Paternalistic Social Assistance: Evidence and Implications from Cash vs. In-Kind Transfers

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Abstract

We estimate impacts of cash and in-kind transfers on the consumption of temptation goods and explore normative implications. We use two decades of data from South Carolina on cash benefits from Supplemental Security Income (SSI) and in-kind benefits from the Supplemental Nutrition Assistance Program (SNAP) linked to detailed data on adults' health care use. Our empirical strategy examines outcome changes in the several days following each transfer's scheduled monthly payout. ED visits for drug and alcohol use increase by 20-30 percent following SSI receipt, but do not respond to SNAP receipt. Additionally, fills of prescription drugs for new illnesses increase following SSI receipt but do not respond to SNAP receipt, and there is suggestive evidence that SNAP, but not SSI, reduces nutrition-sensitive ED visits. Motivated by these non-fungibility results, we develop a model of a paternalistic social planner designing a transfer program when consumers have self-control problems and may engage in mental accounting. The planner's optimal SNAP share is strictly positive and weakly increasing as self-control worsens. A rough calibration suggests that the current level of SNAP benefits is higher than optimal, and may be overly paternalistic.

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> "Economists appear to feel that paternalism is either too simple or too unattractive a rationale for large scale government programs... But it is hard to escape the conclusion that paternalism remains a fundamental underlying rationale for in-kind transfers."
> – Currie and Gahvari (2007)

1 Introduction

One of the primary functions of government is to redistribute resources. In countries across the world, much of this redistribution takes the form of in-kind transfers – such as health care, education, housing and food - rather than cash transfers (Currie and Gahvari 2008). In the U.S. in 2019, over half of transfers were in kind (OECD); indeed, for the non-elderly, cash transfers have all but disappeared in the aftermath of the 1996 welfare reform (Edin and Shaefer 2015; Shmidt et al. 2025).

The widespread use of in-kind transfers is ostensibly in conflict with classic economic theory, which argues that cash is a superior means of redistribution because it leaves recipients free to optimize the use of the transfer (Atkinson and Stiglitz 1976; Kaplow 2006). Economists have therefore developed an array of theoretical rationales for in-kind transfers, and - more recently - provided empirical evidence consistent with many of them. These include the potential for in-kind transfers to have superior targeting properties (e.g., Nichols and Zeckhauser 1982; Currie and Gahvari 2008; Lieber and Lockwood 2019), to create positive pecuniary externalities (e.g., Coate et al. 1994; Cunha et al. 2019; Blanco 2023), to provide insurance against commodity price risk (Gadenne et al. 2024), and to address the Samaritan's dilemma (Coate 1995).

However, in the minds of much of the populace and policy-makers, the primary rationale for in-kind transfers is a paternalistic one. In surveys, respondents overwhelmingly report that they prefer to provide redistribution through in-kind transfers rather than cash; their primary explanation is concern that recipients will spend cash assistance 'inappropriately' (Liscow and Pershing 2022).[1] Policy is also influenced by such paternalistic concerns. In 2012, for example, media coverage of individuals reportedly spending cash welfare benefits on temptation goods prompted Congress to require states to adopt policies and practices to prevent these benefits from being used in liquor stores, casinos, or adult-entertainment establishments (USGAO).[2] Similarly, in 2021, then-Senator Joe Manchin reportedly expressed opposition to an expansion of the child tax credit because of concerns that it would be spent on illegal drugs (Shabad et al. 2021). Such paternalistic impulses can be justified by individual optimization failures such as time-inconsistent preferences (e.g., Laibson

[1] Some potential transfer recipients express similar sentiments. Although only one-quarter of below-poverty survey respondents said that they would prefer to receive an in-kind transfer to an equivalent amount of cash, the most common explanation given for this preference is the desire for a self-control mechanism (Liscow and Pershing 2022).

[2] Likewise, in Brazil, evidence that a large share of a cash transfer program for the poor (Bolsa Familia) was being spent on on-line gambling prompted the government to prohibit use of cash transfer program cards for this purpose (Reuters (2024); Pereira (2024)).

1997).[3]

Yet as the opening quotation suggests, academic economists have paid relatively less attention to evidence for or implications of paternalistic rationales for in-kind transfers. In this paper, therefore, we begin to fill this gap. We provide empirical evidence that, relative to cash transfers, receipt of in-kind transfers reduce the consumption of temptation goods (specifically drugs and alcohol) and explore normative implications for the optimal mix of in-kind and cash transfers in the presence of self-control problems.

Our empirical setting is the policy trade-off for low-income American adults between cash transfers in the form of Supplemental Security Income (SSI) and in-kind food provision in the form of the Supplemental Nutrition Assistance Program (SNAP). Both SSI and SNAP are large-scale, federally-funded, mean-tested transfer programs. SSI provides cash assistance (and typically health insurance coverage via Medicaid) to low income individuals who are elderly or disabled; expenditures are about $60 billion per year and SSI covers about 8.5 million Americans (Duggan et al. 2016; USSSA). SNAP provides food vouchers to low-income individuals; it is the second-largest means-tested program in the United States (Carrington et al. 2013) and one of the only that is virtually universally available to low income individuals. Expenditures on SNAP are about $70 billion per year, and reach about 40 million Americans (USDA a; USSSA; Hoynes and Schanzenbach 2015).

We analyze a customized data set that contains two decades of data on cash and SNAP benefit receipt for individuals in South Carolina, linked to detailed information on their use of health care. Our empirical strategy exploits variation in the date of benefit receipt within the month. For SNAP, we follow Cotti et al. (2018) and Cotti et al. (2020) and take advantage of the fact that in South Carolina, benefits are paid on a monthly schedule that varies based on the last digit of the recipient's case number; this generates plausibly-exogenous individual-level variation in the day of the month that SNAP is received. For SSI, we follow Dobkin and Puller (2007) who analyze changes in outcomes around the receipt of SSI benefits on the first of the month[4]; we augment this strategy by comparing changes in outcomes for SSI recipients with those for other low-income adults who are likely not on SSI.

Our primary focus is on the impact of monthly receipt of each benefit on temptation goods, specifically drugs and alcohol which we proxy for by emergency department (ED) visits for drug and alcohol use. We also look at impacts on ED visits for nutrition-sensitive conditions, and on fills of new prescription drugs. Our evidence is consistent with a higher marginal propensity to consume temptation goods out of cash transfers than out of food vouchers. Specifically, looking at impacts in the six days on and after benefit receipt, we find that receipt of SSI benefits each month

[3]Other paternalistic rationales include social preferences for ensuring a minimum consumption of specific commodities (e.g., Musgrave 1959; Tobin 1970; Harberger 1984).

[4]Other highly related work includes Shaner et al. (1995); Phillips et al. (1999); Stephens Jr (2003); Evans and Moore (2011, 2012)

is associated with a 20 to 30 percent increase in ED visits for drug or alcohol use, while such visits do not change following the receipt of SNAP benefits. We also find that fills of new prescription drugs increase by about 40 to 70 percent following receipt of SSI but do not change following receipt of SNAP, which is consistent with a higher marginal propensity to consume non-labeled non-temptation goods out of cash than out of SNAP. And we find suggestive evidence that while nutrition-sensitive ER visits rise by about 2 to 3 percent following receipt of SSI, they fall by about 1 percent following receipt of SNAP, which is consistent with a higher marginal propesntity consume food out of SNAP than out of SSI. Even after we adjust for the fact that in our population SSI benefits are likely about 4 times higher than SNAP benefits, we can reject the null hypothesis that, *in the same population* the impacts of the two types of benefits on the consumption of temptation goods or on the consumption of non-labeled, non-temptation goods are the same.

These non-fungibility results between cash and SNAP are striking in light of the substantial existing empirical evidence that SNAP benefits tend to be infra-marginal for food consumption: the vast majority of SNAP recipients spend more on food than they receive in SNAP benefits (Trippe and Ewell 2007; Hoynes et al. 2015; Hastings and Shapiro 2018).[5] We therefore extend the model in Hastings and Shapiro (2018) to allow for temptation goods and show that, if individuals engage in mental accounting, we can re-produce the non-fungibility results in the paper even when SNAP is inframarginal.

We then consider a paternalistic social planner's choice of how to split an exogenous transfer budget between SNAP and cash when individuals over-consume temptation goods due to self-control problems. The central tension is that cash increases consumption of temptation goods, but also allows for consumption of other goods not covered by SNAP. In the presence of self-control problems, the planner's optimal choice will always include strictly positive amounts of SNAP; the planner's optimal SNAP share is weakly increasing as time-inconsistency increases, and weakly decreasing in the extent of mental accounting. As a result, if mental accounting is strong enough, the planner will choose a SNAP share that preserves the infra-marginality of SNAP benefits.[6] A (very) rough calibration suggests that the optimal level of SNAP benefits is about 10 to 20 percent of food spending for SNAP recipients; given estimates that SNAP benefits are about 40 percent of food spending for SNAP recipients (Hastings and Shapiro 2018), this suggests that the current level of SNAP benefits may be overly paternalistic. Moreover, when we allow for heterogeneity

[5] Data from the Current Population Survey Food Security Supplement indicate that about three-quarters to eighty percent of households spent more on food than their food stamp benefits in 2005 and 2010 (Trippe and Ewell 2007; Econometrica, Inc.). Data from the Consumer Expenditure Surveys, from 1990 - 2013 indicate that about 84 percent of SNAP recipient households spend more on food at home than the SNAP benefit level. Transaction data from a large U.S. grocery retailer from 2004 through 2016 indicate that for 94 percent of households who ever use SNAP, average SNAP-eligible spending in non-SNAP months is higher than average SNAP benefits in SNAP months (Hastings and Shapiro 2018).

[6] The early literature on mental accounting motivated it as a way to overcome self-control problems (see, e.g., Thaler (1985); for more recent theoretical work in this vein see e.g. Galperti (2019)). In a similar spirit, our paternalistic social planner may use individuals' mental accounting behavior to optimally design the safety net in a way that reduces the negative consequences of their over-consumption of temptation goods.

across agents in both the extent of self-control problems and the extent of mental accounting, the social planner may prefer SNAP to an optimal Pigouvian corrective tax on the temptation good.

Our paper relates to several distinct literatures. Most broadly, as noted at the outset, it contributes to an active literature on economic rationales for in-kind transfers (e.g., Nichols and Zeckhauser 1982; Currie and Gahvari 2008; Lieber and Lockwood 2019; Coate et al. 1994; Cunha et al. 2019; Blanco 2023; Gadenne et al. 2024; Coate 1995). We expand this literature by focusing on paternalism, a relatively-understudied but potentially practically important rationale for the wide-spread use of in-kind transfers.[7] Our normative, theoretical framework draws directly on the literature on time-inconsistent preferences (e.g., Thaler and Shefrin 1981; Laibson 1997; O'donoghue and Rabin 1999; Banerjee and Mullainathan 2010) and mental accounting (e.g., Thaler 1985, 1999), while our analysis of the optimal role for in-kind transfers in the presence of "temptation goods" contributes to a related literature in behavioral public finance on internalities and optimal sin taxes (e.g., O'Donoghue and Rabin 2006; Gruber and Köszegi 2001; Allcott et al. 2019; Farhi and Gabaix 2020).

