

Exploring the Dynamics of Racial Food Security Gaps in the United States

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Abstract

Household-level food insecurity is one of the largest public health concerns facing millions of people in the United States today. Although recent work has highlighted gaps in food security rates between minority and non-Hispanic white households, little is known about how these households evolve through the overall distribution of food security over time. As such, we employ nonparametric estimators of distributional mobility to household-level data on food security from the Early Childhood Longitudinal Survey, Kindergarten Class of 1998-1999 study. Results suggest that Hispanic and non-Hispanic white households with children are equally mobile in the long run whereas non-Hispanic black households with children tend to be less upwardly mobile *and* more downwardly mobile in food security status over time.

JEL: I12, I18

Keywords: Food Security, Mobility, Poverty, Racial Disparity, Transition Dynamics

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1 Introduction

Food insecurity is one of the most significant public health concerns facing the United States today. As noted by Gundersen et al. (2011, p. 281), “the prevalence of food insecurity is of great concern to policy-makers and program administrators, a concern heightened by its many demonstrated negative health consequences.” This is particularly true when looking at childhood health outcomes. In particular, food insecurity has been linked with greater cognitive problems (Howard, 2011), an increase in aggressive behavior (Whitaker et al., 2006), an increase in behavioral and mental issues (Alaimo et al., 2002; Huang et al., 2010), higher probabilities of being diagnosed with asthma (Kirkpatrick et al., 2010), and overall poorer health (Cook et al., 2004, 2006). Further, King (2018) has recently documented an association between housing instability and household-level food security.

While true that food insecurity rates have leveled off since the Great Recession of 2009, the prevailing number of food insecure households remains startlingly high. In particular, figures from 2016 suggest that 12.3% of U.S. households (15.6 million households) were food insecure, meaning these households were classified as lacking consistent access to food required for an active, healthy life (Coleman-Jensen et al., 2017). Among these 15.6 million food insecure households, 6.1 million were classified as being very low food secure (4.9% of U.S. households). Among households with children in 2016, 8% had food insecure children with only 0.8% of those households being classified as very low food secure. These same figures were 9.4 % and 1.1% in 2014 and 10% and 1.2% in 2012, respectively (see, Table 1B, Coleman-Jensen et al., 2017).

In addition to the recent rates of food insecurity noted above, it has been well documented that racial disparities exist in the proportion of households classified as food insecure. In particular, Coleman-Jensen et al. (2017) report that 22.5% of households headed by blacks and 18.5% of households headed by Hispanics were food insecure in 2016 compared to the national average of 12.3%. The authors further report that only 9.3% of households headed by whites were classified as food insecure, resulting in a food insecurity gap of 13.5 percent-

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4 age points and 9.2 percentage points between blacks and whites and Hispanics and whites,
5 respectively. Additionally, these observed gaps in food insecurity have been relatively per-
6 sistent. Even though the gaps in food security have slightly narrowed over recent years, the
7 average gap in food insecurity over the time period of 2013-2015 averaged 14.2 percentage
8 points for black households versus white households and 11.4 percentage points for Hispanic
9 households versus white households (Coleman-Jensen et al., 2016, 2015, 2014).¹

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11 In light of the well documented racial disparities in food security status, this study aims to
12 explore the dynamics of the racial food security gaps by documenting how a household's food
13 security status evolves over time. In particular, and using the Early Childhood Longitudinal
14 Survey, Kindergarten Class of 1998-1999 (ECLS-K) data, we employ nonparametric measures
15 of distributional mobility to estimate the likelihood that minority and non-Hispanic white
16 households with children will move upward, downward, or not at all through the distribution
17 of the food security over time. Specifically, our analyses and results pertain to the mobility
18 dynamics of non-Hispanic black, non-Hispanic white, and Hispanic households with children.

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20 The reasons for performing such an exercise are threefold. First, solely evaluating
21 the racial gaps in food security in levels without understanding how households transition
22 through the distribution of food security over time is incomplete. Not taking into account
23 household-level transition dynamics may lead to inaccurate conclusions with respect to the
24 severity of the food security gap. For example, suppose there is a measurable gap in food
25 security status between minority households with children and non-Hispanic white house-
26 holds with children. At the same time, suppose that the movement through the food security
27 distribution is the same between minorities and non-Hispanic whites. In such a situation one
28 could imagine such movements through the food security distribution leading to all house-
29 holds being evenly dispersed, in a proportional sense, across food security distribution over
30 time relative to the distribution of food security at any particular point in time. Further,
31 it is reasonable to think that a small gap in food security between non-Hispanic whites and

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59 ¹These figures include households with and without children.
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4 minorities with no distributional movement is more of a concern compared to a state where
5 the racial gap in food security is modest yet the households are highly mobile. Although the
6 disparity in levels is relatively small in the first case, it is persistent. Similar to what has
7 been noted by Kopczuk et al. (2010) and Glewwe (2012) in the income inequality literature,
8 inequality in food security by itself is not meaningful; rather, it is both the racial food secu-
9 rity gap in levels and the underlying mobility dynamics that matter for assessing the degree
10 of food insecurity between white and minority households.
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19 Second, understanding racial disparities in mobility patterns of food security is important
20 for the creation of effective policy. On the one hand, if mobility in food security is low
21 for minority households relative to non-Hispanic white households, such that the minority
22 households find themselves persistently food insecure, then policy should perhaps target the
23 reduction in long term economic vulnerability (e.g. through acquisition of physical assets or
24 human capital) of minorities. On the other hand, if mobility is high across all households,
25 and the racial food security gap is transitory – e.g. certain households do not have access
26 to sufficient food for all members during periods of low income and volatile prices – then
27 policy may be more effective if targeted towards sources of income/price volatility and/or
28 credit and insurance markets. In fact, and as noted by Ribar and Hamrick (2003), transient
29 food insecurity (as opposed to chronic food insecurity) would also support the general design
30 of food stamp programs for low income households and, in particular, for those households
31 that have unexpected declines in income.
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46 Third, poverty and food insecurity are often lumped together under the assumption that
47 those who are food insecure are necessarily poor (and vice versa). As noted by Millimet et al.
48 (2018), Gundersen (2013), and Ribar and Hamrick (2003), food insecurity and poverty are
49 not synonymous. Meaning, households in a state of poverty are often *food secure* while many
50 non-poor households are officially *food insecure*. For example, 61.7% of households with an-
51 nual incomes below the official poverty line were food secure in 2016, while 5.6% of the
52 households with incomes exceeding 185% of the poverty line were food insecure (Coleman-
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4 Jensen et al., 2017). Ribar and Hamrick (2003, p. 21) in this context note, “poverty and
5 food insufficiency [a severe form of food insecurity] are related, yet distinct, processes...if
6 a household is able to borrow and save, bouts of poverty need not result in food prob-
7 lems.”² As such, a careful analysis of the racial gaps in food security dynamics, distinct from
8 poverty dynamics, is needed to better understand the economic hardship associated with
9 food insecurity. Considering both the racial food security gap in levels and the underlying
10 dynamics behind the gap helps in understanding whether or not what is observed in the
11 data is a genuine problem, or more of an artifact of when household-levels of food security
12 are measured.

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15 Our results are compelling. We find that relative to non-Hispanic white households with
16 children, non-Hispanic black households with children tend to have a lower probability of
17 transitioning out of the bottom of the food security distribution while at the same time
18 having a higher probability of falling from a state of high food security back into a state of
19 food insecurity. Such mobility dynamics, if allowed to persist over the long-run, would lead
20 to 62% of non-Hispanic black households with children achieving high food security status in
21 the steady-state compared to 88% of non-Hispanic white households with children achieving
22 high food security status. Further, 19% of non-Hispanic black households with children would
23 be classified as food insecure in the steady-state relative to only 7% of non-Hispanic white
24 households with children. Taken together with the documented gap in food security status
25 between non-Hispanic white and non-Hispanic black households with children, the mobility
26 dynamics suggest that we would see very little racial convergence in food security status
27 unless we can better understand how to lift non-Hispanic black households with children out
28 of a state of food insecurity while at the same time keeping households in some state of food
29 security once such status is achieved.

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32 Interestingly, our results for Hispanic households with children present a different picture.

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²Using data from the ECLS-K, the authors confirm that food insufficiency depends on more than simply household-level poverty status, a result that indicates that poverty and food insufficiency proxy for different aspects of economic hardship.

