Weathering Volatility 2.0

October 2019

A Monthly Stress Test to Guide Savings

JPMorgan Chase & Co.
INSTITUTE

Abstract

Inconsistent or unpredictable swings in income and expenses make it difficult for families to plan spending, pay down debt, or determine how much to save. In this report, the JPMorgan Chase Institute uses administrative banking data to study the nature and trends of month-to-month fluctuations in income and spending and the levels of cash buffer families need to weather adverse income and spending shocks. We analyze monthly income, spending, and account balances of over six million families' Chase checking accounts between 2013 and 2018.

We find that month-to-month income volatility remained relatively constant between 2013 and 2018. The level of income volatility remained high, with those at the median level experiencing a 36 percent change in income month-to-month. In addition, families experience large income swings in five months out of a year, where income spikes are twice as likely as dips and most common in March and December. Families with the most volatile incomes experience larger but not more frequent swings than those with less volatile incomes. There is wide variation in the levels of income volatility families experience, and volatility is greatest amongst the young and those in the highest income quintile. However, low-income families experience larger and more frequent income dips, an indication of downside risks. The trend of spending volatility was also flat between 2013 and 2018. While the level of spending volatility was also high, it was 15 percent lower than that of income volatility, except among account holders over the age of 75 and those with the largest cash buffers. Finally, we find that families need roughly six weeks of take-home income in liquid assets to weather a typical and simultaneous income dip and expenditure spike. Sixty-five percent of families lack a sufficient cash buffer to do so. Altogether, our results offer important empirical guidance for the minimum levels of liquid cash buffer families need and have implications for savings strategies to improve families' financial health.

About the Institute

The JPMorgan Chase Institute is harnessing the scale and scope of one of the world's leading firms to explain the global economy as it truly exists. Drawing on JPMorgan Chase's unique proprietary data, expertise, and market access, the Institute develops analyses and insights on the inner workings of the economy, frames critical problems, and convenes stakeholders and leading thinkers.

The mission of the JPMorgan Chase Institute is to help decision makers—policymakers, businesses, and nonprofit leaders—appreciate the scale, granularity, diversity, and interconnectedness of the global economic system and use timely data and thoughtful analysis to make more informed decisions that advance prosperity for all.

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Executive Summary

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In this report, the JPMorgan Chase Institute uses administrative bank account data to measure income and spending volatility and the minimum levels of cash buffer families need to weather adverse income and spending shocks.

Inconsistent or unpredictable swings in families' income and expenses make it difficult to plan spending, pay down debt, or determine how much to save. Managing these swings, or volatility, is increasingly acknowledged as an important component of American families' financial security. In prior JPMorgan Chase Institute (JPMCI) research, we have documented the high levels of income and expense volatility families experience. In this report, we make further progress toward understanding how volatility affects families and what levels of cash buffer they need to weather adverse income and spending shocks. We explore six key questions:

1. What is the trend of month-to-month income volatility between 2013 and 2018?
2. What is the distribution of income volatility and is it persistent from year to year?
3. What are the prevalence and magnitude of income spikes versus dips?
4. How does income volatility differ across demographic groups?
5. How does month-to-month spending volatility compare to income volatility, overall and across demographic groups?
6. What are the minimum levels of cash buffer that families need to weather adverse income and spending shocks?

Data Asset

FROM THE ENTIRE UNIVERSE OF NEARLY 40 MILLION CHASE DEPOSIT CUSTOMERS

SIX MILLION **ANONYMIZED FAMILIES**

form a 75-month balanced panel (October 2012 to December 2018)

Our unit of analysis is the primary account holder, which we refer to as a "family."
To be included in our sample, an account holder must have:

1

At least **five transactions** (inflows or outflows) from a personal checking account in every month between October 2012 and December 2018.

This attempts to ensure the Chase account observed is the account holder's active bank account.

2

At least **$400 in average monthly total income** for every twelve-month rolling period.

This serves to filter for account holders whose income is likely landing at the Chase account observed.

3

At least **$10 in average spending**, and at least $1 spent every month.

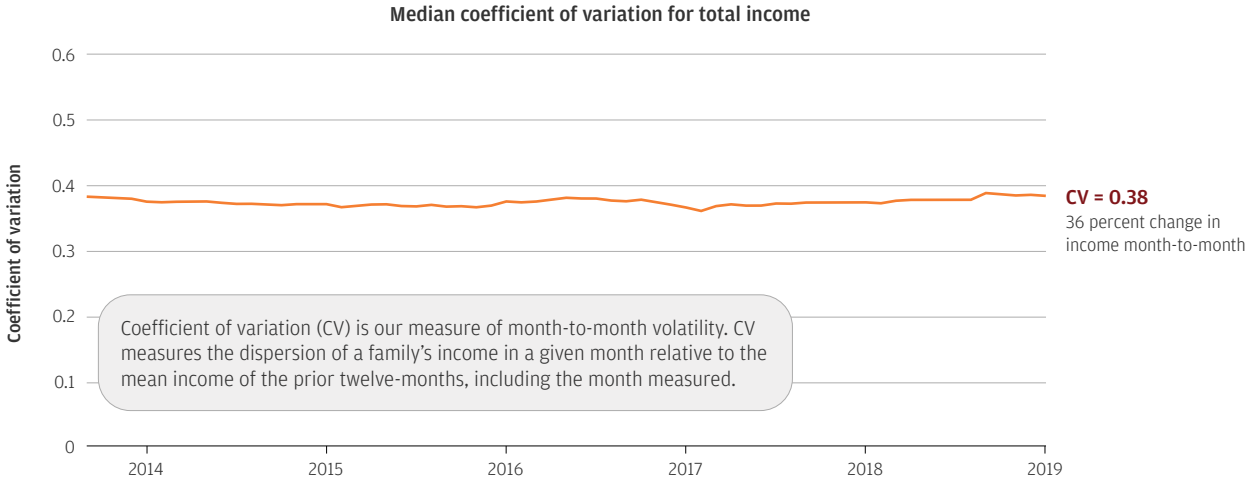
This attempts to ensure we see spending activity for a given account.

Incomes we observe are take-home incomes, meaning after taxes and payroll deductions. Income categories we construct in our data set include labor income (i.e. payroll and other direct deposits) and non-labor income (i.e. government income, capital income, and otherwise).

Source: JPMorgan Chase Institute

Finding One

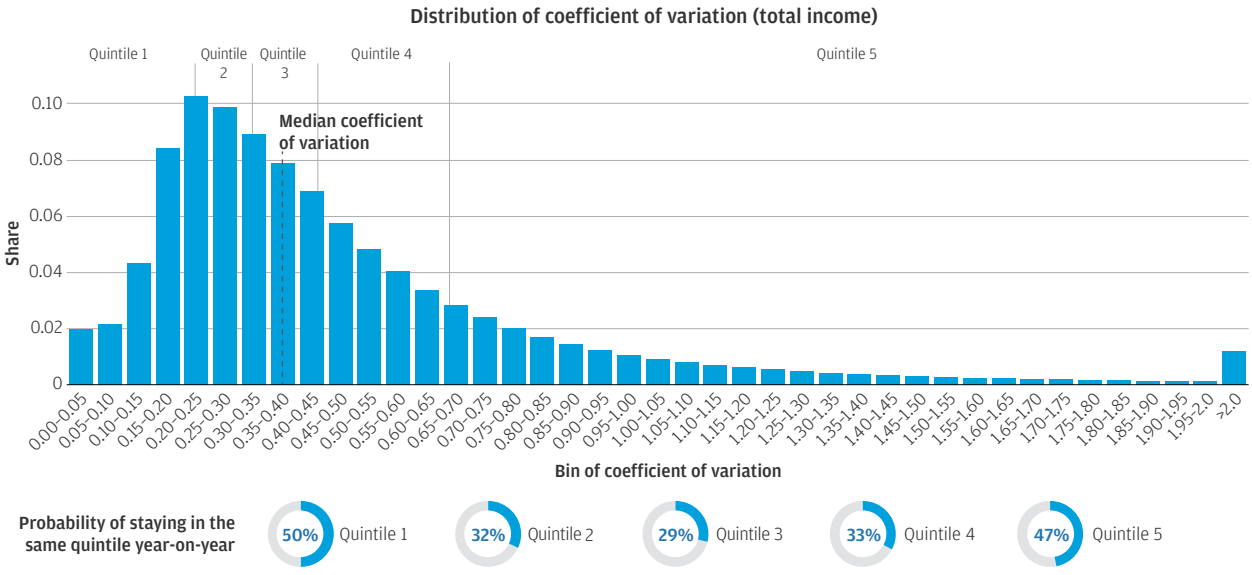
Income volatility remained relatively constant between 2013 and 2018. Those with the median level of volatility, on average, experienced a 36 percent change in income month-to-month during the prior year.



Source: JPMorgan Chase Institute

Finding Two

There is wide variation in the levels of income volatility families experience, both across families at a given point in time and also for a given family across time.

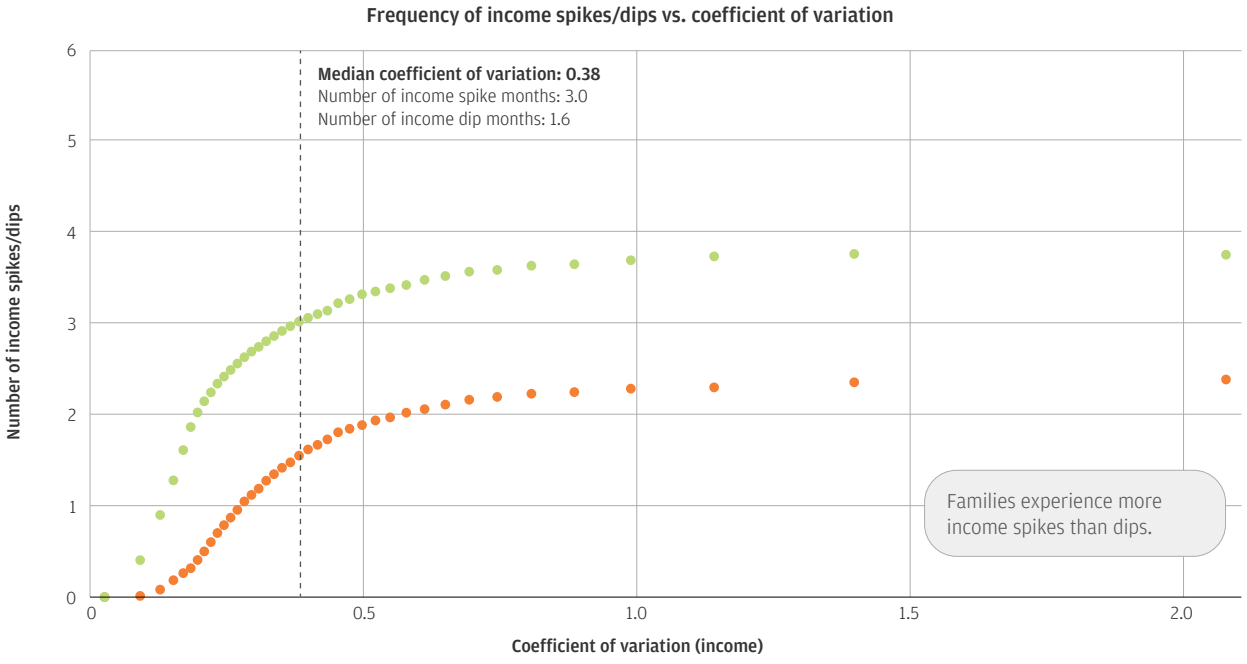


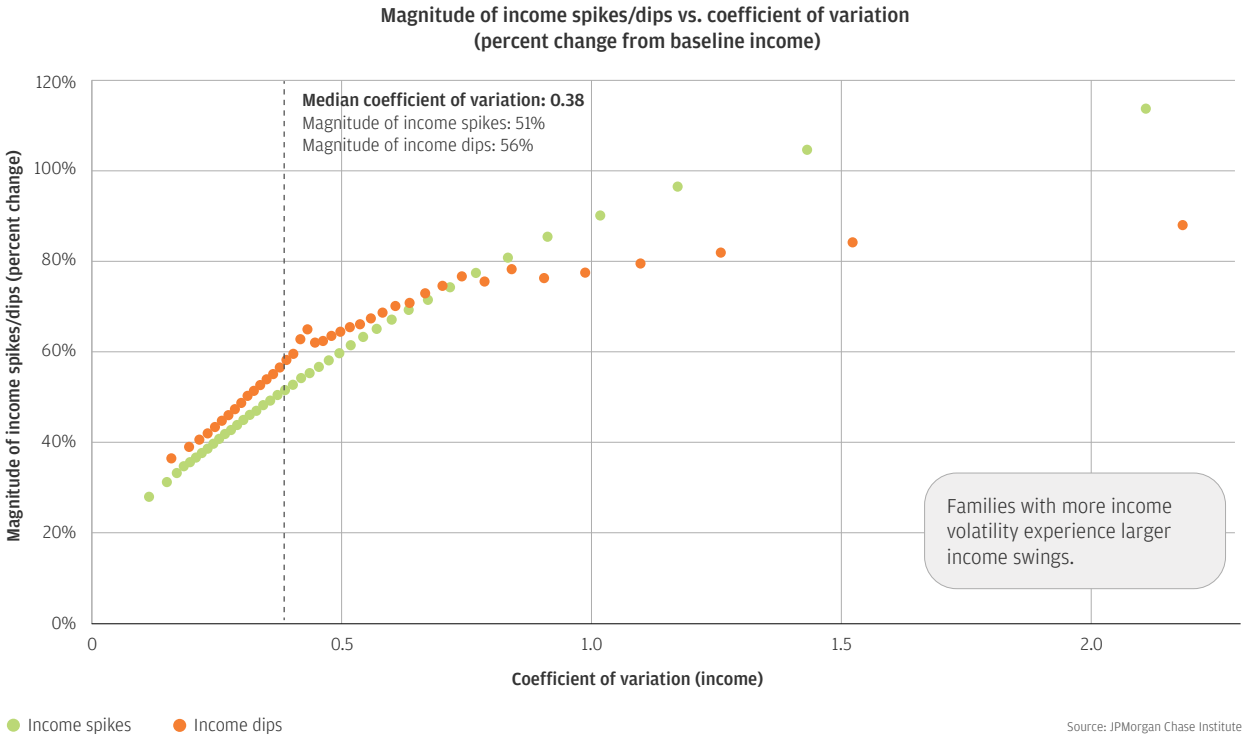
Note: These quintile cutoff points are computed for the year 2013.

Source: JPMorgan Chase Institute

Finding Three

On average, families experience large income swings, in almost five months out of a year. Income spikes are twice as likely as income dips and most common in March and December. Families with the most volatile incomes experience swings that are larger but not more frequent than families with less volatile incomes.

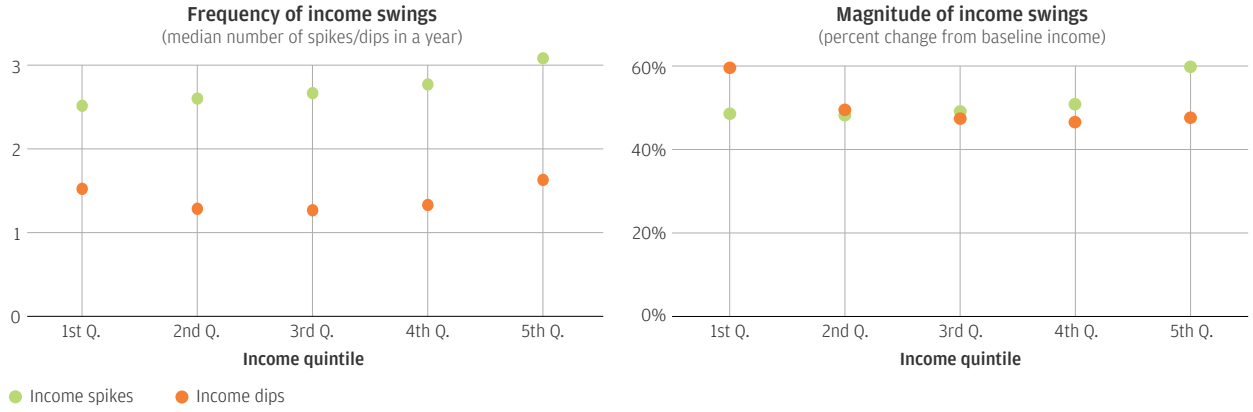




Source: JPMorgan Chase Institute

Finding Four

Income volatility is greatest amongst the young and the high income. However, downside risks, as measured by the magnitude and frequency of income dips, are greatest among low-income families.

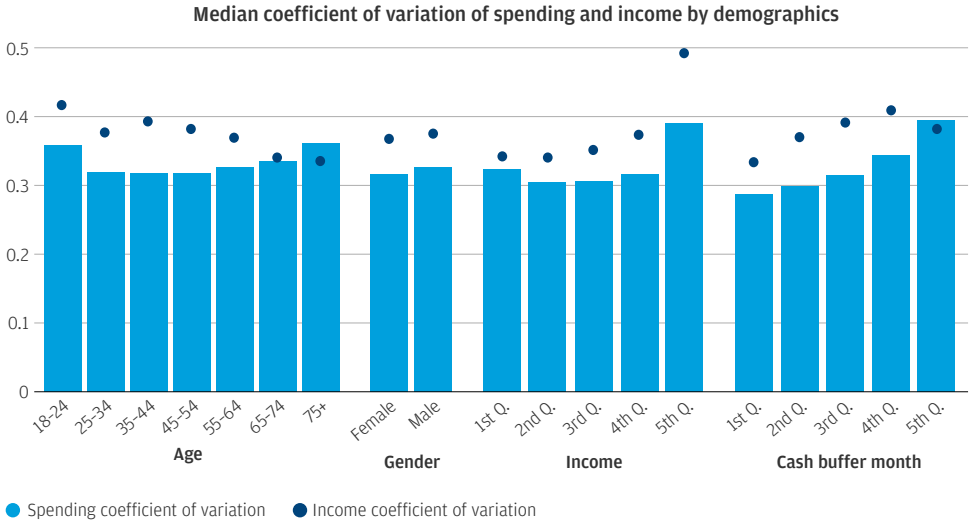


Note: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K.

Source: JPMorgan Chase Institute

Finding Five

The trend of spending volatility was flat between 2013 and 2018. While the level of spending volatility was also high, it was 15 percent lower than that of income volatility, except among account holders over the age of 75 and those with the largest cash buffers.



Spending volatility across demographic groups, while still high, is lower than income volatility.

Note: Cash buffer month is calculated as the average ratio of monthly account balances (checking and savings) to monthly expenses within a year. Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K. Cash buffer month quintile ranges: Quintile 1: <0.24, Quintile 2: 0.24-0.47, Quintile 3: 0.47-0.92, Quintile 4: 0.92-2.35, Quintile 5: >2.35.