Our empirical work goods provides a health care-based test of the fungibility of in-kind transfers that complements existing, consumption-based tests of fungibility. These consumption-based tests have yielded mixed results across and within contexts.[8] Most closely related to our setting are papers examining whether the marginal propensity to consume food (MPCf) out of SNAP is higher than out of cash. Consistent with our non-fungibility results, Hastings and Shapiro (2018) find a much higher MPCf out of SNAP than out of cash when examining detailed data on grocery store purchases; however, consistent with fungibility, work studying the initial roll out of the Food Stamp program in the 1960s was unable to reject the hypothesis that the MPCf out of food stamps and cash were the same (Hoynes and Schanzenbach 2009).[9]

Finally, and most narrowly, we contribute to the existing empirical literature in the U.S. on the impacts of cash on temptation goods, cash on health, and SNAP on health; we review this literature - which has produced mixed results - in more detail in Appendix A, and discuss the relevant findings

[7] Another widely-conjectured but relatively-understudied rationale for in-kind transfers is based on a political economy argument (Currie and Gahvari 2008). One type of political economy rationale is based on the appeal to voters, which in turn may be due to their paternalistic concerns. Other political economy rationales are based on the creation of constituencies who receive benefits from the in-kind nature of the transfers, such as the farming interests that supported the creation of the food stamp program in the U.S. (Hoynes and Schanzenbach 2009; Currie 2006), or, in low-income countries, limited state capacity for preventing misdirection or theft of cash.

[8] Evidence against fungibility includes a randomized evaluation in Indonesia of moving from an infra-marginal in-kind transfer of rice to a voucher that can be used for eggs and rice which finds that the voucher increases consumption of eggs (Banerjee et al. 2023b); there is also evidence that labeled cash transfers (without any requirement for spending the transfer on the labeled good) increase consumption of the labeled good (e.g., Benhassine et al. 2015; Beatty et al. 2014; Kooreman 2000). On the other hand, consistent with fungibility, a randomized evaluation of an infra-marginal food assistance program in Mexico finds no evidence that it increased food consumption relative to an equivalent cash transfer (Cunha 2014).

[9] Additional, albeit much more indirect, evidence against fungibility comes from the growing body of evidence that labor earnings drop substantially following shocks to unearned income via lottery winnings (e.g. Golosov et al. (2024)) but that SNAP receipt does not affect labor market participation (e.g. Gray et al. (2023); Cook and East (2023, 2024).

in the context of our results below. Our study provides what is to our knowledge the first direct, head-to-head comparison of the impact of cash and SNAP *for the same individuals.*[10]

The rest of the paper proceeds as follows. Section 2 presents our empirical setting and estimating equations. Section 3 presents our data, key variable definitions and main analytic samples. Section 4 presents the empirical results and Section 5 presents a normative model that is motivated by these results and explores their implications for optimal transfer policy. There is a brief conclusion.

2 Empirical Framework

2.1 Benefits Schedule

Our empirical strategy exploits variation in South Carolina in the timing of benefit payments within and across people. In every state, SSI benefits are paid on the first of the month, unless the first falls on a weekend or on a federal holiday (which potentially applies only to New Year's Day or Labor Day); in that case, payout occurs on the first preceding weekday (SSA (2023)). Thus in practice, SSI benefits are paid on the first of the month in about 5/7th of the months, and on dates between the 27th and the 31st in the remaining 2/7ths of the months.

The timing of SNAP benefit payments varies across states and time (Cotti et al. 2016). In South Carolina, SNAP benefits are paid on one of 15 possible days between the 1st and the 19th of the month, with the payment day determined by the last digit of the recipient's case number and when they enrolled in SNAP. Specifically, if the person's latest enrollment was before September 1st, 2012, benefits are paid on the first of the month for case numbers whose last digit is a 1, on the second of the month for case numbers whose last digit is 2, and so forth through the last digit of 0 for which benefits are paid on the 10th of the month. If the person's latest enrollment - either as a new or re-enrollee - started on or after September 1st 2012, 10 days were added from the mapping of the case numbers to day of the month for odd-numbered last digits of case numbers, while the receipt dates for even-numbered last digits of cases remained the same (see Appendix Table OA.1). This schedule is not adjusted if the payment date happens to fall on a weekend (USDA (2023))

Our empirical strategy will examine how various outcomes change relative to the day of benefit *receipt*. In practice, the date of benefit receipt and benefit payment are the same. SNAP benefits have been distributed via electronic benefit transfer over our sample period (Tiehen et al. 2024), and SSI payments have been distributed electronically starting in 2013 (SSA 2014). Prior to 2013, SSI checks that were mailed were timed to arrive on the 1st of the month or the first weekday prior to that if the 1st wis a weekend or federal holiday (SSA 2013); the share of SSI recipients in South Carolina who received checks by mail declined from roughly two-thirds in 1998 to one-quarter in 2013 (SSA 2019).

[10]The only other direct comparison of this type that we know of is Bitler et al. (2022), who caution that their evidence is only 'suggestive' due to potential compositional biases in their design.

2.2 Estimating equations

We use within-month variation in the timing of benefit receipt to identify its impact.

SSI. To analyze the impact of monthly SSI benefit receipt, we estimate the following quasi-maximum likelihood Poisson regression:

$$y_{dg} = \exp(\sum_{\substack{l=-13 \\ l\neq -1}}^{13} \alpha_l \mathbb{1}[l(d)=l] + \sum_{\substack{l=-13 \\ l\neq -1}}^{13} \beta_l SSI_g \cdot \mathbb{1}[l(d)=l] + \gamma SSI_g + \mu_{m(d)} + \tau_{t(d)} + \omega_{w(d)} + \sigma_{s(d)})\epsilon_{dg} \quad (1)$$

The analysis takes place at the level of the calendar day d by group g, where d denotes a specific calendar day (such as March 7th, 2006) and group g denotes whether or not that person-day is on SSI. We let l index days relative to the day that SSI is paid out, which we denote by $l = 0$; $\mathbb{1}[l(d) = l]$ are a series of indicator variables for day d corresponding to relative day l. We omit the day prior to SSI payout ($l = -1$) and restrict our analysis sample to the payout day and 13 days on either side of it.[11] We let SSI_g denote an indicator variable for whether the person-day is on SSI (vs. not) and allow the coefficients on the relative day indicators to vary based on this.

In what follows, we will report two sets of estimates for how outcomes change around the timing of SSI payout: the $(\alpha_l + \beta_l)$ coefficients, which show the within month pattern for SSI recipients, and the β_l coefficients, which show the within month pattern for SSI recipients *relative to* other low-income adults who are not SSI recipients. As we will discuss below, the former likely overstates the impact of SSI while the latter likely understates it.

The regression also includes a number of controls. Specifically, we control for fixed outcome differences between groups (SSI_g), and, following the approach of Evans and Moore (2012) we include indicator variables for calendar month ($\mu_{m(d)}$), calendar year ($\tau_{t(d)}$), day of the week ($\omega_{w(d)}$) and 21 "special days" ($\sigma_{s(d)}$).[12] We assume that these various calendar time controls have the same *proportional* effect regardless of the individual's group. We estimate equation (1) as Poisson model to allow for proportional impacts on the outcome variable in the presence of zeros (Chen and Roth forthcoming), and report heteroskedasticity-robust standard errors.

SNAP. To analyze the impact of monthly SNAP benefit receipt, we estimate the following quasi-maximum likelihood Poisson regression:

[11] Specifically, we include separate indicators for relative days -13 to -2 and 0 to 13. We omit from the analysis the few days in each month that are neither. This way, every calendar day has a unique relative day.

[12] The special days are: January 1st and 2nd, the Friday through Monday associated with all federal holidays that occur on Mondays (Presidents' Day, Martin Luther King Jr. Day, Memorial Day, Labor Day, Indigenous People's Day), Super Bowl Sunday and the following Monday, Holy Thursday through Easter Sunday, July 4, Veterans Day, the Monday to Sunday of the week of Thanksgiving, a dummy for the days from the day after Thanksgiving to New Year's Eve, plus single-day dummies for December 24 through December 31.)

$$y_{db} = \exp(\sum_{\substack{r=-13 \\ r\neq -1}}^{13} \beta_r \mathbb{1}[r(db) = r] + \delta_b B_b + \kappa_{k(d)} + \mu_{m(d)} + \tau_{t(d)} + \omega_{w(d)} + \sigma_{s(d)})\epsilon_{db} \quad (2)$$

Here, d once again denotes a specific calendar date, but now group b denotes which of 15 possible benefit payout dates the SNAP benefits are paid on. We let r index days relative to the day that SNAP is paid on, which we denote by $r = 0$, and $\mathbb{1}[r(db) = r]$ are a series of indicator variables for day d and payout group b corresponding to relative day r. Once again, we omit the day prior to SNAP payout ($r = -1$), and restrict our analysis sample to the payout day and 13 days on either side of it. We now control for a series of indicator variables for which benefit group b the individual is in (B_b) and the same set of controls for calendar month, calendar year, day of the week and special days as in equation (1).

The key difference between our approach to estimating the impact of SNAP benefits in equation (2) and the impact of SSI benefits in equation (1) is that, for SNAP, we have variation across SNAP recipients in the payout day. We therefore do not need a control group of individuals not on SNAP, and instead we control directly for day-of-the-month fixed effects; the $\kappa_{k(d)}$ are a series of indicators for which day of the month it is (from the 1st potentially through the 31st). Once again we allow for fixed differences in mean outcome across groups b, and for the various calendar time controls to have the same *proportional* effect regardless of the individual's benefit group. We report heteroskedasticity-robust standard errors.

3 Data

Our data include all individuals in South Carolina born in 1970 or earlier who were on Medicaid at some point between 1998 and 2019. This consists of about a half million unique individuals in total. We obtained linked, longitudinal, individual-level administrative data for these individuals covering the period 1998-2019. The data contain information on the dates and amounts of SNAP (and TANF) benefit receipt, basic demographics, and detailed information on the timing and nature of health care utilization, including all-payer hospital and ED records and all types of Medicaid utilization. The data come from three different sources in South Carolina: Medicaid enrollment and utilization records; emergency and hospital discharge data for all payers; and Department of Social Services (DSS) records on SNAP and TANF recipients. [13]

The DSS records contain the months that each individual receives SNAP and the months that they receive TANF. For each person-month receiving SNAP (and likewise for TANF), we also observe the benefit amount and benefit type (i.e. regular, supplemental, expedited, corrected). For SNAP, we also observe the last digit of the case number which we use to impute the day-of-the-

[13] The South Carolina Office of Revenue and Fiscal Affairs linked the individuals across the data sets using a multi-level algorithm that includes social security number and basic demographic information of the individual.

month in which benefits are received. To identify SSI recipients, we use the Medicaid data which contains information on the months each individual was enrolled in Medicaid and her eligibility category at the beginning of each eligibility spell. The Medicaid data also provide basic demographics for our sample including year of birth, gender, race, and a household ID that allows us to identify members of the same household within our sample.

Our main source for outcomes is the all-payer hospital and ED records contain encounter-level information with exact admission dates, primary and additional diagnoses (ICD9/10 codes), procedures, and other encounter-specific details from the universe of hospitalizations and ED visits in SC. We also use the Medicaid health care utilization data to measure Medicaid-covered prescription drug fills both overall and by type of drug. Unlike the other outcome variables, prescription drug fills are only observable for a subset of our data: person-months in which the individual is on Medicaid and Medicaid is the primary payer for their prescription drugs.

