Internal Migration in the United States: A Comprehensive Comparative Assessment of the Consumer Credit Panel

Jack DeWaard[1,2] • Janna E. Johnson[2,3] • Stephan D. Whitaker[4]

ABSTRACT

We introduce and provide the first comprehensive comparative assessment of the Federal Reserve Bank of New York Consumer Credit Panel (CCP) to demonstrate the utility and unique advantages of these data for research on internal migration in the United States. Relative to other data sources on U.S. internal migration, the CCP permits highly detailed cross-sectional and longitudinal analyses of migration, both temporally and geographically. After introducing these data, we compare cross-sectional and longitudinal estimates of migration from the CCP to similar estimates derived from the American Community Survey, the Current Population Survey, Internal Revenue Service data, the National Longitudinal Survey of Youth, the Panel Study of Income Dynamics, and the Survey of Income and Program Participation. Our results firmly establish the comparative utility and advantages of the CCP. We conclude by identifying some profitable directions for future research on U.S. internal migration using these data.

KEYWORDS

Internal migration • Consumer Credit Panel • Comparative • Cross-sectional • Longitudinal

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Jack DeWaard
jdewaard@umn.edu

1. Department of Sociology, University of Minnesota. 909 Social Science Tower, 267 19th Ave. S., Minneapolis, MN 55455.
2. Minnesota Population Center, University of Minnesota. 50 Willey Hall, 225 19th Ave S., Minneapolis, MN 55455.
3. Hubert H. Humphrey School of Public Affairs, University of Minnesota. 130 Humphrey School, 301 19th Ave S., Minneapolis, MN 55455.
4. Federal Reserve Bank of Cleveland. 1455 E. 6th St. Cleveland, OH 44114.

ACKNOWLEDGEMENTS

DeWaard and Johnson acknowledge support from center grant #P2C HD041023 awarded to the Minnesota Population Center at the University of Minnesota by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. DeWaard and Johnson also acknowledge research assistance provided by Morrison (Luke) Smith with financial support from the Minnesota Population Center. Earlier versions of this paper were presented at the Center for Economic Research and Graduate Education – Economics Institute on November 29, 2018, the Max Planck Institute for Demographic Research on November 27, 2018, the University of Groningen on November 22, 2018, the Urban Institute on November 6, 2018, and the Federal Reserve Bank of Atlanta on August 21, 2018. The authors wish to thank members of these audiences for their helpful comments, and are particularly grateful for feedback provided by Sam Schulhofer-Wohl and Emilio Zagheni.

INTRODUCTION

Human migration is an important demographic, economic, environmental, geopolitical, and sociocultural process (Black et al. 2011; Bodvarsson and Van den Berg 2013; Brettell and Hollifield 2015; Castles et al. 2014; Massey et al. 1998; National Academies of Sciences, Engineering, and Medicine 2017; White 2016). It is therefore concerning that migration data have been and continue to be plagued by significant problems of availability, quality, and comparability. While these problems are pronounced for data on international migration (Abel and Sander 2014; Levine et al. 1985; Poulain et al. 2006; Raymer et al. 2013; Willekens et al. 2016), data on internal migration are not immune (Bell et al. 2002, 2015a, 2015b).

With respect to the aim of this paper, this lack of immunity applies to data on internal migration in the United States (Isserman et al. 1982; Kaplan and Schulhofer-Wohl 2012; Long 1988; Molloy et al. 2011), and motivates our work to introduce and provide the first comprehensive comparative assessment of the Federal Reserve Bank of New York Consumer Credit Panel (CCP) to demonstrate the utility and unique advantages of these data (Lee and van der Klaauw 2010; Whitaker 2018). We begin by introducing the CCP and describing two problems that they resolve better than other data sources on U.S. internal migration. We then compare cross-sectional estimates of migration from the CCP to similar estimates derived from the American Community Survey (ACS), the Current Population Survey (CPS), and migration data from the Internal Revenue Service (IRS). This is followed by comparing longitudinal estimates of migration from the CCP to similar estimates derived from the National Longitudinal Survey of Youth (NLSY 1979 and 1997), the Panel Study of Income Dynamics (PSID), and the Survey of Income and Program Participation (SIPP 2004 and 2008). Our results firmly establish the comparative utility and advantages of the CCP, thereby warranting greater use of these data in future research on U.S. internal migration.

PROBLEMS WITH MIGRATION DATA

At a basic level, migration is one of three components of population change (Preston et al. 2001); however, extensive literatures also detail the economic, environmental, geopolitical, and sociocultural causes, characteristics, and consequences of migration (Ali and Hartmann 2015; Bodvarsson and Van den Berg 2013; Black et al. 2011; Brettell and Hollifield 2015; Castles et al. 2014; Hunter et al. 2015; Massey et al. 1998, 2016; Massey and España 1987; National Academies of Sciences, Engineering, and Medicine 2017; White 2016). Given the breadth and depth of past and current efforts to study migration, as well as policy efforts to monitor and manage migration (IOM 2018), it is therefore concerning that migration data are notoriously poor and suffer from well-documented problems of availability, quality, and comparability.

These problems are particularly acute for data on international migration (Abel and Sander 2014; National Research Council 1985; Poulain et al. 2006; Raymer et al. 2013; Willekens et al. 2016). Bracketing the issue of whether data on international migration are collected at all, the quality and comparability of migration data are problematic for at least three reasons. First, due to both the different underlying definitions and data collection systems used, information is not necessarily collected on the same phenomenon. For example, in some cases, data on migrations (i.e., transitions or events) are collected, while, in others, data on migrants (i.e., persons who have changed their residential status) are collected. Second, different timing criteria (one-year, a few months, etc.) are used to identify and therefore count migration and migrants. Third, there are substantial differences with respect to coverage and undercount, which is an increasingly important consideration in light of whether and how countries track and ultimately respond to flows of asylum seekers and refugees (Abel 2018; Long 2015). As a result, bracketing several recent sets of harmonized

estimates of international migration among European countries (e.g., see Raymer et al. 2013), publicly available data on international migration (e.g., from the World Bank and the United Nations) and estimates derived from them (e.g., see Abel and Sander 2014) are of differing quality and are not necessarily comparable across countries. The same is true for cross-national comparisons of internal migration data and estimates (Bell et al. 2002, 2015a, 2015b).

Even if the focus is restricted to internal migration in a single country like the United States, which is the focus of this paper, and to one data source, two key problems remain (Isserman et al. 1982; Kaplan and Schulhofer-Wohl 2012; Long 1988; Molloy et al. 2011). The first problem is that there is a tradeoff between temporal and geographic specificity. With respect to the former, more frequent measurements of migration permit seeing migration for what it is—namely, a demographic event. However, more frequent measurements of migration come at the expense of data collected at finer spatial scales (counties, census tracts and blocks, etc.). Further complicating this picture is that many data sources that are commonly used to study U.S. internal migration (e.g., the CPS and the PSID) are surveys with small sample sizes, raising serious concerns about the accuracy of estimates of migration, especially at finer spatial scales, as well as privacy concerns.

The second problem of sample attrition is unique to longitudinal data.To provide a concrete example, while the PSID took a number of precautions to ensure high rates of follow-up in each successive wave after the start of the survey in 1968 (Hill 1992), "attrition in the PSID has been substantial" (Fitzgerald 2011:2; see also Fitzgerald et al. 1998; Lillard and Panis 1994). The same is true for other longitudinal surveys like the SIPP (Zabel 1998). Not surprisingly, numerous studies have been conducted to ensure that the PSID has remained nationally representative (Fitzgerald et al. 1998; Hill 1992; Morgan 1979). However, these efforts and findings notwithstanding, high attrition in longitudinal surveys

like the PSID and SIPP further calls into question the accuracy of estimates of migration, especially over long time spans and at finer spatial scales.

As a result of the two problems discussed above, what we know and do not know about internal migration in the United States, both temporally and geographically, is a mixed bag that reflects substantial differences in the logic, implementation, and shortcomings of existing datasets (Isserman et al. 1982; Kaplan and Schulhofer-Wohl 2012; Long 1988; Molloy et al. 2011). And while there is always some slippage between the ideal and what is doable and available in practice, the overarching aim of this paper is to call attention to other underutilized data sources—specifically, the CCP—that better resolve the two problems discussed above.

INTRODUCING THE CONSUMER CREDIT PANEL (CCP)

As described in detail by Lee and van der Klaauw (2010) and Whitaker (2018), data in the CCP are drawn from the credit histories of 240 million U.S. adults maintained by Equifax, which is one of three national credit-reporting agencies (NCRAs). Firms that extend credit to consumers provide monthly reports to NCRAs containing the addresses of borrowers and information on debt-financed consumption activities, including outstanding balances, payments, delinquencies, credit scores, and more. The CCP sample is drawn from the complete set of Equifax records. Each quarter, a subset of records is extracted containing every borrower for whom the last two digits of their social security number matches one of five preselected random two digit numbers.[1] The same five random numbers are used each quarter. Because it is extremely rare for an individual's social security number to change, the same individuals appear in each quarterly sample, thus building their individual panel over

[1] The last four digits of an individual's social security number are determined by the order of arrivals of applications for social security numbers in each state. Numbers are assigned from 0001 to 9999, and then resume at 0001. This is no mechanism for individuals to select a particular number (and no motivation save numerology). They are effectively random.

time. When a first-time borrower appears with a matching social security number, they enter the sample. Individuals can exit the sample by passing seven years with no credit activity, emigrating from the United States, or dying. According to Lee and van der Klaauw (2010:3), the end result of these procedures is "a 5% random sample that is representative of all individuals in the US who have a credit history and whose credit file includes the individual's social security number" (Lee and van der Klaauw 2010:3).

Presently, more than 100 papers, including working papers, have been published using the CCP.[2] Consumer debt is the most commonly studied topic; however, several papers have used the CCP to study internal migration and mobility. Molloy and Shan (2013) showed that experiencing foreclosure increases the risk of moving, but not to less desirable neighborhoods. In contrast, Ding et al. (2016:38; see also Hwang 2018) found that those with low credit scores, or "vulnerable residents," are not more likely than those with high credit scores to move from gentrifying neighborhoods; however, those that do leave tend to move to less desirable neighborhoods. Both Molloy and Shan (2013) and Ding et al. (2016) operationalized neighborhoods as census tracts, thus highlighting an important strength of the CCP, which is that the individual addresses of borrowers can be aggregated up to any desired spatial scale (census blocks and tracts, counties, etc.). Additionally, the CCP, which are available on a quarterly basis, can be recoded to study migration over different time intervals. Molloy and Shan (2013) and Ding et al. (2016), for example, used the CCP to study annual migration, and we follow their lead in the current paper.