Source: JPMorgan Chase Institute

Finding Six

Families need roughly six weeks of take-home income in liquid assets to weather a simultaneous income dip and expenditure spike. Sixty-five percent of families lack a sufficient cash buffer to do so.

Event	Frequency	Magnitude of cash buffer needed to weather event (median weeks of income)	Proportion of families with insufficient cash buffer to weather event
Simultaneous income dip & expenditure spike	Once every 5.5 years	6.2 weeks	65 percent
Income dip	Once every 9 months	2.8 weeks	48 percent
Expenditure spike	Once every 4 months	2.6 weeks	46 percent

Source: JPMorgan Chase Institute

Our findings have important implications for designing savings strategies to improve families' financial health and resilience. They suggest that the tools currently available to help families weather volatile income and spending could be better tailored to an individual's cash flows. Simply saving a certain percentage of monthly income may leave a family with an inadequate cash buffer, exacerbating financial distress in cash flow negative months and resulting in under-saving during cash flow positive months. Instead, families may need to more aggressively harvest savings opportunities during income spike months. We provide empirical guidance for families, financial health advocates, financial advisors, and policymakers on the minimum levels of cash buffer families need to weather adverse shocks. Given the key role stability plays in the health of families' financial life, it is critical that we continue to gauge how income and spending volatility are changing for American families and the implications for families' financial health.

Introduction

In an economic climate of real wage growth and rising employment, families are likely to experience increases in income. However, this prediction says nothing of the stability of these earnings or the manner in which they are dispersed over time. Managing this volatility is increasingly acknowledged as an important component of Americans' financial security. The Federal Reserve's annual Survey of Household Economics and Decisionmaking (SHED)'s latest 2018 survey, for example, now includes measures of income volatility and reveals that one-third of families with varying income month-to-month say they struggled to pay their bills at least once in the prior year for this reason (The Federal Reserve, 2019).

In this report, we make progress toward understanding the degree and nature of the volatility families experience, and what levels of cash buffer they need to weather adverse income and spending fluctuations.

Inconsistent or unpredictable swings in income and expenses make it difficult for families to plan spending, pay down debt, or determine how much to save. Month-to-month income fluctuations can be especially difficult for families to manage if they do not align with fluctuations in expenses. In previous JPMCI research, *Weathering Volatility* and *Paychecks, Paydays and the Online Platform Economy*, we used anonymized and de-identified administrative bank account data to document the high levels of income volatility that Americans experience, finding that forty-one percent of families saw more than a 30 percent change in income on a month-to-month basis. Notably, this high level of income volatility was observed across the income spectrum (Farrell and Greig, 2015; Farrell and Greig, 2016).

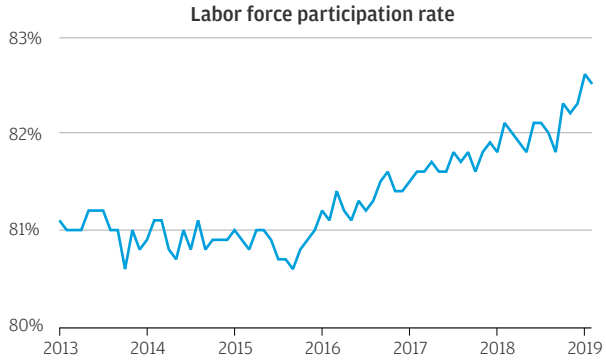
In this report, we explore six additional questions:

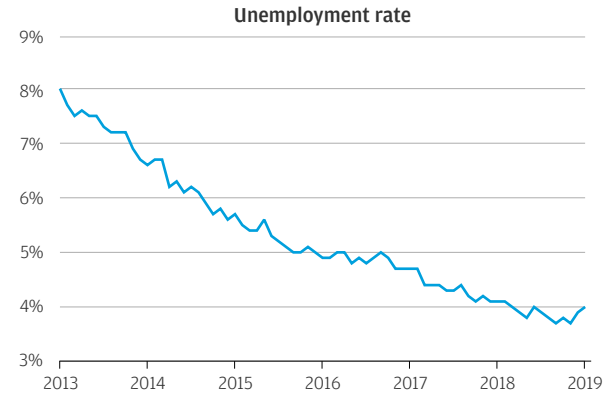
1. What is the trend of month-to-month income volatility between 2013 and 2018?
2. What is the distribution of income volatility and is it persistent from year to year?
3. What is the prevalence and magnitude of income spikes versus dips?
4. How does income volatility differ across demographic groups?
5. How does month-to-month spending volatility compare to income volatility, overall and across demographic groups?
6. What are the minimum levels of cash buffer that families need to weather adverse income and spending shocks?

First, we examine how income volatility has changed between 2013 and 2018. Economic indicators during this period yield varying predictions for trends in families' income volatility. For example, the unemployment rate decreased from eight percent in 2013 to four percent in early 2019 (Figure 1). On the one hand, overall job growth suggests that more people are entering formal employment with stable jobs, which suggests lower income volatility. On the other hand, strong labor market conditions, such as a lower unemployment rate and rising labor force participation, may also mean more frequent job switching which could suggest greater income volatility. In addition, income volatility driven by the rapid rise of contingent work and the Online Platform Economy is an active area of research (Farrell et al. 2018a; Abraham, et al., 2017).[1] While these alternative work arrangements provide highly flexible and accessible opportunities to generate earnings that may be more volatile by choice, online platforms also have the potential to help families smooth income and expense shocks by acting as an opportunity to build additional cash buffer (Farrell et al. forthcoming). In examining how the trend of income volatility has changed between 2013 and 2018, our analysis helps to shed new light on the reality of the income volatility families experience with a new administrative data source.

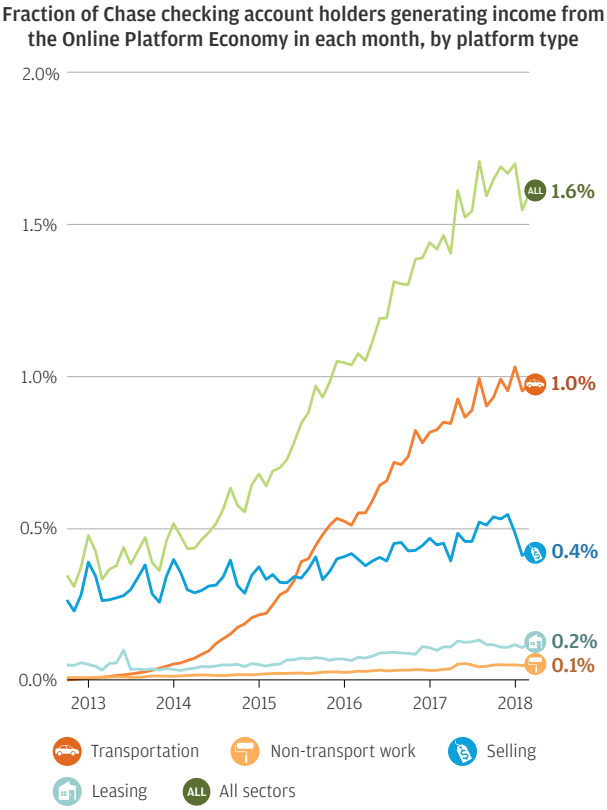
Even in a strong economic climate, families may experience a high level of income volatility.

Figure 1: Trends of economic indicators during our period of analysis (2013-2018).





Source: Bureau of Labor Statistics



Source: JPMorgan Chase Institute

Second, we examine the distribution of income volatility across our sample and the persistence of families' within-year volatility over time. Across the sample, families vary in the levels of volatility they experience. For the same family over time, the level of volatility also varies, meaning there is limited persistence over time. The level of persistence over time is important insofar as the families with the most stable income during one year may or may not have stable income the next year. Thus, their approach to managing cash flows may also need to change accordingly.

Third, we further describe income volatility by detailing the different types of volatility households might experience, specifically in terms of upward and downward variations (spikes and dips) in income. Our overall measure of income volatility represents the total variance a family experiences in its income path. However, not all variances are the same. For example, downward income variations (dips) from job loss have different implications for financial well-being than upward deviations (spikes) from year-end bonuses and warrant different responses. In this report, we distinguish spikes from dips and measure their respective frequency and magnitude separately.

Fourth, we examine heterogeneity in income volatility levels across demographic groups. Building on our prior work, we explore the extent to which both levels and types of income volatility differ across spectra of income, age, gender, and levels of checking and savings account balances held by the family. This allows us to uncover insights and tailor guidance not just for the average family but also specific to their demographic profile.

Fifth, we compare within-year income volatility to within-year spending volatility. To obtain a full picture of families' cash flows, it is important to examine spending as well as income. The dynamics between income volatility and spending volatility are important for consumption smoothing. Income and spending patterns that track closely could imply limited consumption smoothing. In the event of an income dip, a corresponding

spending dip could suggest that families face liquidity constraints to maintain their consumption levels and experience lower welfare, especially if they cut back on basic necessities.

Lastly, we estimate the levels of cash buffer families need to weather three types of adverse shocks to their savings: an income dip, an expenditure spike, and a simultaneous income dip and expenditure spike. The conventional wisdom of putting aside three to six months of expenses as an emergency fund is largely uninformed by data. We attempt to provide empirically grounded guidance on the minimum levels of cash buffer families need to weather adverse shocks and highlight the current savings gap we observe in our data for specific age and income groups.

To explore these questions, we constructed a data asset in the form of a balanced panel of six million anonymized Chase deposit customers for whom we have detailed, monthly transaction-level information on income, spending, and account balances (checking and savings) from 2013 to 2018. Our unit of analysis is the primary account holder which we subsequently refer to as "family" in this report. We aggregate financial activities across all users who are linked to the primary account holder. (For further description of our sample, see the Data Asset and Methodology section.)

Our data asset offers distinctive features that provide a unique lens on individual family income and spending volatility. Most studies on volatility to date rely on cross-sectional data—snapshots of different cohorts at certain points in time—often based on self-reported survey answers. Comprehensive panel data on income and spending, particularly from administrative sources, are rare. Our data asset provides analyses for a single cohort observed continuously over time for six years based on real financial transactions. Most studies, due to data limitations, have focused on year-to-year volatility based on annual income, which can mask important cash flow dynamics families experience within a year.

Our data give us the unique ability to measure volatility at a month-to-month frequency, providing a valuable view of the financial instability families may experience on a more frequent basis. We also observe take-home income—the income that arrives into families' financial accounts after taxes and other payroll deductions—as well as detailed sub-categories of income, including labor, government, capital, and other income. (See definitions of each income category in the Data Assets and Methodology section.) Moreover, alongside income, we observe spending and account balances. This provides us with a higher-frequency and granular view of income and spending that better aligns with the cash flow reality families face compared to other survey-based data sources. Finally, since we arrive at our income and spending estimates by aggregating inflows and outflows from checking accounts, we are less subjected to the measurement biases driven by missing data, recall, and reporting errors that are typically documented in survey data.

In this report, we develop six key findings.

Finding 1: Income volatility remained relatively constant between 2013 and 2018. Those with the median level of volatility, on average, experienced a 36 percent change in income month-to-month during the prior year.

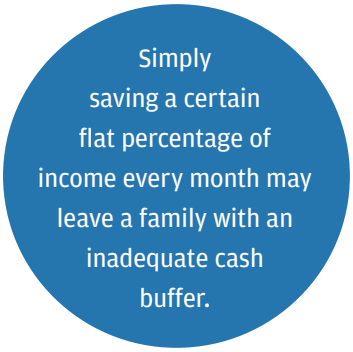
Finding 2: There is wide variation in the levels of income volatility families experience, both across families at a given point in time and also for a given family across time.

Finding 3: On average, families experience large income swings in almost five months out of a year. Income spikes are twice as likely as dips and most common in March and December. Families with the most volatile incomes experience swings that are larger but not more frequent than families with less volatile incomes.

Finding 4: Income volatility is greatest amongst the young and the high income. However, downside risks, as measured by the magnitude and frequency of income dips, are greatest among low-income families.

Finding 5: The trend of spending volatility was flat between 2013 and 2018. While the level of spending volatility was also high, it was 15 percent lower than that of income volatility, except among account holders over the age of 75 and those with the largest cash buffers.

Finding 6: Families need roughly six weeks of take-home income in liquid assets to weather a simultaneous income dip and expenditure spike. Sixty-five percent of families lack a sufficient cash buffer to do so.



Our findings have important implications for designing saving strategies to improve families' financial health and resilience. They suggest that the tools currently designed to help families weather volatile income and spending could be better tailored to individuals' cash flows. Given the timing mismatch between income and spending fluctuations on a month-to-month basis, many families may, from a cash flow perspective, spend more than they earn in some months. Simply saving a certain flat percentage of income every month may leave a family with an inadequate cash buffer, exacerbating financial distress in cash flow negative months and resulting in under-saving during cash flow positive months. Instead, families might be more financially resilient if they more aggressively harvested opportunities to save during income spike months.

The problems associated with saving a flat percentage of income per month do not apply solely to one individual family and their willingness or ability to save take-home pay, but also with the structure of all withholdings and payroll deductions. To the extent that employers want to help employees smooth their income, they might consider offering opportunities to help families take advantage of the possible chances to save presented during months in which they earn larger paychecks. These solutions might include taking larger deductions for benefits, tax withholdings, and pre-tax savings accounts in these months. In line with this thinking, policymakers could consider the possible benefits of providing access to tax withholdings during the year or distributing tax refunds or the Earned Income Tax Credit periodically throughout the year. This report provides empirical guidance and frameworks for families, financial health advocates, financial advisors, and policymakers on the minimum levels of cash buffer families need to weather adverse shocks with a new estimate. Given the key role stability plays in families' financial lives, it is critical that we continue to gauge how income volatility is changing for American families and the implications for their financial health and resilience.

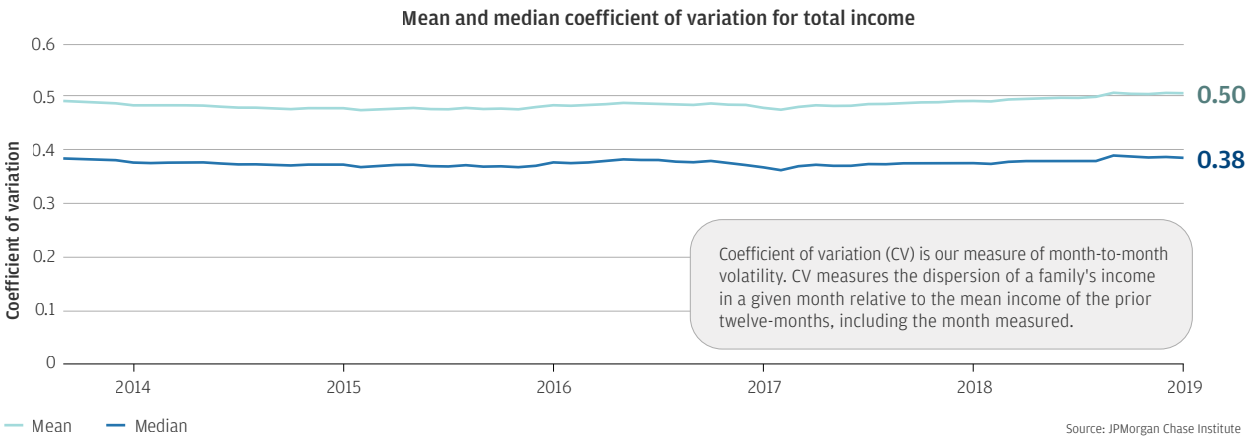
Finding

One

Income volatility remained relatively constant between 2013 and 2018. Those with the median level of volatility, on average, experienced a 36 percent change in income month-to-month during the prior year.

Across our balanced panel of six million families, the trend of total income volatility, measured by the Coefficient of Variation (CV), has remained relatively stable from 2013 to 2018 (Figure 2). In terms of levels of income volatility, we observe an average CV of 0.48 and a median CV of 0.38. Although there are no data sets we are aware of that we can benchmark with for trends of month-to-month income volatility during this timeframe, we compare to the U.S. Financial Diaries (USFD) data for the levels of volatility observed for twelve months between 2012 and 2013. Hannagan and Morduch (2015) find the median CV in the USFD data to be 0.34, lower than what we observe, likely because the USFD sample has lower income range than our sample.[2] They also provide an intuitive example to contextualize CV: a family that maintains the level of their average monthly income for six months of a year and then deviates 50 percent above and 50 percent below the average monthly level alternately for the remaining six months would have a CV of 0.38, the median level of CV in our sample.

Figure 2: Total income volatility remained stable between 2013 and 2018.



Box 1: How we measure income volatility and comparison with existing literature

We measure month-to-month income volatility with the Coefficient of Variation (CV) of monthly total take-home income. In other words, we measure the dispersion of a family's income in a given month relative to the mean income of the prior twelve months, including the month measured. Specifically, for each family-month:

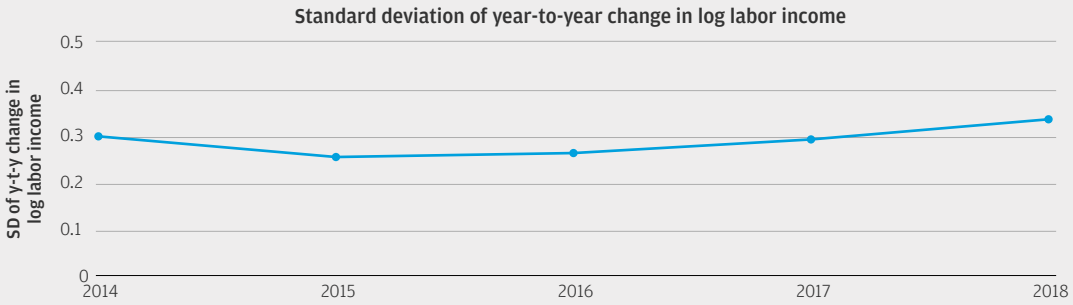
$$Coefficient\ of\ Variation_{i,m,j} = \frac{SD(Y_{i,m-11,j}, Y_{i,m-10,j}, \ldots, Y_{i,m,j})}{AVG(Y_{i,m-11,j}, Y_{i,m-10,j}, \ldots, Y_{i,m,j})};$$

Y = monthly income, i = individual family, m = month, j = income category

Alternative data sources and methodological differences previously used to study trends of income volatility over the past three to four decades have led to diverging conclusions. Using survey data such as the Panel Study in Income Dynamics (PSID) and the Survey of Income and Program Participation (SIPP), researchers have found rising income volatility over the past forty years. More specifically, Moffitt and Gottschalk (2012) show that, in the PSID, the transitory variance of male earnings in the U.S. has increased over time, starting from the 1970s and remaining at the higher level through the 1990s. Carr and Weimers (2017) also estimate a rise in volatility of male earnings from the 1970s through the early 2000s using administrative earnings data matched to SIPP and PSID data. However, using data from the Social Security Administration (SSA), the Congressional Budget Office (2007) finds that earnings volatility has been roughly flat since 1980. Others observe a downward trend in both the volatility of transitory and persistent earnings growth using SSA data (Gevenuen, Ozkan, and Song, 2014). These differences could be due to differences in data, sample, or measurement methods.

