Work Limitations and Income Inequality in the US 1988-2016

Katie Jajtner*[1], Christine Fontain[1], Sophie Mitra[1], and Austin Nichols[2]

[1]Fordham University
[2]Abt Associates

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Abstract

This paper studies income inequality by work limitation status in the United States from 1988 to 2016. Despite a growing literature on income inequality, households or individuals with disabilities in the United States have not been considered as part of investigations of changes in inequality. In a context of rising income inequality within the general population as well as policies to improve rights and inclusion with respect to disability, it is unclear how income inequality might have evolved within and between households with and without work limitations.

We use data from the March supplement of the Current Population Survey (CPS) using the work limitation disability measure of the CPS. We compute measures of income inequality and the progressivity of government transfers and disability income.

Results indicate that income inequality has risen at similar rates overall for households with and without work limitations, thus producing income inequality between the two groups relative to total inequality that is not significantly changing over time. Within groups, for government transfers, we find that a measure of progressivity is significantly declining among households without any work limitation and not changing among households with work limitations. Disability income is found to have significantly increased in progressivity among households with work limitations only.

Overall, disability income may have mitigated rising income inequality for households with work limitations. More broadly, due to static between inequality, it appears that policies aimed to enhance the economic and social participation of persons with disabilities in the last three decades might not have been able to reduce income inequality across work limitation status, and warrant further research.

1 Introduction

Income inequality has unambiguously increased in the United States since the 1980s. This has received much attention in scholarly circles and more recently with the general public (for example:

*Corresponding author: kjajtner@fordham.edu

Piketty (2014)). A large literature has developed on rising vertical inequality, i.e. changes in the distribution of incomes of individuals or families, documenting the fall in relative income at the bottom of the distribution while income at the top of the distribution has pulled further away from the median (e.g. Corak (2013)). There has been much less attention to horizontal inequality, i.e. inequality among groups, except for studies on trends in gender inequality in earnings and wages and racial inequality in income (e.g. Blau and Kahn (2007)). Households or individuals with disabilities in the United States have not been considered as part of these investigations on changes in inequality in the United States. This paper studies trends in income inequality across and within disability status and will attempt to assess the determinants of such trends, including the changing roles of disability programs. Our main objective is to investigate to what extent work limitations among adults may be a factor in changing inequality among American households. It is a descriptive study documenting trends in income inequality by disability status. The objective is to examine income inequality as it relates to families with disabilities, which has been an under researched area.

We use data from the March supplement of the Current Population Survey (CPS) from 1988 to 2016 using the work limitation disability measure of the CPS. We hypothesize that the group of households with work limitations has experienced increasing income inequality similar to the general population. Expected trends in inequality between households with and without disability are less clear. With changes in the disability policy environment with the enactment of the Americans with Disabilities Act (ADA) in 1990 and its amendments later in 2008, one might expect improvements in economic and social inclusion translating into less inequality. At the same time, expected trends in between inequality are unclear given a well documented downward trend in the employment rate of persons with work limitations in the 1990s and 2000s, while the increasing size of the Social Security Disability Insurance program (Autor and Duggan (2006)) might have contributed to reduce the inequality between households with and without disabilities.

In this context, we attempt to answer a couple research questions:

1. Has income inequality between and within households with/without a work limitation increased over time?
2. In what way do government transfers or disability income contribute to these inequality trends?

We construct annual time series of shares of total income accruing to households with and without disabilities. We compute measures of income inequality, such as the generalized entropy indexes for households with and without disabilities, which are decomposable across population subgroups (Shorrocks (1984)). We also construct measures of the progressivity of government transfers and disability income (Kakwani (1977) and Lambert (1985)). In this way, we can measure the contribution of disability to income inequality across households, and also measure the offsetting impact of disability benefits and transfers.

The remainder of this paper is organized into four additional sections and an Appendix. Section 2 discusses some of the relevant literature, section 3 presents our data and methodology, section 4 presents preliminary results, and section 5 concludes.

2 Literature Review

Research shows that inequality increased over the last few decades in the United States (Piketty (2014), Stone (2016), and Rajan (2012)). Additionally, growth from recent economic recoveries has not been shared equally among the entire population, and typically accrues to the top echelons of the income distribution (Saez (2013)). Individuals with impairments or chronic health conditions can have work limitations due to their condition, and thus constrain earnings. However, transfers via social programs aimed at compensating this income loss could mitigate the effect and offset lower earnings.

Persons with disabilities face a variety of economic disadvantages. Before going further, it is important to note that the literature does not maintain a consistent definition of disability. In some cases, typically more recent studies, scholars sometimes employ a functional limitations definition. This would encompass selecting individuals who report difficulty hearing, seeing, concentrating, walking, etc. without assistive devices as "disabled". An example of this research definition includes Kavanagh et al. (2015), where researchers find functional limitations are associated with lower income, education, labor force participation, and increased housing vulnerability. The degree of disadvantage is strongly heterogeneous based on the type of limitation, where persons with cognitive impairments and acquired brain injuries are the most disadvantaged (Kavanagh et al. (2015)).

More commonly, research defines "disability" to encompass work limitations. Some major datasets, including the Current Population Survey (CPS) and Panel Study of Income Dynamics (PSID) only began including functional limitation measures in the survey in the late 1990s or 2000s, with work limitation measures beginning much earlier. The Social Security Disability Insurance (SSDI) program was designed with the latter definition of disability in mind. Disability benefits are awarded to individuals who are no longer able to engage in work similar to their previous employment or transition to a new type of work (Autor (2011)). Using the work-limitations definition of disability, Meyer and Mok (2012) find that generally we see lower earnings, income and higher poverty among persons with disabilities. Again, they also find heterogeneity in results, based on severity of the condition and duration. Those who face a chronic and severe disability face the greatest obstacles, with over 75% decline in earnings, and 34% decline in income. By comparison, those with a temporary condition could encounter a bit more than a 25% reduction in earnings (Meyer and Mok (2012)).