Another strength of the CCP relative to other data sources like the CPS and PSID is its very large sample size of about 12 million borrowers per year. This helps to significantly reduce the tradeoff between temporal and geographic specificity discussed in the previous

[2] See https://www.newyorkfed.org/microeconomics/hhdc/background.html.

section. Also, because the data in the CCP are drawn from the set of all U.S. adults with a credit report and social security number, problems of follow-up and attrition are comparatively less severe.

There are several weaknesses of the CCP. First, according to the Consumer Financial Protection Bureau, about 10-11 percent of U.S. adults lack a credit history with an NCRA (Brevoort et al. 2016). These numbers are higher (about 30 percent) and lower (about four percent) in low and high income neighborhoods, respectively. The CCP is therefore a sample of relatively older and more financially established adults, and is not appropriate for more targeted studies of younger and/or financially disadvantaged persons. Second, the CCP is limited with respect to observables. While the CCP contains data on age and other information provided in a credit report, in explanatory studies, data in the CCP must often be linked to other data sources (e.g., tract level data from U.S. decennial censuses) in order to examine the role of additional demographic and other factors. Third, like other data sources (e.g., the Social Security Administration's Death Master File), the CCP does not always consistently drop those who die. Finally, the CCP data are not public and can only be freely accessed and analyzed by a collaborator working within the Federal Reserve Bank system.

Whether the strengths of the CCP outweigh its weaknesses is an open empirical question that has received very limited attention in prior studies. For example, in a single footnote, Molloy and Shan (2013:233) remarked that the migration rate in the CCP "is somewhat higher than the CPS"; however, they neither reported their CPS estimates nor substantively explained this discrepancy. Ding et al. (2016:41) went one step further and showed that age-specific migration rates in the CCP were "slightly lower than those in the ACS data"; however, results were calculated and provided for only two years, 2006 and 2013. Accordingly, in what follows, we provide the first comprehensive comparative

assessment of the CCP to demonstrate the utility and unique advantages of these data for research on U.S. internal migration.

OVERVIEW OF EMPIRICAL APPROACH

The empirical portion of this paper is divided into two main sections. In the first section, we compare cross-sectional estimates of migration from the CCP to similar estimates from the ACS, CPS, and IRS. In the second section, we compare longitudinal estimates of migration from the CCP to estimates from the NLSY 1979 and 1997, the PSID, and SIPP 2004 and 2008. In doing so, we seek to exhaust the datasets that are commonly used to study U.S. internal migration, and, in the process, to provide an important point of reference for current and future research that will be of interest to scholars, policymakers, and practitioners with an interest in U.S. internal migration.

CROSS-SECTIONAL ANALYSIS

Data

Earlier, we suggested that some of what is known and unknown about internal migration in the United States reflects differences in the logic, implementation, and shortcomings of existing datasets (Isserman et al. 1982; Kaplan and Schulhofer-Wohl 2012; Long 1988; Molloy et al. 2011). Put differently, there is no "ground truth." As we show in Table 1, each of the four datasets used in our cross-sectional analysis is characterized by a different universe, sample size, time span, and migration information. These differences affect the comparability of estimates derived from the four datasets. The selection criteria provided in the final column of Table 1 thus represent our best attempt to restrict our analysis to the most

comparable sets of observations in these four datasets, and we discuss the implications of the remaining differences for our results below.

---TABLE 1 ABOUT HERE---

Following Molloy and Shan (2013) and Ding et al. (2016), we focus on annual migration over about the past decade from 2005 forward at the state, county, and tract levels. Data on state migration are available in all four datasets. Data on county migration are available in the CCP, CPS, and IRS. The ACS does not contain county migration data, and, instead, contains migration data for Public Use Microdata Areas of Migration (MIGPUMAs), which are population-based geographic units.[3] Data on tract migration are only available in the CCP. Our analysis also includes disaggregation by age group, described in the next subsection.

Measures

Just as there are many different datasets used to study U.S. internal migration, there are many different ways to measure migration. As the measurement of migration is not the focus of this paper, we follow the lead of Bell et al. (2002, 2015a, 2015b) who have spent the better part of the last two decades establishing and advocating for a set of best measurement practices that tap four dimensions of migration—intensity, distance, connectivity, and effect—in a parsimonious way. Starting with the simplest of these measures, we calculate the Crude Migration Probability (CMP) in each data set as the ratio of the total number of migrants (M) in a given year divided by the total size of the population (P) at the start of the year. We subsequently calculate the CMP for each of three age groups: "young adults" between the

[3] See https://usa.ipums.org/usa-action/variables/MIGPUMA#description_section.

ages of 25 and 29, "family age" adults between the ages of 30 and 49, and "older adults" between the ages of 50 and 74 (Johnson et al. 2013:1).

$$CMP = \frac{M}{P} \quad (1)$$

The CMP is a measure of the "intensity," or size or magnitude, of migration (Bell et al. 2002:442), and one that ignores the inherently spatial character of migration (Rogers 1975; Roseman 1971). Accordingly, as a measure of the spatial "connectivity" of migration (Bell et al. 2002:452), we also calculate the annual Index of Migration Connectivity (I_{MC}) as follows:

$$I_{MC} = \frac{\sum_{i \neq j} \sum_{j \neq i} MC_{ij}}{n(n-1)} \quad (2)$$

In the numerator of Equation 2, $MC_{ij} = 1$ if there is a migration flow from place *i* to place *j* of any size greater than zero ($MC_{ij} = 0$ otherwise). In the denominator, n is the total number places comprising the migration network. The I_{MC} ranges from zero to one, and summarizes the proportion of all potential place-to-place migration flows that are not zero, or, in more substantive terms, the degree of spatial saturation in the migration network.[4]

The I_{MC} imposes greater data demands than the CMP, and requires data on place-to-place migration flows. Data on state-to-state migration are available in all four datasets. Data on county-to-county migration are only available in the CCP and IRS, with data on MIGPUMA-to-MIGPUMA migration available in the ACS. Finally, data on tract-to-tract migration are only available in the CCP.

Results

Estimates of the annual CMP at the state, county, and tract levels are displayed in Figure 1. These estimates and their associated standard errors are also provided in tabular form in

[4] For those accustomed to the language of [social] network analysis, MC_{ij}, n, and, I_{MC} are referred to as directed edges, nodes, and degree centrality, respectively.

Appendix Table A1.[5] In the way of preliminaries, first, as should be the case within each dataset, the county CMP is higher than the state CMP. In the CCP, the tract CMP is also higher than the county CMP. Second, the scale of the *y*-axis is consistent with the idea that migration is a relatively rare event (King 2012). Third, and finally, each of the nine series displayed has mostly trended downward since 2005. This is consistent with past and current research on the so-called "Great American Migration Slowdown" (Frey 2009:1; see also Cooke 2013; Kaplan and Schulhofer-Wohl 2017; Molloy et al. 2011), which may have started to reverse course in the last year or two (Frey 2017).

---FIGURE 1 ABOUT HERE---

Excluding 2005 (discussed below), estimates of the CMP from the CCP are consistent with similar estimates from the ACS, CPS, and IRS. The CCP performs particularly well against the ACS,[6] and less so against the CPS and IRS. Comparably lower estimates of the state and county CMP in the CPS are likely the product of weak follow-up in the CPS (Koerber 2007). The CPS is designed to collect data in a single week; therefore, little effort is made to contact initial non-responders. In contrast, the ACS attempts to collect data for up to three months after the initial interview date. This difference in follow-up and other survey procedures means that the CPS is less likely to capture migrants.

The IRS data suffer from a different set of problems. One problem stems from the fact that tax returns in consecutive years much be matched in order to identify migrant and non-migrant returns (roughly equivalent to households) and associated exemptions (roughly equivalent to individuals), a process that is seldom perfect because tax returns are not always filed or filed on time (Gross 2005; Johnson et al. 2008; Pierce 2015). A second problem is

[5] Only aggregated state- and county-level migration data are provided by the IRS. Accordingly, Appendix Table A1 contains estimates of the CMP and associated standard errors from the CCP, ACS, and CPS.
[6] Recall that the ACS contains migration data for MIGPUMAs, not counties. MIGPUMAs tend to be larger in size than counties, which helps to explain why the CMP for MIGPUMAs in the ACS is smaller than the CMP for counties in the CCP, CPS, and IRS.

that, starting in 2011, the responsibility for processing these data shifted from the U.S. Census Bureau to the IRS. Importantly, the IRS implemented different data processing, including matching, procedures (Pierce 2015), which may help to explain the apparent increase in the state and county CMP after 2011.

Regarding the 2005 estimates of the CMP from the CCP, these are noticeable departures from the rest of their respective series from 2006 forward. During this period, Equifax sought to improve the process that it uses to identify borrowers' current mailing addresses from among the many addresses that are reported by their creditors. With each change in the underlying algorithm, there is a corresponding change in the share of records for which the census block (or tract, county, or state) does not match the census block from the same quarter one year before. The largest corrections occurred in 2004, and became smaller and less frequent thereafter, which helps to explain the pronounced spike in the CMP from the CCP in 2005. Similar patterns (not shown here) are observed for all age groups, regions, debt levels, and credit scores.

The above limitation notwithstanding, a key takeaway from Figure 1 is that estimates of the CMP from the CCP are generally consistent with similar estimates from the other three data sources, and are probably more accurate than estimates from the CPS and IRS (see also Appendix Table A1). Another key takeaway from Figure 1 is that, bracketing the close correspondence between the CCP and ACS estimates, only the CCP permits further examination of annual tract-level migration. Excluding 2005, an average of 9.6 percent of persons migrated from one tract to another in a given year during the 2006-2018 period. As we discuss in the conclusion of this paper, these sorts of estimates are sorely needed and extremely valuable for studying regular (e.g., annual or seasonal), local (e.g., tract), and very recent (e.g., up to the current year and quarter) migration, particularly in some contexts (e.g., during and after extreme weather events).

