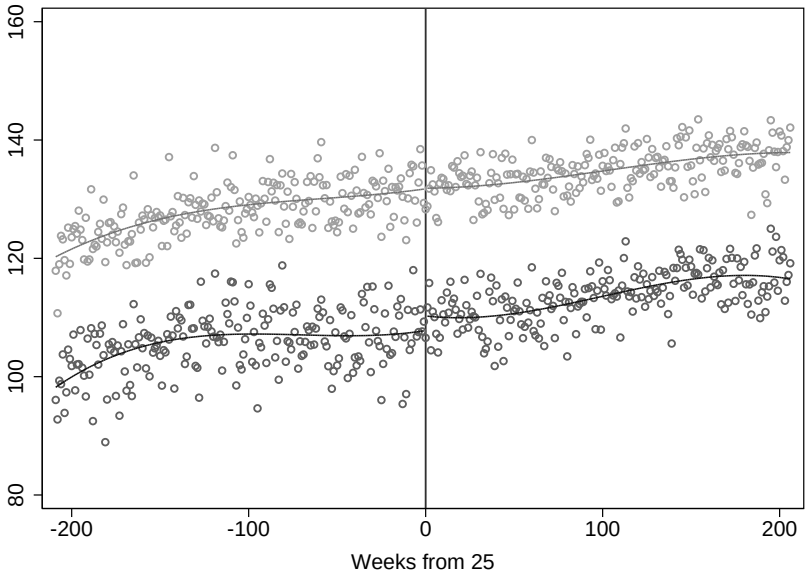
who have children before turning 25 and therefore are not exposed to an increase in the benefit level.

Figure 5: Hourly Wages, 1st and 2nd Quartiles



The rather weak correlation between wages and the behavioral effect of increased benefits is in sharp contrast to the strong correlation between the response to higher benefits and earnings in Jonassen (2013b), suggesting that total earnings matters more for the choice of labor market inactivity than hourly pay. Hourly wages may be a poor predictor of disincentive effects if factors such as e.g. extra pay for night work or danger pay allowances, which increase hourly wages, are correlated with job dissatisfaction, which could make workers more likely to choose labor market inactivity over employment. The next section turns to the role of labor market attachment.

Figure 6: Hourly Wages, 1st and 2nd Quartiles, Parents



6. Labor Market Attachment

Jonassen (2013b) showed that annual earnings are an important predictor of responsiveness to higher benefits. This section focuses on hours of work, and the duration of the employment, in the job held at the end of the year of turning 24. The aim of the section is to explain the behavioral response at the age of 25 according to these determinants of annual earnings. Data with information on the relevant job and employment characteristics and annual earnings comprises 35,000 unmarried individual with no more than compulsory schooling at age 25, and no children before the age of 26.[10] As in Jonassen (2013b) I exclude those with annual earnings of more than twice the equivalent of receiving social assistance at the "high" level of benefits for the whole year.[11] The remaining data set consists of 30,000 individuals. Throughout the paper I use the term "ratio

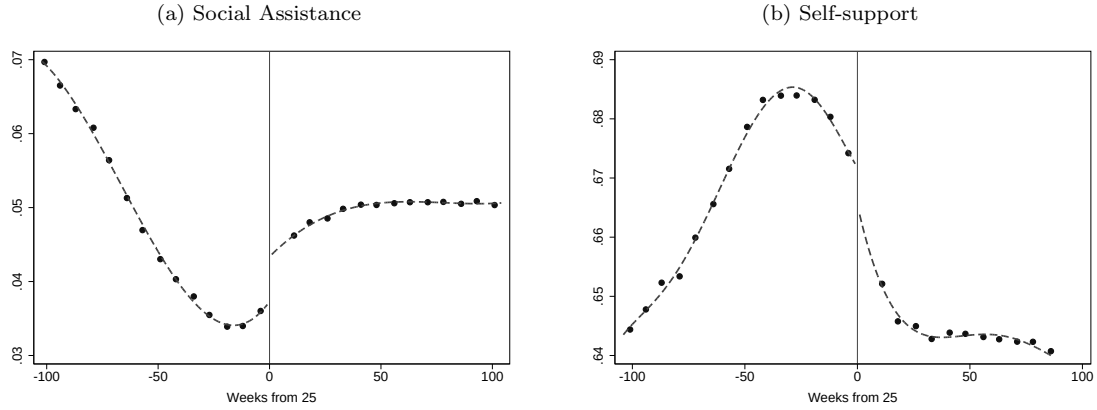
[10]The fact that 35,000 observations are registered with the necessary information implies that of the 49,000 individuals registered as being in the labor force at the end of the year of turning 24 (see Section 3), 12,000 were either unemployed, or were, for a different reason, not registered with either job characteristics or earnings. The unemployed only account for one third of this attrition. The group is generally characterized by a high ratio of social assistance recipients and should be counted among those with very low labor market attachment.

[11]As shown in Jonassen (2013b), those with the highest earnings are more likely to have wealth beyond the maximum of DKK 10,000 allowed for eligibility for social assistance.

to the population", although the number of recipients is relative to the sub-population for whom the relevant information exists in the data. To be clear, all depicted self-support and social assistance ratios are everywhere stated relative to the size of the corresponding sample.

The ratio of social assistance to the population of the 30,000 individuals is depicted in Figure 7(a). Figure 7(b) shows the ratio of economically self-supporting individuals. Both figures include regression lines from the applied regression discontinuity approach described in Section 4. As also mentioned in Section 4, I restrict attention to the age range 23 to 26, i.e., two years before and after the cutoff at the age of 25, to minimize influence of observations far away from the cutoff.

Figure 7: RD, Social Assistance and Self-support, In Labor Force at the age of 24



Note: Regression lines in Figure 7 represent the result from applying the regression discontinuity approach with separate regressions on each side of the cutoff and allowing for a "response time" of up to 5 weeks. Figure 7(a) shows the result from applying the cubic specification, Figure 7(b) from applying the quintic specification. Note that the scale for self-support is slightly wider than for social assistance. In the figure age is grouped by 7.5 weeks as indicated by the dots.

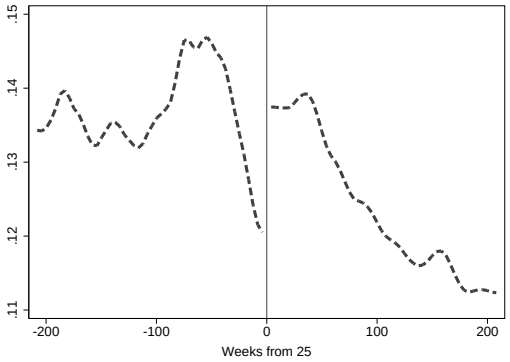
The "jump" in the social assistance ratio in Figure 7(a) is significantly estimated in the range .5 to .6. This section will account for this "jump" according to job and employment characteristics of the job held at the end of the year of turning 24. The "drop" in self-support in Figure 7(a) is significantly estimated in the range -.6 to -.4. Estimates are presented as "Regression 1" in the regression table, Table 1, at the end of this section.

