

**The Impact of Payment Frequency on Consumer Spending and Subjective Wealth
Perceptions**

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Payment frequency is a fundamental yet underexplored feature of consumers' finances. As higher payment frequencies are becoming more prevalent, consumers are receiving more frequent yet smaller paychecks. An analysis of income and expenditure data of over 30,000 consumers from a financial services provider demonstrates a naturally occurring relationship between higher payment frequencies and increased spending. A series of lab studies support this finding, providing causal evidence that higher (vs. lower) payment frequencies increase spending. The effect of payment frequency on spending is driven by changes in consumers' subjective wealth perceptions. Specifically, higher payment frequencies reduce consumers' uncertainty in predicting whether they will have enough resources throughout a period, increasing their subjective wealth perceptions. As such, situational factors that reduce prediction uncertainty for those paid less frequently (e.g., the timing of consumers' expenses, income levels) moderate the impact of payment frequency. The effects of payment frequency on subjective wealth and spending can occur even when objective wealth favors those with lower payment frequencies. More broadly, the current work underscores a need to understand how timing variations in consumers' income impact their perceptions, behaviors, and general well-being.

Keywords: payment frequency, subjective wealth, consumer spending, consumer finance, uncertainty

Payment frequency is a fundamental feature of consumers' finances. An increase in the number of people who hold multiple jobs, lower payroll processing costs, and payroll technology advancements have made it increasingly common for consumers to receive more frequent (albeit smaller) paychecks. Indeed, the percentage of US employers that will increase their employees' payment frequency is expected to quadruple to 20% by 2023 (Gartner Research 2019).

Nevertheless, despite this growing popularity, it is largely unknown how higher payment frequencies (i.e., smaller, more frequent paychecks) will impact consumers' perceptions and behaviors compared to lower payment frequencies (i.e., larger, less frequent paychecks).

Prior research has demonstrated that higher payment frequencies impact when consumers spend. Compared to lower payment frequencies, higher payment frequencies lead to more distributed consumption patterns throughout the month (e.g., Berniell 2018; Parsons and Van Wesep 2013; Shapiro 2005; Stephens 2003, 2006; Stephens and Unayama 2011). In the current work, we examine whether getting paid more frequently impacts consumers in ways that extend beyond merely the timing of their consumption. We suggest that higher payment frequencies lead to increased spending. Specifically, we posit that higher payment frequencies decrease consumers' uncertainty in predicting whether they will have enough resources throughout a period, increasing consumers' subjective wealth perceptions. These higher subjective wealth perceptions lead consumers to increase their spending.

The current research uses real-world spending data and controlled lab studies to examine the impact of payment frequency on spending. First, we analyze banking transactions of more than 30,000 consumers from a financial services provider. Using natural variation in payment frequency, we find a naturally occurring relationship between higher payment frequencies and increased spending (study 1). Next, we test the causal impact of payment frequency on spending

using an online life simulation. Consistent with the real-world spending analysis, we demonstrate that higher payment frequencies lead to more spending than lower payment frequencies (study 2). We then demonstrate that the effect of payment frequency on spending is driven by consumers' subjective wealth perceptions (study 2). These subjective wealth differences stem from differences in consumers' uncertainty in predicting whether they will have sufficient resources throughout a period (studies 3, 4 and 5). As such, situational factors that reduce differences in prediction uncertainty, such as consumers' income level (study 1) and the timing of consumers' expenses (study 4), moderate the effect of payment frequency on spending and subjective wealth. Finally, we demonstrate that the effects of higher payment frequencies persist even when those with lower payment frequencies are objectively more wealthy (studies 3 and 5) or when access to higher payment frequency is optional, and consumers must request additional paychecks (study 6).

THEORETICAL FRAMEWORK

Prior research has demonstrated that consumers readily attend to and automatically encode the frequency of events (Hasher and Zacks 1979; Hasher and Zacks 1984). Processing frequency information seems to be a fundamental human ability, as even kindergartners have been shown to automatically encode frequency information (Hasher and Zacks 1979). Frequency information can influence consumers' judgment and decision-making, especially in complex situations (Alba and Marmorstein 1987; Alba et al. 1994; Alba et al. 1999). For example, when product prices vary widely, the frequency of price discounts influences consumers' price estimates and their product choices (Alba et al. 1999). Thus, the frequency in which an event

occurs may be particularly important in the financial domain, where consumers often make difficult and complex decisions (Iyengar and Kamenica 2010). In the current work, we examine payment frequency, a ubiquitous aspect of consumers' finances.

Payment Frequency and Spending

Consumers' income can vary across three dimensions: level (the amount of income earned), structure (the rate of payment per unit of effort), and timing (any variations in the temporal patterns of when pay is disbursed to employees for a given level and structure) (Parsons and Van Wesep 2013). We focus on an essential aspect of payment timing, which is payment frequency. Payment frequency does not refer to the frequency at which consumers earn their income but rather the frequency at which they receive their income. Traditionally, payment frequency has been described as the recurring cycle by which employers pay their employees (e.g., weekly, bi-weekly, or monthly). In the current research, we define payment frequency from a consumer's perspective, reflecting the number of times a consumer receives income within a given period. This more comprehensive definition allows payment frequency to reflect common payment frequencies when consumers are paid cyclically by one employer (e.g., weekly, bi-weekly), as well as payment frequencies that may result from multiple sources of income, irregular work, or inconsistent pay schedules (Golden 2015; Rothwell 2019; U.S. Bureau of Labor Statistics 2019). Since payment frequency does not impact consumers' income, those with lower payment frequencies have larger and less frequent paychecks, whereas those with higher payment frequencies have smaller and more frequent paychecks.

Recent employment and technological changes are making the study of payment frequency increasingly important. First, the rise of gig economy platforms has made it easier for

consumers to have multiple sources of income. Data suggest that approximately a quarter of US workers have more than one job (Gallup 2018). That number increased to 29% in 2019, reflecting a 21% increase (Rothwell 2019). As consumers increase their income streams and receive paychecks from multiple sources, their payment frequency also increases. Secondly, the ability to transfer funds electronically and automatically has reduced some of the cost and logistical considerations that previously dictated employers' payment frequency decisions (Stell 2016). In addition, an increase in competition has led many payroll providers to decrease their pricing and eliminate the electronic transfer fees associated with making a payroll transfer (Wakefield Research 2019). Thus, employers can now choose a wider variety of payment frequency options for their employees, including higher payment frequencies like daily pay. For example, Walmart, the largest employer in the United States, allows its workers to receive their income daily (Corkery 2017). Given the greater flexibility of employers to select payment frequencies based on factors other than logistical considerations, a natural question that arises is whether and how payment frequency impacts consumers.

The existing literature on payment frequency primarily focuses on how payment frequency impacts the timing of expenditures (e.g., Berniell 2018; Parsons and Van Wesep 2013; Shapiro 2005; Stephens 2003, 2006; Stephens and Unayama 2011). For example, Stephens and Unayama (2011) demonstrated that Japanese retirees exhibited greater consumption smoothing when they received one retirement paycheck every two months instead of one paycheck every three months. In other words, consumers spread their expenditures throughout the year more evenly when paid once every two months instead of every three months. In this work, rather than considering when consumers spend, we examine whether payment frequency impacts how much consumers spend.

Some research suggests that payment frequency should not impact consumers' spending. Such an outcome is in line with the Permanent Income Hypothesis (Friedman 1957). The Permanent Income Hypothesis suggests that barring any liquidity constraints consumers spend money based on their expected lifetime earnings rather than current earnings. Thus, the Permanent Income Hypothesis would argue that because payment frequency does not impact consumers' total income, payment frequency should not impact consumers' spending.

Other research suggests that higher payment frequencies should reduce consumers' spending because getting paid more frequently results in smaller amounts of money per paycheck. Research shows that consumers evaluate money and costs on a relative basis (Buechel and Morewedge 2014; Kassam et al. 2011; Thaler 1985). More specifically, Morewedge, Holtzman, and Epley (2007) showed that consumers spend less when thinking about a small account as compared to a large account and that purchases made from a small account (e.g., the money in their wallet) as compared to a large account (e.g., the money across their financial accounts) because purchases made from a small account feel more expensive than purchases made from a large account. Thus, if consumers focus on their average paycheck size, which by definition decreases as one's payment frequency increases, then higher payment frequencies may make costs feel larger and reduce one's spending.

Despite the aforementioned possibilities, in the current work, we argue that higher payment frequencies increase consumers' spending by increasing consumers' subjective wealth perceptions. Subjective wealth perceptions reflect consumers' assessments about the sufficiency of their financial resources. These perceptions are important for researchers to understand as they predict a wide range of outcomes (e.g., Ailawadi, Neslin, and Gedenk 2001; Fernbach, Kan, and Lynch 2015; Frank 1999; Karlsson et al. 2005; Paley, Tully, and Sharma 2019; Shah,

Mullainathan, and Shafir 2012; Sharma and Alter 2012; Sussman and Shafir 2012; Tully, Hershfield, and Meyvis 2015). Wealth perceptions impact consumers' attention (Shah, Mullainathan, and Shafir 2012; Sharma and Alter 2012), planning behavior (Fernbach, Kan, and Lynch 2015), spending and borrowing decisions (Ailawadi, Neslin, and Gedenk 2001; Karlsson et al. 2005; Tully, Hershfield, and Meyvis 2015; Sussman and Shafir 2012), and post-consumption behaviors like word-of-mouth (Paley, Tully, and Sharma 2019).

