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INCOME VOLATILITY INCREASES FINANCIAL IMPATIENCE

Abstract

Using a multi-method approach, we investigate whether income volatility is associated with financial impatience—the preference to receive a small sum of money immediately over a larger sum of money later. We find that experiencing more income volatility—including a higher frequency of either income dips or spikes – is associated with greater financial impatience. Using longitudinal data on biannual income, Study 1 demonstrates that this effect operates above and beyond individual differences in income risk preferences and wealth. Study 2 conceptually replicates these correlational findings with recent month-to-month income volatility and finds that this effect occurs primarily among people who report having little control over their finances. Using a longitudinal field experimental with low-income working women, Study 3 tests for a causal effect of an externally-induced spike in monthly income on changes in financial impatience. In a pre-post test experimental design, participants randomly assigned to receive cash transfers amounting to a median monthly income spike of 29% exhibit significantly greater financial impatience compared to a control condition in which participants receive no cash transfers. We conclude by discussing the implications of these findings for employers and policymakers.

Keywords: income volatility, compensation, impatience, time preferences

INCOME VOLATILITY INCREASES FINANCIAL IMPATIENCE

Around the world, households are facing increasingly volatile income streams. Over the past 50 years, fewer jobs offer consistent working schedules and predictable salaries (Federal Reserve, 2018; OECD, 2019). The average American household now experiences 30% more variability in year-to-year income compared to 1970. The likelihood of large income ‘dips’ and ‘spikes’ (>50% change from year-to-year) has increased substantially over the past 50 years (Dynan, Elmendorf, & Sichel, 2012; Gottschalk & Moffitt, 2009; Bradley & Ziliak, 2013; Morduch & Schneider, 2017). Income volatility is also rising in other advanced economies where detailed household-level data is available, including Germany (Burkhauser et al., 1997), Great Britain (Dickens, 1996), Sweden (Gustavsson, 2004), and Canada (Baker & Solon, 2003; Beach et al., 2003; 2008; Beach, Finnie & Gray, 2010; Gracia-Medina & Wen, 2014; Peetz & Robson, 2019). Furthermore, in most developing economies, income volatility is ubiquitous due to a variety of economic risks such as harvest failure, health shocks, crime, precarious employment, and a lack of adequate insurance or other risk-sharing arrangements (Morduch, 1999; Dercon, 2002; Baulch & Hoddinott, 2000).

Avoiding financial shortfalls amidst income volatility requires patience and planning. However, the psychological experience of having a volatile income could make it especially difficult to resist temptation and stick to long-term plans, especially when income fluctuations are outside of one’s control. Recent research has shown that temporary income dips or unexpected expenses can impose cognitive load, causing people to focus their attention on near-term outcomes at the expense of long-term planning, ultimately leading to more impatient

decision-making (Mani, Mullainathan, Shafir, & Zhao, 2013; Shah, Mullainathan, & Shafir, 2012). We know comparatively little about how people respond to income spikes. We theorize that income spikes do not typically elicit a compensatory response and can instead contribute to *further* financial impatience. In this research, we investigate the relationship between income volatility—including both income dips and spikes—and financial impatience.

BACKGROUND & HYPOTHESES

Rising household income volatility represents a fundamental change in labor markets around the world (Gottschalk & Moffitt, 2009; Hacker & Jacobs, 2008). A growing percentage of people work in jobs that do not offer a stable salary. For instance, compared to 1980, more people work part-time, as contractors and freelancers, and in the ‘gig economy’ doing ‘crowdwork’ and ‘work-on-demand’ (Federal Reserve, 2018; OECD, 2019; McKinsey Global Institute, 2016; De Stefano, 2016). Full-time workers are also facing increasing income volatility. Union membership has declined and companies are demanding more flexible labor, therefore leading to irregular working schedules and less predictable income streams (Bureau of Labor Statistics, 2019; McMenamin, 2007; Golden, 2015). In addition, compensation packages have shifted towards lower guaranteed salaries and more incentive-based pay, leading to further volatility (e.g. tips, bonuses, commissions, profit-sharing, stock options, etc.; Federal Reserve 2018; Lemieux, MacLeod, & Parent, 2009; Lazear & Shaw, 2008; Lazear, 2018).

The effects of income volatility are most severe for people living paycheck-to-paycheck, since an unexpected negative income shock can lead to housing instability, utility disruptions, food insecurity, and cycles of increasing debt (Bania & Leete, 2009; Leete & Bania, 2010; Collins, Lienhardt, & Smeeding, 2014). However, wealthier households are also affected. Prior survey data suggests that across the economic spectrum, households with more volatile incomes

accumulate less savings, incur more debt, are more likely to default on their debts, and report greater overall financial strain compared to households with stable incomes (Diaz-Serrano, 2005; Schneider & Harknett, 2017; Pew Charitable Trusts, 2017; Fisher, 2010; TD Bank Group, 2017).

These harmful consequences may be caused, in part, by the ways in which people respond to income volatility. Economic research has examined household strategies for managing income volatility and sharing risk (Morduch 1995; 1999; Fafchamps, 1999; 2003; Dercon, 2002), but there is currently little evidence on individuals' psychological responses to income volatility.

Economic models of life-cycle consumption predict that people will respond rationally to income volatility by making more patient economic choices such as increasing precautionary savings and reducing discretionary spending (Leland, 1978; Skinner, 1988; Kimball, 1990; Weil 1993; Carroll, 1997). In contrast to these models, descriptive research from consumer psychology suggests that people are more likely to make short-sighted decisions in response to income volatility. When people face a high degree of uncertainty about the future, prioritizing the present can be viewed as a 'contextually adaptive response' (Pepper & Nettle, 2017; Fawcett, McNamara, & Houston, 2012). That is, if people believe that future financial outcomes are mostly out of their control, they may invest less effort and attention towards this future state. Indeed, low perceived control over future outcomes has been associated with impatient consumer financial decisions, including over-spending and under-saving (Perry & Morris, 2005; Shapiro & Wu, 2011; Cobb-Clark, Kassenboehmer, & Sinnin, 2016). Following from this research, in current work, we theorize that income volatility will lead to greater financial impatience.

Hypothesis 1. Experiencing greater income volatility will be associated with increased financial impatience.

The experience of having a volatile income can stem from both large dips and spikes. The link between income dips and financial impatience is supported by a growing literature on the psychological consequences of financial deprivation. When people have scarce resources, they are forced to make difficult trade-offs between necessities, desires, and aspirations. These trade-offs consume limited mental resources, leaving less cognitive bandwidth for long-term, goal-directed decision-making (Schilback, Schofield, & Mullainathan, 2016; Mani et al., 2020; Lichand & Mani, 2020). As a result, acute financial deprivation leads to more impatient decisions, including less saving, more impulsive spending, and poor planning (Ong, Theseira, & Ng, 2019; Zhao & Tumm, 2018). Similarly, the stress and negative affect associated with financial deprivation has been shown to increase impatience (Haushofer & Fehr, 2014). This research suggests that when people experience a volatile income, they may be especially impatient in response to income dips due to the psychological consequences of acute scarcity.

Hypothesis 2. Exposure to income dips will lead to greater financial impatience.

There is less evidence on how temporary income spikes will influence impatience. A recent study measuring time preferences before and after participants' regular payday found that participants tend to be more patient for financial outcomes after their payday, likely due to greater liquidity (Carvalho, Meier, & Wang, 2016). However, the increase in wealth after a payday does not constitute an income spike as it encompasses both stable and volatile income streams. More relevant is a two-wave Pew panel survey conducted in 2014-2015, which found that households were more likely to experience financial shortfalls following both dips *and* spikes in yearly income. Compared to households with a stable income, those experiencing a dip or spike of at least 25% year-over-year were more likely to miss housing payments, overdraw

their checking account, withdraw retirement savings, and use high-interest loans (Pew, 2017). These outcomes are consistent with exposure to spikes increasing financial impatience in the same fashion as dips. Building on this snap shot survey of dips and spikes, we predict that the experience of income spikes will lead to greater financial impatience. Specifically, we propose that this effect may be driven by the way in which people mentally earmark periodic spikes amidst a volatile income stream. For instance, research on the psychology of financial windfalls indicates that people create separate ‘mental accounts’ for money from unexpected gains, and they spend this money more readily than their regular income (Thaler, 1990; Arkes et al., 1994). Similarly, people tend to be more generous with windfall gains compared to ordinary earned income (Cherry, 2001; Cherry, Frykblom, & Shogren, 2002). Extrapolating these findings to income volatility, we theorize that people may treat temporary spikes like windfalls (i.e. lottery winnings or an unanticipated bonus), leading them to subsequently exhibit greater financial impatience.

Hypothesis 3. Exposure to income spikes will lead to greater financial impatience.

Overview and Analytic Approach

Income volatility is defined as objective fluctuations in earnings away from a general trend (Gottschalk & Moffitt, 1994; Congressional Budget Office, 2008). Previous research has used a wide variety of methods to measure and model income volatility. For instance, several studies use parametric models of income dynamics, often with the aim of separating fixed and variable income components, or distinguishing income mobility from transitory shocks (Moffitt & Gottschalk, 2002; Haider, 2001; Baker & Solon, 2003; DeBacker, Heim, Panousi, Ramnath, & Vidangos, 2013; Moffitt & Zhang, 2018). For testing our hypotheses, we prefer statistics that

reflect psychologically salient fluctuations in income. People tend to be insensitive to gradual changes in their income and are attentive to significant fluctuations from one year or one month to the next. For instance, Mitra and colleagues (Mitra, Gupta, & Douglas, 1997) found that people are largely insensitive to annual pay raises less than 7%. Given our aim of understanding psychological responses to income volatility, we use measures that capture meaningful percentage changes in income (Dynarski & Gruber, 1997; Cameron & Tracy, 1998; Congressional Budget Office, 2008; Dynan et al., 2012; Latner, 2018). Specifically, we focus on the following metrics of income volatility: standard deviation of percentage changes in income from one time period to the next, and frequency of income dips and spikes.