Before addressing the interaction of weekly hours of work and job duration with the response to higher benefits, Figure 8(a) shows the social assistance ratio for those with the lowest annual

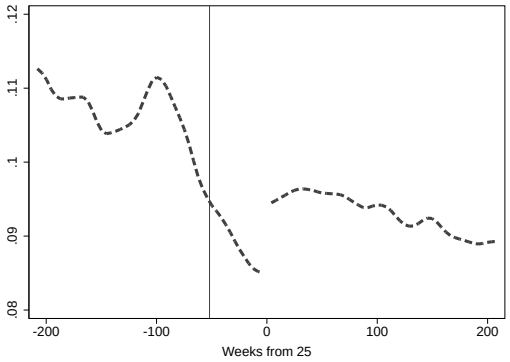
earnings, for whom labor market attachment in the year of turning 24 is too low for a meaningful description in terms of job characteristics. Specifically, Figure 8(a) shows the response to increased benefits for those with earnings at age 24 of less than 60 percent of the equivalent of receiving the "high" level of social assistance, the level of earnings that roughly corresponds to the prevailing lower benefit level at age 24.[12] This group comprises 6,000 individuals.

Figure 8: Social Assistance, Low Earnings

(a) Labor Force Age 24



(b) Labor Force Age 23, Cutoff: Week -52



Note: The figure shows social assistance and self-support using local polynomial smoothing. In Figure 8(b) I condition on labor force participation and low earnings at age 23, indicated by the vertical line at age 24, i.e., week -52.

Imbens and Lemieux (2008) argue that a graphical analysis should be an intergal part of applying the regression discontinuity approach. In accordance with this, I in each of the regressions in this section apply the polynomial specifications yielding estimates in accordance with a graphical representation of the estimation. For all estimations, I find that the cubic and quartic yield appropriate specifications to capture the relationship between social assistance and age. For those with the lowest income, I find that the cubic yields a reasonable description of the relationship between self-support and age. In the remaining regression I allowing for more flexibility by applying the quartic and quintic specifications. Table 1 at the end of this section shows that while the "jump" in social assistance is generally significantly estimated, the "drop" in social assistance is

[12] Jonassen (2013b) shows that the share of annual income at the age of 24 that comes from earnings in this group is less than two thirds.

not significant at the 5 percent level for all specifications. However, point estimates everywhere are within line of the significantly estimated "jump" in social assistance, and are in accordance with a clear "drop" shown in the graphical representations of the estimations. Also, as Table 1 shows, the size and significance of the estimated "drops" in self-support increase when allowing for additional flexibility in the empirical specifications.

The "jump" in social assistance for those with earnings below 60 percent of the "high" social assistance level is estimated in the range 1.3 to 1.8 percentage points of the population. Figure 8(a) shows the "jump" in social assistance for those with low earnings for the whole age range 21-28. The "drop" in self-support is estimated at -1.9 percentage points. Jointly, the estimates imply that those with very low earnings and labor market attachment account for half of the total observed "jump" in Figure 7(a) above.[13] Estimates are presented as "Regression 2" in the regression table, Table 1, at the end of this section. The graphical representations of the regression results are presented in the appendix in Figures A.2(a) and A.2(b).

Given the sharp decline in the ratio of social assistance recipients to the population observed in the period leading up to the cutoff in Figure 8(a), a concern may be that the "jump" could be due to conditioning both on very low earnings and on labor market attachment at age 24, and not due to the change in benefit level. To address this concern Figure 8(b) shows social assistance when conditioning on labor market attachment and equally low annual earnings at age 23. For this reason, the figure includes the age range 21 through 28. Reassuringly, Figure 8(b) shows that conditioning on labor market participation and low earnings at the age of 23 causes social assistance to decline in the same way as in Figure 8(a). However, instead of a "jump" at age 24, i.e., week -52 in the figure, the ratio continues declining until "jumping" age 25, i.e., at week zero in the figure.

The next section addresses the remaining part of the total "jump" in Figure 7(a), that is, the other half not explained by the low-earnings group. This remaining part is to be explained by weekly hours of work and job duration in the part of the population with annual earnings of more than 60 percent of the "high" benefit level, meaning those with a stronger labor market attachment.[14]

[13] Those with earnings below 60 percent of the "high" social assistance constitute 20 percent of the whole sample of 30,286 individuals. Adjusting the estimated disincentive effect of 1.3 to 1.8 for the size of the sub-sample yields estimates in the range 0.25 to 0.35 percentage points of the whole sample, i.e., roughly half of the estimated effect on the whole sample of 0.5 to 0.6.

[14] Jonassen (2013b) shows that the share of annual income that comes from earnings at the age of 24 in this group is more than two thirds.

Section 6.1 addresses the role of number of hours of work by estimating the behavioral response at the week of turning 25 among holders of part-time and full-time jobs, respectively. Section 6.2 takes into account the permanency of the job. Specifically, jobs are grouped into those held (continuously) for at least a year, and those held for less than a year.

6.1. Weekly Hours of Work

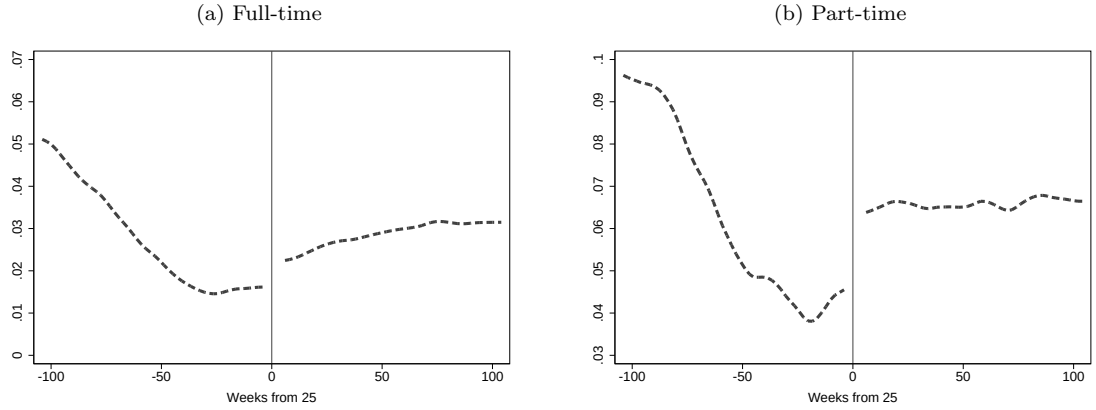
To explore the interaction of the disincentive effect of increased social assistance with the number of weekly hours supplied by workers, this section divides the sample of unmarried individuals with no more than compulsory schooling at age 25, and no children before the age of 26, into those working in a job of at least 30 weekly hours and those in a job of less than 30 hours. This distinction corresponds to the terms for the unemployment insurance scheme as mentioned in Section 2. Full-time and part-time jobs refer to the main job held at the end of the year in which the individual turns 24. As mentioned in the previous section, I restrict attention to those with more than 15 weekly hours, and to those with annual earning greater than 60 percent and less than 200 percent of the "high" benefit level. Conditioning on a minimum of 15 hours of work excludes 1,500 observations. I exclude this group as those with very few hours of work are likely to have other sources of income besides the job in question. The remaining data set consists of 22,500 individuals.