In addition to lower income and earnings, persons with disability also tend to have higher medical expenditures. Using both functional and work limitation disability definitions, Mitra, Findley, and Sambamoorthi (2009) find persons with disabilities are more likely to be older, less educated; and less likely to be employed, or have public insurance. They are also more likely to be poor. Furthermore, that study suggests median total health expenditures are $649 for the non-disabled population, which pales in comparison to the estimated $4,449 medial health expenditures for the disabled population. While insurance may help, out-of-pocket expenditures for persons with disabilities is still more than three times that of the non-disabled population ($208 versus $703) (Mitra, Findley, and Sambamoorthi (2009))[1]. In an era of increasing medical costs, this burden could become even more pronounced.

[1]The figures here represent the differences when utilizing the work-limited disability definition.

Given higher medical costs and lower earnings and income, it is perhaps unsurprising to find that persons with disabilities also have a higher propensity to be in poverty. Depending on the severity of disability, She and Livermore (2007) estimate that persons with disability are two to five times more likely to be in poverty. Furthermore, that figure does not necessarily take into consideration their higher medical expenses. After accommodating for increased medial costs, this study finds the "disability adjusted poverty threshold" to be somewhere between $18,000 and $39,000 (depending on the disability or hardship measure) for an official poverty level of $10,000 (She and Livermore (2007)). Brucker et al. (2015) expand on this idea further and find that poverty is more common among the population with disabilities regardless of poverty measure. They find the poverty gap between the population with disabilities (work limitations) to be between two to three times that of the population without disabilities, depending on the poverty measure used. A supplemental poverty measure (which adjusts for size/type of family, other benefits, and location) produces the lowest gap, followed by official poverty measures, and finally multidimensional measures (which encompass education, employment, health insurance, income, food security, and/or social connectedness and political participation) (Brucker et al. (2015)).

Research also suggests that social programs aimed at assisting individuals with disabilities and work limitations have grown significantly. Autor and Duggan (2006) estimate that in 2006 approximately 4.1% of the population received Social Security Disability Insurance (SSDI) versus 2.2% in 1984. Furthermore, they estimate that without any change in policy, in the steady state 6.5% of U.S. adults will be on SSDI, with over $150 Billion cash benefits (Autor and Duggan (2006)). Real expenditures for SSDI grew at 5.6% compared to just 2.2% for other Social Security programs (Autor (2011)). While the quantity of SSDI recipients doubled between 1989 and 2009, real benefit expenditures tripled and Medicare expenditures more than tripled (Autor (2011)). So not only do we see an increase in the number of individuals claiming SSDI, outlays per claim also appear to be increasing.

It is clear that we should expect persons, or households, who are work-limited to have a higher probability to be in the lower part of the income distribution due to their economic disadvantages. What is unclear, and what this study seeks to determine, is how inequality trends alter the probability that a household finds itself in the lower part of the income distribution, and the amount of rising inequality attributable to work limitations. A priori, the effect is ambiguous. Due to constraints in earnings, income, increased expenditures and poverty, rising inequality and growth accruing to the top of the income distribution should increase inequality between the work-limited and non-work limited population (or make it increasingly probable to find those households near the bottom of the distribution). However, as noted above, expenditures per disability claim are also increasing, perhaps mitigating some issues with rising inequality.

Previous research presents a variety of methods to answer questions such as these with inequality decomposition and measures of progressivity. For inequality decomposition, Shorrocks (1984) lays out a mathematical justification for decomposing certain classes of inequality measures (including the General Entropy measures) for population partitions respectively. Progressivity measures such as Kakwani (1977) or Lambert (1985) aim to quantify the effect of particular taxation policies or

benefits on the distribution of income[2].

Decomposition methods typically fall into one of two categories: a static analysis of within and between group inequality or a regression-based approach[3]. Some researchers note the shortfalls of these more typical methods and propose alternatives applying game theory[4]. It appears (at least initially) that the latter option fares better in theory than application. Most research continues to rely heavily on Shorrocks (1984) to decompose inequality into within group and between group components. According to that method, indices which are additively decomposable can be split into inequality resulting from within mutually exclusive and exhaustive semi-homogenous groups and inequality resulting from differences between these groups. Shorrocks (1984) proves that certain inequality indices fit the property of decomposability by population subgroup: specifically those of the Generalized Entropy family (including Atkinson Measures). Notably, in the case of decomposition by population subgroup the Gini Index is not adequate, although it is appropriate for decomposition by factor source[5].

Particularily informative on decomposition of inequality by population subgroup is Cowell and Jenkins (1995). Using the Atkinson Index, they create four separate semi-homogenous mutually exclusive and exhaustive population partitions based on gender, race, age, and employment status. In all cases, they find that the between-group level of inequality explains rather little of overall inequality and suggest that the main determinant of inequality in the United States must be within gender, race, age, and employment specific cohorts (Cowell and Jenkins (1995)). Breen et al. (2015) also apply this same methodology to educational attainment in the United States and concur with Cowell and Jenkins (1995) - that differences between educational groups are rather small relative to inequality within groups (Breen et al. (2015)). Leibbrandt, Finn, and Woolard (2012) also apply these methods to decomposing income in Post-Apartheid South Africa. While they find that the majority of income inequality is found within the semi-homogenous race groups, they find a significant level of inequality in the between-group category . They extend the analysis to determine the portion of maximum inequality due to race in South African using Elbers et al. (2008) method and find that South Africa's race inequality was 50% of the maximum (Leibbrandt, Finn, and Woolard (2012)).