In Study 1, we use data from the National Longitudinal Study of Youth to investigate the effects of individual historical experiences of income volatility on financial impatience. We examine the effects of within-person biannual income volatility experienced over a 27-year period on present-day financial impatience. In Study 2, we examine intra-year income volatility since most people experience more volatility within-years than across-years (Hannagan & Morduch, 2015; Farrell & Grieg, 2015). We test the effects of within-person month-to-month income volatility over the previous half year (6 months) on present-day financial impatience. In both of these studies, we also investigated the effects of income dips and spikes, defined as a change of 50% or more year-over-year (Dynan et al., 2012) and 25% or more month-over-month (Hannagan & Morduch, 2015). Finally, in Study 3, we examine the causal effects of an income spike using data from a longitudinal field experiment conducted with a sample of low-income workers. In this experiment, half the participants were randomly assigned to experience a median monthly income spike of 29%, relative to their average monthly income. We measured financial impatience before and after participants received this income spike in order to capture changes in

impatience in response to the month-long increase in income. In the control condition, participants completed the same measures of impatience at the same time periods but received no cash transfers. All materials, data, and code are available on the Open Science Framework: https://osf.io/8thmv/?view_only=6aeab100ec7f43fea7eff79cc363b8a2

STUDY 1

Data and Measures

Study 1 uses data from the National Longitudinal Study of Youth (NLSY79), a cohort survey conducted by the Bureau of Labor Statistics. The NLSY79 followed 12,686 individuals beginning in 1979 through 2016. The original sample included Americans born between 1957-1964, therefore they completed the first survey when they were 14-22 years old. Surveys were conducted every year from 1979 to 1994, and then every other year thereafter. In each survey wave, participants reported their annual income, allowing for a longitudinal analysis of income volatility from early adulthood through middle age. The NLSY79 includes a measure of financial impatience in only one survey wave (2006). Therefore, our analysis focused on the biannual income fluctuations experienced between 1980-2006 as a predictor of impatience in 2006. To distinguish the effects of volatility from overall wealth accumulation, we used a detailed measure of net worth captured in the 2004 survey wave as a control variable. Accounting for attrition across the total study period, the resultant sample in 2006 includes 7,653 individuals (51% women, ages 41-49, median net worth in 2004 was \$65,000, median income in 2006 was \$35,000).

Dependent variable. The key outcome of interest was financial patience measured in the 2006 survey wave using a matching elicitation method:

“Suppose you have won a prize of \$1000, which you can claim immediately. However, you can choose to wait 1 month to claim the prize. If you do wait, you will receive more than \$1000. What is the smallest amount of money in addition to the \$1000 you would have to receive 1 month from now to convince you to wait rather than claim the prize now?”

Following past research that has examined impatience in the NLSY79 (DeVoe, House, & Zhong 2013; Courtemanche, Heutet, & McAlvanah, 2015), we calculated a personal discount factor, k , for each individual such that $k=V/A$, where V is the immediate gain (\$1000) and A is the total amount needed in order to wait one month. Therefore, a value of $k=1$ reflects total patience and values lower than 1 reflect successively greater impatience (method based on Mazur, 1987). We observed discount factors ranging from 0.001 to 1. Consistent with past research, we dropped participants who reported being perfectly patient ($k = 1$; $n = 800$), since this indicates a possible misunderstanding of the question, as well as observations lower than 3 standard deviations below the mean ($n = 10$; see SM for robustness checks using no exclusion criteria for the measure of impatience).

Independent variables

Income Volatility. The NLSY79 includes a measure of individual earnings from salary, wages, and incentive-pay in every survey wave from 1980-2006. In order to rule out periods of unemployment as a source of income stability, we marked any year with \$0 in reported income as missing data. We did not need to exclude high outliers with respect to income because the Bureau of Labor Statistics uses a top-code of \$216,200 for annual income data in order to ensure respondents’ anonymity. We calculated income volatility as the standard deviation of percentage change in year-to-year income based on methods used in Dynan et al. (2012) and Shin & Solon

(2011). Biannual percentage change is calculated as follows: $\text{Percent Change}_{t-2 \text{ to } t} = 100 * (Y_t - Y_{t-2}) / [(Y_t + Y_{t-2})/2]$, where Y indicates a respondents' annual income in a given year. This method is useful because it naturally bounds the range from -200% to 200%. We then calculated the standard deviation of biannual percentage changes as a summary measure of the income volatility an individual experienced between 1980-2006. By analyzing percentage changes, rather than absolute income levels, we did not need to use any transformations (such as adjustments for yearly Consumer Price Index) to maintain comparability over time. We also calculated the frequency of large dips and spikes in income, defined as a >50% change in biannual income (Dynan et al., 2012). In order to be included in the analyses, a respondent must have reported income data in two consecutive biannual surveys at least five times between 1980-2006 (i.e. must report at least ten years of income data within the 27-year study period in order to calculate a meaningful measure of variation).

Control variables. We included two primary control variables: total net worth and risk-seeking for income. The NLSY79 captures highly detailed information on participants' assets and debts. This includes respondents' estimates of their home value, details on their mortgage, the market value and debt for all vehicles owned, the total value of investments (including stocks, bonds, mutual funds, and certificates of deposit), the value of IRAs and 401k accounts, the value of any cash savings and other assets (i.e. jewelry, art), and all other outstanding debts, such as credit cards and student loans. NLSY79 uses all of this information to compute a variable depicting total net worth. Since this information on assets and debts is not captured in the 2006 survey wave, we used the total net worth variable from the nearest preceding survey wave (2004). Total net worth includes respondents who are in debt and therefore have a negative net worth (9.3% of respondents) as well as those with \$0 in net worth (7% of respondents).

We also included a measure of ‘risk-seeking for income’. It is possible that especially risk-seeking individuals self-select into jobs with more volatile incomes. Furthermore, rational economic models predict that income volatility will motivate people to engage in precautionary financial behaviors in proportion to their risk aversion (Kimball, 1990). Therefore, we included risk-seeking for income as a control variable to examine whether the link between income volatility and impatience is explained by individual differences in risk-seeking. The NLSY79 includes a useful measure of risk-seeking that is specific to job choices and income. In the 2006 survey wave, respondents answered “yes” or “no” to two of the following three questions:

1. “Suppose you are the only income earner in the family, and you have a good job guaranteed to give you your current income every year for life. You are given the opportunity to take a new and equally good job, with a 50-50 chance that it will double your income and a 50-50 chance it will cut your income by a third. Would you take the new job?”
2. If the answer was “yes” to question 1, respondents are asked: “would you take a new job with a 50-50 chance that it would double your income and a 50-50 chance it would cut your income in half?”
3. If the answer was “no” to question 1, respondents are asked: “would you take a new job with a 50-50 chance that it would double your income and a 50-50 chance it would cut your income by 20%?”

These three questions can be used to create a 1-4 score for risk-seeking. Individuals are defined as *1=very risk averse* if they answer “no” to questions 1 and 3 (question 2 not asked); *2=somewhat risk averse* if they answer “no” to question 1 and “yes” to question 3 (question 2 not asked); *3=somewhat risk-seeking* if they answer “yes” to question 1 and “no” to question 2

(question 3 not asked); and 4=*very risk-seeking* if they answer “yes” to questions 1 and 2 (question 3 not asked).

STUDY 1: RESULTS AND DISCUSSION

Table 1 reports the means, standard deviations and intercorrelations between variables. The raw correlations show that patience is significantly negatively correlated with each of the independent variables (r s range from $-.06$ to $-.04$, all p s $< .01$), providing initial support for each of our hypotheses. Controlling for total net worth and risk-seeking for income, greater income volatility experienced from 1980-2006 was associated with less patience in 2006, $\beta = -.054$, $t(4,827) = -3.721$ $p < .001$, $CI(\beta) = [-.083, -.026]$. This further confirms Hypothesis 1.

Examining income dips and spikes separately showed similar associations, confirming Hypotheses 2 and 3, respectively. Controlling for net worth and risk-seeking for greater income, the frequency of income dips predicted less patience, $\beta = -.048$, $t(4,827) = -3.217$ $p = .001$, $CI(\beta) = [-.078, -.019]$, as did the frequency of spikes $\beta = -.046$, $t(4,827) = -3.010$ $p = .003$, $CI(\beta) = [-.076, -.019]$. Each of the independent variables are plotted separately in Figure 1 and the full regression models for each of the three independent variable we consider is reported in Table 2.

We also found a significant effect of total net worth on patience, such that wealthier individuals tend to be more patient, $\beta = .164$, $t(5,974) = 12.872$ $p < .001$, $CI(\beta) = [.139, .189]$. This aligns with previous research demonstrating a link between poverty and impatience (Shah et al., 2012; Haushofer & Fehr, 2014; Falk et al., 2018). However, we found no interaction between income volatility and total net worth, $\beta = .012$, $t(4,994) = .350$ $p = .726$, $CI(\beta) = [-.053, -.076]$. That is, income volatility is associated with greater impatience across the wealth spectrum—even

people who have accumulated significant wealth tend to be more impatient in response to income volatility.