3.1 Variable Definitions

Identifying benefit receipt. We identify benefit receipt at the person-month level. We code a person-month as receiving SNAP based on whether they received a positive SNAP benefit amount that month. We do not directly observe receipt of SSI benefits, but instead, as in Dobkin and Puller (2007), define an indicator for SSI receipt based on whether the person-month received Medicaid through an SSI-related eligibility category;[14] this approach to identifying person-months on SSI is unlikely to generate false positives, but likely creates false negatives, since individuals can be on SSI but receive Medicaid through a different eligibility category. Therefore, for some of our empirical analyses of the impact of SSI receipt we use a difference-in-differences design in which we contrast the within-month pattern of outcomes for person-months we have identified as on SSI to the within-month pattern for individuals who are likely not SSI recipients. To reduce the chance of false positives when classifying someone as likely not on SSI, we drop any individual who at any point from 1998-2019 belongs to a household whom we ever see receiving SSI (i.e. receiving Medicaid through an SSI-related eligibility category). This does not, however, eliminate the possibility that this individual is on SSI. If the individual enrolled in SSI but their Medicaid eligibility is not via SSI, we will miss the fact that they are SSI; for this reason we refer to this group as "likely not on SSI."

Outcomes. We use the health care data to proxy for consumption of three types of goods: temptation goods, food, and other consumption (that is neither a temptation good nor the labeled good). We use the emergency room data to proxy for consumption of temptation goods based on drug and alcohol related visits, and to proxy for the (lack of) consumption of food based on emergency-room

[14] In South Carolina, SSI recipients are automatically enrolled in Medicaid upon the start of their SSI spell (Rupp and Riley (2016), SCDHHS (2022)).

visits for nutrition sensitive conditions, specifically hypertension-related emergency-room visits.[15]

We use Medicaid-covered prescription drug fills to proxy for consumption that is neither a temptation good nor the labeled good. Prescription drug co-pays in South Carolina's Medicaid program were $2 per drug at the start of our study period and increased to $3 in 2010.[16] Prescription drug purchases may reflect planned, regular re-fills of chronic medications, where the timing of purchase may not reflect the timing of consumption, as well as drugs for newly diagnosed conditions, where the timing of purchase more likely corresponds to the timing of consumption. Moreover, re-fills may be coordinated with other shopping trips, such as for the purchase of food or alcohol. We therefore follow Gross et al. (2022) and define not only the total number of prescription fills each day but also the number of first fills of a drug, where a "first fill" is defined as a prescription in a therapeutic class for which the recipient had no fills in the last six months.

3.2 Analytic Samples

We make a number of sample restrictions to define our analysis samples, In our main analysis, we define a SNAP sample and an SSI sample. The SNAP sample consists of person-months on SNAP, while the SSI sample consists of two sub-samples: person-months on SSI and person-months likely not on SSI. For the likely not on SSI sample, we exclude any individual who at any point from 1998-2019 belong to a household in which any individual was ever receiving SSI. For the SNAP and on SSI samples, we restrict person-months in each benefit category to spells in which the person is in that category for at least 12 months; we do this so that we can interpret benefit receipt as an anticipated income receipt. For all three of the samples, we drop any person-month on TANF, so that we do not conflate the impact of SNAP or SSI receipt with that of TANF. For the SNAP sample, we make a number of other very minor sample restrictions; Appendix Table OA.2 shows the impact of each of these restriction.

The first three columns of Table 1 report summary statistics for the SNAP sample (column 1) and the SSI sample, showing statistics within the SSI sample separately for those on SSI (column 2) and those likely not on SSI (column 3). Because our analysis examines daily changes in outcomes within the month relative to the timing of benefit receipt, our effective sample size scales with the number of person-months. We observe about 29 million person-months (corresponding to about 380,000 individuals) on SNAP, about 19-million person months (about 200,000 individuals) on SSI,

[15] Our coding of drug and alcohol related ER visits follows Dobkin and Puller (2007). Specifically, we include the following drug- and alcohol-related (primary or secondary) diagnoses (and corresponding ICD-9 codes): cocaine (3042*, 3065*), opioid (3040*, 3047*, 3055*), amphetamine (3044*, 3057*), residual drug dependence (admissions for dependence on other drugs) (292*, 304*), and alcohol only (291*, 303*, 3050*). We follow Ojinnaka and Heflin (2018) to proxy for potentially nutrition-sensitive visits based on hypertension-related visits; the ICD-9 codes are 401*-405* and 4372. We also examine tried proxying for for nutrition sensitive as admissions with a primary diagnosis of hypoglycemia (ICD-9 codes 2510-2512), following Seligman et al. (2014), but have very low power as such visits are quite rare; they are less than 0.1 percent of ED visits in our data.

[16] For the low income elderly individuals studied by Gross et al. (2022), co-pays ranged from $2 for generic drugs to $6 for branded drugs.

and about 133 million person-months (about 500,000 indiviudals) likely not on SSI. Compared to person-months on SSI (column 2), the person-months on SNAP (column 1) are slightly younger (mean age of 57 compared to 60), slightly more likely to be female (68 percent vs. 64 percent) and similar in racial make-up (about 48 percent black). The SNAP sample has slightly lower rates of ER visits per month overall (1,034 per 10,000 person-months compared to 1,193 per 10,000) and in each of the categories we examine.

For the SSI analysis we conduct a difference-in-differences analysis between person-months on SSI (column 2) and likely not on SSI (column 3). The differences between these samples is more pronounced. Compared to those not on SSI, those on SSI are more likely to be 40-64 (59 percent vs 46 percent) than 65 and older (35 percent vs 41 percent) or younger than 40 (5 percent vs. 12 percent); they are also more likely to be back (48 percent vs. 33 percent) and slightly less likely to be female (64 percent vs. 66 percent). Most strikingly, the SSI sample has notable higher rates of ER visits both overall (1,193 vs 383 per 10,000 person-months) and by individual categories.

A key focus of our analysis is testing whether we can reject that the response to SNAP benefits is the same as the response to SSI benefits. One challenge in this respect is that while overlapping, the SSI sample (columns 2 and 3) and the SNAP sample (column 1) are not the same; the SSI sample includes people both in the SNAP sample and not, while the SNAP sample likewise includes people in the SSI sample (either in the on SSI or likely not on SSI sub-groups) and not. We therefore also report analyses for the 'overlap sample' of person-months who are in both the SSI sample and the SNAP sample; in the overlap-sample, every person-month is on SNAP, and either on SSI or likely not on SSI. This sample has the advantage of testing differential impacts of SNAP and SSI *among the same individuals*, but at the cost of potentially lower power. Columns (4) through (6) show summary statistics for the overlap sample. Compared to the full sample, we retain about three-quarters of the person-months on SNAP, but only half of the person-months on SSI, and about one-tenth of the person-months likely not on SSI. The outcomes for person-months on SSI and likely not on SSI are now more similar; whether this is a feature or a bug is not clear as it is possible that by requiring everyone to be on SNAP, our 'likely not on SSI' now has a higher share of people who are in fact on SSI whom we simply did not code as such.

Finally, for analyses where the outcome variable is a measure of prescription drug fills, we must further restrict the sample to person-months in which we can observe fills in the Medicaid prescription drug data. This causes us to lose between 60 and 75 percent of our person-months, because in order to observe drug fills the person-month must both be on Medicaid and also not be covered by Medicare Part D prescription drug coverage.[17] As a result, we exclude from the drug fills sample any person-month in 2006 or later who is 65 and over; we also exclude any person-months from 2006 on if the person was ever dually-eligible for Medicare from 2006-2019 when they were

[17]If an individual is covered by both Medicare Part D and Medicaid, Medicare is the primary payer, so the prescription drug fill data in Medicaid will be extremely incomplete.

64 and younger.[18] The bottom panel of Appendix Table OA.2 shows the impact of each of these restriction and Appendix Table OA.3 shows a comparable set of summary statistics to Table 1 for this drug fills subsample and the overlap sample subsample of the drug fills subsample; note that because we are restricting to person-months on Medicaid, we may have a higher share of the 'likely not on SSI' sample that is actually on SSI.

4 Empirical Results

4.1 Graphical Evidence

Consumption of Temptation Goods. Figure 1 shows the impact of SSI and SNAP on emergency room visits for drug and alcohol use, our proxy for (excessive) consumption of temptation goods. Panel (a) shows the pattern of visits relative to the SSI payout day separately for those on SSI (green line) and those likely not on SSI (red line) based on estimating equation 1. For SSI recipients, there is a sharp increase in the probability of a drug-or-alcohol related ER visit immediately following receipt of SSI; more specifically, there is an approximately 10 percent increase on the day of the SSI payout (day 0), rising to 30 percent by the day after receipt (day 1), that stays elevated for another several days before gradually declining. This finding of a cash-benefit cycle and drug and alcohol use is consistent with an existing literature (reviewed in more detail in Appendix A) of this type of cycle in ER visits for substance abuse (e.g., Dobkin and Puller 2007; Shaner et al. 1995), and in substance abuse mortality (e.g., Phillips et al. 1999; Evans and Moore 2012), as well as evidence from tax rebates that on the extensive margin as well, the receipt of cash transfers increase these proxies for consumption of temptation goods (Evans and Moore 2011; Gross and Tobacman 2014). These results are consistent with self-control problems (e.g. Laibson (1997)).

However, this pattern may overstate the impact of SSI if there are other drivers of alcohol and drug use that are correlated with the day of SSI receipt. In particular, the 'around the first of the month' timing of SSI receipt may be correlated with the receipt of other benefits or of monthly paychecks; in this case, while our estimates might represent the impact of liquidity, we would be incorrect in attributing all of the liquidity impact to SSI. There could also be non-liquidity related factors that create 1st-of-the-month cycles in outcomes. To control for potential factors that are correlated with the timing of SSI receipt and the consumption of drugs and alcohol, we augment the typical timing strategy used in prior work with a difference-in-difference analysis of changes in outcomes around the timing of SSI benefit receipt for SSI recipients relative to a sample of low-income adults who are likely not on SSI.

Those likely not on SSI (red line in panel a) also show an increase in ER visits for drug and

[18] Starting in 2006 - the year the Medicare Part D program was introduced - individuals on Medicaid may be covered by Medicare Part D if they are 65 and over, or they are under 65 but disabled.

alcohol use after the date of SSI benefit payout, but this increase is substantially smaller than that observed for those on SSI (green line in panel a). As a result, this difference-in-differences approach suggests that receipt of SSI increases ER visits for drug and alcohol use by about 20 percent in the several days after benefit payout (panel b) compared to the 30 percent impact when examining just the SSI group (panel a). This difference-in-difference analysis likely under-states the SSI effect. as some of the pattern in the 'likely not on SSI' group may in fact reflect the impact of *unmeasured* receipt of SSI; recall that our 'likely not on SSI' sample is not receiving Medicaid via SSI eligiblity, but they might still be on SSI and simply eligible for Medicaid via a different channel.[19] Together, we think the two approaches likely provide bounds on the impact of SSI.

Panel (c) shows the impact of SNAP receipt on drug or alcohol related ER visits from estimating equation 2. In contrast to the estimates for SSI in panels (a) and (b), there is no evidence that receipt of SNAP impacts the probability of drug or alcohol related ER visits.[20] Unlike the link between cash transfers and alcohol and drug use, we are not aware of prior work examining the impact of SNAP on these temptation goods.