Figure 9 shows the ratio of social assistance recipients to the population according to hours of work. Figure 9(a) shows social assistance for those with full-time employment in the primary job held at the end of the year of turning 24. Figure 9(b) shows the same ratio for those with less than 30, but at least 15, working hours per week. Of the 22,500 individuals, close to 20 percent hold part-time jobs.

Figure 9 clearly shows that responsiveness to increased benefits is a phenomenon concerning part-time jobs. The "jump" in Figure 9(b) is estimated in the range 1.2 to 1.3 percentage points of the population. The drop in self-support is estimated in the range -1.6 to -1.0. The previous section showed that those with low earnings explained half of the overall "jump" in Figure 7(a), which this section aims at explaining. The estimated disincentive effect of increased social assistance on part-time jobs accounts for almost all of the remaining unexplained part of the "jump".[15] That is, while

[15]Those in part-time jobs constitute 14 percent of the whole sample of 30,286 individuals. Adjusting the estimated disincentive effect of 1.2 to 1.3 for the size of the sub-sample yields estimates in the range 0.16 to 0.18 percentage points of the whole sample. Those with low earnings left 0.15 to 0.25 percentage points unexplained, of which part-time jobs explain no less than two thirds and possibly all.

Figure 9: Social Assistance, Full-time and Part-time Employment



Note: The figure shows social assistance and self-support using local polynomial smoothing.

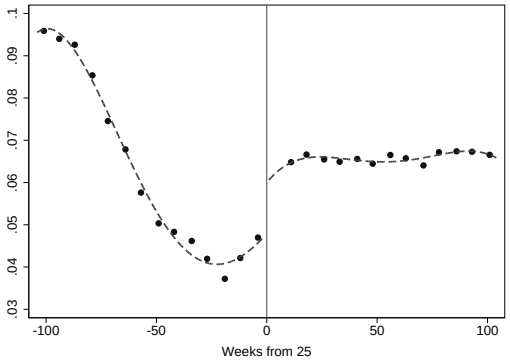
those with low earnings account for half of the estimated "jump", part-time jobs can account for almost the entire other half. Estimates are presented as "Regression 3" in the regression table, Table 1, at the end of the section. Figure 10(a) shows the graphical representation of the estimated "jump" in social assistance from Figure 9(b). Figure 10(b) shows the estimation of the "drop" in self-supporting individuals to the population.

The finding that the response to higher benefits is associated only with part-time jobs, producing a very small increase in social assistance among individuals with full-time jobs, is perhaps not surprising. Jonassen (2013b) finds the disincentive effects of increased social assistance to affect those with low earnings only. Continuous full-time employment is generally not consistent with low earnings. However, short-term employment in a full-time job can be. Among those with full-time jobs almost two thirds had been with the same employer for at least one year, suggesting that the very small "jump" in Figure 9(a) could reflect a larger response among those with a shorter than one year spell with the same employer. However, as mentioned above, the estimated treatment effect on part-time jobs suggests very little left to be explained. By introducing information on the permanency of the job held at the end of the year of turning 24, the next section addresses the possibility of higher responsiveness of individuals in full-time jobs than indicated by Figure 9(a).

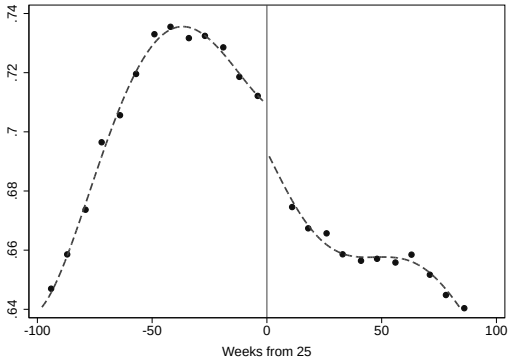
The noteworthy finding that only those who hold part-time jobs exhibit a high degree of responsiveness deserves further attention. In fact, flexibility in the adjustment of desired working hours to allow for the possibility of e.g. working less than full-time is generally considered an important

Figure 10: RD, Part-time Jobs, Social Assistance and Self-support

(a) Part-time Job, Social Assistance



(b) Part-time Job, Self-support



Note: Regression lines in Figure 7 represent the result from applying the regression discontinuity approach with separate regressions on each side of the cutoff and allowing for a "response time" of up to 5 weeks. Figure 10(a) shows the result from applying the quartic specification, Figure 10(b) from applying the quintic specification. Note that the scale for self-support is wider than for social assistance. In the figure age is grouped by 7.5 weeks as indicated by the dots.

element of ensuring high labor market participation, as the lack of flexibility in hours of work is often among the candidates in explaining the dominance of the extensive margin over the intensive in labor market participation responses (Saez, 2002; Bargain et al., 2012). Section 6.2 addresses the issue.of the importance of the permanency of employment in the job held at age 24 in explaining the high observed responsiveness among part-time job holders.

6.2. Job Permanency

This section explores the interaction of the response to higher benefits with the duration of the job held at the end of the year of turning 24. I group observations by whether permanency of the job exceeds one year or not. Those with short-term employment with the same employer include both those who have simply changed employer and those who have entered employment from unemployment. Therefore, the group with short-term employment may include both individuals with weak labor market attachment and individuals with a relatively strong labor market attachment. The group with long-term employment consists only of individuals with a relatively strong labor market attachment.

Figure 11(a) and Figure 11(b) show the ratio of social assistance recipients to the population for those, who at the end of the year of turning 24 had been employed (continuously) with the same employer for at least one year. Figure 11(a) shows individuals in full-time jobs and Figure

11(b) individuals in part-time jobs. Figures 11(c) and 11(d) show the corresponding ratios for those who had not been with the same employer (continuously) for one year at the end of the year of turning 24. The sample consists of 13,800 long-term employees and 8,500 short-term employees. Only 12 percent of long-term employees have part-time jobs, while almost 30 percent of short-term employees have part-time jobs.

Figure 11 shows that the response to higher benefits occurs among those with short-term employment only. This is true for both full-time and part-time employees, although the response to higher benefits is negligible among individuals with short-term full-time jobs. Importantly, Figure 11(b) shows that those with part-time employment who have maintained the same job for at least one year are not affected by the disincentives of higher benefits at age 25.