There are a number of measures to estimate the progressivity of a tax or benefit policy. A relatively simple comparison of inequality without benefits relative to inequality in the total population helps shed light on how benefits shape the income distribution. Research such as Musgrave and Thin (1948) explored these topics early on. In the same spirit of progressivity, namely the difference between inequality associated with a particular distribution with and without a policy, is Lambert (1985). These examples effectively compare the inequality index (Gini in the case of the latter) before and after a tax or benefit policy. Meanwhile, the Kakwani (1977) formulation measures the deviation from proportionality as an indicator of a tax policy's progressivity. Table 1 in Duclos and Tabi (1996) provides an excellent example of how these two theoretical formulations of progressivity could lead to different results, yet both still measure "progressivity".

[2]Also see Jenkins (1988), Duclos and Tabi (1996), and Reynolds and Smolensky (1977)
[3]see Fields (2003)
[4]see Chantreuil and Trannoy (2011)
[5]Shorrocks 1982; Shorrocks 1984.

3 Data and Methodology

Data for this study comes from the March Supplement of the Current Population Survey (CPS) from 1988 to 2016. Our main population partition is whether or not there is a work-limited individual residing in the household. The standard work-limitation question in the survey reads, "Does ... have a health problem or a disability which prevents work or which limits the kind or amount of work?" When this is answered in the affirmative for any individual 15 years of age or older, the household is classified as work-limited. For each year, we find the total number of individuals who report such a work-limitation within each household and proceed to analyze how rising inequality affects this population relative to the non-work-limited population.

We begin by documenting the overall trends in inequality within the two groups of interest. In order to test statistical significance of trends over time we incorporate a simple Ordinary Least Squares (OLS) regression of the variable of interest on year. Then we decompose inequality by population subgroup, relying primarily on the methodology laid out in Shorrocks (1984). We use mean income of the various groups to construct the between-group measure. Intuitively, it represents the amount of inequality present due to the defining characteristic which partitions the groups.

For population decomposition of inequality, we utilize the General Entropy measures with parameter α ranging from zero to two. Lower values of α emphasize changes at the low end of the distribution, while higher values are more sensitive to the top end of the distribution. These are common values for α to take, for example, GE(1) is the Theil Index. Following Shorrocks (1984) and Cowell and Jenkins (1995), we calculate General Entropy as follows:

$$GE(\alpha) = \frac{1}{N}\frac{1}{\alpha(\alpha-1)}\sum_{i=1}^{N}((\frac{y_i}{\mu})^2 - 1) \qquad \alpha \neq 0, 1$$

where y_i is a household's income, N is the population size and μ is the population's mean income. In the case where $\alpha = 0, 1$ the appropriate equations are:

$$GE(0) = -\frac{1}{N}\sum_{i=1}^{N}\ln\frac{y_i}{\mu}$$

$$GE(1) = \frac{1}{N}\sum_{i=1}^{N}(\frac{y_i}{\mu}\ln\frac{y_i}{\mu})$$

We weight the populations according to:

$$w_k = (\nu_k)^{\alpha}(u_k)^{1-\alpha}$$

where ν is the income share of group k, and u is the population share of group k. Inequality between groups is calculated using group means. Therefore, our decomposition in the case of $\alpha = 0$ by populations "ND" (non-disabled) and "D" (disabled) takes the following form:

$$GE(0)_{TP} = w_{ND}GE(0)_{ND} + w_{D}GE(0)_{D} + GE(0)_{between}$$

or,

$$GE(0)_{TP} = \frac{\nu_{ND}}{N_{ND}} \sum_{i=1}^{N_{ND}} (\ln \frac{y_{i,ND}}{\mu_{ND}}) + \frac{\nu_D}{N_D} \sum_{i=1}^{N_D} (\ln \frac{y_{i,D}}{\mu_D}) + \frac{1}{N_{TP}} [N_{ND} (\ln \frac{\mu_{ND}}{\mu_{TP}}) + N_D (\ln \frac{\mu_D}{\mu_{TP}})]$$

This methodology requires semi-homogenous, mutually exclusive subpopulations. For the purpose of this analysis, the "ND" population above would represent those households where no individual reports a work-limitation versus the "D" population where at least one individual (age 15+) reports a work-limitation due to health or disability.

In exploring the progressivity of benefits we consider government transfers in general and disability income in particular. We embark on this research employing the simple measure of progressivity which considers the differences in inequality indices similar to Musgrave and Thin (1948) and Lambert (1985). While progressivity measures in general do not take into consideration the full counterfactual of labor supply in the absence of benefits, it does give a rough estimation of how inequality in the income distribution changes if we were to exclude benefits all else equal. Our definition of government transfers includes all household income reported under the following categories: unemployment compensation, workmen's compensation, Social Security, Supplemental Security Income, Public Assistance and Welfare, and Veteran's Benefits. Under certain circumstances, Survivor's Benefits, disability income and education income also originate from the public sector; however, portions of these income sources are private in nature and so we do not include them among "government transfers".

The second case of distribution progression is between that of household income net of disability income and total household income. CPS began recording the reason for receiving various payments such as Social Security or Veteran's Benefits at the individual level in 2001. For each household from 2001-2016 we aggregate all Social Security, Supplemental Security Income, Veteran's Benefits, disability income[6], and other income received due to disability at the individual level to calculate the household disability income. Unfortunately, we are unable to disaggregate payments such as Veteran's Benefits or Social Security by portions due to disability or other reasons. We simply use all reported Social Security or Veteran's Benefits if the individual indicates that some portion of the benefits are due to disability. This could potentially overstate the level of disability income in the economy because it is feasible for a veteran or Social Security recipient to receive transfers for multiple reasons, among which is disability. When any portion of benefits are received for disability, we classify the entire payment as "disability" income because it is not possible to separate it out in the data. While this certainly is a limitation, it is not feasible to dissect the payments further. Therefore we proceed knowing that our definition of disability income could be biased upward.