Most existing studies have measured earnings volatility of male working-age adults on a yearly frequency using the standard deviation of year-to-year change in log earnings. To provide a benchmark comparison to existing studies, we show the trend and level of labor income volatility among 20 to 64 year old males, using the standard deviation of year-to-year change in log labor income in Figure 3. By this measure, at the yearly level, income volatility dips slightly in 2015 and 2016 and then trends up in 2018—but the overall trend is still mostly constant.

Figure 3: Year-to-year volatility of labor income in terms of standard deviation of year-to-year changes from 2013 to 2017.

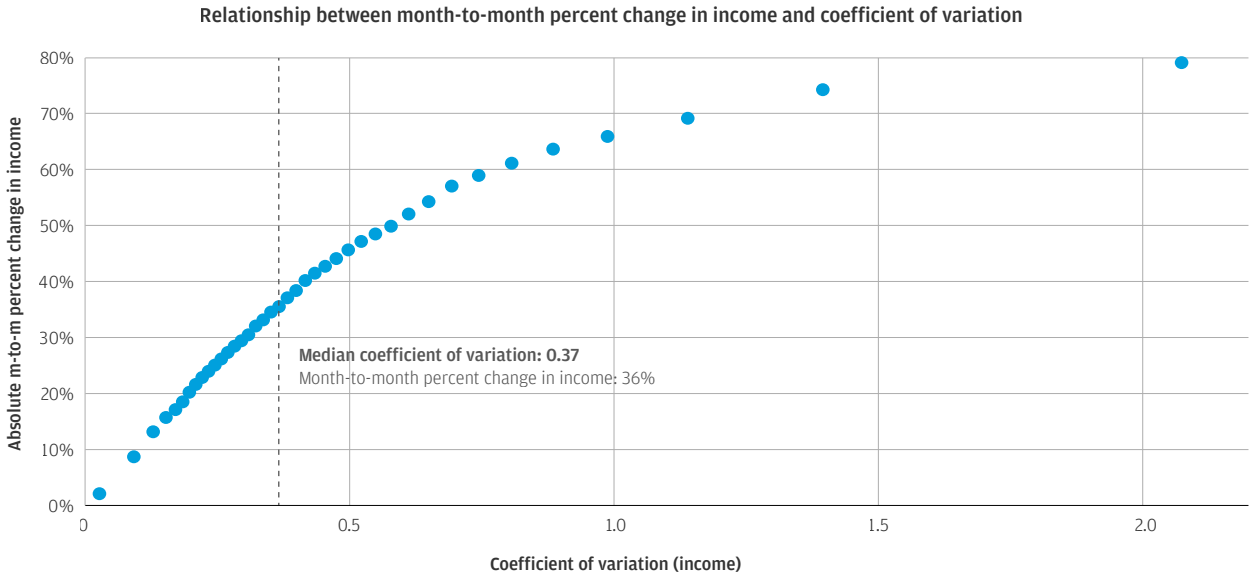


Note: The sample for Figure 3 only includes 20-64 year old male account holders in order to benchmark with existing studies.

Source: JPMorgan Chase Institute

Although the trend of income volatility has remained stable, the level of volatility is high throughout this period. We show the relationship between CV and absolute month-to-month percent change in Figure 4. For each family-month, we calculate the average month-to-month percent change in income and CV during the past twelve months. We then draw a random sample and plot the average month-to-month percent change for 40 equal bins of CV across the distribution.[3] For family-months in the median bin of CV, they experience a 36 percent change in monthly income on average during the prior twelve months.[4]

Figure 4: Families in the middle bin of the CV distribution experience, on average, a 36 percent month-to-month change in income within a year.

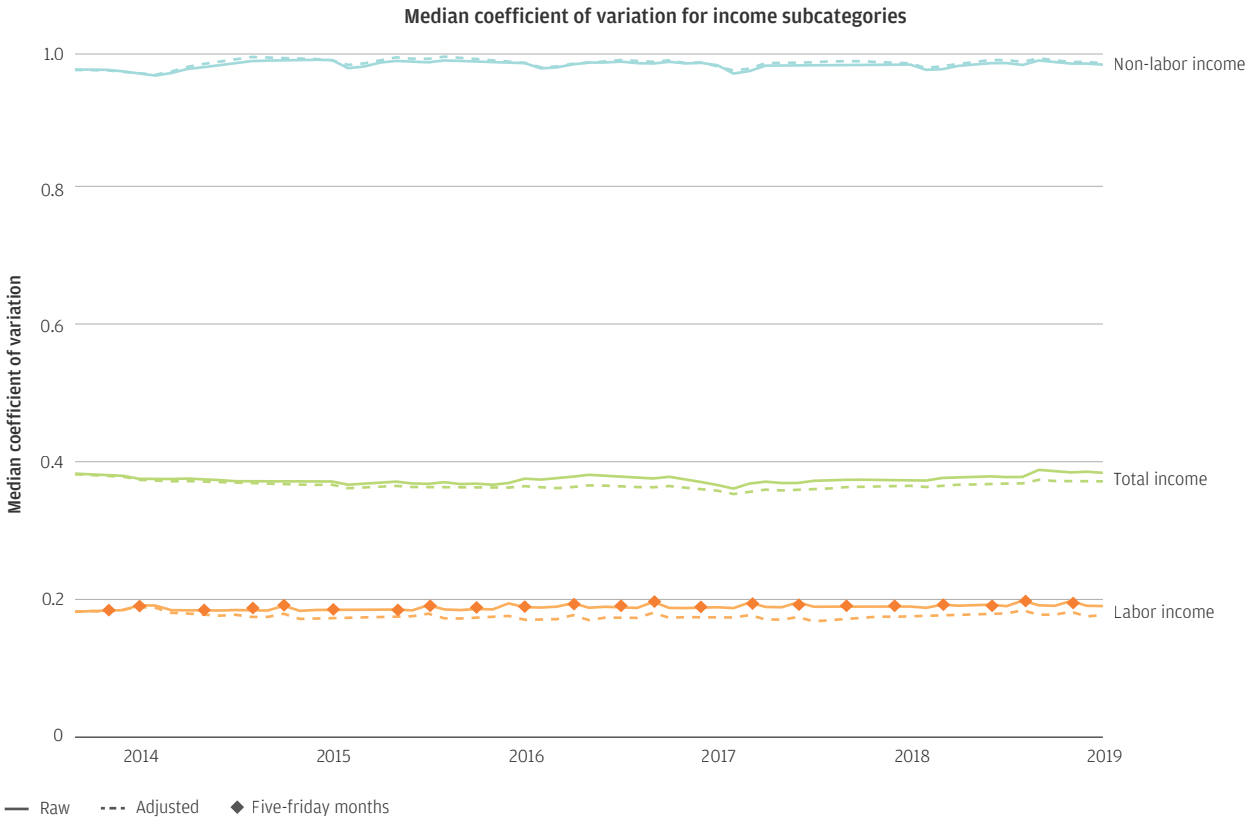


Notes: (1) Throughout this report, we calculate percent change as arc percent change using (B-A)/(0.5* (A+B)) which has the benefit of allowing for positive and negative changes to be represented symmetrically and also for changes from zero to be calculable. We refer to arc percent change in this report as percent change. (2) The median CV reported in Figure 4 does not equal the median CV reported in Figure 1 because, first, the median CV in Figure 1 changes slightly depending on the specific month and year and, second, we draw a random sample to plot the average month-to-month percent change for 40 equal bins of CV in Figure 4.

Source: JPMorgan Chase Institute

Volatility for both labor and non-labor income are also mostly constant during 2013 to 2018 (Figure 5). We calculate volatility trends for labor and non-labor income by measuring their CV separately. In considering labor income, we include any inflow transaction from payroll and direct deposits. Non-labor income includes capital income, government income, retirement income, and other miscellaneous income. Detailed categorization of income and their shares as part of total income are outlined in the Data Asset and Methodology section. Although labor and non-labor income volatility do not differ much in trends, they differ significantly in levels. Non-labor income has a median CV of around 1.0, more than five times higher than the median CV of labor income (CV = 0.23).

Figure 5: Volatility of non-labor income is five times higher than that of labor income. Limited amount of income volatility in our sample can be attributed to secular income trends or month-to-month calendar effects.



Note: For the adjusted series, we adjust for secular income trends and month-to-month calendar effects by running fixed effect regressions with month-year dummies among families within similar income bands.

Source: JPMorgan Chase Institute

Levels of total income volatility decrease only slightly when we adjust for secular income growth and month-to-month calendar effects, such as months with five Fridays resulting in an additional paycheck. Income volatility of this sort is predictable and therefore likely to pose less of a financial management problem than volatility that stems from unpredictable or idiosyncratic fluctuations. For this reason, we adjust our measure of income volatility for both secular trends in income growth and month-to-month calendar effects within a narrow income band.[5] Additionally, we run individual-level regressions on monthly dummies and include the results for this adjusted series in Figure 26 of the Appendix. These two different adjustment methods yield similar results. With these adjustments, volatility of labor income decreases from a CV of 0.19 to 0.17, smoothing out the upticks seen in aggregate labor income series during five-Friday months. We observe little effect of the adjustment on non-labor income. Volatility of total income decreases only slightly, by a CV of 0.01 (Figure 5). This suggests that the majority of total income volatility seen in our data stem from fluctuations that may be idiosyncratic to families or their income sources and cannot be attributed to secular income growth or the vicissitudes of calendar effects.

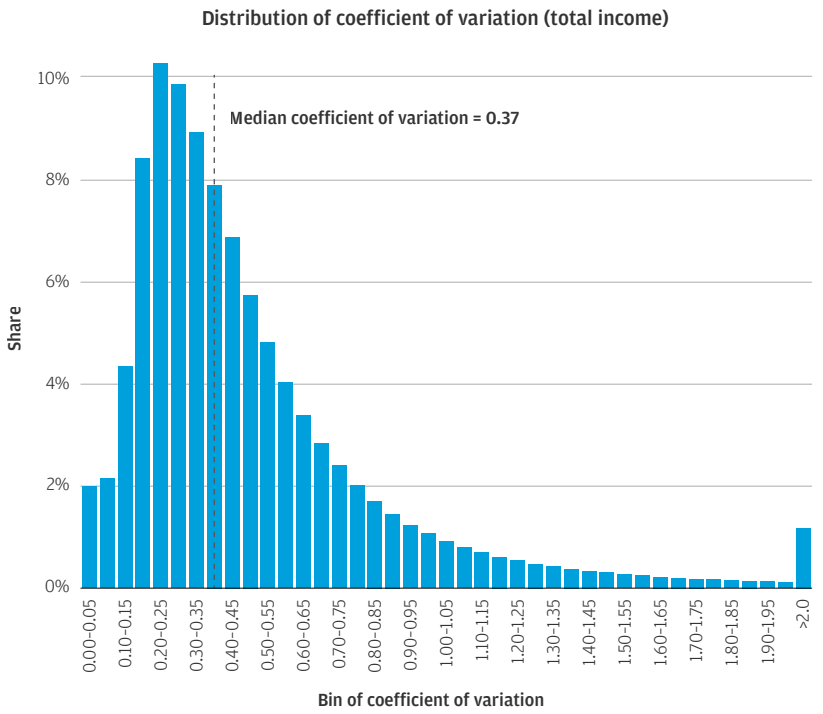
Finding

Two

There is wide variation in the levels of income volatility families experience, both across families at a given point in time and also for a given family across time.

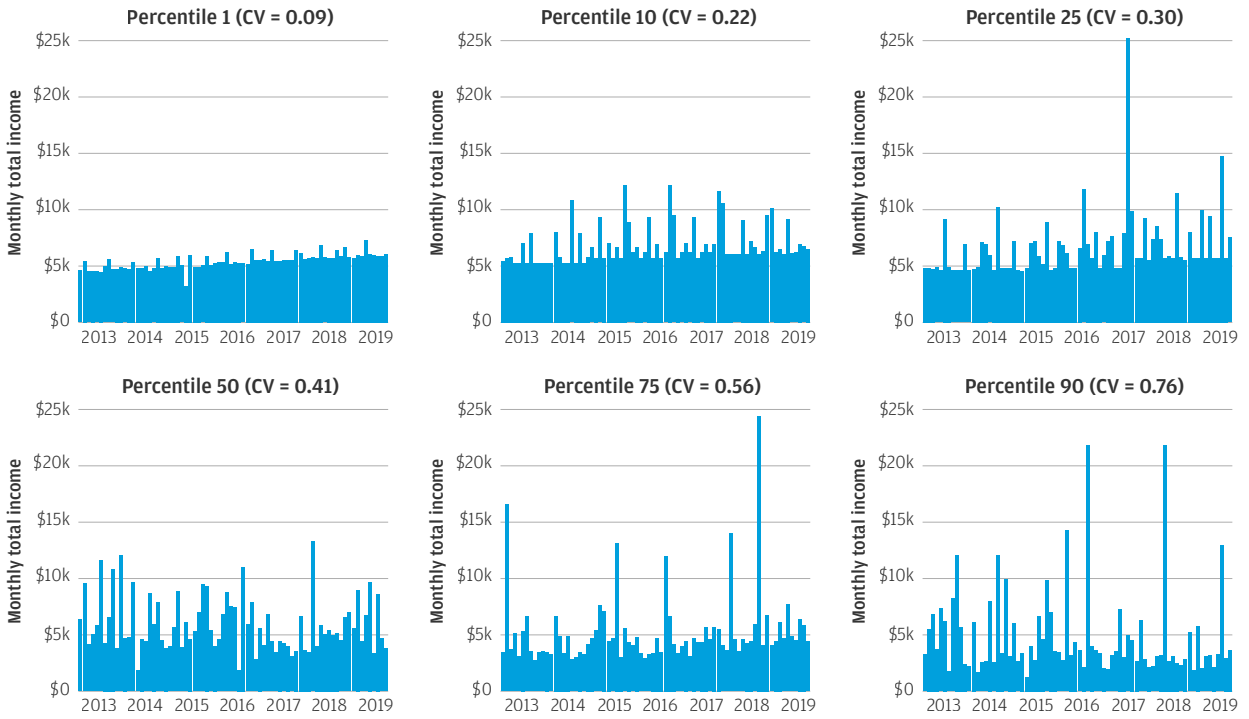
Families vary significantly in the levels of volatility they experience. The distribution of CV has a standard deviation of 0.37 with a long right tail (Figure 6). About eight percent of family-months have a CV above 1.0, which would correspond to a more than 60 percent change in monthly income within a year. To illustrate income patterns for families with different levels of volatility in our data, we show monthly income patterns for hypothetical families at different points of the CV distribution (Figure 7).

Figure 6: Families vary significantly in levels of income volatility they experience.



Source: JPMorgan Chase Institute

Figure 7: Illustrative monthly income patterns for families at different points of the volatility distribution.



Notes: (1) For each hypothetical income pattern we show, we do not reflect actual account holders' cash flow patterns. We multiply each family's monthly incomes by a random scaler between 0 and 1 that is undisclosed. (2) Coefficient of Variation (CV) thresholds shown in Figure 7 are calculated as the average of yearly CV at the individual level. In prior charts, including Figure 6, CVs are measured at the family-month level.

Source: JPMorgan Chase Institute

The level of income volatility a family experiences can change significantly from year to year. Families only have a 30 to 50 percent likelihood of staying in the same CV quintile from one year to the next. For each year t, we divide families into CV quintiles and observe the probability of families ending in different CV quintiles in year t+1. For families with the least (Quintile 1) or most volatile incomes (Quintile 5) in a given year, there is no more than a 50 percent chance of staying in the same quintile the next year (Table 1).[6]

To put this in context, families experience more persistence in their income levels than in their levels of income volatility. In *Weathering Volatility*, we reported that 72 percent of families remained in the same income quintile between 2013 and 2014 (Farrell and Greig, 2015). This is important insofar as the families with the most stable income in one year cannot necessarily expect to have stable incomes the next year. Accordingly, their approach to managing cash flows in one year may not be suitable for the next year as their income patterns change.

Table 1: The levels of month-to-month income volatility families experience are not persistent from year to year.

Probability of transitioning between quintiles of coefficient of variation from one year to the next

		Year t+1				
		Q1	Q2	Q3	Q4	Q5
Year t	Q1	50%	23%	12%	8%	7%
	Q2	23%	32%	22%	13%	9%
	Q3	13%	23%	29%	22%	13%
	Q4	9%	14%	22%	33%	22%
	Q5	8%	10%	13%	23%	47%

Note: Ranges of CVs for each quintile: Quintile 1 (< 0.22), Quintile 2 (0.22-0.32), Quintile 3 (0.32-0.44), Quintile 4 (0.44-0.66), Quintile 5 (>0.66). The CV quintile cutoff points are computed for year 2013 and kept consistent for other years.

Source: JPMorgan Chase Institute

Finding
Three

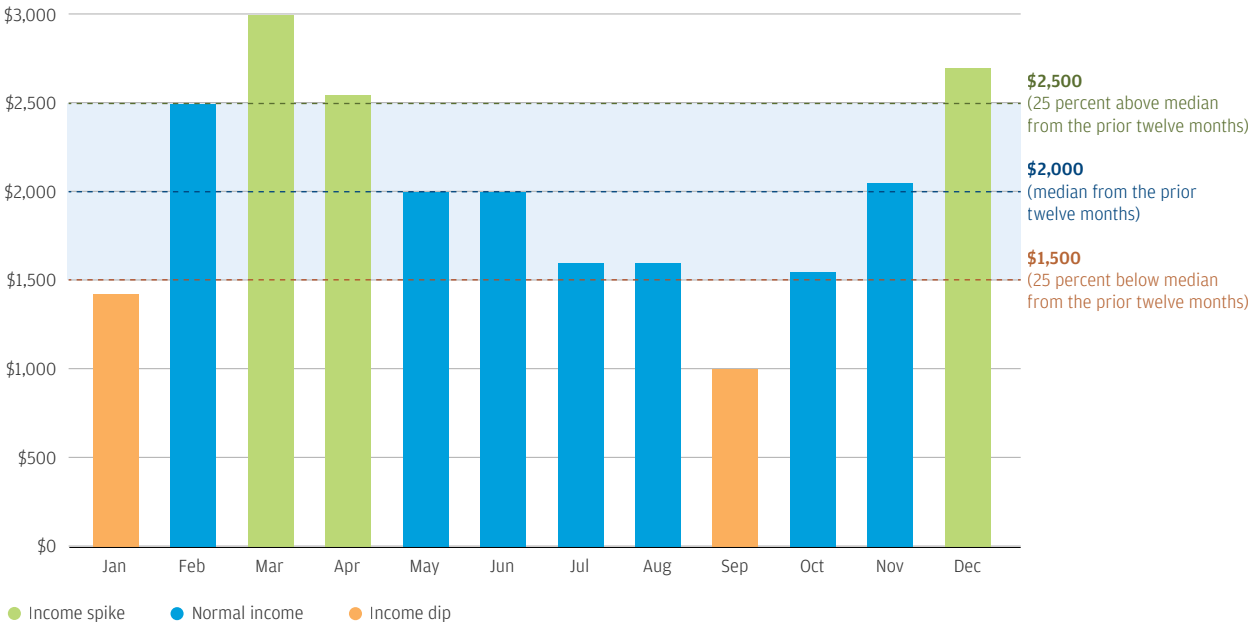
On average, families experience large income swings in almost five months out of a year. Income spikes are twice as likely as dips and most common in March and December. Families with the most volatile incomes experience swings that are larger but not more frequent than families with less volatile incomes.