Payment Frequency and Subjective Wealth

Although subjective wealth perceptions are typically impacted by the level of one's financial resources, subjective wealth perceptions are not simply a measure of objective wealth (e.g., Gasiorowska 2014; Netemeyer et al. 2018; Sharma and Alter 2012; Sussman and Shafir 2012; Tang et al. 2004; Tully, Hershfield, and Meyvis 2015; Zauberman and Lynch 2005). Indeed, consumers with objectively similar levels of financial resources can vary in their perceptions of subjective wealth (Sussman and Shafir 2012). Instead, wealth perceptions are a subjective assessment of the sufficiency of financial resources relative to a benchmark, typically one's spending needs (Berman et al. 2016; Fernbach, Kan, and Lynch 2015; Paley et al. 2019; Tully, Hershfield, and Meyvis 2015; Zauberman and Lynch 2005). Although some research focuses on perceptions of financial oversufficiency (i.e., financial slack; Berman et al. 2016, Zauberman and Lynch 2005) and other research focuses on perceptions of financial insufficiency (i.e., financial constraints, financial deprivation; Fernbach, Kan, and Lynch 2015; Paley et al.

2019; Sharma and Alter 2012; Tully, Hershfield, and Meyvis 2015), in the current work, we refer to perceptions of sufficiency across the continuum as subjective wealth perceptions.

In evaluating their subjective wealth, consumers often predict whether their financial resources are sufficient relative to their spending needs (Berman et al. 2016; Fernbach, Kan, and Lynch 2015; Paley et al. 2019; Tully, Hershfield, and Meyvis 2015; Zauberman and Lynch 2005). Consumers can experience uncertainty in making this prediction. Indeed, prior research has shown that consumers often express uncertainty when predicting their future financial resources (Dominitz and Manski 1997a, 1997b; Ben-David et al. 2018). Such feelings of uncertainty may be an important driver of subjective wealth perceptions. Compared to those with lower prediction uncertainty over their finances, consumers with higher prediction uncertainty have been shown to safeguard their financial resources (Ben-David et al. 2018; Caldwell, Nelson, and Waldinger 2021) and believe they will need more financial resources in the future (Ülkümen, Thomas, and Morwitz 2018). These findings provide suggestive evidence that greater prediction uncertainty decreases consumers' subjective wealth perceptions.

We suggest that because payment frequency inherently changes the resource inflows and outflows that consumers experience throughout a period, payment frequency impacts consumers' uncertainty over predicting their resource sufficiency and thus their subjective wealth perceptions. Consider the temporal patterns of consumers' resources as a function of their income and expenses. Consumers incur expenses very frequently, with the average consumer incurring approximately 70 expenses per month (Greene and Stavins 2018). Therefore, compared to those with higher payment frequencies, those with lower payment frequencies experience larger and more frequent daily decreases in their overall resource levels, as expenses occur very frequently with no income to offset them. For example, a consumer with a weekly payment

frequency typically experiences a resource increase four times per month and a resource decrease on all other days when there is an expense, resulting in a general pattern of resource decumulation. In contrast, a consumer with a daily payment frequency will experience smaller and less frequent daily resource decreases as their income offsets expenses as they occur. This reduced pattern of resource decumulation resulting from higher payment frequencies ought to reduce consumers' uncertainty in predicting their resource sufficiency throughout a period. Thus, higher (vs. lower) payment frequencies should lead to lower prediction uncertainty over their resource sufficiency, and consequently, higher subjective wealth perceptions. More formally, we propose the following hypotheses:

H1: Higher payment frequencies will increase consumers' perceptions of their subjective wealth compared to lower payment frequencies.

H2: Consumer's prediction uncertainty over their resource sufficiency will mediate the effect of higher payment frequencies (vs. lower payment frequencies) on subjective wealth perceptions.

We have argued that higher payment frequencies increase consumers' subjective wealth perceptions by decreasing consumers' prediction uncertainty over whether they will have enough resources throughout a period. If true, then the effect of payment frequency on subjective wealth should depend on differences in prediction uncertainty. Thus, situational factors that reduce the differences in prediction uncertainty, such as consumers' income or their expense profile, should attenuate the effect of payment frequency on subjective wealth. For example, the impact of payment frequency on spending should be attenuated at very high income levels, as consumers with very high incomes likely face little to no uncertainty in predicting their resource sufficiency.

As an additional example, if the timing of expenses is such that a consumer with lower payment frequency can assess whether they will have enough money throughout a period with the same level of uncertainty as a consumer with higher payment frequency, then the impact of payment frequency on subjective wealth should also be attenuated. In sum:

H3: Situational factors that reduce differences in prediction uncertainty will attenuate the impact of payment frequency on subjective wealth perceptions.

If higher payment frequencies increase consumers' perceptions of subjective wealth, then higher payment frequencies should also lead to more spending. Indeed, consumers' subjective wealth perceptions have been shown to predict their spending decisions, above and beyond their objective wealth (Karlsson et al. 2005). Thus, changes to subjective wealth perceptions are likely to influence consumers' spending. More formally, we hypothesize:

H4: Higher payment frequencies will increase consumers' spending compared to lower payment frequencies.

H5: Subjective wealth perceptions will mediate the effect of higher payment frequencies (vs. lower payment frequencies) on spending.

We test these hypotheses across six studies (and four supplemental studies in the web appendix). Data from study 1 is proprietary and the legal data sharing agreement prohibits the dissemination of this data. All other data including data from our web appendix studies, as well as the relevant pre-registrations, can be found in Research Box #231 (<https://researchbox.org/231>).

STUDY 1: PAYMENT FREQUENCY AND REAL-WORLD SPENDING

In study 1, we explored the relationship between natural variations in consumers' payment frequency and their spending. To do so, we analyzed a large dataset from a financial services provider, which included consumers' income and expenditure data. We hypothesized that higher payment frequencies would be associated with increased spending.

Data

We received data from a financial services provider that gathered consumers' income and expense transactions across their debit and credit cards for 2014. The data include both credits (income) as well as debits (expenses). The dataset contained the amount, date, and currency for each transaction for 30,963 consumers. It also included a tag for whether the transaction was a credit or a debit. A summary of the dataset can be found in web appendix A.

We identified consumers for whom analysis of their income and expense transactions was possible. As such, we excluded 132 consumers with foreign exchange transactions as the data set did not provide enough information to convert foreign exchange transaction amounts to the home currency. Further, we excluded three consumers who had missing transaction-level data, such as the amount of the transaction. Thus, the final dataset contained income and expense transactions for 30,828 consumers, accounting for over 5.3 million transactions.

Results

Spending. We first analyzed the number of consumers' expenditures as a function of their payment frequency and income. To do so, we conducted a series of fixed-effect regressions in which we regressed the number of expenditures that consumers made each month on their payment frequency, using the following model specifications:

$$\text{Number of Expenditures}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \alpha_i + \epsilon_{it} \quad (1)$$

$$\text{Number of Expenditures}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \beta_2 * \text{Log(Income)}_{it} + \alpha_i + \epsilon_{it} \quad (2)$$

$$\text{Number of Expenditures}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \beta_2 * \text{Log(Income)}_{it} + \text{Month}_t + \alpha_i + \epsilon_{it} \quad (3)$$

Payment frequency was operationalized as the number of days in which a consumer received income in a month. Payment frequency was positively correlated with total income (log-transformed) in this dataset ($r = .61, p < .001$). Thus, model 2 includes total income (log-transformed) received by consumer i in month t . Model 3 includes month fixed effects to account for differences in total spending throughout the year. Across all models, we included a consumer level fixed effect, α_i , to account for consumer-level heterogeneity. As such, we relied on within-person variability in consumer's monthly payment frequency and spending. All standard errors were clustered at the consumer level. These models were run using the `felm` function in the `lfe` R package. As hypothesized, all models found that consumers' payment frequency was a significant predictor of the number of expenditures consumers made, such that higher payment frequencies predicted a greater number of expenditures (model 3: $b = 3.35, t(20389) = 18.50, p < .001, \text{Cohen's } f^2 = .06$, see table 1 for all models).¹

¹ The relationship between payment frequency and spending is significant using a Poisson regression or a negative binomial regression.

We then performed the same analysis with consumers' total spending amount during the month as our dependent variable (log-transformed). As such, we had the following model specifications:

$$\text{Log(Spending)}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \alpha_i + \epsilon_{it} \quad (4)$$

$$\text{Log(Spending)}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \beta_2 * \text{Log(Income)}_{it} + \alpha_i + \epsilon_{it} \quad (5)$$

$$\text{Log(Spending)}_{it} = \beta_1 * \text{Payment Frequency}_{it} + \beta_2 * \text{Log(Income)}_{it} + \text{Month}_t + \alpha_i + \epsilon_{it} \quad (6)$$

Again, consistent with our hypothesis, all models identified payment frequency as a significant predictor of total spending, with higher payment frequencies predicting more total spending (model 6: $b = 0.05$, $t(20389) = 21.81$, $p < .001$, *Cohen's* $f^2 = .03$, see table 1 for all models).