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4 Specifically, Hispanic households with children, when averaged over all time periods, have a
5 lower probability of being entrenched in a state of food insecurity relative to non-Hispanic
6 white households with children. As well, and similar to non-Hispanic black households,
7 Hispanic households with children are more likely to fall out of a state of high food security
8 once achieving such status relative to non-Hispanic white households with children. However,
9 this downward transition out of a state of high food security for Hispanic households relative
10 to white households with children is less severe compared to the same gap in downward
11 mobility between non-Hispanic black households and non-Hispanic white households with
12 children.
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23 When comparing Hispanic households with children directly with non-Hispanic black
24 households with children, we find mobility dynamics similar to what is found when com-
25 paring non-Hispanic white households to non-Hispanic black households. Such long run
26 mobility dynamics would lead to the steady-state food security distribution to look similar
27 between Hispanic and non-Hispanic white households but at odds with non-Hispanic black
28 households. In particular, in the steady-state 84% of Hispanic households with children
29 would be classified as high food secure (compared to 88% for non-Hispanic white and 62%
30 for non-Hispanic black households with children) while 10% of Hispanic households with
31 children would settle in a state of either low or very low food security (compared to 7% of
32 non-Hispanic white and 19% of non-Hispanic black households with children). Even after
33 conditioning on household-level socioeconomic status, we find evidence that non-Hispanic
34 black households are the most vulnerable group when compared to non-Hispanic white and
35 Hispanic households.
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50 The rest of the paper is organized as follows. Section 2 summarizes the existing literature.
51 Section 3 describes the data. Section 4 presents the mobility measures. Section 5 discusses
52 the results. Section 6 concludes.
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2 Literature Review

The persistence of food insecurity has been quantified by several studies using nationally representative samples from the United States (see for e.g. Jyoti et al., 2005; Hernandez and Jacknowitz, 2009; Wilde et al., 2010; Rank and Hirschl, 2009; Howard, 2011) as well as samples from small scale state level surveys (see for e.g. Heflin et al., 2005; Heflin et al., 2007; Ip et al., 2015).³ While these studies measure persistence in, or duration of, food security, they do so purely to describe their data as a routine exercise. In other words, the focus of these papers is not on measurement of underlying transition dynamics associated with food security, but on the relationship between food security and health or between food security and educational outcomes. Moreover, none of the above studies examine the differences in mobility patterns of non-Hispanic black, non-Hispanic white, and Hispanic households, which is the focal point of our paper.

To our knowledge, there are only two studies that – in addition to analyzing the overall persistence in food security status – examine whether persistence in food security varies across the distribution of race. The first of these is a study by Ribar and Hamrick (2003) who utilize the Survey of Income and Program Participation and the follow-on Survey of Program Dynamics to analyze food security across two points in time using households with children. The authors find that about 4.5% of married couples experienced food insecurity at least once and about 0.5% experienced food insecurity at both points in time. Although the descriptive statistics in their study suggest food insecurity rates were substantially higher among blacks and Hispanics relative to whites, results from hazard models suggest that only blacks were significantly more likely to move into a state of food insufficiency relative to whites. However, Hispanics’ chances of entering into and exiting out of a state of food insufficiency were not statistically different from their white counterparts.

Burke et al. (2012), using the ECLS-K data, examine both the overall persistence in food

³The majority of these studies define food security based on the USDA 18-question Core Food Security Module.

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4 insecurity and the heterogeneity in persistence across racial lines. Here the authors define
5 persistence, and the degree of persistence, as a function the number of consecutive periods a
6 household is classified as food insecure. The authors find that the prevalence of households
7 that experience food insecurity at least once was 35.0% across all time periods, with 21.9%
8 experiencing nonpersistent and 13.1% experiencing persistent food insecurity. Out of all
9 households, black households had the highest incidence of nonpersistent and persistent food
10 insecurity at rates of 34.4% and 23.2%, respectively. White households had the lowest
11 prevalence of food insecurity, with 23.9% of households experiencing food insecurity in one
12 or more time periods. In addition, nonpersistent and persistent food insecurity was lowest
13 in white households followed by Hispanic households.⁴

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15 Our study is most similar to Burke et al. (2012), but differs in methodology. Specifically,
16 Burke et al. (2012) analyze the racial gap in food security simply by deriving the proportion
17 of households that are classified as either persistent or nonpersistent with respect to being
18 food insecure. We on the other hand, and described in detail below, estimate entire Markov
19 chain transition matrices to characterize the mobility patterns of households, by race, across
20 the entire distribution of food security. These estimated mobility dynamics can then inform
21 whether there are racial gaps in directional movements through the distribution over time.
22 Said another way, the estimated mobility dynamics can highlight whether certain groups are
23 getting “stuck” in poor state of food security versus being entrenched in a very positive state.
24 Further, having derived such transition dynamics allows us to evaluate how households are
25 distributed across the food security distribution in a longer-run, steady-state equilibrium.

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49 ⁴Other studies that quantify the racial gaps in food security include Nam et al. (2015), Kirpatrick et al.
50 (2012), Hiza et al. (2013), Anderson et al. (2016). However, none of these analyze the mobility patterns in
51 food security.
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3 Empirics

3.1 Measure of Food Security Mobility

To explore the racial differences in food security dynamics, we construct Markov chain transition matrices capturing the entirety of household transition dynamics over time. Specifically, let y_{it} denote the raw food security score for household i , $i = 1, \dots, N$, in time t , $t = t_0, t_1$, $t_0 \neq t_1$, and let $F_{t_0}(\cdot)$ and $F_{t_1}(\cdot)$ denote the cumulative distribution function (CDF) of raw food security scores for households in two distinct time periods t_0 and t_1 . Further, let $F_{t_0, t_1}(y_{t_0}, y_{t_1})$ denote the bivariate joint CDF, where $y_t \equiv [y_{1t} \cdots y_{Nt}]$.

To summarize and provide intuition to the movement through the distribution of food security captured by $F_{t_0, t_1}(y_{t_0}, y_{t_1})$, we construct a $K \times K$ transition matrix, Π_{t_0, t_1} , given by

$$\Pi_{t_0, t_1} = \begin{bmatrix} \pi_{11} & \cdots & \cdots & \pi_{1K} \\ \vdots & \ddots & & \vdots \\ \vdots & & \ddots & \vdots \\ \pi_{K1} & \cdots & \cdots & \pi_{KK} \end{bmatrix}. \tag{1}$$

where elements of (1) are represented by

$$\pi_{kl} = \frac{\Pr[F_{t_0}(y_{t_0}) \in k, F_{t_1}(y_{t_1}) \in l]}{\Pr[F_{t_0}(y_{t_0}) \in k]} \quad k, l = 1, \dots, K, \tag{2}$$

and k, l denote various partitions of the food security distribution. Thus, π_{kl} is intuitively a conditional probability depicting the probability of moving to some state of food security l in time t_1 conditional on being in some state of food security k in time t_0 .

To derive racial differences in these transition probabilities, we refine (2) by conditioning on covariates given by X . By doing such (2) simply becomes

$$\pi_{kl} = \frac{\Pr[F_{t_0}(y_{t_0}|X = x) \in k, F_{t_1}(y_{t_1}|X = x) \in l]}{\Pr[F_{t_0}(y_{t_0}|X = x) \in k]} \quad k, l = 1, \dots, K, \tag{3}$$

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4 where the covariate of interest is race.
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6 In obtaining the above mobility measures in practice, we first construct the empirical
7 CDF in each time period by pooling all households of all races for which raw food security
8 scores are non-missing. Using definitions of food security provided by the USDA, we assign
9 each household to a particular state of food security where the various states of food security
10 are food insecure, marginal food secure, and high food secure (i.e. $K = 3$). We then track
11 how households move through the distribution of food security from one period to the next.
12 The racial groups of interest in the current analysis center on those households classified as
13 either non-Hispanic black, Hispanic, or non-Hispanic white. Lastly, to get standard errors for
14 the mobility estimates, we employ the paired jackknife method utilizing appropriate replicate
15 weights provided in the data.
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30 **4 Data**

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33 The data come from the Early Childhood Longitudinal Survey, Kindergarten Class of 1998-
34 1999 (ECLS-K).⁵ The survey is conducted by the National Center for Education Statistics
35 (NCES) and is given to a nationally representative sample of over 20,000 students from 1000
36 different schools and tracks their progress and household experiences during early childhood.
37 Although the full sample was surveyed over seven waves, questions regarding household food
38 security status were only assessed in four waves: spring kindergarten, spring third grade,
39 spring fifth grade, and spring eighth grade. Additionally, the food security questions surveyed
40 come from the USDA’s Core Food Security Module (CFSM).
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50 We define three measures of food security following official definitions for all waves of
51 the data where food security data was collected. Specifically, a household with children is
52 classified as high food secure if it affirms zero questions in the CFSM. As well, a household
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56 ⁵United States Department of Education. Institute of Education Sciences. National Center for Edu-
57 cation Statistics. Early Childhood Longitudinal Study [United States]: Kindergarten Class of 1998-1999,
58 Kindergarten-Eighth Grade Full Sample. Ann Arbor, MI: Inter-university Consortium for Political and So-
59 cial Research [distributor], 2014-03-20. See <https://doi.org/10.3886/ICPSR28023.v1>. Last Accessed: July
60 30, 2018.
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4 with children is classified as marginally food secure if it affirms at least one, but less than
5 three, questions in the CFSM. Lastly, a household with children is classified as food insecure
6 if it affirms three or more questions in the CFSM.
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10 In estimating the transition dynamics, we do so over four different time periods: spring
11 kindergarten to spring third grade, spring third grade to spring fifth grade, spring fifth
12 grade to spring eighth grade, and spring kindergarten to spring eighth grade. We utilize the
13 estimated transition matrix over the longest time horizon of spring kindergarten to spring
14 eighth grade to derive the Markov chain steady-state distributions. We retain children for
15 whom we have valid measures of race and household-level food security across all four waves.
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17 Doing such results in a final sample consisting of 642 non-Hispanic black students, 1,210
18 Hispanic students, and 4,970 non-Hispanic white students (for a total of 6,822 students).⁶
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20 In all cases, appropriate sample weights are used. Table 1 presents the descriptive statistics.
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32 **5 Results**

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35 In this section we present the estimated transition dynamics for non-Hispanic black, Hispanic,
36 and non-Hispanic white households. Based on the estimated transition matrices, we then
37 derive the Markov chain steady-state distributions by race. Lastly, we employ a regression
38 framework to assess the impact of various observables, as captured by socioeconomic status,
39 on the racial gap in these estimated mobilities.⁷
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48 **5.1 Black-White Mobility Gap**

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51 In Table 2 we present estimated transition probabilities separately for white households and
52 black households, as well as the differences between transition probabilities for these two
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55 ⁶Note, the race/ethnicity of the student is what determines the racial/ethnic nature of the household.

