



**How and Why the Distribution of Poverty Durations has Changed in the United States
Since the Mid-1980s**

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How and why the distribution of poverty durations has changed in the United States since the mid-1980s *

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Abstract

This paper aims to look ‘behind’ the stability of the US poverty rate and investigate what has happened to the underlying duration distribution of poverty episodes between the mid-1980s and the end of the 2000s. More precisely, it purports to identify what parts of the duration distribution of poverty episodes have been affected the most and to what extent the observed changes may be attributed to (i) changes in the population structure, (ii) changes in the composition of the poor, and (iii) changes in the patterns of poverty among different population subgroups.

To answer these questions, we take advantage of the distribution regression technique and extend it to the context of duration analysis with a discrete dependent variable. The method makes it possible to model the entire duration distribution of poverty episodes as a function of individual characteristics by allowing them to affect this distribution heterogeneously at different values of duration. Once the model is specified, counterfactual distributions can be constructed and used to partition the overall change in the duration distribution of poverty episodes in a set of components. Using data from the Survey of Income and Program Participation (the 1984, 2004 and 2008 panels), we show that albeit the poverty rate was relatively stable in the US over the past decades, the duration of poverty has increased over time. This increase is induced mainly by the changes in the patterns of poverty among different population sub-groups whereas the shifts in the structure of the US population and composition of the poor have contributed to the decrease in the probabilities of having long episodes of poverty.

Keywords: poverty duration, distributional changes, decomposition.

JEL Classification: I3, D3.

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1. Introduction

Although the absolute number of people living in poverty has been on the rise in the US, the official poverty rate did not change much over the past decades. Increasing during the periods of recession and declining during the periods of economic expansion, it was at the same level of 15 percent in the late 2000s as in the mid-1980s.¹

The temporal 'stability' of cross-sectional poverty rate does not automatically imply that the longitudinal patterns of poverty have also remained unchanged. The poverty rate does a good job in revealing the prevalence of poverty in a particular year but it tells us nothing about the composition of the poor in terms of the amount of time they have spent below the poverty line. In their seminal work Bane and Ellwood (1986) show that whereas some people have very short episodes of poverty, the majority of those who are poor at a particular point in time are in the middle of long poverty spells. Hence, the same level of static poverty may be observed under completely different distributions of poverty duration. This heterogeneity in the duration of poverty episodes is completely ignored in the evaluation of temporal trends in cross-sectional poverty rates.

This paper aims to look 'behind' the stability of the US poverty rate and investigate what has happened to the underlying it duration distribution of poverty episodes over the past twenty five years. To be more precise, it purports to identify what parts of the duration distribution of poverty episodes have been affected the most and to what extent the observed changes may be attributed to (i) changes in the population structure, (ii) changes in the composition of the poor, and (iii) changes in the patterns of poverty among different population subgroups.

There are a number of reasons to believe that the distribution of poverty durations has changed in the US since the mid-1980s. One of the arguments in support of this thesis is that the absolute poverty rate itself evolved differently for different population sub-groups. Whereas it has decreased among the elderly, female-headed families, and people with black and Hispanic origin, white individuals and working-age population have become more prone to poverty over time.² Since individuals belonging to these groups tend to have different probabilities of exiting poverty, changes in their within-group poverty rates might imply that

¹ For a detailed description of the temporal fluctuations in the official US poverty rate see DeNavas-Walt et al. (2013).

² Trends in the poverty rate by demographic sub-groups are very well described in DeNavas-Walt et al. (2013) and Gabe (2012).

the duration of their poverty episodes also have changed.³ The study of Card and Blank (2008) provides a good example that this might be the case. Focusing on female-headed families, they find that poverty spells experienced by this specific population subgroup became shorter but more frequent between the early 1990s and the early 2000s.

Another explanation of why the distribution of time spent in poverty might have changed in the US lies in the recent demographic and labor market trends. There is well documented evidence that the proportion of foreign-born population has been rapidly increasing in the US which, in turn, has generated more racial and ethnical diversity. The country has also experienced substantial changes in family composition over the years manifesting themselves in the spread of single-parent and one-person families.⁴ Along with demographic trends, there have also been profound labor market changes. Most of them are associated with the Federal Welfare Reform of 1996 and expansions in the earned income tax credits which served as activation policies and pushed a lot of previously economically inactive individuals back into labour force (Blank, 2009; Bollinger et al., 2009). On top of these reforms, income volatility doubled (Hardy and Ziliak, 2014) and inequality in earnings and income increased in the US between the 1980s and late 2000s affecting both the upper and bottom parts of income distribution (Daly and Valletta, 2006; Hardy and Ziliak, 2014). Finally, people have become more educated over time (Meyer et al., 2012).

In order to identify whether the duration distribution of poverty episodes indeed has changed in the US over time, we first estimate the conditional hazard function of exiting poverty at different spell lengths and then use it to recover the entire unconditional distribution of time spent in poverty. Individual characteristics are introduced in the model in a flexible way which allows them to influence the distribution of poverty durations heterogeneously at different values of duration. Once the model is specified a set of counterfactual distributions can be constructed and used to partition the overall change in the distribution of poverty durations into the parts induced by the changes in the population structure, characteristics of the poor, and the effects of these characteristics. The analysis is performed on data from the 1984, 2004 and 2008 panels of the Survey of Income and Program Participation.

The contribution of this paper to the literature is twofold. First of all, it provides new evidence about the changes in the duration distribution of poverty episodes in the US since

³ For more evidence about variation in the amount of time spent in poverty by demographic subgroups see Bane and Ellwood (1986) and Stevens (1999).

⁴ See Shrestha and Heisler (2011) for more details on recent trends in the US demographic profile.

the mid-1980s. Although there is quite extensive literature analysing temporal trends in U.S. income inequality and static poverty (e.g. Dickens & Ellwood, 2004; McKernan & Ratcliffe, 2005; Daly & Valetta, 2006; Meyer et al., 2012; Larrimore, 2013) little has been done to explore how longitudinal experiences of poverty have changed over time. Those studies which are available in the field focus either on changes in poverty dynamics (McKernan and Ratcliffe, 2005; Sandoval et al., 2009) or trends in the duration of poverty for specific population subgroups (Card and Blank, 2008). We extend this work by focusing explicitly on the duration distribution of poverty episodes for the overall adult population and development of this distribution over time.

Secondly, we extend the distribution regression approach to the context of duration analysis and model the entire distribution of poverty durations. Distribution regression has been previously applied for the analysis of distributional changes in wages and income (Fortin and Lemieux, 1998; Donald et al., 2000; Bonjour and Gerfin, 2001; Chernozhukov et al. 2013). Albeit being based on the estimation of the hazard function in most of the applications, it has not been used in the context of duration analysis where time is measured in discrete units. The main advantage of the distribution regression approach is that it allows for heterogeneous effects of covariates at different values of dependent variable. In the context of this paper, it makes it possible to identify even minor changes in the duration distribution of poverty episodes over time and link them to the shifts in the distribution of covariates and their effects.

The paper is structured as follows. Section 2 describes data and Section 3 presents estimation strategy used for the empirical analysis. Section 4 provides the results. Section 5 concludes.

2. Data

The paper is based on data from the Survey of Income and Program Participation (SIPP). The SIPP is a multiple-panel survey which covers a nationally representative sample of US non-institutionalized households whose members are interviewed at four-month intervals during two to four consecutive years. At each interview, the respondents are asked about their demographic and labor market characteristics, family composition, sources and amounts of income, and participation in governmental programs in each of the preceding four months. The sample size in the SIPP ranges between 12000 households in the early panels and 50000 households in the most recent ones.

The main advantage of the SIPP is that it provides monthly longitudinal information on both individual attributes and income amounts. Previous research has shown that there is a lot of fluctuation in income during the year, especially among low income families. Almost half of those who fall into poverty exit it within the next four months while only few individuals remain poor for more than a year (Ruggles and Williams, 1989; Card and Blank, 2008; Anderson, 2011). These short episodes of poverty would have been missed with annual data. Another merit of the SIPP is that it measures income amounts and individual attributes at the same point in time. This is vital for correct identification of individuals' poverty status given that it depends on income of all family members and family composition. Simultaneous measurement of income and individual attributes also makes it possible to better identify the relationship between characteristics of individuals and the amount of time they spend below the poverty line.

In this study we use data from the 1984, 2004 and 2008 SIPP panels. The 1984 panel is the oldest SIPP panel which contains data collected between October 1983 and July 1986. The 2004 and 2008 panels are the most recently available panels with the interviews administered from February 2004 through January 2008 and from September 2008 through December 2010 correspondingly. These three panels enables us to construct and compare the duration distribution of poverty episodes which prevailed in the mid-1980s, the period of economic expansion, with two other distributions observed twenty years later, one just before the Great Recession of 2008 and the other one during and after it. We use up to 32 consecutive months of information from each panel and keep in the sample only those individuals who report complete data for all 32 months.⁵ This restriction gives all individuals the same time frame for experiencing poverty episodes and makes it possible to correct for sample attrition by applying longitudinal weights.⁶ We also keep only adult individuals (18 years and older) in the sample because poverty status of children is directly determined by incomes of their parents.

The poverty status of each respondent is defined using the absolute measure of poverty developed by the Census Bureau. According to it, all individuals living in a family are considered to be poor if total family income falls below the officially defined poverty

⁵ Albeit the 1984 Panel provides up to 36 month of information for some rotation groups, for other rotation groups only 32 monthly records are available.

⁶ All calculations in Section 4 are performed using longitudinal weights.

threshold.⁷ The poverty threshold is based on the minimum amount of money which is needed for a family of a given size and composition to buy food and other necessities.⁸ Having been established in 1964, the thresholds for all family types are regularly adjusted by the Consumer Price Index in order to account for changes in the costs of living. Albeit this poverty measure has been heavily criticized (see, among others, Garner and Short, 2010), it remains the major eligibility criteria for many governmental programs and is the most widely used definition of poverty in the US.

We define a spell of poverty as beginning in the first month total family income falls below the poverty threshold and as ending in the first month it moves above the threshold. This definition of spells implies that even small fluctuations in income might result in a transition across the poverty threshold. It usually poses a problem when the duration of poverty is studied during a single period of time. In our case the focus is on changes in the distribution of poverty duration over time. Hence, as soon as income fluctuations around the threshold remain the same in all periods, they are not expected to influence the conclusions about the trend in the duration distribution of poverty episodes.