Insert table 1 about here

Though the number of days a consumer receives a deposit in a month is arguably the most straightforward means of identifying payment frequency, we performed a series of robustness checks operationalizing payment frequency in different ways. Specifically, we used the following alternative operationalizations of payment frequency: (1) the number of days in a month a consumer received a deposit that was explicitly labeled as income (e.g., “Salary/Paychecks”, “Wages Paid”) and (2) the number of individual deposits a consumer received throughout a month. Furthermore, we identified consumers who were in the dataset for at least three months and calculated the average number of days each consumer received income

per month. As such, we relied on between-person (rather than within-person) variability in consumer's monthly payment frequency and spending. Across all three of these robustness checks, payment frequency predicted both the number of purchases and the amount of spending (log-transformed) (see web appendix B for more details).

Payment frequency and income. We have suggested that the relationship between payment frequency and spending should depend on situational factors that impact prediction uncertainty. Since prediction uncertainty should decrease as one's income increases, we next analyzed whether consumers' monthly income level moderated the relationship between payment frequency and spending. Indeed, we found a significant interaction between consumers' payment frequency and their income level on the number expenditures ($b = .55$, $t(20388) = 6.26$, $p < .001$) as well as their total spending ($b = .03$, $t(20388) = 22.18$, $p < .001$), such that the relationship between payment frequency on spending was attenuated at higher income levels, see table 2 and web appendix B for more details).

Insert table 2 about here

This study found that payment frequency predicted spending. Higher payment frequencies were associated with higher spending both in terms of the number of expenditures and the amount of spending. The relationship between payment frequency and spending was robust to the inclusion of multiple controls, as well as various operationalizations of payment frequency. The results indicate that getting paid every workday as opposed to once a week would increase monthly spending by approximately \$20. Furthermore, the results suggest that the relationship of payment frequency on spending may be attenuated at high income levels.

Of course, as with any correlational data, it is not possible to establish causality. Furthermore, while we try to control for consumers' monthly income, we recognize that the amount of money deposited into a consumer's account is an imperfect measure of their entire financial situation. Thus, the following study uses a more controlled lab environment to examine the causal link between payment frequency and spending.

STUDY 2: PAYMENT FREQUENCY'S IMPACT ON SPENDING AND SUBJECTIVE WEALTH

Study 2 aimed to examine the impact of payment frequency on spending in a more controlled setting. To do so, we created a life simulation where participants earned income, incurred expenses, and made a series of binary spending decisions. We varied the frequency with which participants got paid such that some participants were paid weekly (lower payment frequency), whereas others were paid daily (higher payment frequency). We expected higher (vs. lower) payment frequency to result in more spending, and for these differences in spending to be mediated by consumers' subjective wealth perceptions.

Method

This study was pre-registered on AsPredicted.org (<https://aspredicted.org/hn2am.pdf>). Four hundred and five participants completed the study on Prolific Academic in exchange for monetary compensation. Participants were informed that they would play a life simulator game in which they would work, incur expenses, and make spending decisions just as they would in real life. All participants were given the same starting balance in their checking account (\$850).

Participants could spend more than was in their checking account, but to increase realism they were informed that if their balance ever went negative, they would incur a \$35 overdraft-fee (the most common amount charged for overdrafting; see Bankrate 2018). Participants were asked to make decisions as they would in their everyday life.

All participants received the same total amount of income during the five weeks (\$2,800). However, the disbursement of these funds varied by condition. At the beginning of the study, participants in the high payment frequency condition read that they would receive \$140 per day, every Monday through Friday. In contrast, those in the lower payment frequency condition read that they would receive \$700 per week, every Friday. As participants worked and earned income, participants were informed of their earnings (i.e., “You earned \$700 this week”). Participants incurred bills (e.g., rent, phone bill, utilities) and made fifteen binary spending decisions (e.g., whether to eat out or not, whether to go to a concert or not, whether to buy expensive or cheap sneakers) throughout the life simulation (see web appendix C for a complete list of decisions and a short video preview of the simulation). For each of the fifteen decisions, there was a more expensive option and a less expensive option. For example, in one decision, consumers could choose to eat out or cook dinner at home (more expensive vs. no expense decision), and in another decision, they could choose to buy an expensive or cheap pair of jeans (more expensive vs. less expensive). The number of times a person chose the more expensive option across the fifteen decisions served as our primary dependent measure. Participants were always shown their current checking account balance at the bottom of every screen in order to control for any differences in the potential saliency of their checking accounts (e.g., “Current Checking Account Balance: \$850”).

After participants finished the life simulation, they were asked to write down any reflections they had regarding their experience. Next, participants answered four questions assessing their subjective wealth perceptions throughout the simulation: Based on your experience in the life simulation, how often did you... (1) feel like you had excess money?, (2) feel like you had more than enough money?, (3) feel like you had a low checking account balance?, and (4) make a decision you did not want to make because you had a low checking account balance? (all 7-point scales, 1 = Never, 7 = Always).

Participants were then given a list of three decisions, where two were decisions they made during the simulation, and one was not. They were asked to select which of the three decisions listed was not a decision they had to make during the life simulation. This measure served as an attention check to filter out participants who had not paid attention throughout the simulation. Finally, participants reported to what extent they made decisions as they would have made in real life on a 7-point scale (1= not at all, 7 = very much) and shared their demographic information.

Results

Four participants failed the attention check and were excluded from all analyses, leaving a final sample of 401 participants ($M_{age} = 32.07$, 48% female). Overall, participants reported making decisions as they would in real-life, with the median response rating being a 7 out of 7 ($M = 6.63$, $SD = 0.70$).

Spending. We first examined our primary dependent measure: the number of times a participant chose the more expensive option across the fifteen decisions in the life simulation. Consistent with our hypothesis, participants in the higher payment frequency condition chose the

more expensive options significantly more often than those in the lower payment frequency condition ($M_{\text{higher payment frequency}} = 6.17$, $SD = 2.55$ vs. $M_{\text{lower payment frequency}} = 5.16$, $SD = 2.09$), $t(399) = 4.35$, $p < .001$, *Cohen's d* = .43.

As a secondary dependent measure, we examined whether payment frequency impacted the total amount of money consumers' spent overall. Aggregating the amount of money spent across the fifteen decisions, participants in the higher payment frequency condition spent more money than those in the lower payment frequency condition ($M_{\text{higher payment frequency}} = \404.35 , $SD = \$122.26$ vs. $M_{\text{lower payment frequency}} = \363.55 , $SD = \$107.73$), $t(399) = 3.55$, $p < .001$, *Cohen's d* = .35.

Subjective wealth perceptions. We combined the four questions assessing participants' subjective wealth perceptions into a single index, reverse-coding the last two questions (Cronbach's $\alpha = 0.77$). As expected, participants in the higher payment frequency condition reported higher subjective wealth perceptions relative to those in the lower payment frequency condition ($M_{\text{higher payment frequency}} = 2.86$, $SD = 1.22$ vs. $M_{\text{lower payment frequency}} = 2.24$, $SD = 1.01$), $t(399) = 5.53$, $p < .001$, *Cohen's d* = .55. Thus, even though participants in the daily condition ended the life simulation with objectively less money (since they spent more), they *felt* that they had more financial resources.

We then examined whether perceptions of subjective wealth mediated the effect of payment frequency on the number of times participants chose the more expensive option. To do so, we utilized the bootstrapping mediation method outlined in Hayes (2017) (PROCESS, Model 4). In line with our predictions, subjective wealth perceptions significantly mediated the effect of payment frequency on the number of expensive decisions (*indirect effect* = 0.27, 95% CI [0.12, 0.46], 10,000 resamples).

In study 2, participants paid more frequently spent more than participants that were paid less frequently. Moreover, this study found that the effect of payment frequency on spending was explained by differences in consumers' perceptions of their subjective wealth. In this study, participants were allowed to spend as much as they wanted, even if it meant having a negative checking account balance. However, the overdraft fee may have created the sense of having liquidity constraints. Thus, across two additional web appendix studies, we examine the effect of payment frequency on spending in contexts where lack of liquidity is not a concern. These results demonstrate that higher payment frequency increases spending even in the absence of any overdraft fees or when account balances and spending opportunities are constructed such that participants can never run out of money (see web appendix D and E).

STUDY 3: OBJECTIVE VERSUS SUBJECTIVE WEALTH

Study 2 demonstrated that higher payment frequency increases consumer spending by increasing subjective wealth perceptions. Study 3 aimed to examine the link between payment frequency and subjective wealth perceptions. In particular, study 3 was designed to disentangle differences in subjective wealth from differences in objective wealth. Because getting paid more frequently often results in receiving funds earlier, those paid more frequently often have greater accumulated wealth on any given day compared to those paid less frequently. Indeed, in the previous study, while total income and possible expenditures were held constant across conditions, participants in the higher payment frequency condition had a higher average daily account balance than participants in the lower payment frequency condition. To isolate the

impact of payment frequency on subjective wealth, in this study, those paid less frequently were endowed with more money than those paid more frequently.