We employ three different measures to test the annual difference in inequality in the distribution with and without government transfers (or disability income). First, we consider the difference in concentration indices calculated using the convenient covariance approach in Jenkins (1988) analogous to Gini coefficients. The difference here is that we allow for negative and zero incomes as opposed to the second formulation where all zero and negative income is adjusted to \$1. This second formula considers the absolute difference in Gini coefficients forcing positive income. The

[6]This disability income is a separate income factor in CPS. It can include private disability insurance, company or union disability, or disability payments from the federal, state or local government level.

final formulation is similar to the Kakwani (1977) approach for measuring progressivity. This takes the concentration index of income net of government transfers, but with rank calculated by total household income[7], net of the concentration index of total household income.

4 Preliminary Results

4.1 Descriptive Statistics

Figure 1 shows the size of the group of household with disabilities over time. Each year 15-19% of households are work-limited. Fluctuations in the prevalence of work-limitation at the household level seem to track the business cycle with a variable lag: all three recessions within the last 30 years are followed by increases in the proportion of work-limited households. By quintile (not shown here), the prevalence of work-limited households follows a similar trend, with higher variance of prevalence following business cycles at lower ends of the distribution.

Figure 1: Prevalence of work limitations track the business cycle.

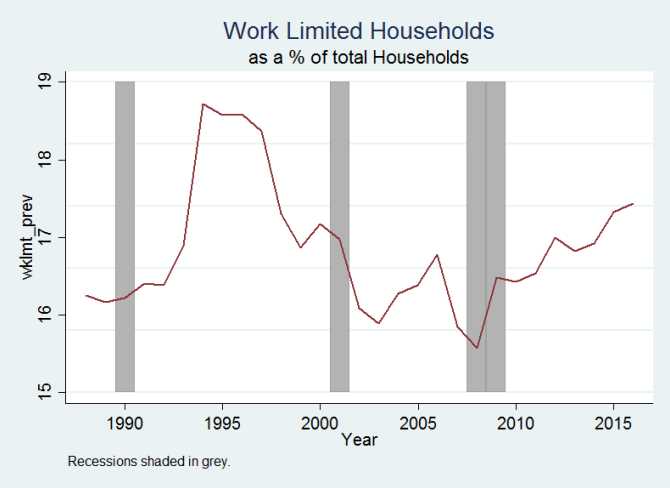


Table 1 shows the frequency of households in the sample from 2001 to 2016 with work limitations and who either receive no transfers or disability income, receive government transfers only, or receive government transfers and/or disability income. From the table one can see over the last 16 years most of the work-limited population is receiving either transfers or disability benefits (77.5% of the population), while most of the non-work-limited population receives no benefits (72%). It is rather rare for a non-work-limited household to receive disability income. 76% of disability payments go to work-limited households, while among households receiving only government transfers, 20% are work-limited. Only 5% of households who receive no transfers or disability income are classified as work-limited.

[7] As opposed to using the rank of household income net of government transfers as in the first formulation

Table 1: Frequency of households from 2001-2016 by work limitation and whether the household receives any government transfers and/or disability payments.

	Government Transfers and/or Disability income status			
	None	Transfers Only	Disability & Transfers	Total
Non-Work-Limited	699,325	240,346	27,982	967,653
	(94.21)	(80.10)	(23.96)	(83.48)
	(72.27)	(24.84)	(2.89)	(100.00)
Work-Limited	43,009	59,708	88,798	191,515
	(5.79)	(19.90)	(76.04)	(16.52)
	(22.46)	(31.18)	(46.37)	(100.00)
Total	742,334	300,054	116,780	1159168
	(100.00)	(100.00)	(100.00)	(100.00)
	(64.04)	(25.89)	(10.07)	(100.00)

Number of observations: 1,159,168 Households

Column and row percentages in parenthesis

Some households may be observed twice

4.2 Trends in Inequality

We first present results of the general entropy measure of inequality in Figure 2 for the entire population and then for the subgroups of households with and without disability over the last three decades. Figure 2 gives results for α=0[8], and shows that inequality based on the general entropy measure is rapidly increasing for the entire population and for the groups of households with and without work limitations. Both work-limited and non-work-limited households show an upward trend in inequality, resulting in relatively stable inequality between the two groups.

Furthermore, the results in Table 2 show that these trends are statistically significant. While the magnitudes of the coefficients may at first seem small, it is a statistically significant and sizeable trend. For example, the 0.007 growth rate for GE(0) over 30 years is about a 0.21 points increase over that time frame. Given that the GE(0) range is approximately 0.38 to 0.60, this is a large increase in the measure. Inequality between the work-limited and non-work-limited populations consistently explains anywhere from 2%-4%[9] of total inequality over the past three decades, but does not show a statistically significant trend. In this regard, we consider work-limitations to play a minor but consistent role in explaining inequality in the United States. However, it is important to note that the actual dispersion between the two populations continues to grow, just at approximately the same rate as total inequality in the society. This produces a relatively constant measure for between inequality as a percentage of total inequality, with consistent growth in the disparity between the two groups[10].

[8] Figures for other values of alpha can be found in Figure A1 of the Appendix.

[9] See the bottom left panel of Figure A1 in the Appendix.

[10] The GE(2) measure indicates a minor decline in between inequality, meaning that the inequality between the two groups is growing at a slightly lower rate than the general rise of inequality in the society. This result is only produced at with $\alpha = 2$, which could be due to less extremely high incomes among the work-limited population. See Table A2 in the Appendix.

