Mistakes in Future Consumption, High MPCs Now*

Chen Lian†

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Abstract

In this paper, I show how anticipation of mistakes in future consumption explains key deviations from the permanent income hypothesis: most importantly high marginal propensities to consume (MPCs), but also violations of the fungibility principle. The main theoretical contribution is a new approach to use “wedges” to capture behavioral mistakes and to derive robust predictions independent from the exact psychological cause of these mistakes. Specifically, I use this approach to study how sophistication, i.e., knowledge of future behavioral mistakes, robustly influences current consumption. My framework nevertheless nests most widely-studied behavioral biases, such as inattention, mental accounting, rules of thumb, hyperbolic discounting, and distorted expectations. The main applied contribution is to help resolve the empirical puzzles on high liquidity consumers’ high MPCs, which are hard to square with canonical liquidity-constraints-based models.

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†UC Berkeley; chen_lian@berkeley.edu.
1 Introduction

It is well documented that consumption behavior exhibits several important deviations from the permanent income hypothesis (Thaler, 1990). These deviations include, importantly, high marginal propensities to consume (MPCs) out of current income (Johnson, Parker and Souleles, 2006; Parker et al., 2013). They also include violations of the fungibility principle (Shefrin and Thaler, 1988), i.e., the prediction of the permanent income hypothesis that consumption is only a function of the total present value of all components of income and savings.

There are two main strands of explanations for these deviations. The first strand focuses on liquidity constraints (Carroll, 1997; Gourinchas and Parker, 2002; Kaplan and Violante, 2010, 2014). This explanation has tremendous success in explaining low-liquidity consumers’ behavior, but may be hard to explain the recent evidence on high liquidity consumers’ deviations such as their high MPCs (Parker, 2017; Kueng, 2018; Olafsson and Pagel, 2018; Fagereng, Holm and Natvik, 2019; McDowall, 2020).

The second strand focuses on behavioral biases, such as mental accounting (Thaler, 1990), inattention (Sims, 2003; Reis, 2006; Maćkowiak and Wiederholt, 2015; Gabaix, 2016), present bias (Laibson, 1997; Gul and Pesendorfer, 2004; Fudenberg and Levine, 2006), and distorted expectations (Mullainathan, 2002; Azeredo da Silveira and Woodford, 2019). This approach successfully disentangles deviations from the permanent income hypothesis from liquidity constraints. But the myriad of potential behavioral biases can make readers lost about what the actual take-home lessons are about the consumption behavior.

In this paper, I provide a new angle to study how behavioral biases can influence consumption behavior. Different from the existing behavioral literature, I do not take an exact stand on what the underlying behavioral biases are. Instead, I use “wedges” to capture how behavioral mistakes influence the actual consumption rules. Building upon this approach, I show how anticipation of future consumption mistakes (in response to changes in savings), no matter the exact behavioral cause of these mistakes, is enough to explain the deviations such as high MPCs and violations of the fungibility principle. The framework nevertheless nests most widely-studied behavioral biases, such as inattention, mental accounting, rules of thumb, hyperbolic discounting, and distorted expectations.

Mistakes in future consumption, high MPCs now. I study a canonical intertemporal

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\(^1\) Other papers that document excess sensitivity to current income include, but are not limited to, Zeldes (1989), Campbell and Mankiw (1989), Souleles (1999), Shapiro and Slemrod (2003), Jappelli and Pistaferri (2010), Agarwal, Liu and Souleles (2007), Agarwal and Qian (2014)
consumption and saving problem. To clarify the mechanism behind the high MPC result, the consumer is not subject to borrowing constraints. To illustrate how future consumption mistakes lead to high current MPCs, I first consider a simple benchmark case in which future consumptions, as in the frictionless case, remain functions of the permanent income (i.e. total present value of all components of incomes and savings). Future consumption mistakes come from their inefficient responses to changes in permanent income. The main result is that such mistakes lead to a high MPC of current consumption.

To understand this result, I first show that the inefficient responses of future consumption lead to the excess concavity of the continuation value function. As a result, in response to changes in current permanent income, the consumer is more willing to adjust her current consumption instead of her savings. She hence displays a high current MPC. Intuitively, using a positive shock as an example, if the consumer saves the additional money, her future selves will not respond to it efficiently. She then consumes more now.

The high MPC result does not depend on the exact behavioral causes of mistakes in future consumption. In fact, no matter whether future consumption mistakes lead to over-reaction or under-reaction to changes in permanent income, they always increase the current MPC. But I also illustrate that my framework can nest many widely-studied behavioral biases, such as inattention, rules of thumb, hyperbolic discounting, and distorted expectations. In sum, using the language of O’Donoghue and Rabin (1999, 2001), “sophistication” alone, i.e., knowledge of future selves’ mistakes alone, leads to a high MPC of the current consumption.

**Future non-fungibility begets current non-fungibility.** I now turn to the general, non-fungible case, in which mistakes in future consumption may also include inefficiently differential responses to different components of permanent income. In this general case, I first show that the above high MPC result remains to be true: as long as future consumption responds inefficiently to changes in savings, the current MPC is higher.

Interestingly, the non-fungibility of future consumption alone also suffices to generate the non-fungibility of the current consumption, even if the current self fully understands how to calculate permanent income correctly. For example, if future consumption responds more to income than savings, the current consumption will endogenously respond less to changes in future income and exhibit excess discounting of future income. In this sense, mistakes in future consumption also provide a justification for non-fungibility of the current consumption. Such excess discounting of future income independent from liquidity constraints is also consistent with the empirical evidence in Kueng (2018).
Applications. The main application of the proposed channel is to explain high-liquidity consumers’ high MPCs. I conduct several calibration exercises to gauge its magnitude. The key mechanism behind the high MPCs, i.e., the excess concavity of the continuation value function, can also speak to three other well-known puzzles in intertemporal decisions: excess discounting of future income mentioned above; large risk aversion and the equity premium puzzle (Mehra and Prescott, 1985); small elasticity of intertemporal substitution, i.e., the empirical evidence on the small consumption responses to interest rate changes (Hall, 1988; Campbell and Mankiw, 1989; Havránek, 2015).

Literature review. This paper builds upon the behavioral literature on intertemporal consumption problems. For example, inattention (e.g. Gabaix and Laibson, 2002; Sims, 2003; Reis, 2006; Luo, 2008; Abel, Eberly and Panageas, 2007, 2013; Luo and Young, 2010; Alvarez, Guiso and Lippi, 2012; Mackowiak and Wiederholt, 2015; Gabaix, 2016), hyperbolic discounting (e.g. Laibson, 1997; Barro, 1999; Angeletos et al., 2001), mental accounting (Shefrin and Thaler, 1988; Thaler, 1990), distorted expectations (e.g. Mullainathan, 2002; Rozsypal and Schlafmann, 2017; Azeredo da Silveira and Woodford, 2019) and news utility (e.g. Kőszegi and Rabin, 2009; Pagel, 2017).

Compared to this large literature, this paper takes a new route. Instead of studying a specific behavioral bias, I use “wedges” to capture deviations from the optimal consumption rules. I then show that wedges in future consumption rules, independent of their behavioral causes, robustly increase the current MPC. Methodologically, this paper shows one can apply the wedge approach, widely used to study macroeconomic frictions (Chari, Kehoe and McGrattan 2007; Shimer 2009), to study behavioral predictions independent from the exact psychological foundations. I hope this approach provides a new avenue for future behavioral research. Farhi and Gabaix (2020) use the wedge approach to study optimal taxation with behavioral agents but does not touch upon the positive predictions on behavior focused here.

In terms of applications, this paper provides a potential explanation for the empirical evidence on high-liquidity consumers’ deviations from the permanent income hypothesis. These include, most importantly, the evidence on high liquidity consumers’ high MPCs (Parker, 2017; Kueng, 2018; Olafsson and Pagel, 2018; Fagereng, Holm and Natvik, 2019; McDowall, 2020), but also the evidence on their deviations from the fungibility principle (Thaler, 1990; Baker, Nagel and Wurgler, 2007; Di Maggio, Kermani and Majlesi, 2018; Fagereng et al., 2019).

Layout. Section 2 introduces a standard income fluctuations problem and deliberate consumption rules, which isolate the impact of future consumption mistakes on current consumption.
Section 3 studies the benchmark fungibility case and illustrates how future consumption mistakes can lead to high MPCs now. Section 4 studies the general non-fungibility case. Section 5 focuses on Applications. Section 6 concludes. The Appendix contains proofs and additional results.

2 Set up

Utility and budget. I first introduce a canonical, single-agent, intertemporal consumption problem. The consumer can save and borrow through a risk-free asset. To isolate the friction of interest, the consumer here is not subject to any borrowing constraints.

The consumer’s utility is given by

\[ U_0 = \sum_{t=0}^{T-1} \delta^t u(c_t) + \delta^T v(a_T + y_T), \]

where \( c_t \) is her consumption at period \( t \in \{0, 1, \ldots, T - 1\} \), \( \delta \) is her discount factor, \( u(\cdot) \) captures the consumption utility, and \( v(\cdot): \mathbb{R} \to \mathbb{R} \) captures the utility from retirement or bequests. Both \( u(\cdot) \) and \( v(\cdot) \) are strictly increasing and concave. In the main analysis, for analytical results and to ensure that the high MPCs results are not driven by precautionary saving motives, I let \( u(\cdot) \) and \( v(\cdot) \) be quadratic. But the main high MPCs results remain true with general concave utility, as Proposition 4 below shows.