In Figure 2, we present estimates of the annual CMP for each of three age groups: young adults, family age adults, and older adults. These estimates and their associated standard errors are similarly provided in tabular form in Appendix Table A2. Estimates from the IRS data are not and cannot be provided because the IRS data are not disaggregated by age. Focusing, first, on preliminaries, consistent with a long line of research on age patterns of migration (e.g., see Rogers and Castro 1981), the $CMPs$ for young adults are higher than those for family age adults, which, in turn, are higher than those for older adults. These differences are expected because they ultimately reflect different life course stages that include, for example, labor force entry and [peak] working years, as well as retirement and elderly migration (Rogers and Watkins 1987; Wilson 2010). Second, recalling our earlier mention of the slowdown in U.S. internal migration in recent years and decades (Cooke 2013; Frey 2009; Kaplan and Schulhofer-Wohl 2017; Molloy et al. 2011), our results are in line with findings from other studies showing that demographic factors, particularly changing age patterns of migration, may have played a partial role (Cooke 2011).

---FIGURE 2 ABOUT HERE---

The results displayed in Figure 2 show that estimates of the CMP for each age group from the CCP are generally within the ballpark of similar estimates from the ACS and CPS. The most noticeable difference is the relatively more pronounced downward time trend in the CMP among young adults in the CCP.[7] As we noted earlier, part of this difference relative to the time trend in the CPS estimates may have to do with the problem of weak follow-up in CPS (Koerber 2007). However, this does not help to explain the difference relative to the time trend in the ACS estimates, which likely involves, at least in part, some consideration of sample size. The CCP contains information on approximately one million young adults in a

[7] Among young adults, at the state level, $r = -0.626$ ($p = 0.017$) in the CCP. The corresponding correlations in the ACS and CPS are $r = -0.391$ ($p = 0.209$) and $r = 0.184$ ($p = 0.548$), respectively. Similarly, at the county/MIGPUMA level, $r = -0.630$ ($p = 0.016$) in the CCP, $r = -0. - .749$ ($p = 0.005$) in the ACS, and $r = -0.311$ ($p = 0.301$) in the CPS.

given year. The corresponding sample sizes in the ACS and CPS are about 170,000 and 10,000 young adults, respectively. One obvious implication of these different sample sizes is that the CCP estimates are more precise. Another implication is that, in the absence of oversampling for migrants in the CCP, ACS, and CPS, simply by virtue of its larger sample size, the CCP does a better job of capturing [more] migrants by default.

However, the downward trend in the CCP among family age and older adults is also stronger than that in the ACS and CPS, although it is harder to see in the figure. Results of additional analyses (not shown here) indicate that the slope of this downward trend does not vary by characteristics like credit score, census division, or homeownership. We therefore suspect it may be related to changes in the address updating algorithm used by Equifax.

Another area where the CCP excels relative to the other datasets is with respect to capturing the spatial "connectivity" of migration (Bell et al. 2002:452). In Figure 3, we display annual estimates of the I_{MC} at the state, county, and tract levels. Focusing on the state-level estimates in Panel A, the I_{MC} from the CCP and IRS is consistently around 1.0, meaning that every state is connected to every other state by a migration flow of any size. While this is intuitive, estimates of the I_{MC} from the ACS and CPS fall short on account of their smaller sample sizes. Thus, while the ACS and CPS data are representative of the U.S. population, they are not necessarily representative of all moves made between U.S. states. As a result, the ACS and CPS data are poorly suited to study the spatial connectivity of migration.

---FIGURE 3 ABOUT HERE---

At the county level, there is considerably less spatial connectivity. As we foreshadowed earlier (see Footnote 6), estimates of the I_{MC} from the ACS are higher than corresponding estimates from the CCP and IRS because MIGPUMAs tend to be larger than counties, and are therefore more likely to be connected. The county-level I_{MC} from the CCP

has been remarkably stable over time, averaging 1.8 percent per year during the 2006-2015 period. The I_{MC} from the IRS has also been stable over time, but less so in more recent years, perhaps due in part to the different data processing procedures that were implemented by the IRS in 2011 (Pierce 2015; see also DeWaard et al. 2017).[8] Finally, considering that there are 73,057 tracts in the United States,[9] and 5,337,252,192 possible migration ties among them,[10] it is not surprising that the tract-level I_{MC} from the CCP averaged only 0.02 percent during the 2006-2015 period.

Taken together, the results provided and discussed in this section establish the comparative utility and some of the unique advantages of the CCP, at least after 2005. In the next section, we turn our attention to a similar set of exercises focusing on longitudinal estimates and comparisons using the CCP and other data sources.

LONGITUDINAL ANALYSIS

Data

Excluding the CCP, which we described earlier in Table 1, we describe the other five datasets used in our longitudinal analysis in Table 2. These datasets are similarly characterized by different universes, sample sizes, time spans, and migration information. Unlike in our cross-sectional analyses, it is not possible to develop a single set of selection criteria that permit us to simultaneously compare all six datasets to one another. In the final column in Table 2, we therefore provide selection criteria that are specific to each paired comparison between the dataset listed and the CCP.

[8] Another potential factor is that county-to-county migration estimates in the IRS are only disclosed for flows comprised of 10 or more households.
[9] See https://www.census.gov/geo/maps-data/data/tallies/tractblock.html.
[10] 5,337,252,192 = 73,057 migrant-sending, or origin, tracts X 73,056 possible migrant-receiving, or destination, tracts.

---TABLE 2 ABOUT HERE---

Observation windows differ across each paired comparison, and, excluding the SIPP04 and SIPP08, cover a roughly 10 year period since 2004 or 2005. We restrict our focus to within each paired comparison (e.g., we compare a migration estimate from the NLSY79 to a CCP-equivalent estimate based on implementing the selection criteria in Table 2), and do not compare across paired comparisons (e.g., we do not compare a migration estimate from the NLSY79 and its CCP-equivalent to an estimate from the SIPP04 and its CCP-equivalent).

We provide attrition rates and coverage ratios for all six longitudinal datasets in Appendix Table A3. The attrition rate measures the fraction of the sample at the beginning of the observation period that does not have complete location histories through the end of the period. This rate is much lower in the CCP than in the other five datasets. One reason for this is that borrowers are in legally binding contracts with their creditors. For most individuals, it would be costly and inconvenient to end all credit relationships, and thereby exit the set of Equifax credit records from which the CCP is drawn. In contrast, participants can opt out of longitudinal surveys with little or no cost or consequence. The coverage ratio measures the fraction of the sample at the end of the observation period that has complete location histories through the entire period. The coverage ratio of the CCP is lower than that of the NLSY and PSID surveys because first-time borrowers are added to the CCP each year. The CCP is always a combination of complete histories and new entrants. Finally, attrition and coverage are considerably higher and lower, respectively, in the SIPP04 and SIPP08, raising serious concerns at the outset about the utility of the SIPP for studying migration (Murillo et al. 2011; Zabel 1998).

Measures

Similar to Bell et al. (2002, 2015a, 2015b), Bernard (2017) recently proposed a set of ten longitudinal measures of migration. Among the simplest of these measures, and one that will likely resonate with fertility scholars, is the Migration Progression Ratio ($MPR_{i,i+1}$), which is defined as the proportion a cohort that migrated *i* times that went on to migration *i+1* times during the observation window:

$$MPR_{i,i+1} = \frac{M_{i+1}}{M_i} \quad (3)$$

Our starting point is to estimate the $MPR_{0,1}$, or the proportion of individuals in each dataset who migrated at least once. We subsequently calculate the $MPR_{0,1}$ for each of the same three age groups in our cross-sectional analysis: young adults between the ages of 25 and 29 at the start of the observation window, family age adults between the ages of 30 and 49, and older adults between the ages of 50 and 74 (Johnson et al. 2013). Finally, we estimate the $MPR_{1,2}$ and $MPR_{2,3}$ in order to examine second and third migrations.

Bernard's (2017) contribution notwithstanding, the set of measures that she proposed is not exhaustive and misses an important and understudied aspect of migration over the life course, which is the fact that, for a variety of reasons, people sometimes return to the very places that they had previously migrated from (Eldridge 1965; Johnson and Schulhofer-Wohl 2018). We therefore augment Bernard's (2017) work by incorporating the measure of the Return Migration Ratio ($RMR_{j.0,T}$), which we define as the proportion of individuals that resided in place *j* at the beginning of the observation window, migrated from *j* during the observation window, and returned to *j* at the end of the window.

$$RMR_{j.0,T} = \frac{M_{j,T}}{M_j} \quad (4)$$

Results

Estimates of the $MPR_{0,1}$ at the state, county, and tract levels are displayed in Figure 4. These estimates and their associated standard errors are also provided in tabular form in Appendix Table A4. Starting with the NLSY79, about 10.9 percent and 24.7 percent of individuals migrated from one state and one county to another during the observation window, respectively. The corresponding CCP-equivalent estimates are 12.8 percent and 26.8 percent, respectively. In the NLSY97, the CCP-equivalent estimates of the $MPR_{0,1}$ are slightly lower than the corresponding estimates in the NLSY97.

---FIGURE 4 ABOUT HERE---

While estimates of the $MPR_{0,1}$ in the NLSY79 and NLSY97 are similar to their corresponding CCP-equivalent estimates, the observed discrepancies might be due to the fact that the NLSY records location information at the annual interview date, which can occur at any point during the year. In contrast, we used first quarter location in the CCP. Another explanation for these discrepancies is selection. As we noted earlier, the CCP is a sample of relatively older and more financially established adults. This observation is particularly important for understanding discrepancies between estimates of the state and county $MPR_{0,1}$ in the NLSY97 and the corresponding CCP-equivalent estimates. Specifically, individuals in the NLSY97 sample are quite young, and were between the ages of 20 and 24 in 2004. Given that the CCP selects on older ages by virtue of only including individuals with a credit history and social security number (Lee and van der Klaauw 2010; Whitaker 2018), the CCP underestimates migration relative to other datasets and samples composed [primarily] of young adults.

Estimates of the state $MPR_{0,1}$ in the PSID and the corresponding CCP-equivalent estimate are also comparable, with reasons for the small observed discrepancy likely similar to those discussed above. The PSID records location information at the biennial interview date, which can occur at any time during the year. The PSID is also a representative sample

of the entire U.S. resident population, while the CCP only represents adults with a credit score and social security number.

The story is somewhat different with the SIPP04 and SIPP08. Estimates of the state $MPR_{0,1}$ in these datasets are consistently and considerably lower than the corresponding CCP-equivalent estimates. The most likely explanation for these discrepancies is very high attrition in the SIPP (see Appendix Table A3). Importantly, in his analysis of attrition in two earlier SIPP panels, the SIPP84 and SIPP90, Zabel (1998) showed that moving between survey waves was strongly positively associated with attrition. Thus, despite the many potential benefits of the SIPP described by Murillo et al. (2011), the SIPP04 and SIPP08 probably [substantially] underestimate migration.