These findings show that income volatility experienced over a 27-year period can shape current financial impatience, controlling for both risk-seeking and a highly detailed assessment of household assets and debts. The effects hold across the wealth spectrum, indicating that the psychological consequences of income volatility extend to households that are not living paycheck-to-paycheck. Furthermore, we find that both dips and spikes in income are associated with increased impatience, with dips having a slightly stronger effect. Although the results are correlational, the ordering and temporal separation of measurement in this study support our theory for a causal link between experienced income volatility and subsequent impatience. While this design minimizes concerns of a ‘same source’ bias (Richardson et al., 2009; Burton-Jones, 2009; Podsakoff et al., 2003), it cannot rule out reverse causality. It could be that static preferences for impatience lead respondents to choose income-earning activities that produce more volatile income streams. The ability to control for risk-seeking income preferences is an important step in addressing such an alternative explanation but it cannot do it definitively, so caution is warranted in interpreting these associations.

Overall, this study provides evidence that long-run income histories with income volatility are an important factor in predicting current intertemporal financial decision-making. However, shorter-term income fluctuations may be even more impactful. Many recurring expenses are paid on monthly cycles (e.g. credit card debts, phone bills, cable bills, rent, mortgages, car leasing payment, utilities, etc.) and therefore, even relatively small deviations in monthly earnings could have significant consequences. As a result, people may be especially attuned to monthly income fluctuations. Therefore, in Study 2 we examine the effects of income

volatility on a month-to-month time scale and explore the moderating role of perceived control over one's financial circumstances.

STUDY 2

Many workers' incomes may *appear* stable when observed on a yearly basis, but when viewed on a more granular time-scale it becomes apparent that they experience substantial volatility (Farell & Greig, 2015; 2016; Hannagan & Morduch, 2016; Morduch & Siwicki, 2018; Morduch & Schneider, 2017). In this study we examine the effects of month-to-month income volatility on financial impatience, controlling for overall earnings across the study period and risk preferences. We used a sample of fully-employed workers in the United States in order to rule out the possibility that the consequences of income volatility are driven by changes to employment status. This sample, recruited via Amazon's Mechanical Turk, is slightly lower-income compared to the overall population of the United States, which is beneficial for our purposes¹. We are particularly interested in the experience of low-income individuals because they are the most exposed to the harms of income volatility. Furthermore, in Study 1, we observe no interaction between income volatility and income-level with respect to effects on impatience.

In addition, we explore perceived control over financial outcomes as a moderator. The effect of income volatility on impatience may depend on how much personal control people feel over their financial circumstances. That is, income volatility may have a greater psychological influence on impatience when fluctuations are caused by factors outside of their control. This likely involves both *real* and *perceived* control income fluctuations. For instance, some income

¹ Recent research has shown that studies examining preferences and behaviors conducted via Amazon's Mechanical Turk (Mturk) tend yield similar results to studies conducted in in-person lab settings (Casler, Bickel, & Hackett, 2013). Furthermore, the sample on Mturk tends to be more representative of the US population relative to student samples and other online platforms (Paolacci & Chandler, 2014; Horton, Rand, & Zeckhauser, 2011)

fluctuations are mostly controllable (e.g. many workers in the ‘gig’ economy treat this work as a secondary source of income that can be increased or decreased at their discretion; see Irwin, 2019 and Collins et al., 2019). Other sources of income volatility involve a lesser degree of control, such as income from casual labor, shift work, and incentive-pay. Moreover, psychological predispositions and childhood experiences can lead people to feel a greater or lesser degree of control in uncertain environments, irrespective of actual control. For example, growing up in stressful, low-SES environments can lead people to feel less control when faced with economic uncertainty in adulthood, leading to more impatient decision-making (Griskevicius et al., 2013; Mittal & Griskevicius, 2014; Compas et al., 1991; Frankenhuus, Panchanathan, & Nettle 2016).

Data and Measures

We collected monthly income data from a sample of 286 fully-employed workers via Amazon’s Mechanical Turk (ages 18-72, $M_{\text{age}} = 37.046$, $SD = 11.884$; 44% women; 43% single, 42% married, 14% living with someone as a couple; 46% have at least one child; median income = \$40,000-\$49,000 per year). Participants reported their income for each of the past six months using any records they have available (e.g. online banking, pay stubs, etc.). Participants’ monthly incomes were then displayed in a line graph. We tested two different line graph formats to investigate whether the display method influenced participants’ perceptions of their own income volatility. The graphical display method did not influence participants’ perceptions of income volatility, $F(1, 324) = 1.40$, $p = .238$, and had no effect on financial impatience, $F(1, 285) = 0.002$, $p = .967$. Therefore, we report the effects of income volatility on financial impatience collapsing across display method (see SM for robustness checks).

After viewing the graph of their monthly incomes, participants completed the same measure of patience as in Study 1, followed by an assessment of risk preferences (Benjamin et al., 2010). Lastly, participants responded to a scale that measures perceived financial control. To capture perceived financial control, we adapted the general locus of control scale developed by Pearlin & Schooler (1978). The general locus of control scale has been validated across a large number of studies (see Cobb-Clark & Schurer, 2013; Cobb-Clark et al., 2016) and it has been adapted to the domain of personal health (Wallston & Wallston, 1981). In this study, we adapted the items so that they were specific to personal finances.² Participants rated their agreement with the following 6 items on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale: “I have little control over my financial circumstances,” “There is really no way I can solve some of the financial problems that I have,” “There is little I can do to change my financial circumstances,” “I often feel helpless in dealing with problems related to money,” “Sometimes I feel that I am pushed around in life by my financial circumstances,” and “My financial future mostly depends on me” ($\alpha = .81$). All but the last item on this scale are reverse-coded so that higher scores indicate more perceived control over one’s financial situation ($M = 3.306$, $SD = 0.931$).

To measure income volatility, we constructed the same three metrics as in Study 1: standard deviation of percentage of change, frequency of income dips, and frequency of income spikes. We define monthly income dips and spikes as changes greater than 25% from one month to the next based on prior work regarding meaningful monthly volatility (Hannagan & Morduch,

² In early work on locus of control, Rotter (1960; 1966) advocated for domain-specific measures. Locus of control scales have been adapted to be specific to the domain of health (health-related locus of control scale, HLC scale; Wallston & Wallston 1981; multi-dimensional health locus of control scales, MHLC scale; Wallston, Wallston, & DeVellis, 1978). These scales measure the extent to which people feel that their health outcomes are under their personal control versus determined by factors outside their control. Health locus of control has been shown to predict a range of health-related behaviors including smoking, alcohol consumption, exercise, diet, and adherence to medical regimens (Waller & Bates, 1992; Weiss & Larson, 1990; Norman et al., 1998; Grotz et al., 2011; O’Hea et al., 2005). To our knowledge, no previous research has used a locus of control scale adapted to be specific to personal finance.

2015). We also calculated monthly discount factors using the same method as in Study 1 ($k=V/A$), dropping respondents who indicated perfect patience and observations lower than 3 standard deviations below the mean.

STUDY 2: RESULTS AND DISCUSSION

Table 3 reports the means, standard deviations and intercorrelations between variables. The raw correlations show patience exhibited significant negative correlations with each of the independent variables (r s range from $-.17$ to $-.12$, all p s $< .01$) provide initial confirmation for each of our hypotheses and show stronger associations than observed in the previous study with biannual income variation. Further confirming Hypothesis 1, controlling for total 6-month earnings and risk preferences, we found a significantly negative association between monthly income volatility and patience, $\beta = -.194$, $t(279) = -2.387$ $p = .001$, $CI(\beta) = [-.305, -.084]$. With 6 months of income data, we observe 5 month-to-month income changes where 33% of participants experienced at least one dip, and 43% experience at least 1 spike. The frequency of both dips and spikes each separately predicted a decrease in patience, controlling for overall earnings and risk preferences again further confirming Hypotheses 2 and 3 (see Table 4).

We found no significant interaction between income volatility and total 6-month earnings with respect to effects on patience, $\beta = -0.045$, $t(282) = -0.625$ $p = 0.532$, $CI(\beta) = [-0.186, 0.097]$. However, we did observe a significant interaction effect between income volatility and perceived financial control, $\beta = -0.515$, $t(281) = -2.974$ $p = 0.003$, $CI(\beta) = [-0.856, -0.174]$. To further probe the role of perceived financial control, we conducted a bootstrapped moderation analysis. The results indicate that income volatility had a greater effect on patience when people felt like they had little control over their financial circumstances. Adjusting for total 6-month earnings,

income volatility was a significant negative predictor of patience when perceived financial control was low (conditional effect, $\beta = -0.314$, $p < .001$, 95% CI(β) = [-0.457, -0.169]) and at the mean (conditional effect, $\beta = -0.157$, $p = .005$, 95% CI(β) = [-0.267, -0.047]), but there was no association when perceived financial control was high (conditional effect, $\beta = 0.001$, $p = .993$, 95% CI(β) = [-0.159, 0.157]) (Figure 2). We also conducted a Johnson-Neyman floodlight analysis to estimate the effects of income volatility on patience across the entire range of perceived financial control. We found that, at a 95% confidence level, income volatility was associated with significantly greater impatience when perceived financial control was less than 3.59 on a 1-5 scale, which included 56% of our sample.

This moderation analysis indicates the effect of income volatility on impatience depends on how much personal control people feel over their financial circumstances. Specifically, we found that when people reported a greater sense of control, they were more patient in response to income volatility. These findings align with past research showing that a sense of personal control is critical in self-regulation, cognitive control, and goal achievement (Bandura & Wood, 1989; Karniol & Ross, 1996; Schmid et al., 2015). The cross-sectional nature of the data still allows for a reverse-causal relationship, but it is more difficult to account for why respondents with low control over their financial situation exhibit greater impatience without appealing to an unmeasured variable explaining this moderation.