Moreover, study 3 examined why, if not for differences in objective wealth, payment frequency increases subjective wealth. We have suggested that getting paid more frequently decreases consumers' uncertainty in predicting whether they will have enough resources throughout a period, which leads to higher subjective wealth perceptions. To examine this explanation for changes to subjective wealth, we measured subjective wealth, as well as consumers' prediction uncertainty.

Method

One hundred and fifty-two participants completed the study on Amazon Mechanical Turk in exchange for monetary compensation. This study was similar to the previous life simulation, except that the life simulation included 28 “days.” To isolate the impact of payment frequency from the impact of objective wealth, all expenses were held constant. Specifically, all participants saw the same daily expenses, and no expenses were optional such that all participants made the same expenditures totaling \$2,600. Participants in the higher payment frequency condition received \$100 each day, while participants in the lower payment frequency condition received \$700 each week. As such, all participants earned \$2,800 in the simulation. Each day, participants saw their income, expenses and checking account balance. Importantly, participants in the daily pay condition started the simulation with \$20 while participants in the weekly pay condition started the simulation with \$500. Thus, participants in the daily pay condition had a lower average daily balance (\$322 vs. \$513) and a lower minimum balance than the weekly pay condition (\$20 vs. \$44; see web appendix F for daily account balances).

After the simulation, participants were asked six questions measuring their subjective wealth perceptions on a 101-point scale (0 = not at all, 100 = very much): As you were going through the simulation, to what extent did you feel like you (1) had a lot of money? (2) had more than enough money? (3) had excess money? (4) lacked money? (5) did not have enough money, (6) were going to run out of money?. Participants then answered four questions regarding their prediction uncertainty on a 101-point scale (0 = disagree, 100 = agree): My daily income and expenses made (1) it easy to predict whether I would have enough money throughout the simulation, (2) it difficult to predict whether I would have enough money throughout the simulation, (3) me feel confident predicting whether I would have enough money throughout the simulation, (4) me feel uncertain predicting whether I would have enough money throughout the simulation.

Participants were then asked if they believed they had taken part in a similar study in the past. We asked participants to answer this question honestly and assured them that their answer would not affect their compensation for the study. Next, participants were asked three attention check questions: (1) how often they were paid, (2) how much they were paid per paycheck, and (3) the typical range for their daily expenses. Finally, participants reported their demographic information.

Results

Thirty-one participants reported taking a similar study in the past and nine additional participants failed our attention checks. Consistent with the exclusion criteria used in all of our lab studies, these participants were excluded from all analyses, leaving a final sample of 112 participants ($M_{\text{age}} = 36.59$, 41% female).

Subjective wealth perceptions. We combined the six subjective wealth perception measures into an index (Cronbach's $\alpha = .93$)². Consistent with our hypothesis, but in contrast to what would be predicted by objective wealth levels, participants in the higher payment frequency condition reported higher subjective wealth perceptions than participants in the lower payment frequency condition ($M_{\text{higher payment frequency}} = 44.40$, $SD = 25.55$ vs. $M_{\text{lower payment frequency}} = 34.57$, $SD = 24.17$), $t(110) = 2.09$, $p = .039$, *Cohen's d* = .40.

Prediction uncertainty. We combined the four prediction uncertainty measures into an index (Cronbach's $\alpha = .92$). Consistent with our hypothesis, participants in the higher payment frequency condition indicated feeling less uncertainty than participants in the lower payment frequency condition in predicting whether they would have enough resources throughout the simulation ($M_{\text{higher payment frequency}} = 35.29$, $SD = 23.16$ vs. $M_{\text{lower payment frequency}} = 50.34$, $SD = 28.63$), $t(110) = -3.05$, $p = .003$, *Cohen's d* = -.58.

Mediation. As predicted, the impact of payment frequency on subjective wealth perceptions was mediated by differences in prediction uncertainty (*indirect effect* = -8.22, 95% CI [2.55, 13.89], 10,000 resamples).

In study 3, participants paid more (vs. less) frequently felt greater subjective wealth. This effect emerged despite the fact that initial endowments differed across conditions such that those paid more frequently had objectively less money than those paid less frequently. These subjective wealth differences were explained by differences in consumers' prediction uncertainty.

² We conducted a principal component analysis to understand whether our subjective wealth and prediction uncertainty measures loaded onto two different factors. Indeed, they did (see web appendix G for more details).

STUDY 4: MODERATING THE EFFECT OF PAYMENT FREQUENCY ON SUBJECTIVE WEALTH

Studies 2 and 3 demonstrate that payment frequency impacts subjective wealth perceptions (hypothesis 1). Study 3 suggests that the effects of payment frequency are not solely the result of objective wealth differences. Instead, study 3 demonstrates that the effect of payment frequency on subjective wealth perceptions is explained by differences in consumers' prediction uncertainty (hypothesis 2). If so, situational factors that reduce differences in consumers' prediction uncertainty should attenuate the effect of payment frequency on subjective wealth perceptions (hypothesis 3).

According to our account, the frequency of expenses can impact consumers' prediction uncertainty. Due to the high frequency of expenses and the inability to offset these expenses as they occur, lower (vs. higher) payment frequencies are more likely to lead to a pattern of daily resource decumulation, which should increase consumers' prediction uncertainty. When the frequency and timing of expenses enable consumers with lower payment frequencies to avoid patterns of resource decumulation, differences in prediction uncertainty and subjective wealth across payment frequencies should be attenuated. We tested this moderation in study 4.

In study 4, we also examined two alternative explanations for the effect of payment frequency on subjective wealth. One alternative explanation is that because consumers prefer receiving segregated (vs. aggregated) gains (Thaler 1985; Thaler 1999), consumers who receive higher payment frequencies—and thus receive income in their preferred manner—may feel better about their financial situation, resulting in greater subjective wealth. Another alternative

explanation is that segregated gains are miscalculated to be larger than their equivalent sum. Both of these explanations suggest that expense frequency should be irrelevant in moderating the effect of payment frequency on subjective wealth perceptions.

Method

This study was pre-registered on AsPredicted.org (<https://aspredicted.org/np53c.pdf>). Five hundred and ninety-nine participants completed the study on Prolific Academic in exchange for monetary compensation. This study used the same design as study 3 with the following two exceptions. First, all participants received the same initial endowment amount (\$500). Second, aside from manipulating consumers' payment frequency, we also manipulated the frequency of consumers' expenses. In the high expense frequency conditions, participants paid expenses every day. In contrast, in the low expense frequency condition, participants' expenses were aggregated and paid once a week (on Fridays). Thus, this study used a 2 (payment frequency: higher vs. lower) X 2 (expense frequency: higher vs. lower) design. Importantly, the total amount of income and expenses was held constant across all conditions. After the simulation, participants answered the same questions as in study 3.

Results

Thirty-seven participants reported taking a similar study in the past and thirty-four additional participants failed our attention checks. As pre-registered, these participants were excluded from all analyses, leaving a final sample of 528 participants ($M_{age} = 32.06$, 47% female).

Subjective wealth perceptions. We combined the six subjective wealth measures into an index (Cronbach's $\alpha = .89$). We then regressed participants' subjective wealth perceptions on their payment frequency (higher payment frequency = 1, lower payment frequency = -1), expense frequency (higher expense frequency = 1, lower expense frequency = -1), and the interaction term between these two factors. The model revealed a significant main effect of payment frequency ($b = 5.57$, $t(524) = 5.42$, $p < .001$) and a significant main effect of expense frequency ($b = -6.05$, $t(524) = -5.90$, $p < .001$) on consumers' subjective wealth perceptions. Importantly, these effects were qualified by a significant interaction ($b = 4.10$, $t(524) = 3.99$, $p < .001$, Cohen's $f = .17$ (see figure 1). When expenses were incurred on a daily basis, we replicated the effects in previous studies, such that higher payment frequency led to higher subjective wealth perceptions compared to lower payment frequency ($b = 19.32$, $t(524) = 6.66$, $p < .001$). In contrast, when expenses were incurred on a weekly basis, payment frequency did not significantly impact subjective wealth perceptions ($b = 2.94$, $t(524) = 1.01$, $p = .311$).

Insert figure 1 about here

Prediction uncertainty. We combined the four prediction uncertainty measures into an index (Cronbach's $\alpha = .91$). We then regressed participants' prediction uncertainty on their payment frequency, expense frequency, and the interaction term between these two factors using the same effect coding as in the previous analysis. The model revealed a significant main effect of payment frequency ($b = -3.16$, $t(524) = -2.70$, $p = .007$) and a significant main effect of

expense frequency ($b = 4.46$, $t(524) = 3.82$, $p < .001$) on consumers' prediction uncertainty. Again, these effects were qualified by a significant interaction ($b = -5.28$, $t(524) = -4.52$, $p < .001$, *Cohen's f* = .20). When expenses were incurred on a daily basis, higher payment frequency significantly decreased consumers' prediction uncertainty compared to lower payment frequency ($b = -16.87$, $t(524) = -5.11$, $p < .001$). In contrast, when expenses were incurred on a weekly basis, payment frequency did not significantly impact prediction uncertainty ($b = 4.24$, $t(524) = 1.28$, $p = .200$).