Figure 2: Time Trend of Inequality for $\alpha = 0$

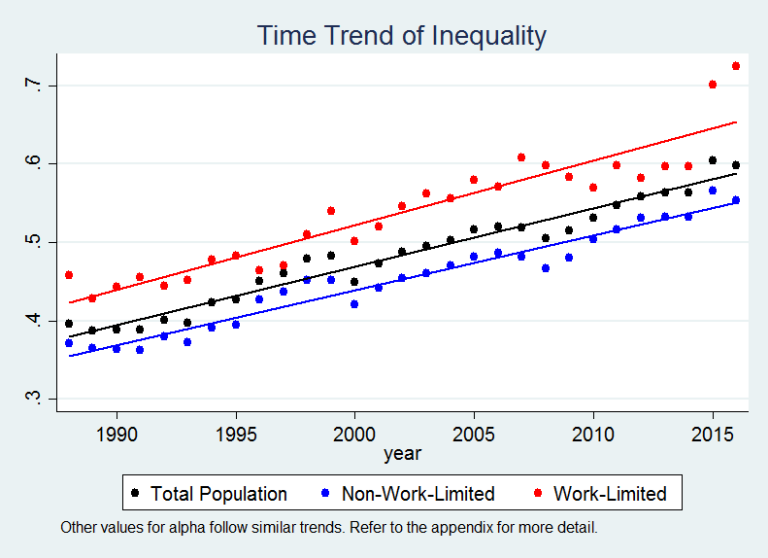


Table 2: Time Trend of Inequality: GE(0)

	(1) Total Population	(2) Non-Work-Limited	(3) Work-Limited	(4) Between Inequality
Year	0.00742***	0.00697***	0.00826***	0.00205
	(0.000296)	(0.000302)	(0.000597)	(0.00949)
Constant	-14.37***	-13.51***	-16.00***	-0.799
	(0.593)	(0.605)	(1.194)	(19.01)
N	29	29	29	29
r2	0.959	0.952	0.877	0.00173
F	627.2	533.5	191.9	0.0468
ll	85.06	84.51	64.77	-15.49

Results for other values of alpha can be found in the appendix

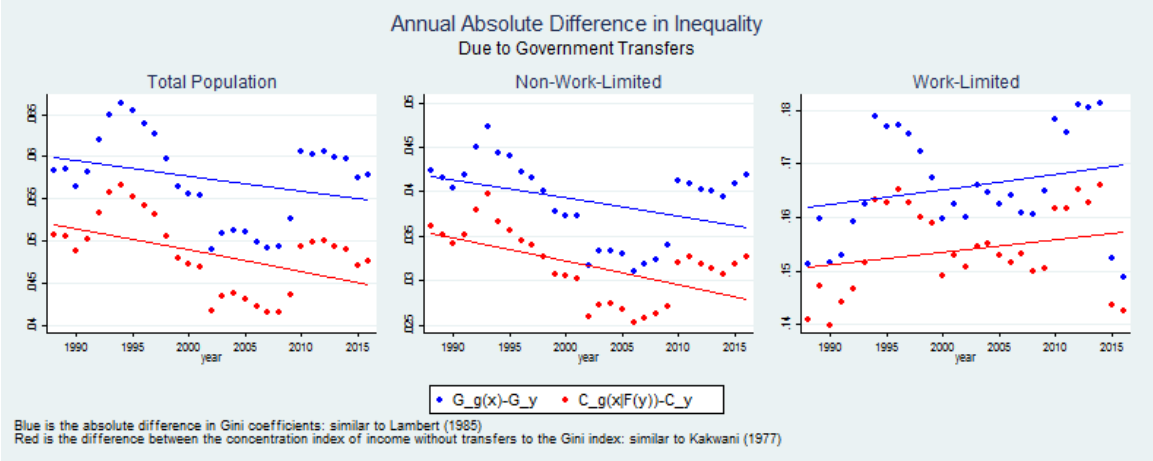
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.3 The Contribution of Changes in Government Transfers to Inequality Trends

Next we turn our attention to what could be driving increasing inequality coupled with relatively consistent inequality between the two populations. From the literature we know that benefits such as SSDI are rapidly increasing. If policies are targeted towards poorer households, this rapid increase should be reflected in a more equal distribution of income all else equal. We also know from the literature and our results above that inequality is increasing not only in the general population, but specifically among the work-limited as well. Therefore, while it appears unlikely that benefits successfully decrease inequality in the population, they could still play a mitigating role.

Fortunately in our case the Lorenz curves for different income variations do not cross[11], and so the comparison of inequality with and without benefits is more straightforward. For the non-work-limited population, there is evidence to suggest that the progressivity of government transfers could be falling. Specifically we know that the distribution of income without government benefits is growing more unequal at a slower rate than is the distribution of total household income, which means that transfers could be playing less of a mitigating role. The series of graphs below demonstrate that regardless of the progressivity formulation or inequality measure, there is a statistically significant decline in this differential among the non-work-limited population[12].