The consumer can save and borrow through a risk-free asset and is subject to the budget constraints

\[ a_{t+1} = R(a_t + y_t - c_t) \quad \forall t \in \{0, \cdots, T - 1\}, \]

where \( y_t \) is her exogenous income at period \( t \), \( a_t \) is her wealth (i.e. savings/borrowings) at the start of period \( t \), and \( R \) is the gross interest rate on the risk-free asset.

In each period \( t \), the payoff relevant state for the consumer in each period \( t \) can then be summarized by

\[ (a_t, s_t), \]

where \( s_t \) is the exogenous income state at period \( t \) summarizing information about current income \( y_t \) and future incomes \( \{y_{t+k}\}_{k \geq 1} \) and \( a_t \) is the endogenously determined current wealth level based on the consumer’s past decisions (except the exogenous initial wealth \( a_0 \)).

For illustration purposes, I follow Chetty and Szeidl (2007) and assume that all income un-
certainty in the economy is resolved in period 0, so \( s_t = (y_t, \cdots, y_T) \). In fact, with quadratic
utility and linear decision rule here, the well known certainty equivalence result implies that the
consumer’s MPC remains the same with gradual resolution of income uncertainty (see Corollary
6 below).

Finally, I use the widely adapted “multiple-selves” language as in Piccione and Rubinstein
(1997) and Harris and Laibson (2001). That is, self \( t \in \{0, \cdots, T-1\} \) is in charge consumption
and saving decisions at period \( t \).

**A pair of consumption rules.** In the paper, I work with a pair of consumption rules: each
self \( t \)’s actual consumption rule \( c_t(a_t, s_t) \), subject to her current behavioral mistakes; and her
deliberate consumption rule \( c_t^{\text{Deliberate}}(a_t, s_t) \), i.e., the consumption she would have chosen if she is
not subject to any current behavioral biases and takes future selves’ actual (mistaken) consumption
rules as given.

Specifically, we can define this pair of consumption rules through backward induction.

**Definition 1.** For each \( t \in \{0, \cdots, T-1\} \), self \( t \)’s deliberate consumption rule is chosen optimally to maximize the consumer’s utility in (1), taking future selves’ actual consumption rules \( \{c_{t+k}(a_{t+k}, s_{t+k})\}_{k=1}^{T-k-1} \) as given:

\[
    c_t^{\text{Deliberate}}(a_t, s_t) \equiv \arg\max_{c_t} u(c_t) + \sum_{k=1}^{T-t-1} \delta^{k-1} u(c_{t+k}(a_{t+k}, s_{t+k})) + \delta^{T-t}v(a_T + y_T) \tag{3}
\]

where \( a_{t+k} = R(a_{t+k-1} + y_{t+k-1} - c_{t+k-1}) \).

Self \( t \)’s actual consumption rule \( c_t(a_t, s_t) \) is given by

\[
    c_t(a_t, s_t) = S(c_t^{\text{Deliberate}}(a_t, s_t), \lambda_t), \tag{4}
\]

where \( S(c_t^{\text{Deliberate}}(a_t, s_t), \lambda_t) \) captures how the actual consumption rule differs from the deliberate
consumption rule and \( \lambda_t \) parametrizes self \( t \)’s own behavioral biases (e.g. inattention, hyperbolic
discounting).

The deliberate consumption rule in (3) is introduced because it isolates the impact of future consumption mistakes, the focus of the paper. In the language of O’Donoghue and Rabin (1999,
2001), it isolates the impact of “sophistication,” i.e., knowledge of future selves’ mistakes. It helps
illustrate the main theme of the paper: once we focus on the impact of future consumption mistakes,
it robustly leads to a high current MPC, no matter the micro-foundations of these mistakes.
The actual consumption rule in (4) captures how self t’s own behavioral bias, λ_t, leads to deviations from the deliberate consumption rule. Here, a larger absolute value of λ_t means self t’s own behavioral bias is larger. When λ_t = 0, the current self’s is not subject to any behavioral bias and the actual consumption rule coincides with the actual consumption rule. That is, when λ_t = 0, \( c_t(a_t, s_t) = S(c^{\text{Deliberate}}_t(a_t, s_t), 0) = c^{\text{Deliberate}}_t(a_t, s_t) \).

Methodologically, one can view λ's in the actual optimal consumption rule (4) as “wedges” away from the deliberate consumption rules in (3). In this sense, Definition 1 shows how one can use the wedge approach, useful to study macroeconomic frictions (Chari, Kehoe and McGrattan 2007; Shimer 2009), to capture behavioral frictions. In the following, I show that wedges in future consumption rules, independent of their behavioral causes, robustly increase current MPCs.

A recursive formulation. Given each self’s actual consumption rules \( \{c_t(a_t, s_t)\}_{t=0}^{T-1} \) and based on the utility in (1), I can define the value function \( V_t(a_t, s_t) \) as a function of the current state \((a_t, s_t)\) for each \( t \in \{0, \cdots, T-1\} \),

\[
V_t(a_t, s_t) \equiv u(c_t(a_t, s_t)) + \sum_{k=1}^{T-t-1} \delta^k u(c_{t+k}(a_{t+k}, s_{t+k})) + \delta^{T-t} v(a_T + y_T),
\]

where \( a_{t+k} = R(a_{t+k-1} + y_{t+k-1} - c_{t-1}) \). Finally, for the last period \( T \), we have \( V_T(a_T, s_T) = v(a_T + y_T) \).

Based on (5), I can express the deliberate consumption rule in (3) recursively. This paves ways to the analysis in the rest of the paper.

**Proposition 1.** For \( t \in \{0, \cdots, T-1\} \), each self t’s deliberate consumption rule defined in (3) is given by

\[
c^{\text{Deliberate}}_t(a_t, s_t) = \max_{c_t} u(c_t) + \delta V_{t+1}(R(a_t + y_t - c_t), s_{t+1}).
\]

Moreover, for \( t \in \{0, \cdots, T-1\} \), the value \( V(t, s_t) \) defined in (5) satisfies

\[
V_t(a_t, s_t) = c_t(a_t, s_t) + \delta V_{t+1}(R(a_t + y_t - c_t(a_t, s_t)), s_{t+1}),
\]

where the actual consumption rule \( c_t(a_t, s_t) \) is given by (4).

Finally, if consumption rules and value functions \( \{c^{\text{Deliberate}}_t(a_t, s_t), c_t(a_t, s_t)\}_{t=0}^{T-1} \) and \( \{V_t(a_t, s_t)\}_{t=0}^{T} \) satisfy (4)–(7) and the boundary condition \( V_T(a_T, s_T) = v(a_T + y_T) \), they then coincide with the corresponding objects defined sequentially in Definition 1.

A note on budget constraints. It is worth noting that the final wealth \( a_T \) is allowed to
be negative, as the utility from retirement or bequests $u(\cdot)$ is defined on the entirety of $\mathbb{R}$. This guarantees that, even with consumption mistakes, the budget in (2) is always satisfied and the intrapersonal problem is always well defined. The final period also does not play a special role: below, I show that the consumer’s deliberate and actual consumption rules converge to simple limits when $T \to +\infty$.

3 The Benchmark Fungibility Case

To illustrate how future consumption mistakes lead to high current MPCs, I first consider a simple benchmark case in which actual consumptions, as in the frictionless case, remain functions of the permanent income (i.e. total present value of all components of incomes and savings/borrowings). Future consumption mistakes come from their inefficient responses to changes in permanent income. The main result is such mistakes lead to a high MPC of current consumption. This result does not depend on the exact micro-foundations about were the future consumption mistakes come from. But I illustrate how my framework can easily nest common behavioral biases such as inattention, rules of thumb, hyperbolic discounting, and distorted expectations.

3.1 Mistakes in Future Consumption, High MPCs Now

In this section, to illustrate the key result in the simplest manner, I let the fungibility principle be maintained. Both $c_t$ and $c_t^{\text{Deliberate}}$ are functions of permanent income only: $w_t = a_t + y_t + \sum_{k=1}^{T-t} R^{-k} y_{t+k}$. I henceforth rewrite the consumption rules and value functions as $\{c_t^{\text{Deliberate}}(w_t), c_t(w_t)\}_{t=0}^{T-1}$ and $\{V_t(w_t)\}_{t=0}^T$. The case where fungibility principle is allowed to be violated is studied in the next Section.

Here, the mistakes in actual consumption rules come from inefficient response to changes to permanent income, i.e., inefficient MPCs. Specifically, in the quadratic-linear environment considered here, I study the case in which the actual consumption rule of each self $t \in \{0, \ldots, T-1\}$ can be written as

$$c_t(w_t) = \phi_t w_t + \tilde{c}_t, \quad \text{with} \quad \phi_t = (1 - \lambda_t) \phi_t^{\text{Deliberate}}, \quad (8)$$

where $\phi_t$ captures self $t$’s actual MPC, $\lambda_t$ captures self $t$’s mistake (i.e., deviation from the deliberate MPC $\phi_t^{\text{Deliberate}}$ introduced below), and $\tilde{c}_t$ is an exogenous constant capturing the overall level of self $t$’s consumption (its exact value will not influence the deliberate MPCs calculated below). $\lambda_t$ in (8) can be viewed as a behavioral “wedge” between self $t$’s actual response $\phi_t$ and her deliberate
response $\phi_{\text{Deliberate}}^t$. When $\lambda_t > 0$, self $t$ under-reacts to changes in $w_t$. When $\lambda_t < 0$, it means self $t$ over-reacts to changes in $w_t$. Each self’s mistake $\{\lambda_t\}_{t=0}^{T-1}$ is treated as exogenous here, but can be connected to the exact underlying behavioral biases as below.