Moderated mediation. A moderated mediation analysis was conducted using PROCESS Model 7 (Hayes 2017). We found support for the expected moderated mediation (*indirect effect* = 4.86, 95% CI [2.71, 7.13], 10,000 resamples). The analysis showed that when consumers experienced daily expenses, their prediction uncertainty mediated the effect of payment frequency on subjective wealth (*indirect effect* = 3.88, 95% CI [2.32, 5.52], 10,000 resamples). However, this mediation was not observed when consumers experienced weekly expenses (*indirect effect* = -.98, 95% CI [-2.47, 0.51], 10,000 resamples).³

Study 4 shows that differences in subjective wealth across payment frequencies result from differences in experiencing resource decreases. Specifically, lower (vs. higher) payment frequencies typically result in larger and more frequent resource decreases, which increase consumers' uncertainty in predicting whether they will have enough resources throughout a period. As such, when consumers with lower payment frequencies did not experience larger, more frequent resource decreases than those with higher payment frequencies, the effect of payment frequency on subjective wealth was attenuated.

³ For the curious mind, results are consistent and significant when allowing for a direct effect of expense frequency on subjective wealth as well (PROCESS Model 8).

STUDY 5: PAYMENT FREQUENCY'S IMPACT ON PREDICTION UNCERTAINTY, SUBJECTIVE WEALTH, AND SPENDING

Study 5 was designed to examine the full model, whereby higher payment frequencies decrease prediction uncertainty, thereby increasing subjective wealth, and in turn, increased spending. To do so, we returned to the version of the life simulation where participants could make spending decisions (as in study 2). Moreover, we aimed to ensure that differences in subjective wealth were not the result of differences in objective wealth by using a context in which higher payment frequencies result in a lower average daily account balance than lower payment frequencies. Instead of varying initial endowments as in study 3, in study 5, participants were paid either daily or bi-weekly, but we changed the bi-weekly pay schedule so that participants received their first bi-weekly paycheck after the first week and their last bi-weekly paycheck in the second to last week. Thus, total pay was held constant across conditions, but those paid bi-weekly had a higher average daily balance than those paid daily. If differences in spending result from differences in objective wealth levels, then those in the lower payment frequency condition should spend more than those in the higher payment frequency condition. However, if higher payment frequencies increase perceptions of subjective wealth by decreasing prediction uncertainty, then those in the higher payment frequency condition should spend more than those in the lower payment frequency condition despite the differences in objective wealth. Moreover, these differences in spending should be explained by differences in subjective wealth perceptions that result from differences in prediction uncertainty.

We considered the possibility that the effect of payment frequency on spending may be multiply determined. Thus, in addition to measuring subjective wealth as the primary mechanism, we examined other potential mechanisms. One possibility is that due to the shorter time period between paychecks, higher payment frequencies reduce the extent to which consumers plan for future expenses, which could increase spending. Another possibility is that, because segregated gains have a larger effect on affect than aggregated gains (Morewedge et al. 2007), spending differences across payment frequencies may be a function of affect differences. Although the compensatory and retail therapy literature would suggest that negative affect increases spending (e.g., Atalay and Meloy 2011), some research supports the possibility that positive affect increases spending (e.g., Babin and Darden 1996). To examine these possibilities, in study 5 we measured planning behavior and affect. For each measure, we aimed to explore whether the potential mechanism was operating, and if so, whether it was a better explanation for the effect of payment frequency on spending than subjective wealth differences. Finally, we also measured participants' financial literacy and intertemporal discount rates to examine whether either of these factors moderated the effect of payment frequency on spending.

Method

This study was pre-registered on AsPredicted.org (<https://aspredicted.org/zd5xz.pdf>). One thousand two hundred participants completed the study on Prolific Academic in exchange for monetary compensation. Participants played a four-week life simulator where they had to work and make spending decisions. All participants started with an \$875 checking account balance. Participants were then randomized into either a higher payment frequency condition or a lower payment frequency condition (\$140 daily, every Monday through Friday vs. \$1400 bi-

weekly, every other Friday), with those in the lower payment frequency condition getting their first paycheck on the first Friday of the game. This ensured that with no differences in spending, the average daily balance in the bi-weekly condition would be higher than the average daily balance in the daily condition (\$2,516 vs. \$2,371; see web appendix H for complete details). In this life simulation, all expenses (including bills) had a decision associated with them and participants made one spending decision per day (28 in total, see web appendix I for the complete list of decisions). For each decision, one option was more expensive and the other option was either less expensive or resulted in no spending. As in study 2, the number of times a participant selected the more expensive option served as our primary dependent measure. There were no overdraft fees in this study.

After going through the life simulation, participants completed the subjective wealth and prediction uncertainty measures from studies 3 and 4. They also answered the same attention check question as in study 2. To measure planning behavior, participants indicated their level of agreement with the following three statements: During the life simulation... (1) I actively tried to plan for large upcoming bills (rent, cellphone, tv and internet, health insurance, gas and electricity, etc.), (2) I actively tried to budget for future expenses, and (3) I consulted my checking account balance to budget how to spend my money for the next few days (all on 7-point scales: 1 = disagree, 7 = agree). Participants were asked to think back to their experience in the life simulation and report their valence, arousal, and power during the simulation using the 3-item Self-Assessment Manikin scale (Bradley and Lang 1994).

Additionally, we measured participants' financial literacy (8 items, Lusardi and Mitchell 2011) and intertemporal discount rates (16 item titration task) to explore whether either of these factors moderated the effect of payment frequency on spending. As in prior studies, in order to

ensure the naivety of our sample, we asked participants whether they believed they had taken this study in the past. Finally, participants completed demographic questions.

Results

Seventeen participants failed the attention check question and sixty-six participants reported previously participating in a similar experiment. As pre-registered, these participants were excluded from all analyses, leaving a final sample of 1,120 participants ($M_{\text{age}} = 32.71$, 52% female).

Spending. First, we examined the number of times a participant selected the more expensive option across the 28 decisions. Replicating the results of study 2, participants in the higher payment frequency condition selected the more expensive option significantly more often than those in the lower payment frequency condition, ($M_{\text{higher payment frequency}} = 17.00$, $SD = 3.63$ vs. $M_{\text{lower payment frequency}} = 15.21$, $SD = 3.30$), $t(1,118) = 8.64$, $p < .001$, *Cohen's d* = .52. Additionally, participants in the higher payment frequency condition spent more money on their purchases compared to participants in the lower payment frequency condition ($M_{\text{higher payment frequency}} = \$2,919.58$, $SD = \$198.39$ vs. $M_{\text{lower payment frequency}} = \$2,816.52$, $SD = \$175.98$), $t(1,118) = 9.19$, $p < .001$, *Cohen's d* = .55. We also analyzed each of the individual spending decisions across the 28 days (see figure 2 and web appendix K for more details).

Insert figure 2 about here

Aside from having a lower average daily balance overall, participants in the higher payment frequency condition had a lower checking account balance than those in the lower payment frequency condition on 20 out of the 28 days. Thus, we ran an additional analysis to understand the effect of payment frequency on these days since it is possible that differences in spending were the result of differences in decisions on the eight days when those paid more frequently had higher balances. Even when we restrict our analysis to these 20 days, participants in the higher payment frequency condition selected the more expensive option more often than participants in the lower payment frequency condition ($M_{\text{higher payment frequency}} = 13.53$, $SD = 2.74$ vs. $M_{\text{lower payment frequency}} = 12.59$, $SD = 2.66$), $t(1,118) = 5.86$, $p < .001$, *Cohen's d* = .35 (see web appendix K for more details).

Subjective wealth perceptions. The six questions assessing subjective wealth perceptions were combined into a single index (Cronbach's $\alpha = 0.90$). Despite the fact that those in the higher payment frequency condition had a lower average daily balance than those in the lower payment frequency condition, perceptions of subjective wealth were higher for those in the higher payment frequency condition as opposed to the lower payment frequency condition ($M_{\text{higher payment frequency}} = 37.00$, $SD = 23.46$ vs. $M_{\text{lower payment frequency}} = 26.07$, $SD = 19.72$), $t(1,118) = 8.44$, $p < .001$, *Cohen's d* = .50.

Prediction uncertainty. The four questions assessing prediction uncertainty were combined into a single index (Cronbach's $\alpha = 0.90$). As predicted, prediction uncertainty was lower for those in the higher payment frequency condition as opposed to those in the lower payment frequency condition ($M_{\text{higher payment frequency}} = 55.49$, $SD = 27.19$ vs. $M_{\text{lower payment frequency}} = 64.52$, $SD = 25.78$), $t(1,118) = -5.70$, $p < .001$, *Cohen's d* = -.34.

Serial mediation. As pre-registered, we used the serial mediation bootstrapping methodology as outlined in PROCESS Model 6 (Hayes 2017), entering payment frequency as the independent variable, prediction uncertainty as the first mediator, subjective wealth as the second mediator, and the number of times a participant selected the more expensive option across the 28 decisions as the dependent variable. The serial mediation was significant, such that higher payment frequency decreased consumers' prediction uncertainty, which increased their subjective wealth perceptions, and in turn, increased the number of times consumers selected the more expensive option (*indirect effect* = .12, 95% CI [0.06, 0.18], 10,000 resamples).