Focusing on the $MPR_{0,1}$ at the tract level in the CCP, slightly more than half (52.3 percent) of the sample migrated from one tract to another during the observation window. Given that we cannot corroborate this estimate against similar estimates from the NLSY79, NLSY97, PSID, SIPP04, and SIPP08, we took the selection criteria used to calculate the $MPR_{0,1}$ at the tract level in the CCP and used these to estimate the corresponding state and county $MPR_{0,1}$ in the CCP to ensure that the latter two estimates were lower than the former. As is evident in Figure 4, the state $MPR_{0,1}$ is lower than the county $MPR_{0,1}$, which, in turn, is lower than the tract $MPR_{0,1}$.

In Figure 5, we present estimates of the $MPR_{0,1}$ for each of three age groups: young adults, family age adults, and older adults.[11] These estimates and their associated standard errors are also provided in tabular form in Appendix Table A5. Recalling our earlier discussion of age patterns of migration as a reflection of the life course (Rogers and Castro

[11] We do not include estimates from the NLSY79 and NLSY97 in Figure 5 because the NLSY is age-limited by design. Those in the NLSY79 were between the ages of 39 and 47 in 2004, and thus a subset of the "family age adults" category. Those in the NLSY97 were between the ages of 20 and 24 in 2004, and thus younger than those in the "young adults" age category.

1981), younger adults are more mobile than family age adults who, in turn, are more mobile than older adults at all geographic levels. For each age group, the estimate of the state $MPR_{0,1}$ in the PSID is highly similar to the corresponding CCP-equivalent estimate. In contrast, age-specific estimates of the state $MPR_{0,1}$ in the SIPP04 and SIPP08 are less comparable to their corresponding CCP-equivalent estimates, especially among the most mobile young adults.

---FIGURE 5 ABOUT HERE---

Estimates of the $MPR_{1,2}$ and $MPR_{2,3}$ at the state, county, and tract levels are displayed in Figure 6. These estimates and their associated standard errors also provided in Appendix Table A6. Similar to our discussion of Figures 4 and 5, there are two main take-away messages from the estimates displayed in Figure 6. First, the CCP-equivalent estimates are roughly in line with corresponding estimates from the NLSY79, NLSY97, PSID, SIPP04, and SIPP08. Second, any observed discrepancies are due to differences in the implementation of these surveys with respect to such features as recording location information, selection, attrition, and more.

---FIGURE 6 ABOUT HERE---

At the tract level, 56.8 percent of individuals in the CCP who had migrated once went on to migrate a second time. Of these, 53.1 percent went on to migrate a third time. Again, because we cannot corroborate these estimates against similar estimates from the NLSY79, NLSY97, PSID, SIPP04, and SIPP08, we took the selection criteria used to calculate the $MPR_{1,2}$ and $MPR_{2,3}$ at the tract level in the CCP and used these to estimate the corresponding state and county $MPR_{1,2}$ and $MPR_{2,3}$ in the CCP to ensure that the state estimates were lower than the corresponding county estimates, and that the county estimates were lower than the corresponding tract estimates.

Going beyond the set of longitudinal measures of migration proposed by Bernard (2017), we present estimates of the $RMR_{j.0,T}$ in Figure 7, with corresponding estimates and standard errors provided in tabular form in Appendix Table A7. For each paired comparison, the $RMR_{j.0,T}$ in the NLSY79, NLSY97, and PSID is higher than the corresponding CCP-equivalent estimate. Having already discussed several potential candidate explanations for these discrepancies, the final step in our analysis is to verify that, in the CCP the tract $RMR_{j.0,T}$ is lower than the county $RMR_{j.0,T}$, which, in turn, is lower than the state $RMR_{j.0,T}$. In substantive terms, individuals are much more likely to return to their state and county, and not necessarily their census tract (crudely, their neighborhood) of origin.

---FIGURE 7 ABOUT HERE---

DISCUSSION

In this paper, we provided the first comprehensive comparative assessment of the CCP to demonstrate the utility and unique advantages of these data for research on internal migration in the United States. We did so because the CCP better resolves two persistent problems that plague other cross-sectional and longitudinal datasets (Lee and van der Klaauw 2010; Whitaker 2018). First, due to its very large sample size of about 12 million borrowers per year, the CCP requires less of a tradeoff between temporal and geographic specificity, which, in turn, permits portraits of simultaneously regular (down to the quarter) and local (down to the addresses of borrowers) migration. Second, the construction of the CCP is such that problems of follow-up and attrition are much less severe.

The comparative utility and unique advantages of the CCP warrant greater use of these data in future research on U.S. internal migration. One area that would particularly benefit from these data is research on migration and population displacement in response to

climate and environmental shocks and corresponding economic effects (Boustan et al. 2017; Curtis et al. 2015; Fussell et al. 2014; Gallagher and Hartley 2017; Hunter et al. 2015; Tran and Sheldon 2018). Specifically, the CCP affords the opportunity to study the demographic and economic implications of both rapid and slow-onset shocks at different time intervals and spatial scales. The CCP data are also available up to the most recent quarter, which makes them particularly well-suited for studying very recent shocks like Hurricanes Florence and Michael in the fall of 2018, as well as other types of shocks like the Mendocino Complex Wildfire in California earlier that summer. The large sample size of the CCP also gives it great advantage over smaller longitudinal datasets. The small sample size of datasets like the NLSYs and PSID limit their usefulness in the study of individual migration dynamics over time, as individuals move relatively infrequently over their lifetimes. For example, future work could use the CCP to explore differences in return migration patterns by age, area of the country (i.e., are younger/older individuals more likely to return to some states/counties than others) as well as other characteristics.

In pursuing this and other research, it is important to also keep in mind the many weaknesses of the CCP. Bracketing the issue of accessibility and the need for an internal collaborator working within the Federal Reserve Bank system, perhaps the greatest weaknesses of the CCP, especially in the context of studying climate and environmental shocks, is that CCP is a sample of relatively older and more financially established adults. Relative to younger and less financially established adults, those in the CCP not only have more resources at their disposal to adapt to climate and environmental shocks in-situ, they can also use these resources to overcome the sometimes prohibitive costs of migration that might trap others in place (Black et al. 2011; Bodvarsson and Van den Berg 2013).

The above limitations notwithstanding, the central contribution of this paper is to provide a much needed introduction to the CCP and a comprehensive comparative point of

reference. The CCP data are a valuable and underutilized resource for studying U.S. internal migration. While descriptive, we hope that our work in this paper will help to stimulate future efforts to use these data. In the process, we hope that our work also help to continue important conversations about [improving] the availability, quality, and comparability of migration data more generally. As several recently published high level papers and books on the state of migration research have argued (Raymer et al. 2018; White 2016; Willekens et al. 2016), the future of migration research and its intersections with the work of policymakers and practitioners is very much bound up with the availability, quality, and comparability of migration data. Data on internal migration in the United States are no exception.

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TABLES AND FIGURES

Table 1. Descriptions of Cross-sectional Datasets

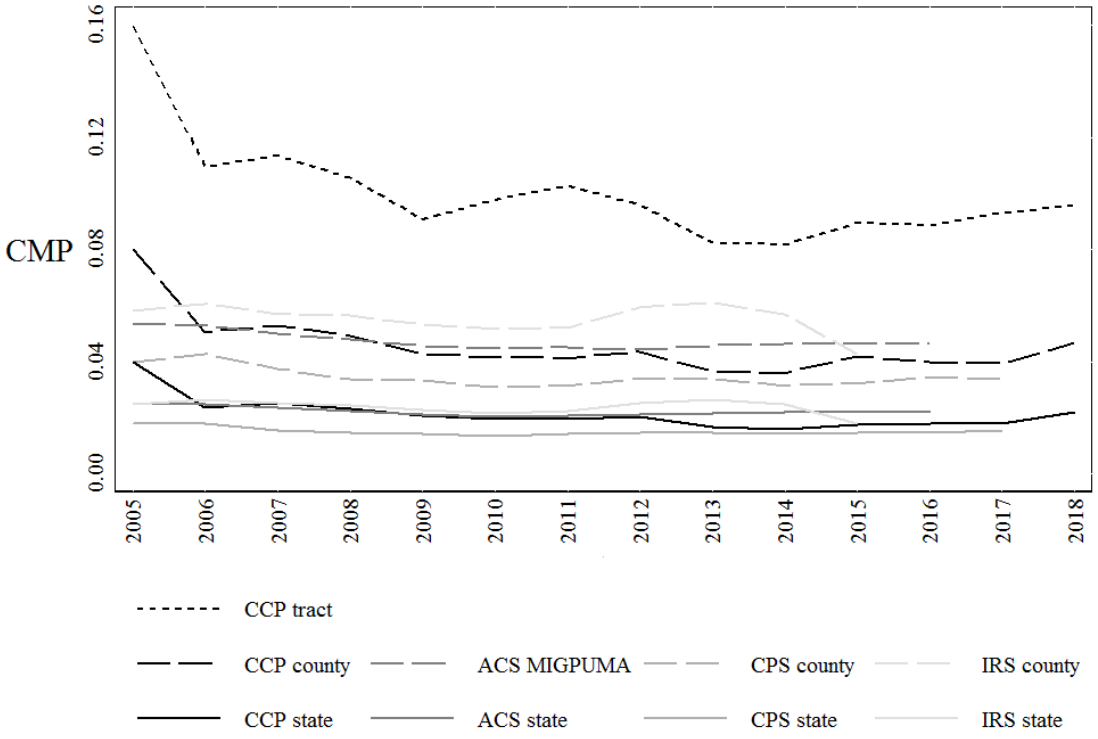
Dataset	Universe	Sample Size	Time Span	Unit of Observation	Migration Information	Selection Criteria for Analysis
Consumer Credit Panel (CCP)	U.S. resident population with a credit report and social security number	12 million per year	Quarterly from 1999-2018; annual migration measures use location in the first quarter	Individual	Based on previous and current addresses on credit reports.	Prior location determined by linking records with a unique individual identifier. Excludes individuals living in U.S. territories, without a valid birth year, and/or with implied ages above 105.
American Community Survey (ACS)	U.S. resident population	3 million per year	Annually from 2005-2016	Individual	Contains questions on last year's place of residence and on whether one moved in past year.	Excludes individuals residing in group quarters, who reported living abroad last year, and/or less than one year old.
Current Population Survey (CPS)	U.S. civilian non-institutionalized population	100,000 per year	Annually from 1963-2018[a]	Individual	Contains question asked in March on whether one moved in past calendar year and whether move was within county, between counties in same state, or between states.	Excludes individuals residing in group quarters, who reported living abroad last year, less than one year old, and/or with imputed migration status.
Internal Revenue Service (IRS)	U.S. tax-filing population	Not a sample	Annually from 1990-91 to 2015-16[b]	State and county[c]	Based on previous and current addresses on tax returns.[c]	Excludes flows from and/or to outside of the United States, including U.S. territories.