Although we use family income to define the poverty status, the unit of analysis is individual. In this way we can follow individuals over time when they move from one household to another and analyze changes in the duration distribution of poverty episodes for different population subgroups. For each individual in the sample we delete the first spell of poverty (non-poverty) because of the unknown elapsed duration (left-censored observations). The final sample of poverty spells with the observed beginnings comprises 5866 individuals (10923 spells) for the 1984 panel, 10857 individuals (16748 spells) for the 2004 panel, and 9775 individuals (14838 spells) for the 2008 panel.

3. Modeling the distribution of poverty duration

3.1. The unconditional distribution of time spent in poverty

Consider a sample of N individuals who have just fallen into poverty and can exit it at any time. Let T denote the duration of time individuals spend poor from the moment they enter poverty until the moment they exit it. If time is measured in discrete units (e.g., in days,

⁷ The family is defined as a group of individuals who reside together and who are related by birth, marriage or adoption. Under this definition, all family members who are not connected to each other by birth, marriage or adoption are perceived as unrelated individuals or a subfamily (U.S. Census Bureau, 2001).

⁸ The corresponding poverty thresholds are attached to each family in the SIPP. Monthly thresholds are derived by dividing the annual threshold by 12.

months, years) so that $t \in \{1, 2, \dots, t_{max}\}$, the probability of exiting poverty in period t given that individual i has been poor for previous $t-1$ periods, $h(t_i)$, can be defined as:

$$h(t_i) = \Pr[T_i = t | T_i \geq t]. \quad (3.1)$$

Estimation of Equation (3.1) for the sample of individuals yields the conditional distribution of event occurrence or so called hazard function. Once the estimates of the hazard function are derived, they may be used to recover unconditional distribution of time spent in poverty. Equation (3.2) below describes the link between the conditional hazard function and unconditional probability distribution function (PDF) of T :

$$p(T) = h(t) \cdot \prod_{s=1}^{t-1} (1 - h(t_s)), \quad (3.2)$$

where $p(T)$ stands for the PDF of T .

The estimates of the unconditional PDF of time uninterruptedly spent in poverty can be used to derive the unconditional cumulative distribution function (CDF) of T , $F(T)$:

$$F(T) = p(1) + p(2) + \dots + p(t_{max}) = \sum_{j=1}^{t_{max}} p(t_j). \quad (3.3)$$

3.2. The duration distribution of poverty episodes in the presence of covariates

The conditional specification of the hazard function makes it straightforward to model the probability of exiting poverty as a function of individual characteristics and time spent in poverty, $h_{t|X}(t_i|X_i)$:

$$h_{t|X}(t_i | X_i) = \Pr[T_i = t | T_i \geq t, X_i] = \Theta(t_i, X_i), \quad (3.4)$$

where X_i is a vector of individual characteristics, t_i measures the amount of time individual i has been poor, and Θ stands for the function linking covariates to the dependent variable. By including the time variable in the right hand side of Equation (3.4) we allow the probabilities of exiting poverty to vary at different values of t . The effect of t may be specified in different ways (e.g. in a linear or quadratic form, as an intercept, or with a set of dummies allowing for heterogeneous probabilities of poverty exit at different values of t).

Similarly, the effects of covariates may be restricted to the first order estimates or extended to higher order interactions.

Using the logit specification as a link function, we can re-write Equation (3.4) in the following way:

$$\log h_{t|X}(t_i | X_i) = \lambda t_i + \sum_{k=1}^K X_{ik} S_k \quad (3.5)$$

where λ captures the effect of time spent below the poverty line on the probability of exiting poverty, and β is a vector of coefficients associated with covariates X . The logit specification of the hazard function guarantees consistent parameter estimates by satisfying two vital statistical properties: (i) it makes hazard probabilities, $h(t)$, fall between 0 and 1 so that $0 \leq h(t) \leq 1$; (ii) it guarantees that the cumulative distribution of poverty durations is a monotonically increasing function so that $0 \leq F(T=1) \leq \dots \leq F(T=t_{max}) \leq 1$.

To avoid extensive assumptions about the distribution of T and its interplay with the vector of covariates X , rather than estimating the effects of t and X on the probabilities of exiting poverty for all observations pulled together, we can estimate a sequence of binary models at each value of t . This specification allows for a flexible identification of the baseline hazard, on the one hand and heterogeneous effects of covariates across the entire distribution of T on the other. The dependent variable Y in this case is simply a binary variable indicating whether individual i exits poverty at duration t given that this individual has been poor up to period t and the vector of covariates X_i :

$$\log y_{it} = I(\lambda t + \sum_{k=1}^K X_{ik} S_k) \quad \text{for each } t = 1, 2, \dots, t_{max} \quad (3.6)$$

where $I(\cdot)$ is the indicator function showing whether a given observation is for period t or not, and λ is the constant capturing the effect of time spent in poverty on the probability of exiting it in period t .

Estimates from Equation (3.6) can be used to derive predicted probabilities of exiting poverty in period t for each individual i given his or her characteristics X_i , $\hat{h}_{t|X}(t_i | X_i)$:

$$\hat{h}_{t|X}(t_i | X_i) = \frac{\exp(\lambda t + \sum_{k=1}^K X_{ik} S_k)}{1 + \exp(\lambda t + \sum_{k=1}^K X_{ik} S_k)}, \quad \text{for each } t = 1, 2, \dots, t_{max} \quad (3.7)$$

Equation (3.7) makes it straightforward to recover the values of the PDF and CDF of T conditional on X for each observation in the sample:

$$\hat{p}_{t|x}(t_i | X_i) = \hat{h}_{t|x}(t_i | X_i) \cdot \prod_{s=1}^{t-1} (1 - \hat{h}_{s|x}(s_i | X_i)) \quad (3.8)$$

$$\hat{F}_{t|x}(t_i | X_i) = 1 - \prod_{t=1}^T (1 - \hat{h}_{t|x}(t_i | X_i)) \quad (3.9)$$

The unconditional PDF and CDF of T can then be derived by integrating individual estimates of $\hat{p}_{t|x}(t | X)$ and $\hat{F}_{t|x}(t | X)$ over the density of X , $g(x)$:

$$\hat{p}(t) = \int \hat{p}_{t|x}(t | X) g(x) dx \quad (3.10)$$

$$\hat{F}(t) = \int \hat{F}_{t|x}(t | X) g(x) dx \quad (3.11)$$

3.3. Decomposition of the change in the distribution of poverty duration over time

Specification of Equations (3.10) and (3.11) makes it straightforward to decompose the overall change in the marginal PDF and CDF of T between two points in time into three components capturing (i) the contribution of the shifts in the population structure, (ii) the contribution induced by the changes in the characteristics of the poor, and (ii) the contribution associated with the shifts in the effects of these characteristics.

Consider, for example, the change in the CDF of T between the 1984 and 2008 SIPP panels. Using the framework described above it can be decomposed as follows:

$$\begin{aligned} F^{2008}(t) - F^{1984}(t) &= \int \hat{F}_{t|x}^{2008}(t | X) g^{2008}(x) dx - \int \hat{F}_{t|x}^{1984}(t | X) g^{1984}(x) dx = \\ &[\int \hat{F}_{t|x}^{2008}(t | X) g^{2008}(x) dx - \int \hat{F}_{t|x}^{2008}(t | X) \cdot \mathbb{E} \cdot g^{2008}(x) dx] + \\ &[\int \hat{F}_{t|x}^{2008}(t | X) \cdot \mathbb{E} \cdot g^{2008}(x) dx - \int \hat{F}_{t|x}^{2008}(t | X) \cdot \mathbb{E} \cdot g^{1984}(x) dx] + \\ &[\int \hat{F}_{t|x}^{2008}(t | X) \cdot \mathbb{E} \cdot g^{1984}(x) dx - \int \hat{F}_{t|x}^{1984}(t | X) g^{1984}(x) dx] \end{aligned} \quad (3.12)$$

The first term in the right-hand side of Equation (3.12) identifies the contribution of the change in the general structure of the US population on the cumulative distribution of poverty durations between the 1984 and 2008 panels. It does so by taking the difference between the actual duration distribution of poverty episodes in the 2008 panel and the

counterfactual distribution that would have prevailed in the 2008 panel if the population structure had remained the same as twenty five years ago. To derive such a counterfactual distribution, we take advantage of the DiNardo, Fortin, Lemieux (1996) re-weighting technique. This technique is based on the construction of the reweighting factor which allows imposing on the 2008 distribution the structure of the US population in 1984:

$$\mathbb{E} = \frac{dH^{1984}(C)}{dH^{2008}(C)} = \frac{\Pr(t = 1984 | C)}{\Pr(t = 2008 | C)} \cdot \frac{\Pr(t = 2008)}{\Pr(t = 2004)} \quad (3.13)$$

where $H^{1984}(C)$ and $H^{2008}(C)$ stand for the CDFs of the vector of population characteristics C in the 1984 and 2008 panels correspondingly.

The second term in the right-hand side of Equation (3.12) captures the contribution of the changing composition of the poor to the overall shift in the duration distribution of poverty episodes. It does so by taking the difference between the adjusted for population structure duration distribution in the 2008 panel and the counterfactual distribution that would have prevailed in that panel if both the structure of the general population and composition of the poor had remained the same as in the 1984 panel. Finally, by taking the difference between this counterfactual distribution and the actual distribution of poverty episodes in the 1984 panel, the last term in Equation (3.12) captures the contribution of the changes in the effects of characteristics of the poor to the overall shift in the distribution of poverty durations.

Equation (3.12) provides a framework for sequential aggregate decomposition of the change in the cumulative distribution of poverty durations over time. As any sequential decomposition, it might suffer from the path dependency problem manifesting itself in the dependence of the results on the order of decomposition. To test whether this is the case, we also perform decomposition in the reverse order.

4. Results

4.1. Changes in the duration distribution of poverty episodes over time

Figure 4.1 below plots cumulative distribution of poverty episodes by their durations for 1984, 2004 and 2008 SIPP panels. The horizontal line, which crosses the CDFs at the 0.5 point, helps to identify the median duration of poverty spells. In all three panels, the majority of people who fall into poverty remain poor for a relatively short period of time. Depending

on the panel chosen, 50 percent of poverty entrants exit poverty within 2 to 4 months after the start of the spell. Additional 30 to 40 percent have their poverty spells ended within a year whereas only 10 to 20 percent of individuals remain poor for more than twelve months. While being relatively steep in the period immediately after the start of the spell, the CDFs flatten at longer durations suggesting that the probabilities of exiting poverty decline as time in the spell elapses.