Based on future selves’ actual consumption rules $\{c_{t+k}(w_{t+k})\}_{k=1}^{T-1-t}$, each self $t$’s deliberate consumption rule (barring any self $t$’s own friction) defined in (3) will take the following form:

$$c_t^\text{Deliberate}(w_t) = \phi_t^\text{Deliberate} w_t + c_t^\text{Deliberate},$$

where $\phi_t^\text{Deliberate}$, a function of $\{\lambda_{t+k}\}_{k=1}^{T-t-1}$, $\delta$, and $R$, captures self $t$’s deliberate MPC and $c_t^\text{Deliberate}$ captures the overall level of self $t$’s deliberate consumption.

The main result of this section is that future selves’ consumption mistakes (larger $\{\lambda_{t+k}\}_{k=1}^{T-t-1}$) lead to a high current MPC ($\phi_t^\text{Deliberate}$) of the deliberate consumption.

Proposition 2. For $t \in \{0, \cdots, T-2\}$, $\phi_t^\text{Deliberate} > \phi_t^\text{Frictionless}$ and increases with each future self’s mistake $\{|\lambda_{t+k}|\}_{k=0}^{T-t-1}$, where $\phi_t^\text{Frictionless}$ is the frictionless MPC of the actual consumption when all $\lambda$s are equal to 0.

Excess concavity of the value function. Let me now introduce an intermediate step to understand why future consumption mistakes can lead to high MPCs now. From the recursive formulation in (6), we know that understanding the properties of the continuing value function is crucial for understanding the MPC today.

Specifically, for each $t \in \{0, \cdots, T\}$, let me use $\Gamma_t$ to capture the “concavity” of the consumer’s value function in (5). That is,

$$\Gamma_t = \frac{\partial^2 V_t(w_t)}{\partial w_t^2} / u'',$$

where a larger $\Gamma_t$ means a more concave value function $V_t(w_t)$.

Lemma 1. For $t \in \{0, \cdots, T-1\}$, consumption mistakes lead to excess concavity of the value function : $\Gamma_t > 0$ strictly increases with the friction $\{|\lambda_{t+k}|\}_{k=0}^{T-t-1}$.

The intuition behind the excess concavity is as follows: larger frictions $\{|\lambda_{t+k}|\}_{k=0}^{T-t-1}$ lead to more inefficient consumption responses to changes in permanent income $w_t$. As a result, the marginal value $\frac{\partial V_t}{\partial w_t}$ decreases faster with $w_t$ and the value function $V_t$ becomes more concave. It is worth noting that the excess concavity depends on the size of the mistakes $|\lambda_{t+k}|$, but does not depend on whether mistakes take the form of under-reaction ($\lambda_{t+k} > 0$) or over-reaction ($\lambda_{t+k} < 0$).

$2u'' < 0$, a constant, is the second derivative of the utility function.
Here, even with the existence of behavioral biases, the value function \( V_t(w_t) \) here is always concave \((\Gamma_t > 0)\). This feature is guaranteed as the current paper focuses on providing a theory for high-liquidity consumers’ high MPCs and does not feature borrowing constraints. The pathological non-concave value function case with behavioral biases arises only when there is a kink in consumption rules due to borrowing constraints (e.g. Laibson, 1997 and Harris and Laibson, 2001).

**High current MPCs.** I now explain the main Proposition 2. The general intuition is that, because of the excess concavity of the continuation value function in Lemma 1, in response to changes in current permanent income, the current deliberate self is more willing to adjust her current consumption instead of her savings. She hence displays a higher MPC.

Specifically, with fungibility, the FOC of the deliberate consumption in (6) can be written as

\[
u'\left(c_t^{\text{Deliberate}}(w_t)\right) = \frac{\delta R \partial V_{t+1}\left(R\left(w_t - c_t^{\text{Deliberate}}(w_t)\right)\right)}{\partial w_{t+1}}.
\] (9)

That is, each self \( t \) equates the marginal utility of consuming now with her marginal value of saving for the next period.

Consider an increase of \( w_t \) first. From Lemma 1, we know that, with larger \( \{\lambda_{t+k}\}_{k=1}^{T-t-1} \), future selves respond more inefficiently to changes in permanent income and the marginal value of saving \( \frac{\partial V_{t+1}}{\partial w_{t+1}} \) decreases faster with \( w_{t+1} \). As a result, the current deliberate self is less willing to increase her savings after the increase of \( w_t \) and instead increases her current consumption more. Similarly, consider a decrease of \( w_t \). Because of the excess concavity in Lemma 1, the current deliberate self is less willing to decrease her savings after the negative income shock. She instead decreases her current consumption more. In sum, the current deliberate consumption \( c_t^{\text{Deliberate}}(w_t) \) exhibits excess sensitivity to changes in \( w_t \) (a high MPC).

In sum, Proposition 2 shows that, once we isolate the impact of future consumption mistakes on current MPCs, it always raises the current MPC, no matter whether future selves over-react \((\lambda_{t+k} < 0)\) or under-react \((\lambda_{t+k} > 0)\) to changes in permanent income. This result is in contrast with the impact of current behavioral biases \((\lambda_t)\) on current MPCs, which of course can go either way and “anything goes.”

**3.2 Different Micro-Foundations, Same Results**

The high MPC result in Proposition 2 does not depend on the exact behavioral causes of mistakes in future consumption. Nevertheless, even the simple fungibility case here nests many widely-studied
behavioral biases, such as inattention, rules of thumb, distorted expectations, and hyperbolic
discounting.

**Inattention.** My framework can nest inattention (e.g. Sims, 2003; Gabaix, 2014; Mackowiak
and Wiederholt, 2015). In this case, the consumer’s consumption mistakes can come from her
inattention to her permanent income. Specifically, I follow the sparsity approach in Gabaix (2014)
and let each self’s perceived permanent income be given by

\[ w_t^p (w_t) = (1 - \lambda_t) w_t + \lambda_t w_t^d, \tag{10} \]

where \( \lambda_t \in [0, 1] \) captures self \( t \)’s degree of inattention (a larger \( \lambda_t \) means more attention) and \( w_t^d \) captures the default (an exogenous constant of which the exact value does not matter for
the MPCs). It is worth noting that an alternative way to model inattention is through noisy
signals (Sims, 2003). With linear consumption rules and Normally distributed incomes, the two
approaches will lead to the same predictions on MPCs, as explained in the Appendix.

Based on the perceived permanent income \( w_t^p (w_t) \) in (10), the actual consumption rule of each
self \( t \) is given by

\[
    c_t (w_t^p (w_t)) = \arg\max_{c_t} u(c_t) + \delta V_{t+1} (R (w_t^p (w_t) - c_t)),
\]

where the continuing value function \( V_{t+1} \) is defined similarly to above, based on future selves’
actual consumption rules. On the other hand, the deliberate consumption is decided based on the
correct permanent income

\[
    c_t^{\text{Deliberate}} (w_t) = \arg\max_{c_t} u(c_t) + \delta V_{t+1} (R (w_t - c_t)),
\]

taking future selves’ consumption mistakes as given, driven by their inattention to permanent
income. As a corollary of Proposition 2, these future consumption mistakes lead to a high current
deliberate MPC.

**Corollary 1.** For \( t \in \{0, \ldots, T - 2\} \), \( \phi_t^{\text{Deliberate}} \equiv \frac{\partial c^{\text{Deliberate}}}{\partial w_t} > \phi_t^{\text{frictionless}} \) and increases with future
selves’ degrees of inattention \( \{\lambda_{t+k}\}_{k=1}^{T-t-1} \). Moreover, the degrees of inattention \( \{\lambda_{t+k}\}_{k=1}^{T-t-1} \) here
coincide exactly with \( \{\lambda_{t+k}\}_{k=1}^{T-t-1} \) in the general framework in Proposition 2.

This means that future selves’ consumption mistakes driven by their inattention will increase
the current deliberate MPC. When the current self is attentive (\( \lambda_t = 0 \)), this result then unam-
biguously translates into a high current actual MPC. Even if the current self is inattentive, the above result translates into a high current actual MPC out of \textit{perceived} permanent income.

**Heuristics and rules of thumb.** Another commonly studied behavioral bias is heuristics and rules of thumb (e.g. Kahneman, 2011). In the environment here, I can capture it as follows. For each self \( t \in \{0, \ldots, w, T - 1\} \), I let her actual consumption rule be given by

\[
c_t (w_t) = \begin{cases} 
  c_t^R (w_t) & \text{with probability } p_t \\
  c_t^{\text{Deliberate}} (w_t) & \text{with probability } 1 - p_t,
\end{cases}
\]

where \( c_t^R (w_t) \equiv \phi_t^R w_t + c_t^R \) captures a rule of thumb. That is, with probability \( p_t \), the current self makes her consumption decision based on “system 1,” following a simple rule of thumb captured by \( c_t^R (w_t) \). With probability \( 1 - p_t \), the current self makes her consumption decision based on “system 2:” the actual consumption coincides with the deliberate consumption.

The deliberate consumption rule is defined as usual:

\[
c_t^{\text{Deliberate}} (w_t) = \arg\max_{c_t} u (c_t) + \delta V_{t+1} (R (w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\},
\]

not subject to any current behavioral bias and taking future selves’ mistakes as given. As a corollary of Proposition 2, future consumption mistakes, in the form of rules of thumb, lead to a high current MPC of the deliberate consumption.