This study conceptually replicates the findings of the previous study on a monthly time-scale and identifies that the effect operates primarily when finances are perceived to be outside one's individual control. However, the data is still correlational, raising concerns about causality and third variable problems. Therefore, in Study 3 we conduct a field experiment to test for causal effects. Given that impatience can be considered a contextually adaptive response to

income dips, the most theoretically interesting causal test to conduct is of Hypothesis 3, observing whether the experience of a randomly-induced income spike for one month causes an increase in impatience. The naturally occurring spikes in monthly income we observed in Study 2 are prohibitively expensive to test among Americans; however, such income spikes can be tested in a field context with low income workers in less wealthy countries (Ariely, Gneezy, Loewenstein, & Mazar, 2009). We sought to test this in our final study.

STUDY 3

Income volatility is especially prevalent among low-income workers in developing countries. The most common sources of employment—casual labor, agricultural activities, and micro-entrepreneurship—involve a high degree of income volatility, and there is a lack of available financial services to help households smooth their income (Baulch & Hoddinott, 2000; Gollin, 2008; Townsend, 1995; Morduch, 1999; Dercon, 2002; Dupas & Robinson, 2013; Jayachandran, 2020). Therefore, in Study 3, we focus on a low-income population in Nairobi, Kenya. Participants were randomly assigned to receive unexpected cash transfers that induced a temporary spike in their monthly income. By conducting this study in a developing country with low-income participants, we were able to provide cash transfers that amount to a substantial monthly income spike, similar in magnitude to the naturally occurring income spikes observed in Study 2. Such cash transfers allow us to directly test Hypothesis 3 by measuring changes in financial impatience from pre-spike to post-spike. Our theory regarding the effects of an income spike on impatience directly contrasts with economic models of life-cycle consumption. Indeed, these economic models posit that the normative response to income volatility is to engage in more patient economic choices, and that people will have a precautionary savings motive in

mind if their economic circumstances allow for it, which is precisely the case after having experienced an income spike.

METHOD

In this study, we took advantage of a field experiment testing the benefits of unconditional cash transfers relative to other types of economic aid (see West & Whillans pre-registered report for complete methodological details: OSF: <https://osf.io/pkyt9/>). This experiment was conducted in Kibera, a large urban informal settlement located near Nairobi, Kenya. Our analysis of the sample consists of 524 employed women whose median monthly income is KSH 5,000 (USD 50). The mean age is 38.12 ($SD = 9.56$), ranging from 22 to 70. Forty percent are single or widowed and 59% are married or in a marriage-like relationship. For the majority of these women, their primary source of income is causal labor, including jobs such as housekeeping, cooking, working in a salon, and mending clothing. Also, a significant percentage of this sample (28%) are microentrepreneurs, the most common business activities being the sale of fruit and vegetables, prepared meals, and clothing. In order to participate, women had to be at least 18 years of age, provide informed consent, work for pay at least 25 hours per week, and have at least 1 school-aged child. This last criterion reduces the likelihood of attrition since mothers with school-aged children are more likely to remain in their current residence.

Eligible participants were invited to participate in a 6-week study. First, they completed a baseline survey (week 0) conducted in-person at the Kibera Town Center (KTC). In this survey, we measured baseline financial impatience and collected information on participants' average monthly income. Participants were then randomly assigned to either a treatment condition in

which they received an income spike for one month (weeks 2-5) via a series of unexpected cash transfers, or a control condition in which they received no cash transfers.³ Lastly, participants completed an endline survey (week 6), which included the same measure of financial impatience in order to observe within-person changes in response to the monthly income spike, relative to the control condition.

Manipulation. Participants randomly assigned to the income spike condition received 3 consecutive weekly unconditional cash transfers (UCTs) in weeks 3, 4, and 5. UCTs were sent via M-Pesa, a cellphone-based mobile money service that is widely used in Kibera. Money received on M-Pesa is as fungible as cash—M-Pesa can be transferred peer-to-peer, used at nearly all local stores, deposited into a mobile savings account, and withdrawn as physical cash from any local M-Pesa agent for a low-fee (for more detail on cash transfers administered via M-Pesa and other mobile money services see Jack & Suri, 2014; Haushofer & Shapiro, 2016; Aker et al., 2016). Each UCT was worth KSH 500 (USD 5), amounting to a total income spike of KSH 1500 (USD 15). Within our sample, this amounts to a median income spike of 29%, relative to baseline monthly earnings (winsorized mean spike size = 46%, $SD = 41%$, range: 10-250%).

Dependent variable. To measure financial impatience at baseline and endline, participants complete an elicitation based on Benjamin, Choi, and Strickland (2010), adapted for the low-income context in Kibera. This multiple-price list (MPL) elicitation of impatience is widely used in experimental and behavioral economics (Frederick et al., 2002; Andersen et al., 2006 Andreoni, Kuhn, & Sprenger, 2015). Participants were asked to make 13 binary choices

³ This study was part of a larger field experiment which included two additional treatment conditions that provided time-saving vouchers to participants (i.e. vouchers for laundry and prepared meal services design to reduce their burden of unpaid labor). This larger experiment focused on subjective well-being, stress, and relationship conflict as outcome measures (for details on all treatment arms, see OSF: <https://osf.io/pkyt9/>). Also, see SM for effects on impatience across all conditions.

between KSH 500 today or some larger amount in 6 months, ranging from KSH 510 to KSH 5000. The instructions make it clear that the questions ask only for preferences and are not an evaluation of performance: “For each pair, check the alternative that you prefer. There are no right or wrong answers, so simply tell us your true preference. Imagine that you could choose between receiving KSH 500 immediately, or another amount 6 months from now. Please indicate which option you would choose in each case” (e.g. “KSH 500 today” versus “KSH 510 in 6 months”; “KSH 500 today” versus “KSH 525 in 6 months”). The specific larger-later amounts were chosen based in pilot testing in Kibera to ensure that there were no ceiling or floor effects (see SM for details). Participants were excluded if they violated monotonicity in either the baseline or endline measure ($n = 2$). The dependent variable is the percentage of impatient choices (i.e. participant chose the payment “today”) where a *higher* percentage indicates greater impatience. By controlling for baseline responses to this measure, we are able to observe changes in impatience due to the manipulation in a pre-post test analysis in regression.

STUDY 3: RESULTS AND DISCUSSION

Table 5 reports the full regression analyses. As expected, participants’ impatience at baseline was a strong predictor of impatience at endline, $\beta = 0.472$, $p < .0001$, 95% $CI(\beta) = [0.396, 0.548]$. Above and beyond these baseline differences, random assignment to receive a monthly spike was a significant predictor of impatience at endline, $\beta = 0.094$, $p = .015$, 95% $CI(\beta) = [0.019, 0.170]$. This finding provides strong causal evidence for Hypothesis 3. The effect of the treatment on impatience was unchanged by the inclusion of baseline monthly income as an additional covariate in the analysis. Figure 3 reports the adjusted marginal means of endline impatience by condition. Additional robustness tests that include demographic controls into the

regression equation did not substantively change the findings (i.e., age, education level, number of dependents; see SM for results). Additionally, we found no interaction effect between baseline income and the income spike treatment with respect to the observed effect on impatience, $\beta = 0.00$, $p = .955$, 95% $CI(\beta) = [-0.015, 0.155]$.

GENERAL DISCUSSION

This research examines the consequences of income volatility for financial decision-making. In Study 1, we use individual-level longitudinal income data collected over a period of 27 years, spanning from late adolescence through middle age. Experiencing greater income volatility over this period predicts increased subsequent financial impatience, controlling for total net worth and a measure of risk-seeking for income. Both income dips and spikes contributed to increased impatience. A limitation of this study is that the National Longitudinal Study of Youth only includes the measure of impatience for the 2006 survey wave, and therefore we are unable to observe within-person changes in impatience over time.

In Study 2, we zoom-in to examine recent month-to-month income to observe the relationship between volatility and impatience. Monthly income volatility may be especially difficult for households to manage from a practical budgeting standpoint, and therefore monthly volatility may also be the most psychologically salient. We find that month-to-month income volatility—including both dips and spikes—is associated with greater impatience, controlling for overall earnings. Cross-sectionally, overall income does not appear to buffer against the effects of income volatility. Instead, people are affected by income volatility to the extent that they feel in control of their financial circumstances. For those who feel a high degree of control over their financial lives, income volatility is unrelated to financial impatience.

In Study 3, we examine the causal effects of an unexpected monthly income spike. We took advantage of a larger field experiment conducted with a low-income sample in Kibera (West & Whillans, 2020). This larger field experiment focused on the benefits of unconditional cash transfers versus time-saving services for subjective wellbeing, however it also provided the opportunity to test the effects of a large exogenous monthly income spike on financial impatience in a pre-post test experimental analysis. In Kibera, median monthly income is USD 50 and we randomly assigned participants to receive a spike of USD 15—a highly consequential temporary change in income. By using a pre-post test design, we were able to conduct a high-powered within-person test of the causal effects. Our results show that, despite providing greater and more liquid financial resources, income spikes induced an increase in subsequent financial impatience.

Taken together, these studies highlight an important psychological consequence of income volatility. The increase in impatience caused by income volatility undermines the compensatory response likely needed to effectively manage a volatile income over time. While these consequences are no doubt experienced most severely by poor households, our findings show that income volatility is related to increased impatience regardless of income level, which suggests that many of the harmful consequences associated with poverty may extend to households who are not poor but face increasingly volatile income streams. Indeed, research across the fields of psychology, public health, and economics have shown that financial impatience—measured with choice-based elicitation similar to the one’s used in these studies—predict less savings, more credit card debt, increased rates of smoking and obesity, and lower overall lifetime earnings (Angeletos et al., 2001; Chabris et al., 2008; Nyhus & Webley, 2001; Meier & Sprenger, 2010; Meier & Sprenger, 2012; Golsteyn, Gronqvist, & Lindahl, 2013; Sutter

et al., 2013). Therefore, these results have important practical implications for the study of labor markets, compensation structures in organizations, and the design of economic aid programs.