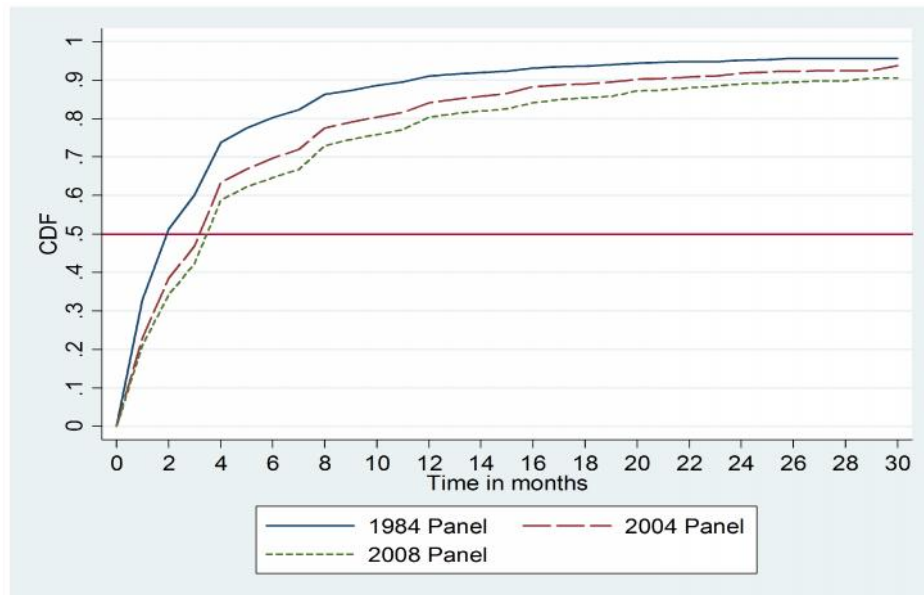


Figure 4.1. CDFs of time spent in uninterrupted spells of poverty

Note: weighted estimates. The upper limit of the CDF is not equal to one because of the small portion of spells lasting beyond 30 months.

The duration distribution of poverty episodes from the 2004 and 2008 panels lie below the distribution from the 1984 panel at all points. Remarkably, that the difference is statistically significant not only between the 1984 and 2008 panels but also between the 1984 and 2004 panels. This implies that poverty has become more persistent in the US since the mid-1980s and the trend is not simply driven by the Great Recession of 2008. Indeed, the median duration of poverty episodes has shifted from 2 months in the 1984 panel to more than 3 months in the 1984 panel. During the same period, the proportion of those who exit poverty by the 12th month after entering a new spell dropped from 91 to 84 percent. Because of the overall decline in the cumulative probabilities of exiting poverty, the share of individuals, who are still poor 30 months after the start of the spell, increased from 4.4 percent in the 1984 panel to 6.4 in the 2004 panel. The observed shift in the duration

distribution of poverty spells has deepened during the years of the Great Recession leading to a further increase in the persistence of poverty.

Figure 4.2 provides additional evidence on the changes in the cumulative distribution of poverty durations since the mid-1980s. By plotting the absolute and relative differences in the CDFs between the 1984 and later panels, it shows in which parts of the distribution the major shifts have occurred.

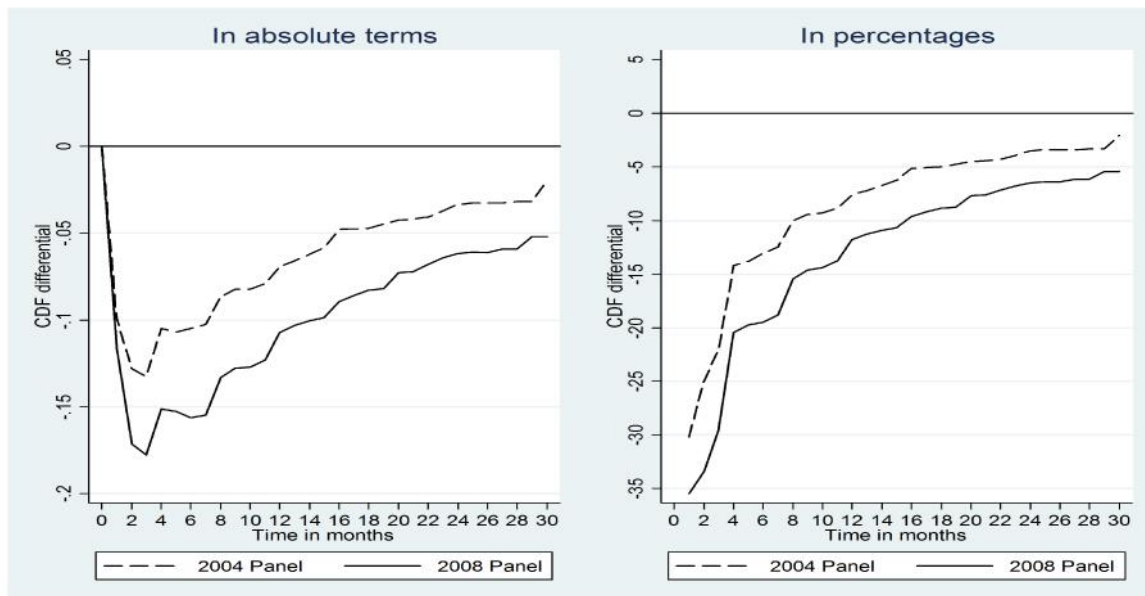


Figure 4.2. The change in the CDF of poverty durations over time

Note: weighted estimates.

The largest decline in the cumulative probabilities of exiting poverty took place in the lower tail of the distribution comprising spells with the durations of up to 3 months. For example, the probability that a new entrant into poverty will spend poor only one month declined by 30 percent between 1984 and 2004 and by more than 35 percent between 1984 and 2008. The probabilities of exiting poverty within two and three months after the entry also declined by 25 and 22 percent in the 2004 panel and by 33 and 30 percent in the 2008 panel. The pace of the decline in cumulative probabilities, however, slows down for longer poverty episodes. In the 2004 panel, it fluctuates between 5 and 15 percent for durations of 4-18 months and falls below 5 percent for durations beyond 18 months. In the 2008 panel, the magnitude of the decline is more pronounced but the trend looks very similar. This implies that the downward shift in the duration distribution of poverty episodes has occurred mainly in its bottom and middle parts.

The analysis of the absolute differences in the CDFs of poverty durations between the 1984 and later panels sheds further light on the nature of the distributional changes that have taken place. By looking at the variation in the magnitude of the absolute differences along the distribution, we can identify whether a decline in the CDF at a given value of t is driven by the decrease in the proportion of spells which last exactly for t months, or by the decrease in the proportion of spells which last $t-1$ months. For example, the left-hand side of Figure 4.2 shows that the downward trend in the cumulative distribution of poverty durations between the 1984 and later panels was driven by the decline in the likelihood of having very short spells of poverty (between 1 and 3 months). From month 4 onwards, the gap between the 1984 and 2004 (2008) distributions started slowly to decrease. These results suggest that the probability of having a spell of poverty lasting beyond 3 months has increased over time. This increase, however, was mainly concentrated in the middle of the distribution whereas the share of extremely long poverty spells has grown relatively little.

4.2. Explaining the change in the distribution of poverty durations over time

In order to understand what underlies the observed changes in the duration distribution of poverty episodes, we perform further analysis aiming to partition the overall shift in the CDF of poverty durations into three components capturing the contributions of (i) changes in the structure of the general population, (ii) changes in the composition of the poor, (iii) changes in the patterns of poverty experienced by different population subgroups.

Changes in the population structure

Table 4.1 below describes the structure of the US population in terms of the main demographic and socio-economic characteristics (age, gender, race, educational attainment, family composition) which, according to the literature, have changed substantially over recent decades. Looking at the racial and ethnical composition first, we can see that the proportion of white individuals has declined over time whereas the proportions of individuals with Hispanic or Asian origin increased. As one would expect, the population has also become older since the mid-1980s. The share of individuals below 35 years old declined whereas the shares of all other age groups increased in the 2004 and 2008 panels as compared to the 1984 panel. In terms of education, the trend is towards a sizable increase in the share of grown-up individuals with a college or higher than college diploma. Between the mid-1980s and 2000s, this share increased by more than 20 percentage points. Finally, the society underwent profound changes in family structure. The proportion of couple-based families has

decreased over time whereas the proportions of single parent and one-person families have increased. The trends observed between the 1984 and 2004 panels became even more pronounced in the 2008 panel.

Table 4.1. Changes in the structure of the US population over time

Individual characteristics	1984 Panel, %	2004 Panel,%	2008 Panel, %	Difference 1984-2004	Difference 1984-2008
<i>Race and ethnicity</i>					
Only white	81.32	72.34	69.99	-8.98***	-11.33***
Only black	10.13	10.86	10.97	+0.73	+0.84
Hispanic or Asian origin	8.55	16.80	19.04	+8.25***	+10.49***
<i>Gender</i>					
Men	46.94	46.94	47.29	0	+0.35
Women	53.06	53.06	52.71	0	-0.35
<i>Family type</i>					
Single parent	12.77	15.28	15.99	+2.51***	+3.22***
Single	15.56	21.42	22.92	+5.86	+7.36***
Couple	71.67	63.30	61.09	-8.37***	-10.58***
<i>Age</i>					
18-34	39.85	28.63	28.16	-11.22***	-11.69***
35-54	32.00	39.94	38.26	+7.94***	+6.26***
55-64	13.23	14.57	16.24	+1.34***	+3.01***
65	14.92	16.86	17.34	+1.94***	+2.42***
<i>Education</i>					
Uncompleted high school	23.57	13.47	12.00	-10.10***	-11.57***
Completed high school	37.09	26.06	25.47	-11.03***	-11.62***
College or higher	39.34	60.47	62.53	+21.13***	+23.19***

Note: Longitudinally weighted estimates based on the SIPP 1984, 2004 and 2008 panels. The differences are tested for statistical significance, accounting for the complex survey design in the SIPP.

* significant at 0.001 level, ** significant at 0.01 level, *** significant at 0.05 level.

Figure 4.3 below shows the contribution of the observed trends in the structure of the US population to the shift in the duration distribution of poverty episodes. It does so by plotting actual duration distributions of poverty episodes in the 1984 and later panels against the counterfactual distribution that would have prevailed in these later panels if the structure of the US population had remained the same as in 1984. The vertical distance between the actual distribution for the 2004 (2008) panel and counterfactual distribution yields the contribution of the changes in the population structure to the overall shift in the duration distribution of poverty episodes. Albeit relatively small in magnitude, this contribution is favorable in terms of the direction of influence. Had the demographic composition of the US population remained the same as twenty five years ago, the cumulative distribution of poverty durations would have been even below its actual level in both 2004 and 2008 panels. This

suggests that changes in the structure of the overall population have contributed to the decrease in the probabilities of having long poverty spells.