Although a measure like CV captures the level of total absolute income variations that families experience, it does not capture variations in different directions. Upward and downward variations (spikes and dips) have different consequences and families' respective responses should also differ accordingly. In Finding 3, we identify income spikes and dips separately for each family at the monthly level and measure their respective frequency and magnitude.

There are many ways of defining an income spike and dip and the exact definitions are consequential for the outcome we intend to measure. The frequency and magnitude of monthly income deviations depend on the baseline income of comparison. Depending on whether monthly incomes are compared to the average or median income within a year, measurements of spikes and dips differ significantly.[7] In this report, we choose the median income during the prior twelve months as the baseline income of comparison. We outline our rationale for using median income as our baseline in detail in the Data Asset and Methodology section. Throughout this report, we use the following definitions:

- **Income spike month:** when monthly income is more than 25 percent *larger* than a family's median income during the prior twelve months;
- **Income dip month:** when monthly income is more than 25 percent *smaller* than a family's median income during the prior twelve months;
- **Normal income month:** when monthly income is between 75 percent and 125 percent of a family's median income during the prior twelve months.

Figure 8: An illustrative example of spike, dip, and normal months.



Notes: (1) This chart does not reflect actual cash flow patterns of individuals but is meant to serve as a visual aid. (2) In this visual aid, the $2,000 median income should be interpreted as the median income during the prior twelve months. We have simplified the visual aid to represent monthly cash flow in a year.

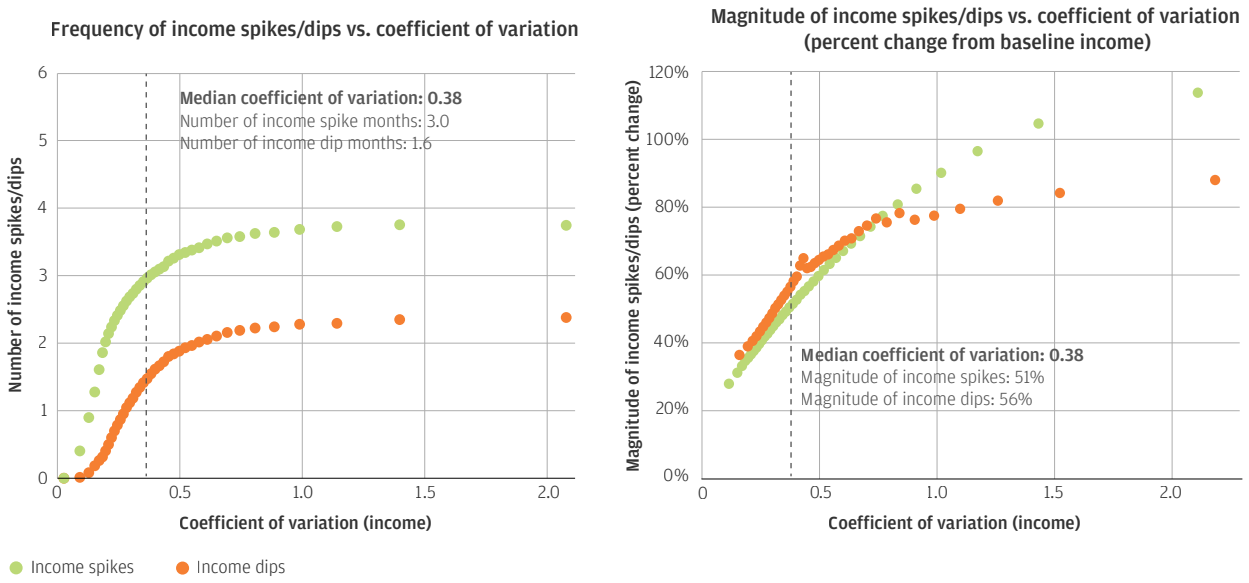
Source: JPMorgan Chase Institute

Families can experience highly volatile incomes in three ways: more frequent income swings, larger income swings when they occur, or a combination of both. Hence, we measure both the frequency and magnitude of income spikes and dips. Regarding frequency, the median family in terms of CV experiences large income swings in almost five months out of the year, including three spike months and one and a half dip months. Regarding magnitude, we measure the magnitude of income spikes and dips as the percent change from the median monthly income during the prior year. Families whose CVs fall in the middle bin of the CV distribution experience spikes that are 51 percent above and dips that are 56 percent below their baseline income (Figure 9).

As families' incomes become more volatile, the frequency of income swings they experience flattens out but not the magnitude. Beyond a CV of 1.0, families' frequency of income swings plateaus. Even for those with the most volatile income, their income swings are concentrated in six months out of the year, with four spike months and two dip months. The magnitude of income swings, however, does not plateau as families' incomes become more volatile. As CV increases, the magnitude of income spikes and dips continues to increase, especially that of spikes (Figure 9). This suggests that for families with more volatile incomes, it is the magnitude and not the frequency of income swings that accounts for the greater volatility.

We observe a strong seasonal pattern of spikes but not dips. We examine the distribution of spikes and dips throughout the year and find that for every calendar month of a year, spikes are more common than dips. On average, the probability of experiencing an income spike and an income dip within a given month is 25 percent and 11 percent respectively. While dips are evenly distributed throughout a year, income spikes tend to concentrate in particular months, namely in February, March, April, and December (Figure 10). In particular, families have a more than 30 percent chance of experiencing an income spike in the months of March and December. The February, March, and April spikes are likely due to tax refunds and the December spike is likely due to bonus season and overtime work.[8] The strong seasonal pattern of income spikes but not dips has important implications for designing saving strategies, which we discuss in greater detail in the Conclusion and Implications section. In short, families may need to more aggressively harvest the savings opportunities that income spikes present, which are most pronounced in months when income spikes are more frequent, namely February, March, April, and December.

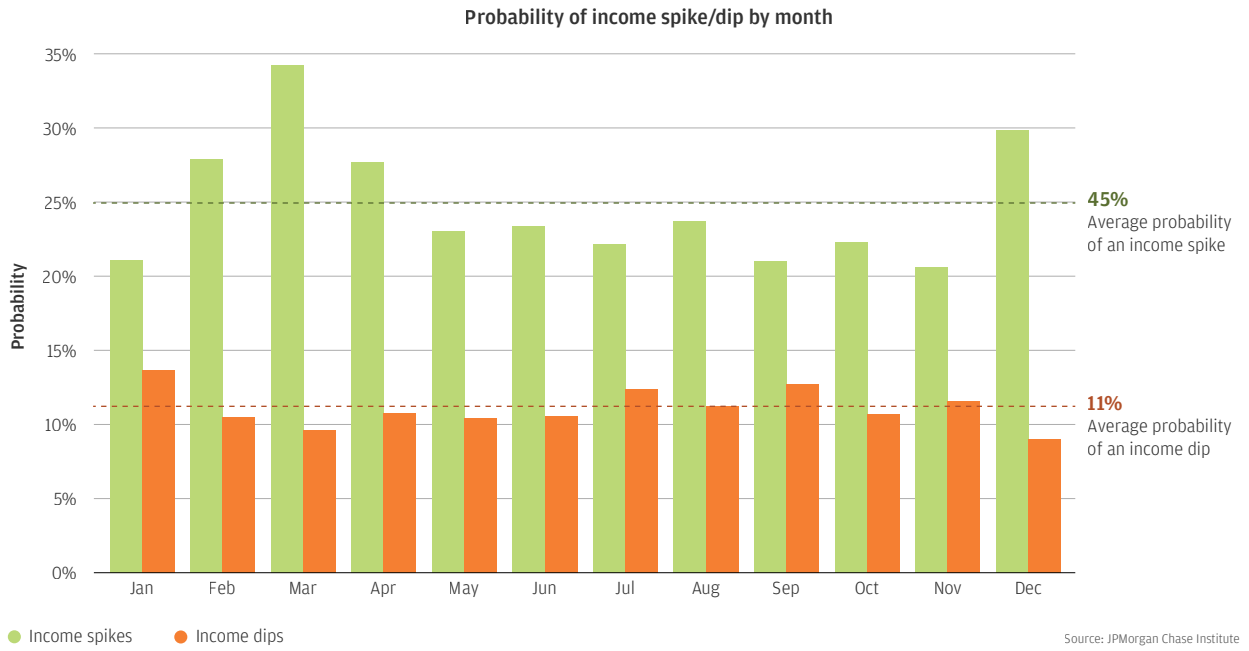
Figure 9: Across the distribution of volatility, families experience more spikes than dips. As families' incomes become more volatile, it is the magnitude and not the frequency of income swings that accounts for higher volatility.



Note: We define baseline income as the median income during the prior twelve months.

Source: JPMorgan Chase Institute

Figure 10: Income spikes tend to concentrate in certain months of a year, while income dips are more evenly spread out throughout a year.



Source: JPMorgan Chase Institute

Finding

Four

Income volatility is greatest amongst the young and the high income. However, downside risks, as measured by the magnitude and frequency of income dips, are greatest among low-income families.

In Finding 4, we analyze heterogeneity of income volatility across demographic groups, including age, gender, income quintiles, and "cash buffer months," which we define as the average ratio of monthly Chase account balances (checking and savings) to monthly total spending within a year. Demographic characteristics are attributed to the primary account holder. We examine the heterogeneity of income volatility in terms of overall CV and the frequency and magnitude of income spikes and dips. For age, income, and cash buffer month, we group account holders into age bins, income quintiles, and cash buffer month quintiles in Figure 11 and Figure 12. We show variations in frequency and magnitude of income spikes and dips across the continuous spectrums of these demographic characteristics in Figure 27 and Figure 28 of the Appendix.

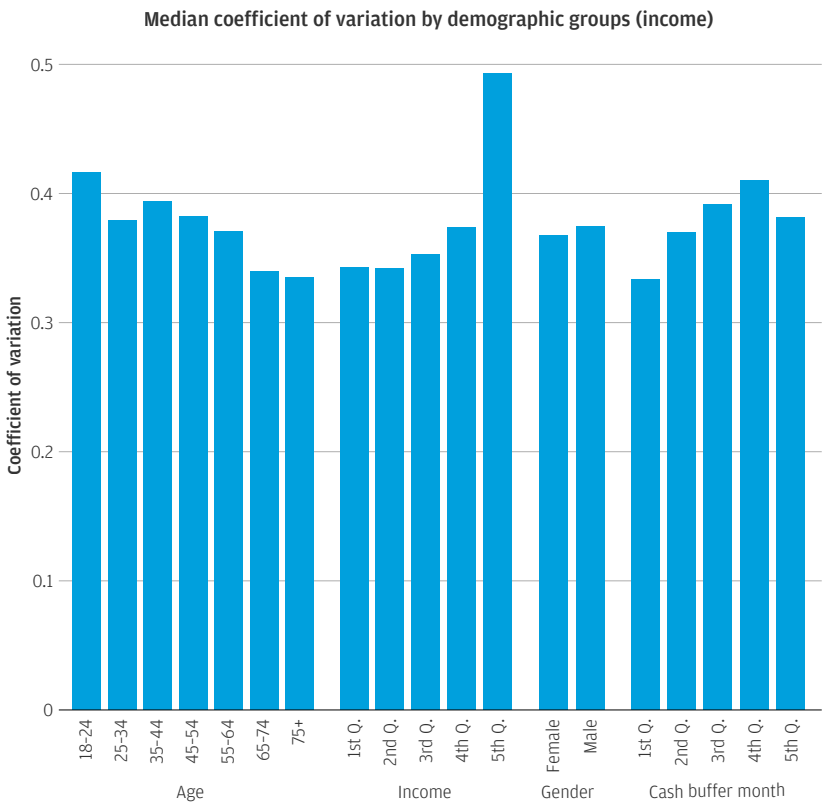
Across age groups, we find that younger families (primary account holders between the ages of 18 and 24 years old) experience the most volatile incomes, with a median CV of 0.42. In contrast, the post-retirement age families in our sample (65-74 and 75+ year old) have the least volatile incomes of all age groups, with a median CV of roughly 0.33 (Figure 11). High levels of income volatility among younger adults are likely related to less stable attachment to the labor force and more frequent job transitions. Those over 65 typically have much less volatile incomes, likely driven by a tendency to rely more on stable income sources, such as Social Security benefits, pensions, and other annuities, during retirement. We observe similar patterns by age in terms of the frequency of income spikes and dips, where the average number of large income swings in a year decreases with age (Figure 12). While the magnitude of income spikes are similar across the age spectrum, account holders ages 18-24 and 75+ face greater downside risk when they experience an income dip, seeing an income drop of 60 percent below their baseline during dip months (Figure 12). This income dip could create notable hardship for those without a sufficient level of cash buffer.

Account holders ages 18-24 and 75+ face greater downside risk when they experience an income dip.

This volatility is largely driven by greater frequency and magnitude of income spikes (Figure 12). Comparing across income groups, the highest income families experience the greatest number of income spikes (more than three per year) and the largest income spikes (60 percent above baseline income) across all income groups. In contrast, income volatility among low-income families is driven more by downside risk. Families among the lowest income quintile experience larger income dips when income dips occur, observed at 60 percent below baseline income (Figure 12). In summary, although high-income families display the most volatile incomes, their greater income volatility is driven by larger and more frequent income spikes. In contrast, income volatility among low-income families is driven more by downside risk in the form of larger income dips.

Our observation that the highest-income families face the most volatile incomes may differ from the findings of other studies due to sample differences. For example, in the U.S. Financial Diaries data, household income volatility is greatest below the poverty line (Hannagan and Morduch, 2015). Mills and Amick (2010), using the national SIPP data, find that those from the lowest income quintile have the highest CV of monthly household income. Such differences may arise because lower-income families, especially those below the poverty line, are underrepresented in our sample and those with higher incomes are underrepresented in other data sources. For example, the top-income families included in the U.S. Financial Diaries have lower income than top-income families in our data (greater than 200 percent of the Supplementary Poverty Measure versus $94K in post-tax income, respectively). Additionally, Hardy and Ziliak (2014) show with 1995-2005 Current Population Survey (CPS) data that those above the 99th percentile of income have lower income volatility than those from the 1st-10th percentiles have higher income volatility than those from the 10th-90th percentiles. It is possible that the poorest families in the CPS data (1st-10th percentiles) are underrepresented in our sample and that our sample has families with incomes beyond the 99th percentile measured by the CPS. Additionally, it is possible that our data captures more large spikes, such as bonuses, miscellaneous deposits, and inter-account transfers, which make up a larger portion of total income for higher-income families.

Figure 11: Younger and higher-income families experience the most volatile incomes in terms of overall Coefficient of Variation (CV).

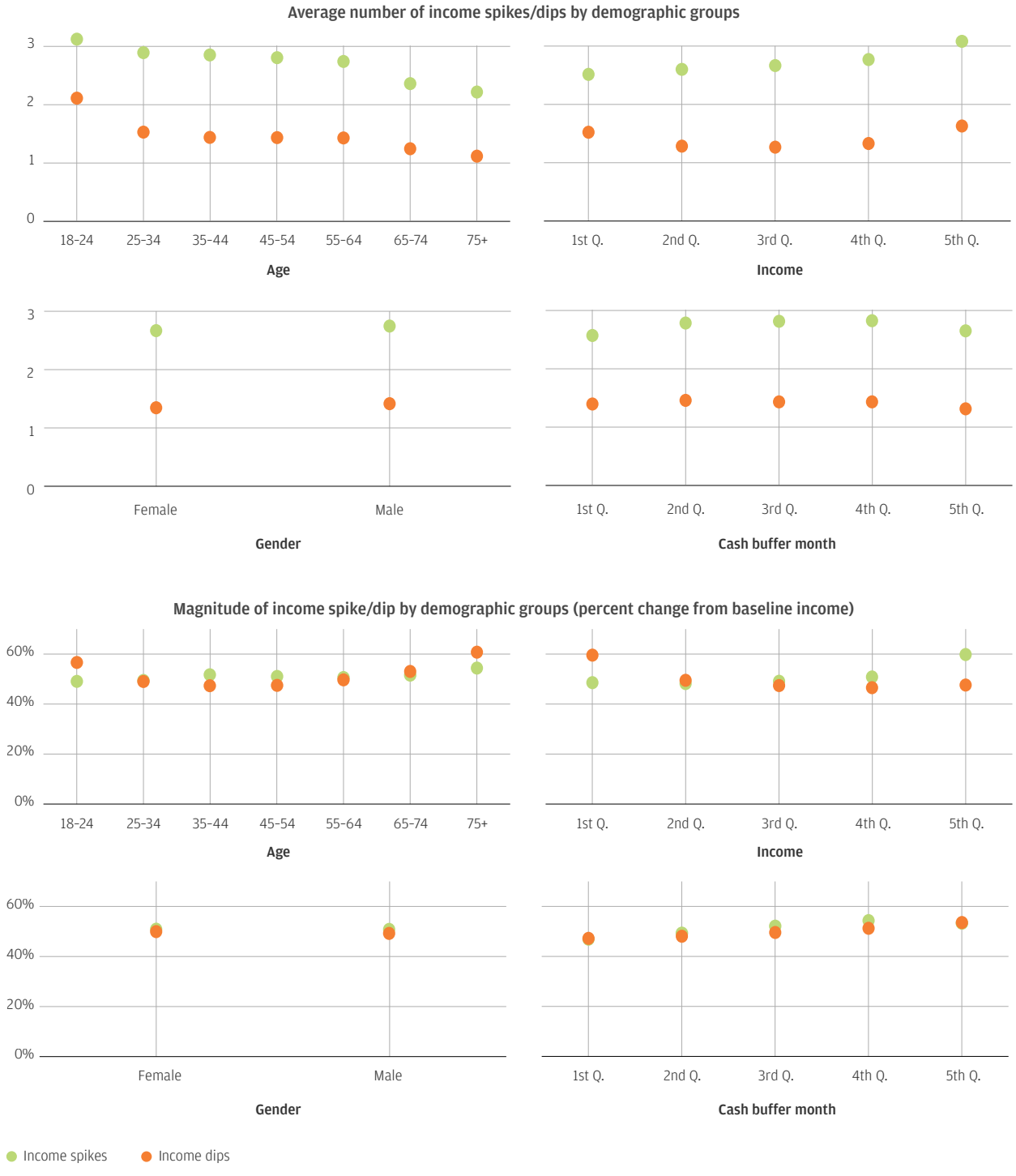


Notes: (1) Cash buffer month is calculated as the average ratio of monthly account balances (checking and savings) to monthly expenses within a year. (2) We calculate income and cash buffer month quintiles by year. For simplicity, we note the cutoff points by quintile across all years: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K. Cash buffer month quintile ranges: Quintile 1: <0.24, Quintile 2: 0.24-0.47, Quintile 3: 0.47-0.92, Quintile 4: 0.92-2.35, Quintile 5: >2.35. (3) We report statistics by gender of the primary account holder for roughly 80 percent of account holders for whom gender could be reasonably inferred.