Notes: [a] Migration data not available for all years. [b] Years correspond to consecutive tax-filing years; hereafter, we refer to each two-year period by first tax-filing year. [c] Only aggregated state- and county-level migration data are provided by the IRS.

Table 2. Descriptions of Longitudinal Datasets

Dataset	Universe	Sample Size	Time Span	Unit of Observation	Migration Information	Selection Criteria for Analysis
National Longitudinal Survey of Youth, 1979 Cohort (NLSY79)	American youth born between 1957 and 1964	12,686 in first round	1979-2014	Individual	State and county of residence at date of interview, annually until 1994, and biennially thereafter	All individuals age 39-47 as of January 2004 with non-missing location information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014.
National Longitudinal Survey of Youth, 1997 Cohort (NLSY97)	American youth born between 1980 and 1984	8,984 in first round	1997-2016	Individual	State and county of residence at date of interview, annually until 2011, and biennially thereafter	All individuals age 20-24 as of January 2004 with non-missing location information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016.
Panel Survey of Income Dynamics (PSID)	U.S. families in 1968 and their descendants. Immigrants added in 1997 and 1999.	32,393 individuals in 2015	1968-2015	Individual	State of residence annually until 2003 and biennially thereafter	All individuals with non-missing location information in all biennial interviews from 2005-2015, inclusive.
Survey of Income and Program Participation, 2004 Panel (SIPP04)	U.S. civilian non-institutionalized population	106,611 individuals in March 2004	2004-2007	Individual	Monthly state of residence	All individuals with non-missing location information from March 2004-March 2007, location measured as of last month of quarter (March, June, September, December)
Survey of Income and Program Participation, 2008 Panel (SIPP08)	U.S. civilian non-institutionalized population	85,723 individuals in September 2008	2008-2013	Individual	Monthly state of residence	All individuals with non-missing location information from September 2008-June 2013, location measured as of last month of quarter (March, June, September, December)

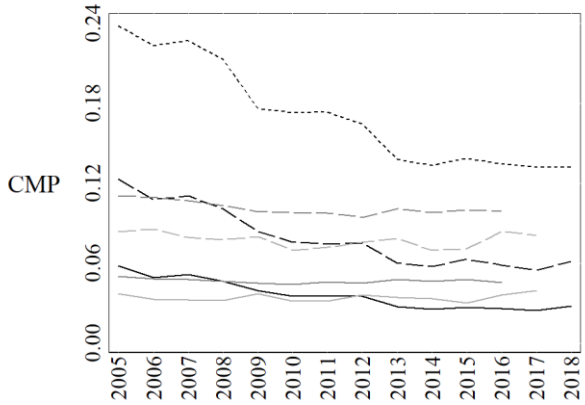
Figure 1. Annual Crude Migration Probability of U.S. Internal Migration at State, County, and Tract Levels since 2005 in Consumer Credit Panel, American Community Survey, Current Population Survey, and Internal Revenue Service Data



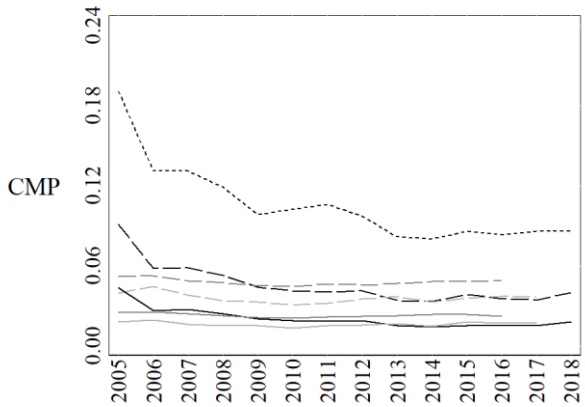
Notes: Selection criteria for analysis provided in Table 1. CMP = Crude Migration Probability; CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey; IRS = Internal Revenue Service; MIGPUMA = Public Use Microdata Area for Migration. CCP, ACS, and CPS estimates are weighted.

Figure 2. Annual Crude Migration Probability of U.S. Internal Migration by Age Group at State, County, and Tract Levels since 2005 in Consumer Credit Panel, American Community Survey, Current Population Survey

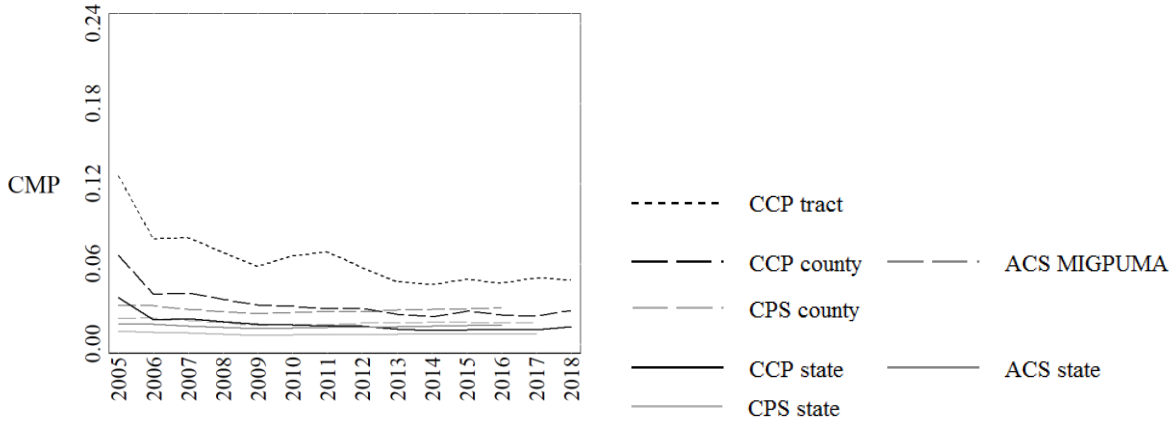
Panel A. Young Adults (Age 25-29)



Panel B. Family Age Adults (Age 30-49)



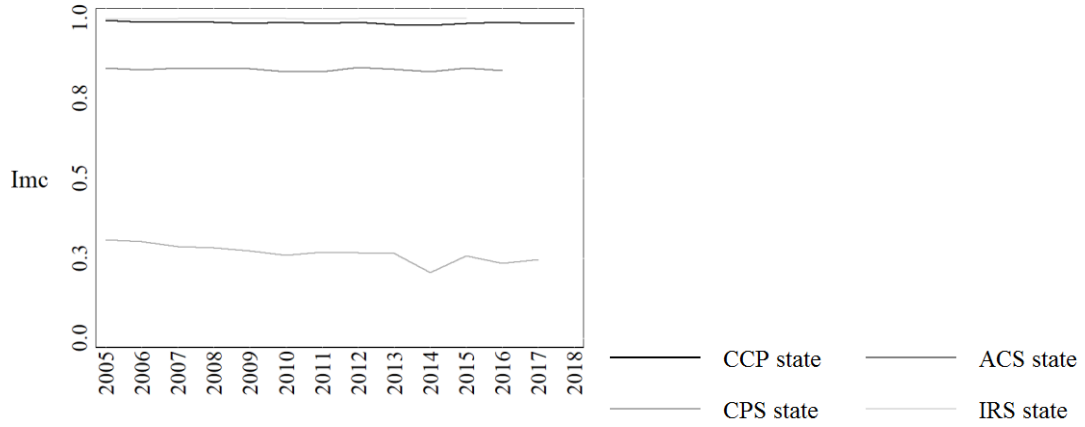
Panel C. Older Adults (Age 50-74)



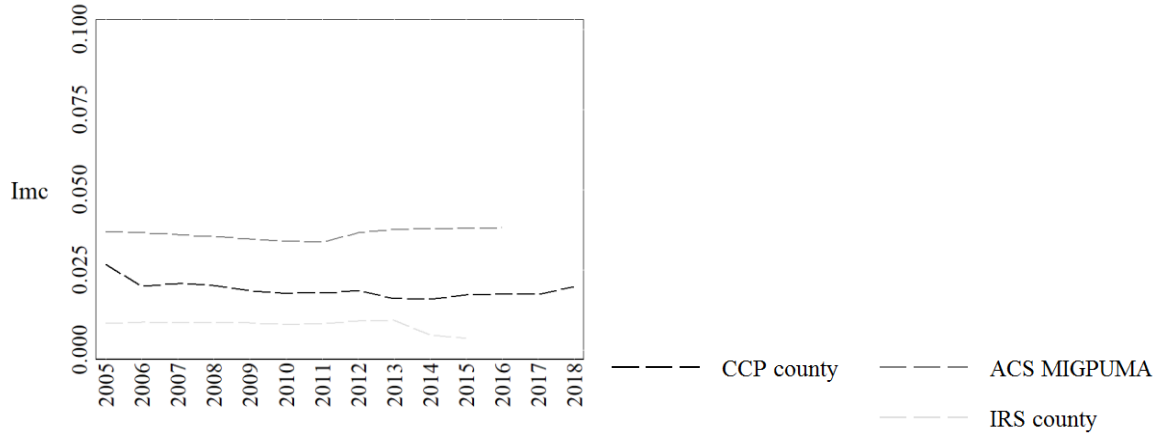
Notes: Selection criteria for analysis provided in Table 1. For ease of display, scales of y-axes differ from that in Figure 1. CMP = Crude Migration Probability; CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey; MIGPUMA = Public Use Microdata Area for Migration. CCP, ACS, and CPS estimates are weighted.