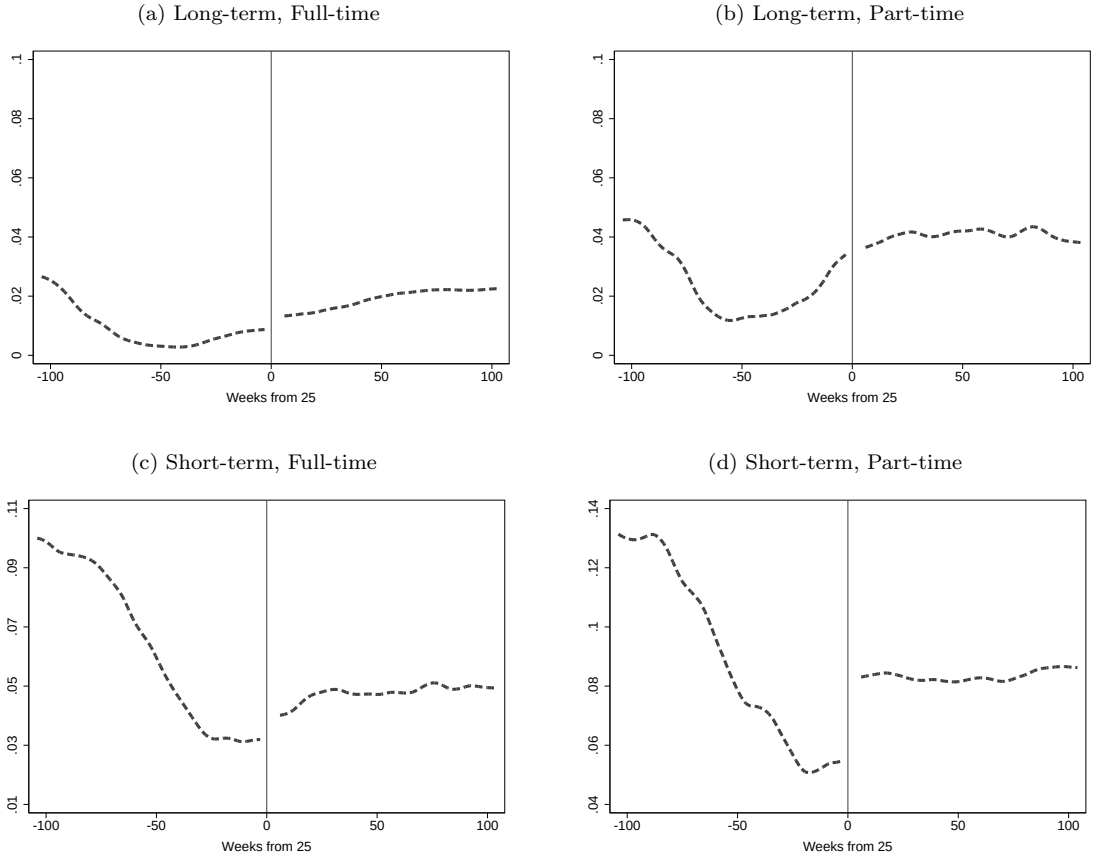
Figure 12 shows the graphical representation of the regression discontinuity results of the disincentive effect of higher increased social assistance for short-term employees in part-time jobs. The "jump" in social assistance is estimated between 2.4 and 2.5 percentage points of the sample of short-term part-time job holders, who constitute 2,400 individuals. The "drop" in self-support is estimated in the range -3.3 to -2.0. The regression results are presented as "Regression 4" in Table 1.

As suggested by the absence of an observable "jump" among long-term employees in part-time jobs, the estimated treatment effect on short-term part-time job holders of 2.4 to 2.5 percentage points, fully accounts for the previously estimated "jump" among all part-time job holders and no less than three quarters of the whole remaining unexplained part of the "jump".[16] This means that short-term part-time jobs account for close to the entire observed "jump" among those with earnings above 60 percent of the "high" social assistance level. Jointly, very low earnings and short-term part-time jobs explain close to the entire disincentive effect among the low-educated, unmarried and childless individuals registered as being in the labor force at the end of the year of turning 24, for whom data on earnings and job characteristics at age 24 is available.

As previously noted, the interaction of the number of hours of work with the adjustment of labor force participation to higher benefits is of particular interest given the widespread consensus in the

[16]Those in short-term part-time jobs constitute 8 percent of the whole sample of 30,286 individuals. Adjusting the estimated disincentive effect of 2.4 to 2.5 for the size of the sub-sample yields estimates in the range 0.19 to 0.2 percentage points of the whole sample. Those with low earnings left 0.15 to 0.25 percentage points unexplained, of which short-term part-time jobs explain no less than three quarters and possibly all.

Figure 11: Social Assistance, Long-term and Short-term Jobs



Note: The figure shows social assistance and self-support using local polynomial smoothing.

literature of the relative importance of labor market participation responses along the extensive margin compared to the intensive margin, a finding which is often associated with a limited scope for adjusting hours of work. Section 7 discusses the implications of the finding that the response to higher benefits occurs among those with short-term part-time jobs only. Section 7 also extends on the analysis of this section by addressing the role of the firm's demand for labor, and presents suggestive evidence that low labor demand plays an important role in explaining disincentive effects of higher benefits.

Table 1: Treatment Effects

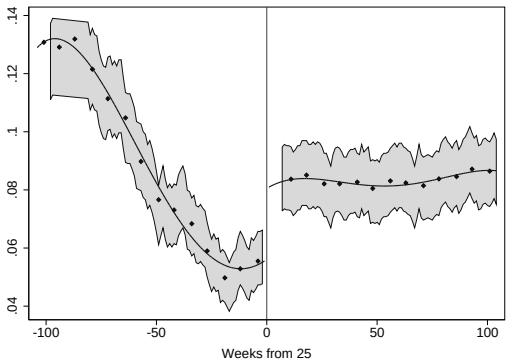
	Social Assistance		Self-support		
	Cubic	Quartic	Cubic	Quartic	Quintic
Regression 1	0.006***	0.005**	-0.006***	-0.004**	-0.006***
(All)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	30,286				
Regression 2	0.018***	0.013*	-0.019***		
(Low Earnings)	(0.005)	(0.007)	(0.007)		
Observations	5,910				
Regression 3	0.013**	0.012*		-0.010	-0.016*
(Part-time Jobs)	(0.006)	(0.007)		(0.008)	(0.009)
Observations	4,115				
Regression 4	0.025***	0.024**		-0.020*	-0.033**
(Short-term,	(0.008)	(0.010)		(0.012)	(0.014)
(Part-time Jobs)					
Observations	2,424				
Time periods	208				

Standard errors in parentheses

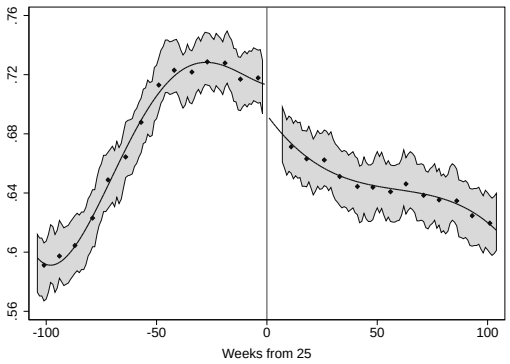
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 12: Social Assistance and Self-support, RD Graphs