Practical Implications

This research provides potentially useful insights for policymakers and companies. Indeed, a direct implication of this research for policymakers and employers is that they should focus both on reducing the amount of income volatility workers experience as well as increasing workers' control over income fluctuations.

Implications for policymakers. Many policy programs designed to support low-income households inadvertently increase income volatility. For instance, many income assistance programs—unemployment benefits, Supplemental Security Income, Temporary Assistance for Needy Families, and food stamps—are frequently interrupted because recipients are required to re-certify their eligibility. For instance, food stamps recipients are typically required to re-apply every 6 or 12 months (Center on Budget and Policy Priorities, 2018). While verifying eligibility (e.g. income-testing) is important for ensuring that the program reaches the target recipients, lengthy renewal processes often exacerbate income volatility as people wait for payments to resume. In addition, benefit amounts often change from one eligibility period to the next based on reported income level. These programs focus on *absolute* levels of poverty and, in doing so, often neglect 'episodic poverty'—periodic dips in monthly income that cause people to temporarily fall below the poverty line (Morduch & Siwicky, 2017). Individuals may lose benefits if they experience income spikes in the months leading up to re-certification and find themselves facing an income dip without the safety net of benefits in the subsequent months. Our results suggest that income assistance programs should be designed to account for episodic

poverty by lengthening eligibility periods and providing greater predictability to recipients. In addition, these programs should consider the fact that people with volatile incomes may be especially impatient. As a result, they may drop out of lengthy benefit application and renewal processes, and they may spend benefits more impulsively if they feel like they could lose these benefits in the next re-certification process.

In the United States, some recent state and municipal legislation has been introduced to address irregular working hours, which has the effect of reducing income volatility. Irregular working hours is the largest cause of income volatility, especially for low-income workers in the food services and retail industries (Federal Reserve, 2018). Together, these industries account for 28 million US jobs—19% of the total US workforce (Bureau of Labor Statistics, 2019). Aside from managerial roles, most people are paid hourly and they typically receive just 3-7 days' notice on their working schedule for the following week (Williams et al., 2018). Schedule volatility has been shown to harm employee wellbeing and increase financial strain (Henly & Lambert, 2014). To address these concerns, 'fair workweek' legislation was passed in Oregon in 2017, followed by municipal ordinances in Seattle, San Francisco, Philadelphia, Chicago, and New York City (Wolfe, Jones, & Cooper 2018). This legislation requires food service and retail companies employing >700 people to post schedules at least 2 weeks in advance and compensate workers for any last-minute changes. On a federal level, fair workweek legislation has been introduced, but not passed. The Schedules That Work Act (S.1772, 2015) would require companies in the food service, cleaning, hospitality, warehouse, and retail industries to provide at least 2 weeks' notice on schedules for all employees. A recent study found that fair workweek legislation can improve family wellbeing (Gassman-Pines & Ananat, 2018). Our findings suggest that more advance notice and predictability in work schedules—and therefore earnings—

may also bolster feelings of financial control and help workers make more patient financial decisions.

Implications for employers and financial institutions. Companies can also benefit from stabilizing workers' schedules. In the food service and retail industries, irregular working hours are typically a result of companies seeking to match labor to predicted customer traffic in order to increase profitability (Perdikaki et al., 2012). However, the evidence indicates that irregular scheduling does not increase profits, and it may have downstream consequences on workers' wellbeing, productivity, and retention (Williams et al., 2018; Schneider & Harknett, 2019; Choper, Schneider, & Harknett, 2019). An experiment with Gap stores in San Francisco and Chicago found that stabilizing sales associates' working hours led to an increase in workers' productivity as well as store-level sales (7% increase in sales in the treatment stores relative to control stores during the 10-month intervention period; Williams et al., 2018).

Companies should also consider restructuring their employees' compensation packages so that incentive-pay represents a smaller proportion of overall compensation or disburse incentive-pay more evenly throughout the year. Furthermore, companies should ensure that workers feel a high degree of control over their incentive-pay outcomes. Incentive-pay tends to increase workers' psychological focus on the incentives themselves (Hur & Nordgren, 2016), and can often be effective in increasing workers' productivity (Weibel, Rost, & Osterloh, 2007). However, there may be deleterious downstream effects on financial wellbeing. Our results suggest that, holding total compensation constant and to the extent that incentive-pay schemes feel uncontrollable, workers with a higher proportion of incentive-pay may be more financially impatient.

Companies can also reduce workers' income volatility through income-smoothing initiatives such as subsidized employee loans and early access to paychecks. For instance, Walmart allows their 1.4 million workers to access a portion of their pay between bi-weekly paychecks for hours they have already worked (Corkery, 2017). Walmart's intention was to help their hourly employees—who earn an average of \$14.26/hour—avoid payday loans. Our findings indicate that this initiative could increase their employees' financial patience and help them stick to longer-term financial plans. Additionally, employers could help their employees manage income volatility via short-term savings programs. Many employers already offer matched-contribution 401(k) savings programs for retirement. Short-term savings programs with similar employer-matched contributions may be even more beneficial for overall financial wellbeing.

Given rising income volatility, there is a growing need for new financial products and innovations that can help workers from across the socioeconomic spectrum smooth their income and feel a greater sense of control over their financial life. Financial literacy initiatives are largely ineffective (Fernandes, Lynch, & Netemeyer, 2014) and short-term credit products ('short-term, small-dollar credit' such as payday loans, auto loans, and bank overdraft protection) tend to worsen long-term financial stability (CFPB, 2014). Banks and fintech companies need to develop new financial products tailored to the primary source of income volatility: within-job earnings fluctuations. Existing products tend to focus exclusively on income dips. Similar attention should be paid to managing income spikes given their effect on impatience.

People who experience income volatility should have a strong incentive to be patient, resisting impulse spending and increasing precautionary savings to protect against future income shocks. Our research shows that, despite these incentives, the psychological experience of income volatility—especially when it is outside of one's control—can lead people to be more

impatient. Policymakers and companies need to consider not only the absolute level of financial constraints facing workers, but the practical and psychological consequences of income volatility.

REFERENCES

- Ainslie, G., & Haslam, N. (1992). Hyperbolic discounting. In G. Loewenstein and J. Elster (Eds.), **Choice over time**: 57–92. New York, NY: Russell Sage Foundation.
- Aleem, I. (1990). Imperfect information, screening, and the costs of informal lending: A study of a rural credit market in Pakistan. *The World Bank Economic Review*, 4(3): 329-349.
- Andersen, S., Harrison, G. W., Lau, M. I., & Rutström, E. E. (2006). Elicitation using multiple price list formats. *Experimental Economics*, 9(4): 383-405.
- Andreoni, J., Kuhn, M. A., & Sprenger, C. (2015). Measuring time preferences: A comparison of experimental methods. *Journal of Economic Behavior and Organization*, 116: 451-464.
- Angeletos, G. M., Laibson, D., Repetto, A., Tobacman, J., & Weinberg, S. (2001). The hyperbolic consumption model: Calibration, simulation, and empirical evaluation. *Journal of Economic Perspectives*, 15(3): 47-68.
- Ariely, D., Gneezy, U., Loewenstein, G., Mazar, N. (2009). Large stakes and big mistakes. *The Review of Economic Studies*, 76: 451-469.
- Arkes, H. R., Joyner, C. A., Pezzo, M. V., Nash, J. G., Siegel-Jacobs, K., & Stone, E. (1994). The Psychology of Windfall Gains. *Organizational Behavior and Human Decision Processes*, 59(3): 331-347.
- Baker, M., & Solon, G. (2003). Earnings dynamics and inequality among Canadian men, 1976–1992: Evidence from longitudinal income tax records. *Journal of Labor Economics*, 21(2): 289-321.
- Bandura, A., & Wood, R. (1989). Effect of perceived controllability and performance standards

- on self-regulation of complex decision making. *Journal of Personality and Social Psychology*, 56(5): 805-814.
- Banerjee, A. V. (2004). Educational Policy and the Economics of the Family. *Journal of Development Economics*, 74(1): 3-32.
- Banerjee, A., & Mullainathan, S. (2010). The shape of temptation: Implications for the economic lives of the poor (No. w15973). *National Bureau of Economic Research*.
- Bania, N., & Leete, L. (2009). Monthly household income volatility in the US, 1991/92 vs. 2002/03. *Economics Bulletin*, 29(3): 2100-2112.
- Baulch, B., & Hoddinott, J. (2000). Economic mobility and poverty dynamics in developing countries. *The Journal of Development Studies*, 36(6): 1-24.
- Bureau of Labor Statistics (2019). The Economics Daily. U.S. Department of Labor. Available at <https://www.bls.gov/opub/ted/2019/union-membership-rate-10-point-5-percent-in-2018-down-from-20-point-1-percent-in-1983.htm>
- Bureau of Labor Statistics (2020). National Longitudinal Surveys: NLSY79 Overview. U.S. Department of Labor. Available at <https://www.bls.gov/nls/nlsy79.htm>
- Burton-Jones, A. (2009). Minimizing method bias through programmatic research. *MIS Quarterly*, 33(3): 445-471.
- Cameron, S., & Tracy, J. (1998). Earnings variability in the United States: An examination using matched-CPS data. *Columbia University and Federal Reserve Bank of New York*.
- Carroll, C. D. (1997). Buffer-stock saving and the life cycle/permanent income hypothesis. *The Quarterly Journal of Economics*, 112(1): 1-55.
- Center of Budget and Policy Priorities (2018). Improving SNAP and Medicaid access: SNAP

renewals. Available at <https://www.cbpp.org/research/food-assistance/improving-snap-and-medicaid-access-snap-renewals>

Chabris, C. F., Laibson, D., Morris, C. L., Schuldt, J. P., & Taubinsky, D. (2008). Individual laboratory-measured discount rates predict field behavior. *Journal of Risk and Uncertainty*, 37: 237-269.