56 ⁷For the sake of brevity when discussing the results, we drop the qualifiers of “non-Hispanic” and “with
57 children” when referring to particular households. However, the term “black” still implies “non-Hispanic
58 black” and “white” still implies “non-Hispanic white.” Also, if not explicitly stated, any reference to “house-
59 holds” is to still be interpreted as “households with children.”
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4 groups. We estimate the transition probabilities for food security between kindergarten and
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6 third grade (panel (A)), third and fifth grade (panel (B)), fifth and eighth grade (panel (C)),
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8 and finally kindergarten and eighth grade (panel (D)). While the transition probabilities
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10 reported in panels (A)–(C) are meant to capture short run dynamics of food security, the
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12 final panel (D) is likely to capture a more long run mobility in food security.
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15 16 **5.1.1 Black-White Staying Probabilities** 17 18

19 We begin our discussion focusing on staying probabilities, i.e. the diagonal elements of the
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21 transition matrices. That is, the probability of remaining classified in a particular state of
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23 food security in the terminal period conditional on being classified in that same state in the
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25 initial period. Focusing first on the staying probabilities associated with being “stuck” in
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27 a state of food insecurity, we find that, for all panels except panel (C), black households
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29 have a higher probability of remaining food insecure compared to white households over
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31 time. According to the transition probability estimates reported in panel (C), which traces
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33 the dynamics of food security from fifth to eighth grade, white households appear to have a
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35 slightly higher probability of staying food insecure relative to black households. However, it
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37 is noteworthy that this difference is not statistically significant at conventional levels.⁸
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40 Turning our attention to the probability of remaining marginally food secure, we find
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42 that in all the cases black households have a higher probability of remaining marginally food
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44 secure compared to white households. For example, between kindergarten and third grade,
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46 black households have an 11 percentage point higher probability of staying marginally food
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48 secure compared to white households, and between fifth and eighth grade, this difference in
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50 the likelihood of remaining marginally food secure is about 14 percentage points. The gap in
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52 the likelihood of staying marginally food secure over the longest time horizon (i.e., between
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54 kindergarten and eighth grade) is even more stark. Specifically, as per our estimates reported
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56 in panel (D), black households, compared to white households, are estimated to have almost
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59 ⁸Conventional levels are $\alpha = 0.01$, $\alpha = 0.05$, or $\alpha = 0.10$.
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4 a 26 percentage point higher probability of remaining marginally food secure in eighth grade
5 conditional on being marginally food secure in kindergarten, with the estimated gap being
6 statistically significant at conventional levels. As a note of caution, it is hard to infer whether
7 or not this finding is positive from the perspective of black households. On the one hand,
8 black households seem to not climb out of a state of marginal food security and into a state
9 of high food security, relative to white households, over time. On the other hand, having a
10 higher probability of remaining marginally food secure over time would suggest that black
11 households, relative to white households, do not fall from a state of marginal food security
12 into a more desperate state of food insecurity. This is why the extremes of the distribution
13 are arguably more informative.
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25 Finally, we focus on the upper end of the food security distribution and estimate the
26 probability of a household remaining in a state of high food security over time. We find that
27 for all panels, the estimated differences in the probability of remaining classified as high food
28 secure, between black and white households, are negative and statistically significant. This
29 would suggest that white households, relative to black households, have a greater probability
30 of remaining entrenched in a state of high food security in some terminal period conditional
31 of being classified as high food secure in some initial period. The differences in staying
32 probabilities associated with high food security range from -0.13 to -0.18, implying that black
33 households, relative to white households, are anywhere from 13 to 18 percentage points less
34 likely to remain in a state of high food security once achieving such status. Further, these
35 estimated differences are all statistically significant at conventional levels.
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48 Thus, the estimated transition dynamics above would suggest that black households are
49 disadvantaged, relative to white households, in the extremes of the food security distribution.
50 Meaning, black households seem to have a higher probability of getting “stuck” in a state of
51 food insecurity over time while at the same time appear to revert out of a state of high food
52 security once achieving such a state.
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5.1.2 Black-White Directional Transition Probabilities

Turning attention to directional movements, either up or down, through the distribution of food security, the following results stand out. First, conditional on being food insecure in the initial period, black households, compared to white households, have a much lower probability of traversing upward through the distribution of food security to such an extent of being classified as high food secure in the terminal period. For example, between kindergarten and third grade, black households have an estimated 8 percentage point lower probability of becoming high food secure in the terminal period conditional on being classified as food insecure in the initial period. The magnitude of the estimated gap in mobility is similar for transitions between third and fifth grade, and fifth and eighth grade. However, none of these estimated gaps are statistically significant at conventional levels. Looking over the longest horizon of time from kindergarten to eighth grade, the gap in estimated mobilities becomes strikingly large. Specifically, black households have an estimated 29% likelihood of becoming high food secure in the terminal period conditional on being classified as food insecure in the initial period, whereas the corresponding estimate for white households is 47%. The estimated mobilities, then, result in a black-white gap in the upward transition from food insecure to high food secure of 17 percentage points with the estimated gap being statistically significant at conventional levels.

Second, conditional on being classified as high food secure in the initial period, black households, relative to white households, always have a higher probability of being classified as food insecure in the terminal period. Averaged over all horizons of time, black households are approximately 6 percentage points more likely to slide down through the distribution of food security, and subsequently classified as food insecure, even when initially classified as high food secure.

In sum, white households (black households) seem to be significantly more upwardly (downwardly) mobile relative to black households (white households) in the food security distribution.

5.2 Hispanic-White Mobility Gap

In Table 3 we present the transition dynamics for white and Hispanic households, as well as the estimated differences in transition probabilities between the two racial groups. As in Table 2, we estimate the transition probabilities for food security between kindergarten and third grade (panel (A)), third and fifth grade (panel (B)), fifth and eighth grade (panel (C)), and finally kindergarten and eighth grade (panel (D)).

5.2.1 Hispanic-White Staying Probabilities

As before, we begin our discussion focusing on the estimated staying probabilities, but now in the context of white and Hispanic households. What immediately surfaces is that we find mixed results when focusing on staying probabilities at the low end of the food security distribution. In particular, we find that between kindergarten and third grade, and third grade and fifth grade, Hispanic households, conditional on being food insecure in the initial period, have a higher probability of remaining food insecure over time compared to white households. However, the estimated staying probabilities from fifth to eighth grade, and from kindergarten to eighth grade, suggest that white households are more likely to become “stuck” in the lower end of the food security distribution relative to Hispanic households. For example, between fifth and eighth grade, white households have an approximate 20 percentage point higher probability, compared to Hispanic households, of remaining in a state of food insecurity, while the corresponding figure between kindergarten and eighth grade is approximately 14 percentage points. Both of these estimated gaps in mobility are statistically significant at conventional levels. Note, this level of ambiguity is in contrast to the estimated gaps in staying probabilities between white and black households at the lower end of the food security distribution where the estimated staying probabilities, when statistically significant, suggest that black households have a higher probability of being entrenched in a poor state of food security over time.

Looking at the estimated staying probabilities associated with marginal food security we

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4 find that Hispanic households almost always have a higher probability of staying marginally
5 food secure relative to white households. For example, between kindergarten and third
6 grade, third and fifth grade, and kindergarten and eighth grade, the probability of stay-
7 ing marginally food secure is higher for Hispanic households, compared to white households,
8 by approximate magnitudes of 3 percentage points, 11 percentage points, and 5 percentage
9 points, respectively. The one exception is when looking from fifth to eighth grade. Over this
10 period of time, white households seem to have a higher likelihood of remaining marginally
11 food secure compared to Hispanic households. However, the estimated gap in the staying
12 probability is small (around 3 percentage points) and not statistically significant at conven-
13 tional levels.
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25 Turning attention to the estimated staying probabilities associated with high food se-
26 curity, it becomes immediately clear that, across all time periods, the estimated proba-
27 bilities of white households remaining high food secure over time is greater compared to
28 Hispanic households. However, even though statistically significant at conventional levels,
29 the Hispanic-white gaps in the probability of remaining high food secure over time are much
30 smaller, in absolute value, compared to the estimated gaps in the likelihood of remaining
31 high food secure between black and white households. For example, between kindergarten
32 and eighth grade, white households have almost a 6 percentage point higher probability of
33 staying high food secure relative to Hispanic households. At the same time, and as can
34 be seen in Table 2, the black-white gap in remaining high food secure is, on average, 16
35 percentage points. In other words, the black-white gap in the probability of remaining high
36 food secure over time is, on average, more than two times the Hispanic-white gap.
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50 Summarizing the findings thus far, both Hispanic and black households, relative to white
51 households, are disadvantaged in terms of distributional mobility at the extremes of the food
52 security distribution. Both minority groups have higher likelihoods of remaining food inse-
53 cure over time while at the same time have lower probabilities of remaining high food secure
54 once achieving such status. However, the results for Hispanic-white differences in remaining
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4 food insecure over time are mixed. Further, the estimated gaps in staying probabilities in
5 the extremes of the food security distribution are less prominent for Hispanic relative to
6 white households compared to the estimated gaps between black and white households over
7 the same time periods.
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14 **5.2.2 Hispanic-White Directional Transition Probabilities**