(a) Social Assistance



(b) Self-support



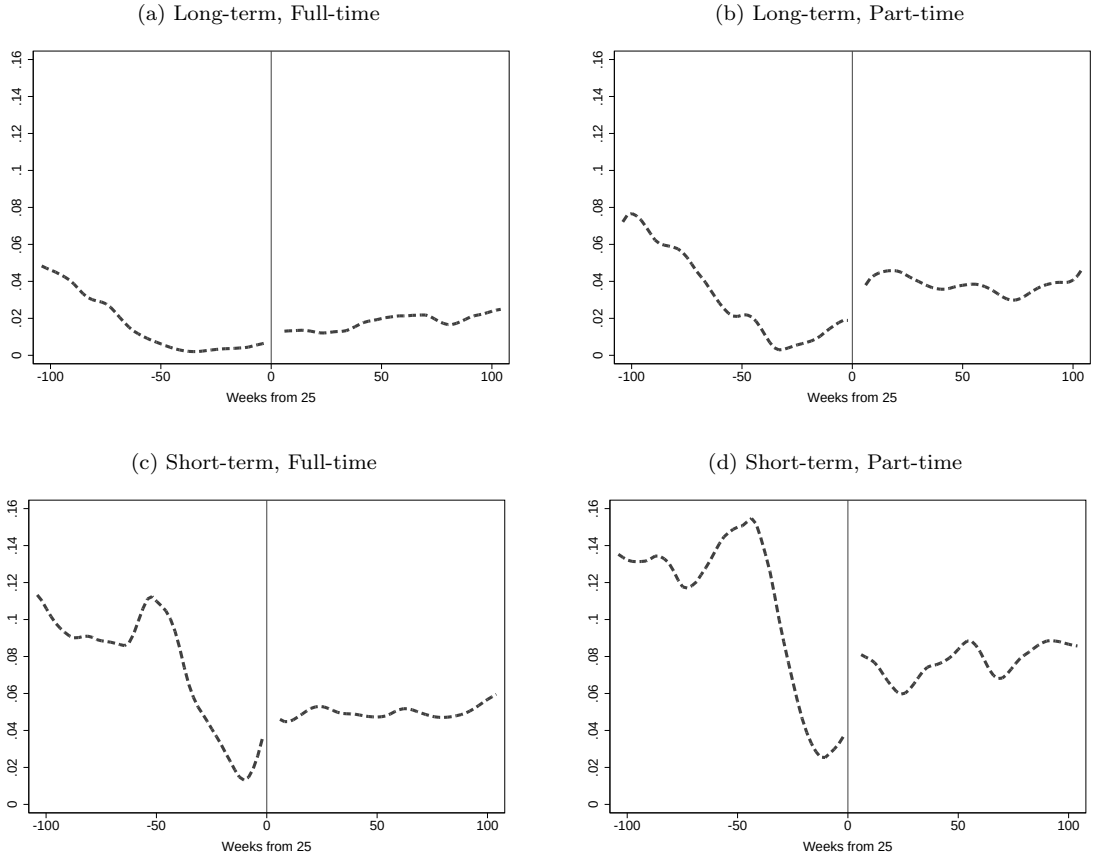
Note: Regression lines in Figure 7 represent the result from applying the regression discontinuity approach with separate regressions on each side of the cutoff and allowing for a "response time" of up to 5 weeks. Figure 12(a) shows the result from applying the quartic specification, Figure 12(b) from applying the quintic specification. In the figure age is grouped by 7.5 weeks as indicated by the dots. To fit the entire range of observations, the scale used for self-support is twice that used for social assistance. The grey areas represent the 95-percent confidence intervals on the mean of weekly observations.

6.3. Robustness Check

As mentioned in Section 3 a potential concern for the validity of the above results is that all variables on job characteristics and labor market attachment refer to the end of November in the year of turning 24, meaning that the time from measuring these variables to the change in eligibility at the age of 25 differs across individuals. For those born at the beginning of the year the measures of employment characteristics will be measured precisely as the time of measurement is close to the time of the change in eligibility. However, conditioning on labor market status immediately prior to the cutoff could create a "dip" in the social assistance ratio to the population by construction, making it difficult to separate the effect of the change in benefits on the social assistance ratio from the effect of conditioning on labor market status, as conditioning on labor market status in any given month the social assistance ratio will typically be higher in both the previous month and in the following

Figure 13 shows the main results from Figure 11 when only including individuals born in January or February, meaning those individuals who are closest to the time of measurement at the end of November the year before. As expected, the figure shows a tendency to a U-shaped "dip" just before the cutoff, yet largely yields the same conclusions as those drawn on the basis of Figure 11.

Figure 13: Social Assistance, Long-term and Short-term Jobs, Birthday January or February



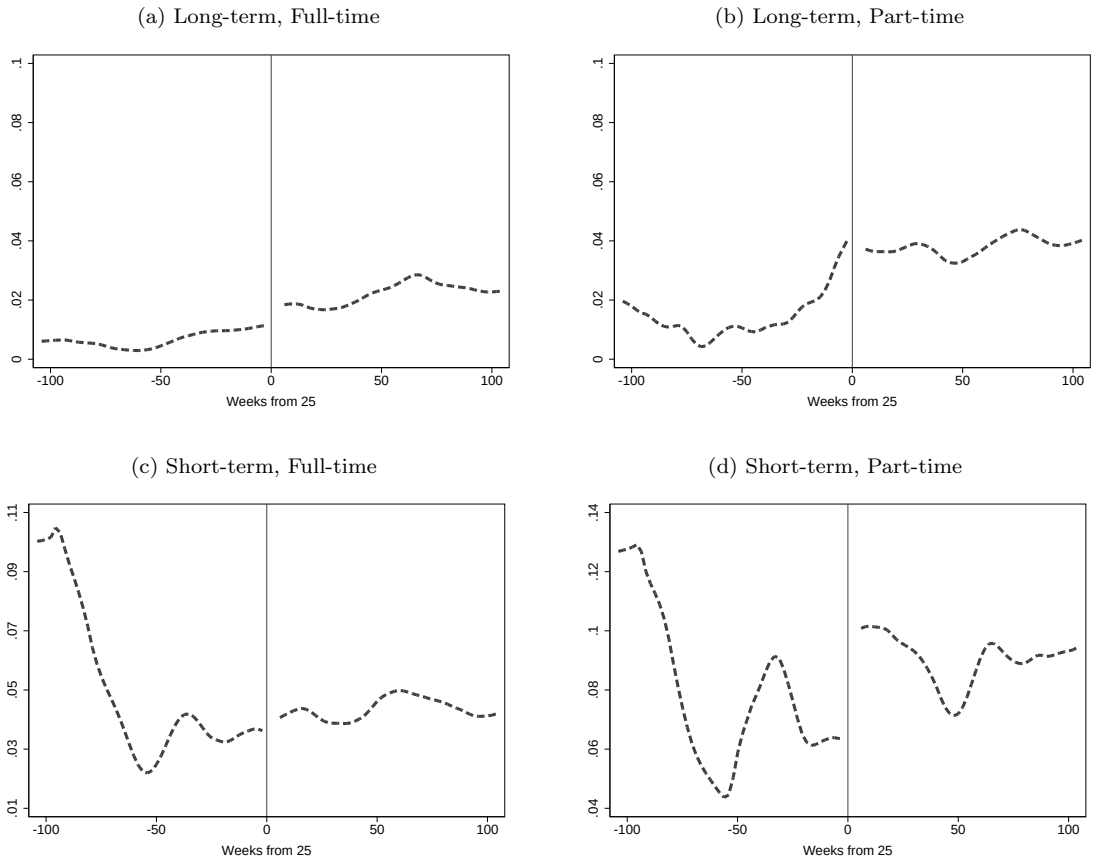
Note: The figure shows social assistance and self-support using local polynomial smoothing.