Choper, J., Schneider, D., & Harknett, K. (2019). Uncertain time: Precarious schedules and job turnover in the U.S. service sector. *Washington Center for Equitable Growth*. Available at <https://equitablegrowth.org/wp-content/uploads/2019/10/WP-Choper-Schneider-and-Harknett-Uncertain-Time.pdf>

Cobb-Clark, D. A., Kassenboehmer, S. C., & Sinning, M. G. (2016). Locus of control and savings. *Journal of Banking and Finance*, 73: 113-130.

Cobb-Clark, D. A., & Schurer, S. (2013). Two economists' musings on the stability of locus of control. *The Economic Journal*, 123(570): F358-F400.

Collins, B., Garin, A., Jackson, E., Koustas, D., & Payne, M. (2019). *Has the Gig Economy Replaced Traditional Jobs over the Last Two Decades? Evidence from Tax Returns*. Working paper, University of Illinois, Urbana-Champaign.

Collins, J. M., Lienhardt, H., & Smeeding, T. M. (2014). Getting by: earning, spending, saving, and borrowing among the poor. The Institute for Research on Poverty and the Center for Financial Security at the University of Wisconsin–Madison. Available at <https://www.irp.wisc.edu/publications/fastfocus/pdfs/FF20-2014.pdf>

Compas, B. E., Banez, G. A., Malcarne, V., & Worsham, N. (1991). Perceived control and coping with stress: A developmental perspective. *Journal of Social Issues*, 47(4): 23-34.

Congressional Budget Office. (2008). Recent Trends in the Variability of Individual Earnings

- and Household Income. Available at <https://www.cbo.gov/sites/default/files/110th-congress-2007-2008/reports/06-30-variability.pdf>
- Consumer Financial Protection Bureau (2014). CFPB Data Point: Payday Lending. The CFPB Office of Research. March 2014. Available at https://files.consumerfinance.gov/f/201403_cfpb_report_payday-lending.pdf
- Corkery, M. (2017, December 13). Walmart Will Let Its 1.4 Million Workers Take Their Pay Before Payday. *New York Times*.
- Courtemanche, C., Heutel, G., & McAlvanah, P. (2015). Impatience, incentives and obesity. *The Economic Journal*, 125(582): 1-31.
- Dercon, S. (2002). Income risk, coping strategies, and safety nets. *The World Bank Research Observer*, 17(2): 141-166.
- Dercon, S. (1996). Risk, crop choice, and savings: Evidence from Tanzania. *Economic Development and Cultural Change*, 44(3): 485-513.
- DeBacker, J., Heim, B., Panousi, V., Ramnath, S., & Vidangos, I. (2013). Rising inequality: transitory or persistent? New evidence from a panel of US tax returns. *Brookings Papers on Economic Activity*, (1): 67-142.
- De Stefano, V. (2016). The rise of the just-in-time workforce: On-demand work, crowdwork, and labor protection in the gig-economy. *Comparative Labor Law and Policy Journal*, 37(3): 461-471.
- DeVoe, S. E., House, J., & Zhong, C. B. (2013). Fast food and financial impatience: A socioecological approach. *Journal of Personality and Social Psychology*, 105(3): 476-494.
- Diaz-Serrano, L. (2005). Income volatility and residential mortgage delinquency across the

- EU. *Journal of Housing Economics*, 14(3): 153-177.
- Dynan, K., Elmendorf, D., & Sichel, D. (2012). The evolution of household income volatility. *The BE Journal of Economic Analysis and Policy*, 12(2): 1-44.
- Dynarski, S., Gruber, J., Moffitt, R. A., & Burtless, G. (1997). Can families smooth variable earnings? *Brookings Papers on Economic Activity*, 1: 229-303.
- Fafchamps, M. (1999). Risk sharing and quasi-credit. *Journal of International Trade and Economic Development*, 8(3): 257-278.
- Fafchamps, M. (2003). *Rural Poverty, Risk and Development* (Vol. 144). Edward Elgar Publishing.
- Farrell, D., & Greig, F. (2015). *Weathering Volatility: Big data on the Financial Ups and Downs of U.S. Individuals*. JP Morgan Chase Institute. Washington
- Farrell, D., & Greig, F. (2016). *Paychecks, paydays, and the online platform economy: Big data on income volatility*. JP Morgan Chase Institute. Washington.
- Fawcett, T. W., McNamara, J. M., & Houston, A. I. (2012). When is it adaptive to be patient? A general framework for evaluating delayed rewards. *Behavioural Processes*, 89(2): 128-136.
- Federal Reserve (2014). Report on the Economic Well-Being of U.S. Households in 2013. Available at <https://www.federalreserve.gov/econresdata/2013-report-economic-well-being-us-households-201407.pdf>
- Federal Reserve (2018). Report on the Economic Well-Being of U.S. Households in 2018. Available at <https://www.federalreserve.gov/publications/files/2018-report-economic-well-being-us-households-201905.pdf>
- Fernandes, D., Lynch Jr, J. G., & Netemeyer, R. G. (2014). Financial literacy, financial

- education, and downstream financial behaviors. *Management Science*, 60(8): 1861-1883.
- Fisher, P. J. (2010). Income uncertainty and household saving in the United States. *Family and Consumer Sciences Research Journal*, 39(1): 57-74.
- Frankenhuis, W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Psychology*, 7: 76-80.
- Frederick, S., Loewenstein, G., and O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, 40(2): 351-401.
- Gassman-Pines & Ananat (2018). Findings from our research evaluating Emeryville, CA's Fair Workweek Ordinance. Sanford School of Public Policy, Duke University. Available at http://clkrep.lacity.org/onlinedocs/2019/19-0229_pc_6-25-19.pdf
- Golden, L. (2015). Irregular work scheduling and its consequences. *Economic Policy Institute Briefing Paper* (394).
- Golsteyn, B. H., Grönqvist, H., & Lindahl, L. (2014). Adolescent time preferences predict lifetime outcomes. *The Economic Journal*, 124(580): F739-F761.
- Gottschalk, P., & Moffitt, R. (2009). The rising instability of US earnings. *Journal of Economic Perspectives*, 23(4): 3-24.
- Griskevicius, V., Ackerman, J. M., Cantú, S. M., Delton, A. W., Robertson, T. E., Simpson, J. A., ... & Tybur, J. M. (2013). When the economy falters, do people spend or save? Responses to resource scarcity depend on childhood environments. *Psychological Science*, 24(2): 197-205.
- Grotz, M., Hapke, U., Lampert, T., & Baumeister, H. (2011). Health locus of control and health behaviour: results from a nationally representative survey. *Psychology, Health and Medicine*, 16(2): 129-140.

- Hacker, J. S., & Jacobs, E. (2008). The Rising Instability of American Family Incomes, 1969-2004: Evidence from the Panel Study of Income Dynamics. *Economic Policy Institute*, Briefing paper #213.
- Haider, S. J. (2001). Earnings instability and earnings inequality of males in the United States: 1967-1991. *Journal of Labor Economics*, 19(4): 799-836.
- Hannagan, A., & Morduch, J. (2015). *Income gains and month-to-month income volatility: Household evidence from the US Financial Diaries*. Working paper, NYU Wagner Research Paper (No. 2659883).
- Hardy, B., & Ziliak, J. P. (2014). Decomposing trends in income volatility: The “wild ride” at the top and bottom. *Economic Inquiry*, 52(1): 459-476.
- Haushofer, J., & Fehr, E. (2014). On the psychology of poverty. *Science*, 344(6186): 862-867.
- Henly, J. R., & Lambert, S. J. (2014). Unpredictable work timing in retail jobs: Implications for employee work-life outcomes. *Industrial and Labor Relations Review*, 67(3): 986–1016.
- Hur, J. & Nordgren, L. F. (2016). Paying for performance: Performance incentives increase desire for the reward object. *Journal of Personality and Social Psychology*, 111(3): 301-316.
- Irwin, N. (2019, September 15). Maybe we’re not all going to be gig economy workers after all. *New York Times*. Retrieved from <https://www.nytimes.com/2019/09/15/upshot/gig-economy-limits-labor-market-uber-california.html>
- Jayachandran, S. (2020). *Microentrepreneurship in developing countries*. Working paper, Northwestern University.
- Karniol, R., & Ross, M. (1996). The motivational impact of temporal focus: Thinking about the future and the past. *Annual Review of Psychology*, 47(1): 593-620.

- Kimball, M. S. (1990). Precautionary saving and the marginal propensity to consume (No. w3403). *National Bureau of Economic Research*.
- Latner, J. P. (2018). Income volatility and mobility: A conceptual exploration of two frameworks. *Research in Social Stratification and Mobility*, 53: 50-63.
- Lazear, E. P. (2018). Compensation and Incentives in the Workplace. *Journal of Economic Perspectives*, 32(3): 195-214.
- Lazear, E., & Shaw, K. (2008). *An International Comparison of the Structure of Wages Within and Across Firms*. University of Chicago: Press.
- Leete, L., & Bania, N. (2010). The effect of income shocks on food insufficiency. *Review of Economics of the Household*, 8(4): 505-526.
- Leland, H. E. (1978). Saving and uncertainty: The precautionary demand for saving. In *Uncertainty in Economics*: 127-139. Academic Press.
- Lemieux, T., MacLeod, W. B., & Parent, D. (2009). Performance pay and wage inequality. *The Quarterly Journal of Economics*, 124(1): 1-49.
- Lichand, G., & Mani, A. (2020). *Cognitive droughts*. Working paper (No. 341), University of Zurich, Department of Economics.
- Mani, A., Mullainathan, S., Shafir, E., and Zhao, J. (2013). Poverty impedes cognitive function. *Science*, 341(6149): 976-980.
- Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2020). Scarcity and cognitive functioning around payday: a conceptual and empirical analysis. *Journal of the Association of Consumer Research*. Preprint DOI: <https://doi.org/10.1086/709885>
- Mazur, J. E. (1985). Probability and delay of reinforcement as factors in discrete-trial choice. *Journal of the Experimental Analysis of Behavior*, 43(3): 341-351.

- Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. In M.L. Commons, J.E. Mazur, J.A. Nevin, and H. Rachlin (Eds.), *Quantitative analyses of behavior: Vol. 5. The effect of delay and intervening events on reinforcement value: 55-73*. Hillsdale, NJ: Erlbaum.
- Mazur, J. E. (1997). Choice, delay, probability, and conditioned reinforcement. *Animal Learning and Behavior*, 25(2): 131-147.
- McKinsey Global Institute. (2016). *Independent work: Choice, necessity and the gig economy: 1-134*. McKinsey Global Institute. October.
- McMenamin, T. M. (2007). A time to work: recent trends in shift work and flexible schedules. *Monthly Labor Review*, 130: 3-7.
- Meier, S., & Sprenger, C. (2010). Present-biased preferences and credit card borrowing. *American Economic Journal: Applied Economics*, 2(1): 193-210.
- Meier, S., & Sprenger, C. D. (2012). Time discounting predicts creditworthiness. *Psychological Science*, 23(1): 56-58.
- Mitra, A., Gupta, N., & Douglas Jr, J. G. (1997). A drop in the bucket: when is a pay raise a pay raise? *Journal of Organizational Behavior*, 18(2): 117-137.
- Mittal, C., & Griskevicius, V. (2014). Sense of control under uncertainty depends on people's childhood environment: A life history theory approach. *Journal of Personality and Social Psychology*, 107(4): 621-37.
- Moffitt, R. A., & Gottschalk, P. (2002). Trends in the transitory variance of earnings in the United States. *The Economic Journal*, 112(478): C68-C73.
- Moffitt, R. A., & Gottschalk, P. (2012). Trends in the transitory variance of male earnings methods and evidence. *Journal of Human Resources*, 47(1): 204-236.

- Moffitt, R., & Zhang, S. (2018, May). Income volatility and the PSID: Past research and new results. In *AEA Papers and Proceedings*, 108: 277-80.
- Morduch, J. (1995). Income smoothing and consumption smoothing. *Journal of Economic Perspectives*, 9(3): 103-114.
- Morduch, J. (1999). Between the state and the market: Can informal insurance patch the safety net? *The World Bank Research Observer*, 14(2): 187-207.
- Morduch, J., & Schneider, R. (2017). *The financial diaries: How American families cope in a world of uncertainty*. Princeton University Press.
- Morduch, J., & Siwicki, J. (2017). In and out of poverty: Episodic poverty and income volatility in the US financial diaries. *Social Service Review*, 91(3): 390-421.
- Norman, P., Bennett, P., Smith, C., & Murphy, S. (1998). Health locus of control and health behaviour. *Journal of Health Psychology*, 3(2): 171-180.
- Nyhus, E. K., & Webley, P. (2001). The role of personality in household saving and borrowing behaviour. *European Journal of Personality*, 15(S1): S85-S103.
- O'Donoghue, T., and Rabin, M. (2015). Present bias: Lessons learned and to be learned. *American Economic Review*, 105(5): 273-79.
- OECD (2019). The Future of Work: OECD Employment Outlook 2019. Available at <https://www.oecd-ilibrary.org/docserver/9ee00155en.pdf?expires=1588368817&id=idandacname=guest&ndchecksum=26EB3796BD40CF41BF51DD5D3E32C9BF>
- O'Hea, E. L., Grothe, K. B., Bodenlos, J. S., Boudreaux, E. D., White, M. A., and Brantley, P. J. (2005). Predicting medical regimen adherence: The interactions of health locus of control beliefs. *Journal of Health Psychology*, 10(5): 705-717.

- Ong, Q., Theseira, W., & Ng, I. Y. (2019). Reducing debt improves psychological functioning and changes decision-making in the poor. *Proceedings of the National Academy of Sciences*, 116(15): 7244-7249.
- Pampel, F. C., Krueger, P. M., & Denney, J. T. (2010). Socioeconomic disparities in health behaviors. *Annual Review of Sociology*, 36: 349-370.
- Pepper, G. V., & Nettle, D. (2017). The behavioural constellation of deprivation: Causes and consequences. *Behavioral and Brain Sciences*, 40: 1-66
- Perdikaki, O., Kesavan, S., & Swaminathan, J. M. (2012). Effect of traffic on sales and conversion rates of retail stores. *Manufacturing and Service Operations Management*, 14(1): 145-162.
- Perry, V. G., & Morris, M. D. (2005). Who is in control? The role of self-perception, knowledge, and income in explaining consumer financial behavior. *Journal of Consumer Affairs*, 39(2): 299-313.
- Pew Charitable Trusts (2017). How Income Volatility Interacts with American Families' Financial Security. (Issue Brief, March 2017). Available at https://www.pewtrusts.org/-/media/assets/2017/03/incomevolatility_and_financialsecurity.pdf
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5): 879-903.
- Richardson, H. A., Simmering, M. J., & Sturman, M. C. (2009). A tale of three perspectives: Examining post hoc statistical techniques for detection and correction of common method variance. *Organizational Research Methods*, 12(4): 762-800.
- Rotter, J. B. (1960). Some implications of a social learning theory for the prediction of goal

- directed behavior from testing procedures. *Psychological Review*, 67(5), 301-316.
- Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. In J. Rotter, J. Cance, and E.J. Phares (Eds.), *Applications of Social Learning Theory of Personality*: 260-295, New York: Holt, Rinehart and Winston.
- Schedules That Work Act of 2015, S. 671, 114th Cong. (2015).
- Schmid, P. C., Kleiman, T., & Amodio, D. M. (2015). Power effects on cognitive control: Turning conflict into action. *Journal of Experimental Psychology: General*, 144(3): 655-663.
- Schneider, D., & Harknett, K. (2017). Income Volatility in the Service Sector: Contours, Causes, and Consequences. Aspen Institute, The Expanding Prosperity Impact Collaborative (EPIC). Available at https://assets.aspeninstitute.org/content/uploads/2017/07/ASPEN_RESEARCH_INCOME_VOLATILITY_WEB.pdf
- Schneider, D., & Harknett, K. (2019). Consequences of routine work-schedule instability for worker health and well-being. *American Sociological Review*, 84(1): 82-114.
- Shah, A. K., Mullainathan, S., & Shafir, E. (2012). Some consequences of having too little. *Science*, 338(6107): 682-685.
- Shapiro, J., & Wu, S. (2011). Fatalism and savings. *The Journal of Socio-Economics*, 40(5): 645-651.
- Shin, D., & Solon, G. (2011). Trends in men's earnings volatility: What does the Panel Study of Income Dynamics show? *Journal of Public Economics*, 95(7-8): 973-982.
- Skinner, J. (1988). Risky income, life cycle consumption, and precautionary savings. *Journal of Monetary Economics*, 22(2): 237-255.

- Soman, D., Ainslie, G., Frederick, S., Li, X., Lynch, J., Moreau, P., ... & Wertenbroch, K. (2005). The psychology of intertemporal discounting: Why are distant events valued differently from proximal ones? *Marketing Letters*, 16(3-4): 347-360.
- Sutter, M., Kocher, M. G., Glätzle-Rützler, D., & Trautmann, S. T. (2013). Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. *American Economic Review*, 103(1): 510-31.
- TD Bank Group (2017). Pervasive and Profound: The impact of income volatility on Canadians. Available at <https://learninghub.prospercanada.org/knowledge/pervasive-and-profound-the-impact-of-income-volatility-on-canadians/>
- Thaler, R. H. (1990). Anomalies: Saving, fungibility, and mental accounts. *Journal of Economic Perspectives*, 4(1): 193-205.
- Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy*, 89(2): 392-406.
- Waller, K. V., & Bates, R. C. (1992). Health locus of control and self-efficacy beliefs in a healthy elderly sample. *American Journal of Health Promotion*, 6(4): 302-309.
- Wallston, K. A., & Wallston, B. S. (1981). *Research with the locus of control construct* (Vol 1): 189-243.
- Wallston, K. A., Strudler-Wallston, B., & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health education monographs*, 6(1): 160-170.
- Weibel, A., Rost, K., & Osterloh, M. (2007). Crowding-out of intrinsic motivation-opening the black box. Available at SSRN 957770.
- Weil, P. (1993). Precautionary savings and the permanent income hypothesis. *The Review of*

Economic Studies, 60(2): 367-383.

TABLE 1**Descriptive statistics and correlations in Study 1**

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Patience	6,392	.71	.21	--					
2. <i>SD</i> % income change	7,670	59%	29%	-.06**	--				
3. Frequency of 50% dips	7,670	7%	10%	-.06**	.77**	--			
4. Frequency of 50% spikes	7,670	28%	15%	-.04**	.52**	.29**	--		
5. Total net worth in 2004	7,536	\$190k	\$400k	.16**	-.05**	-.06**	.02	--	
6. Risk-seeking for income	7,292	1.96	1.20	-.04**	.09**	.08**	.08**	-.03*	--

Notes. Reporting means, standard deviations, and correlations. Patience is measured as a monthly discount factor. Valid *N* (listwise) = 4,831. * $p < .05$, ** $p < .01$

TABLE 2**Effects of income volatility on impatience in Study 1**

DV: monthly discount factors	β	t	p	95% CI (β)	
				Lower bound	Upper bound
Model 1:					
SD % change 1980-2006	-0.054	-3.721	< .001	-0.083	-0.026
Net worth 2004	0.149	10.721	< .001	0.122	0.177
Risk-seeking for income	-0.025	-1.739	.082	-0.054	0.003
Model 2:					
Freq of 50% dips 1980-2006	-0.048	-3.217	.001	-0.078	-0.019
Net worth 2004	0.149	10.756	< .001	0.122	0.176
Risk-seeking for income	-0.026	-1.785	.074	-0.055	0.003
Model 3:					
Freq of 50% spikes 1980-2006	-0.046	-3.010	.003	-0.076	-0.016
Net worth 2004	0.152	10.986	< .001	0.125	0.179
Risk-seeking for income	-0.026	-1.797	.072	-0.055	0.002

Note. Three separate OLS regression models predicting monthly discount factors. Reporting standardized regression coefficients, t -statistics, p -values, 95% confidence intervals. $N = 4,831$.