Source: JPMorgan Chase Institute

Female and male account holders have similar levels of volatility in terms of overall CV, frequency of income swings, and magnitude of income swings. By cash buffer month, overall CV levels increase with quintiles of cash buffer month. However, those at the highest quintile of cash buffer month do not have CV levels as high as those from the highest income quintile. We also do not observe the largest income spikes among families with the highest cash buffer levels and largest income dips among those with the lowest cash buffer levels, as seen across income quintiles (Figure 12).

Figure 12: Younger and higher-income families experience more frequent income swings. Lower-income families experience the largest dips when dips happen.



Notes: (1) Cash buffer month is calculated as the average ratio of monthly account balances (checking and savings) to monthly expenses within a year. (2) We calculate income and cash buffer month quintiles by year. For simplicity, we note the cutoff points by quintile across all years: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K. Cash buffer month quintile ranges: Quintile 1: <0.24, Quintile 2: 0.24-0.47, Quintile 3: 0.47-0.92, Quintile 4: 0.92-2.35, Quintile 5: >2.35. (3) We report statistics by gender of the primary account holder for roughly 80 percent of account holders for whom gender could be reasonably inferred.

Source: JPMorgan Chase Institute

Finding

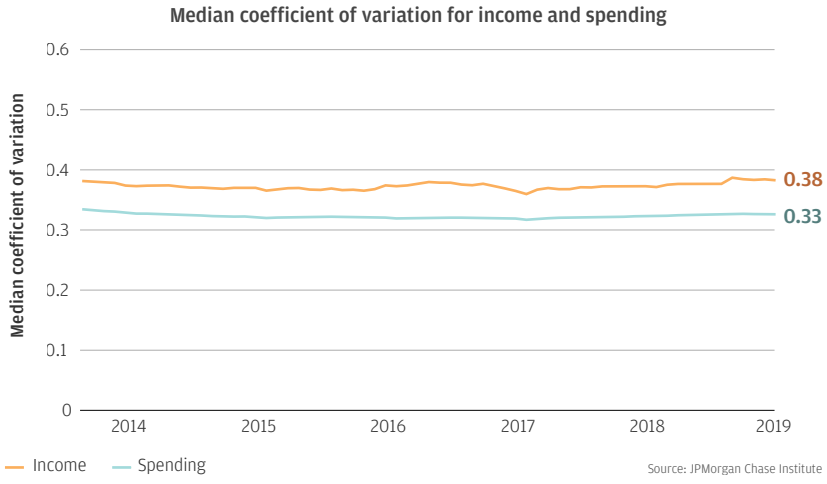
Five

The trend of spending volatility was flat between 2013 and 2018. While the level of spending volatility was also high, it was 15 percent lower than that of income volatility, except among account holders over the age of 75 and those with the largest cash buffers.

To better understand the key elements of building financial resilience, we need a more complete view of families' cash flows, for which income is only half of the picture. In this section, we consider families' expenses and examine spending volatility as it compares to income volatility. We apply the same volatility measures we used for income on spending, namely, CV, and frequency and magnitude of spikes and dips. Spending spikes and dips are defined as months with more than a 25 percent deviation above or below a family's median spending during the prior twelve months. We measure total spending across spending categories by aggregating outflow transactions that are not intra-account transfers made via debit cards, credit cards, and deposit accounts.

Compared to income, spending has similar CV trends and behaviors of spikes and dips, but lower CV levels. Similar to the trend of income volatility, spending volatility has been stable between 2013 and 2018. The median CV level for spending is around 0.33, about 15 percent lower than that of income (median CV = 0.38) (Figure 13). Conventional economic theory would predict spending to be less volatile than income due to consumption smoothing motives. However, we still observe a large degree of spending volatility. This could either be attributed to large lumpy expenditures by families, i.e. purchase of durables like appliances, or a lack of sufficient liquidity to smooth expenditures over time.

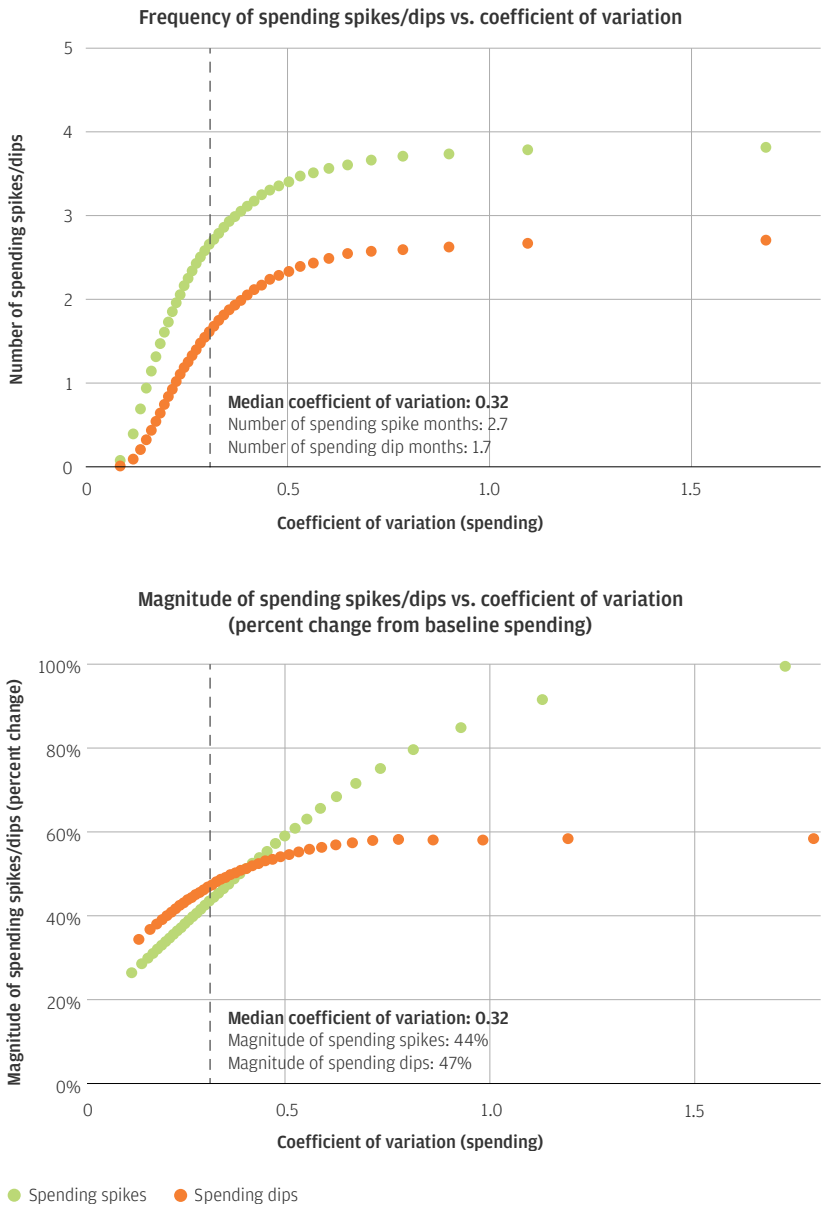
Figure 13: The median CV for spending volatility between 2013 and 2018 is about 0.33, 15 percent lower than that of income volatility.



The median within-family correlation between month-to-month income and spending changes across our sample is 0.24, suggesting that there is limited co-movement between a family's income and spending within a year.[9] On the one hand, this could imply that families face liquidity constraint to smooth their consumption. On the other hand, it could also indicate families' ability to cut consumption when faced with an income dip. Depending on whether consumption changes originate from discretionary or non-discretionary categories, families' welfare and savings level may or may not be negatively impacted. We further explore the relationship between liquidity buffers and adverse spending and income shocks in Finding 6.

For families with more volatile spending, it is the magnitude of spending swings, especially spikes, rather than frequency, that accounts for the higher spending volatility (Figure 14). This is in line with our observation of the magnitude of income swings, especially spikes, driving a rise in income volatility. It is important to note that certain spending swings could be anticipated such as making a tuition payment or a large durable purchase, or unanticipated such as large cash outlays from emergency medical expenses or car repairs. We do not distinguish between expected and unexpected sources of spending swings but our measures capture the reality of large financial flows for families. The probability of experiencing a spending spike in a given month is 23 percent on average compared to a 13 percent probability of experiencing a spending dip. The probability of spending spikes is highest in March (30 percent), April (28 percent), and December (27 percent), notably coinciding with the months in which income spikes are most common in aggregate (Figure 15). Spending dips are most likely in January and February, likely due to reversion to the mean from December holiday spending spikes.

Figure 14: Across the distribution of spending volatility, families experience more spending spikes than dips. Families with more volatile spending experience larger but not necessarily more frequent spending spikes.



Note: We define baseline spending as the median spending during the prior twelve months.

Source: JPMorgan Chase Institute

Figure 15: Spending spikes are more likely than spending dips and tend to happen more in March, April, and December.

Demographic patterns in spending volatility differ from those of income volatility, especially along the spectra of age and cash buffer months. Income volatility decreases with age, but spending volatility does not. While younger families have the highest income volatility, older families show more stable income, which is expected given more stable income streams such as Social Security income and annuities. Spending volatility in terms of overall CV for the 75+ group, however, is as high as that of the 18-24 group (Figure 16). The higher spending volatility observed for older families may result from a higher probability of unexpected medical expenditures during older age. In fact, earlier JPMorgan Chase Institute research finds that families 65 and beyond were more than twice as likely as those under 25 to have made an extraordinary medical payment (Farrell et al. 2017).

The other group for which spending volatility patterns differ from income volatility is those with the highest amount of cash buffer. Spending volatility increases monotonically with quintiles of cash buffer month. Those at the fifth quintile have a median CV of 0.43, 13 percent higher than the sample median (0.38). Both frequency and magnitude of spending spikes and dips increase with levels of cash buffer month (Figure 17).

Figure 16: Spending volatility is lower than income volatility, except among account holders above age 75 and those with the largest cash buffers.

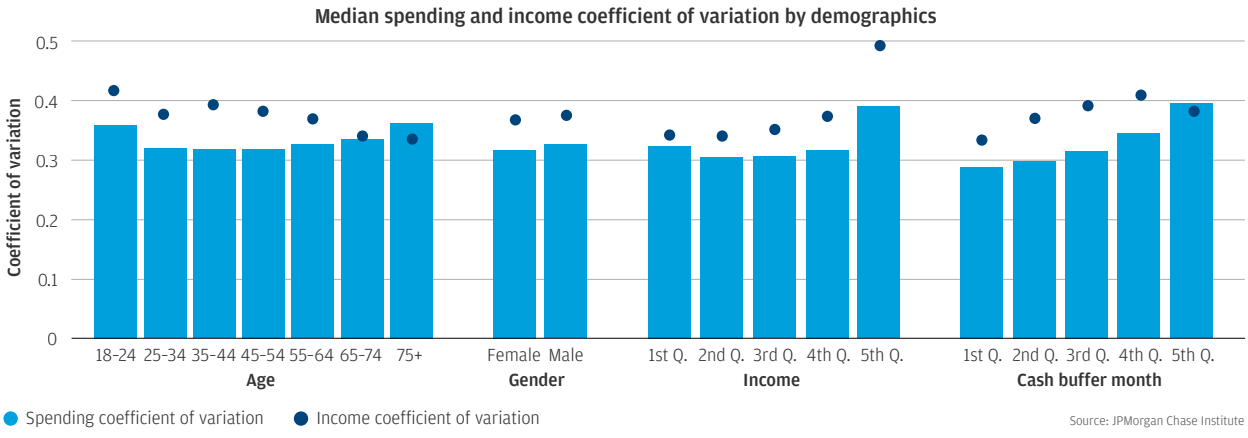
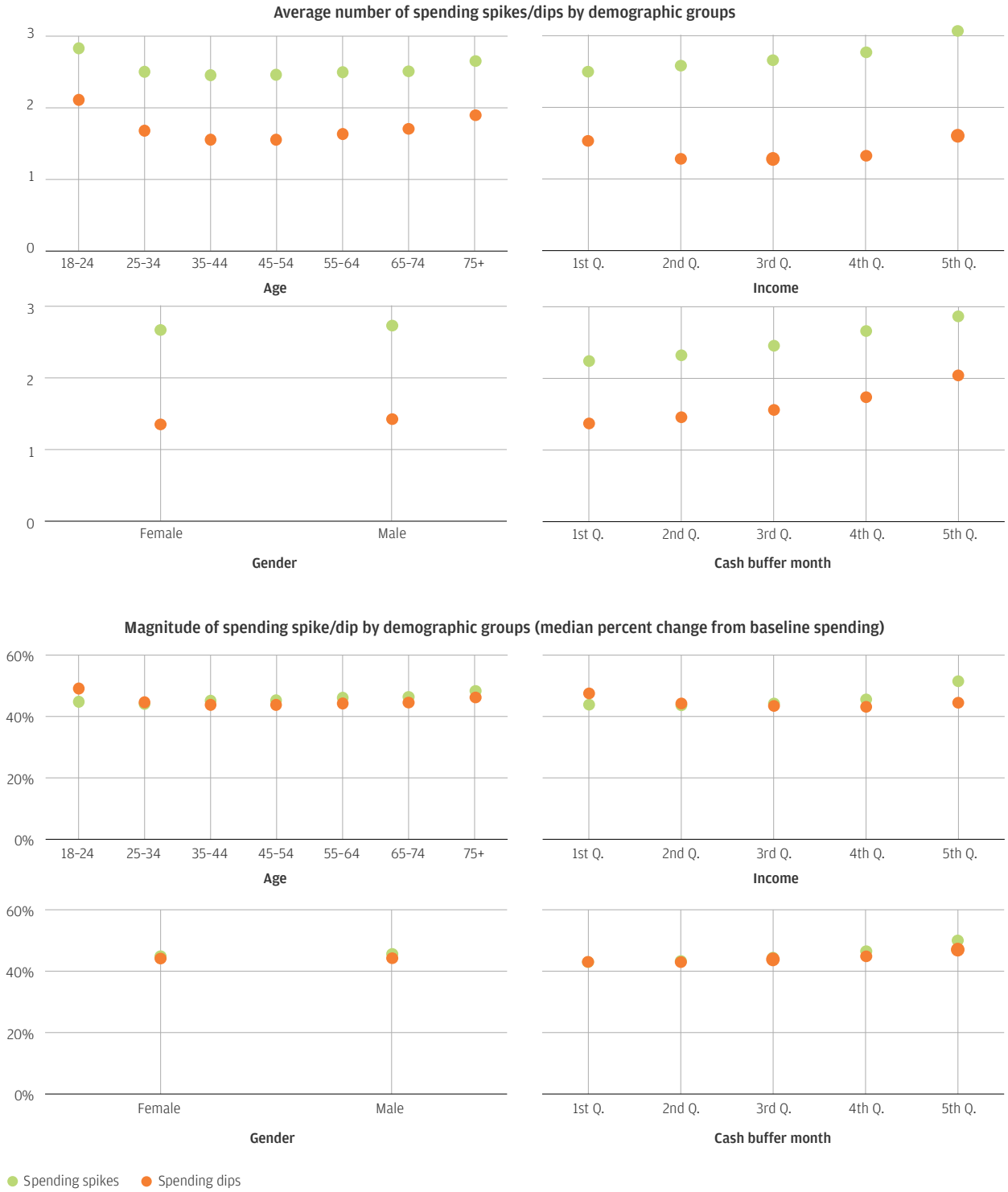


Figure 17: Spending volatility is higher among those who are younger, higher-income, and have larger cash buffers.



Notes: (1) Cash buffer month is calculated as the average ratio of monthly account balances (checking and savings) to monthly expenses within a year. (2) We calculate income and cash buffer month quintiles by year. For simplicity, we note the cutoff points by quintile across all years: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K. Cash buffer month quintile ranges: Quintile 1: <0.24, Quintile 2: 0.24-0.47, Quintile 3: 0.47-0.92, Quintile 4: 0.92-2.35, Quintile 5: >2.35. (3) We report statistics by gender of the primary account holder for roughly 80 percent of account holders for whom gender could be reasonably inferred.

Source: JPMorgan Chase Institute

Finding Six

Families need roughly six weeks of take-home income in liquid assets to weather a simultaneous income dip and expenditure spike. Sixty-five percent of families lack a sufficient cash buffer to do so.

Recent research, such as the Federal Reserve's annual SHED survey, has drawn attention to the lack of financial security experienced by many American families. In the latest 2018 survey results, 39 percent of families reported that when faced with an unexpected expense of $400, they would need to either borrow or sell property to cover the expense or not be able to cover it at all. The high levels of income and expense volatility we observe in our data and the difficulties that many families' report experiencing in covering emergency expenses underscores the importance of building a sufficient liquid cash buffer.

Many personal finance experts recommend that families keep three to six months-worth of typical total expenditures in emergency savings to insure against a major financial emergency, such as job loss, medical payments, or other unexpected one-time events. This conventional wisdom on savings targets could be improved for multiple reasons. First, tucking three to six months of expenses away as emergency savings is unrealistic for many families. Second, such guidance is not tailored to specific demographic groups who experience unique financial situations. For example, a rainy day fund sufficient for younger families may not be sufficient for older families who typically face more medical needs. Third, with the benefit of a high-frequency lens into families' financial lives, we can now base this guidance on empirical research and observed fluctuations.

Few studies have empirically estimated the liquidity buffer needed to weather financial hardships. Sabat and Gallagher focus on low-income households and show that as liquid savings increase above a certain threshold, the reduction in probability of financial hardships such as rent delinquency, skipping food, healthcare, or bills tend to diminish. Sabat and Gallagher (2019) estimate this savings threshold point as the minimum liquidity buffer needed by the average low-income households, which amounts to to $2,467 or roughly one month of income. Without the ability to fully observe individual risk preferences, it is difficult to provide individual-based guidance on a savings threshold. Financial advisors could use such guidance to provide more realistic financial advice.

In this report, we provide empirical estimates on the minimum levels of cash buffer needed for a broader income spectrum and focus on adverse income and spending shocks, with the goal of providing savings guidance that is more evidence-based than the existing conventional wisdom. We focus on three types of adverse shocks: income dips, expenditure spikes, and simultaneous income dips and expenditure spikes.