**Corollary 2.** For \( t \in \{0, \ldots, T - 2\} \), \( \phi_t^{\text{Deliberate}} \equiv \frac{\partial c_t^{\text{Deliberate}}}{\partial w_t} > \phi_t^{\text{Frictionless}} \) and increases with future selves’ probabilities of following the rules of thumb \( \{p_{t+k}\}_{k=1}^{T-t-1} \).

This means, even when the current self is not subject to any behavioral bias on her own, future selves’ rules of thumb behavior will increase her current MPC.

**Hyperbolic discounting.** My framework can also nest hyperbolic discounting (e.g. Laibson, 1997; Barro, 1999; Angeletos et al., 2001; Harris and Laibson, 2001). Consider a standard beta-delta model with sophistication and without borrowing constraints. In this case, the actual consumption rule is given by

\[
c_t (w_t) = \arg\max_{c_t} u (c_t) + \delta \beta_t V_{t+1} (R (w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\},
\]

where \( \delta \in [0, 1] \) is the standard discount factor, \( \beta_t \in [0, 1] \) captures self \( t \)'s present bias (a smaller \( \beta_t \) means a larger present bias), and \( V_{t+1} (\cdot) \) is the continuing value function defined similarly to
above. In fact, such an actual consumption rule is the focus of the hyperbolic discounting literature cited above. It combines the direct effect of present bias on current consumption with the effect of anticipated future mistakes.

Similar to the analysis above, I can also define the deliberate consumption rule as:

$$c_t^{\text{Deliberate}}(w_t) = \arg \max_{c_t} u(c_t) + \delta V_{t+1}(R(w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\}.$$ 

That is, the consumption that would have been chosen if the current self is deliberate enough to not be subject to the present bias and to take future selves’ present bias into consideration. In other words, the deliberate consumption rule isolates the impact of future consumption mistakes driven by future selves’ present biases. As a corollary of Proposition 2, these future consumption mistakes lead to a high current deliberate MPC.

**Corollary 3.** For $t \in \{0, \ldots, T - 2\}$, $\phi_t^{\text{Deliberate}} \equiv \frac{\partial c_t^{\text{Deliberate}}}{\partial w_t} > \phi_t^{\text{Frictionless}}$ and increases with future selves’ present bias, i.e., decreases in each $\{\beta_{t+k}\}_{k=1}^{T-t-1}$.

In fact, in the environment here, the high actual MPC under hyperbolic discounting comes solely from future consumption mistakes. The current present bias, though increases the level of current actual consumption, actually decreases the MPC of the current actual consumption. To see this, using the FOC of the actual consumption in (11) and taking a partial derivative with respect to $w_t$, we have

$$\phi_t = \frac{\partial c_t}{\partial w_t} = \frac{\delta R^2 \beta_t V''_{t+1}}{u'' + \delta R^2 \beta_t V''_{t+1}}.$$ 

That is, holding constant the concavity of the continuation value $V''_{t+1}$, the MPC of current actual consumption $\phi_t$ decreases with the degree of present bias (i.e., increases with $\beta_t$). The intuition is, with present bias, the current self prefers to use savings instead of current consumption to absorb changes in permanent income, because she discounts changes in the marginal value of saving more.\(^3\)

More generally, nesting the above hyperbolic discounting as a special case, a strand of literature (Thaler and Shefrin, 1981; Gul and Pesendorfer, 2004; Fudenberg and Levine, 2006) poses that the actual decision is based on the short-run "impulsive" utility $U^{\text{shortrun}}(c_t, w_{t+1})$, i.e.,

$$c_t(w_t) = \arg \max_{c_t} U^{\text{shortrun}}(c_t, R(w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\},$$

\(^3\)With precautionary saving motives (i.e., when $u''' \neq 0$), there could be an additional channel about how future selves’ present biases lead a current MPC: as future selves over-consume because of the present bias, the current MPC may be high akin to the buffer stock behavior in Carroll (1997) driven by precautionary saving motives. This channel is out of the scope of the current paper but will be explored in future works.
which may deviate from the “long-run” utility in (1). On the other hand, the “long-run” utility in (1) determines the deliberate consumption.

\[
\begin{align*}
  c_t^{\text{Deliberate}}(w_t) &= \arg\max_{c_t} u(c_t) + \delta V_{t+1}(R(w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\}. 
\end{align*}
\]

From (12) - (13), we can see how my framework can also nest this strand of literature.

**Distorted expectations.** Another commonly studied behavioral bias in intertemporal consumption problems is distorted expectations (e.g. Mullainathan, 2002; Rozsypal and Schlafmann, 2017; Azeredo da Silveira and Woodford, 2019). The general idea is the consumer over-extrapolates based on her current situation. The detailed psychological foundations may include bounded recall in Azeredo da Silveira and Woodford (2019), representativeness in Mullainathan (2002), and diagnostic expectations in Bordalo et al. (2018).

In the simple fungibility case here, I summarize such a friction by letting each self \( t \)'s perceived permanent income be given by

\[
  w_t^p(w_t) = w_t + \theta_t (w_t - w_t^d) \quad \forall t \in \{0, \ldots, T - 1\},
\]

where \( \theta_t \) captures self \( t \)'s degree of distorted expectations and \( w_t^d \) captures the default (an exogenous constant of which the exact value does not matter for the MPCs). \( \theta_t > 0 \) means that each self \( t \)'s perceived permanent income \( w_t^p(w_t) \) is based on an over-extrapolation from her current permanent income.\(^4\)

In this case, the actual consumption rule is decided based on the perceived permanent income \( w_t^p(w_t) \):

\[
  c_t(w_t^p(w_t)) = \arg\max_{c_t} u(c_t) + \delta V_{t+1}(R(w_t^p(w_t) - c_t)) \quad \forall t \in \{0, \ldots, T - 1\},
\]

where the continuing value function \( V_{t+1} \) is defined similarly to above. On the other hand, the deliberate consumption rule is decided based on the correct permanent income

\[
  c_t^{\text{Deliberate}}(w_t) = \arg\max_{c_t} u(c_t) + \delta V_{t+1}(R(w_t - c_t)) \quad \forall t \in \{0, \ldots, T - 1\},
\]

taking future selves’ consumption mistakes as given, driven by future selves’ distorted expectations. As a corollary of Proposition 2, these future consumption mistakes lead to a high MPC of the

\[^4\text{In fact, when } \theta_t < 0, \text{ the case here is the same as the inattention case studied above.}\]
current deliberate consumption.

**Corollary 4.** For \( t \in \{0, \ldots, T - 2\} \), \( \phi_t^{\text{Deliberate}} \equiv \frac{\partial \bar{c}_t^{\text{Deliberate}}}{\partial w_t} > \phi_t^{\text{Frictionless}} \) and increases with future selves’ degrees of distorted expectations \( \{[\theta_{t+k}]\}_{k=1}^{T-t-1} \).

An interpretation independent of the specific biases. Beyond the specific biases studied above, let me provide another interpretation of the key mechanism independent of the specific biases. Through her life experiences, the consumer knows that she has cognitive limitations and her future consumption may not respond efficiently to changes in permanent income. With this knowledge and even without knowledge of the exact mistakes of their future selves, the consumer will increase her current MPC as a second-best response to future consumption mistakes.

Let me also mention another reason why future consumption mistakes in response to changes in permanent income can be prevalent: as Cochrane (1989) and Kueng (2018) show, the welfare cost of these consumption mistakes is small, at most second order in mistakes (\( \lambda s \)).

### 3.3 The \( T \to \infty \) limit and Gauging the Magnitudes

**The \( T \to \infty \) limit.** The MPCs out of deliberate consumption \( \phi_t^{\text{Deliberate}} \) converges to simple limits when \( \lambda_t = \lambda \) and the consumer’s horizon \( T \) goes to infinity.

**Corollary 5.** Let \( \lambda_t = \lambda \) with \( |\lambda| < (\delta^{-1/2} R^{-1}) \) for all \( t \). We have, for \( T \to +\infty \),

\[
\phi_t^{\text{Deliberate}} \to \phi^{\text{Deliberate}} = \frac{\delta R^2 - 1}{\delta R^2 (1 - \lambda^2)} \quad \forall t,
\]

where the condition \( |\lambda| < (\delta^{-1/2} R^{-1}) \) guarantees that the transversality condition \( \lim_{t \to +\infty} \delta^t u'(c_t) = 0 \) holds.

When \( \lambda \to (\delta^{-1/2} R^{-1})^{-} \), the deliberate MPC \( \phi^{\text{Deliberate}} \) achieves its upper bound,

\[
\lim_{\lambda \to (\delta^{-1/2} R^{-1})^{-}} \phi^{\text{Deliberate}} = 1.
\]

That is, when future selves’ consumption mistakes are large enough, the deliberate current self is so worried about her future selves’ mistakes and follows a simple rule of thumb: she consumes all changes in her permanent income.

**Gauging the magnitudes.** Another use of the limit result in Corollary 5 is that it helps us isolate and gauge the magnitudes of how much anticipation of future mistakes of a particular sort can impact current consumption.
Specifically, based on the analysis in the previous subsection, one can use the standard calibration of a particular friction to calibrate $\lambda$ and use (14) to gauge how much anticipation of this friction can increase the current MPCs. This helps disentangle the channel of interest from the direct impact of current friction. The two are often tangled together in the literature.