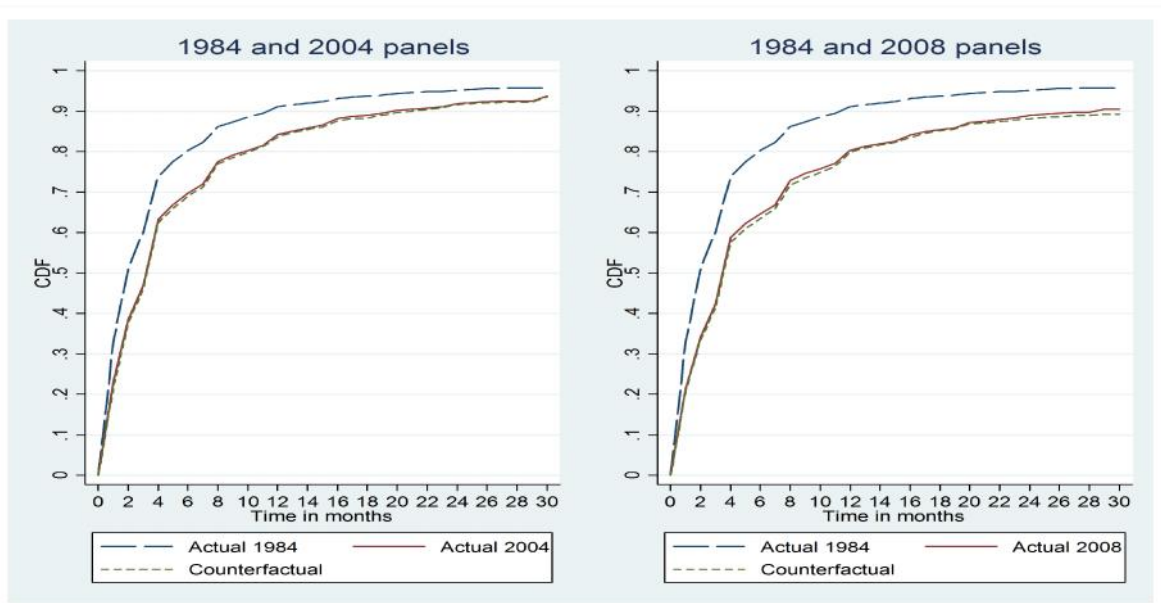


Figure 4.3. Contribution of the changes in the population structure to the shift in the CDF of time spent in poverty

Note: weighted estimates.

Figure 4.4 quantifies the contribution of the changes in the population structure to the shift in the duration distribution of uninterrupted poverty episodes over time. It does so by plotting the difference in the actual duration distribution of poverty episodes in the 2004 (2008) panel and counterfactual distribution that would have prevailed in that panel had the population structure remained the same as in 1984.

Consistent with what we have seen in Figure 4.2, changes in the population structure are associated with the increase in the cumulative probabilities of having a spell of poverty ended at absolutely all points of the distribution. Between 1984 and 2004, the changing structure of the population has induced 5 percent increase in the proportion of poverty episodes which end within one month. This shift in the very bottom part of the cumulative distribution moved its mass slightly upwards also in other parts, especially for durations up to 11 months. The likelihood of having a spell completed 15 to 18 months after its start has also slightly increased, shifting the upper tail of the CDF further upwards.

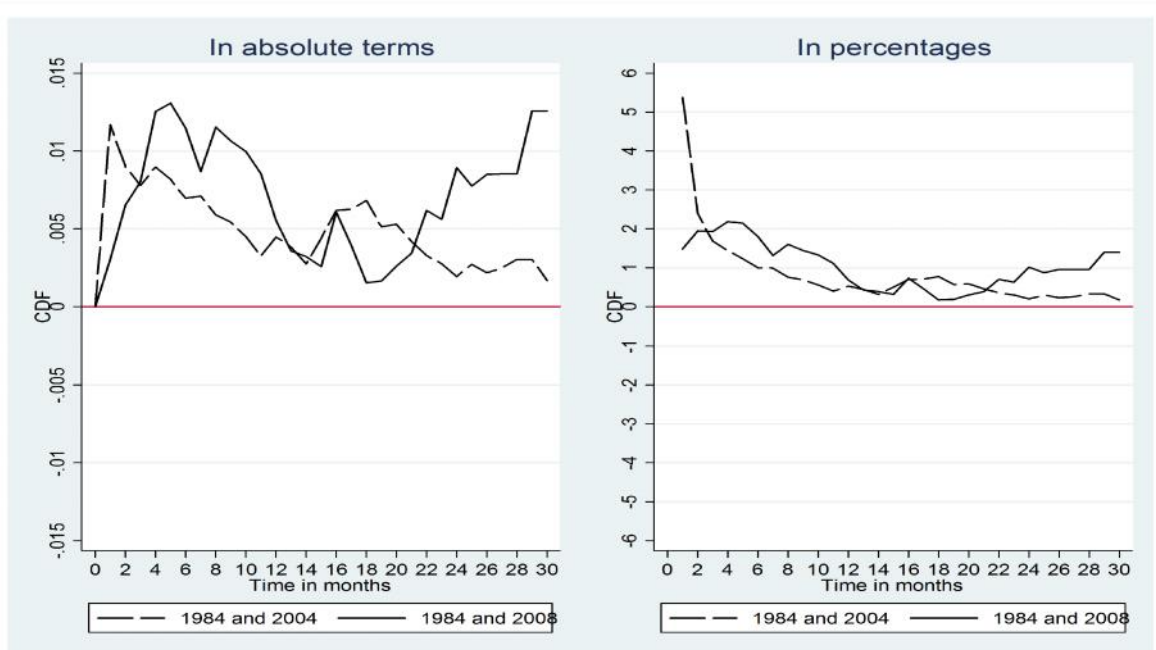


Figure 4.4. Changes in the CDF of poverty durations induced by the shift in the population structure

Note: weighted estimates.

The contribution of the changes in the population structure to the shift in the CDF of poverty durations was a bit different for the years after the Great recession. Albeit positive, the effects are more pronounced in size and differently spread along the distribution in the 2008 panel compared to the 2004 one. In the 2008 panel, they are concentrated mainly in the lower and upper tails of the cumulative distribution of poverty durations whereas its middle part is affected very little. This means that changes in the characteristics of the total population have induced an increase in the proportion of relatively short poverty spells, and decline in the proportion of extremely long poverty spells.

Changes in the composition of the poor

Table 4.2 lists sample means for the characteristics of the poor in each of the three panels and provides unadjusted and adjusted differences between them. The adjustment is performed by re-weighting poverty observations in the cleaned 2004 and 2008 spell samples with the weights calculated to account for the change in the population structure.

Table 4.2. Changes in the composition of the poor over time

Individual characteristics	1984 Panel, %	2004 Panel, %	2008 Panel, %	Difference 1984-2004	Difference 1984-2008	Adjusted difference 1984-2004	Adjusted difference 1984-2008
<i>Race and ethnicity</i>							
Only white	69.01	58.85	57.49	-10.16***	-11.52***	+0.93	+1.98
Only black	19.12	16.33	15.57	-2.79	-3.55	-3.97*	-4.91**
Hispanic or Asian origin	11.87	24.82	26.94	+12.95***	+15.07***	+3.03*	+2.92**
<i>Gender</i>							
Men	42.60	42.29	45.23	-0.31	+2.63	-0.53	+1.93
Women	57.40	57.71	54.77	+0.31	-2.63	+0.53	-1.93
<i>Family type</i>							
Single parent	23.38	26.60	25.44	+3.22***	+2.06***	+1.43	+1.05
Single	24.96	33.29	33.85	+8.33***	+8.89***	+1.51	-0.33
Couple	51.66	40.11	40.71	-11.55***	-10.95***	-2.96	-0.73
<i>Age</i>							
18-34	46.69	39.37	38.36	-7.32***	-8.33***	+6.35***	+6.52***
35-54	29.33	37.97	39.85	+8.64***	+10.52***	-0.7	+1.44
55-64	11.93	12.63	13.01	+0.7*	+1.08***	-1.97*	-2.62**
65	12.05	10.03	8.77	-2.02	-3.28	-3.69***	-5.37***
<i>Education</i>							
Uncompleted high school	38.45	24.35	22.99	-14.10***	-15.46***	-5.7***	-5.18*
Completed high school	35.70	29.04	29.33	-6.66***	-6.37***	+3.44*	+4.82**
College or higher	25.85	46.61	47.68	+20.76***	+21.83***	+2.25	+0.34

Note: Weighted estimates. The differences are tested for statistical significance accounting for the complex survey design in the SIPP.

* significant at 0.001 level, ** significant at 0.01 level, *** significant at 0.05 level.

The last two columns in Table 4.2 show that albeit the composition of the poor has changed over time, to a large extent this change is induced by the shift in the demographic structure of the US population. For example, one will find a decline of more than 10 percentage points in the proportion of white individuals among the poor, when no adjustment for the shift in the population structure is performed. In a similar way we can report a significant increase over time in the share of poor individuals living in single parent and single person families. These differences become much smaller in magnitude and insignificant as soon as we adjust for the changes in the structure of the US population which took place during the same period of time.

Compared to the early 1980s, nowadays there are fewer black people, individuals of pre-retirement and retirement age as well as those who have not finished high school among the poor. In contrast, even after the adjustment for the changes in the population structure, we can report that individuals with Hispanic or Asian origin, persons aged 18-34 years old, and

individuals with completed high school education have become more prone to poverty over the past twenty five years.

Figures A.1 and A.2 in the Appendix depict the distribution of the characteristics of the poor along the spell lengths. In this way, we can trace who are the short-term and long-term poor as well as how the composition of these groups has changes over time. The figures show that white individuals, those of 18-54 years old, men, people with tertiary education, and individuals living in couples are disproportionately concentrated among the short-term poor. In contrast, the shares of the elderly, individuals with Hispanic or Asian origin, people without tertiary education and single parent families increase with the spell length. Regarding the trends over time, individuals of 18-34 years old, Latino and Asians, people with uncompleted school education and those living in couples have become more represented among the long-term poor. On the other hand, the shares of the elderly, black people and single parent families among the long-term poor have declined over time.