Figure 3: Time Trend of Differences in Inequality due to Government Transfers

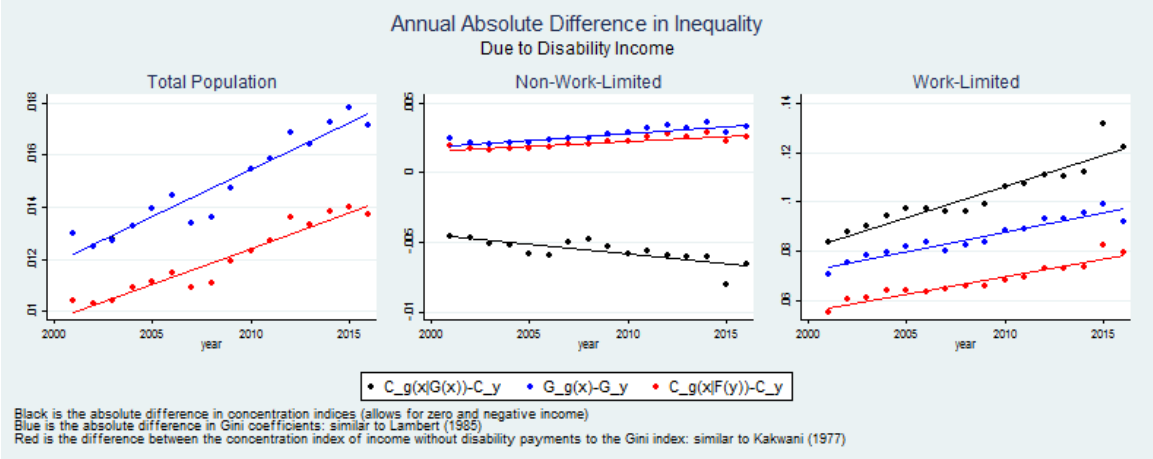


In contrast to the non-work-limited population, work-limited households visually appear to be experiencing increasing differences of inequality associated with income net of government transfers and that of total income. There is significant variation about the mean, the magnitude of the trend effect is extremely small, and the positive trend is statistically not significant from zero[13]. It is nevertheless interesting to see that the pattern in the general and non-work-limited population is different than that experienced among work-limited households.

When it comes to disability income specifically, as demonstrated in Table 1 above, the non-work-limited population receives relatively few such payments. Therefore, we focus our analysis on the work-limited population's disability income. In this case we find a statistically significant positive trend[14] in the difference between the income distribution net of disability income and that of the distribution of total income. In this case, the total population trend mirrors that of the work-limited population due to the fact that most disability income (about 75%) is observed in work-limited households.

[11] See Figure A2 in the Appendix.
[12] Annual trend regression results are Table A3 in the Appendix.
[13] See regression results in the Appendix, Table A3
[14] See results in Appendix Table A4.

Figure 4: Time Trend of Differences in Inequality due to Disability Income



Taken together, these trends for differences in inequality due to benefits suggest that government transfers are not decreasing inequality as much as they perhaps did thirty years ago for the non-work-limited population. Meanwhile, they may be more successful among work-limited households. Disability income specifically seems to increase equality all else equal among the work-limited population.

5 Discussion and Conclusion

We find significant and rising levels of inequality among the work-limited population. The binary partition of households with and without a work-limited member consistently represents 2%-4% of total inequality over the last three decades. While this measure of between inequality is consistent over time, the nominal disparity between households with and without work limitations continues to grow in step with total inequality. Part of the rise in inequality within groups could be explained by trends in progressivity. Using our simple progressivity measure, we find inequality in the distribution of income net of government transfers grows more slowly than inequality of total income, especially for the non-work-limited population. The work-limited population though exhibits some evidence that they are different than the non-work-limited household in this regard. For that population, the distribution of income net of government transfers and that of inequality in total income grow at approximately the same rate. With regard to the inequality in distribution of income net of disability income, this difference shows some evidence of growth exceeding that of the distribution of total income indicating that these payments could be more targeted in recent years, offsetting more inequality than earlier in the sample. On the whole, results in this paper suggest that government transfers may be offsetting less inequality than they had previously for the non-work-limited population. Among the work-limited, government transfers (and disability income) appear to be as effective, or possibly slightly more effective, at offsetting inequality in the distribution of total income.

These results are interesting in light of growing interest in inequality, but relatively scarce research specifically concerning how rising inequality in the United States affects the work-limited

population. This paper begins to fill that void and explores how benefits, including government transfers and disability income, may have helped shape inequality in the United States over the last three decades. In the next phase of this project, we plan to supplement these findings with other measures of disability. Beginning in 2009, CPS introduced six questions on functional limitations (e.g. limitation seeing, walking) that we plan to analyze and incorporate into this research to supplement the definition of disability beyond work-limitations. Additionally, we will use data from the Survey of Income and Program Participation (SIPP) for 1984 to 2013 using work limitation and impairment measures of disability.

It is important to also consider the limitations of these results. We do not take account of the full counterfactual when comparing distributions before and after benefits (government transfers or disability income). This is a major shortcoming, that unfortunately cannot be addressed with CPS data. In that respect, the inequality without government transfers (or disability income) could overestimate inequality that would exist given an environment without these benefits. Additionally, inequality indices that make up the bulk of this analysis do not adequately describe the entire distribution. Rather, these measures are a summary statistic that should be viewed as one piece to the puzzle of inequality in society.

The issue of progressivity of benefits also merits further discussion. While the Kakwani (1977) progressivity approach is appealing, given the concavity of benefits in certain circumstances, our analysis is not the most direct application of that theory. However, considering simple differences in inequality of distributions with and without benefits is not unprecedented[15]. This difference need not be viewed explicitly as "progressivity" of benefits, yet it does offer some information on distributional impacts of benefits. In both cases, the distribution is more equal with the inclusion of benefits than without. However, this is of course also subject to the issues raised concerning the counterfactual in particular.

Additionally, the very definition of "work limitations" relating to disability has ties to unemployment. From our early analysis (Figure 1) we can clearly see the prevalence of work limitations tracking the business cycle, with more volatile swings in work limitation reports at lower portions of the distribution. Autor and Duggan (2006) suggest that disability programs can effectively function as "nonemployability" programs that substitute for unemployment. Finally, depending on an individual's background "work limitations" may mean vastly different things. A carpenter with arthritis could be "work-limited", while a university professor would have a lower likelihood of being limited by such a condition. Therefore the essence of "work-limitations" is not without ambiguity, and is intimately linked with issues of unemployment and educational attainment.

Finally, our analysis shows inequality among the work-limited population is even higher than the non-work-limited population. Our simple partition effectively treats all work-limitations equally whether they be chronic or temporary, or among the elderly or the working-age household members. Additionally, this definition makes no consideration of the quantity of work-limited members in a given household. Naturally, these assumptions can obscure what is happening within the population itself, and create abnormally high levels of inequality according to factor and/or population decomposition.