Figure 14 addresses the concern that the employee "type" of those born latest in the year are poorly captured by the measure of job characteristics as these characteristics are measured around a year prior to the cutoff. Figure 14 shows the same as Figure 13, but including only individuals born in November or December. The figure shows results similar to those in Figure 11, the most notable difference being the "dip" in the social assistance ratio around a year prior to the cutoff in Figure 14(d).

Figure 14 shows that the main results are not affected by conditioning on being born late in the year (November and December), meaning that the results do not change by only considering observations where the distance from the measurement of employment "type" to the change in eligibility is greatest. This result in turn implies that the main results are not due conditioning on

being employed closely to the cutoff as could be the concern in Figure 13. Jointly, Figure 11, Figure 13, and Figure 14 show that applying a measure of a "type" of employee measured at different distances from the cutoff creates a smoothing of the social assistance ratio making it easier to single out the variation caused by the change in benefits.

Figure 14: Social Assistance, Long-term and Short-term Jobs, Birthday November or December



Note: The figure shows social assistance and self-support using local polynomial smoothing.

7. Discussion

The finding of this paper that the response to higher social assistance is strongly correlated with low labor market attachment has strong implications for the evaluation of the cost of increasing generosity of the program. The finding that the adverse behavioral response to higher benefits displaces short-term part-time jobs and those with the lowest earnings means that e.g. ascribing the value of an average job to each of the individuals found to be affected by disincentives would severely overestimate the cost of expanding the generosity of income security. The actual value of production, income, and taxes foregone by individuals choosing labor market inactivity as benefits increase is far lower than it would have been if individuals with strong labor market attachment had been displaced. Conversely, the gains from jobs saved by not extending generosity will also be smaller.

The result is in line with the findings in Bargain and Doorley (2011) that around 75 percent of the estimated disincentive effect of higher social assistance in France is due to either fewer short-term contracts, fewer individuals employed in public subsidised employment, or fewer apprentices. The result suggests that greater generosity does not seem to imply a greater loss of employment characterized by strong labor market attachment. While those with very low earnings are inherently difficult to describe in terms of employment characteristics, the high responsiveness among individuals with part-time jobs deserves some discussion. The following section discusses what might explain low earnings and high responsiveness in this group. Specifically, the section discusses the role of insufficient demand, i.e. underemployment.

7.1. Extension: The Role of Labor Demand

This section discusses the findings of the paper in relation to two key findings in recent research on participation responses to taxes and benefits. One is the consistent finding that participation responses mainly occur along the extensive margin, meaning that the consequences of differences in taxes or benefits translate into a behavioral response affecting the decision to participate or not, rather than affecting the intensity of supplied work through the adjustment of hours of work (Eissa et al., 2008). The dominance of the extensive margin over the intensive margin is frequently interpreted as a consequence of a lack of flexibility in choosing hours of work (Saez, 2002).

The second finding relates to the participation response according to potential earnings. Several studies have shown participation responses to be highest among those with least schooling,

suggesting a strong correlation between responsiveness to incentives and potential earnings (Eissa and Liebman, 1996; Meghir and Phillips, 2008; Lemieux and Milligan, 2008; Bargain and Doorley, 2011; Jonassen, 2013a). Estimates based on actual earnings are less common, yet three exceptions find participation responsiveness to be highly negatively correlated with income (Aaberge et al., 2002; Bargain et al., 2012; Jonassen, 2013b).

As sometimes argued, the low general responsiveness at higher income levels, and the finding that the importance of the intensive margin, although low, increases with income, suggests that high-income jobs typically allow more flexibility in setting hours of work (Bargain et al., 2012). While an improved scope for decreasing work hours may very well explain participation responses at higher income levels, the inability to reduce hours of work does not obviously account for participation responses at low income levels if low income is in itself the result of already few weekly hours of work. For those with already few hours of work, inflexible work time could result in a lower than desired number of actual hours, i.e., underemployment. A restriction on the number of hours of work implies a restriction on attainable earnings, which could motivate labor market inactivity as the level of public income support increases.

As shown in Jonassen (2013b) the response to the increase in social assistance benefits is highly concentrated at the bottom of the earnings distribution. This finding clearly indicates that those with stable full-time employment are on average not responsive to the increase in social assistance, as strong labor market attachment is generally not consistent with low earnings. By implication, the responsive individuals are to be found among those with full-time jobs, but low labor market attachment, or among those with part-time employment. Labor market attachment in the latter group could be characterized by either a stable or unstable employment pattern.

In analysing the extent to which the response to higher benefits is related to weekly hours of work this paper found that the responsiveness was, in fact, associated with individuals in part-time jobs. Interestingly, the results show that individuals in stable part-time employment do not exhibit responsiveness to the increase in benefits. If long-term employment in the same job is associated with a correspondence between actual and desired number of hours of work, then the finding that long-term employees in part-time jobs do not exhibit responsiveness to higher benefits, while the short term-employed do, is in line with the argument that responsiveness is associated with not being able to adjust hours.

If the inability to choose the desired amount of working hours is the main determinant in

explaining observed participation decisions, then high responsiveness among the group of short-term part-time job holders could be explained by the desire to work even less, but could also be explained by an insufficient number of hours and corresponding low earnings. Interestingly, both explanations could, given reasonable assumptions, potentially account for the finding that mainly those with low schooling are affected by disincentives even though, as shown in Section 5 of this paper, their immediate gain from work does not differ substantially compared to those with some additional schooling. If those with low schooling have a higher preference for leisure this would lead to an expected lower number of work hours and at the same time an increased propensity to respond to the improved scope for maintaining a sufficient level of income with less work. Alternatively, if underemployment, i.e., low demand, is predominantly a phenomenon in low-skill jobs, then we should expect a response to inadequate earnings to occur among those with low schooling. Obviously, which of these determinants is driving the observed response to higher benefits is crucial for the justification for increasing generosity of any social assistance scheme.