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17 Noteworthy results also emerge when looking at directional movements through the food
18 security distribution between Hispanic and white households. First, conditional on being
19 classified as food insecure in the initial period, results are mixed with respect to the likelihood
20 of Hispanics being classified as high food secure in the terminal period relative to white
21 households. For example, between kindergarten and third grade, Hispanic households have
22 a 12 percentage point lower probability of becoming high food secure over time relative to
23 white households conditional on being initially classified as food insecure. However, between
24 kindergarten and eighth grade, the underlying distributional mobility between Hispanic and
25 white households is reversed. Relative to white households, Hispanic households now have
26 approximately a 19 percentage point higher probability of transitioning out of a food insecure
27 state and into being classified as high food secure. This is strikingly different compared to
28 what we found between black and white households over the same time period. Looking at
29 the corresponding figure to assess the black-white gap in upward mobility, we find that black
30 households, unlike the Hispanic households, had a 17 percentage point lower probability of
31 transitioning from a state of food insecurity and into a state of high food security over the
32 same time period.
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51 Second, conditional on being classified as high food secure in the initial period, Hispanic
52 households generally have a higher probability of falling down through the distribution of
53 food insecurity relative to white households. Averaged over all time periods, Hispanic house-
54 holds have approximately a 4 percentage point higher probability of being classified as food
55 insecure in the terminal period conditional on initially being classified as high food secure.
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4 Further, the estimated differences are statistically significant at conventional levels. How-
5 ever, and similar to earlier findings, the Hispanic-white gap in downward mobility is less
6 severe relative to the estimated black-white gap in downward mobility.
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10 11 12 **5.3 Hispanic-Black Mobility Gap** 13 14

15 For the sake of completeness, we present the transition dynamics for Hispanic and black
16 households, as well as the estimated differences in transition probabilities between the two
17 racial groups, together in Table 4. As in Tables 2 and 3, we report the transition probabilities
18 for food security between kindergarten and third grade (panel (A)), third and fifth grade
19 (panel (B)), fifth and eighth grade (panel (C)), and finally kindergarten and eighth grade
20 (panel (D)). Other than the estimated gap between Hispanic and black households, there is
21 no new information presented in Table 4 that has not been previously discussed. As such, we
22 keep the discussion brief and primarily focus on the estimated gap in food security mobility
23 between black and Hispanic households.
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35 36 **5.3.1 Hispanic-Black Staying Transition Probabilities** 37

38 Exploring the gaps in transition dynamics between black and Hispanic households reveal
39 estimates that are qualitatively similar to those observed between black and white house-
40 holds. With respect to the gaps in staying probabilities, there are two notable exceptions.
41 First, when looking at the estimated gap in likelihood of remaining food insecure over the
42 time period of kindergarten to eighth grade, the estimated staying probabilities for black
43 households is approximately 8 percentage points higher relative to white households. The
44 same measure when looking at black households relative to Hispanic households yields an
45 estimated gap in the probability of remaining food insecure of approximately 22 percentage
46 points. Thus, black households, relative to Hispanic households, have a 22 percentage point
47 higher probability of remaining food insecure over the time period of kindergarten to eighth
48 grade. This estimated gap is statistically significant at conventional levels and is nearly
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4 three times that of the estimated gap in the probability of remaining food insecure when
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6 comparing black and white households.
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9 Second, conditional on being classified as high food secure in the initial period, black
10 households have a 9 percentage point higher likelihood, when averaged across all time periods,
11 of falling out of a state of high food security relative to Hispanic households. This same
12 figure for blacks relative to whites, again averaged over all time periods, suggests that black
13 households have a 16 percentage point higher likelihood of *not* remaining high food secure
14 over time.
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21 Taking into account the mobility dynamics presented thus far together with the two
22 exceptions noted above suggests that black households are at a disadvantage relative to
23 both white and Hispanic households with respect to becoming entrenched in a state of food
24 insecurity and falling out of a state of high food security after reaching such status.
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29 With that said, the magnitude of the gaps in staying probabilities are not as large be-
30 tween black and Hispanic households at the upper extreme of the food security distribution
31 compared to the same gap between black and white households. Nonetheless, the size of the
32 gaps in staying probabilities are, on average, even larger between black and Hispanic house-
33 holds when evaluating the probability of remaining food insecure over time compared to the
34 same gap in the probability of remaining food insecure between black and white households.
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43 **5.3.2 Hispanic-Black Directional Transition Probabilities**

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46 Similar to the estimated gaps in staying probabilities between black and Hispanic house-
47 holds, the overall estimated differences in directional transition probabilities between black
48 and Hispanic households are qualitatively similar to the estimated differences in the same
49 mobility measures between black and white households with black households having lower
50 probabilities of moving upward in food security status and higher probabilities of moving
51 downward in food security status relative to Hispanic households over time.
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59 However, one difference is worth highlighting. Specifically, the estimated gaps in the
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4 probability of moving upward out of a state of food insecurity and into a state of high
5 food security are much smaller for black households relative to Hispanic households when
6 compared to black households relative to white households. This is particularly true over
7 the longer run horizon of kindergarten to eighth grade where the estimated gap in moving
8 from a state of food insecurity to a state of high food security is approximately 36 percentage
9 points (in absolute value) when comparing black and Hispanic households. In other words,
10 black households relative to Hispanic households are 36 percentage points less likely to climb
11 out of a state of food insecurity and into a state of high food security over the time period
12 of kindergarten to eighth grade. This same value obtained by comparing black and white
13 households is approximately 17 percentage points.
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25 Taking into account these results, it appears that black households are at a disadvantage,
26 with respect to upward and downward mobility, relative to both white and Hispanic house-
27 holds. These results, taken together with the estimated differences in staying probabilities,
28 suggests that black households are the most vulnerable group when compared to both white
29 and Hispanic households. All results comparing Hispanic to black households can be found
30 in Table 4.
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40 **5.4 Implications of the Mobility Gaps**

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42 As documented above, black households and white households appear to be on divergent tra-
43 jectories of distributional mobility. In particular, black households relative to white house-
44 holds, almost always have a higher probability of staying food insecure while at the same
45 time having a lower probability of remaining high food secure over time. Additionally, black
46 households have a much lower probability of achieving high food secure status when ini-
47 tially being classified as food insecure. Further, black households have a significantly greater
48 chance of reverting into a state of food insecurity when starting from a state of high food
49 security.
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59 Unlike our findings for black households relative to white households, it is more diffi-
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4 cult to gauge whether the mobility patterns of Hispanic and white households are divergent
5 over time. While Hispanic households have higher probabilities of remaining food insecure
6 relative to white households, the estimated gaps in staying probabilities (in both the food in-
7 secure and high food secure states) between the Hispanic and white households are much less
8 prominent compared to the gaps in staying probabilities between black and white households.
9 Further, conditional on being classified as food insecure in the initial period, Hispanic house-
10 holds are not always at a disadvantage with respect to the likelihood of achieving high food
11 secure status over time. Finally, although the probability of downward mobility is always
12 higher for the Hispanic households compared to white households, the Hispanic-white gap
13 in downward mobility is significantly smaller compared to the black-white gap in downward
14 mobility. Given the observed transition dynamics between black and white households and
15 between Hispanic and white households, reasonable questions to ask are: what are the long
16 run implications of such mobility patterns, and how different are the mobility patterns of
17 black and white households, and Hispanic and white households? To get at these questions,
18 we derive the Markov chain steady-state distributions based on the transition dynamics es-
19 timated using the longest horizon of time of kindergarten to eighth grade. The Markov
20 chain steady-state distributions for black versus white households and Hispanic versus white
21 households can be seen in Figures 1 and 2, respectively.

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42 After constructing the steady-state distributions, the following patterns emerge. First,
43 looking at Figure 1, one can see that approximately 88% of white households settle in a state
44 of high food security, while the corresponding figure for black households is approximately
45 62%. Further, close to 20% of black households settle in the food insecure portion of the food
46 security distribution and another 20% settle in the marginally food secure portion of the food
47 security distribution. In contrast, only 7% and 5% of white households settle in the food
48 insecure and marginally food secure portions of the food security distribution, respectively.