Consumption of other goods. Figure 2 shows the impact of SSI and SNAP on emergency room visits for nutrition sensitive conditions, our proxy for (lack of) food consumption. Panels (a) and (b) show evidence that these visits increase by about 3% following the receipt of SSI; it is unclear why this might be but it is consistent with a general pattern of a slight increase in many types of emergency room visits following the receipt of SSI. Strikingly, however panel (c) shows evidence of a *decline* in ER visits for nutrition sensitive conditions following receipt of SNAP. The decline in nutrition-sensitive admissions following SNAP receipt is consistent with an existing literature (reviewed in more detail in Appendix A) that SNAP recipients redeem a large share of their month's benefit immediately upon receipt (Castner and Henke 2011; Wilde and Ranney 2000), and that their caloric intake declines over the benefit month (Wilde and Ranney 2000; Shapiro 2005; Todd 2015; Gassman-Pines and Schenck-Fontaine 2019; Kuhn 2018; Hamrick and Andrews 2016); there is also prior evidence of a decline in ER visits for nutrition-sensitive conditions following receipt of SNAP (e.g., Ojinnaka and Heflin 2018; Arteaga et al. 2018).[21] Most closely related to our work, Cotti et al. (2020) and Cotti et al. (2018) exploit the within-month variation in SNAP benefit

[19] Moreover, unlike SSI recipients who are restricted from substantial earnings , those actually not on SSI may be employed and receiving pay checks timed around SSI benefit receipt dates; if paycheck receipt is driving some of the increase in ER visits for drug and alcohol use for the likely not on SSI group, such an effect may not be present in the SSI group.

[20] For the SNAP analysis, a key assumption is that variation in the timing of benefit receipt within the month across individuals is not correlated with variation in the time pattern of outcomes across individuals. This seems plausible since benefit receipt date is based on the last digit on one's case number; moreover we have confirmed that demographics and outcomes are balanced across groups receiving SNAP on different benefit dates.

[21] Some studies have proxied for nutrition sensitive ER visits with visits for hypoglycemia; this is extremely rare (about 0.5% of ER visits in our sample), and here the existing evidence on whether there is a SNAP cycle for hypoglycemia is mixed, with Seligman et al. (2014) finding evidence consistent with such a cycle and Heflin et al. (2017) finding no evidence for it. In Appendix Figure OA.5 we show the (noisy) results in our data.

receipt in South Carolina to document, respectively, that Medicaid-covered emergency department use overall falls following SNAP benefit receipt and student test scores decline when the exam falls late in the SNAP benefit cycle, a result that they interpret as indicative of poor nutrition.

Figure 3 shows the results for fills of new prescription drugs, our proxy for non-labeled, non-temptation consumption. Figures (a) and (b) suggest there is a 40 to 70 percent increase following the receipt of SSI. This is consistent with evidence from Gross et al. (2022) who find an increase in first drug fills among low-income elderly adults facing small co-pays following the receipt of their Social Security check; which they interpret as evidence of an impact of liquidity on prescription drug consumption, rather than merely purchases. By contrast, panel (c) shows no evidence that such fills increase following SNAP benefit receipt. We focus on fills of new prescription drugs to measure purchases that reflect plausibly time sensitive consumption (i.e. filling a new medication that has been prescribed) rather than merely the timing of purchase of a chronic medication - whose consumption may be unaffected by when the refill occurs. [22]

4.2 Fungibility tests

Table 2 Panel A summarizes our estimated impacts on each of the three types of consumption. We report estimated effects of SNAP (column 2) and two different estiamtes of the 6-day effect of SSI; the (larger) estimates are based only on the within-month variation in outcomes for the SSI sample (column 1) and the (smaller) estimates based on the difference-in-difference analysis of changes in outcomes for this sample relative to low income adults likely not on SSI (column 5); as discussed, we suspect that these bound the impact of SSI. The first two rows show six-day impacts on ER visits - drug and alcohol and then nutrition sensitive respectively. We estimate statistically impacts of SSI on ER visits for drug and alcohol use (18 to 30 percent) and on ER visits for nutrition sensitive conditions (2.3 to 3 percent); by contrast, for SNAP we estimate a statistically insignificant effect on ER visits for drug and alcohol use (point estimate of 0.2 percent) and a marginally statistically significant decline in ER visits for nutrition sensitive conditions of -1.6 percent. The third row shows the impact on fills for new prescription drugs in the payout day;[23] We estimate that receipt of SSI increases new fills of prescription drugs by a statistically significant 36.8 to 69.3 percent, while receipt of SNAP increases new fills of prescription drugs by a statistically insignificant 0.7 percent.

The remaining columns report tests of equality of effects between SSI and SNAP. Columns (3) and (6) report the raw difference. However, a test of fungibility requires testing the impact of a dollar of SSI benefits compared to a dollar of SNAP benefits. Since SSI benefits tend to be higher

[22] Interestingly, Appendix Figure OA.6 shows that drug refills - which are about 85 percent of total fills - do increase slightly following receipt of SNAP (although much less than following receipt of SSI), a response that we interpret as a shopping, or purchasing effect.

[23] we focus on the payout day because, consistent with the purchase generating a subsequent flow of consumption, Figure 3 indicates that the main impact on new prescription drug fills on the day of benefit receipt.

than SNAP benefits, this may be biasing us toward finding differences in impacts of SSI benefit receipt compared to SNAP benefit receipt. Unfortunately, we only observe SNAP benefit payments in our data. Instead, we try to account for these differences by noting between 2006 and 2019, the ratio of the legislated, maximum individual benefit for SSI relative to SNAP ranged from 3.4 to 4.0 (USDA b). We therefore, in columns (4) and (7) also try scaling the SSI benefit amounts for one-fourth and testing whether we still detect differences in impacts of SNAP and this (scaled) SSI estimate. For either approach - and either SSI estimate - we can reject the null hypothesis of equality. Our (statistically significantly) larger increases in drug and alcohol related ER visits from SSI than SNAP are consistent with a higher marginal propensity to consume temptation goods out of cash than SNAP. Likewise, our statistically significantly larger declines in ER visits for nutrition sensitive conditions from SNAP than SSI are consistent with a higher marginal propensity to consume food out of SNAP than cash. Finally, the higher marginal propensity to consume new prescription drug fills out of SSI than SNAP highlights that cash provides the flexibilty not only for 'bads' (i.e. temptation goods) but also to optimize over 'goods' that are not provided by the in kind transfer.

Panel B reports the same set of estimates but limited to the overlap sample of person-months on SNAP who are also in the SSI sample, so that we are not comparing estimated impacts of SSI and SNAP for the *same* individuals; Appendix Figures OA.1, OA.2 and OA.3 present the underlying event studies. Recall from Table 1 that the focus on the overlap sample involves a considerable sample size reduction and therefore, not surprisingly, a worsening of precision. The point estimates remain extremely similar for both ER visits for drugs and alcohol and new prescription drug fills and we continue to reject the null of same effects for all of the four tests of new prescription drug fills and for three out of the four for ER visits for drug and alcohol use. For nutrition sensitive ER visits, however, the point estimates are also considerably closer together in the overlap sample and we can no longer reject the null hypothesis of differential effects for any of the tests.

5 Framework and Normative Implications

The empirical results indicate a lack of fungibility between cash and SNAP. Given the extensive existing evidence that SNAP benefits are infra-marginal for food consumption (Trippe and Ewell 2007; Hoynes and Schanzenbach 2015; Hastings and Shapiro 2018), we begin in Section 5.1 by following Hastings and Shapiro (2018) to show that if individuals engage in mental accounting, we can generate the empirical findings of a higher marginal propensity to consume temptation goods and non-food goods out of cash than out of infra-marginal SNAP, and a higher marginal propensity to consume food out of infra-marginal SNAP than out of cash. In Section 5.2 we then explore the normative implications for the optimal mix of in-kind and cash transfers for a paternalistic social planner facing individuals with self-control problems, which leads them to over-consume temptation goods such as drugs and alcohol.

5.1 Model setup

We consider a two-period model ($t = 1, 2$) in which, at the start of period 1, the social planner chooses how much of a fixed transfer budget ($\bar{y}$) she should allocate to cash (y_1), which can be used to consume anything, or to SNAP benefits (b_1), which can only be spent on food. The consumer can allocate their budget over total food consumption in both periods ($f \equiv f_1 + f_2$), total non-food consumption in both periods ($n \equiv n_1 + n_2$) and the "bad" temptation good that can only be consumed in the first period (c_1^b), and which has negative utility consequences in period two.

Normalizing the price of non-food to one ($p_n = 1$), the individual's budget constraints are:

$$\begin{aligned} p_f * f + n + p_b * c_1^b &\leq y_1 + b_1 \\ n + p_b * c_1^b &\leq y_1 \end{aligned}$$

where the second constraint follows from the fact that SNAP benefits (b_1) can only be spent on food (f), creating the familiar "kinked" budget set.

The consumer chooses consumption in each period to maximize her total utility across periods, subject to these budget constraints. We denote utility in each period by:

$$\begin{aligned} U_1 &= \alpha_g \alpha_f \log(f_1) + \alpha_g(1-\alpha_f)\log(n_1) + (1-\alpha_g)\log(c_1^b) \\ U_2 &= \alpha_g \alpha_f \log(f_2) + \alpha_g(1-\alpha_f)\log(n_2) - \gamma(1-\alpha_g)\log(c_1^b) \end{aligned}$$

where U_1 and U_2 are the utility functions in each period, α_g and α_f are Cobb-Douglas preference parameters that determine the budget shares for each good (with $0 < \alpha_g, \alpha_f < 1$), and $0 < \gamma < 1$ scales the negative health consequences in period two from consuming the temptation good in period one.[24]

Total utility is given by:

$$U = U_1 + \beta U_2 - \kappa[(\phi_0 y_1 + b_1) - p_f(f_1 + f_2)]^2.$$

This formulation for total utility extends Hastings and Shapiro (2018)'s model of mental accounting of SNAP benefits to allow for the presence of a temptation good with negative future health consequences. We denote by $0 < \beta \leq 1$ the individual's subjective discount factor between the two periods. We interpret the model as capturing consumption decisions in a relatively short time period, and we follow Hastings and Shapiro (2018) by defining $\beta = 1$ as the standard rational model benchmark and $\beta < 1$ as short-run hyperbolic discounting following Laibson (1997). The individual's optimal choice of the temptation good is decreasing in self-control (i.e. β), while her optimal choice of food and non-food are increasing in self-control (see Appendix for proof).

[24] We assume $0 < \gamma < 1$ so that the individual consumes a strictly positive amount of the temptation good, which avoids having to consider corner solutions in all of the derivations that follow.

Intuitively, a consumer with more self-control (higher β) spends more of their income on food (and non-food) and less of their income on the temptation good, since the consumer more strongly internalizes the future negative health consequences from consuming the temptation good when β is higher.[25]

The last term in the total utility function captures mental accounting, with the $\kappa \geq 0$ parameter governing the strength of the individual's mental accounting of SNAP benefits. The parameter ϕ_0 captures the share of the individual's budget that she would choose to spend on food in the absence of mental accounting (i.e., $\kappa = 0$, or equivalently if the entire transfer were made in cash, i.e., $y_1 = \bar{y}$ and $b_1 = 0$); it is a function of the other preference parameters (α_g, α_f, β, and γ). Mental accounting is modeled as a quadratic utility cost associated with the gap between actual food consumption ($p_f(f_1 + f_2)$) and "target" food consumption ($\phi_0 y_1 + b_1$).[26] Target food consumption is determined by the sum of SNAP benefits (b_1) and the amount the consumer would choose to spend on food in the absence of mental accounting (i.e. $\phi_0 y_1$). Intuitively, the individual treats SNAP income as "food money".