[15] See Jenkins (1988) for examples of various index formations

In future research, we plan to address a number of these issues. Specifically, we will supplement the work-limitations definition of disability with functional limitations. It will also be informative to disaggregate the work-limited household and address some of the heterogeneity among this population. Additionally, policies and legislation (such as ADA and its amendments) are aimed at improving the environment persons with disabilities face. Although, our research does not offer evidence to support an improving inequality climate for this population, it does not mean that these policies haven't played a mitigating role.

6 Appendix

Table A1: Time Trend of Inequality: GE(1)

	(1) Total Population	(2) Non-Work-Limited	(3) Work-Limited	(4) Between Inequality
Year	0.00452***	0.00448***	0.00339***	0.00690
	(0.000401)	(0.000402)	(0.000355)	(0.00988)
Constant	-8.688***	-8.636***	-6.381***	-9.862
	(0.803)	(0.804)	(0.710)	(19.78)
N	29	29	29	29
r2	0.825	0.822	0.772	0.0178
F	127.0	124.4	91.43	0.488
ll	76.29	76.23	79.85	-16.64

The range for GE1 is (0.29-0.42)

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

Table A2: Time Trend of Inequality: GE(2)

	(1) Total Population	(2) Non-Work-Limited	(3) Work-Limited	(4) Between Inequality
Year	0.0119***	0.0116***	0.00916***	-0.0287***
	(0.00114)	(0.00111)	(0.00112)	(0.00741)
Constant	-23.42***	-22.80***	-17.75***	60.16***
	(2.283)	(2.213)	(2.240)	(14.83)
N	29	29	29	29
r2	0.803	0.804	0.713	0.358
F	109.8	110.5	67.05	15.07
ll	45.98	46.87	46.53	-8.285

The range for GE2 is (0.33-0.67)

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

Table A3: Time Trend of Absolute Change in Inequality due to Government Transfers

	(1) C, TP	(2) C, ND	(3) C, D	(4) Gini, TP	(5) Gini, ND	(6) Gini, D
Year	-0.000253***	-0.000265***	0.000241	-0.000183	-0.000205**	0.000282
	(0.0000881)	(0.0000735)	(0.000174)	(0.000112)	(0.0000942)	(0.000220)
Constant	0.554***	0.562***	-0.328	0.423*	0.449**	-0.398
	(0.176)	(0.147)	(0.349)	(0.224)	(0.189)	(0.440)
N	29	29	29	29	29	29
r2	0.233	0.325	0.0662	0.0901	0.149	0.0573
F	8.224	12.98	1.913	2.673	4.723	1.641
ll	120.2	125.5	100.5	113.3	118.3	93.73

Standard errors in parentheses

C is the Concentration formulation in contrast to the Gini Index, Gini.

TP is the total population, ND is non-work-limited, and D is work-limited populations.

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

Table A4: Time Trend of Absolute Change in Inequality due to Disability Income

	(1) C, TP	(2) C, ND	(3) C, D	(4) Gini, TP	(5) Gini, ND	(6) Gini, D
Year	0.000358***	-0.000139***	0.00251***	0.000360***	0.0000963***	0.00157***
	(0.0000308)	(0.0000306)	(0.000238)	(0.0000307)	(0.0000134)	(0.000135)
Constant	-0.705***	0.274***	-4.938***	-0.707***	-0.191***	-3.077***
	(0.0618)	(0.0615)	(0.479)	(0.0616)	(0.0269)	(0.271)
N	16	16	16	16	16	16
r2	0.907	0.596	0.888	0.908	0.787	0.907
F	135.8	20.62	110.8	137.6	51.71	136.5
ll	97.96	98.02	65.20	98.02	111.3	74.32

Standard errors in parentheses

C is the Concentration formulation in contrast to the Gini Index, Gini.

TP is the total population, ND is non-work-limited, and D is work-limited populations.

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

Figure A1: General Entropy for $\alpha = 0, 1, 2$ by work-limitation status:

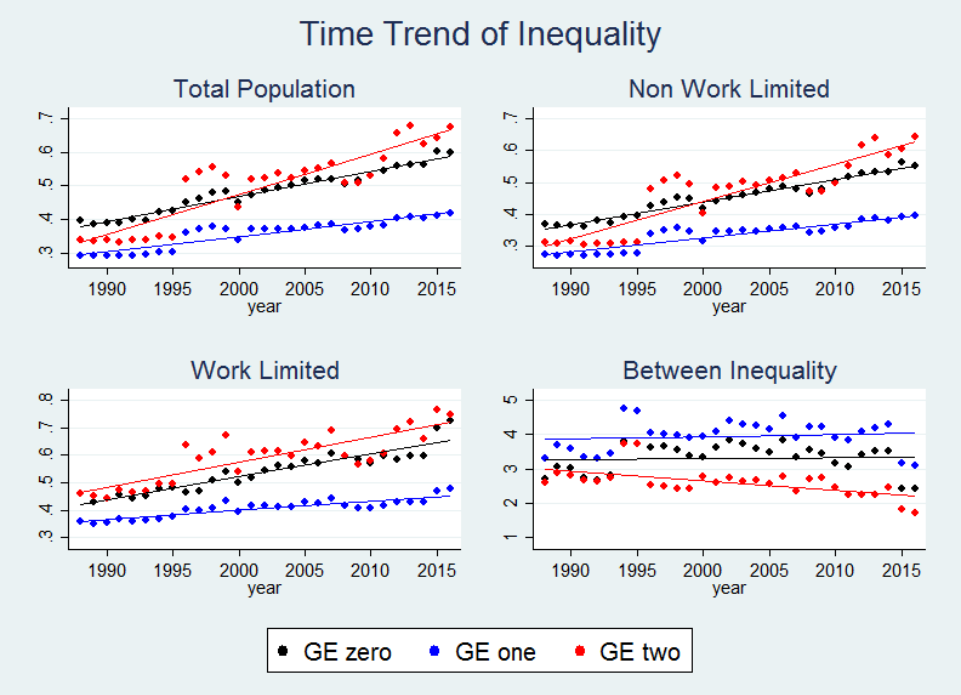


Figure A2: The Lorenz curves do not appear to cross at any point, which makes the comparison of Gini coefficients relatively straightforward. Below are also some graphs on the Concentration indices. While the picture is not as clear, we proceed with the analysis under the assumption that they do not cross noting that the Gini index analysis compares favorably with that of the concentration index.