Figure 4.5 shows how the observed changes in the composition of the poor have reflected on the duration distribution of poverty episodes. For each period, it presents four CDFs of time uninterruptedly spent in poverty: two actual distributions observed at the beginning and at the end of the period, and two counterfactual distributions depicting how the distribution in the final period would have looked like if the structure of the population had not changed (Counterfactual 1) and what this distribution would have been if, on top of the population structure, the composition of the poor also had not changed (Counterfactual 2). The contribution of the change in the composition of the poor to the overall shift in the duration distribution of poverty episodes can be defined as a vertical distance between these two counterfactual distributions.

Figure 4.5 shows that the counterfactual CDF which would have prevailed in the 2004 panel if both the population structure and composition of the poor had remained at the level of the 1980s, to a large extent overlaps with the actual CDF of poverty durations in the 2004 panel. The difference becomes visually noticeable only in the middle of the distribution. Holding the population structure fixed at its 1980s level, the change in the composition of the poor has contributed to the increase in the cumulative probabilities of having a poverty spell ended within 4 to 17 months.

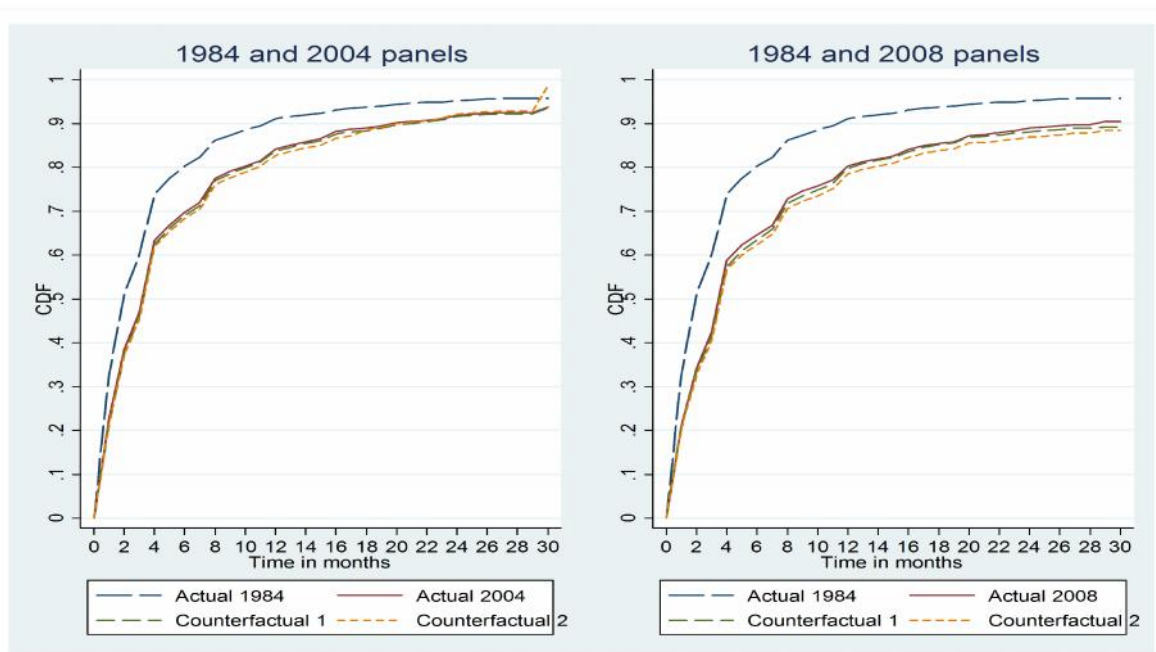


Figure 4.5. Contribution of the changes in the population structure and composition of the poor to the shift in the CDF of time spent in poverty

Note: weighted estimates.

The results are more pronounced for the 1984 and 2008 panels. The vertical distance between two counterfactual distributions is bigger for these panels than for the 1984 and 2004 panels, and it also increases in the upper tail of the distribution. It means that the change in the composition of the poor between the mid-1980s and late 2000s contributed to a decline in the proportion of long poverty spells. Had the distribution of covariates remained the same in the mid-2000s as it was in the mid-1980s, the persistence of poverty would have been higher than it actually was.

Figure 4.6 quantifies the contribution of the changes in the composition of the poor to the shift in the CDF of poverty durations by depicting the magnitude of this contribution at different values of duration. In line with what can be seen in Figure 4.5, the shift in the composition of the poor between 1984 and 2004 has contributed to a small increase in the proportion of individuals who have a spell of poverty ended within the first 17 months. However, from month 17 onwards, the effects become negative suggesting that changes in the composition of the poor in this part of the duration distribution have contributed to the increase in the persistence of poverty.

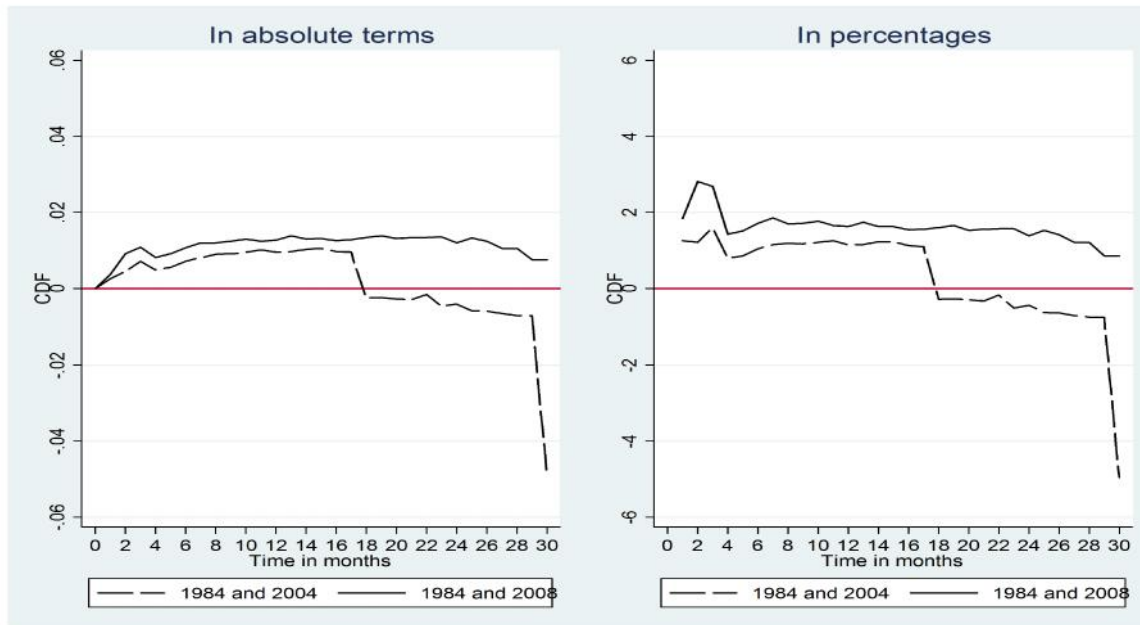


Figure 4.6. Changes in the CDF of poverty durations induced by the shifts in the composition of the poor

Note: weighted estimates.

The contribution of the changes in the composition of the poor to the shift in the CDF of poverty durations looks differently for the 2008 panel. The effects are also relatively small in size but they remain positive along the distribution. Hence, we can conclude that changes in the composition of the poor between 1984 and 2008 induced an increase in the proportion of spells ending within the first 3 months which, in turn, shifted the entire CDF of poverty durations upwards.

Changes in the patterns of poverty among different population subgroups

The results presented so far suggest that the contribution of the changes in the population structure and composition of the poor to the overall downward shift in the duration distribution of poverty episodes is relatively small. This implies that the major factor contributing to the increase in the persistence of poverty in the US should be the change in the patterns of poverty experienced by population sub-groups.

Figure 4.5 above allows us to explore the extent to which changes in the effects of characteristics of the poor have contributed to the shift in the overall CDF of poverty durations. Following the order of the sequential decomposition in Equation (3.12), this contribution is measured as a difference between the counterfactual distribution, that would have prevailed in the 2004 (2008) panel if both the population structure and composition of

the poor had been the same as in the 1984 panel, and the actual distribution observed in the 1984 panel. We plotted this difference for both 2004 and 2008 panels in Figure 4.7.

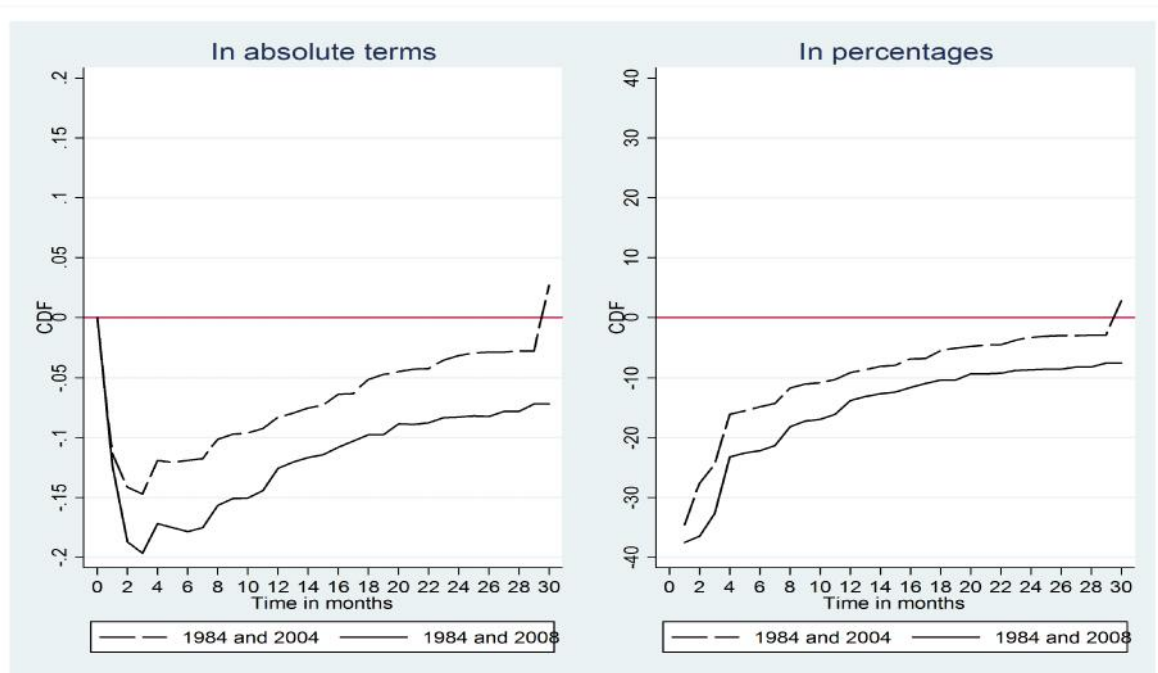


Figure 4.7. Changes in the CDF of poverty durations induced by the shifts in the effects of the characteristics of the poor

Note: weighted estimates.