The following will be useful for what follows:

Definition 1. Inframarginal SNAP benefits. *SNAP benefits (b_1) are **inframarginal** if they are below the amount that the consumer would have chosen to spend on food in the absence of mental accounting (or, equivalently, if the planner had allocated the entire transfer as cash): i.e. $b_1 < \frac{\phi_0}{1-\phi_0} y_1$.*

Definition 2. Marginal Propensities to Consume. *The consumer's marginal propensities to consume food ($MPCf$), non-food ($MPCn$), and the "bad" temptation good ($MPCb$) out of cash and out of SNAP are denoted by $MPCx^{cash} \equiv \frac{d(x^*)}{dy_1}$ and $MPCx^{SNAP} \equiv \frac{d(x^*)}{db_1}$, where x denotes f, n or b and x^* indicates the consumer's choice of expenditure on good x.*

The key fungibility (or non-fungibility) result from this model is that when SNAP benefits are infra-marginal, mental accounting ($\kappa > 0$) is necessary and sufficient for SNAP and cash to be non-fungible:

Proposition 1. ***Mental accounting and non-fungibility.*** *For $b_1 < \frac{\phi_0}{1-\phi_0} y_1$:*

1. *if $\kappa = 0$, then $MPCf^{cash} = MPCf^{SNAP} = \phi_0$, $MPCb^{cash} = MPCb^{SNAP} = \theta_0$, and $MPCn^{cash} = MPCn^{SNAP} = 1 - \phi_0 - \theta_0$, where θ_0 denotes the share of the consumer's income she chooses to spend on the temptation good when $\kappa = 0$.*

[25] Note, however, that even when $\beta = 1$, the individual will choose to consume some temptation good (since $0 < \gamma < 1$).

[26] Although Hastings and Shapiro (2018) use an absolute value functional form instead of the quadratic functional form for the utility cost of departing from "target" food consumption, we choose a quadratic form for its analytical tractability in deriving our comparative statics, since it allows for a straightforward first-order approach. In the Appendix, we discuss the functional form in more detail and also show that the quadratic functional form allows the model to more closely match the existing empirical evidence on fungibility of SNAP and cash.

2. *if* $\kappa > 0$, *then* $MPCf^{cash} < MPCf^{SNAP}$, $MPCn^{cash} > MPCn^{SNAP}$, *and* $MPCb^{cash} > MPCb^{SNAP}$. *The differences* $(MPCf^{SNAP} - MPCf^{cash})$ *and* $(MPCb^{cash} - MPCb^{SNAP})$ *are decreasing in* β *and increasing in* κ, *and the difference* $(MPCn^{cash} - MPCn^{SNAP})$ *is increasing in* κ.

Proof: See Appendix.

Proposition 1 says that in the absence of mental accounting ($\kappa = 0$), individuals' consumption responses to cash transfers and infra-marginal SNAP benefit are the same. However with mental accounting ($\kappa > 0$), individuals will respond differently to cash transfers and SNAP benefits, even if SNAP benefits are infra-marginal; this leads to a lack of fungibility and to $MPCF$, $MPCN$, and $MPCB$ values that are no longer equal for cash and SNAP. Intuitively, with mental accounting, the marginal propensity to consume food is higher out of SNAP than cash, making all other marginal propensities lower out of SNAP. Moreover, as the individual's mental accounting behavior gets stronger (i.e., as κ increases), the individual's consumption responses to SNAP and cash diverge more. As the individual's self-control decreases (i.e., β decreases from 1), the consumption responses to SNAP and cash diverge for food and the temptation good, but could either converge or diverge for non-food depending on the budget share parameters.

Relation to empirical work. The consumption (or lack of consumption) of food, non-food, and the temptation good were proxied in the empirical work by emergency room visits for nutrition-sensitive conditions, purchases of prescription drug medication for new illnesses, and emergency room visits for drug and alcohol use, respectively. Our key empirical results were a rejection of fungibility between cash and SNAP; more specifically, we found a higher marginal propensity to consume temptation goods and prescription drugs out of cash than SNAP, but higher marginal propensity to consume food out of SNAP than cash. Given the existing evidence that SNAP benefits are inframarginal for most consumers (Trippe and Ewell 2007; Hoynes et al. 2015; Hastings and Shapiro 2018), Proposition 1 indicates that these empirical results are consistent with individuals having mental accounting.

However, the model is one in which cash and in-kind transfers can be thought of as permanent income, and the theoretical results concern the uncompensated responses that would arise from permanent policy changes that would provide recurring transfers each month, while our empirical results reveal the individual's response to anticipated inter-temporal fluctuations in the timing of these benefits. In Appendix B.6, therefore, we show that with self-control problems, mental accounting and borrowing constraints, evidence of non-fungibility in response to within-month timing of benefit receipt is informative of the presence of non-fungibility in response to permanent changes in benefit amounts. Specifically, in response to the permanent introduction of a small cash transfer or a small SNAP transfer, the consumption of all three goods will increase following the (regular) benefit payment; however, relative to the regular cash payment, the regular SNAP payment

will trigger a bigger immediate increase in food consumption and a smaller immediate increase in consumption of the temptation good and the non-labeled non-temptation good. Intuitively, if the reason why consumption "spikes" immediately after receipt of cash transfer or SNAP comes from a combination of present bias and borrowing constraints, then our "within-month" estimates are informative about the degree of mental accounting as well as the extent to which cash and SNAP have "permanently" different effects of consumption.

A related concern is that our empirical results could reflect severe liquidity constraints rather than mental accounting. In particular, if people have no cash on hand prior to receipt of SNAP, it is possible that they could treat SNAP and cash as fungible over the course of the month, but our within-month strategy strategy would detect what looks like non-fungibility because on the day SNAP arrives, people have no cash on hand. In this case, we would not see an increase in temptation goods and in new prescription fills associated with the date of SNAP benefits, because the individual would literally have no cash to purchase temptation goods or prescriptions, but SNAP and cash could be fungible over the course of the month. However, we find that when we limit to individuals who receive SSI and receive SNAP within 10 days of that (so that they still have cash-on-hand) we find similar non-fungibility results, suggesting that they cannot be entirely driven by the absence of cash on hand.

5.2 Benefit Design: Optimal Mix of SNAP vs Cash

We consider the problem faced by a paternalistic social planner choosing y_1 and b_1 subject to a total budget available $\bar{y}$ to maximize the consumer's utility evaluated at $\beta = 1$ and $\kappa = 0$:

$$\begin{aligned} \max_{y_1, b_1} \quad & U^{SP}(\beta = 1, \kappa = 0) \\ \text{s.t.} \quad & y_1 + b_1 \leq \bar{y} \\ & \text{consumer maximizes } U \text{ given } y_1 \text{ and } b_1 \end{aligned} \tag{3}$$

where U^{SP} denotes the individual's utility evaluated at the social planner's (SP's) preferences $\beta = 1$ and $\kappa = 0$ and the individual's privately optimal consumption choices that are made after the planner chooses transfers y_1 and b_1. Intuitively, the planner is trying to choose b_1^* so that the individual's optimal choices (given y_1^* and b_1^*) coincide with the planner's social optimum. The planner is paternalistic because she considers the individual's utility at $\beta = 1$ and $\kappa = 0$ rather than at the individual's actual β and κ parameters (O'donoghue and Rabin 1999).

Our first result is that in the absence of self control problems ($\beta = 1$), the planner's optimal transfer is all cash, while in the presence of self-control problems ($\beta < 1$), the planner will always choose a strictly positive amount of both SNAP and cash. This is summarized in the following theorem:

Theorem 1. *If $\beta = 1$, then the social planner maximizes (3) by choosing $y_1^* = \bar{y}$ and $b_1^* = 0$.*

If $\beta < 1$, then the social planner maximizes (3) by choosing $0 < y_1^* < \bar{y}$ and $0 < b_1^* < \bar{y}$, with $y_1^* + b_1^* = \bar{y}$.
Proof: See Appendix.

Intuitively, if the consumer has no self-control problems, so there is no reason in the model for the planner to use SNAP benefits to try to distort the consumer's consumption choices. However, when individuals have self-control problems ($\beta < 1$), the individual chooses to over-consume the temptation good relative to the social planner's $\beta = 1$ benchmark; the social planner therefore uses SNAP benefits to reduce the individual's over-consumption of the temptation good. With self-control problems it is useful to consider two cases. The first, is when the planner keeps the SNAP share sufficiently low that it is infra-marginal, and the planner exploits mental accounting - and the resultant higher marginal propensity to consume the bad out of cash than out of SNAP (recall proposition 1) - to help address the consumer's self-control problems; specifically, by "swapping" some of the cash transfer for SNAP benefits (starting from $b_1 = 0$), the planner is able to get the individual to make consumption choices closer to the paternalistic planner's social optimum. The second case is when the social planner uses SNAP to increase food consumption directly by increasing the amount of SNAP above the infra-marginal amount, hence decreasing consumption of the bad. As we will see in the next result, which case we end up in depends on the strength of the mental accounting parameter κ. Note that the theorem indicates that self-control problems are both necessary and sufficient for the social planner to optimally choose to use SNAP benefits, but that mental accounting is neither necessary nor sufficient for this.[27]

We now show that, all else equal, the optimal SNAP share of the planner's total transfer is weakly decreasing in the strength of mental accounting (κ) and weakly increasing in the individual's self-control problems (i.e., decreasing in β):

Theorem 2. *When $\beta < 1$, the optimal SNAP share $\frac{b_1^*}{\bar{y}}$ is constant for all $0 \leq \kappa < \kappa^*$ and is strictly decreasing in κ and β for all $\kappa^* \leq \kappa < \infty$, with κ^* defined as the lowest value of κ where the optimal SNAP share is such that SNAP benefits are inframarginal.*
Proof: See Appendix.

These two comparative static results establish the role of SNAP in the safety net in the presence of self-control problems ($\beta < 1$). The optimal SNAP share is larger the greater the self-control problems of the individual; intuitively, the farther β is from 1, the farther the individual's choices are from what the planner would choose, and the planner therefore chooses a larger SNAP benefit share in order to have the consumer to make larger consumption responses in the direction the planner prefers. The optimal SNAP share is decreasing in the strength of the consumer's mental accounting because the more that consumers engage in mental accounting, the smaller the SNAP

[27] The fact that, for any value of κ, the planner will never choose only SNAP benefits is a consequence of our assumption that the consumer has no resources other than the cash and SNAP transfers provided by the government; as a result, choosing only SNAP benefits would force consumption of non-food goods to zero which cannot be optimal.

benefit is needed to induce a given increase in food consumption. In other words, if κ is large, then the individual's mental accounting behavior is very strong, so SNAP is very effective at increasing food consumption to the level desired by the social planner; but as κ decreases from a large value, the planner needs to increase SNAP benefits to achieve the same increase in food consumption. More subtly, when κ becomes sufficiently small, the planner hits the infra-marginality constraint (at $\kappa = \kappa^*$) - i.e. the amount of SNAP benefits becomes larger than the amount of food the individual would have chosen to consume if the entire transfer were in cash; below this point the planner switches from using mental accounting to increase food consumption to increasing food consumption directly by using the kink in the budget constraint created by SNAP benefits. This is why the planner chooses a constant optimal SNAP share that is independent of κ and β for $0 \leq \kappa \leq \kappa^*$: in this range, the planner is instead targeting food spending directly using the kinked budget constraint; the consumer's food consumption will now exactly equal the SNAP benefit because the planner's choice of SNAP is above what they would have chosen had the entire transfer been in cash. An implication of this result is that if mental accounting is strong enough, the planner will choose a SNAP benefit share that preserves the infra-marginality of SNAP benefits.