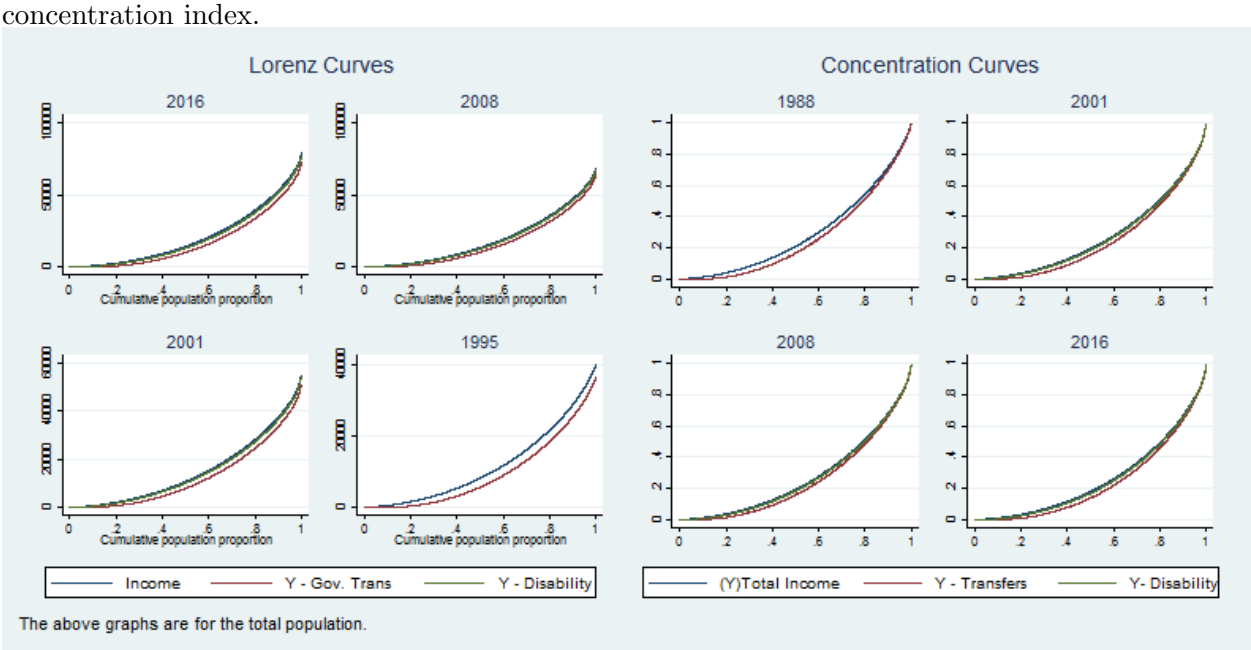
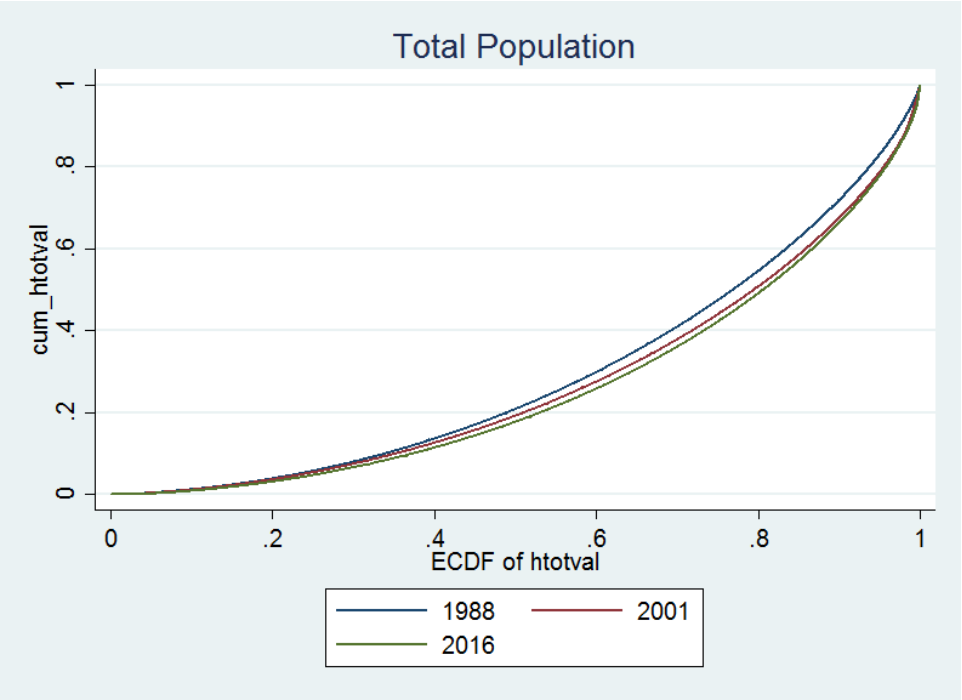


Figure A3: Concentration curves for the total population do not appear to cross in select years, indicating that a long run trend comparison of the index values is an appropriate approximation to changes in inequality.



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