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57 Interestingly, and as can be seen in Figure 2, the steady-state distribution for Hispanic
58 households is very similar to that of white households. Specifically, approximately 84%

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4 of Hispanic households settle in a state of high food security, whereas only 10% and 7%
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6 of Hispanic households settle in the food insecure and marginally food secure states of the
7
8 distribution, respectively. Given the similarities in the long-run transition dynamics of white
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10 and Hispanic households, it is not surprising to see that the steady-state distribution of
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12 Hispanic households plotted against the steady-state distribution of black households (Figure
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14 3) appears qualitatively similar to the steady-state distributions of white households plotted
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16 against black households (Figure 1).
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19 The above findings related to the steady-state are not something one would expect given
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21 the well-documented gaps in food security rates between white and minority households.
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23 Taken together, the food security gaps in levels and the gaps in mobility further suggest that
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25 the observed disparity in food security rates may be more of a problem for black households
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27 relative to both white and Hispanic households. Further, the long run steady-state distri-
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29 butions suggest that the black-white gap in food security is more of a persistent problem
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31 whereas the Hispanic-white gap in food security may be more related to the timing of when
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33 household-level food security status is measured.
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38 5.5 Conditional Mobility Gaps

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41 Given the differences in mobility patterns highlighted above, we employ a regression frame-
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43 work in an attempt to uncover the observable characteristics that might be associated with
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45 these differences. Ideally, we would hope to employ a strategy aimed at identifying causality,
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47 but given obvious difficulty in doing such we opt for a more descriptive approach. With
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49 that said, we explore whether particular observables that one may think are associated with
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51 food security can attenuate the gaps in mobility between black and white households and
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53 between Hispanic and white households. To do this we estimate a linear probability model
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55 and decompose the impact of various observable measures on the unconditional gaps in mo-
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57 bility. Further, we do this for both upward transition probabilities conditional on initially
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59 being classified as *food insecure*, and for downward transition probabilities conditional on
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4 initially being classified as *high food secure*. In short, we want to focus on the extremes of the
5 food security distribution and see what characteristics can help explain why certain groups
6 are able to move out of a state of food insecurity as well as why certain groups tend to not
7 remain in a high state of food security once there.
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12 Specifically, we estimate

$$13 \quad y_{it} = \alpha + \gamma_1 B_i + \gamma_2 H_i + x_{it}\beta + \lambda_t + \varepsilon_{it} \quad (4)$$

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20 where y_{it} is equal to 1 if a household moves upward out of a state of *food insecurity* between
21 t_0 and t_1 (when estimating upward transition probabilities) or y_{it} is equal to 1 if a household
22 moves downward out of a state of *high food security* between t_0 and t_1 (when estimating
23 downward transition probabilities), B_i and H_i are black and Hispanic indicator variables,
24 respectively, x_{it} is a vector of covariates, λ_t is a complete set of time fixed effects, and ε_{it}
25 is a normally distributed, well-behaved error term. We estimate (4) multiple times for both
26 upward and downward transition dynamics. For the base cases, we fix β and λ_t equal to
27 zero. The coefficient estimates on B_i and H_i can then be interpreted as the unconditional
28 gaps in distributional mobility between whites and blacks and whites and Hispanics, respec-
29 tively. In a sequential manner, we then introduce observables and time fixed effects into the
30 model. Since γ_1 and γ_2 capture the average difference in distributional mobility between
31 white and black households and white and Hispanic households, respectively, any estimated
32 statistical differences in these coefficients across model specifications may suggest that ob-
33 servable characteristics and/or time fixed effects play a role in influencing the black-white
34 and Hispanic-white gaps in mobility. The particular covariates used in estimating the con-
35 ditional mobility gaps include socioeconomic status (SES) and its square.⁹ Estimates for
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54 ⁹This singular measure of SES is composed of many potential observables related to the divergent gaps
55 in food security dynamics. In particular, the measures that the National Center for Education Statistics
56 (NCES) uses to construct this measure of SES include father/male guardian's education, mother/female
57 guardian's education, father/male guardian's occupational prestige, mother/female guardian's occupational
58 prestige, and household income. See https://nces.ed.gov/ecls/data/ECLSK_K8_Manual_part2.pdf Last Ac-
59 cessed: March 21, 2019.
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4 the black-white and Hispanic-white gaps in mobility, as well as the estimated changes in the
5 gaps across model specifications, can be found in Table 5.
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9 First focusing on upward transition probabilities out of the bottom of the food security
10 distribution for black households relative to white households, we can see that moving from
11 column (1) to column (3), each time adding measures of SES and/or time fixed effects,
12 effectively attenuates the gap, on average, between black and white households. Specifically,
13 in column (1) the point estimate of -0.075 is interpreted as black households, on average,
14 being 7.5 percentage points *less* likely to move upward and out of the bottom of the food
15 security distribution compared to white households when initially starting out in a state
16 of food insecurity. However, after controlling for SES and time fixed effects, this point
17 estimate becomes less negative at -0.021. Although these point estimates are statistically
18 insignificant, the change in these point estimates of 5.5 percentage points is statistically
19 significant at $\alpha = 0.01$.
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32 For Hispanic households, sequentially adding covariates and time fixed effects increases
33 the mobility gap associated with moving out of the bottom of the food security distribu-
34 tion from 3.5 percentage points in favor of Hispanics relative to whites (column (1)) to 9.5
35 percentage points (column (3)). This 6 percentage point change in the average probability
36 of traversing upward out of a state of food insecurity for Hispanic households compared to
37 white households is statistically significant at $\alpha = 0.01$.
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44 Turning attention to movements downward out of the top of the food security distribution
45 (columns (4) through (6)), we can see that for black households there is again a statistically
46 significant attenuation towards zero in the mobility gap. Interpreting the coefficient esti-
47 mate for black households in column (4) suggests that black households, relative to white
48 households, have, on average, a 15.3 percentage point *greater* probability of falling out of a
49 state of high food security compared to white households conditional on starting out in a
50 state of high food security. Controlling for SES and time fixed effects attenuates this gap by
51 5.9 percentage points, or 38%, with this change being statistically significant at $\alpha = 0.01$.
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4 However, even after adding relevant controls and time fixed effects, the black-white gap in
5 the probability of falling out of the top of the food security distribution still persists at 9.5
6 percentage points (column (6)). For Hispanics, we also observe a statistically significant re-
7 duction, on average, in the downward mobility gap between Hispanic and white households
8 from 7.4 percentage points to 1.4 percentage points with this 6 percentage point reduction
9 in the Hispanic-white gap being statistically significant at $\alpha = 0.01$.

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11 In summary, it appears that in most cases SES and time fixed effects are meaningfully
12 *associated* with reducing the gap in both upward and downward transition probabilities be-
13 tween black and white households and in reducing downward transition probabilities between
14 Hispanic and white households. In particular, if we were to assign black households with
15 children entering kindergarten the mean value of SES of white households, and assume that
16 the relationship between upward mobility and SES are in fact causal, then the gap in up-
17 ward mobility between white and black households would be attenuated by approximately 9
18 percentage points. With respect to the gap in upward transition probabilities between His-
19 panic and white households, the gap actually widens in favor of Hispanic households once
20 controlling for SES and time fixed effects. If we were to perform the same exercise as we did
21 for black households and assign Hispanic households with children in kindergarten the mean
22 value of SES of white households, the gap would widen, in favor of Hispanic households,
23 by approximately 9 percentage points. The gap in downward transition probabilities are
24 attenuated for both black and Hispanic households when controlling for SES and time fixed
25 effects. In particular, if we were to again assign the mean level of SES of white households
26 to both Hispanic and black households, and again assume a causal relationship, then the
27 gap in downward probabilities would decrease by approximately 6 percentage points for both
28 Hispanic and black households.

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30 Finally, we find further evidence that the differences in upward and downward transi-
31 tion probabilities favor Hispanic households relative to black households. Across all model
32 specifications in Table 5, the coefficient estimates on the black and Hispanic indicators are

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4 statistically different from each other at conventional levels. This, perhaps, is further sug-
5 gestive of black households being the most vulnerable group, relative to white and Hispanic
6 households, even after conditioning on socioeconomic status.
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10 11 12 13 **6 Conclusion** 14