Calibration. To get a quantitative sense of the model's implications we calibrate the the preference parameters in order to match several empirical targets. The Appendix provides the full details, which we briefly summarize here. First, we calibrate $\beta = 0.7$ based on a large literature estimating hyperbolic discounting in the lab (see, e.g., Frederick, Loewenstein, and O'Donoghue 2002 and Andreoni and Sprenger 2012). Second, we calibrate the Cobb-Douglas preference parameters (α_g and α_f) to match an assumed share of spending on food and temptation goods of 16 percent and 4 percent, respectively . Third, we calibrate the κ parameter to match existing empirical evidence on the $MPCF$ out of cash and SNAP, which gives a range of $0.032 < \kappa < 0.051$ to match $0.5 < MPCF^{SNAP} < 0.6$ (Hastings and Shapiro 2018). Lastly, we calibrate γ by choosing a value to match a given change in spending on temptation goods moving from $\beta = 1$ to $\beta = 0.7$, which we assume is a proportional increase of 2.1 based on the ratio of the drug and alcohol hospitalization rate in the SSI sample relative to the likely not on SSI sample. This results in an implied value of $\gamma = 0.8$. Since γ scales the negative health consequences of consuming temptation goods, we evaluate sensitivity to this parameter in the Appendix.

Using the calibrated parameters, we numerically solve for the optimal SNAP share, which we express as the optimal SNAP benefit as a share of the individual's total food spending. Our simulations reproduce the comparative static in Proposition 2 that the optimal SNAP share of food spending is 100 percent of food spending for small values of κ (including $\kappa = 0$), because in this range SNAP benefits induce the individual to bunch at the kink in the budget constraint, and the optimal SNAP share is strictly decreasing in κ for $\kappa > \kappa^*$. At the range of κ values chosen to match the $MPCF^{SNAP}$ estimates from the literature, we calculate an optimal SNAP share of 10-17 percent of food spending.

By comparison, Hastings and Shapiro (2018) report that SNAP households receive SNAP benefits that are roughly 40 percent of food spending. This implies that the SNAP benefits are "overly paternalistic" given our calibrated parameters. To rationalize the current SNAP share as optimal, we would need $\gamma = 0.95$ (holding the other empirical targets and preference parameters constant). In our model, at $\gamma = 0.95$, hyperbolic discounting leads consumers to over-consume temptation goods by a factor of 15 relative to what the planner would prefer.

5.3 Alternative policy instruments

Thus far, we have restricted the social planner to choosing between transferring cash income and SNAP benefits for a representative agent. We now consider other policy instruments and how they perform relative to SNAP, both under a representative agent model and when we allow for heterogeneity in the extent of agent's self-control problems (β) and their mental accounting (κ). We consider two other policy instruments: the optimal Pigouvian tax on the temptation good, which seems a more natural and direct way to correct the "internality" of over-consumption of the temptation good due to self-control problems, and an optimal (linear) food subsidy.[28]

Representative agent.

In the Appendix, we show that if $\beta < 1$, the optimal Pigouvian tax on the temptation good is positive, and that the government would not use subsidies on other goods or SNAP if a Pigouvian tax on the temptation good is available.[29] We also show that if a linear food subsidy is the only policy instrument available alongside a cash transfer (i.e., the government can only transfer cash and subsidize food), then there is an equivalence result between the optimal food subsidy and the optimal SNAP policy. Specifically, if the planner has to choose to allocate money between a cash transfer and a food subsidy, then for $\beta < 1$, the optimal food subsidy (which is positive) causes the individual to make the exact same consumption choices as in the optimal SNAP share planner problem, and at the same share of the planner's transfer spent on the food subsidy and SNAP. In other words, for a government designing an income transfer, the two policy instruments (choosing the optimal SNAP benefit share and choosing the optimal food subsidy) lead the consumer to make the same choices.

Heterogeneous agents.

(NOTE: What follows are conjectures verified by simulations. Proofs in progress!) Allowing for heterogeneity across consumers in both their self-control (β) and the extent of mental accounting

[28] One can think of an inframarginal SNAP benefit b_1 as providing a non-linear food subsidy: 100% of food costs are covered up to $\bar{1}$, and 0% beyond that.

[29] Technically, the social planner can do even better with time-dependent taxes since the planner also prefers that the individual allocate more total consumption to second period, which could be achieved by a general tax on first-period consumption, but we abstract from that here.

(κ) has implications not only for optimal SNAP but for the performance of SNAP compared to other potential policy instruments. To explore this, we consider a "two-by-two" heterogeneity structure. That is, individuals can either have a β parameter of $\beta = 1$ or $\beta = \bar{\beta}$ (with $\bar{\beta} < 1$) and can either have a κ parameter of $\kappa = 0$ or $\kappa = \bar{\kappa}$ (with $\bar{\kappa} > 0$). Suppose there is a unit mass of individuals, with population shares defined by $s_{\beta,\kappa}$, with $s_{\bar{\beta},\bar{\kappa}} + s_{\bar{\beta},0} + s_{1,\bar{\kappa}} + s_{1,0} = 1$. In what follows, we will often focus on the case in which β and κ are *negatively* correlated, sometimes by restricting to two types: $(\bar{\beta}, \bar{\kappa})$ and $(1, 0)$. In other words, individuals with self-control problems ($\beta = \bar{\beta}$) tend to engage in mental accounting ($\kappa = \bar{\kappa}$). This would be consistent with the original thinking of mental accounting as a way that agents may attempt to mitigate their own self-control problems (Thaler 1985).

Optimal mix of cash and SNAP If the individual "types" are observable, then the planner would choose group-specific transfers. Specifically, theorem 1 tells us that the individuals with $\beta = 1$ would receive only cash and the individuals with $\beta < 1$ would receive SNAP. Moreover, theorem 2 tells us that within the $\beta < 1$ sub-group, the planner would want to have a (weakly) greater share of SNAP benefits for the $\kappa = 0$ sub-group compared to the $\kappa > 0$ sub-group.

If the social planner cannot identify the individual "types", then the social planner will maximize social welfare by choosing a safety net that balances out the paternalistic benefits of using SNAP for the $\beta < 1$ types against the welfare costs of using SNAP for the $\beta = 1$ types. In the special case where there are only two types - individuals with no self-control problems and no mental accounting, and individuals with self-control problems and mental accounting (i.e. $s_{\bar{\beta},\bar{\kappa}} + s_{1,0} = 1$) the planner will optimize the safety net only for the $\beta < 1$ types as long as $\bar{\kappa}$ is large enough; for sufficiently large $\bar{\kappa}$, the optimal SNAP share for the $\beta < 1$ type preserves infra-marginality of SNAP, and there is therefore no welfare cost for the ($\beta = 1$,$\kappa = 0$) type from substituting SNAP for cash.

Comparison to alternative policies. With heterogeneous agents, a mix of SNAP and cash may now outperform the optimal Pigouvian tax on the temptation good, which was not possible in the homogeneous case. The key is that the optimal Pigouvian tax on the temptation good achieve the first best because the first best policy would distort the behavior of the $\beta = \bar{\beta}$ types but not the behavior of the $\beta = 1$ types, while the optimal (uniform) Pigouvian tax will distort both types' behavior.[30] To see the intuition for how SNAP can outperform the Pigouvian tax, consider the two type case $s_{\bar{\beta},\bar{\kappa}} + s_{1,0} = 1$. Once again, SNAP can be used to only affect the behavior of the individuals with self-control problems, since the individuals without self-control problems do not engage in mental accounting, while the Pigouvian tax on the temptation good will affect the behavior of both types. Of course, the Pigouvian tax directly addresses consumption of

[30] This is the 'internality' version of he classic (Diamond 1973) result that in the presence of heterogenous agents, the optimal (uniform) Pigouvian tax for externalities can no longer achieve the first best.

the temptation good while SNAP does so only indirectly, by affecting food consumption; however for sufficient substitutibility between food consumption and the temptation good, the decrease in consumption of the temptation good through SNAP-induced consumption of food may be able to achieve the first best.

In addition, with heterogeneous agents, the optimal mix of SNAP and cash is no longer equivalent to the optimal (linear) food subsidy. In the perfectly negatively correlated two type case, SNAP will outperform the food subsidy for the same reason it can outperform the tax on temptation goods: it only distorts consumption for the individuals with self-control problems. Using a mix of SNAP and cash strictly dominates the combination of cash and food subsidies, since the latter would distort food consumption choices for the ($\beta = 1$,$\kappa = 0$) type as well. Of course, in the case of perfectly positively correlated types (i.e. the agents who engage in mental accounting have $\beta = 1$ and the agents with self control problems do not engage in mental accounting) then SNAP will do worse than the optimal linear food subsidy since SNAP only distorts the behavior of individuals with $\beta = 1$, which is counter-productive.

More generally, as long as β and κ are "sufficiently negatively correlated", we conjecture that the optimal safety net will always include a mix of SNAP and cash and will not use food subsidies or Pigouvian taxes on the temptation good even if they are available to the planner; such corrective subsidies or taxes distort consumption on the margin for *all agents*. By using SNAP to reduce the consumption of temptation goods for the low β individuals (since they also have high mental accounting), SNAP provision can avoid distorting consumption choices for those without self-control problems.

6 Conclusion

We consider, both empirically and theoretically, a paternalistic rationale for providing transfers in-kind rather than in cash based on their different impacts on consumption of temptation goods. Empirically, we find evidence of non-fungibility between cash (SSI) and in-kind (SNAP) transfers for adults in South Carolina. In particular, we estimate that ER visits for drugs and alcohol increase by 20 to 30 percent immediately following receipt of SSI but do not respond to SNAP receipt. We also find that fills of prescriptions for new illnesses increase substantially following SSI receipt but not SNAP recept, and suggestive evidence that nutrition-sensitive ER visits rise slightly in response to SSI but fall slightly in response to SNAP.

Given the existing empirical evidence that SNAP is infra-marginal for most individuals, we show that allowing for mental accounting can generate our empirical findings of a higher marginal propensity to consume temptation goods and non-food goods out of cash than out of infra-marginal SNAP, and a higher marginal propensity to consume food out of infra-marginal SNAP than out of cash. We then explore the normative implications of providing transfers in cash vs. in-kind for a paternalistic social planner. We show that when individuals have self-control problems, the

paternalistic social planner will choose to provide a strictly positive amount of its total transfer in SNAP, in order to reduce over-consumption of temptation goods; moreover the optimal SNAP share of the transfer is weakly increasing in the amount of self-control problems and weakly decreasing in the strength of mental accounting. A (very) rough calibration suggests that the current level of SNAP benefits may be overly paternalistic. Work-in-progress suggests that with heterogeneous agents, the optimal mix of SNAP and cash transfers may outperform an optimal Pigouvian tax on the temptation good.