Let me use the inattention case in Corollary 1 to illustrate. Of course there is caveat that attention to different objects differ (in fact Corollaries 9 and ?? below study such differential attention), but let me use the mean of the estimated attention in the literature review in Gabaix (2019), 0.44, to calibrate $\lambda = 1 - 0.44 = 0.56$ in (10). From (14), this implies that anticipation of future inattention can increase current MPC by around 45%. In Appendix, I also use Corollary 3 to map the standard present bias estimate $\beta = 0.504$ in Laibson et al. (2018) to $\lambda \approx 0.49$. This implies that anticipation of future hyperbolic discounting can increase current MPC by around 32%.

3.4 Extensions and Discussion

Gradual resolution of uncertainty. Above, for illustration purposes, I assume that all income uncertainty in the economy is resolved in period 0. In fact, with quadratic utility here, the well known certainty equivalence result implies that the consumer’s MPC remains the same with gradual resolution of income uncertainty.

Specifically, with a graduate resolution of the income uncertainty and in the fungibility case here, the actual consumption rule of each self $t \in \{0, \cdots, T - 1\}$ can now be written as a function of the expected permanent income:

$$c_t(w_t) = \phi_t w_t + \bar{c}_t, \quad \text{with} \quad \phi_t = (1 - \lambda_t) \psi_t,$$

where $w_t = E_t \left[ a_t + y_t + \sum_{l=1}^{T-t} R^{-l} y_{t+l} \right]$ captures the expected permanent income based on period $t$’s state $(a_t, s_t)$, $\phi_t$ captures self $t$’s actual MPC, and $\lambda_t$ captures self $t$’s mistake. Based on future selves’ actual consumption rules $\{c_{t+k}(w_{t+k})\}_{k=0}^{T-1-t}$, each self $t$’s deliberate consumption rule can be written as

$$c_t^\text{Deliberate}(w_t) = \phi_t^\text{Deliberate} w_t + c_t^\text{Deliberate},$$

where $\phi_t^\text{Deliberate}$ captures self $t$’s deliberate MPC. We have:

Corollary 6. For $t \in \{0, \cdots, T - 2\}$, $\phi_t^\text{Deliberate}$ shares the exact same formula as $\phi_t^\text{Deliberate}$ in Proposition 2.
Partial sophistication. Using the language of O’Donoghue and Rabin (1999, 2001), the deliberate consumption \( c_t^{Deliberate}(w_t) \) isolates the impact of “sophistication,” i.e., the current self’s understanding about her future selves’ mistakes. Proposition 2 shows that “sophistication” alone, no matter what the underlying behavior cause, leads to a high current MPC.

The main Proposition 2 is established with full sophistication for clarity. But the result can be easily translated to the case of partial sophistication. Specifically, I now let the deliberate consumption \( c_t^{Deliberate} \) be determined with a partial understanding of her future selves’ mistakes:

\[
\lambda'_{t,t+k} = s_t \lambda_{t+k},
\]

where \( s_t \in [0, 1] \) captures the degree of self \( t \)’s partial sophistication. The FOC of the deliberate consumption in (6) can be re-written as

\[
u'(c_t^{Deliberate}(w_t)) = \frac{\delta R \partial \hat{V}_{t,t+1} (R (w_t - c_t^{Deliberate}(w_t)))}{\partial w_{t+1}}, \quad (15)
\]

where \( \hat{V}_{t,t+1} (\cdot) \) is self \( t \)’s perceived continuation value function based on her partial understanding about her future selves’ mistakes.

In fact, \( \hat{V}_{t,t+1} (\cdot) \) coincides with the actual continuation value function in (5) if future selves’ actual mistakes are given by \( \{ \lambda_{t,t+k} \}_{k=1}^{T-t-1} \). As a result, the Proposition 2 can be rewritten as:

**Proposition 3.** The deliberate MPC \( \phi_t^{Deliberate} \) is now a function of \( \{ \lambda'_{t,t+k} \}_{k=1}^{T-t-1} \) and increases with each \( \{ |\lambda'_{t,t+k}| \}_{k=1}^{T-t-1} \), i.e., self \( t \)’s perceived mistake of her future self \( t + k \).

General concave utilities. The above analysis studies the case with quadratic utility (Hall, 1978) so I can illustrate the key mechanism clearly with analytically solved linear decision rules. In fact, the key mechanism of how mistakes in future consumption lead to high current MPCs still holds in the case of the general concave utility.

Consider the environment above with general concave utility functions \( u(\cdot) \) and \( v(\cdot) \). Similar to (8), I still focus on the inefficient responses of actual consumption to changes in permanent income. That is,\(^\text{5}\) self \( t \)’s mistake

\[
\lambda_t \equiv 1 - \left( \frac{\partial c_t(w_t)}{\partial w_t} / \frac{\partial c_t^{Deliberate}(w_t)}{\partial w_t} \right), \quad (16)
\]

can be non-zero.

\(^{5}\)(16) coincides with (8) when consumption functions are linear.
To isolate the impact of inefficient responses of future consumption to changes in permanent income in (16), I impose that the actual consumption does not make “level” mistakes. That is, there is a frictionless outcome path \( \{\tilde{w}_t, \tilde{c}_t\}_{t=0}^{T-1} \), where \( \tilde{c}_t = c_t^{\text{Frictionless}}(\tilde{w}_t) \) and \( c_t^{\text{Frictionless}}(\cdot) \) is the frictionless optimal consumption rule. At each \( \tilde{w}_t \), the actual consumption \( c_t(\tilde{w}_t) \) coincides with the frictionless consumption \( \tilde{c}_t \). Without this restriction, future “level” mistakes could also impact current deliberate consumption through third-order precautionary motives, an interesting channel outside the scope of the current paper.\(^6\)

We can now establish that the deliberate MPC at \( \tilde{w}_t \) here in approximated by the same \( \phi_t^{\text{Deliberate}} \) in the main Proposition 2 above. As a result, Proposition 2 above about how mistakes in future consumption lead to high current MPCs remains relevant in the general case here.

**Proposition 4.** For each \( t \in \{0, \ldots, T-1\} \),

\[
\frac{\partial c_t^{\text{Deliberate}}(\tilde{w}_t)}{\partial w_t} = \phi_t^{\text{Deliberate}} + O^3 \left( \{\lambda_{t+k}\}_{k=1}^{T-t-1} \right),
\]

where \( \phi_t^{\text{Deliberate}} \) shares the same formula as in Proposition 2 and \( O^3 \) denotes terms with third or higher orders.

**Empirical support.** Proposition 2 provides a potential explanation for the emerging empirical evidence on excess sensitivity for consumers with high liquidity. For example, Fagereng, Holm and Natvik (2019) study consumption responses to unexpected Norwegian lottery prizes, and find the MPC remains high among liquid winners: their estimates of the MPC for the group with the highest liquid asset balance is 0.459 dollars per year. They argue that conventional models based on liquidity constraints do not imply such large magnitudes for high-liquidity winners. Kueng (2018) documents excess sensitivity of the consumption response to the Alaska Permanent Fund payments, and finds the excess sensitivity is largely driven by high-income households with substantial liquid assets. Relatedly, Stephens and Unayama (2011), Parker (2017), Olafsson and Pagel (2018), Ganong and Noel (2019), McDowall (2020) also question whether liquidity constraints can explain their findings on high MPCs.

\(^6\)Note that this additional restriction is not needed in the benchmark analysis (\( \bar{e}_t \) in (8) can be an arbitrary constant), as \( u''' \), \( v''' \equiv 0 \) there.
4 The Non-Fungibility Case

I now turn to the general, non-fungible case, in which mistakes in future consumption may also include inefficiently differential responses to different components of permanent income. In this general case, I first show that the above high MPC result remains true: as long as future consumption responds inefficiently to changes in savings/borrowings, the current MPC is higher. Then, I show that the non-fungibility of future consumption alone also suffices to generate the non-fungibility of the current consumption, even if the current self fully understands how to calculate permanent income correctly. In this sense, mistakes in future consumption also provide a justification for non-fungibility and separate mental accounts. Finally, I illustrate how the framework can nest several behavioral biases involving non-fungibility.

4.1 The Main Results

In this Section, I allow mistakes in actual consumption rules to include inefficiently differential responses to different components of permanent income. Specifically, the actual consumption rule of each self $t \in \{0, \ldots, T-1\}$ is given by:

$$c_t(a_t, s_t) = \phi_t^a a_t + \phi_t^y \left( y_t + \sum_{k=1}^{T-t} \omega_{t,k} R^{-k} y_{t+k} \right) + \bar{c}_t,$$

where $\phi_t^a$ captures actual MPC out of wealth (i.e. savings/borrowings), $\phi_t^y$ captures actual MPC out of current income, $\phi_t^y \omega_{t,k}$ captures actual MPC out of future income $k$ periods later, and $\omega_{t,k}$ captures how this MPC violates the fungibility principle. For example when $\omega_{t,k} < 1$, it means the consumer excessively discounts future income $k$ periods later. Finally, $\bar{c}_t$ in (17) is an exogenous constant capturing the overall level of self $t$’s actual consumption, of which the exact value will not influence the deliberate MPCs calculated below.