Figure 4.7 shows that changes in the amount of time spent below the poverty line by different population sub-groups were the major factor responsible for the increase in the duration of poverty episodes between the 1980s and 2000s. Had the returns to the characteristics of the poor remained the same as they used to be in the 1984 panel, the duration distribution of poverty episodes would have been more convex upwards than it actually was in both 2004 and 2008 panels. Remarkably, that Figure 4.7 looks very similar to Figure 4.2 depicting the overall change in the CDF of poverty durations between the 1984 and later panels. In Figure 4.7, however, we observe a deeper decline in the proportion of short-term spells for both 2004 and 2008 panels. This means that changes in the population structure and composition of the poor have slightly softened the negative influence of the changes in the effects of characteristics of the poor on the shift in the CDF of poverty durations.

Table 4.3 helps to identify individuals with which characteristics have become more / less prone to long poverty episodes over time. The first three columns of the Table present

the coefficients from the equations modeling the probability of exiting poverty as a function of covariates separately in each panel. For interpretability purposes, we present the estimates from the model where all individuals are pulled together and the effects of covariates are forced to be the same at all values of duration. Along with the model estimates, we also present differences in the coefficients between the 1984 and later panels.

Table 4.3. Model estimates for poverty exits

	1984 Panel, %	2004 Panel,%	2008 Panel, %	Difference 1984-2004	Difference 1984-2008	Difference 2004-2008
	(1)	(2)	(3)	(4)	(5)	(6)
Duration dummies						
1 month	-0.407***	-0.995***	-0.956***	-0.588***	-0.549***	0.039
2 months	-0.639***	-1.074***	-1.275***	-0.435***	-0.636***	-0.201**
3 months	-1.150***	-1.532***	-1.583***	-0.382***	-0.433***	-0.051
4 months	-0.266***	-0.513***	-0.573***	-0.247*	-0.307***	-0.060
5 months	-1.439***	-1.932***	-2.008***	-0.493***	-0.569***	-0.076
6 months	-1.610***	-2.000***	-2.247***	-0.39***	-0.637***	-0.247
7 months	-1.786***	-2.225***	-2.208***	-0.439*	-0.422*	0.017
8 months	-0.828***	-1.053***	-1.131***	-0.225	-0.303*	-0.078
9 months	-2.021***	-2.256***	-2.261***	-0.235	-0.24	-0.005
10 months	-1.845***	-2.379***	-2.505***	-0.534*	-0.66**	-0.126
11 months	-1.967***	-2.238***	-2.288***	-0.271	-0.321	-0.05
12 months	-1.302***	-1.537***	-1.303***	-0.235	-0.001	0.234
13 months	-2.309***	-2.429***	-2.325***	-0.12	-0.016	0.104
14 months	-2.614***	-2.424***	-2.820***	0.19	-0.206	-0.396
15 months	-2.532***	-2.701***	-2.880***	-0.169	-0.348	-0.179
> 15 months	-2.444***	-2.503***	-2.562***	-0.059	-0.118	-0.059
Age 18-34	0.019	-0.003	-0.043	-0.022	-0.062	-0.04
Age 55-64	-0.195***	-0.064	-0.039	0.131*	0.156*	0.025
Age > 65	-0.490***	-0.430***	-0.267***	0.060	0.223**	0.163*
Only black	-0.184*	-0.205***	-0.300***	-0.021	-0.116	-0.095
Hispanic or Asian	-0.124*	-0.087	-0.026	0.037	0.098	0.061
Male	0.036	0.130***	0.077**	0.094***	0.041	-0.053
Single parent	-0.279***	-0.196***	-0.276***	0.083	0.003	-0.08*
Single	-0.297***	-0.235***	-0.348***	0.062	-0.051	-0.113
Uncompleted high school	-0.265***	-0.380***	-0.431***	-0.115*	-0.166**	-0.051
Completed high school	-0.100**	-0.193***	-0.228***	-0.093*	-0.128*	-0.035
N of observations	41366	85332	82771	-	-	-

Note: weighted estimates based on the SIPP data. All coefficients are logit estimates. Standard errors are corrected for clustering of individuals within families. * stands for the significance at .10 level, ** stands for the significance at .01 level, *** stands for the significance at .001 level.

Columns 4 and 5 in Table 4.3 show that the tendency towards longer poverty episodes, which was found in Section 4.1, is also confirmed by the model estimates. The probabilities of exiting poverty have declined significantly for the durations up to eight months which is in line with the shift of the mass of the duration distribution of poverty episodes to the right in Figure 4.1. The differences between the panels in the estimated coefficients associated with the characteristics of the poor reveal that individuals of the pre-retirement and retirement age

have improved their chances of exiting poverty over time whereas those, who do not have at least a college diploma, tend to stay in poverty longer nowadays than they used to twenty five years ago. On top of it, male individuals have become better off than female over time. The difference is not statistically significant between the 1984 and 2008 panels but the coefficient remains significant in the 2008 panel as opposed to the 1984 panel.

Comparison of the estimates between the 2004 and 2008 panels (column 6 in Table 4.3) reveals that the probability of exiting poverty has increased for the elderly during the period of the Great recession. Albeit they still have lower chances of exiting poverty compared to the group of 35-54 years old, the differential decreased between the 2004 and 2008 panels. In contrast, individuals living in single parent families became more prone to long episodes of poverty during the years of the crisis.

Figures 4.8 and 4.9 shed further light on how poverty experiences of different population sub-groups have changed over time. They do so by plotting the between-panel differences in the estimated CDFs of poverty durations for specific types of individuals. In contrast to the results presented in Table 4.3, the estimation here is based on the distributional regression approach which allows the effects of covariates to vary at different values of duration. We start the exercise by estimating the model for the reference type of individuals (white male aged 35-54 with higher education and living in a couple) and then explore how the duration distribution of poverty episodes changes when we shift the values of certain covariates. More precisely, we explore differences in the development of the CDFs over time for individuals of different age, gender, race, educational and family background.

Figure 4.8 shows that there is almost no difference in the changes over time in the CDFs of poverty durations for individuals of 35-54 and 18-34 years old (the reference type). Both groups have experienced a decrease in the cumulative probabilities of exiting poverty with the most profound decline taking place in the bottom of the distribution. Compared to these two groups, the change in the duration distribution of poverty episodes over time is less pronounced for individuals between 55 and 64 years old. Albeit the proportion of short-term spells also decreased for this population subgroup, the size of the decrease was smaller than for the reference type. The elderly also experienced a downward shift in the CDF of poverty durations over time, but the magnitude of the decline was smaller in the bottom part of the distribution and somewhat larger in its upper part.

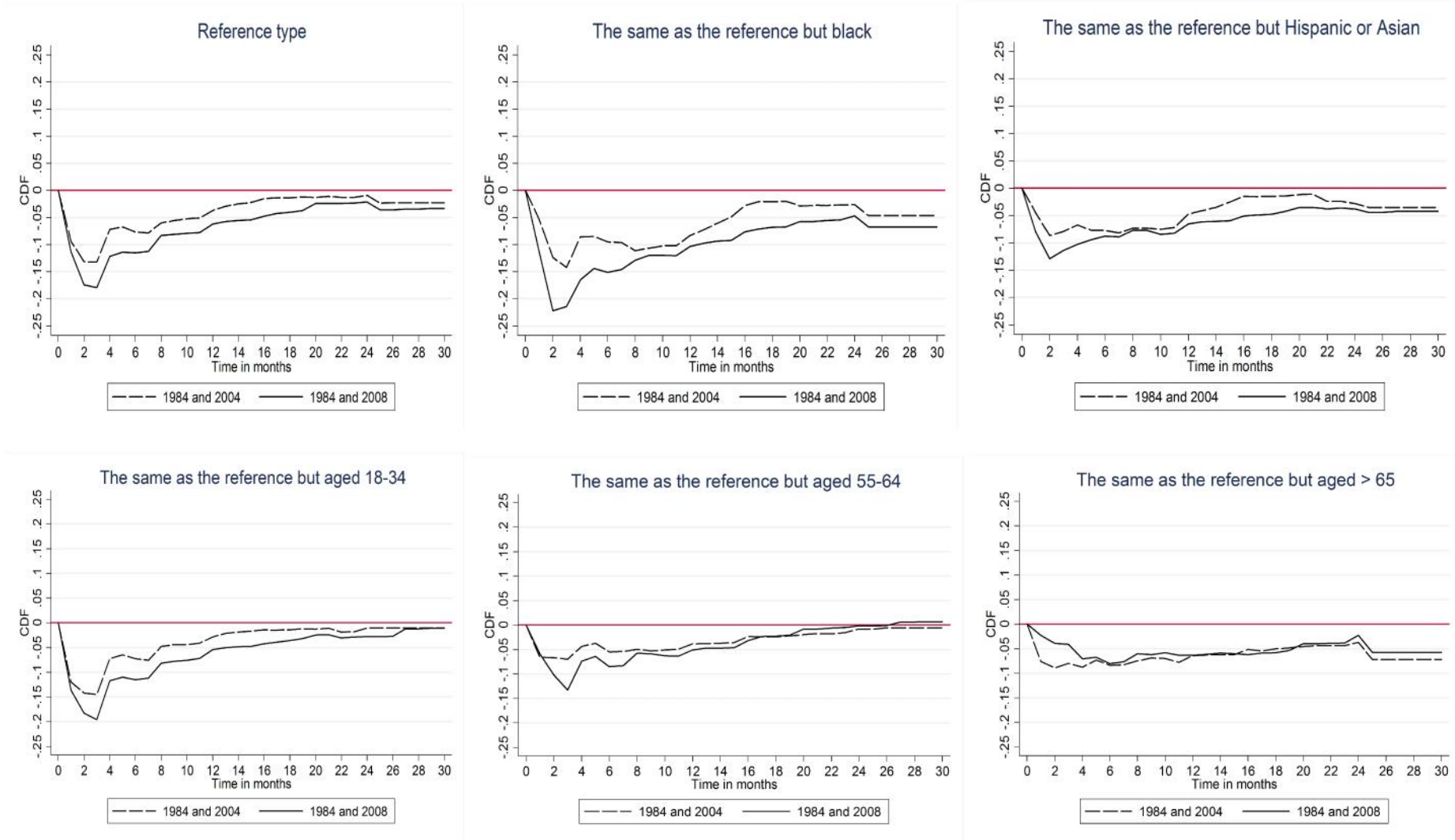


Figure 4.8. Race and age differentials in the development of the duration distribution of poverty episodes over time

Note : Simulated on the basis of the weighted estimates. Reference individual: white male aged 35-54 with higher education and living in a couple.