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16 Household-level food insecurity is a considerable public health concern faced by millions of
17 individuals in the United States today. Further, the proportion of households with children
18 that are food insecure is not homogenous across racial lines. In particular, there is a well-
19 documented gap in the rates of food insecurity between non-Hispanic white and minority
20 households with the proportion of non-Hispanic white households classified as food insecure
21 being less than both Hispanic and non-Hispanic black households. With that said, very
22 scant attention has been paid to understanding how various racial groups traverse through
23 the distribution of food security over time. Understanding how various groups move through
24 the food security distribution is necessary in understanding the severity of these documented
25 level-gaps in the rates of food security. Meaning, are the mobility dynamics of the various
26 groups equally high suggesting that the long run distributions of food security will normalize
27 across the various groups? Or, are the mobility patterns divergent in such a way that we
28 would expect a higher proportion of minority households settling at the bottom of the food
29 security distribution while a higher proportion of non-Hispanic white households settling
30 towards the top of the food security distribution? These are the questions posed here.
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48 Our results suggest that Hispanic and non-Hispanic white households with children are
49 equally mobile in the long run whereas non-Hispanic black households with children tend
50 to both get “stuck” in the low end of the food security distribution *and* transition out of
51 the top end of the distribution after having achieved high food security status. In the long
52 run, then, rates of food insecurity between Hispanic and non-Hispanic white households
53 with children would tend to converge as an equal proportion of non-Hispanic white and
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4 Hispanic households stabilize across the food security distribution. However, convergence
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6 in food security rates between non-Hispanic black and non-Hispanic white households with
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8 children is unlikely unless policy-makers can figure out how to keep at-risk, non-Hispanic
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10 black households out of a state of food insecurity while at the same time keeping non-Hispanic
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12 black households in a state of high food security once such status is achieved. Further,
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14 the results tend to suggest that non-Hispanic black households with children are the most
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16 vulnerable group when compared to both non-Hispanic white and Hispanic households with
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18 children, even after controlling for socioeconomic status. This revealing contribution to the
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20 literature can, perhaps, inform policy-makers that moving various groups out of a state of
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22 food insecurity while at the same time keeping households in some state of food security
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24 may require policy that is well-targeted and group specific. A note of caution is needed.
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26 The results presented here are not intended to reveal causal determinants of the differential
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28 in food security dynamics between non-Hispanic white and minority households. Although
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30 we reveal associations between socioeconomic status and the gaps in upward and downward
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32 mobility measures, further work is needed to establish a causal relationship. Understanding
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34 the causal determinants of such mobility patterns is a natural next step in building off our
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36 results presented here.
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40 As with only focusing on the level gap in food security rates between non-Hispanic white
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42 and minority households with children, focusing solely on the underlying mobility dynamics
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44 associated with food security would be equally incomplete as evaluating the level gaps in
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46 food security rates alone. It is both the gaps in levels *and* the gaps in mobility dynamics
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48 that provide policy-makers with the insight needed to craft effective, well-targeted policy
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50 aimed at mitigating food insecurity for all households.
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Figure 1. Markov-Chain Steady State Distributions, Black vs. White