Figure 3. Annual Index of Migration Connectivity of U.S. Internal Migration at State, County, and Tract Levels since 2005 in Consumer Credit Panel, American Community Survey, Current Population Survey, and Internal Revenue Service Data

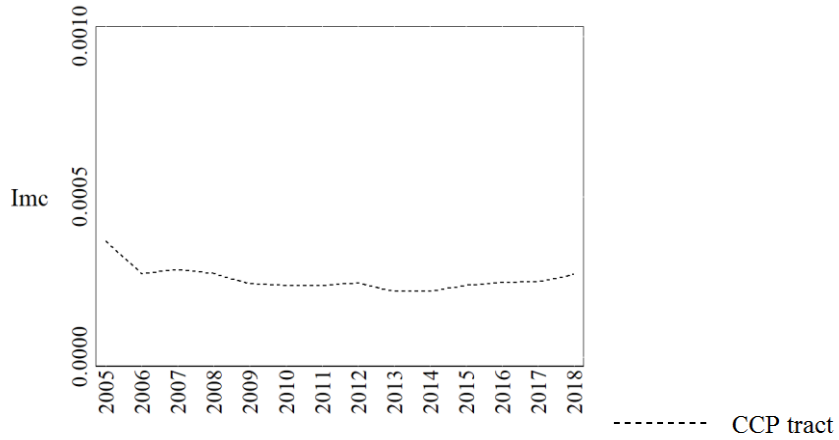
Panel A. State



Panel B. County

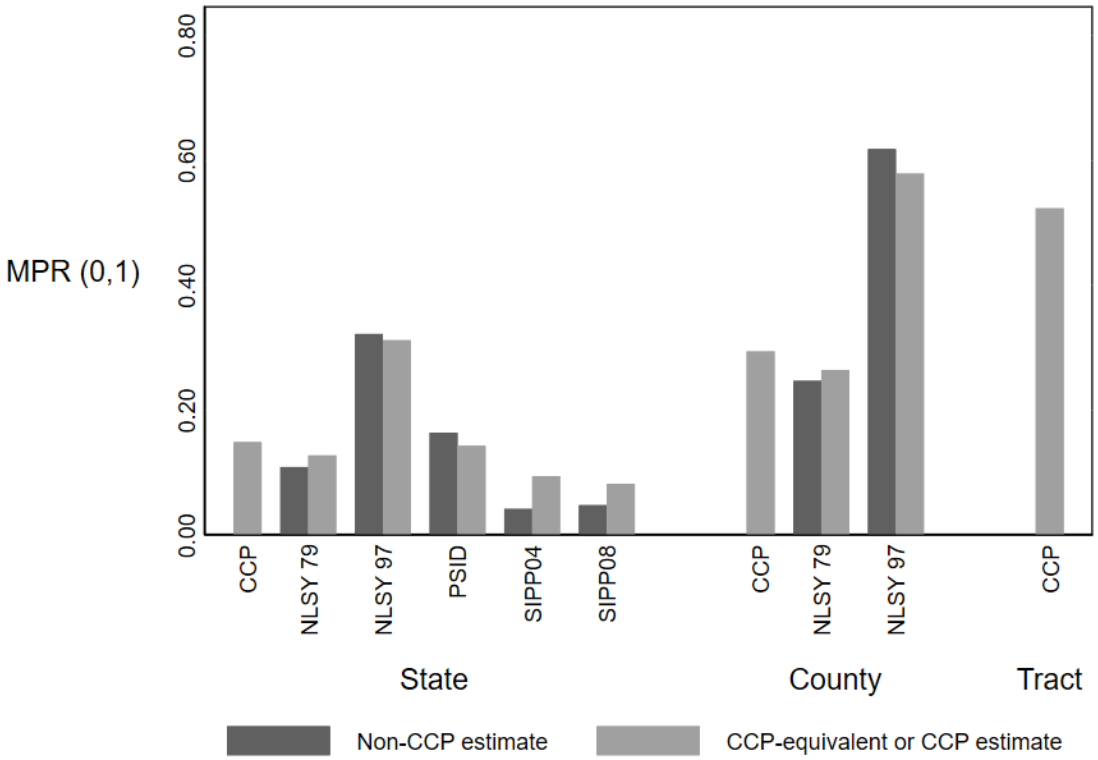


Panel C. Tract



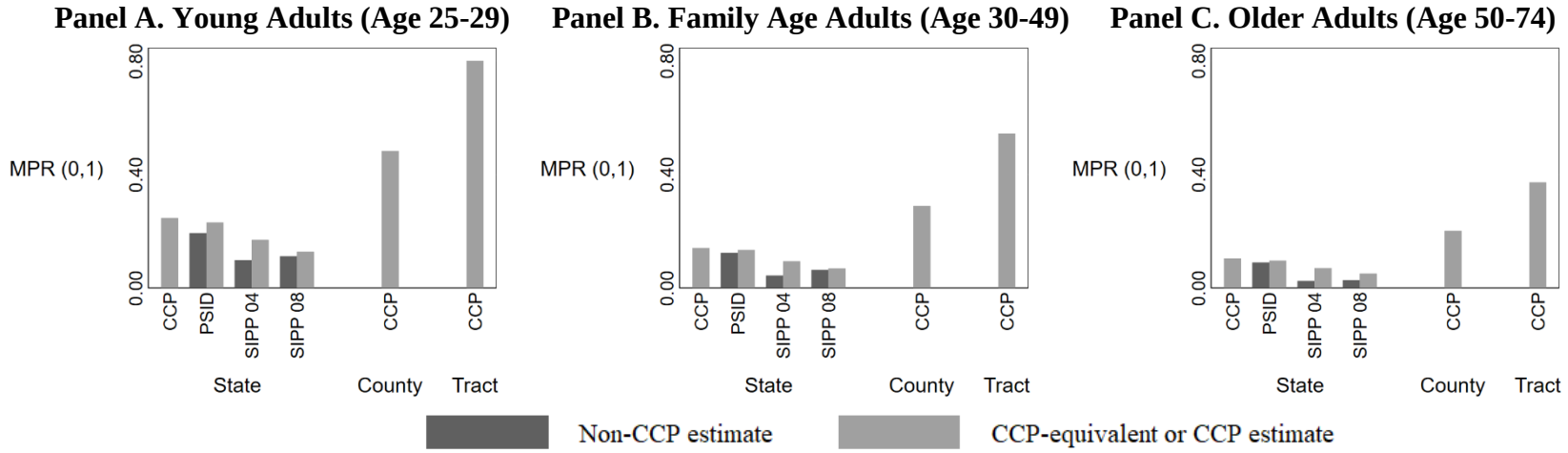
Notes: Selection criteria for analysis provided in Table 1. For ease of display, scales of y-axes differ across panels. Imc = Index of Migration Connectivity; CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey; IRS = Internal Revenue Service; MIGPUMA = Public Use Microdata Area for Migration. CCP, ACS, and CPS estimates are weighted.

Figure 4. Migration Progression Ratio of First U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)



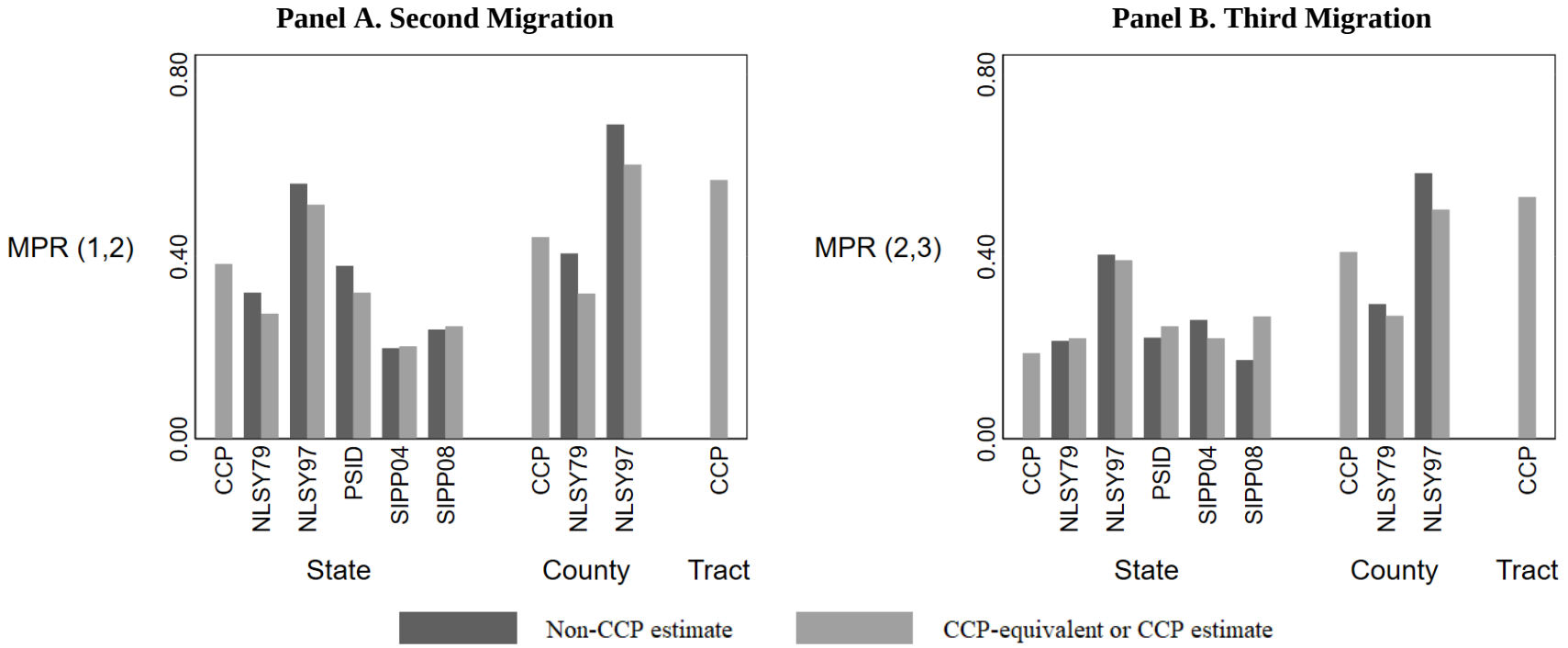
Notes: Selection criteria for analysis provided in Table 2. MPR(0,1) = Migration Progression Ratio of first migration; CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Figure 5. Migration Progression Ratio of First U.S. Internal Migration by Age Group at State, County, and Tract Levels in the Consumer Credit Panel and the Panel Study of Income Dynamics