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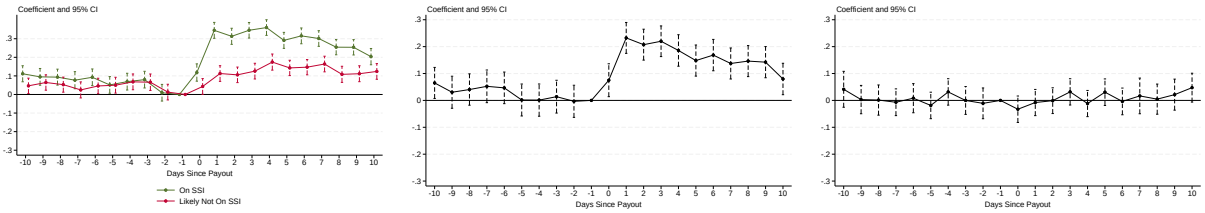
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Figures

Figure 1: Effects of SSI and SNAP on Drug-and-Alcohol-related ER Visits

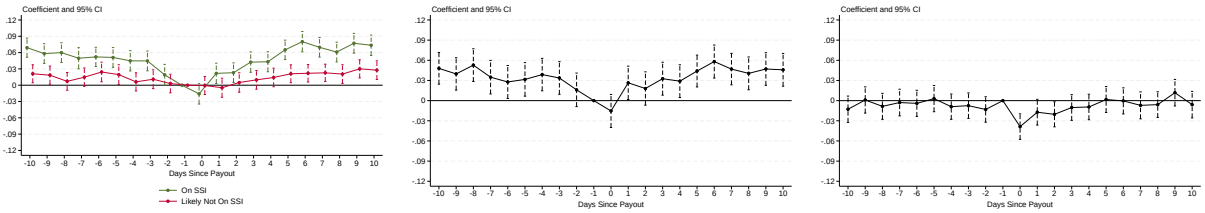
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is drug-and-alcohol-related ER visits per 10,000 individuals. In (a)-(b), N person-months on SSI = 19,122,759 and N person-months not likely on SSI = 133,056,093. In (c), N person-months on SNAP = 29,223,459. Standard errors are heteroskedasticity-robust.

Figure 2: Effects of SSI and SNAP on Nutrition-Sensitive ER Visits

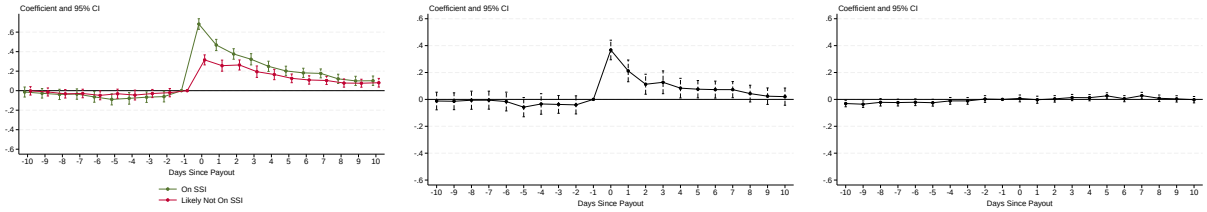
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is nutrition-sensitive ER visits per 10,000 individuals. In (a)-(b), N person-months on SSI = 19,122,759 and N person-months not likely on SSI = 133,056,093. In (c), N person-months on SNAP = 29,223,459. Standard errors are heteroskedasticity-robust.

Figure 3: Effects of SSI and SNAP on First Fills

(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is "first fills" per 10,000 individuals. In (a)-(b), N person-months on SSI = 9,744,088 and N person-months not likely on SSI = 8,402,170. In (c), N person-months on SNAP = 8,498,230. Standard errors are heteroskedasticity-robust.

7 Tables

Table 1: Summary Statistics

	SNAP Sample	SSI Sample		Overlap Sample: On SNAP & Either On or Likely Not On SSI		
	On SNAP	On SSI	Likely Not On SSI	Full	On SSI	Likely Not On SSI
Panel A: Demographics						
Mean Age	56.745	60.389	61.726	57.520	61.172	54.766
Share 65+	0.262	0.352	0.412	0.292	0.361	0.240
Share 40-64	0.661	0.594	0.466	0.629	0.611	0.643
Share less than 40	0.077	0.053	0.122	0.079	0.028	0.117
Share Female	0.637	0.615	0.660	0.654	0.627	0.673
Share White	0.387	0.334	0.500	0.388	0.315	0.437
Share Black	0.435	0.431	0.327	0.440	0.440	0.440
Share Other	0.172	0.235	0.155	0.166	0.245	0.112
Share Missing	0.006	0.000	0.018	0.007	0.000	0.011
Panel B: ER Visits Per Month (Per 10,000)						
Drug/alcohol-related (DA)	57.33	71.91	12.77	52.22	75.25	34.56
Nutrition-sensitive (NS)	421.1	526.9	148.0	420.7	583.3	300.0
Any cause	1,034	1,193	382.9	1,021	1,282	822.8
Panel C: Share Receiving Benefits						
Person-Months on SNAP	1.000	0.541	0.115	1.000	1.000	1.000
Person-Months on SSI	0.338	1.000	0.000	0.430	1.000	0.000
People ever on SNAP	1.000	0.750	0.508	1.000	1.000	1.000
People ever on SSI	0.414	1.000	0.000	0.404	1.000	0.000
N Person-Months	29,223,459	19,122,759	133,056,093	22,647,594	9,738,800	12,908,794
N Unique Individuals	381,258	197,076	507,486	335,239	135,474	199,765

Notes: This table presents descriptive statistics for the SNAP sample (column (1)), the SSI sample (columns (2) and (3)), and the overlap sample (columns (4)-(6)), derived from the Medicaid data. Mean age is calculated as the average age across person-months in each sample defined by the column headers. ER visits per month per 10,000 are calculated by averaging the number of ER visits in a given category to the month level, multiplying by 10,000, then averaging across all months. "Other" nests all non-Black, non-white, and non-missing racial categories. As of 2014, filling out the race field was no longer required on the South Carolina Medicaid application form.

Table 2: Fungibility Tests

	(1) SSI Estimate, On SSI	(2) SNAP Estimate	(3) Raw Difference (SNAP - On SSI)	(4) Scaled Difference (SNAP - $\frac{1}{4}$ * On SSI)	(5) SSI Estimate, DD	(6) Raw Difference (SNAP - SSI DD)	(7) Scaled Difference (SNAP - $\frac{1}{4}$ * SSI DD)
Panel A: Full Sample							
Drug and Alcohol (First Six Days)	0.296	0.002	-0.294	-0.072	0.178	-0.177	-0.043
	(0.017)	(0.020)	(0.026)	(0.020)	(0.023)	(0.030)	(0.020)
Nutrition Sensitive (First Six Days)	0.030	-0.016	-0.046	-0.023	0.023	-0.038	-0.021
	(0.007)	(0.008)	(0.010)	(0.008)	(0.008)	(0.011)	(0.008)
First Drug Fills (Payout Day)	0.683	0.007	-0.676	-0.164	0.368	-0.360	-0.085
	(0.028)	(0.008)	(0.029)	(0.010)	(0.030)	(0.031)	(0.011)
Panel B: Overlap Sample							
Drug and Alcohol (First Six Days)	0.264	-0.010	-0.274	-0.076	0.116	-0.126	-0.039
	(0.024)	(0.023)	(0.033)	(0.024)	(0.039)	(0.045)	(0.025)
Nutrition Sensitive (First Six Days)	0.017	-0.003	-0.019	-0.007	0.024	-0.027	-0.009
	(0.009)	(0.027)	(0.029)	(0.028)	(0.016)	(0.032)	(0.028)
First Drug Fills (Payout Day)	0.730	0.006	-0.724	-0.177	0.409	-0.403	-0.096
	(0.028)	(0.008)	(0.029)	(0.011)	(0.028)	(0.030)	(0.011)

Notes: This table shows point estimates and standard errors for the average effects of the SSI and SNAP cycles from relative days 0 through 5 on ER outcomes, and from relative day 0 for first drug fills. Column (1) reports the point estimates and standard errors for $\frac{(\alpha_0+\beta_0+...+\alpha_0+\beta_5)}{6}$ ($\alpha_0 + \beta_0$ for first drug fills) from equation 1. Column (2) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6}$ (β_0 for first drug fills) from equation 2. Column (3) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6} - \frac{(\alpha_0+\beta_0+...+\alpha_0+\beta_5)}{6}$ ($\beta_0 - (\alpha_0 + \beta_0)$ for first drug fills), where the first term comes from equation 2 and the second term comes from equation 1. Column (4) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6} - \frac{\frac{1}{4}(\alpha_0+\beta_0)+...+\frac{1}{4}(\alpha_5+\beta_5)}{6}$ ($\beta_0 - \frac{1}{4}(\alpha_0 + \beta_0)$ for first drug fills), where the first term comes from equation 2 and the second term comes from equation 1. Column (5) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6}$ (β_0 for first drug fills) from equation 1. Column (6) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6} - \frac{(\beta_0+...+\beta_5)}{6}$ ($\beta_0 - \beta_0$ for first drug fills), where the first term comes from equation 2 and the second term comes from equation 1. Column (7) reports the point estimates and standard errors for $\frac{(\beta_0+...+\beta_5)}{6} - \frac{\frac{1}{4}\beta_0+...+\frac{1}{4}\beta_5}{6}$ ($\beta_0 - \frac{1}{4}\beta_0$ for first drug fills), where the first term comes from equation 2 and the second term comes from equation 1. Standard errors are clustered at the date (day-month-year) level.

Appendices

A Impacts of Cash and In-Kind Transfers

A.1 Impacts on Temptation Goods

A.1.1 Cash transfers

There is a substantial literature examining the impact of cash on consumption of temptation goods, although it has reached very different conclusions in the U.S. and in developing countries. In the U.S., a growing body of evidence suggests that cash transfers are associated with adverse health outcomes from substance abuse. Most closely related to our work is evidence in other U.S. contexts of the cyclicality of substance abuse based on cash-transfer benefit cycles that we replicate in our setting. For example, Dobkin and Puller (2007) use patient-level data on admissions to California hospitals between 1994 and 2000 and find that drug-related admissions spike for SSI recipients after they receive their benefits on the first of the month; likewise, Shaner et al. (1995) find that low-income individuals with schizophrenia and cocaine dependence receiving disability benefits (paid on the first of the month) experienced an increase in cocaine use, psychiatric symptoms and hospital admissions during the first week of the month. In highly-related work, Phillips et al. (1999) and Evans and Moore (2012) document that U.S. mortality - and particularly mortality from substance abuse - peeks in the first week of the month; Evans and Moore (2012) also show that this pattern is larger among individuals of lower SES, a finding they attribute to increased liquidity around the first of the month, while Evans and Moore (2011) document mortality spikes - including substance-abuse mortality - following the arrival of monthly Social Security payments or regular wage payments for military personnel. These findings are consistent with evidence of an increase in 'instantaneous consumption' – which includes food and alcohol consumed away from home - following receipt of a social security check (Stephens Jr 2003).

There is also evidence on the extensive margin of the impact of new or increased cash transfers on temptation goods in the United States. Substance abuse mortality (Evans and Moore 2011) and emergency department visits for drug and alcohol use (Gross and Tobacman 2014) increased following the 2001 and 2008 tax rebates, respectively.[31] However, there is no evidence of increased self-reported use of tobacco, alcohol, cannabis or illicit substances following the 2021 Advance child tax credit .