In the following I investigate whether underemployment is likely to play a role in explaining disincentive effects. The aim of the exercise is not to rule out one explanation or the other, high preference for leisure or underemployment, as both can be true at the same time. An obvious way to go about investigating the relationship between underemployment and the response to benefits would be to estimating the size of the response over the business cycle, i.e., at different levels of demand for labor. A higher level of aggregate demand would suggest an improved scope for achieving more hours of work. However, the period of observation of this study is characterized by a relatively stable macroeconomic environment with no clear distinction of periods of low or high demand. More importantly perhaps, such an approach may not be advisable, as a period of low demand would also mean that a larger part of the population of interest, those in low-demand jobs, would be without a job and already receive social assistance and therefore not respond to the change in benefits, even if they would have responded while holding a job in periods of higher demand.

To explore the question of the role of underemployment I instead exploit a unique feature of the data, which is the possibility of linking individual observations at the end of the year of turning 24 to data on the employer. This data entails information on changes to employment within the firm during the preceding year, i.e., whether the firm has reduced the number of employees. I divide individuals, for whom employer-data with information on changes in employment exists, into two

groups: those in firms which have reduced employment by more than 5 percent and those in firms that have not.[17] The change in employment during the preceding year, i.e., an indicator of the firm's demand for labor, serves as a proxy for the individual worker's scope for increasing the number of hours of work. If the firm has significantly reduced the number of employees this indicates poorer chances of increased number of hours. Importantly, all observed individuals are still employed with the firm at the time of observation.

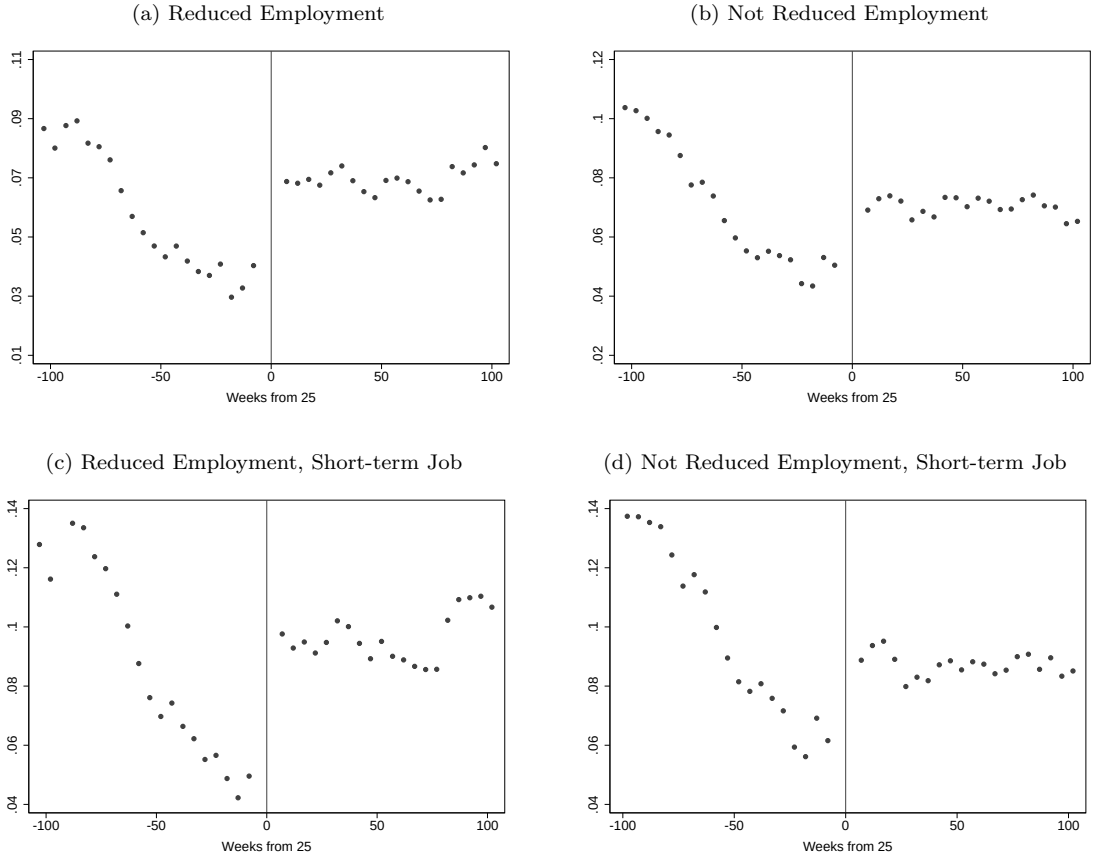
Figure 15 shows the response to the increase in social assistance among individuals employed in a firm which has reduced the number of employees during the past year and for those in firms that have not. Figure 15(a) and Figure 15(b) clearly show that the responsiveness to higher benefits is greater in the former group, indicating that those with the lowest potential for an increase in hours of work exhibit the strongest responsiveness to higher benefits. Figures 15(c) and 15(d) show the same as Figures 15(a) and 15(b) for those who have not been in the same job for more than a year.

Figure 16(b) shows self-support for the group who have not been in the same job for more than a year in a firm which has reduced the number of employees, while Figure 16(a) shows social assistance for this group, as in Figures 15(c), but on a comparable scale to Figure 16(b).

Thus far I have suggested that the amplified "jump" at week zero in left-hand side figures of Figure 15 is due to underemployment. That is, the response is higher because of the lack of demand that places a restriction on the number of feasible hours and corresponding earnings. If underemployment is driving the increased response we should not expect that conditioning on low demand for labor in the firm would affect the responsiveness of those working full-time, as full-time employment is not in general a phenomenon consistent with underemployment. Nor should we expect that conditioning on low demand for labor in the firm would increase responsiveness among those who are satisfied working part-time, that is among those with long-term part-time employment. Figure 17a shows the social assistance ratio to the population for holders of a short-term full-time job, meaning those who have been employed in the same job for less than one year, who are employed in a firm which has reduced the number of employees during the year. Figure 17(b) shows the corresponding ratio for those with a long-term part-time job, meaning those who have been employed in the same job for at least one year, who are likewise employed in a firm which has reduced the number of employees during the year. Figure 17a shows that conditioning on low

[17] The distinction on 5 percent is set by the available information in the dataset.

Figure 15: Social Assistance, Part-time Employees, Change in Firm Employment

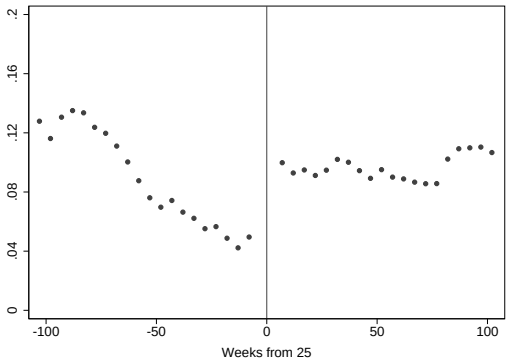


firm labor demand does not imply responsiveness to benefits in either of these groups. The finding that neither of the two groups exhibit increased responsiveness when conditioning on low firm labor demand is consistent with the hypothesis of underemployment driving the increased responsiveness among those employed in part-time jobs for less than a year.