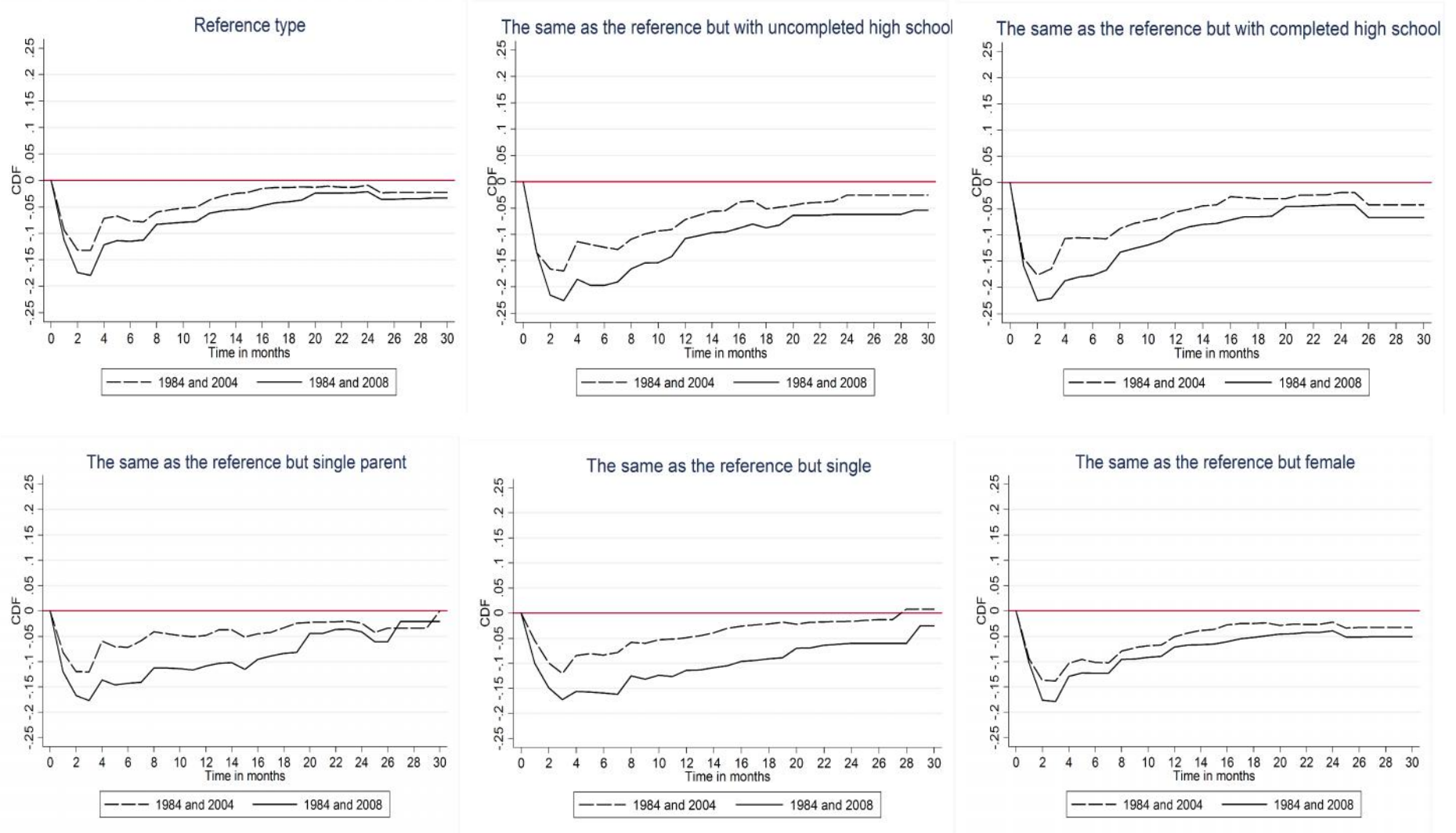


Figure 4.9. Gender, educational, and family differentials in the development of the duration distribution of poverty episodes over time

Note : Simulated on the basis of weighted estimates. Reference individual: white male aged 35-54 with higher education and living in a couple.

Comparison of the trends for different race categories reveals that both black people and individuals with Hispanic (or Asian) origin have experienced a larger downward shift in the duration distributions of poverty episodes than their white counterparts. The difference is especially pronounced between white and black individuals. For the latter group the probabilities of exiting poverty dropped substantially not only in the bottom but also in the middle and upper parts of the distribution.

Figure 4.9 presents changes over time in the CDFs of poverty durations for individuals of different gender, educational and family background. It shows that individuals with both uncompleted and completed high school education have experienced substantially larger increase in the probabilities of having long poverty spells than those individuals who have at least a college diploma. The differences in the development of the CDFs for different family arrangements show that single parent and single person families have become more prone to long poverty episodes over time than couples. A similar trend is also documented for female individuals.

Figures 4.8 and 4.9 also allow us to identify which socio-economic groups have been affected the most by the Great Recession. Judging from the trends, it is mainly black individuals, single person and single parent families, as well as uneducated people, who became especially likely to have a long spell of poverty in the 2008 panel. In contrast, the patterns of poverty duration for individuals of pre-retirement and retirement age remained almost unchanged during the years of the crisis.

4.3. Robustness check

Figure A.3 in the Appendix presents the results of the reverse-order decomposition of the overall change in the CDF of poverty durations between the 1984 panel, on the one hand, and 2004 and 2008 panels, on the other hand. In this version of decomposition, after accounting for the change in the structure of the US population over time (Counterfactual 1), we first derived the contribution of the changes in the effects of the characteristics of the poor to the shift in the entire duration distribution of poverty episodes (Counterfactual 2) and only then estimate the contribution of the changes in the composition of the poor.

The results of the reverse order decomposition confirm our previous findings by showing a relatively large contribution of the changes in the effects of covariates to the decrease in the cumulative probabilities of exiting poverty over time. The contributions of the shifts in the population structure and composition of the poor, in turn, are relatively small but

inducing an upward shift in the CDF of time spent in poverty. Similarly to Figure 4.3, the findings hold for both 2004 and 2008 panels signifying robustness of decomposition results.

4.4. Changes in the probabilities of poverty re-entry

Given that the poverty rate did not change much in the US between the early 1980s and late 2000s, one might expect that an increase in the duration of uninterrupted poverty episodes was ‘compensated’ by a decrease in their frequency. Figure 4.11 below plots the differences between the CDF of time spent out of poverty between the 1984 and later panels.

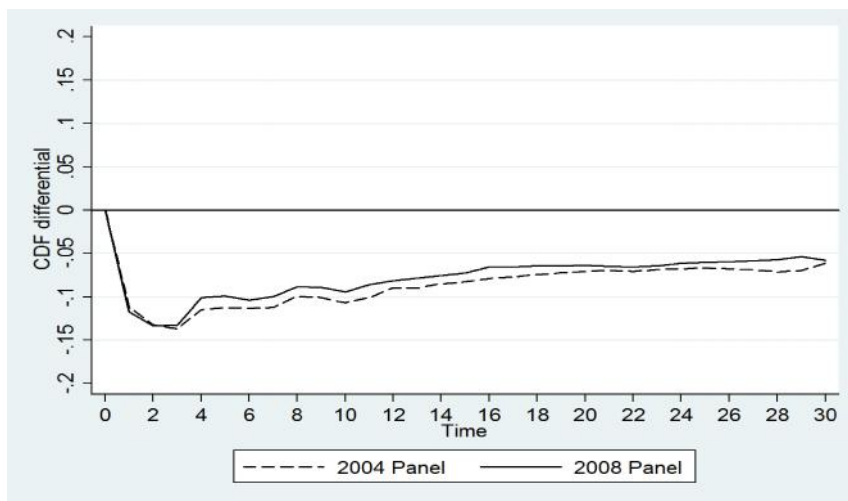


Figure 4.11. Changes in the CDF of time spent out of poverty

Note: weighted estimates.

In line with our expectations, the cumulative probabilities of re-entering poverty indeed have declined over time. By comparing the estimates in Figure 4.11 with the estimates in Figure 4.2 we can see that the gap between the 2004 and 2008 differentials is more pronounced for poverty than for non-poverty episodes. It implies that the deep economic crisis of 2008 hit the conditional probabilities of exiting poverty to a larger extent than the probabilities of poverty re-entry, leading to even more persistent episodes of poverty towards the end of the 2000s.

5. Conclusions.

Using data from the SIPP, this paper explores how and why the cumulative distribution of poverty durations has changed between the early 1980s and late 2000s in the United States. To do that, we take advantage of the distribution regression technique which

allows us to construct the entire duration distribution of poverty episodes in the presence of covariates and decompose its change over time into three components attributable to the changes in: (i) the structure of the US population, (ii) composition of the poor, and (iii) poverty experiences of individuals representing different population subgroups.

The results show that albeit the official poverty rate was relatively stable in the US between the early 1980s and late 2000s, poverty became more persistent. From the distributional point of view, this increase in the persistence of poverty was driven by the decline in the probabilities of having very short poverty spells (1 to 3-month long) with a subsequent increase in the probabilities of having longer poverty spells, especially those lasting between 4 and 18 months.

The downward shift in the duration distribution of poverty episodes over time is mainly induced by the changes in the poverty experiences of different population subgroups. More precisely, black individuals, women, people with uncompleted or complete high school education, as well as those living in single parent and single person families have experienced a disproportionately large increase in the probability of having long spells of poverty. Albeit to a smaller extent, the amount of time spent below the poverty line has also increased for all other population subgroups.

In contrast, changes in the structure of the US population and composition of the poor have positively influenced the duration distribution of poverty spells. Had the population structure and the composition of the poor remained at their 1984 level, the persistence of poverty would have been even higher in the 2000s. The size of the effect, however, was relatively small to offset the negative contribution induced by the changes in the within-group patterns of poverty.