The actual consumption rule in (17) allows differential mistakes in response to different components of permanent income. I use $\left( \lambda_t^a, \{ \lambda_t^y \omega_{t,k} \}_{k=0}^{T-t} \right)$ to capture the mistake in self $t$’s actual consumption in responses to changes in different components of income and wealth. That is, how the actual MPCs in (17) deviate from the deliberate MPCs $\phi_t^\text{Deliberate}$ and $\left\{ \phi_t^\text{Deliberate} \omega_{t,k} \right\}_{k=0}^{T-t}$ introduced below in (19). Specifically, the mistakes $\lambda_t^a$ and $\left\{ \lambda_t^y \omega_{t,k} \right\}_{k=0}^{T-t}$ are given by:

$$\phi_t^a = (1 - \lambda_t^a) \phi_t^\text{Deliberate}, \quad \phi_t^y = (1 - \lambda_{t,0}^y) \phi_t^\text{Deliberate}, \quad \text{and} \quad \phi_t^y \omega_{t,k} = (1 - \lambda_{t,k}^y) \phi_t^\text{Deliberate} \omega_{t,k}^\text{Deliberate},$$

(18)
where $\lambda_t^a$ captures the mistake in self $t$’s actual MPC out of wealth (i.e., savings/borrowings), $\lambda_{t,0}^y$ captures the mistake in self $t$’s actual MPC out of current income, and $\lambda_{t,k}^y$ captures the mistake in self $t$’s actual MPC out of future income $k \geq 1$ periods later. Similar to (8), a positive $\lambda$ means under-reaction and a negative $\lambda$ means over-reaction. Similar to (8), the mistakes $\lambda_t^a$ and $\{ \lambda_{t,k}^y \}_{k=0}^{T-t}$ are treated as exogenous.

It is worth noting that the fungibility case analyzed in Section 4 is nested here by $\lambda_t = \lambda_t^a = \lambda_{t,k}^y$, for all $t$ and $k \in \{0, \cdots, T-t \}$. That is, the fungibility case analyzed above is a special case in which mistakes in response to different components of permanent income are restricted to be the same.

Based on future selves’ actual consumption rules $\{ c_{t+k}(a_{t+k}, s_{t+k}) \}_{k=0}^{T-t-1}$ above, each self $t$’s deliberate consumption rule (barring any self $t$’s own friction) will take the following form.

**Lemma 2.** For $t \in \{0, \cdots, T-1 \}$, each self $t$’s deliberate consumption rule defined in (3) is given by:

$$c_t^{Deliberate} (a_t, s_t) = \phi_t^{Deliberate} (a_t + y_t + \sum_{k=1}^{T-t} \omega_{t,k}^{Deliberate} R^{-k} y_{t+k}) + c_t^{Deliberate}. \quad (19)$$

In (19), $\phi_t^{Deliberate}$ captures the MPC of the deliberate consumption out of current income and wealth, $\omega_{t,k}^{Deliberate}$ captures the deliberate MPC out of future income $k$ periods later, $\omega_{t,k}^{Deliberate}$ captures how this MPC violates the fungibility principle, and $c_t^{Deliberate}$ captures the overall level of self $t$’s deliberate consumption.

In the rest of this Subsection, I will first show that the high MPC result in Section 3 remains true: as long as future consumption responds inefficiently to changes in savings/borrowings ($\lambda_{t+k}^a \neq 0$), the current deliberate MPC, i.e., $\phi_t^{Deliberate}$ in (19), will be higher. Then, I will show how the non-fungibility of future consumption ($\lambda_{t+k}^a \neq \lambda_{t+k}^y$) also suffices to generate the non-fungibility of the current sophisticated consumption. That is, the $\omega_{t,k}^{Deliberate}$ term in (19), which captures how the MPC out of future income $l$ periods late violates the fungibility principle, will generically deviate from 1. In other words, even if the current deliberate self knows how to calculate permanent income correctly, as long as she anticipates future consumption mistakes in the form of future non-fungibility, she will also violate the fungibility principle and behave as if she displays separate mental accounts for current and future income.

**High current MPCs.** Here, I show that the main results in Section 3, i.e., Lemma 1 (excess concavity) and Proposition 2 (high current deliberate MPCs), remain true. I further emphasize that the key behind these result is the mistakes in the responses of future consumption to changes in wealth (i.e., savings/borrowings).
Specifically, in the general case here, the FOC of the deliberate consumption in (6) can be written as

$$u'(c_t^{\text{Deliberate}}(a_t, s_t)) = \frac{\delta R\partial V_t+1}{\partial a_t+1} \left( R \left( a_t - c_t^{\text{Deliberate}}(a_t, s_t) \right), s_t+1 \right).$$

That is, the deliberate self $t$ equates the marginal utility of consuming now with the marginal continuation value of wealth. The current MPC is then connected to how fast the marginal continuation value of wealth changes with wealth, i.e., the concavity of value function with respect to wealth. Similar to Lemma 1, I henceforth use $\Gamma_t > 0$ to denote the “concavity” of the consumer’s value function in (5) with respect to wealth:

$$\frac{\partial^2 V_t(a_t, s_t)}{\partial a_t^2} \equiv u'' \cdot \Gamma_t.$$

**Proposition 5.** 1. For $t \in \{0, \cdots, T-1\}$, consumption mistakes lead to excess concavity of the value function: $\Gamma_t$ strictly increases with the friction $\{\{\lambda_{t+k}^a\}_{k=0}^{T-t-1}\}$.

2. For $t \in \{0, \cdots, T-2\}$, future consumption mistakes lead to a high current MPC of the deliberate consumption: $\phi_t^{\text{Deliberate}} > \phi_t^{\text{Frictionless}}$ and increases with each of $\{\{\lambda_{t+k}^a\}_{k=1}^{T-t-1}\}$.

The first part of Proposition 5 establishes how consumption mistakes lead to excess concavity of the value function. Similar to Lemma 1, larger $\{\{\lambda_{t+k}^a\}_{k=0}^{T-t-1}\}$ means more inefficient consumption responses to changes in wealth. As a result, the marginal value of wealth $\frac{\partial V_t(a_t, s_t)}{\partial a_t}$ decreases faster with $a_t$ and the value function $V_t$ becomes more concave with respect to wealth. It is worth noting, here, the relevant mistakes $\{\lambda_{t+k}^a\}_{k=0}^{T-t-1}$ are inefficient responses to changes in wealth. This is because the consumption responses to changes in wealth directly determine the marginal value of wealth and the concavity $\Gamma_t$.

The second part of Proposition 5 establishes how future consumption mistakes lead to high current MPCs. As the first part of the Proposition establishes, with larger $\{\{\lambda_{t+k}^a\}_{k=1}^{T-t-1}\}$, future consumption responds more inefficiently to changes in wealth and this leads to excess concavity of the continuation value. In response to changes in current income, the current self is then more willing to adjust her current consumption instead of her savings. Again, it is worth noting that, as in the first part of the Proposition, the relevant mistakes $\{\lambda_{t+k}^a\}_{k=1}^{T-t-1}$ are future selves’ inefficient responses to changes in wealth. This is because (20) links the deliberate MPC $\psi_t$ with the concavity of the value function $\Gamma_t$, which depends only on $\{\lambda_{t+k}^a\}_{k=0}^{T-t-1}$.

**Future non-fungibility begets current non-fungibility.** Now, I turn to a new prediction: the non-fungibility of future actual consumption alone suffices to generate the non-fungibility of the current deliberate consumption.

**Proposition 6.** For $t \in \{0, \cdots, T-1\}$, the deliberate consumption in (19) violates fungibility principle generically, i.e., there exists $k \in \{0, \cdots, T-t\}$ such that $\omega_{t,k} \neq 1$. Here, generically is
in the sense of the Euclidean measure of the product space generated by future selves’ mistakes, 
\[ \{ \lambda_{t+k}^a, \lambda_{t+k}^y \}_{k \in \{1, \ldots, T-t-1\}, \ t \in \{0, \ldots, T-t-1\}} \].

In other words, the fungibility case studied in Section 3 is rather special. There, the fungibility of future selves means that their actual consumption exhibits the same degree of mistakes in responses to changes in different components of income and wealth,

\[ \lambda_{t+k} = \lambda_{t+k}^a = \lambda_{t+k,0}^y = \lambda_{t+k,1}^y = \cdots = \lambda_{t+k,T-t-k-1}^y \quad \forall k \in \{1, \ldots, T-t-1\}. \quad (21) \]

With this restriction, the current deliberate consumption there then also follows the fungibility principle. On the other hand, away from the condition in (21), even if the current self is not subject to any behavioral mistakes and knows how to calculate permanent income correctly, as long as she anticipates future non-fungibility (\( \lambda_{t+k}^a \neq \lambda_{t+k}^y \)), her current consumption will endogenously violate the fungibility principle.

**Excess discounting.** Here, I further study an empirically relevant case of how future selves violate the fungibility. That is, mistakes in future actual consumption involve a smaller MPC out of wealth than out of income, i.e., \( \lambda_{t,l}^a \geq \lambda_{t,l}^y \) for all \( t \in \{0, \cdots, T-1\} \) and \( l \in \{0, \cdots, T-t\} \) (recall a larger \( \lambda \) means a smaller MPC). This is consistent with the empirical evidence on small MPC out of financial wealth in Thaler (1990), Baker, Nagel and Wurgler (2007), Paiella and Pistaferri (2017), Di Maggio, Kermani and Majlesi (2018), and Fagereng et al. (2019), which will be further discussed below.

I show that, in this case, future selves’ non-fungibility leads to excess discounting of future income for the current deliberate consumption.

**Proposition 7.** Consider the case that \( \lambda_{t,l}^a \geq \lambda_{t,l}^y \) and \( \lambda_{t,l}^a \geq 0 \) for all \( t \in \{0, \cdots, T-1\} \) and \( l \in \{0, \cdots, T-t\} \).

The deliberation consumption in (19) for each self \( t \in \{0, \cdots, T-1\} \) has the following properties:

1. For \( l \in \{0, \cdots, T-t\} \), \( \omega_{t,l}^{\text{Deliberate}} < 1 \). That is, the deliberate self \( t \) excessively discount future income.