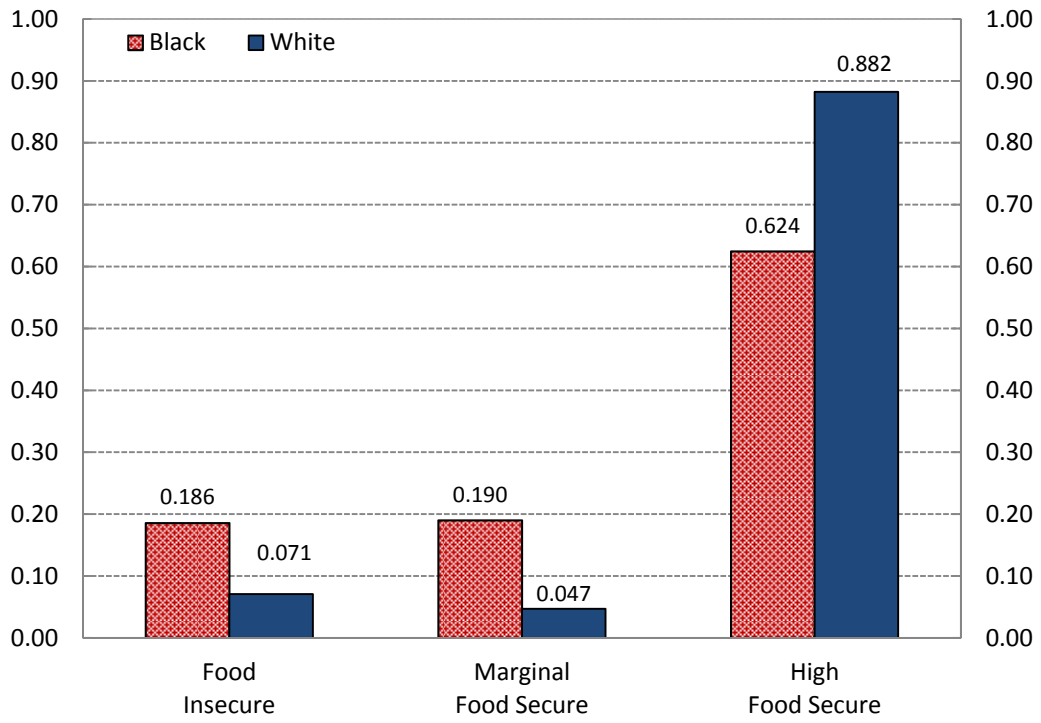


Figure 2. Markov-Chain Steady State Distributions, Hispanic vs. White

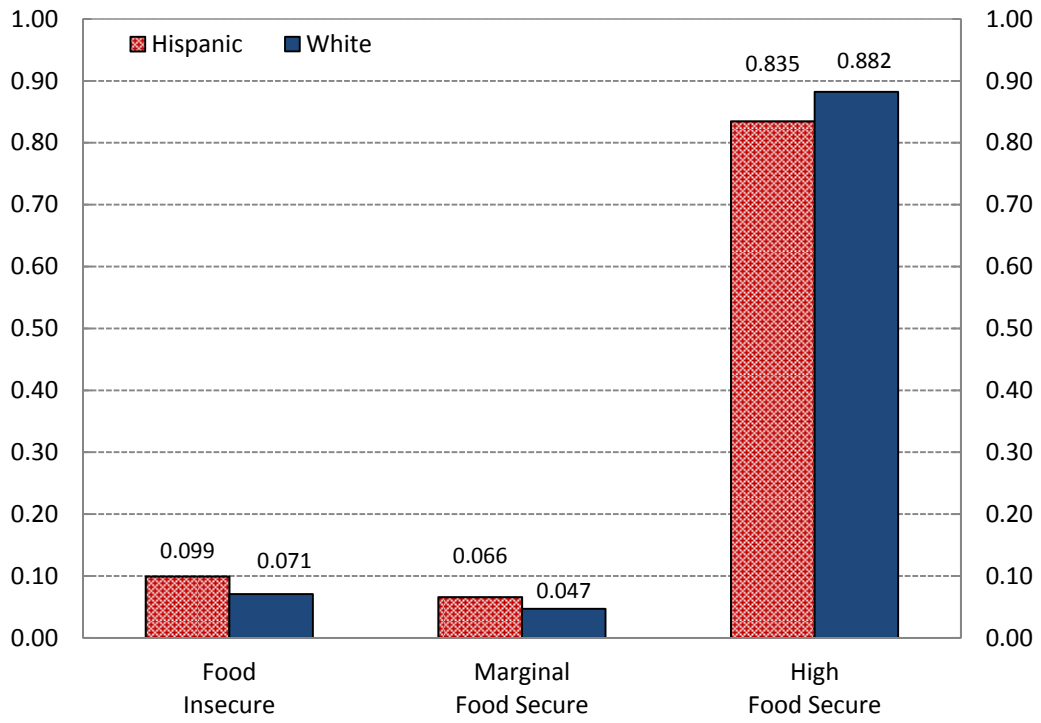


Figure 3. Markov-Chain Steady State Distributions, Hispanic vs. Black

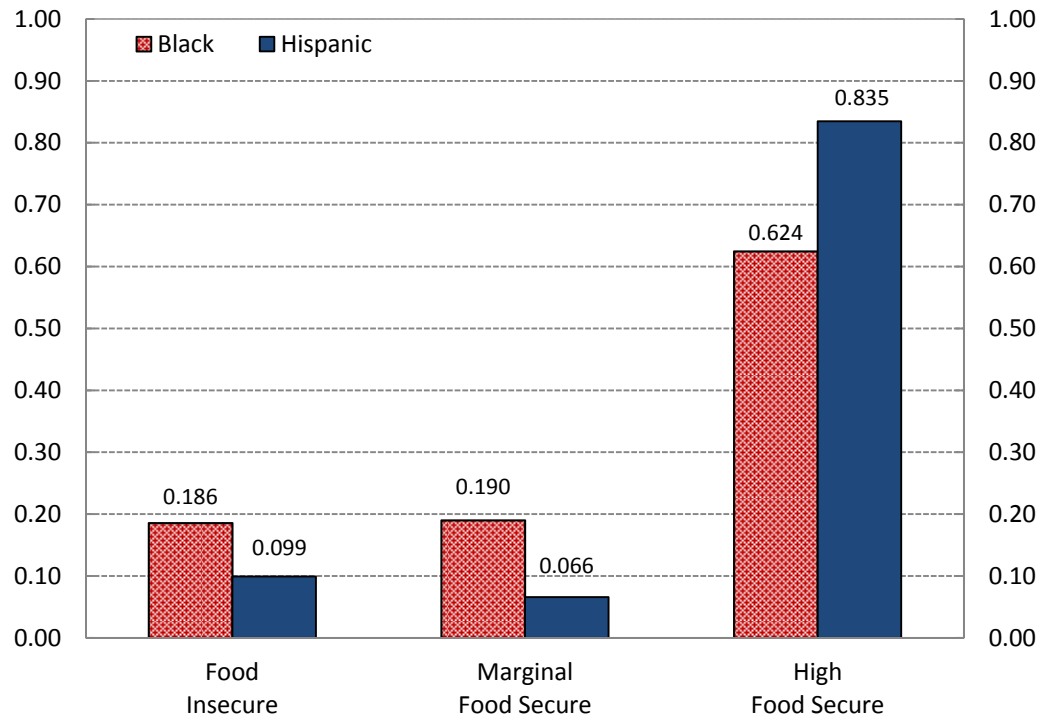


Table 1. Descriptive Statistics

	Full Sample		White		Black		Hispanic	
(A) Spring Kindergarten								
HFS	0.837	(0.370)	0.886	(0.318)	0.767	(0.423)	0.744	(0.436)
MFS	0.076	(0.265)	0.057	(0.232)	0.109	(0.312)	0.105	(0.307)
FI	0.087	(0.283)	0.057	(0.232)	0.123	(0.329)	0.151	(0.358)
SES	0.023	(0.792)	0.277	(0.719)	-0.411	(0.769)	-0.388	(0.680)
(B) Spring Third Grade								
HFS	0.858	(0.349)	0.913	(0.281)	0.739	(0.440)	0.790	(0.407)
MFS	0.069	(0.254)	0.042	(0.201)	0.130	(0.337)	0.099	(0.299)
FI	0.073	(0.260)	0.044	(0.206)	0.131	(0.337)	0.110	(0.314)
SES	-0.040	(0.801)	0.220	(0.745)	-0.466	(0.705)	-0.475	(0.692)
(C) Spring Fifth Grade								
HFS	0.833	(0.373)	0.898	(0.303)	0.709	(0.455)	0.741	(0.438)
MFS	0.068	(0.251)	0.042	(0.200)	0.128	(0.334)	0.095	(0.294)
FI	0.099	(0.299)	0.061	(0.239)	0.164	(0.370)	0.164	(0.370)
SES	0.019	(0.799)	0.232	(0.751)	-0.427	(0.700)	-0.441	(0.693)
(D) Spring Eighth Grade								
HFS	0.833	(0.373)	0.886	(0.318)	0.669	(0.471)	0.815	(0.388)
MFS	0.073	(0.259)	0.045	(0.208)	0.168	(0.374)	0.071	(0.257)
FI	0.095	(0.293)	0.069	(0.253)	0.163	(0.370)	0.114	(0.317)
SES	0.072	(0.787)	0.165	(0.747)	-0.439	(0.673)	-0.486	(0.702)

Notes: HFS = High Food Secure; MFS = Marginal Food Secure; FI = Food Insecure; SES = Socioeconomic Status. Standard deviation in parentheses. In all cases appropriate sample weights were used as provided by the ECLS.

Table 2. Estimated Transition Matrices, Black and White Household Dynamics

Panel	Period t_0	Period t_1								
		FI			MFS			HFS		
		White	Black	B-W	White	Black	B-W	White	Black	B-W
(A) K to 3rd	FI	0.266	0.385	0.118	0.106	0.066	-0.040	0.628	0.550	-0.078
	[$N_w = 214, N_b = 77$]	(0.050)	(0.069)	(0.094)	(0.030)	(0.035)	(0.043)	(0.060)	(0.074)	(0.101)
	MFS	0.137	0.156	0.019	0.090	0.201	0.110 ‡	0.773	0.644	-0.12889
	[$N_w = 233, N_b = 85$]	(0.031)	(0.059)	(0.066)	(0.024)	(0.058)	(0.063)	(0.035)	(0.071)	(0.080)
(B) 3rd to 5th	HFS	0.024	0.086	0.062 †	0.035	0.131	0.095 *	0.941	0.783	-0.158 *
	[$N_w = 4,523, N_b = 480$]	(0.004)	(0.025)	(0.026)	(0.005)	(0.032)	(0.032)	(0.006)	(0.043)	(0.044)
	FI	0.526	0.650	0.124	0.186	0.136	-0.051	0.288	0.215	-0.073
	[$N_w = 177, N_b = 72$]	(0.074)	(0.073)	(0.098)	(0.041)	(0.062)	(0.069)	(0.064)	(0.077)	(0.096)
(C) 5th to 8th	MFS	0.201	0.141	-0.060	0.155	0.198	0.044	0.645	0.661	0.016
	[$N_w = 171, N_b = 78$]	(0.048)	(0.056)	(0.075)	(0.043)	(0.051)	(0.068)	(0.060)	(0.063)	(0.082)
	HFS	0.032	0.082	0.050 †	0.029	0.114	0.084 *	0.939	0.805	-0.134 *
	[$N_w = 4,622, N_b = 492$]	(0.005)	(0.021)	(0.021)	(0.005)	(0.028)	(0.030)	(0.006)	(0.029)	(0.031)
(D) K to 8th	FI	0.515	0.482	-0.033	0.067	0.185	0.118 †	0.418	0.333	-0.085
	[$N_w = 227, N_b = 90$]	(0.042)	(0.068)	(0.082)	(0.011)	(0.054)	(0.055)	(0.045)	(0.061)	(0.074)
	MFS	0.265	0.166	-0.099	0.097	0.237	0.140 ‡	0.638	0.597	-0.041
	[$N_w = 184, N_b = 81$]	(0.061)	(0.062)	(0.098)	(0.028)	(0.066)	(0.071)	(0.063)	(0.086)	(0.123)
(D) K to 8th	HFS	0.030	0.089	0.059 *	0.041	0.151	0.110 *	0.929	0.760	-0.169 *
	[$N_w = 4,559, N_b = 471$]	(0.005)	(0.018)	(0.018)	(0.006)	(0.029)	(0.027)	(0.008)	(0.035)	(0.032)
	FI	0.361	0.443	0.082	0.172	0.265	0.092	0.467	0.292	-0.174 ‡
	[$N_w = 214, N_b = 77$]	(0.052)	(0.101)	(0.113)	(0.038)	(0.079)	(0.089)	(0.058)	(0.077)	(0.093)
(D) K to 8th	MFS	0.270	0.153	-0.118 ‡	0.048	0.305	0.257 *	0.682	0.542	-0.139
	[$N_w = 233, N_b = 85$]	(0.049)	(0.044)	(0.064)	(0.012)	(0.072)	(0.074)	(0.051)	(0.070)	(0.090)
	HFS	0.037	0.119	0.082 *	0.037	0.133	0.096 *	0.926	0.748	-0.178 *
	[$N_w = 4,523, N_b = 480$]	(0.005)	(0.020)	(0.021)	(0.006)	(0.028)	(0.027)	(0.007)	(0.035)	(0.035)

Notes: See text for description of the estimator. FI = Food Insecure, MFS = Marginal Food Secure, HFS = High Food Secure; Balanced panels were constructed using the second, fifth, sixth, and seventh wave of the data; appropriate longitudinal weights were used in the estimation. Paired jackknife (JK2) standard errors are in parentheses; only B-W differences in transition probabilities annotated for statistical significance.

‡ $p < 0.10$, † $p < 0.05$, and * $p < 0.01$

Table 3. Estimated Transition Matrices, Hispanic and White Household Dynamics

Panel	Period t_0	Period t_1								
		FI			MFS			HFS		
		White	Hispanic	H-W	White	Hispanic	H-W	White	Hispanic	H-W
(A) K to 3rd	FI	0.266	0.375	0.108 ‡	0.106	0.114	0.008	0.628	0.511	-0.116
	[$N_w = 214, N_h = 180$]	(0.050)	(0.042)	(0.064)	(0.030)	(0.023)	(0.035)	(0.060)	(0.045)	(0.073)
	MFS	0.137	0.184	0.047	0.090	0.119	0.028	0.773	0.697	-0.07573
	[$N_w = 233, N_h = 128$]	(0.031)	(0.032)	(0.045)	(0.024)	(0.034)	(0.041)	(0.035)	(0.044)	(0.056)
(B) 3rd to 5th	HFS	0.024	0.046	0.022 †	0.035	0.094	0.059 *	0.941	0.860	-0.081 *
	[$N_w = 4,523, N_h = 902$]	(0.004)	(0.009)	(0.010)	(0.005)	(0.017)	(0.017)	(0.006)	(0.017)	(0.019)
	FI	0.526	0.538	0.012	0.186	0.153	-0.033	0.288	0.309	0.021
	[$N_w = 177, N_h = 132$]	(0.074)	(0.057)	(0.092)	(0.041)	(0.045)	(0.060)	(0.064)	(0.061)	(0.085)
(C) 5th to 8th	MFS	0.201	0.230	0.029	0.155	0.265	0.110	0.645	0.505	-0.140
	[$N_w = 171, N_h = 97$]	(0.048)	(0.056)	(0.074)	(0.043)	(0.078)	(0.091)	(0.060)	(0.081)	(0.110)
	HFS	0.032	0.103	0.071 *	0.029	0.066	0.036 *	0.939	0.831	-0.107 *
	[$N_w = 4,622, N_h = 981$]	(0.005)	(0.012)	(0.013)	(0.005)	(0.010)	(0.012)	(0.006)	(0.017)	(0.019)
(D) K to 8th	FI	0.515	0.319	-0.196 *	0.067	0.156	0.089 †	0.418	0.525	0.107
	[$N_w = 227, N_h = 196$]	(0.042)	(0.054)	(0.069)	(0.011)	(0.036)	(0.040)	(0.045)	(0.068)	(0.083)
	MFS	0.265	0.248	-0.016	0.097	0.072	-0.025	0.638	0.679	0.041
	[$N_w = 184, N_h = 104$]	(0.061)	(0.066)	(0.087)	(0.028)	(0.030)	(0.041)	(0.063)	(0.065)	(0.095)
(E) K to 8th	HFS	0.030	0.051	0.021 †	0.041	0.052	0.011	0.929	0.897	-0.032 †
	[$N_w = 4,559, N_h = 910$]	(0.005)	(0.009)	(0.010)	(0.006)	(0.009)	(0.011)	(0.008)	(0.014)	(0.016)
	FI	0.361	0.224	-0.137 ‡	0.172	0.120	-0.052	0.467	0.656	0.189 †
	[$N_w = 214, N_h = 180$]	(0.052)	(0.047)	(0.069)	(0.038)	(0.030)	(0.046)	(0.058)	(0.051)	(0.076)
(F) K to 8th	MFS	0.270	0.243	-0.028	0.048	0.101	0.053 ‡	0.682	0.656	-0.025
	[$N_w = 233, N_h = 128$]	(0.049)	(0.040)	(0.065)	(0.012)	(0.023)	(0.028)	(0.051)	(0.049)	(0.074)
	HFS	0.037	0.073	0.036 *	0.037	0.057	0.020 ‡	0.926	0.870	-0.056 *
	[$N_w = 4,523, N_h = 902$]	(0.005)	(0.011)	(0.012)	(0.006)	(0.010)	(0.012)	(0.007)	(0.012)	(0.014)