The evidence presented in this section is far from conclusive, but suggest that future research should take into consideration the role of demand in explaining disincentive effects of public income transfers.

Figure 16: Social Assistance and Self-support, Part-time Employees, Reduced Employment

(a) Social Assistance



(b) Self-support

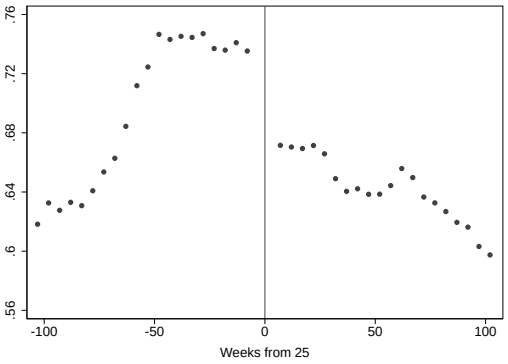
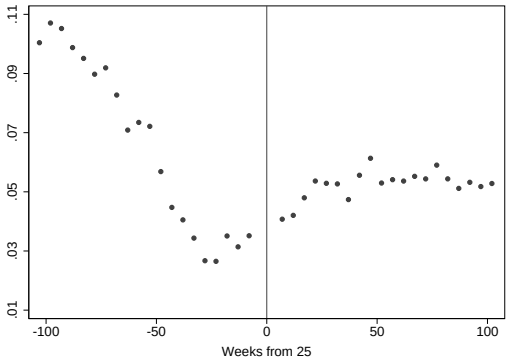
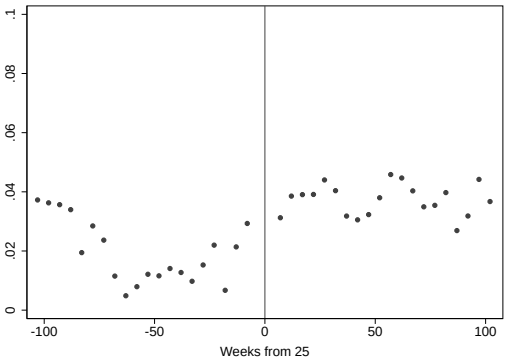


Figure 17: Social Assistance, Part-time Employees, Change in Firm Employment

(a) Reduced Employment, Short-term, Full-time Job



(b) Reduced Employment, Long-term, Part-time Job



8. Conclusion

Given the high level of benefits by international standards, a concern regarding Danish social assistance is that the level of generosity to a larger extent displaces employment characterized by strong labor market attachment.

The findings of this paper show that the response to a significant increase in social assistance at the age of 25 in Denmark is highly correlated with low labor market attachment at the age of 24. At the age of 25 social assistance increases by 55 percent. The paper uses this age-dependent rule to estimate the disincentive effect on labor market participation of the extended generosity of benefits. It does so for individuals in the labor force at age 24, and explains the total effect according to different aspects of labor market attachment and wages. By applying a regression discontinuity approach, the paper finds that those with the lowest annual earnings in the year of turning 24 explain half of the total disincentive effect. Individuals in short-term part-time jobs explain the other half.

The participation decision among those in jobs of at least one year's duration is not affected by the lower work incentive taking effect upon turning 25 years old. This is true for individuals in full-time jobs as well as for those in part-time jobs. The paper also shows that the correlation between responsiveness to higher benefits and the level of hourly wages is rather weak. Comparing this finding with Jonassen (2013b) suggests that total earnings matter more for participation responses than hourly pay.

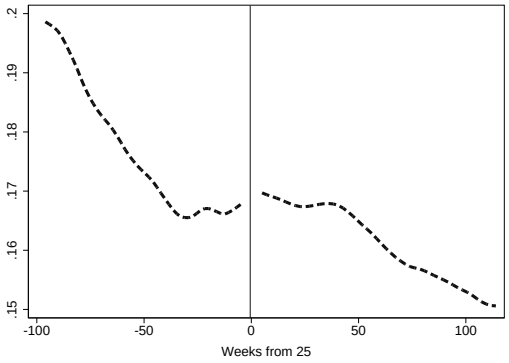
As only those with low labor market attachment, indicated by low earnings or few hours of weekly work on a short-term basis, are affected by the associated lower incentives, the findings of this paper suggest that the cost associated with providing the more generous benefits are lower than previously shown.

Finally, the paper addresses the role of demand for labor in explaining the large response of part-time jobs. By including information on changes in employment within the firm, the paper presents suggestive evidence that low labor demand plays an important role in the explaining disincentive effects of higher social assistance, and deserves further attention in future research.

Appendix A.

Figure A.1 shows Figure 2a on a comparable scale by only maintaining data points two year before and after the cutoff at week zero. The group of parents consists of 13,500 individuals.

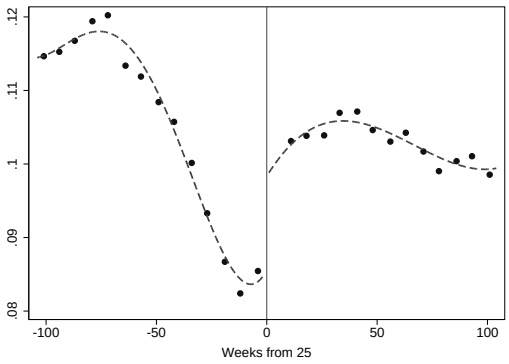
Figure A.1: Social Assistance, Parents



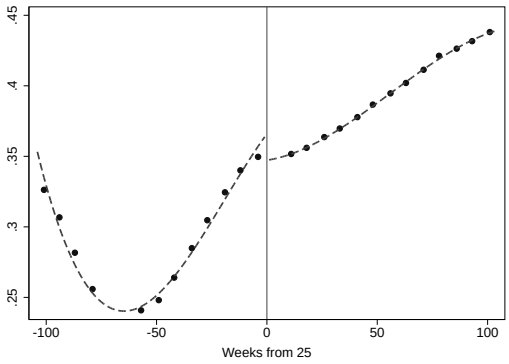
Figures A.2(a) and A.2(b) show the graphical representations of the estimated treatment effect for those with earnings below 60 percent of the "high" social assistance level. The effect is estimated in the range 1.3 to 1.8 percentage points of the population.

Figure A.2: RD, Social Assistance and Self-support, Low Earnings

(a) Social Assistance



(b) Self-support



Note: Regression lines in Figure A.2 represent the result from applying the regression discontinuity approach with separate regressions on each side of the cutoff and allowing for a "response time" of 5 weeks. Figure A.2(a) shows the result from applying the quartic specification, Figure A.2(b) from applying the cubic specification. Note that the scale for self-support is much wider than for social assistance. In the figure age is grouped by 7.5 weeks as indicated by the dots.

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