2. For \( l \in \{0, \cdots, T-t\} \), \( \omega_{t,l}^{\text{Deliberate}} \) decreases with each \( \{ \lambda_{t+k}^a \}_{k=1}^{T-t-1} \) (i.e., increases with future selves’ actual MPCs out of wealth) and increases with each \( \{ \lambda_{t+k,T-t-k}^y \}_{k=1}^{\min(t, T-t-1)} \) (i.e., decreases with future selves’ actual MPC out of income).

3. \( \omega_{t,l}^{\text{Deliberate}} \) decreases with \( l \).
Proposition 7 means that, if the non-fungibility of future actual consumption takes the form of an inefficiently small MPC out of wealth, the current deliberate consumption exhibits excess discounting of future income. To understand the mechanism behind the excess discounting, we first understand the comparative statics in part 2 of Proposition 7.

First, $\omega_{t,l}^{\text{Deliberate}}$ decreases with each $\{\lambda_{t+k}^{a}\}_{k=1}^{T-t-1}$. If future selves’ mistakenly respond too little to wealth (a larger $\{\lambda_{t+k}^{a}\}_{k=1}^{T-t-1}$), because of the excess concavity in Proposition 6, the current self will be less willing to change her saving. This means that the current self is also less willing to adjust her current consumption in response to changes in future income (note that the response of current consumption to future income requires changes in saving). As a result, $\omega_{t,l}^{\text{Deliberate}}$ is lower and there is excess discounting.

Second, $\omega_{t,l}^{\text{Deliberate}}$ increases with each $\{\lambda_{t+k,l-k}^{y}\}_{k=1}^{\min\{l, T-t-1\}}$. That is, if future selves’ mistakenly respond too little to income $l$ periods from now (a larger $\{\lambda_{t+k,l-k}^{y}\}_{k=1}^{\min\{l, T-t-1\}}$), the current self will be more willing to respond to income $l$ periods from now. But, in the empirical relevant case here that future consumption responds less to wealth than to income, the first channel dominates and the current self exhibits excess discounting of future income.

Part 3 of Proposition 7 further establishes a “distance effect;” there is more discounting when the consumer responds to income further in the future. That is, the mechanism behind the excess discounting accumulates over the distance between the current consumption and the future income.

Consistent with excess discounting of future income, empirical studies typically find very limited consumption response to news about future income, i.e., a very limited “announcement effect.” Papers that find this pattern cannot be fully explained by liquidity constraints include Stephens and Unayama (2011), Parker (2017), Olafsson and Pagel (2018), and Kueng (2018).

In the Appendix, I also study the case that mistakes in actual consumption take the form of mistakenly responding more to wealth than to income. Though this case is potentially empirically irrelevant, the main lesson in Proposition 6 remains true: the non-fungibility of future consumption will lead to the non-fungibility of the current deliberate consumption. The difference compared to Proposition 7 is that, in this case, $\omega_{t,l}^{\text{Deliberate}}$ may be larger than 1. In fact, this is consistent with the intuition behind the comparative statistics in part 2 of Proposition 7.

**Gradual resolution of uncertainty.** Above, for illustration purposes, I assume that all income uncertainty in the economy is resolved in period 0. In fact, similar to Corollary 6, the consumer’s MPC remains the same with gradual resolution of income uncertainty.

Specifically, with a gradual resolution of the income uncertainty, the actual consumption rule
of each self \( t \in \{0, \ldots, T - 1\} \) can now be written as a function of the expected permanent income:

\[
c_t(a_t, s_t) = \phi_t^a a_t + \phi_t^y \left( y_t + \sum_{k=1}^{T-t} \Omega_{t,k} R^{-k} E_t[y_{t+k}] \right) + \bar{c}_t,
\]

where \( E_t[y_{t+k}] = E_t[y_{t+k}|s_t] \) captures the expected future income based on the current income state \( s_t \). Self \( t \)'s mistakes \( \lambda^a_t \) and \( \{\lambda^y_{t,k}\}_{k=0}^{T-t-1} \) are still given by (18).

Based on future selves’ actual consumption rules \( \{c_{t+k}(a_{t+k}, s_{t+k})\}_{k=0}^{T-1-t} \), each self \( t \)'s deliberate consumption rule defined in (3) will take the following form.

**Corollary 7.** For \( t \in \{0, \ldots, T - 1\} \), each self \( t \)'s deliberate consumption rule defined in (3) is given by:

\[
c^\text{Deliberate}_t(a_t, s_t) = \phi^\text{Deliberate}_t a_t + \phi^\text{Deliberate}_t \left( a_t + y_t + \sum_{k=1}^{T-t} \omega^\text{Deliberate}_{t,k} R^{-k} y_{t+k} \right) + \bar{c}^\text{Deliberate}_t,
\]

where \( \phi^\text{Deliberate}_t \) and \( \{\omega^\text{Deliberate}_{t,k}\}_{k=0}^{T-t} \) share the exact same formula as in Lemma 2.

**The \( T \to \infty \) and hand-to-mouth limit.** Similar to Corollary 5, I can establish a simple limit for the deliberate consumption rule in (19) when the consumer’s horizon \( T \) goes to infinity.

**Corollary 8.** Let \( \lambda^a_t = \lambda^a \) with \( |\lambda^a| < (\delta^{-1/2} R^{-1}) \) and \( \lambda^y_{t,k} = \lambda^y \) for all \( t \) and \( k \). We have, when \( T \to +\infty \),

\[
\phi^\text{Deliberate}_t \to \phi^\text{Deliberate} = \frac{\delta R^2 - 1}{\delta R^2 (1 - (\lambda^a)^2)}.
\]

\[
\omega^\text{Deliberate}_{t,1} \to (\omega^\text{Deliberate})^I \equiv \left( 1 - \frac{(\delta R^2 - 1) \lambda^a (\lambda^a - \lambda^y)}{1 - (\lambda^a)^2} \right)^I
\]

Furthermore, when \( \lambda^a \to (\delta^{-1/2} R^{-1})^- \) and \( \lambda^y \to 0 \).

\[
\phi^\text{Deliberate} \to 1 \quad \text{and} \quad \omega^\text{Deliberate} \to 0.
\]

The limit in (24) is effectively a “hand-to-mouth” limit. When the current self is so worried about future mistaken responses to changes in wealth, her consumption does not respond to future income and just tracks changes in her current income. In other words, she is effectively “hand-to-mouth” with respect to changes in income, even though her total consumption does not need to track current income (\( c_t \neq y_t \)).
This simple “hand-to-mouth” limit also illustrates how my mechanism can also explain the empirical evidence on excess sensitivity to anticipated future income shocks away from liquidity constraint (e.g. Kueng, 2018). In this limit, consumption does not respond to future income until it arrives. Only at that point, consumption fully responds.

### 4.2 Different Micro-Foundations, Same Results

The results in Propositions 5 - 7 do not depend on the exact behavioral causes of future consumption mistakes. Nevertheless, the analysis nests several widely-studied behavioral biases. Here, I focus on two biases which will naturally lead to non-fungibility, i.e., mental accounting and differential inattention to income and wealth. The biases studied in the previous fungible section can also be extended to the non-fungible case here.

**Mental accounting.** Thaler (1990) provides evidence that consumers systematically violate the fungibility principle. He proposes that consumers have separate mental accounts for current income, expected future income, and wealth, and exhibit different MPCs out of these separate mental accounts. These separate mental accounts then provide a direct micro-foundation for different $\lambda$s in (18), that is, why the actual consumption exhibits differential responses to different components of income and wealth. The result in Propositions 6 and 7 then shows that the fact that future selves have separate mental accounts alone suffices to generate the non-fungibility of the current consumption.

**Differential inattention to income and wealth.** When I study inattention in the fungibility case, I let the perceived permanent income be a function of actual permanent income, as in (10). In other words, to maintain fungibility there, the consumer has the same degree of inattention to all components of income and wealth. Here, instead, I study the non-fungible case with differential attention to income and wealth. Below I study the rather “overlooked” case in which the consumer is inattentive to her endogenous wealth $a_t$. In Appendix, I also replicate the case focused in the literature (e.g. Sims, 2003; Gabaix, 2016, 2019; Luo, 2008). That is, the consumer is fully attentive to her endogenous wealth $a_t$ but is inattentive to her income state $s_t$.

**Imperfect perception of wealth.** Here I study the case in which the consumer is inattentive to her endogenous wealth $a_t$ but is fully attentive to her income state $s_t$. This is the focus of the job market version of Lian (2019), which the current, more general, paper subsumes part of its result.

Specifically, similar to Corollary 1 above, I follow the sparsity approach in Gabaix (2014) and
let each self’s perceived wealth be given by a weighted average of her actual wealth and a default. To isolate the friction of interest, I also let each self perfectly perceive her current income state \( s_t \). That is, for \( t \in \{0, \cdots, T - 1\} \),

\[
a^p_t (a_t) = (1 - \lambda^a_t) a_t + \lambda^a_t a^d_t \quad \text{and} \quad s^p_t (s_t) = s_t,
\]

where \( \lambda^a_t \in [0, 1] \) captures self \( t \)'s degree of imperfect perception of wealth (a larger \( \lambda^a_t \) means more frictions) and \( a^d_t \) captures the default (an exogenous constant of which the exact value does not matter for the MPCs). Also similar to Corollary 1, an alternative way to model inattention is through noisy signals (Sims, 2003). With linear consumption rules and Normally distributed incomes, the two approaches will still lead to the same predictions on MPCs, as explained in Appendix.