Though the predicted serial mediation was significant, we considered the possibility that the process works in a different order such that payment frequency impacts subjective wealth, which in turn impacts prediction uncertainty, and ultimately spending. However, this serial mediation was not significant (*indirect effect* = .05, 95% CI [-0.03, 0.13], 10,000 resamples).

Other potential processes. The three measures assessing the extent to which participants' planned for the future during the life simulation cohered well and were combined into a single planning index (Cronbach's $\alpha = 0.76$). Payment frequency did not significantly impact the extent to which participants planned for future expenses ($M_{\text{higher payment frequency}} = 5.62$, $SD = 1.21$ vs. $M_{\text{lower payment frequency}} = 5.67$, $SD = 1.30$), $t(1,118) = -.57$, $p = .566$, *Cohen's d* = -.03.

Payment frequency significantly impacted participants' valence ($M_{\text{higher payment frequency}} = 5.59$, $SD = 1.78$ vs. $M_{\text{lower payment frequency}} = 5.02$, $SD = 1.76$), $t(1,118) = 5.36$, $p < .001$, *Cohen's d* = .32, arousal ($M_{\text{higher payment frequency}} = 4.43$, $SD = 1.88$ vs. $M_{\text{lower payment frequency}} = 4.74$, $SD = 1.88$), $t(1,118) = -2.79$, $p = .006$, *Cohen's d* = -.17, and power ($M_{\text{higher payment frequency}} = 4.80$, $SD = 1.61$ vs. $M_{\text{lower payment frequency}} = 4.53$, $SD = 1.71$), $t(1,118) = 2.72$, $p = .007$, *Cohen's d* = .16. As such, participants in the higher payment frequency condition felt more positive, less aroused, and more

powerful than participants in the lower payment frequency condition. Participants' valence and power significantly mediated the effect of payment frequency on the number of times participants selected the more expensive option (*indirect effect_{valence}* = 0.21, 95% CI[0.11, 0.32], 10,000 resamples; *indirect effect_{power}* = 0.08, 95% CI[0.01, 0.14], 10,000 resamples), but arousal did not (*indirect effect_{arousal}* = 0.01, 95% CI[-0.03, 0.04], 10,000 resamples).

We then explored the influence of each of the potential mediators in a parallel mediation model using PROCESS Model 4 (Hayes 2017). This model included subjective wealth perception, valence, and power as potential mediators. Valence significantly mediated the effect (*indirect effect_{valence}* = 0.12, 95% CI[0.03, 0.21], 10,000 resamples), but power did not (*indirect effect_{power}* = 0.02, 95% CI[-0.02, 0.06], 10,000 resamples). Importantly, subjective wealth remained a significant mediator (*indirect effect_{subjective wealth}* = 0.23, 95% CI[0.11, 0.36], 10,000 resamples). These results show that even after accounting for valence and power as potential mediators, there was still a significant, independent effect of subjective wealth.

Individual differences. Neither financial literacy nor intertemporal discount rates varied by condition, all $t < 1$. Additionally, neither of these measures moderated the effect of payment frequency on the number of times participants selected the more expensive option (all $t < 1$). See web appendix J for full results.

Study 5 provided more evidence for our hypotheses. Those paid more frequently experienced less prediction uncertainty, which led to increased perceptions of subjective wealth and increased their propensity to spend. This effect emerged even though those paid more frequently had a lower average daily account balance than those paid less frequently (see web appendix K for additional analyses and robustness checks). These effects were also replicated in a supplemental study using a similar study design (see web appendix L for more details).

This study also explored some potential alternative mechanisms. We did not find any evidence that differences in spending arise from differences in planning behavior. Furthermore, a supplemental study demonstrated that payment frequency did not impact the number of expenses that participants considered or the extent to which they thought about these expenses (see web appendix M for full details). These results again suggest that payment frequency does not impact planning behavior.

In line with the research on segregated vs. aggregated gains, higher payment frequencies increased positive affect. These affect differences helped explain the effect of payment frequency on spending. Importantly, a parallel mediation model found that the subjective wealth explanation is separable from any impact of affect. Thus, this study suggests that affect may be an additional, rather than an alternative, explanation for the impact of payment frequency on spending.

STUDY 6: ACCESS TO MORE FREQUENT PAY

In the previous studies, we examined the impact of differences in payment frequency that are imposed on consumers. However, millions of consumers can actively choose how often to receive their income (Corkery 2017). For example, workers are increasingly gaining access to daily pay services whereby they can choose whether or not to receive their earned income everyday instead of waiting until their scheduled payment. In this study, we examined whether such access to more frequent pay similarly increases consumer spending. Additionally, although we did not find evidence that the effect of payment frequency was moderated by consumers' intertemporal discount rates in study 5, we explored the possibility that self-control or

intertemporal discount rates may impact the effect of payment frequency on spending when consumers can elect to get paid more frequently.

Method

This study was pre-registered on AsPredicted.org (<https://aspredicted.org/aq7ah.pdf>). Three hundred and ninety-four participants completed the study on Prolific Academic in exchange for monetary compensation. Study 6 used a life simulation paradigm similar to study 2 where some expenses were fixed and others were not. There were 15 spending decisions across five weeks. In this version, all participants received their income on a weekly basis. Our conditions varied whether participants had access to daily pay (access vs. no access). Thus, participants in the access to daily pay condition could choose to receive the income they had earned up to that point every weekday (Monday through Thursday) before their weekly payday on Fridays. Any payments they chose to receive early were deducted from their weekly paycheck. There were no overdraft fees in this study.

After going through the life simulation, participants completed the subjective wealth measures from study 2. They also answered the same attention check question as in study 2. Additionally, we measured participants' self-control (13 items, Tangney, Baumeister, and Boone 2014) and intertemporal discount rates (16 item titration task). As in previous studies, we asked participants whether they believed they had taken this study in the past, ensuring them that their responses to this question would not affect their payment for completing the study.

Results

Sixteen participants failed the attention check question and fifty-five participants reported previously participating in a similar experiment. As pre-registered, these participants were excluded from all analyses, leaving a final sample of 333 participants ($M_{\text{age}} = 28.13$, 59% female).

Access to daily pay. We first analyzed participants' usage of the daily pay access. Relative to those in the no access to daily pay condition who received a total of five paychecks, participants in the access condition received 13.03 paychecks on average ($SD = 7.38$), $t(331) = 13.85$, $p < .001$, *Cohen's d* = 1.54. Roughly 84% of participants in the access condition chose to take advantage of the daily pay option, taking an additional 9.53 paychecks on average ($SD = 7.09$).

Spending. Consistent with our prior studies, participants in the daily pay access condition selected the more expensive options significantly more often than those in the no access condition, ($M_{\text{access}} = 5.94$, $SD = 2.65$ vs. $M_{\text{no access}} = 4.52$, $SD = 2.08$), $t(331) = 5.41$, $p < .001$, *Cohen's d* = .59. Additionally, participants in the access condition spent more money on their purchases compared to participants in the no access condition ($M_{\text{access}} = \$474.91$, $SD = \$166.32$ vs. $M_{\text{no access}} = \$390.86$, $SD = \$136.83$), $t(331) = 5.02$, $p < .001$, *Cohen's d* = .55.

Intertemporal discount rates. We calculated discount rates using Mazur's (1987) hyperbolic model. Eleven participants were excluded from the analysis as they had inconsistent preferences. As expected, participants' intertemporal discount rates did not vary by condition ($M_{\text{access}} = .038$, $SD = .026$ vs. $M_{\text{no access}} = .038$, $SD = .027$), $t(320) = .23$, $p = .822$, *Cohen's d* = .03. We used a linear regression to examine whether participants' intertemporal discount rate moderated the impact of access to daily pay on the number of times participants chose the more expensive option. The analysis revealed a significant main effect of access condition ($b = .69$,

$t(318) = 5.29, p < .001$) and a significant main effect of intertemporal discount rate on spending decisions ($b = 14.28, t(318) = 2.91, p = .004$). However, these effects were qualified by a significant interaction ($b = 11.58, t(318) = 2.36, p = .019$). The effect of our access conditions was more pronounced among those with higher intertemporal discount rates (see figure 3).

Insert figure 3 about here

Self-control. Unexpectedly, the access to pay manipulation marginally impacted participants' responses to the self-control questions ($M_{\text{access}} = 42.83, SD = 9.21$ vs. $M_{\text{no access}} = 41.10, SD = 8.98$), $t(331) = 1.74, p = .084$, *Cohen's d* = .19. We used a linear regression to check whether participants' self-control moderated the impact of the access conditions on the number of times participants chose the most expensive option. The analysis revealed a significant main effect of access condition ($b = .75, t(329) = 5.76, p < .001$) and a significant main effect of self-control on spending decisions ($b = -.04, t(329) = -3.11, p = .002$). The interaction failed to reach significance ($b = .02, t(329) = 1.49, p = .136$). However, this result should be interpreted with caution since the self-control measure was impacted by the manipulation.