It is important to note that the nature of these events varies widely. For example, a household facing an expenditure spike could be making a predictable tuition payment, buying a new television set, or funding an emergency automobile repair. A household experiencing an income dip might be in the midst of an unemployment spell or simply taking an unpaid sabbatical. Thus, a simultaneous

income dip and expenditure spike could represent a household in dire straits that must drain its savings (as in the case of an auto repair coincident with unemployment) or one that has a sufficient cash buffer to allow it to make expenditure decisions independent of the path of its income (as in the case of a television purchase coincident with a sabbatical). In our estimates of simultaneous income dips and expenditure spikes, we are agnostic towards which of these extremes might prevail in each individual case. Our estimate is meant to capture the cash buffer required to finance these fluctuations, regardless of their underlying nature. It is worth noting that because income dips and expenditure spikes are defined at the monthly level for each family, our estimates reflect the cash buffer required to sustain such adverse fluctuations for a single month, even though financial shocks from job loss or a sustained health event may last much longer.

We introduce a new empirically based approach to estimating cash buffer levels that families need to weather an income dip, an expenditure spike, and both simultaneously. As mentioned, the median correlation between month-to-month income and spending changes observed in our sample is 0.24. Hence, it is possible for families to experience an expenditure spike when they are hit with an income dip. For a simultaneous income dip and expenditure spike, families generally need roughly six weeks of income in liquid cash buffer, which is lower than the existing advice of three to six months (Table 2). Such simultaneous adverse income and spending volatility has the most negative impact on families' savings but is rare, happening on average once every five and a half years. Months with a singular adverse event—an income dip or an expenditure spike only—are more common but the funds required to finance these fluctuations are significantly lower. Families need roughly three weeks of income to weather an income dip or an expenditure spike and they happen on average every four months and nine months, respectively.[10]

Based on our liquid cash buffer guidance measures, 65 percent of families do not have the requisite funds in their checking and savings accounts to weather the extreme adverse event of simultaneous spending spike and income dip (Table 2).[11] In the event of this simultaneous adverse shock, these families would potentially need to borrow, cut other expenditures, or find the cash from elsewhere.

Table 2: While simultaneous income dips and expenditure spikes are rare, families need roughly six weeks of income to cover them and 65 percent of families do not have sufficient liquid cash buffer to do so.

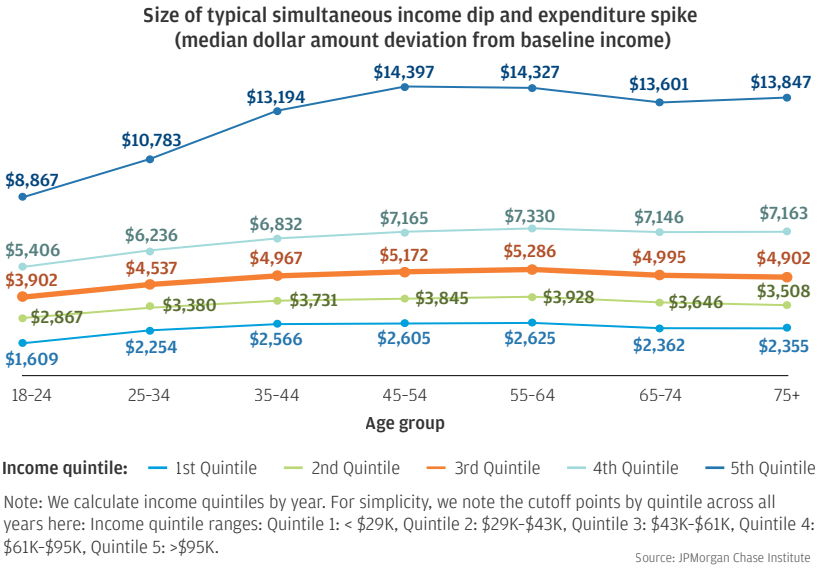
Event	Probability in a given month[1]	Frequency	Magnitude of cash buffer needed to weather event (median weeks of income)[2]	Proportion of households with insufficient cash buffer to weather event[3]
Simultaneous income dip & expenditure spike	1.5 percent	Once every 5.5 years	6.2 weeks	65 percent
Income dip	11 percent	Once every 9 months	2.8 weeks	48 percent
Expenditure spike	23 percent	Once every 4 months	2.6 weeks	46 percent

Notes: (1) The probability of an event in a given month is calculated as the sum of family-months that experience a particular event divided by the sum of total family-months across sample. (2) In order to assess each event's magnitude, for all family-months that experience a particular event, we calculate the ratio of the event's dollar amount relative to the family's baseline monthly income to obtain the magnitude of events in terms of months of income. We then take the median of all event magnitude-to-monthly income ratios. To express magnitude in terms of weeks of income, we multiply the ratios in terms of months by 4.3 to convert into weeks. Baseline income is calculated as a family's median monthly income during the prior twelve months. (3) This measure estimates the proportion of households whose typical cash buffer levels are insufficient to cover a particular adverse event, i.e. below the event-to-income ratios. A family's "typical cash buffer level" is calculated as the median ratio of monthly balances across checking and saving accounts to monthly income.

Source: JPMorgan Chase Institute

This estimate for how many weeks worth of take-home income is needed as a cash buffer differs only slightly by demographic groups, ranging between six and seven weeks (see Table 8 in the Appendix).[12] In dollar terms, middle-income families (Quintile 3) need about $5,000 to sustain a simultaneous adverse shock on both income and spending (Figure 18). The dollar size of income dips and spending spikes are relatively consistent over the life cycle for middle-income families but they naturally scale with income quintiles. For example, for simultaneous shocks, middle-age families (45-54 years old) in the lowest income quintile require $2,600 in cash buffer, while middle-age families in the highest income quintile require close to $15,000.

Figure 18: Middle-age, middle-income families need $5,000 to weather a simultaneous income dip and expenditure spike.



Note: We calculate income quintiles by year. For simplicity, we note the cutoff points by quintile across all years here: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K.

Source: JPMorgan Chase Institute

Unsurprisingly, the share of families who lack a sufficient liquid cash buffer to manage the simultaneous adverse volatility is higher among low-income families. For every age group, the proportion of families with insufficient cash buffer is highest among families in the lowest-income quintile and decreases as income increases (Table 3). Depending on the age group, 40 to 70 percent of middle-income families (Quintile 3) have an insufficient cash buffer.

It is useful to think about the cash buffer gap not just in terms of the share of families who lack a sufficient buffer but also in terms of the dollar amount by which they fall short. To quantify the cash buffer gap families face in dollar terms, we subtract the amount needed to sustain simultaneous adverse shocks from their current level of liquid assets observed across families' checking and savings accounts.

As evident in Table 3, the median middle-income family across age groups currently faces a savings gap, except for those account holders above age 75. A middle-income family aged 45-54 needs about $5,000 to cover concurrent adverse income and spending shocks (Figure 18) but has only $2,000 (Figure 19), leaving a gap of $3,000 (Figure 20).

Table 3: More low-income families lack a sufficient liquid cash buffer to sustain a simultaneous income dip and expenditure spike.

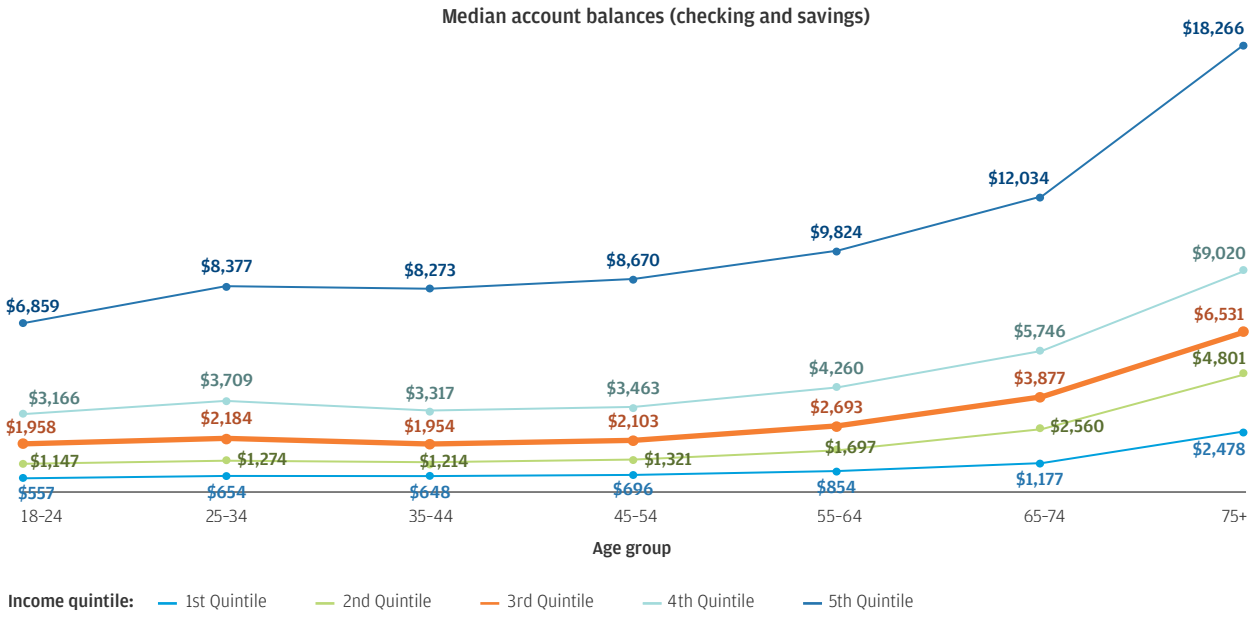
Proportion of families with an insufficient cash buffer to weather simultaneous shocks

Age group	Q1	Q2	Q3	Q4	Q5
18-24	66%	58%	51%	46%	38%
25-34	74%	71%	66%	61%	56%
35-44	73%	73%	70%	67%	64%
45-54	73%	71%	69%	67%	65%
55-64	69%	66%	64%	63%	62%
65-74	61%	54%	53%	53%	53%
75+	48%	41%	40%	40%	40%

Note: We calculate income quintiles by year. For simplicity, we note the cutoff points by quintile across all years here: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K.

Source: JPMorgan Chase Institute

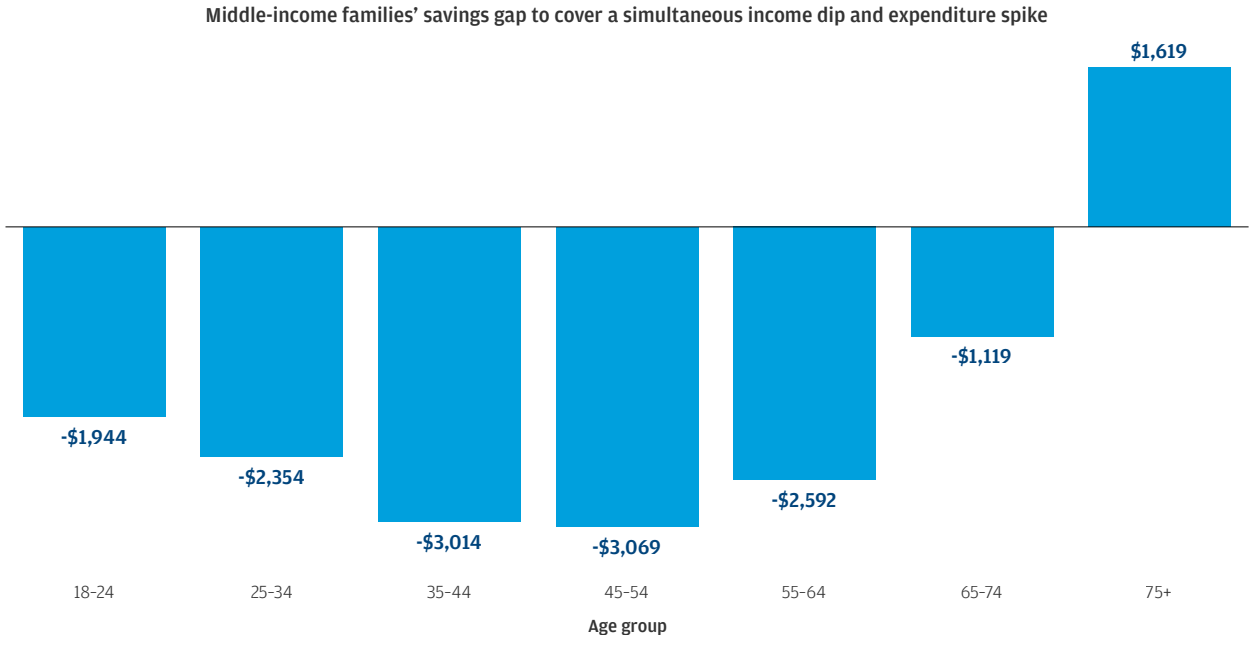
Figure 19: Levels of liquid assets increase with age and income quintiles. The middle-income families hold around $2,000 to $7,000 in checking and savings accounts from ages 18-24 to 75+.



Note: We calculate income by year. For simplicity, we note the cutoff points by quintile across all years here: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K.

Source: JPMorgan Chase Institute

Figure 20: Middle-income families age 35-54 face a savings gap of $3,000 to cover a simultaneous income dip and expenditure spike.



Source: JPMorgan Chase Institute

Implications

In this report, we leverage high-frequency bank account data to measure month-to-month income and spending volatility from 2013 to 2018. We extend our analysis beyond absolute variations in income and spending to include different types of variations in terms of spikes and dips, as well as the heterogeneity in volatility experienced by different demographic groups. Insights from our data have important implications for financial security advocates, employers and payroll administrators, financial service providers, policymakers, and the economic measurement community. We highlight a few key takeaways.

Families need realistic and empirically-based estimates on how much of a cash buffer to keep, given the adverse income and spending shocks they experience. Many personal finance experts recommend keeping three to six months of typical expenses for emergency savings. This general advice lacks specificity, is often unrealistic for many families, and is not empirically grounded. We provide empirical estimates to the minimum amount of cash buffer families need to weather adverse shocks to income and spending. In general, families need roughly six weeks of income in savings at minimum to weather a simultaneous income dip and expenditure spike. The buffer needed in terms of weeks' worth of income could vary slightly across demographic groups but six weeks of income can be utilized as a general estimate. The dollar amount of cash buffer needed varies based on age and income groups, far more than the weeks of income metric. For example, among middle-age families, the dollar amount of cash buffer needed is around $5,000 for middle-income families compared to roughly $2,500 for low-income families and close to $15,000 for high-income families. Should families draw upon this cash buffer, which is expected given the high levels of volatility we observe for most families, they should aim to re-build and maintain the level of liquidity needed to withstand the next possible adverse shock they may experience. Overall, 65 percent of families lack sufficient cash buffer to weather simultaneous adverse income and spending shocks and this proportion is the highest among lower-income families.

Instead of a single standard percent-based savings target every month, families need to harvest the few savings opportunities that income spikes present. We observe that families with the most income volatility experience about four spike months and one and a half dip months in a year. This suggests that savings opportunities that come with large income spikes may only happen three to four times a year and tend to be concentrated to specific months. When financial service providers, such as banks and fintech companies, provide savings guidance, families are often advised to save a certain percentage of income or expenses on a monthly basis. This advice is occassionally maintained automatically after families opt in. However, it may be unrealistic for a family to save money in a month with negative cash flow. Instead, their aim could be to harvest savings opportunities during their income spike months, which tend to happen during five-Friday months, tax refund season, and year-end bonus season. Additionally, in years with particularly volatile income, a family may experience much larger income dips, suggesting that they may need to save even more aggressively during income spike months to insure against adverse events. Put simply, the amount a family saves should not be a fixed percentage of income, but rather vary on a month-to-month basis based on the cash flow reality of that month, reflecting both income and expenses.

A variety of stakeholders including financial advisors, policymakers, and employers could use our estimates and frameworks to help families mitigate volatility and promote savings. Existing research has highlighted the negative impact of income volatility. For example, households with more volatile incomes tend to experience more financial hardships and use high-cost alternative financial services (Schneider and Harknett, 2017). In addition, prior JPMCI research shows income dips precede mortgage defaults regardless of the homeowner's income, home equity, or mortgage payment burden (Farrell et al., 2019b). Employers could help employees smooth their income by offering to take larger deductions

for benefits, tax withholdings, and pre-tax savings accounts in months with larger paychecks. There is also growing interest in employer-sponsored emergency savings plans such as sidecar accounts. For example, NEST Insight is partnering with government in the U.K. to launch a sidecar savings trial where employees contribute to a combined emergency savings account and their pension. Once the balance reaches a "savings cap", all contributions go into the pension pot. Some companies in the U.S., including Levi Strauss & Co. and Kroger Co., are also offering cash and other incentives to encourage employees to build emergency savings. The empirical frameworks and estimates we provide gives better guidance on threshold levels of the "savings cap" and how much employees should target to put aside for emergency savings.

The amount a family saves should vary on a month-to-month basis based on the cash flow reality of that month.

In the broader policy arena, governments could provide an option to pay out tax refunds over time or allow families to either minimize or increase access to their withholdings during the year. Though some tax filers might prefer to receive a lump sum tax refund as a forced savings mechanism, past JPMCI research shows that expenditures, including those on in-person healthcare services, increase significantly after the arrival of the tax refunds, suggesting that families may have been better off if they had had access to the funds earlier (Farrell et al., 2018b; Farrell et al., 2019a). Even as a forced savings mechanism, there are proposals to help families better leverage their tax refunds for savings purposes. In the 116th Congress, bipartisan legislation has been introduced with the goal of encouraging borrowers to build up savings as a cash buffer to be utilized in the event of financial distress. The Refund to Rainy Day Savings Act, for example, would create opportunity for tax filers receiving a refund to hold a portion of their refund in an account to accumulate interest before being transferred to taxpayers as a direct deposit after six months. In addition to policies designed to encourage families to save, state and local governments are considering ways in which they might help families mitigate the amount of income volatility they experience at the outset through policies such as predictive scheduling. In July 2019, the city council of Chicago approved an ordinance that would require employers to provide advance notices of workers' schedules. Should employers fail to notify employees about a change in schedule within an established timeframe, they are obligated to provide the worker partial compensation.

This report highlights the importance of monitoring income and spending volatility trends from different data sources and continues to iterate on empirical measurements that enrich our understanding on volatility as a key financial security indicator. Researchers using different data sources have reached different conclusions on income volatility trends. Carr and Weimers (2017) argue that much of these differences can be attributed to methodological variations. High-frequency administrative data provide an important complementary lens that unveils the month-to-month variations often masked by aggregated yearly data. Beyond reconciling different approaches to measure total volatility, the economic measurement community should also distinguish between different types of volatility and their frequency and magnitude.

In this report, we demonstrate that measurements for income spikes and dips are in fact sensitive to their exact definitions. Informed by a growing body of research, policymakers and financial security advocates increasingly view income volatility as an important measure. It is all the more important that we continue to leverage complementary data sources to build our understanding of volatility as a key financial security metric.

Data Asset and Methodology

Box 2: JPMC Institute—Public Data Privacy Notice

The JPMorgan Chase Institute has adopted rigorous security protocols and checks and balances to ensure all customer data are kept confidential and secure. Our strict protocols are informed by statistical standards employed by government agencies and our work with technology, data privacy, and security experts who are helping us maintain industry-leading standards.