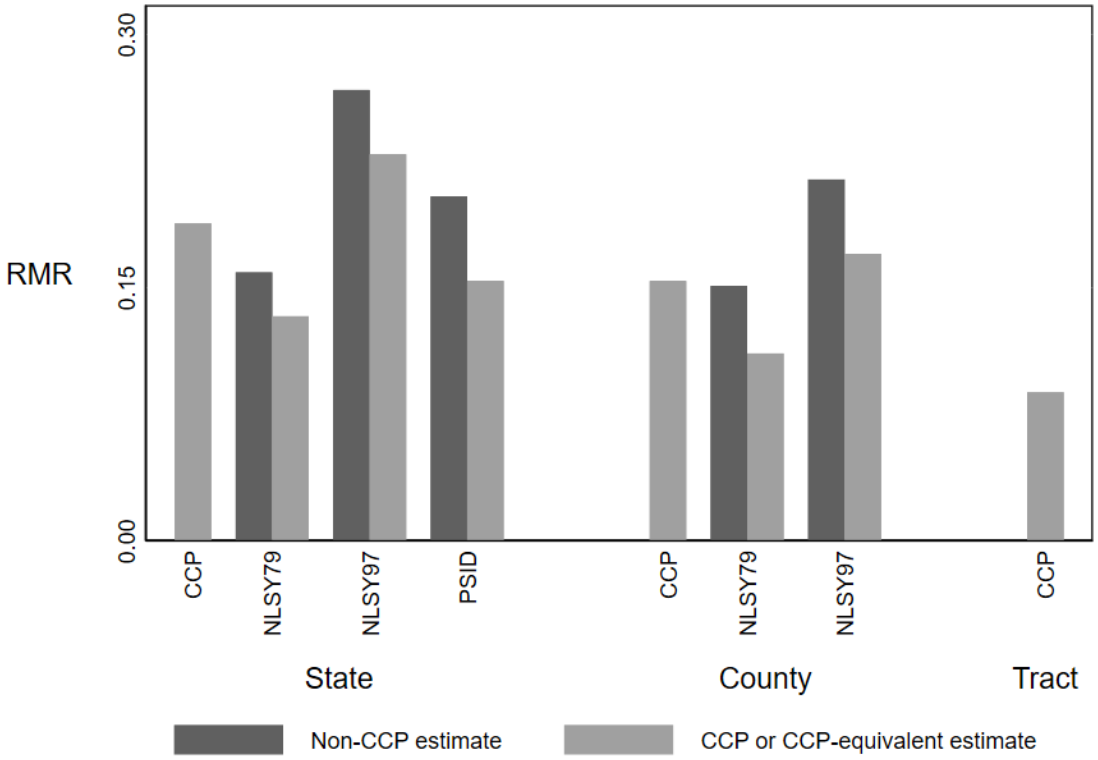
Notes: Selection criteria for analysis provided in Table 2. MPR(0,1) = Migration Progression Ratio of first migration; CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. PSID observation period spans 2005-2015; location measured biennially.

Figure 6. Migration Progression Ratios of Secord and Third U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)



Notes: Selection criteria for analysis provided in Table 2. MPR(1,2) = Migration Progression Ratio of second migration; MPR(2,3) = Migration Progression Ratio of third migration; CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Figure 7. Return Migration Ratio of U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), and Panel Study of Income Dynamics



Notes: Selection criteria for analysis provided in Table 2. RMR = Return Migration Ratio; CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially.

APPENDIX TABLES

Table A1. Estimates and Standard Errors of Annual Crude Migration Probability of U.S. Internal Migration at State, County, and Tract Levels since 2005 in Consumer Credit Panel, American Community Survey, and Current Population Survey

	State			County			Tract
	CCP	**ACS**	**CPS**	**CCP**	**ACS**	**CPS**	**CCP**
2005	0.0479	0.0251	0.0181	0.0975	0.0532	0.0400	0.1946
	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2006	0.0292	0.0249	0.0179	0.0628	0.0530	0.0427	0.1348
	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2007	0.0308	0.0235	0.0157	0.0655	0.0499	0.0375	0.1396
	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2008	0.0282	0.0225	0.0148	0.0604	0.0480	0.0337	0.1289
	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0005)	(0.0001)
2009	0.0248	0.0211	0.0145	0.0521	0.0456	0.0333	0.1102
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0005)	(0.0001)
2010	0.0230	0.0205	0.0134	0.0488	0.0448	0.0310	0.1123
	(<0.0001)	(0.0001)	(0.0003)	(0.0001)	(0.0002)	(0.0005)	(0.0001)
2011	0.0229	0.0209	0.0144	0.0481	0.0450	0.0316	0.1156
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0005)	(0.0001)
2012	0.0238	0.0211	0.0149	0.0500	0.0443	0.0339	0.1096
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2013	0.0192	0.0218	0.0149	0.0418	0.0457	0.0341	0.0944
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2014	0.0186	0.0221	0.0141	0.0413	0.0463	0.0315	0.0943
	(<0.0001)	(0.0001)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2015	0.0202	0.0223	0.0149	0.0445	0.0463	0.0323	0.0990
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2016	0.0205	0.0221	0.0149	0.0455	0.0464	0.0345	0.1012
	(<0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0002)	(0.0006)	(0.0001)
2017	0.0203		0.0156	0.0451		0.0336	0.1052
	(<0.0001)		(0.0004)	(0.0001)		(0.0006)	(0.0001)
2018	0.0245			0.0526			0.1073
	(<0.0001)			(0.0001)			(0.0001)

Notes: Selection criteria for analysis provided in Table 1. CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey. Due to data limitations, county ACS estimates reflect Public Use Microdata Areas for Migration (MIGPUMAs), not counties. CCP, ACS, and CPS estimates are weighted.

Table A2. Estimates and Standard Errors of Annual Crude Migration Probability of U.S. Internal Migration by Age Group at State, County, and Tract Levels since 2005 in Consumer Credit Panel, American Community Survey, and Current Population Survey

Panel A. Young Adults (Age 25-29)

	State			County			Tract
	CCP	**ACS**	**CPS**	**CCP**	**ACS**	**CPS**	**CCP**
2005	0.0829	0.0502	0.0371	0.1774	0.1106	0.0836	0.3423
	(0.0003)	(0.0007)	(0.0024)	(0.0004)	(0.0010)	(0.0035)	(0.0005)
2006	0.0570	0.0485	0.0331	0.1261	0.1094	0.0857	0.2586
	(0.0003)	(0.0007)	(0.0021)	(0.0004)	(0.0010)	(0.0034)	(0.0005)
2007	0.0615	0.0480	0.0324	0.1340	0.1069	0.0793	0.2710
	(0.0003)	(0.0007)	(0.0021)	(0.0004)	(0.0010)	(0.0033)	(0.0005)
2008	0.0589	0.0463	0.0320	0.1296	0.1033	0.0776	0.2653
	(0.0003)	(0.0007)	(0.0021)	(0.0004)	(0.0010)	(0.0032)	(0.0005)
2009	0.0523	0.0449	0.0370	0.1130	0.0988	0.0801	0.2305
	(0.0002)	(0.0006)	(0.0022)	(0.0003)	(0.0009)	(0.0032)	(0.0004)
2010	0.0491	0.0440	0.0316	0.1065	0.0979	0.0699	0.2272
	(0.0002)	(0.0006)	(0.0020)	(0.0003)	(0.0009)	(0.0030)	(0.0004)
2011	0.0512	0.0458	0.0314	0.1089	0.0975	0.0719	0.2318
	(0.0002)	(0.0007)	(0.0021)	(0.0003)	(0.0010)	(0.0031)	(0.0005)
2012	0.0541	0.0450	0.0364	0.1155	0.0946	0.0757	0.2337
	(0.0002)	(0.0007)	(0.0023)	(0.0003)	(0.0009)	(0.0033)	(0.0005)
2013	0.0438	0.0480	0.0346	0.0971	0.1009	0.0784	0.2060
	(0.0002)	(0.0007)	(0.0022)	(0.0003)	(0.0009)	(0.0034)	(0.0004)
2014	0.0436	0.0465	0.0333	0.0982	0.0982	0.0697	0.2085
	(0.0002)	(0.0006)	(0.0029)	(0.0003)	(0.0009)	(0.0040)	(0.0004)
2015	0.0479	0.0478	0.0301	0.1059	0.0999	0.0709	0.2193
	(0.0002)	(0.0007)	(0.0021)	(0.0003)	(0.0009)	(0.0033)	(0.0004)
2016	0.0479	0.0457	0.0361	0.1072	0.0988	0.0840	0.2220
	(0.0002)	(0.0006)	(0.0026)	(0.0003)	(0.0009)	(0.0038)	(0.0004)
2017	0.0478		0.0395	0.1066		0.0808	0.2262
	(0.0002)		(0.0026)	(0.0003)		(0.0036)	(0.0005)
2018	0.0580			0.1242			0.2374
	(0.0003)			(0.0004)			(0.0005)

Notes: Selection criteria for analysis provided in Table 1. CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey. Due to data limitations, county ACS estimates reflect Public Use Microdata Areas for Migration (MIGPUMAs), not counties. CCP, ACS, and CPS estimates are weighted.

Panel B. Family Age (Age 30-49)

	State			County			Tract
	CCP	**ACS**	**CPS**	**CCP**	**ACS**	**CPS**	**CCP**
2005	0.0472	0.0248	0.0181	0.0987	0.0518	0.0396	0.2095
	(0.0001)	(0.0002)	(0.0007)	(0.0002)	(0.0003)	(0.0011)	(0.0002)
2006	0.0300	0.0255	0.0192	0.0652	0.0526	0.0445	0.1480
	(0.0001)	(0.0002)	(0.0008)	(0.0001)	(0.0003)	(0.0012)	(0.0002)
2007	0.0321	0.0241	0.0161	0.0688	0.0490	0.0382	0.1546
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0011)	(0.0002)
2008	0.0298	0.0229	0.0154	0.0643	0.0474	0.0337	0.1448
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0010)	(0.0002)
2009	0.0264	0.0214	0.0153	0.0560	0.0451	0.0331	0.1248
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0010)	(0.0002)
2010	0.0249	0.0206	0.0134	0.0538	0.0446	0.0307	0.1298
	(0.0001)	(0.0002)	(0.0006)	(0.0001)	(0.0003)	(0.0010)	(0.0002)
2011	0.0260	0.0220	0.0155	0.0554	0.0463	0.0321	0.1369
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0011)	(0.0002)
2012	0.0275	0.0222	0.0157	0.0589	0.0457	0.0353	0.1350
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0011)	(0.0002)
2013	0.0227	0.0226	0.0165	0.0506	0.0467	0.0369	0.1202
	(0.0001)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0011)	(0.0002)
2014	0.0233	0.0235	0.0147	0.0527	0.0481	0.0329	0.1247
	(0.00006)	(0.0002)	(0.0009)	(0.0001)	(0.0003)	(0.0013)	(0.0002)
2015	0.0262	0.0238	0.0179	0.0582	0.0485	0.0358	0.1332
	(0.0001)	(0.0002)	(0.0009)	(0.0001)	(0.0003)	(0.0012)	(0.0002)
2016	0.0267	0.0237	0.0170	0.0601	0.0486	0.0373	0.1379
	(0.0001)	(0.0002)	(0.0009)	(0.0001)	(0.0003)	(0.0012)	(0.0002)
2017	0.0268		0.0176	0.0601		0.0367	0.1428
	(0.0001)		(0.0008)	(0.0001)		(0.0012)	(0.0002)
2018	0.0325			0.0705			0.1491
	(0.0001)			(0.0001)			(0.0002)

Notes: Selection criteria for analysis provided in Table 1. CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey. Due to data limitations, county ACS estimates reflect Public Use Microdata Areas for Migration (MIGPUMAs), not counties. CCP, ACS, and CPS estimates are weighted.