This study demonstrates that the effect of payment frequency is not limited to contexts where payment frequencies are imposed on consumers, as giving consumers access to getting paid more frequently also increases their spending. Furthermore, this study highlights the nuanced relationship between consumers' payment frequency, intertemporal discount rates, and their spending. As shown in study 5, when payment frequencies are imposed, consumers are affected similarly by higher payment frequencies regardless of their intertemporal discount rates.

However, as shown in this study, the spending of those with higher intertemporal discount rates are impacted more so than those with lower intertemporal discount rates by gaining access to higher payment frequencies.

GENERAL DISCUSSION

Payment frequency is a fundamental yet underexplored feature of consumers' finances. As higher payment frequencies become more prevalent, understanding the impact of payment frequency on consumer behavior is essential. An examination of real-world spending behavior, and a series of laboratory studies demonstrate that higher payment frequencies increase consumers' spending (studies 1, 2, 5, and 6). This effect is not limited to contexts where payment frequencies are imposed on consumers, as giving consumers access to getting paid more frequently also increases their spending (study 6). The effect of payment frequency on spending is explained, at least in part, by changes in consumers' subjective wealth perceptions (studies 2 and 5) that result from differences in consumers' uncertainty in predicting whether they will have enough resources throughout a period (studies 3, 4, and 5). As such, situational factors that reduce differences in prediction uncertainty moderate the effect of payment frequency on subjective wealth and spending. In line with this theorizing, when the expense profile allows consumers with lower payment frequency to predict their resource sufficiency with the same level of certainty as a consumer with higher payment frequency, then the impact of payment frequency on subjective wealth is attenuated (study 4). Furthermore, the effect of payment frequency on spending is attenuated for high income consumers who likely face little to no uncertainty in predicting their resource sufficiency (study 1). Moreover, the effects of payment frequency on subjective wealth and spending can occur even when objective wealth favors those with lower payment frequencies (studies 3 and 5).

The fact that higher payment frequencies can increase spending even when those paid more (vs. less) frequently have lower objective wealth is in line with research showing that the frequency of events can be more impactful than the magnitude of those events (Alba et al. 1994). However, we are not suggesting that objective wealth differences do not matter. Instead, we suspect that the independent effect of payment frequency relative to the independent effect of objective wealth depends on the extent to which each of these factors impact prediction uncertainty. For example, because consumers presumably face little to no uncertainty in predicting their resource sufficiency at high income levels, we find that the effect of payment frequency on spending is attenuated at high income levels (study 1). By the same logic, despite their lower payment frequency, a person with high income and low payment frequency will likely outspend a person with low income and high payment frequency.

We have provided evidence that the effect of payment frequency on spending is driven, at least in part, by consumers' prediction uncertainty and their subjective wealth perceptions. Although the evidence suggests that consumers' planning behavior and expense elaboration are unlikely to explain the effect of payment frequency on spending (study 5; supplemental study 3 web appendix L), we acknowledge that this effect is probably multiply determined. For instance, in line with prior research demonstrating that consumers feel happier when receiving smaller, segregated gains rather than larger, aggregated gains (e.g., Morewedge et al. 2007; Thaler 1985), we find that higher payment frequencies lead to more positive affect than lower payment frequencies (study 5). In addition to subjective wealth, affect also helped explain the effect of payment frequency on spending.

This research adds to both the subjective wealth and payment frequency literatures. With respect to the subjective wealth literature, most of the existing research has focused on how

subjective wealth is impacted by consumers' overall resources, (e.g., Karlsson et al. 2005), their resources relative to other people (Frank 1999; Sharma and Alter 2012), their resources relative to their spending needs (e.g., Tully et al., 2015; Zauberman and Lynch 2005), or the makeup of their balance sheets (e.g., Sussman and Shafir 2012). Our research demonstrates that beyond these factors, variations in the timing of when consumers receive their income can also impact subjective wealth. Future work could examine whether other variations in consumers' payment timing (e.g., receiving one's pay in advance vs. in arrears, in the morning vs. the evening, on specific days) impact consumers' wealth perceptions and spending. For example, when consumers are paid in advance (vs. in arrears), lower payment frequencies result in receiving larger payments upfront which lead to higher average daily balances throughout a period (i.e., higher objective wealth). In situations where these differences in objective wealth are large enough to impact prediction uncertainty, lower payment frequencies that are received in advance could increase subjective wealth perceptions compared to higher payment frequencies. In line with this possibility, Spiller (2011) demonstrated that when participants received a large lump sum at the start of the month (vs. smaller amounts throughout the month) they were less likely to consider their opportunity costs at the beginning of the month. With respect to the payment frequency literature, the current work demonstrates that payment frequency can impact not just when consumers spend (e.g., Stephens and Unayama 2011), but also how much consumers spend.

The current research also raises important questions about the types of consumers and spending decisions that are most impacted by the trend towards higher payment frequencies. As previously mentioned, we find that the effect of payment frequency on spending was more pronounced for lower-income consumers (study 1; see web appendix B). Additionally, our

research suggests that services that provide on demand payments may be particularly consequential for consumers with higher intertemporal discount rates (study 6). Thus, consumers with higher intertemporal discount rates may benefit more from not having access to on demand pay since lower payment frequencies may serve as a commitment device. Indeed, Laibson argues that less access to liquidity can serve as a commitment device for consumers, and that these commitment devices may benefit some consumers more so than others (1997). Beyond examining differences across consumers, future work should examine whether some types of spending decisions are more impacted by payment frequency than others. An exploratory analysis of the different types of spending decisions used in the life simulation for study 5 suggests that the effect of payment frequency may be more pronounced for discretionary, experiential, and hedonic purchases (see web appendix K).

In this work, we compared daily to both weekly and bi-weekly payment frequencies because these frequencies are the most common, especially among workers who may get access to daily payment frequencies in the future. We also examined a wider range of payment frequencies by using the natural variation in consumers' payment frequencies (study 1). However, future research could examine a broader range of payment frequencies including much higher payment frequencies (e.g., receiving income after each task, each hour, or even each second). Our theorizing might suggest an attenuation of the effect of payment frequency on spending when comparing daily to intraday payment frequencies as both of these payment frequencies should lead to the same pattern of daily balance decreases, and thus similar prediction uncertainty. Moreover, it is possible that these extremely high payment frequencies (e.g., getting paid by the second) could result in consumers feeling less subjectively wealthy due to the perception that each paycheck is negligible. For instance, Morewedge et al. (2007) argues

that consumers may not receive any hedonic benefit from receiving very small gains. Further, the pennies-a-day literature finds that small, segregated costs under \$11.50 a day are viewed as more affordable than the equivalent aggregated monthly costs (Gourville 2003).

Outside of spending decisions, this research should serve as a call for more research on the impact of payment frequency on other consumer behaviors such as saving, donating, borrowing, and lending. For example, it is unclear how payment frequency will impact savings behavior. Our work finds that higher payment frequencies lead to greater feelings of subjective wealth. To the extent that decisions to save are impacted by how subjectively wealthy one feels, higher payment frequencies could facilitate more savings. On the other hand, because higher payment frequencies lead to greater spending, consumers' paid more frequently may not have as much money to save. Furthermore, it is also unclear how payment frequency impacts consumers' borrowing behavior. While daily payment frequencies have been offered as a means to help consumers avoid borrowing and overdrafting (Corkery 2017), and such a finding occurred in our lab setting (study 2, see web appendix N for more details), this was not the case in our real-world dataset. In fact, in study 1, higher payment frequencies were associated with more bank fees, both in terms of the likelihood of incurring a bank fee ($b = .01$, $t(20389) = 6.75$, $p < .001$) as well as the amount of money spent on fees (log-transformed) ($b = .05$, $t(20389) = 7.28$, $p < .001$). Thus, over time, higher payment frequencies could increase rather than decrease consumers' need to borrow. Moreover, some payroll providers charge consumers a fee of up to \$2.99 per paycheck to access higher payment frequencies. This fee would translate into a 428% annual percentage rate (APR) for a full-time employee earning \$15 an hour who chooses to receive a paycheck each weekday rather than waiting for their weekly Friday paycheck. Thus, whether consumers will truly benefit financially from access to higher payment frequencies remains

unclear, which may be a reason why the Consumer Financial Protection Bureau has focused on these daily pay providers (U.S. Consumer Financial Protection Bureau 2020).

Consumers' assessments of their resources are based not just on how much resources they receive, but also on how and when they receive their resources. We demonstrate that timing variations in when consumers receive their income impact their prediction uncertainty, subjective wealth perceptions and ultimately, their spending. The current work underscores a broader need to understand the impact of different resource timing variations on consumers' perceptions, behaviors, and general well-being.

DATA COLLECTION INFORMATION

Data for Study 1 was sent to the first author by Stanford University's Data, Analytics and Research Computing Team. Data collection for Studies 2-6 was supervised by the Stanford Behavioral Lab. Study 2 was conducted in Summer 2019, Studies 3-4 were conducted in Fall 2020, Study 5 was conducted in Winter 2020-2021, and Study 6 was conducted in Summer 2020. Both authors analyzed the data for all studies. Data from study 1 is proprietary and the legal data sharing agreement prohibits the dissemination of this data. All other data including data from the web appendix studies, as well as the relevant pre-registrations, can be found in Research Box #231 (<https://researchbox.org/231>).