There are several key steps the Institute takes to ensure customer data are safe, secure, and anonymous:

- Before the Institute receives the data, all unique identifiable information—including names, account numbers, addresses, dates of birth, Social Security numbers, and Employer Identification Numbers (EIN)—is removed.
- The Institute has put in place privacy protocols for its researchers, including requiring them to undergo rigorous background checks and enter into strict confidentiality agreements. Researchers are contractually obligated to use the data solely for approved research and are contractually obligated not to re-identify any individual represented in the data.
- The Institute does not allow the publication of any information about an individual consumer or business. Any data point included in any publication based on the Institute's data may only reflect aggregate information.
- The data are stored on a secure server and can be accessed only under strict security procedures. The data cannot be exported outside of JPMorgan Chase's systems. The data are stored on systems that prevent them from being exported to other drives or sent to outside email addresses. These systems comply with all JPMorgan Chase Information Technology Risk Management requirements for the monitoring and security of data.

The Institute provides valuable insights to policymakers, businesses, and nonprofit leaders. But these insights cannot come at the expense of customer privacy. We take precautions to ensure the confidence and security of our account holders' private information.

Constructing our sample

From the entire universe of Chase checking account customers, we select six million anonymized families to form a 75-month balanced panel (October 2012 to December 2018) of primary account holders for whom we have information on monthly income, spending, and account balances (checking and savings) held at Chase. To be included in our sample, an account holder must have:

1. At least five transactions (inflows or outflows) from a personal checking account in every month between October 2012 and December 2018. This attempts to ensure the Chase account observed is the account holder's active bank account.

2. At least $400 in average monthly total income for every twelve-month rolling period. This serves to filter for account holders whose income is likely landing at the Chase account observed.

3. At least $10 in spending on average and a minimum of $1 in spending every month. This attempts to ensure we see spending activity for a given account.

Our unit of analysis is the primary account holder. Bank accounts are likely shared among co-resident family members, although the number of distinct users can differ. Nonetheless, bank accounts aggregated up to the primary account holder more closely resemble a tax unit rather than individuals. Therefore, throughout this report, we interpret our results in terms of families, which could contain single- or multiple-person families.

For every inflow transaction, we categorize whether it should be considered as income and, if yes, the specific associated income category. Not all inflows are considered income. For example, we do not consider movement between a person's multiple accounts (i.e. intra-account transfers), reversals and refunds, or loans as income. Among those that we do consider as income, specific categories we include are:

- Labor income: payroll and other direct deposits;
- Non-labor income:
  - From identifiable sources:
    a) Government income: Social Security, unemployment benefits, tax refunds;
    b) Capital income: dividends, interest income;
    c) Retirement income: annuities, pension, 401(k);
    d) Other income: health benefits, rewards;
  - From unidentifiable sources:
    e) Miscellaneous deposits: ATM cash and check deposits, unclassified Automatic Clearing House (ACH) deposits, and fedwire transfers.

Among all transactions that we consider as income, we can identify the sources for 65 percent in terms of dollar amount. The remaining 35 percent come from ATM cash and check deposits, unclassified ACH deposits, and fedwire transfers. These deposits could be from payroll, expense reimbursement, government benefits, and annuities and interest payments, among others.[13] We consider inflows from such miscellaneous deposits as income and test the sensitivity of our results to income from these unidentifiable sources. We provide the composition of income among identifiable sources and of all income sources in Table 4.

Table 4: Composition of income.

Among identifiable income sources only		Among all income sources, including identifiable and non-identifiable income	
Income category	**Composition**	**Income category**	**Composition**
Labor income	65%	Labor income	45%
Government income	24%	Government income	13%
Capital income	3%	Capital income	1%
Retirement income	5%	Retirement income	3%
Other income	3%	Other income	1%
		Cash deposits	3%
		Check deposits	7%
		Fedwire transfers	1%
		ACH deposits	24%

Note: Composition of all income sources may not add to 100 percent due to rounding.

Source: JPMorgan Chase Institute

Robustness checks on volatility trends

We provide two robustness checks on the trends of income volatility measured by CV as reported in Finding 1. First, we measure volatility trends for a less restrictive sample than the balanced six-year panel. Second, we measure volatility trends for samples with higher percentages of income from identifiable sources.

By restricting our main analysis sample to account holders who maintain a minimum level of activity on their accounts continuously for six years, we exclude account switchers. To test the sensitivity of income volatility trends for a less restrictive sample, we construct a two-year rolling sample for which we require account holders to meet our activity threshold for the current and the prior year only. The median CV for the two-year rolling sample is slightly higher at 0.40 compared to 0.38 for the six-year balanced panel. However, the trend of CV remains largely the same (Figure 21).

Because a significant portion of income for our sample come from non-identifiable sources, we test the sensitivity of income volatility trends to such sources. To do so, we show income CV trends among those for whom we have more visibility into their income from identifiable sources. We create a few variations of our original analysis sample (sample A): those who have $400 monthly income from identifiable sources on average (sample B1), those with at least 50 percent of total income from identifiable sources (sample B2), and those who not only meet these criteria but also have positive annual labor income, i.e. we observe payroll deposits in their Chase accounts (sample C1 and C2). These four sample variations have less of their income from non-identifiable sources (slightly more than 20 percent compared to 35 percent) (Table 5). Figure 22 shows that all four sample variations demonstrate similar CV trends as the original analysis sample.

Figure 21: Volatility trends for a six-year balanced panel and a two-year rolling sample.

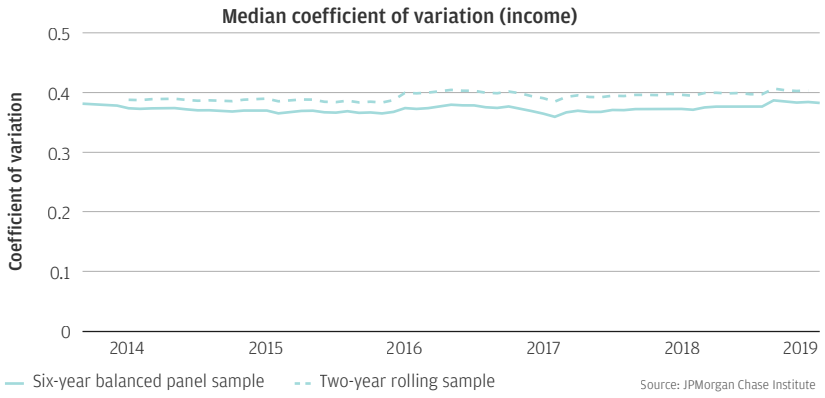


Figure 22: Income volatility trends for samples with less income from non-identifiable sources.

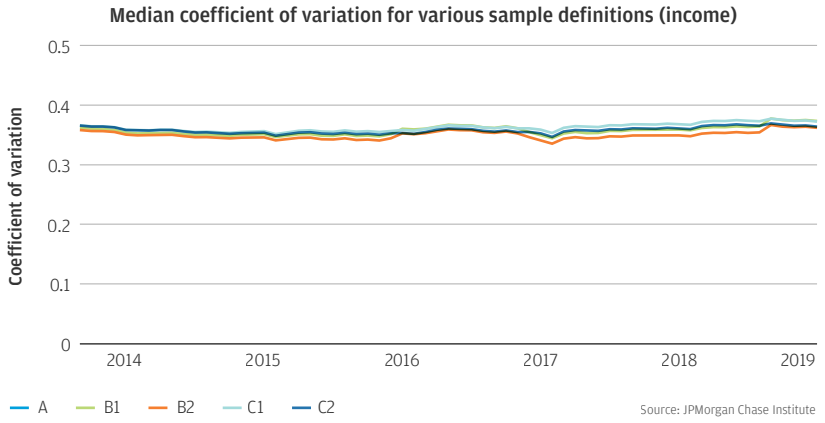


Table 5: Sample definitions for volatility trend robustness check.

Sample	Definition	Sample size	Fraction of income from non-identifiable sources, i.e. miscellaneous deposits
A	$400 average monthly income on a rolling twelve-month basis (original analysis sample)	6.1m	35 percent
B1	$400 average monthly income from identifiable sources on a rolling twelve-month basis	4.6m	24 percent
B2	At least 50% of total income come from identifiable sources	4.5m	21 percent
C1	B1 + positive annual labor income	3.9m	23 percent
C2	B2 + positive annual labor income	3.9m	21 percent

Source: JPMorgan Chase Institute

How our data compare to public data sets

In order to assess the representativeness of our data, we benchmark to nationally representative data sets. This includes benchmarking the distributions of annual incomes and checking/savings account balances we observe to that of the Survey of Consumer Finances (SCF), and average monthly expenditures to the Consumer Expenditure Survey (CEX). In both cases, we focus our comparisons to the year 2016.

It should be noted that the SCF, like many publicly available survey data, asks households to report gross (pre-tax) income, and that we observe take-home (post-tax) income. In order to make these measures more comparable, we also normalize SCF incomes by the average federal tax rate by income bracket (i.e. we multiply SCF incomes by 1 – tax rate), as reported in the Congressional Budget Office (CBO)'s Distribution of Household Income report (CBO, 2019). Further, the take-home incomes we observe are likely more homogenous than the general population of U.S. households, with the unbanked trimmed at the left tail and those utilizing other forms of wealth management at the right tail.

In comparison to the SCF, we understate the level of checking and savings account balances available to households, especially among wealthier households. Notwithstanding the differences between take-home and gross income, we understate the level of wage earnings across the distribution. This is likely due to labor incomes that are untagged as payroll but included among the 35 percent of income from non-identifiable sources. For example, if a Chase customer receives their paychecks via paper checks or generic ACH deposits, their wage earnings would not be tagged as "labor income" in our categorization but would still be included in their total take-home income.

Table 6: Summary statistics for sample attributes between JPMCI and the Survey of Consumer Finance

JPMCI (2016)

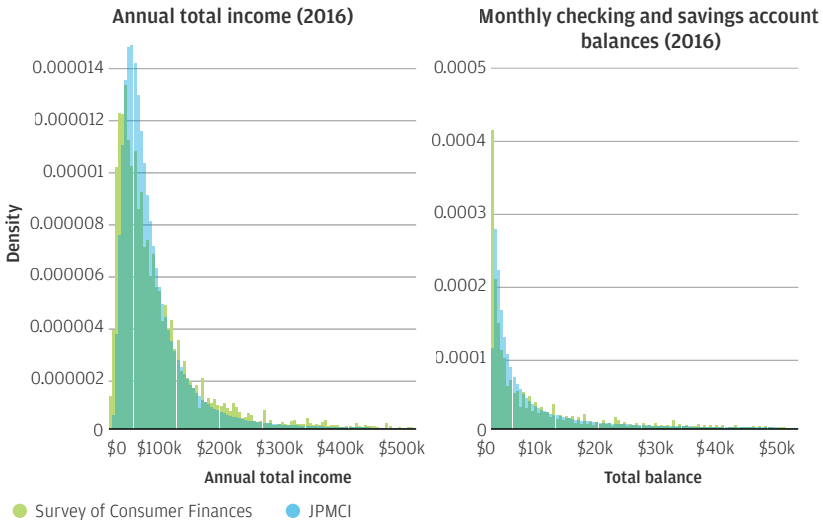
Percentile cutoff	Age	Monthly checking and savings account balance	Annual total take-home income	Annual take-home wage income
20%	36	$806	$29,163	–
40%	46	$1,973	$43,067	$13,614
60%	55	$4,497	$61,248	$31,682
80%	65	$11,799	$94,672	$54,763

Survey of Consumer Finance (2016)

Percentile cutoff	Age	Monthly checking and savings account balance	Annual gross income	Annual take-home income (approximated by average federal tax rate)	Annual gross wage income	Annual take-home wage income (approximated by average federal tax rate)
20%	34	$300	$23,291	$22,895	–	–
40%	46	$1,800	$41,518	$37,615	$18,227	$17,918
60%	57	$6,000	$67,847	$58,416	$45,569	$41,285
80%	68	$19,600	$111,390	$91,451	$88,099	$72,330

Source: JPMorgan Chase Institute

Figure 23: Distribution of annual income and average checking and savings account balances between JPMCI and the Survey of Consumer Finance



Note: JPMCI measures take-home income (post-tax), while SCF measures gross income (pre-tax).

Source: JPMorgan Chase Institute

We also benchmark average monthly expenditures and annual incomes observed in our data to the CEX. In contrast with the SCF, the CEX reports measures of post-tax income.

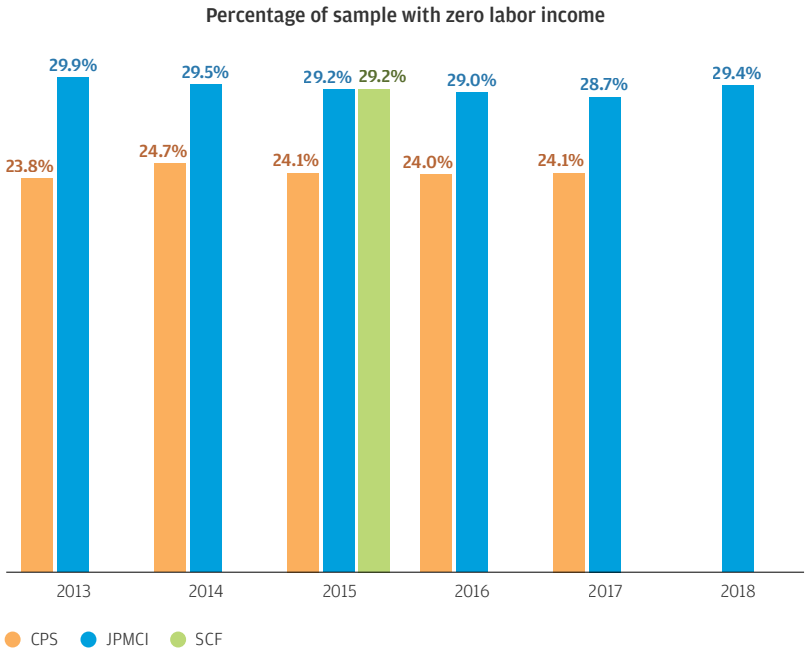
In addition to income, spending, and account balances, we also benchmark to public data sets in terms of trends of the proportion of families with zero labor income. The proportion of a sample with zero income directly affects income volatility trends because an income pattern with stable zeros is the least volatile, with a CV of 0. We do exclude those with zero total income at the outset because we want to ensure we are observing accounts for which their incomes are landing at Chase. However, we do not exclude those with no labor income as that would exclude the unemployed population. Hence, when looking at trends of labor income volatility, it is important that we benchmark to public data sets in terms of proportion of families with no labor income. In terms of levels, we observe a similar proportion of sample with no labor income compared to the SCF but higher than the CPS. Close to 30 percent of families in our data and the SCF have no labor income in any given year between 2013 and 2018 while for the CPS, slightly below 25 percent of families have no labor income in any given year between 2013 and 2018. The differences in levels may be due to the different definitions of the unit of analysis in different data sets. In the SCF, the unit of analysis is the primary economic unit. In the CPS, we re-construct our own unit of analysis of "families" to include both single- and multi-person families.[14] In terms of trends, both our sample and the CPS show a flat trend in terms of the fraction of families with no labor income in a year (Figure 24).

Table 7: Summary statistics for average annual income and monthly expenditure between JPMCI and CEX.

	JPMCI (2016)	CEX (2016)
Average annual income	$71,979	$64,175
Average monthly expenditure	$6,114	$4,776

Source: JPMorgan Chase Institute

Figure 24: Benchmarking percent of JPMCI sample with no labor income over time with public data sets.



Note: Since the 2016 SCF wave collects income information from the previous year, we only show SCF data for the year of 2015.

Source: JPMorgan Chase Institute

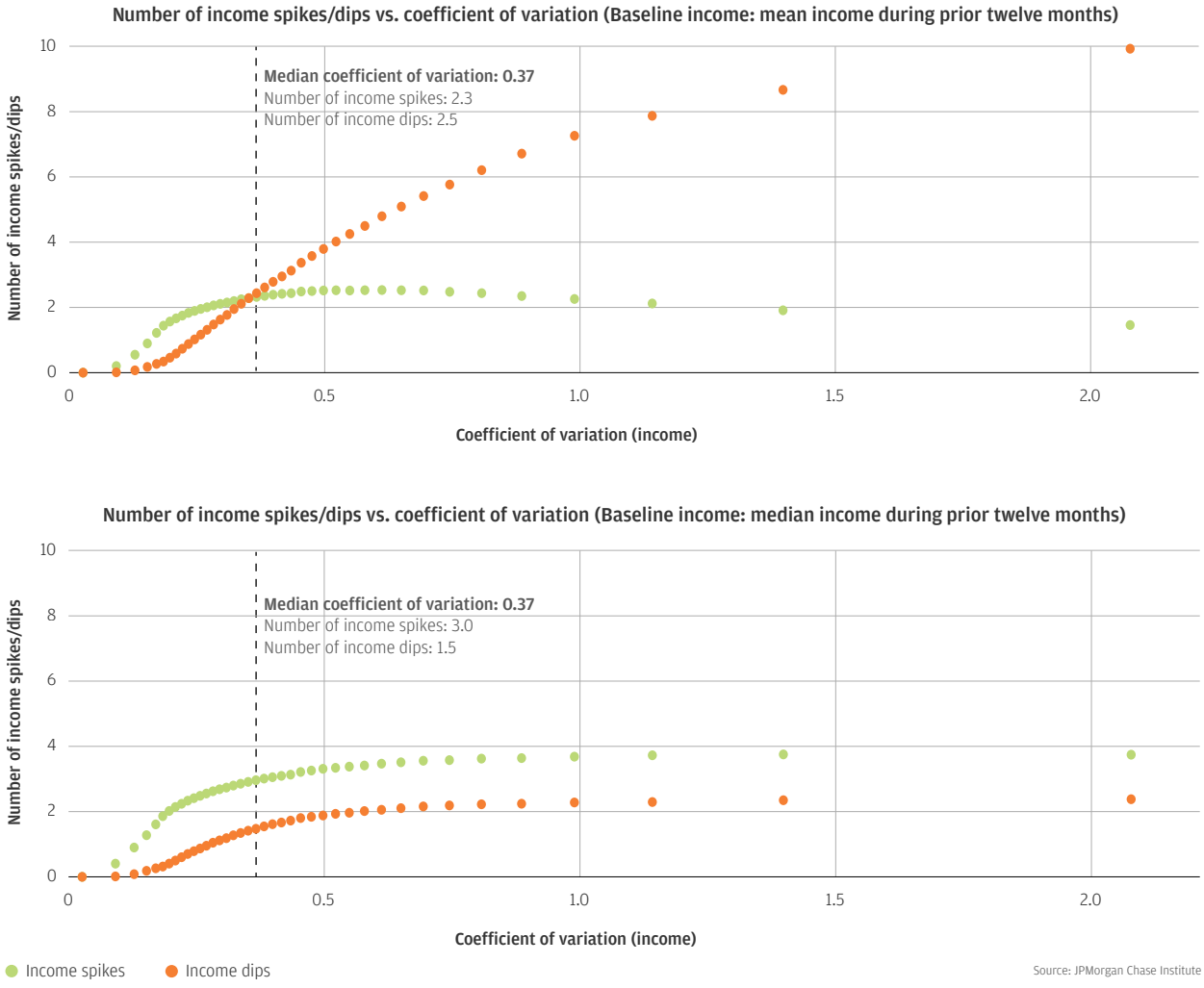
Defining spikes and dips in monthly income patterns

Prior studies have typically defined months as income spikes or dips if monthly income deviates 25 percent above or below mean monthly income within a year, or sometimes more than 25 percent above or below the prior month. For example, Hannagan and Morduch (2015) define spikes and dips as more than 25 percent above or below the monthly average and conclude that households experienced, on average, 2.7 spikes and 2.7 dips. Magg et al. (2017) use the same definition. Chikhale (2018) provides a different definition of spikes or dips, as gains or drops of 25 percent or more from one month to the next or one year to the next.