Notes: See text for description of the estimator. FI = Food Insecure, MFS = Marginal Food Secure, HFS = High Food Secure; Balanced panels were constructed using the second, fifth, sixth, and seventh wave of the data; appropriate longitudinal weights were used in the estimation. Paired jackknife (JK2) standard errors are in parentheses; only H-W differences in transition probabilities annotated for statistical significance.

‡ $p < 0.10$, † $p < 0.05$, and * $p < 0.01$

Table 4. Estimated Transition Matrices, Hispanic and Black Household Dynamics

Panel	Period t_0	Period t_1								
		FI			MFS			HFS		
		Black	Hispanic	B-H	Black	Hispanic	B-H	Black	Hispanic	B-H
(A) K to 3rd	FI	0.385	0.375	0.010	0.066	0.114	-0.048	0.550	0.511	0.038
	[$N_h = 180, N_b = 77$]	(0.069)	(0.042)	(0.077)	(0.035)	(0.023)	(0.042)	(0.074)	(0.045)	(0.086)
	MFS	0.156	0.184	-0.029	0.201	0.119	0.082	0.644	0.697	-0.053
	[$N_h = 128, N_b = 85$]	(0.059)	(0.032)	(0.068)	(0.058)	(0.034)	(0.060)	(0.071)	(0.044)	(0.077)
(B) 3rd to 5th	HFS	0.086	0.046	0.040	0.131	0.094	0.037	0.783	0.860	-0.077 ‡
	[$N_h = 902, N_b = 480$]	(0.025)	(0.009)	(0.027)	(0.032)	(0.017)	(0.035)	(0.043)	(0.017)	(0.045)
	FI	0.650	0.538	0.112	0.136	0.153	-0.018	0.215	0.309	-0.094
	[$N_h = 132, N_b = 72$]	(0.073)	(0.057)	(0.100)	(0.062)	(0.045)	(0.073)	(0.077)	(0.061)	(0.101)
(C) 5th to 8th	MFS	0.141	0.230	-0.089	0.198	0.265	-0.066	0.661	0.505	0.156
	[$N_h = 97, N_b = 78$]	(0.056)	(0.056)	(0.076)	(0.051)	(0.078)	(0.099)	(0.063)	(0.081)	(0.107)
	HFS	0.082	0.103	-0.021	0.114	0.066	0.048	0.805	0.831	-0.027
	[$N_h = 981, N_b = 492$]	(0.021)	(0.012)	(0.023)	(0.028)	(0.010)	(0.030)	(0.029)	(0.017)	(0.034)
(D) K to 8th	FI	0.482	0.319	0.163 ‡	0.185	0.156	0.029	0.333	0.525	-0.192 †
	[$N_h = 196, N_b = 90$]	(0.068)	(0.054)	(0.089)	(0.054)	(0.036)	(0.065)	(0.061)	(0.068)	(0.094)
	MFS	0.166	0.248	-0.083	0.237	0.072	0.165 †	0.597	0.679	-0.082
	[$N_h = 104, N_b = 81$]	(0.062)	(0.066)	(0.091)	(0.066)	(0.030)	(0.073)	(0.086)	(0.065)	(0.110)
(E) K to 8th	HFS	0.089	0.051	0.038 ‡	0.151	0.052	0.099 *	0.760	0.897	-0.137 *
	[$N_h = 910, N_b = 471$]	(0.018)	(0.009)	(0.020)	(0.029)	(0.009)	(0.030)	(0.035)	(0.014)	(0.040)
	FI	0.443	0.224	0.219 ‡	0.265	0.120	0.145 ‡	0.292	0.656	-0.363 *
	[$N_h = 180, N_b = 77$]	(0.101)	(0.047)	(0.113)	(0.079)	(0.030)	(0.083)	(0.077)	(0.051)	(0.095)
(F) K to 8th	MFS	0.153	0.243	-0.090	0.305	0.101	0.204 ‡	0.542	0.656	-0.114
	[$N_h = 128, N_b = 85$]	(0.044)	(0.040)	(0.056)	(0.072)	(0.023)	(0.075)	(0.070)	(0.049)	(0.090)
	HFS	0.119	0.073	0.046 †	0.133	0.057	0.076 †	0.748	0.870	-0.122 *
	[$N_h = 902, N_b = 480$]	(0.020)	(0.011)	(0.021)	(0.028)	(0.010)	(0.030)	(0.035)	(0.012)	(0.037)

Notes: See text for description of the estimator. FI = Food Insecure, MFS = Marginal Food Secure, HFS = High Food Secure; Balanced panels were constructed using the second, fifth, sixth, and seventh wave of the data; appropriate longitudinal weights were used in the estimation. Paired jackknife (JK2) standard errors are in parentheses; only H-B differences in transition probabilities annotated for statistical significance.

‡ $p < 0.10$, † $p < 0.05$, and * $p < 0.01$

Table 5. Influence of Observables on the B-W and H-W Gaps in Directional Transition Dynamics

	Upward Transition Probabilities				Downward Transition Probabilities			
	(1)	(2)	(3)	PP Change (1) to (3)	(4)	(5)	(6)	PP Change (4) to (6)
Black	-0.075 (0.063)	-0.033 (0.065)	-0.021 (0.061)	0.055 * (0.020)	0.153 * (0.023)	0.095 * (0.023)	0.095 * (0.023)	-0.059 * (0.007)
Hispanic	0.035 (0.050)	0.095 ‡ (0.049)	0.095 † (0.048)	0.060 * (0.015)	0.074 * (0.010)	0.014 (0.011)	0.014 (0.011)	-0.060 * (0.005)
SES	-	0.144 * (0.035)	0.157 * (0.038)	-	-	-0.094 * (0.007)	-0.094 * (0.007)	-
SES ²	-	0.009 (0.026)	0.018 (0.027)	-	-	0.030 * (0.005)	0.030 * (0.005)	-
Time FE	no	no	yes	-	no	no	yes	-
N	1,304	1,304	1,304	-	17,515	17,515	17,515	-

Notes: Estimates for the upward transition dynamics are conditional on being *food insecure* in time t_0 ; estimates for the downward transition dynamics are conditional on being *high food secure* in time t_0 ; SES = Socioeconomic Status; FE = Fixed Effects; PP = Percentage Points; N = Number of Observations; appropriate survey design weights were used to estimate standard errors (in parentheses); see text for more details.

‡ $p < 0.10$, † $p < 0.05$, and * $p < 0.01$.

Table A1. Core Food Security Module (CFSM)

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1. "We worried whether our food would run out before we got money to buy more". Was that **often, sometimes** or never true for you in the last 12 months?
 2. "The food that we bought just didn't last and we didn't have money to get more". Was that **often, sometimes** or never true for you in the last 12 months?
 3. "We couldn't afford to eat balanced meals". Was that **often, sometimes** or never true for you in the last 12 months?
 4. "We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food". Was that often, sometimes or never true for you in the last 12 months?
 5. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food? (**Yes/No**)
 6. "We couldn't feed our children a balanced meal, because we couldn't afford that". Was that **often, sometimes** or never true for you in the last 12 months?
 7. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (**Yes/No**)
 8. (If yes to Question 5) How often did this happen – **almost every month, some months but not every month**, or in only 1 or 2 months?
 9. "The children were not eating enough because we just couldn't afford enough food". Was that **often, sometimes** or never true for you in the last 12 months?
 10. In the last 12 months, were you ever hungry, but didn't eat, because you couldn't afford enough food? (**Yes/No**)
 11. In the last 12 months, did you lose weight because you didn't have enough money for food? (**Yes/No**)
 12. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food? (**Yes/No**)
 13. In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (**Yes/No**)
 14. In the last 12 months, were the children ever hungry but you just couldn't afford more food? (**Yes/No**)
(If yes to Question 13) How often did this happen – **almost every month, some months but not every month**, or
 15. in only 1 or 2 months?
 16. In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food? (**Yes/No**)
 17. (If yes to Question 16) How often did this happen – **almost every month, some months but not every month**, or in only 1 or 2 months?
 18. In the last 12 months did any of the children ever not eat for a whole day because there wasn't enough money for food? (**Yes/No**)
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Note: Responses in bold are "affirmative". Table taken from Kuku et al. (2012)