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Appendix A

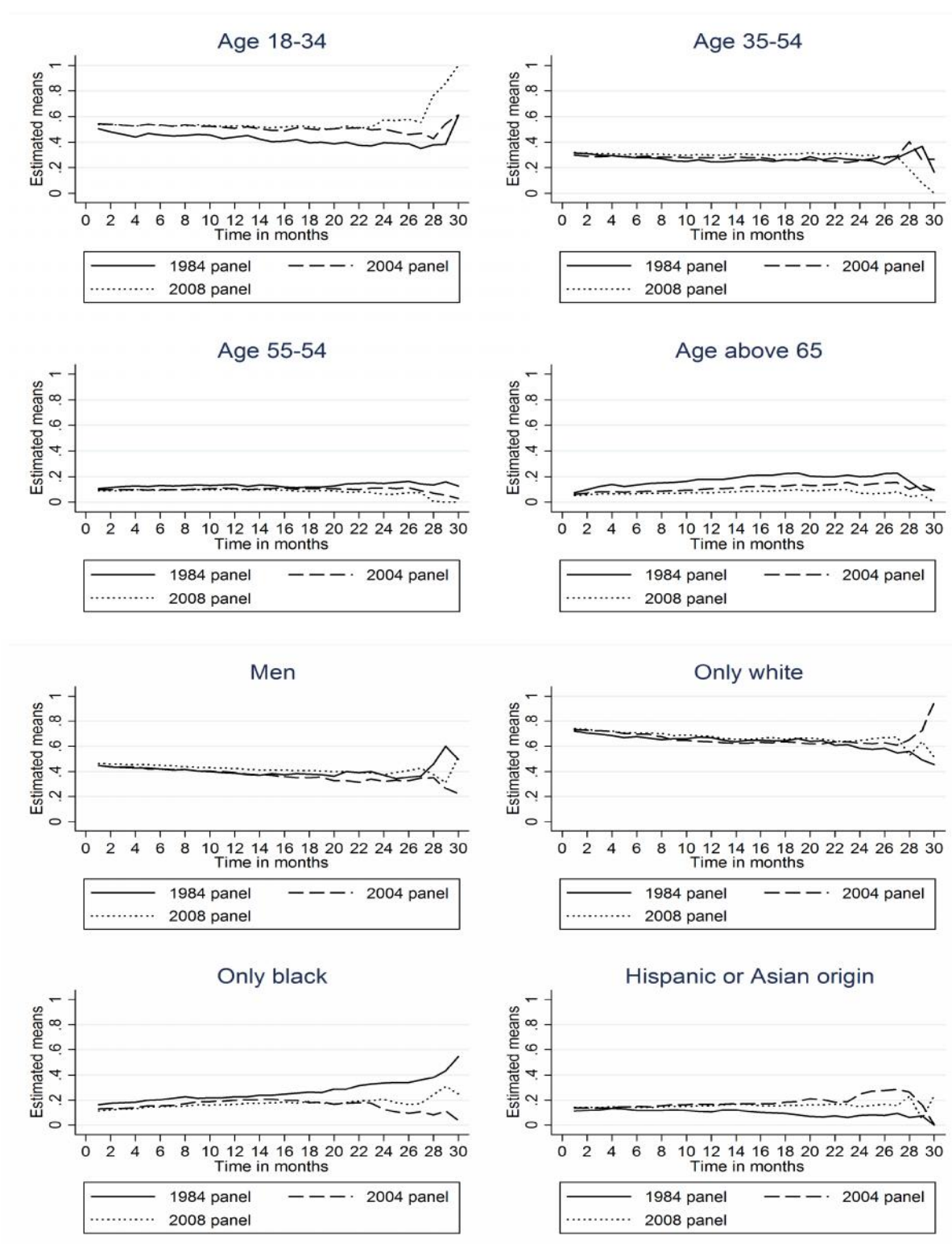


Figure A.1. Distribution of the demographic characteristics of the poor across the spell lengths

Note: weighted data. The estimates for the 2004 and 2008 panels are adjusted for the changes in the population structure since 1984. The volatility of the estimates in the upper tails of the distributions is induced by a smaller number of observations located there.

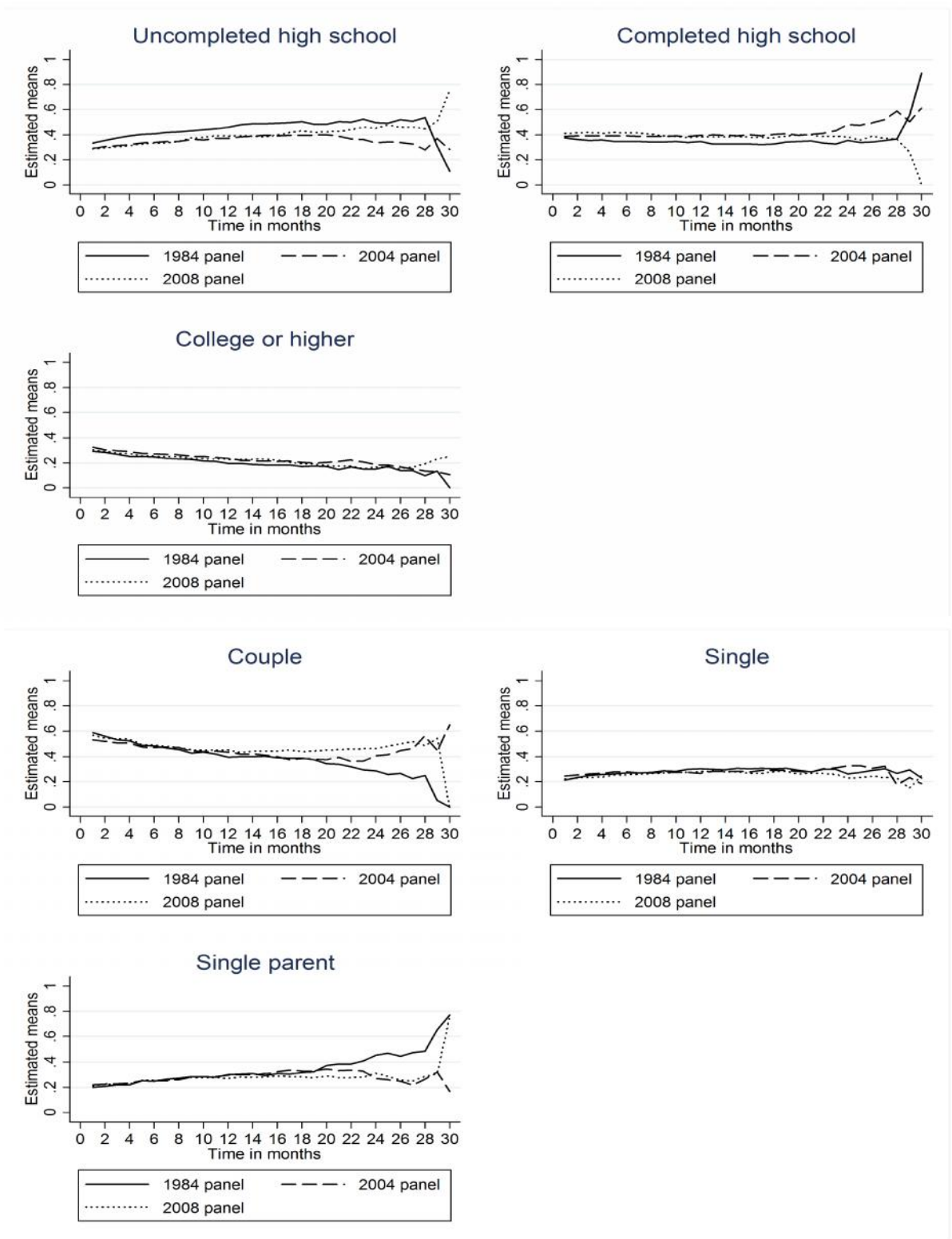


Figure A.2. Distribution of the socio-economic characteristics of the poor across the spell lengths

Note: weighted data. The estimates for the 2004 and 2008 panels are adjusted for the changes in the population structure since 1984. The volatility of the estimates in the upper tails of the distributions is induced by a smaller number of observations located there.

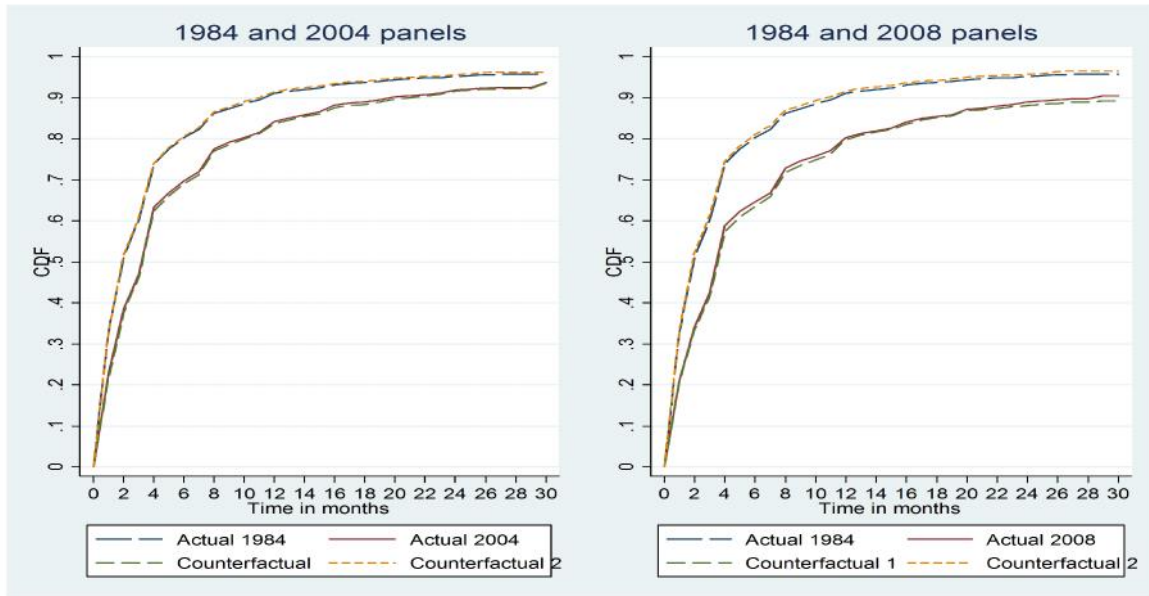


Figure A.3. Reverse order decomposition of the change in the CDF of poverty durations

Note: weighted estimates.