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TABLES

The observed relationship between payment frequency and spending (study 1).

	<i>Dependent variable:</i>					
	Number of Expenditures			Log(Spending)		
	(1)	(2)	(3)	(4)	(5)	(6)
Payment Frequency	3.771*** (0.186)	3.525*** (0.178)	3.350*** (0.181)	0.071*** (0.002)	0.048*** (0.002)	0.046*** (0.002)
Log(Income)		1.569*** (0.220)	1.527*** (0.217)		0.143*** (0.008)	0.143*** (0.008)
Month Fixed Effects	No	No	Yes	No	No	Yes
Consumer Level Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,230	51,230	51,230	51,230	51,230	51,230
<i>Note:</i>		+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001				

Table 1. The observed relationship between payment frequency and spending (study 1).

The observed interaction between payment frequency and income (study 1).

	<i>Dependent variable:</i>			
	Number of Expenditures		Log(Spending)	
	(1)	(2)	(3)	(4)
Payment Frequency	-2.072** (0.787)	-2.058** (0.775)	-0.232*** (0.013)	-0.232*** (0.013)
Log(Income)	0.505* (0.208)	0.500* (0.206)	0.090*** (0.007)	0.090*** (0.007)
Interaction Term (Pay Frequency * Log(Income))	0.564*** (0.088)	0.545*** (0.087)	0.028*** (0.001)	0.028*** (0.001)
Month Fixed Effects	No	Yes	No	Yes
Consumer Level Fixed Effects	Yes	Yes	Yes	Yes
Observations	51,230	51,230	51,230	51,230
<i>Note:</i>	+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001			

Table 2. The observed interaction between payment frequency and income (study 1).

FIGURES

The effect of payment frequency and expense frequency on subjective wealth perceptions (study 4)

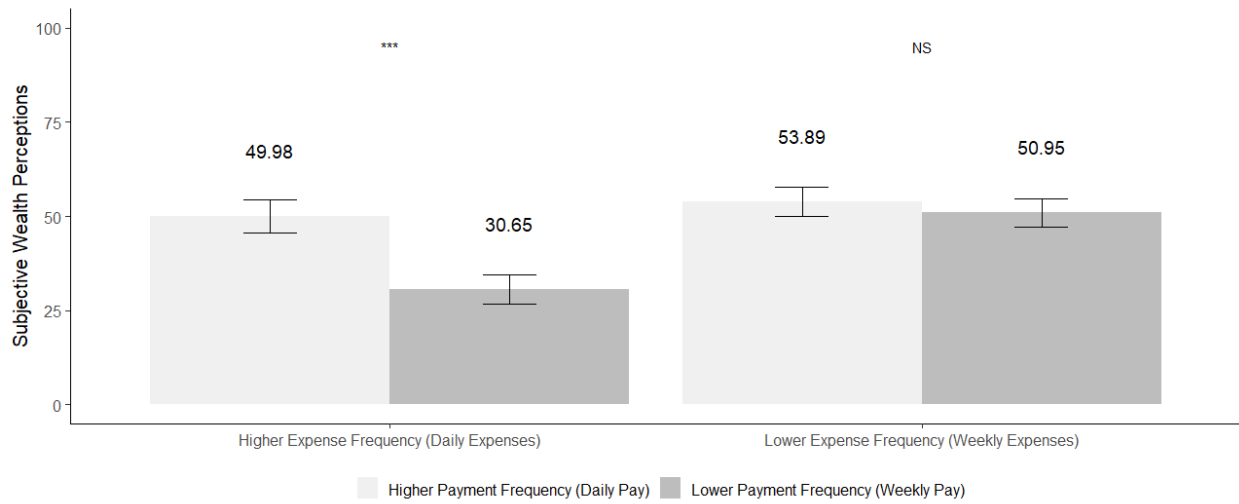


Figure 1. Expense frequency moderated the effect of payment frequency on consumers' subjective wealth perceptions (study 4). Error bars represent 95% confidence intervals. Significance levels: + $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Participants spending decisions across day and payment frequency condition (study 5).

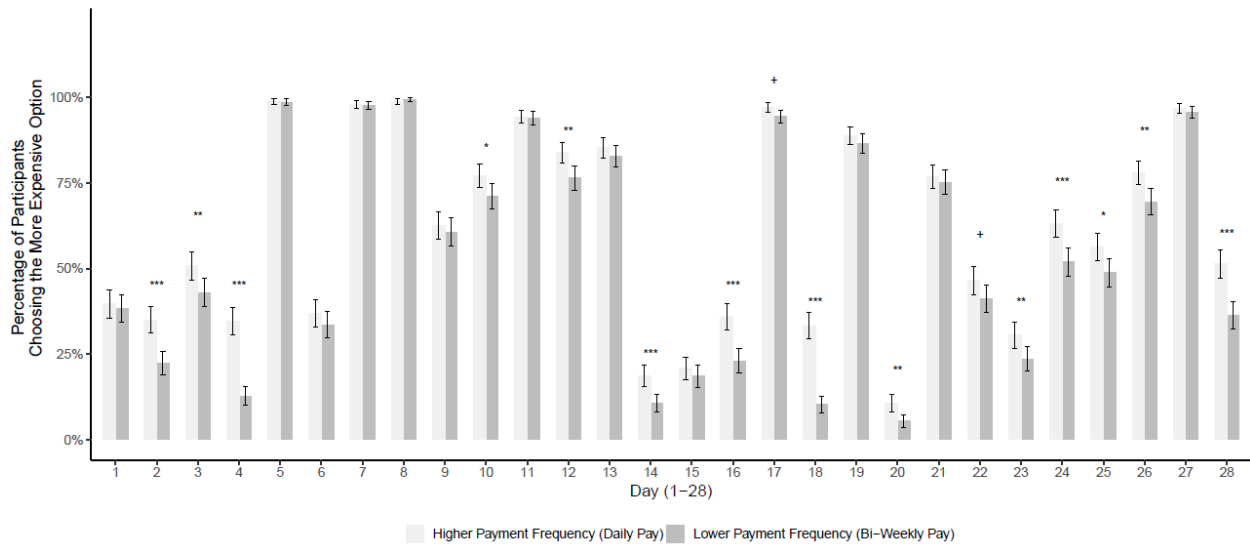


Figure 2. Higher (vs. lower) payment frequency led to more spending throughout the period.

Error bars represent 95% confidence intervals. Significance levels: + $p < 0.1$; * $p < 0.05$; ** p

<0.01; *** $p < 0.001$

Participants' spending by access condition

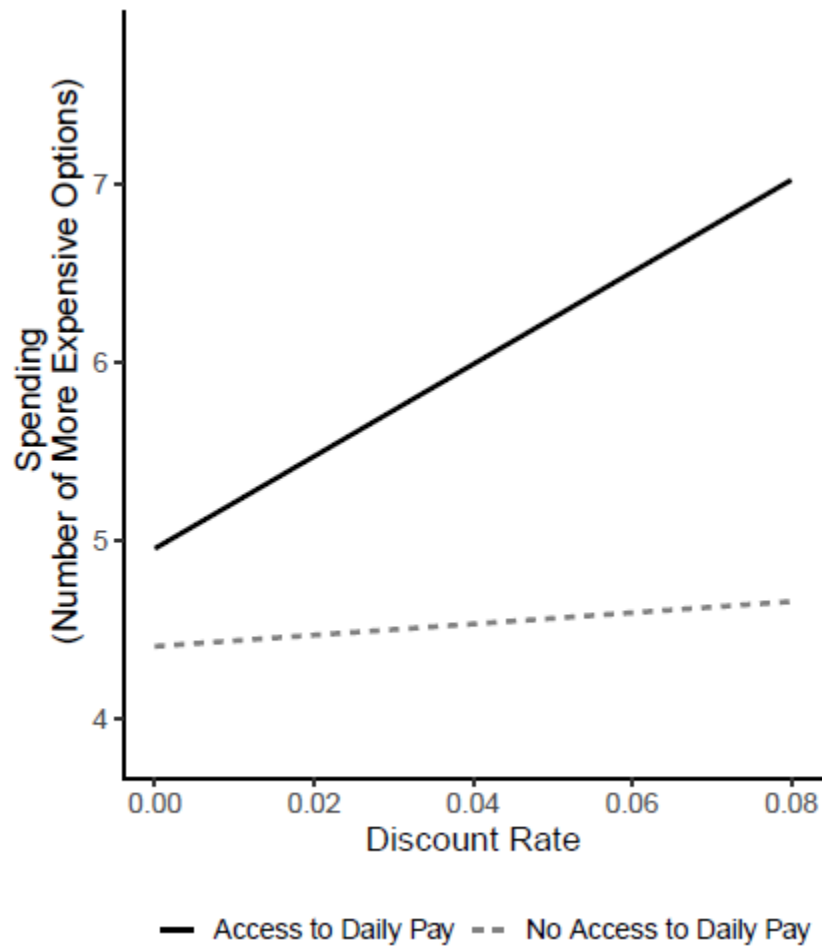


Figure 3. Participants' spending by access condition and their intertemporal discount rates (study 6). The effect of access to daily pay on spending is attenuated at low discount rates.