Panel C. Older Adults (Age 50-74)

	State			County			Tract
	CCP	**ACS**	**CPS**	**CCP**	**ACS**	**CPS**	**CCP**
2005	0.0381	0.0150	0.0099	0.0720	0.0286	0.0190	0.1380
	(0.0001)	(0.0002)	(0.0006)	(0.0001)	(0.0003)	(0.0009)	(0.0002)
2006	0.0200	0.0149	0.0086	0.0406	0.0286	0.0194	0.0865
	(0.0001)	(0.0002)	(0.0006)	(0.0001)	(0.0002)	(0.0009)	(0.0002)
2007	0.0207	0.0134	0.0081	0.0421	0.0260	0.0175	0.0900
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0008)	(0.0002)
2008	0.0181	0.0124	0.0074	0.0368	0.0243	0.0160	0.0781
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0008)	(0.0001)
2009	0.0159	0.0115	0.0064	0.0320	0.0229	0.0138	0.0674
	(0.0001)	(0.0001)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2010	0.0152	0.0122	0.0070	0.0310	0.0235	0.0150	0.0738
	(0.0001)	(0.0001)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2011	0.0145	0.0123	0.0071	0.0296	0.0244	0.0143	0.0772
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2012	0.0149	0.0125	0.0069	0.0303	0.0243	0.0157	0.0685
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0008)	(0.0001)
2013	0.0122	0.0128	0.0072	0.0256	0.0253	0.0155	0.0582
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2014	0.0118	0.0132	0.0079	0.0253	0.0258	0.0164	0.0587
	(0.0001)	(0.0002)	(0.0006)	(0.0001)	(0.0002)	(0.0009)	(0.0001)
2015	0.0127	0.0137	0.0076	0.0272	0.0266	0.0161	0.0612
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0007)	(0.0001)
2016	0.0133	0.0137	0.0072	0.0285	0.0269	0.0156	0.0638
	(0.0001)	(0.0002)	(0.0005)	(0.0001)	(0.0002)	(0.0008)	(0.0001)
2017	0.0133		0.0075	0.0286		0.0159	0.0686
	(0.0001)		(0.0005)	(0.0001)		(0.0008)	(0.0001)
2018	0.0163			0.0341			0.0695
	(0.0001)			(0.0001)			(0.0001)

Notes: Selection criteria for analysis provided in Table 1. CCP = Consumer Credit Panel; ACS = American Community Survey; CPS = Current Population Survey. Due to data limitations, county ACS estimates reflect Public Use Microdata Areas for Migration (MIGPUMAs), not counties. CCP, ACS, and CPS estimates are weighted.

Table A3. Attrition Rates and Coverage Ratios in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)

	Attrition Rate	Coverage Ratio
CCP	0.051	0.819
NLSY79	0.220	0.920
NLSY97	0.265	0.862
PSID	0.319	0.900
SIPP04	0.742	0.665
SIPP08	0.783	0.585

Notes: CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. Attrition rate is fraction of sample at beginning of observation period with incomplete location histories through end of period. Coverage ratio is fraction of sample at end of observation period with complete histories back to beginning of period. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Table A4. Estimates and Standard Errors of Migration Progression Ratio of First U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)

	State	County	Tract
NLSY79	0.1090	0.2470	
	(0.0050)	(0.0070)	
CCP-Equivalent	0.1276	0.2680	
	(0.0003)	(0.0003)	
NLSY97	0.3220	0.6180	
	(0.0080)	(0.0080)	
CCP-Equivalent	0.3120	0.5944	
	(0.0005)	(0.0006)	
PSID	0.1640		
	(0.0030)		
CCP-Equivalent	0.1430		
	(0.0001)		
SIPP04	0.0420		
	(0.0010)		
CCP-Equivalent	0.0944		
	(0.0001)		
SIPP08	0.0480		
	(0.0002)		
CCP-Equivalent	0.0821		
	(0.0001)		
CCP	0.1489	0.2940	0.5230
	(0.0001)	(0.0002)	(0.0002)

Notes: Selection criteria for analysis provided in Table 2. CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015; locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Table A5. Estimates and Standard Errors of Migration Progression Ratio of First U.S. Internal Migration by Age Group at State, County, and Tract Levels in the Consumer Credit Panel, Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)

Panel A. Young Adults (Age 25-29)

	State	County	Tract
PSID	0.1945		
	(0.0142)		
CCP-Equivalent	0.2400		
	(0.0005)		
SIPP04	0.0995		
	(0.0099)		
CCP-Equivalent	0.1702		
	(0.0004)		
SIPP08	0.1117		
	(0.0134)		
CCP-Equivalent	0.1283		
	(0.0004)		
CCP	0.2468	0.4833	0.8006
	(0.0005)	(0.0006)	(0.0005)

Panel B. Family Age Adults (Age 30-49)

	State	County	Tract
PSID	0.1241		
	(0.0068)		
CCP-Equivalent	0.1363		
	(0.0002)		
SIPP04	0.0440		
	(0.0027)		
CCP-Equivalent	0.0940		
	(0.0001)		
SIPP08	0.0645		
	(0.0045)		
CCP-Equivalent	0.0685		
	(0.0001)		
CCP	0.1411	0.2885	0.5445
	(0.0002)	(0.0002)	(0.0003)

Panel C. Older Adults (Age 50-74)

	State	County	Tract
PSID	0.0905		
	(0.007)		
CCP-Equivalent	0.1010		
	(0.0002)		
SIPP04	0.0255		
	(0.0020)		
CCP-Equivalent	0.0702		
	(0.0001)		
SIPP08	0.0287		
	(0.0024)		
CCP-Equivalent	0.0514		
	(0.0001)		
CCP	0.1053	0.2018	0.3715
	(0.0002)	(0.0002)	(0.0003)

Notes: Selection criteria for analysis provided in Table 2. CCP = Consumer Credit Panel; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015. Locations are derived from current mailing addresses reported by lenders to Equifax. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Table A6. Estimates and Standard Errors of Migration Progression Ratios of Second and Third U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), Panel Study of Income Dynamics, and Survey of Income and Program Participation (2004 and 2008)

Panel A. Second Migration

	State	County	Tract
NLSY79	0.3210	0.4070	
	(0.0220)	(0.0150)	
CCP-Equivalent	0.2748	0.3189	
	(0.0009)	(0.0007)	
NLSY97	0.5600	0.6900	
	(0.0160)	(0.0100)	
CCP-Equivalent	0.5136	0.6017	
	(0.0011)	(0.0008)	
PSID	0.3800		
	(0.0100)		
CCP-Equivalent	0.3207		
	(0.0004)		
SIPP04	0.1990		
	(0.0140)		
CCP-Equivalent	0.2033		
	(0.0004)		
SIPP08	0.2400		
	(0.0190)		
CCP-Equivalent	0.2467		
	(0.0005)		
CCP	0.3839	0.4427	0.5683
	(0.0004)	(0.0003)	(0.0002)

Panel B. Third Migration

	State	County	Tract
NLSY79	0.2150	0.2960	
	(0.0033)	(0.0220)	
CCP-Equivalent	0.2205	0.2696	
	(0.0017)	(0.0011)	
NLSY97	0.4040	0.5820	
	(0.0210)	(0.0130)	
CCP-Equivalent	0.3918	0.5027	
	(0.0015)	(0.0010)	
PSID	0.2220		
	(0.0140)		
CCP-Equivalent	0.2468		
	(0.0007)		
SIPP04	0.2610		
	(0.0360)		
CCP-Equivalent	0.2214		
	(0.0010)		
SIPP08	0.1730		
	(0.0340)		
CCP-Equivalent	0.2694		
	(0.0010)		
CCP	0.3427	0.4100	0.5310
	(0.0007)	(0.0005)	(0.0003)

Notes: Selection criteria for analysis provided in Table 2. CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics; SIPP04 = Survey of Income and Program Participation 2004; SIPP08 = Survey of Income and Program Participation 2008. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015. Locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.

Table A7. Estimates and Standard Errors of Return Migration Ratio of U.S. Internal Migration at State, County, and Tract Levels in Consumer Credit Panel, National Longitudinal Survey of Youth (1979 and 1997 Cohorts), and Panel Study of Income Dynamics

	State	County	Tract
NLSY79	0.1590	0.1510	
	(0.0170)	(0.0110)	
CCP-Equivalent	0.1331	0.1110	
	(0.0007)	(0.0005)	
NLSY97	0.2670	0.2140	
	(0.0140)	(0.0009)	
CCP-Equivalent	0.2292	0.1699	
	(0.0009)	(0.0006)	
PSID	0.2040		
	(0.0008)		
CCP-Equivalent	0.1539		
	(0.0003)		
CCP	0.1877	0.1536	0.0883
	(0.0003)	(0.0002)	(0.0001)

Notes: Selection criteria for analysis provided in Table 2. CCP = Consumer Credit Panel; NLSY79 = National Longitudinal Survey of Youth, 1979 Cohort; NLSY97 = National Longitudinal Survey of Youth, 1997 Cohort; PSID = Panel Study of Income Dynamics. CCP sample contains all individuals with complete panels from Q1 2005 to Q1 2015. Locations are derived from current mailing addresses reported by lenders to Equifax. NLSY79 sample contains all individuals age 39-47 as of January 2004 with non-missing migration information through 2014 interview; location measured as of biennial interview date from January 2004-December 2014. NLSY97 sample contains all individuals age 20-24 as of January 2004 with non-missing migration information through 2016 interview; location measured as of biennial interview date from January 2004-June 2016. PSID observation period spans 2005-2015; location measured biennially. SIPP04 observation period spans March 2004-March 2007; location measured quarterly. SIPP08 observation period spans September 2008-September 2013; location measured quarterly.