There is ample empirical support for imperfect perception of wealth and its influence on economic decisions. The credit card literature, e.g., Agarwal et al. (2008) and Stango and Zinman (2014), finds that consumers often neglect their credit card balances, and this neglect often leads to suboptimal credit card usage. Brunnermeier and Nagel (2008) and Alvarez, Guiso and Lippi (2012) find that consumers often have imperfect knowledge of their financial wealth changes and fail to adjust accordingly. Moreover, the recent literature on Fintech shows that providing information about a consumer’s total wealth by aggregating her financial account will change her consumption behavior. Levi (2015) conducts an experiment in which he provides the participants with account aggregation tools that display their current total wealth. Participants significantly change their consumption and saving after seeing their wealth, implying that they have imperfect perception of wealth without the tool. Likewise, Carlin, Olafsson and Pagel (2017) study the introduction of a financial app that consolidates all of its users’ bank account information and transaction histories. They show that the app significantly reduces its users’ interest expenses on consumer debt as well as other bank fees.

Based on the perceived wealth in (10), the actual consumption rule of each self \( t \) is given by

\[
ct (a^p_t (a_t), s_t) = \arg \max_{ct} u (ct) + \delta V_{t+1} \left( R (a^p_t (a_t) + yt - ct), s_{t+1} \right),
\]

where the continuing value function \( V_{t+1} \) is defined similarly to above, based on future selves’ actual consumption rules. On the other hand, the deliberate consumption is decided as in (6), based on the correct current wealth and taking future selves’ imperfect perception of wealth as given.
Here, future selves’ imperfect perception of wealth lead to inefficient responses of future consumption to changes in wealth. As discussed in Propositions 5 - 7, such mistakes lead to a high MPC out of current income and excess discounting of future income.

**Corollary 9.** For each \( t \in \{0, \ldots, T - 1\} \), self \( t \)’s deliberate consumption is given by

\[
c_t^{\text{Deliberate}}(a_t, s_t) = \phi_t^{\text{Deliberate}} \left( a_t + y_t + \sum_{k=1}^{T-t} \omega_{t,k}^{\text{Deliberate}} R^{-k} y_{t+k} \right) + c_t^{\text{Deliberate}}
\]

(26)

where \( \phi_t^{\text{Deliberate}} \) and \( \{\omega_{t,k}^{\text{Deliberate}}\}_{t=0}^{T-t} \) are given by the formula in Lemma 2 with \( \{\lambda_t^a\}_{t=0}^{T-1} \) in (25) and \( \lambda_{t,k}^y = 0 \) for all \( t, k \).

Following directly from the above Corollary, the current deliberate consumption exhibits a high MPC out of current income (\( \phi_t^{\text{Deliberate}} > \phi_t^{\text{Frictionless}} \)) and excess discounting of future income (\( \omega_{t,k} < 1 \)). Moreover, because the consumer here is fully attentive to her current income state, the above properties of the deliberate MPCs out of current and future income then naturally translate to properties of the actual MPCs.

Similar to Section 3, one can use the limit result in Corollary 8 to gauge the magnitudes of how much anticipation of future imperfect perception of wealth can impact current MPCs. Here, because direct estimates of imperfect perception of wealth are not necessarily available, I instead choose to back out \( \lambda^a \) from relevant moments of MPCs in the data. Specifically, in the \( T \to \infty \) studied in Corollary 8, we have \( \phi^a/\phi^y = 1 - \lambda^a \).

The ratio between the MPC out of wealth and the MPC out of current income is also directly available from empirical studies. For example, Di Maggio, Kermani and Majlesi (2018) estimate the MPC out of wealth and the MPC out of current income for rich households away from liquidity constraints. In their estimates, for consumers in the top half of wealth distribution, the MPC out of wealth is \( $0.05 \) per year, and the MPC out of current income for rich households is \( $0.35 \) per year. Together, they imply \( \lambda^a = 1 - \frac{1}{7} = \frac{6}{7} \). In fact, their estimates reflect a general theme in the recent empirical literature: the estimates of MPC out of wealth are typically much smaller than the estimates of the MPC out of current income.

Based on this estimated friction \( \lambda^a \), the

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7 This assumes perfect attention to the income state \( s_t (\lambda^y = 0) \) as in (25). For a given \( \phi^a/\phi^y \), if I allow inattention to income state, the implied degree of imperfect perception of wealth (\( \lambda^a = 0 \)) will be larger.

8 In their published version (Maggio, Kermani and Majlesi, 2019), their estimates of MPC out of current income are slightly larger than their NBER version above, which implies an even higher larger \( \lambda^a \) and hence even larger frictions. To be conservative, I use their estimates in the NBER working paper version above.

9 Using other estimates of the MPC out of wealth and the MPC out of current income, I can get similar, if not smaller, estimates of the ratio \( \frac{1 - \lambda^a}{1 - \lambda^y} \). For example, Chodorow-Reich, Nenov and Simsek (2019)’s estimate of
anticipation of future imperfect perception of wealth can increase the current MPC by as much as 2.77 times.

5 Other Applications

The main application of the proposed channel is to explain high-liquidity consumers’ high MPCs and non-fungibility, as studied above. In addition, the key mechanism behind those results, i.e., the excess concavity of the continuation value function driven by future consumption mistakes, can also speak to other well-known puzzles in intertemporal decisions: large risk aversion and equity premium puzzle (Mehra and Prescott, 1985); small elasticity of intertemporal substitution, i.e., the empirical evidence on the small consumption responses to interest rate changes (Hall, 1988; Campbell and Mankiw, 1989; Havránek, 2015).

Risk aversion. A consumer’s degree of risk aversion is proportional to her second order derivatives of her value function. Using the fungibility case in Section 3 as an example: the degree of relative risk aversion is given by \(-\frac{\partial^2 V_t}{\partial w_t^2} \frac{u_t}{\sigma w_t^2}\) and the degree of absolute risk aversion is given by \(-\frac{\partial^2 V_t}{\partial w_t^2} \frac{\sigma w_t^2}{u_t}\), both proportional to \(\frac{\partial^2 V_t}{\partial w_t^2}\). From Lemma 1 about excess concavity, we know that consumption mistakes lead to excess concavity of the value function. We then know that consumption mistakes will also lead to a larger risk aversion.

To gauge the magnitudes of how much consumption mistakes can increase risk aversion, let us again use the $T \to +\infty$ in Corollary 5. In this limit, we have \(\Gamma_t \equiv \frac{\partial^2 V_t}{\partial w_t^2} / u'' \to \Gamma = \frac{\delta R^2 - 1}{\delta R^2 (1 - \delta R^2 \lambda^2)}\). With the calibration of \(\lambda\) used in Section 3 (\(\lambda = 0.56\) for inattention or \(\lambda = 0.49\) for hyperbolic discounting) and standard calibration of \(\delta\) and \(R\) (closer to 1), consumption mistakes can increase the degree of risk aversion by 30% – 50%.

A smaller effect of interest rate changes. Another famous puzzle in intertemporal consumption is the empirical evidence on the small response of consumption to interest rate changes (Hall, 1988; Campbell and Mankiw, 1989; Havránek, 2015). The proposed channel, i.e., the impact of future consumption mistakes, can also help resolve this puzzle. To illustrate this, I allow the interest rate between period \(t\) and period \(t + 1\), \(R_t\), to be time-varying in the fungibility case in Section 3. The FOC of the deliberate consumption in (9) at \(t\) is given by

the MPC out of financial wealth is only $0.028 per year, smaller than Di Maggio, Kermani and Majlesi (2018)’s. Fagereng et al. (2019) also find that rich households consume very little out of capital gains and have a savings rate out of capital gains close to one hundred percent.
\[ u'(c^\text{Deliberate}_t(w_t)) = \delta R_t \frac{\partial V_t+1}{\partial w_t} \left( R_t (w_t - c^\text{Deliberate}_t(w_t)) \right). \]

From this expression, one can see that the excess concavity of the continuing value function driven by future consumption smooth mistakes makes the current self less willing to intertemporally substitute.

To formalize and focus on the intertemporal substitution motive, similar to Proposition 4, I shut down “level” mistakes by studying deviations from a frictionless outcome path \( \{\hat{w}_s, \hat{c}_s\}_{s=0}^{T-1} \). I can then establish:

**Proposition 8.** The response of deliberate consumption to interest rate changes, \( \frac{\partial c^\text{Deliberate}_t(\hat{w}_t)}{\partial R_t} \), decreases with each future self’s mistake \( \{[\lambda_{t+k}]\}_{k=1}^{T-t-1} \).

The intuition is: the response of current consumption to interest rate changes leads to changes in savings; with future consumption mistakes and excess concavity, the marginal utility of saving decreases faster with \( w_{t+1} \). The current self is then less willing to respond to interest rate changes.

## 6 Conclusion

In this paper, I show how anticipation of mistakes in future consumption can lead to high marginal propensities to consume now. This channel is independent from liquidity constraints and hopefully can help resolve the empirical puzzles on high liquidity consumers’ high MPCs, which are hard to square with canonical liquidity-constraints-based models. The main approach, using “wedges” to capture behavioral mistakes and deriving robust predictions independent from the exact psychological cause of these mistakes, can also be useful in other contexts. For example, in ongoing works, I am exploring how “level effects,” i.e., mistakes in overall future consumption levels briefly discussed after Proposition 4, can robustly impact current decisions.

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\(^{10}\)Note that, with time-varying interest rates, consumption rules may not be linear anymore. That is why there could be “level” effects.
Appendix

Under construction.
References