In Figure 25, we illustrate results of the frequency of spikes and dips in our data with two different definitions of spikes and dips. If we define spikes and dips by more than 25 percent deviation from the twelve-month *average* income, those with highly volatile income have significantly more dips than spikes. If we define spikes and dips by more than 25 percent deviation from the twelve-month *median* income, families across the CV distribution have more spikes and dips. This is because large income spikes tend to raise the mean and when using mean as the baseline, we mechanically create more dips than spikes. To avoid mechanically creating more dips, we use median income as the baseline when defining spikes and dips.

It is possible that we see more spikes in our data than other data sources because, first, miscellaneous large income do not appear in administrative wage data, second, people do not always remember infrequent and irregular income sources when completing a survey, and third, there may be large positive inflows counted as income in our data that are not captured as income in surveys.

Figure 25: Using mean vs. median as baseline when defining income spikes and dips.



Source: JPMorgan Chase Institute

Appendix

Figure 26: Volatility trends for total income, labor income, non-labor income adjusting for individual-level month fixed effect.

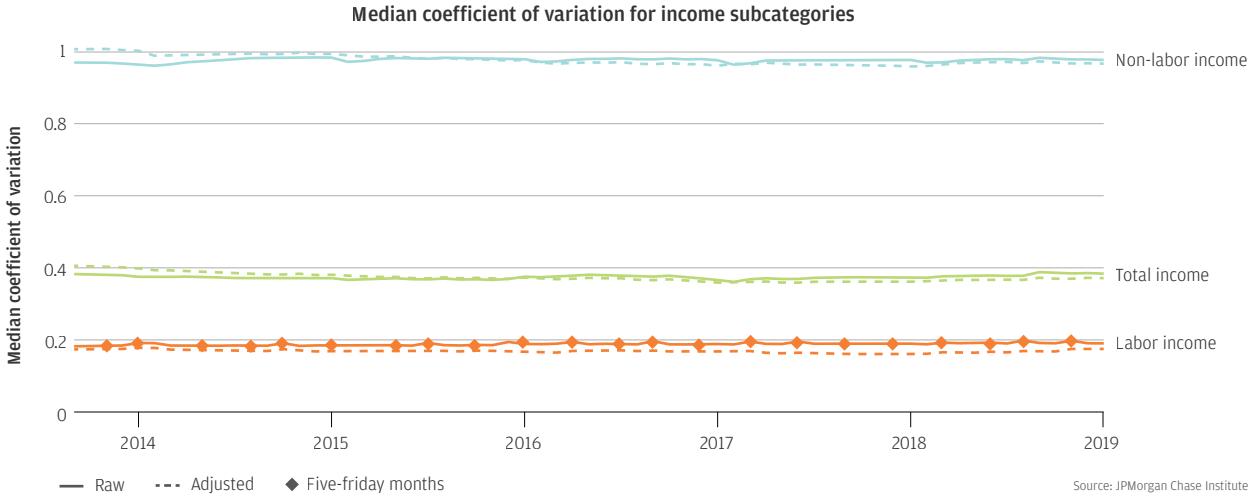


Figure 27: Frequency of income and spending spikes and dips by age, income, and cash buffer month.

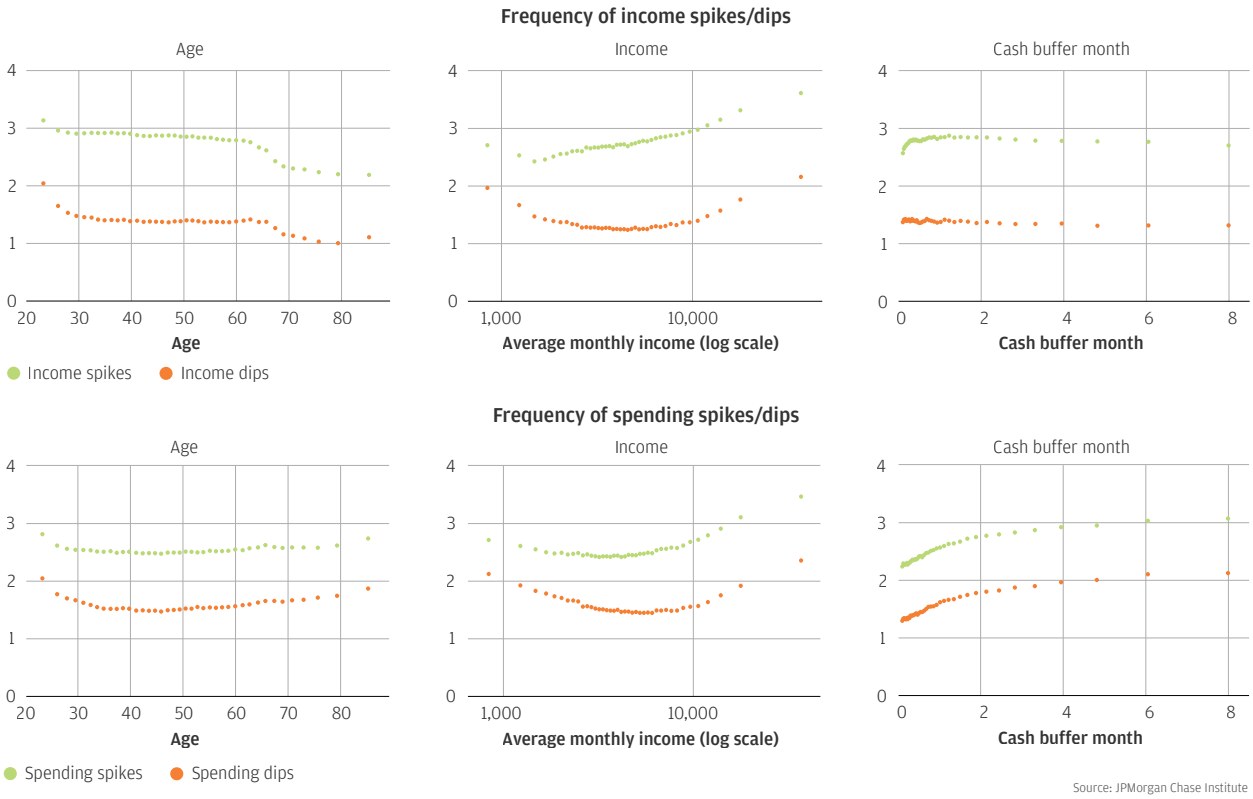
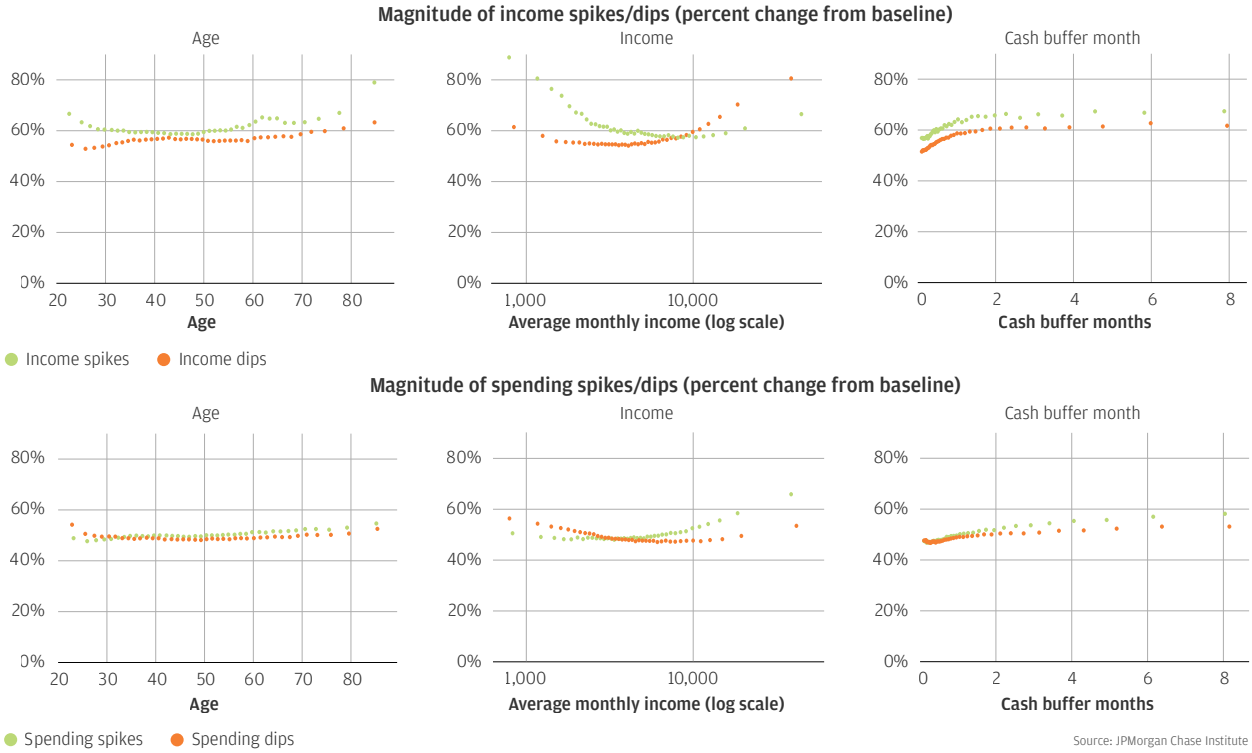
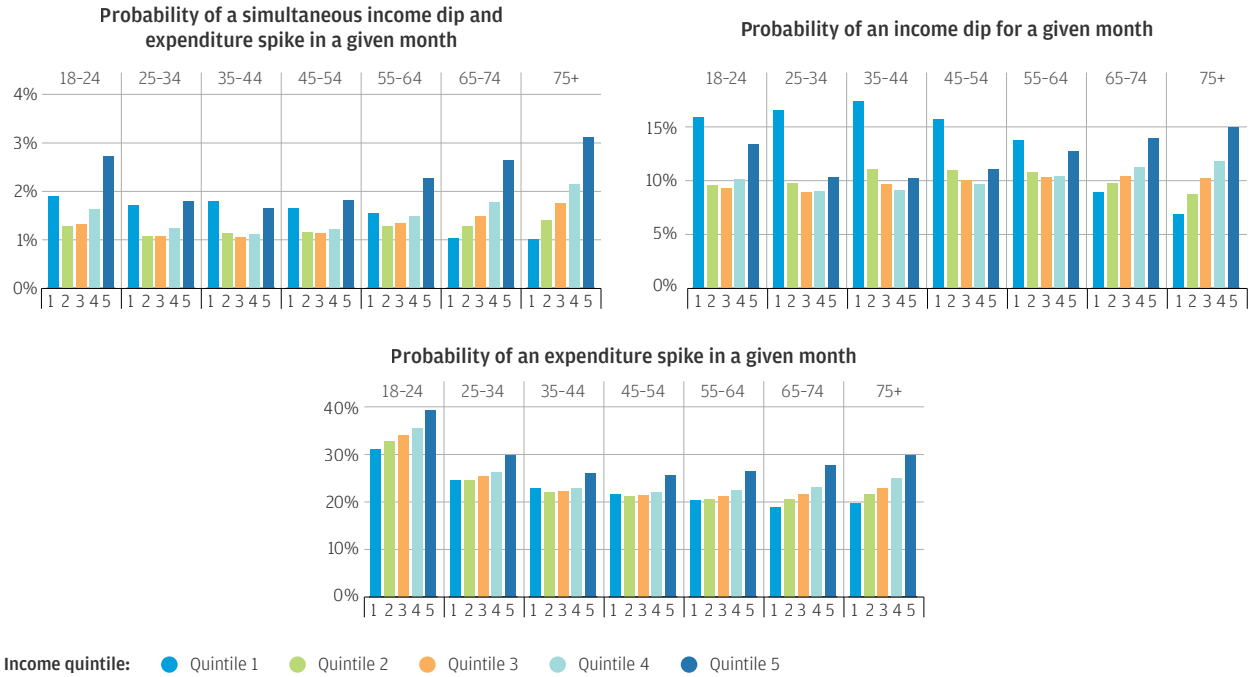


Figure 28: Magnitude of income and spending spikes and dips by age, income, and cash buffer month.



Source: JPMorgan Chase Institute

Figure 29: Probability of simultaneous income dips and expenditure spikes, income dips, and expenditure spikes by age and income groups.



Note: We calculate income by year. For simplicity, we note the cutoff points by quintile across all years here: Income quintile ranges: Quintile 1: < $29K, Quintile 2: $29K-$43K, Quintile 3: $43K-$61K, Quintile 4: $61K-$95K, Quintile 5: >$95K.

Source: JPMorgan Chase Institute

Table 8: Median weeks of income needed in cash buffer by age and income groups.

Median weeks of income needed in cash buffer for a simultaneous income dip & expenditure spike

Age group	Income quintile 1	Income quintile 2	Income quintile 3	Income quintile 4	Income quintile 5
18-24	6.6	6.0	5.7	5.9	6.9
25-34	6.7	5.9	5.6	5.5	5.7
35-44	7.4	6.2	5.9	5.7	5.9
45-54	7.4	6.3	6.1	5.9	6.1
55-64	7.2	6.3	6.1	6.1	6.5
65-74	6.1	5.6	5.5	5.6	6.4
75+	6.2	5.5	5.5	5.8	6.7

Median weeks of income needed in cash buffer for an income dip

Age group	Income quintile 1	Income quintile 2	Income quintile 3	Income quintile 4	Income quintile 5
18-24	4.3	3.2	2.8	2.8	3.6
25-34	4.3	3.0	2.5	2.3	2.4
35-44	4.3	3.2	2.7	2.5	2.4
45-54	4.3	3.1	2.8	2.6	2.6
55-64	4.2	2.9	2.8	2.7	2.9
65-74	2.4	2.3	2.5	2.6	2.9
75+	2.6	2.2	2.4	2.6	3.0

Median weeks of income needed in cash buffer for an expenditure spike

Age group	Income quintile 1	Income quintile 2	Income quintile 3	Income quintile 4	Income quintile 5
18-24	2.6	2.4	2.5	2.6	3.2
25-34	2.5	2.3	2.3	2.4	2.7
35-44	2.7	2.4	2.3	2.3	2.6
45-54	2.6	2.4	2.4	2.4	2.8
55-64	2.6	2.4	2.5	2.5	3.0
65-74	2.7	2.6	2.6	2.7	3.2
75+	2.7	2.8	2.9	3.1	3.9

Source: JPMorgan Chase Institute

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Endnotes

1 The growth in Online Platform Economy and contingent work is evident in administrative banking and tax data but not in the Bureau of Labor Statistics' Contingent Worker Survey (JPMorgan Chase Institute, 2018).

2 The top-income families included in the U.S. Financial Diaries have lower incomes than top-income families in our data (greater than 200 percent of the Supplementary Poverty Measure versus $94K in post-tax income).

3 Throughout this report, we calculate symmetric percent change between A and B, as (B-A)/(0.5 * (A+B)). This formula has the benefit of allowing for positive and negative changes to be represented symmetrically and for changes from zero to be calculable.

4 We also calculated the average month-to-month income changes for each family across the panel and then obtained the median across all families. When calculated in this way, at the family level, as opposed to the family-month level, the median month-to-month income change is 35 percent.

5 We adjust for secular income trends and month-to-month calendar effects by running fixed effect regressions with month-year dummies among families within similar income bands. Specifically, we compute $Y_{i,m,\,adjusted} = Y_{i,m,\,raw} - (\overline{Y_m} - \overline{Y})$, where the adjusted income for family i in month m is the difference between the raw income for family i, month m and the adjustment factor $(\overline{Y_m} - \overline{Y})$. We construct the adjustment factors for each band of 500 families with similar levels of average monthly income. $\overline{Y_m}$ is the average income for month m among all families in a narrow income band and $\overline{Y}$ is the average monthly income within a year.

6 We also computed the transition matrix from one year to the next (i.e. from 2013-2014, 2014-2015, etc.). The results are robust to the average transition probabilities across all years, t to t+1.

7 In a previous JPMCI report, *Paychecks and Paydays*, dips are more frequent than spikes (Farrell and Greig, 2016). The difference in the relative frequency of spikes and dips is likely due to the difference in baseline income. Notably, in previous research, we use the average income instead of median income as the baseline.

8 In previous JPMCI research, we showed the majority of families who receive tax refunds receive them between mid-February and mid-May (Farrell et al., 2018b)

9 In an earlier JPMCI report, *Coping with Costs*, we report that a one percent increase in income was associated with just a 0.07 percent increase in expenses, an even lower correlation than what we report here (Farrell and Greig, 2017). The difference is likely due to several updates we made to our data assets that include different samples, time frames, and updated categorizations of income and spending.

10 Consistent with the broader population, we observe that expenditure spikes are more common than income dips and simultaneous shocks are rare across demographic groups. The probabilities of these events, however, differ across age and income groups. Lower-income families are more likely to experience income dips and younger families are more likely to experience expenditure spikes. We provide detailed estimates for each age and income group in the Appendix (Figure 29).

11 It is important to note that the amount of liquid asset measure we utilize is the sum of of families' Chase checking and savings accounts. However, families may hold liquid assets at other banks or other in other liquid savings vehicles, such as Certificates of Deposits and Money Market Accounts. We view the amount of cash available in their checking and savings accounts as families' most readily available first-line of defense against financial shocks.

12 One group that differs from the general population is 18-64 year olds in the lowest income quintile who need slightly more than four weeks of income to weather an income dip, compared to three weeks of income for the general population.

13 Source: https://www.nacha.org/news/what-ach-quick-facts-about-automated-clearing-house-ach-network

14 The unit of analysis in our data includes both single-person and multi-person families (i.e. primary account holders). In order to compare our data with the Current Population Survey (CPS), we construct our own tag of heads of family for single- and multi-person families in the CPS. For single-person families, the head of family is definitional. For multi-person families, we create our own tag for the head of family by tagging the person with the maximum income or maximum age.

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