TABLE 3**Descriptive statistics and correlations in Study 2**

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Patience	287	.73	.22	--					
2. SD % income change	325	27%	31%	-.17*	--				
3. Number of 25% dips	325	.44	.71	-.16**	.67**	--			
4. Number of 25% spikes	325	.65	.89	-.12**	.67**	.60**	--		
5. Total 6-month earnings	325	\$20k	\$40k	-.18**	-.11**	-.09	-.15**	--	
6. Risk preferences (0-10)	323	4.19	3.24	.03	.04	.04	.06	.17**	--
7. Financial control (1-5)	326	3.31	.93	.15**	-.05	-.03	-.09	.02	.05

Note. Patience is measured as a monthly discount factor ($k=V/A$). Reporting means, standard deviations, and correlations. Valid *N* (listwise), *N* = 283. * $p < .05$, ** $p < .01$

TABLE 4**Effects of income volatility on impatience in Study 2**

DV: monthly discount factors	β	t	p	95% CI (β)	
				Lower bound	Upper bound
Model 1:					
SD % change monthly income	-0.194	-3.462	.001	-0.305	-0.084
Total 6-month earnings	-0.314	-3.466	.001	-0.492	-0.135
Risk preferences	0.065	1.086	.278	-0.053	0.183
Model 2:					
Frequency of 25% dips	-0.198	-3.472	.001	-0.310	-0.086
Total 6-month earnings	-0.326	-3.587	< .001	-0.504	-0.147
Risk preferences	0.065	1.083	.280	-0.053	0.183
Model 3:					
Frequency of 25% spikes	-0.165	-2.787	.006	-0.282	-0.049
Total 6-month earnings	-0.328	-3.566	< .001	-0.509	-0.147
Risk preferences	0.061	1.010	.313	-0.058	0.180

Note. Three separate OLS regression models predicting monthly discount factors. Reporting standardized regression coefficients, t -statistics, p -values, 95% confidence intervals. $N = 283$.

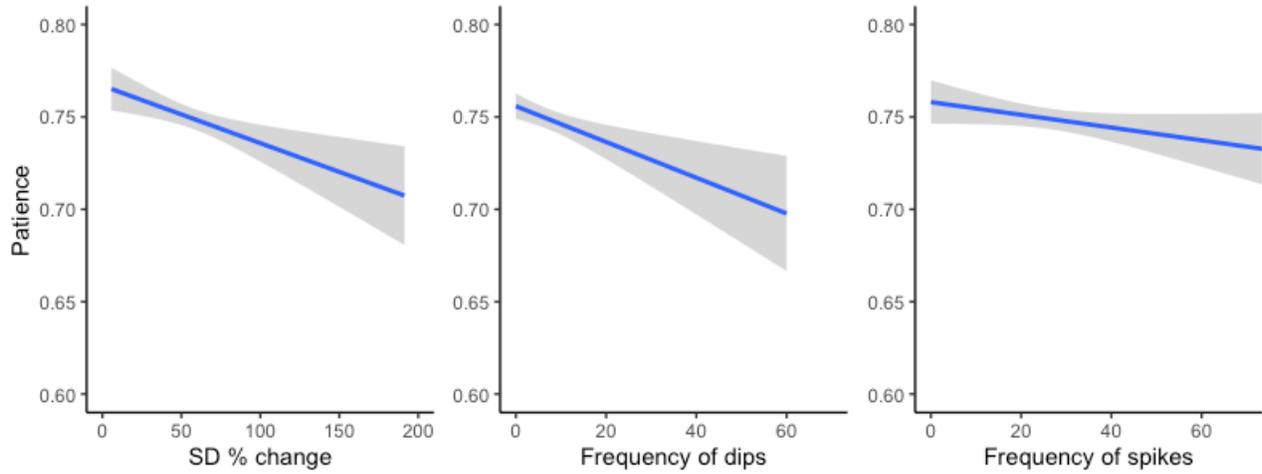
TABLE 5**Treatment effect on impatience in Study 3**

DV: % impatient choices	β	t	p	95% CI (β)	
				Lower bound	Upper bound
Model 1:					
Baseline impatience	0.459	11.779	< .001	0.382	0.536
Income spike treatment	0.094	2.447	.015	0.019	0.170
Model 2:					
Baseline impatience	0.459	11.761	< .001	0.382	0.536
Baseline monthly income	-0.009	-0.196	.845	-0.097	0.080
Income spike treatment	0.094	2.441	.015	0.018	0.170
Model 3:					
Baseline impatience	0.459	11.750	< .001	0.382	0.536
Baseline monthly income	-0.009	-0.153	.879	-0.119	0.102
Income spike treatment	0.095	1.703	.089	-0.015	0.204
Spike * Baseline income	0.000	-0.007	.995	-0.115	0.115

Note. Three separate OLS regression models predicting the percentage of choices in which a participant chose the sooner-smaller options (the impatient choice) in the series of 13 binary choices. Reporting standardized regression coefficients, t -statistics, p -values, 95% confidence intervals. $N = 520$.

FIGURE 1

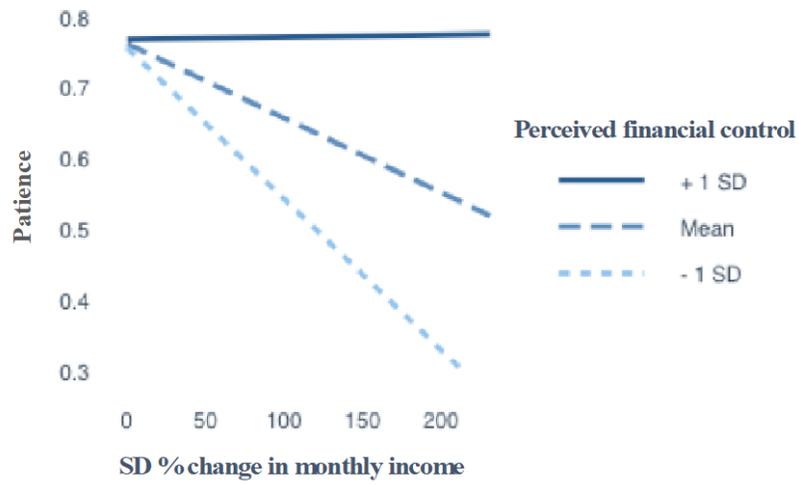
Relationship between income volatility and patience in Study 1



Note. Frequency of dips and spikes is measured as the number of 50% income dips and spikes as a percentage of biannual income changes reported between 1980-2006. Patience is measured as individual monthly discount factors, k .

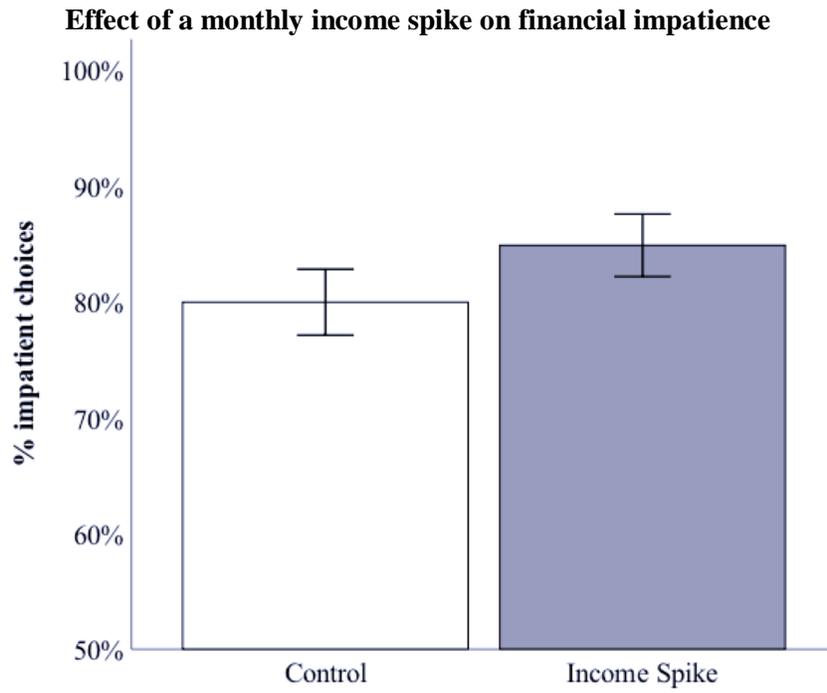
FIGURE 2

The moderating effects of perceived financial locus of control in Study 2



Note. Simple slopes plot for the association between income volatility (standard deviation of percentage change in monthly income) and discount factors at three levels of perceived financial control (-1 *SD* = 2.38, *Mean* = 3.31, and +1 *SD* = 4.24).

FIGURE 3



Note. Adjusted marginal means by condition, controlling for baseline impatience. Error bars represent 95% confidence interval. Impatience is measured as the percentage of binary choices in which participants chose the impatient option (e.g. chose the amount “today”).