By contrast, a large body of evidence from developing countries has failed to find evidence that cash transfers increase use of temptation goods such as alcohol and tobacco. Evans and Popova (2017) review a large number of studies and conclude that there is no evidence for an impact of cash transfers (either conditional or unconditional ones) on temptation goods in Latin America, Africa, and Asia; more recent papers have reached similar conclusions (e.g., Haushofer and Shapiro 2016). One potential reason for these ostensibly conflicting findings is that, as Evans and Popova (2017) note, the cash transfer programs they study often come with strong social messaging, which may make them more akin to 'labeled cash'; this is not the case for the US programs. Another potential explanation is that the U.S.-based literature tends to measure (arguably more welfare-relevant) extreme consumption of temptation goods that manifests itself in mortality or admissions, rather than consumption levels, and to use administrative data on outcomes rather than self-reported

[31] Likewise, evidence from Australia indicates that when individuals were allowed early pension withdrawals during the COVID-19 pandemic, there was a high marginal propensity to spend on gambling (**?**).

consumption measures; consistent with this hypothesis. the one U.S. study we are aware of that looked at self-reported consumption of temptation goods also found no evidence of cash impacts

A.1.2 In-kind transfers

There is relatively little work in the US on the impact of in-kind transfers on temptation goods. The closest we have found is Cotti et al. (2016) who find that alcohol-related traffic fatalities in the U.S. decline on the day of food stamp receipt, a result they hypothesize is due to families being more likely to eat at home on these days. In addition, Castellari et al. (2017) find that in months in which food stamps are paid on a weekend rather than a weekday, monthly purchases of beer are higher.

However, several studies in developing countries - all randomized trials - have compared the impact on temptation goods of cash transfers relative to in-kind food transfers. In contrast to our findings, they found no evidence that cash increased consumption of temptation goods (specifically alcohol or tobacco) relative to in-kind food transfers (Cunha 2014; Gilligan and Roy 2013). In closely related work, Banerjee et al. (2023a) find no evidence that moving from an (inframarginal) in-kind food transfer to a food voucher increases consumption of temptation goods.

A.2 Adult Health Impacts

We are not aware of any direct comparisons in the U.S. or other developed countries of the impact of cash and in-kind transfers on health outcomes.[32] However, there are distinct literatures looking separately at the imnpact of cash and of in-kind transfers on adult health outcomes in the U.S.

A.2.1 Cash Transfers

The evidence on the impact of cash outcomes on health in the U.S. is mixed. As discussed above, there is considerable evidence of deleterious health consequences of an injection of cash liquidity operating through induced over-consumption of drugs or alcohol (Dobkin and Puller 2007; Evans and Moore 2011, 2012; Shaner et al. 1995; Phillips et al. 1999; Gross and Tobacman 2014). However, there is also evidence of positive health impacts of cash transfers for low-income individuals, suggesting that the impacts of liquidity may be nuanced. For example, a randomized evaluation of providing substantial monthly cash benefits for three-quarters of a year to low-income individuals in Chelsea, MA during the pandemic indicated that receipt of cash reduced emergency room visits, including reductions in visits related to behavioral health and substance use (Agarwal et al. 2024).[33] Moreover, several recent papers have also found a cash benefit cycle in which low-income individuals increase their prescription drug fills upon benefit receipt; these include including new

[32] In the U.S., the only direct comparison of the impact of cash and in-kind food transfers on health outcomes that we know of is Bitler et al. (2022). In a difference-in-differences design, they find that when Wisconsin reduced the cash payment to SSI recipients and replaced it with an equivalent amount of food stamps in 1992, food stamp use increased; they also find 'suggestive evidence' that hospitalizations for food-related diagnoses decreased among a population that was likely covered by SSI. However, the authors caution that there is also evidence of compositional changes in their 'likely SSI' sample associated with Wisconsin's policy change, which may be contributing to their estimates.

[33] However, impacts on health have been more muted or mixed from other recent randomized cash transfers to a low-income populations such as a guaranteed income (Miller et al. 2024) or the extension of the earned income tax credit to adults without dependent children (Courtin et al. 2020, 2022; Muennig et al. 2024).

fill (vs. refills) and fills for drugs used to treat acute conditions, where timely treatment may be essential (Lyngse 2020; Gross et al. 2022).[34]

A.2.2 SNAP

Most closely related to our work is the literature on SNAP benefit cycles and health.[35] Several (although not all) papers find evidence consistent with receipt of SNAP reducing hospital or ER visits for hypoglycemia or other potentially-nutrition sensitive conditions. Seligman et al. (2014) find that admissions for hypoglycemia in California increase in low-income populations toward the end of the month, a result they interpret as reflecting an exhaustion of the month's food budget, particularly SNAP benefits which are paid in California in the first 10 days of the month. However, exploiting random variation across individuals in the day of the month of receipt of SNAP benefits in Missouri, Heflin et al. (2017) find no evidence that the probability of ER visits covered by Medicaid for hypoglycemia declines with receipt of SNAP. Using the same data and empirical strategy, Arteaga et al. (2018) find that SNAP receipt is associated with a decline in the probability of a pregnancy-related ER visit (and note that dietary quality is considered an important component of health for pregnant women) while Ojinnaka and Heflin (2018) find that SNAP receipt is associated with a decline in hypertension-related ER visits, visits that they argue can be affected by food insecurity.

Some of this existing evidence comes from South Carolina and exploits the same within-month variation in SNAP benefit receipt that we do to document that Medicaid-covered emergency department use overall falls on the day of SNAP benefit receipt (Cotti et al. 2020) and student test scores decline when the exam falls late in the SNAP benefit cycle (Cotti et al. 2018), a result that they interpret as indicative of poor nutrition.[36] Our findings that SNAP receipt is associated with an immediate but short lived decline in ER visits for nutrition-sensitive conditions complements this existing evidence base, and is consistent with other studies finding a substantial decline in caloric intake among SNAP recipients at the end of the benefit month (Wilde and Ranney 2000; Shapiro 2005; Todd 2015; Gassman-Pines and Schenck-Fontaine 2019; Kuhn 2018; Hamrick and Andrews 2016) and that SNAP recipients redeem a large share of their month's benefit immediately upon receipt (Castner and Henke 2011; **?**).

B Proofs and Derivations

B.1 Derivations of Intermediate Results Used in the Formal Proofs

To simplify the derivations, we re-cast the individual's optimization problem as being over three variables: f (total food consumption), n (total non-food consumption), and c_1^b (consumption of

[34] Looking beyond liquidity per se, a much larger income has examined the causal impact of income on health, with very mixed results across studies; Lleras-Muney (2022) reviews some of this evidence.

[35] In addition, several papers examining the roll out of the introduction of food stamps across counties in the 1960s and early 1970s have found that this was associated with both short-run and longer-run health improvements (Almond et al. 2011; Hoynes et al. 2016).

[36] In a similar vein, Bond et al. (2022) using data from several states find that low-income students who take the SAT in the last two weeks of the SNAP benefit cycle do worse than those who take it in the two weeks following disbursement.

temptation good). This makes the individual's utility function, U, the following:

$$\begin{aligned} U = \quad & \alpha_g \alpha_f \left[\log\left(\frac{f}{1+\beta}\right) + \beta \log\left(\frac{\beta f}{1+\beta}\right) \right] + \\ & \alpha_g (1-\alpha_f) \left[\log\left(\frac{n}{1+\beta}\right) + \beta \log\left(\frac{\beta n}{1+\beta}\right) \right] + \\ & (1-\alpha_g)(1-\beta\gamma) \log(c_1^b) - \kappa(\phi_0 y_1 + b_1 - p_f f)^2 \end{aligned}$$

which comes from the definitions $f = f_1 + f_2$ and $n = n_1 + n_2$ and the optimal decisions:

$$\begin{aligned} f_1 &= \frac{f}{1+\beta}, \qquad f_2 = \frac{\beta f}{1+\beta} \\ n_1 &= \frac{n}{1+\beta}, \qquad n_2 = \frac{\beta n}{1+\beta} \end{aligned}$$

We normalize the price of n to one and use p_f and p_b to denote the relative prices of food and the temptation good, respectively.

The following definitions will be useful for the analysis, where x^* indicates the optimal choice of good x made by the consumer:

- ϕ denotes the share of the individual's income she chooses to spend on food, with $\phi(\alpha_g, \alpha_f, \beta, \gamma, \kappa) \equiv \frac{p_f f^*}{y_1 + b_1}$,
- θ denotes the share of the individual's income she chooses to spend on the temptation good, with $\theta(\alpha_g, \alpha_f, \beta, \gamma, \kappa) \equiv \frac{p_b(c_1^{b*})}{y_1 + b_1}$
- ϕ_0 and θ_0 denote the values of ϕ and θ (respectively) when $\kappa = 0$ (i.e. there is no mental accounting). Thus $\phi_0 \equiv \phi(\alpha_g, \alpha_f \beta, \gamma, \kappa = 0)$ and $\theta_0 \equiv \theta(\alpha_g, \alpha_f, \beta, \gamma, \kappa = 0)$
- We define SNAP benefits (b_1) as ***inframarginal*** if they are below the amount that the consumer would have chosen to spend on food in the absence of mental accounting (or if the planner had allocated the entire transfer as cash): i.e. $b_1 < \frac{\phi_0}{1-\phi_0} y_1$
- Marginal propensities to consume food ($MPCF$), non-food ($MPCN$), and the "bad" temptation good ($MPCB$) out of cash and SNAP are:

$$\begin{aligned} MPCF^{cash} &\equiv \frac{d(p_f f^*)}{dy_1} \qquad MPCF^{SNAP} \equiv \frac{d(p_f f^*)}{db_1} \\ MPCN^{cash} &\equiv \frac{d(n^*)}{dy_1} \qquad MPCN^{SNAP} \equiv \frac{d(n^*)}{db_1} \\ MPCB^{cash} &\equiv \frac{d(p_b(c_1^{b*}))}{dy_1} \quad MPCB^{SNAP} \equiv \frac{d(p_b(c_1^{b*}))}{db_1} \end{aligned}$$

Using these definitions, we can derive several comparative statics on individual behavior.

First, with no mental accounting ($(\kappa = 0)$, the individual's optimal choice of food is increasing in self-control, her optimal choice of the temptation good is decreasing in self-control, and her optimal choice of the non-food good is increasing in her self-control:

Proposition 1. $\frac{\partial \phi_0}{\partial \beta} > 0$, $\frac{\partial \theta_0}{\partial \beta} < 0$, *and* $\frac{\partial (1-\phi_0-\theta_0)}{\partial \beta} > 0$.

Proof: Differentiating ϕ_0 and θ_0 with respect to β:

$$\begin{aligned}
\phi_0 &= \frac{(1+\beta)\alpha_g\alpha_f}{(1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma)} \\
\theta_0 &= \frac{(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma)} \\
\frac{\partial \phi_0}{\partial \beta} &= \frac{\alpha_g\alpha_f(1-\alpha_g)(1+\gamma)}{((1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma))^2} > 0 \\
\frac{\partial \theta_0}{\partial \beta} &= \frac{-\alpha_g(1-\alpha_g)(1+\gamma)}{((1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma))^2} < 0
\end{aligned}$$

Next, since $\frac{\partial (1-\phi_0-\theta_0)}{\partial \beta} = -\frac{\partial \phi_0}{\partial \beta} - \frac{\partial \theta_0}{\partial \beta}$, we have:

$$\begin{aligned}
\frac{\partial (1-\phi_0-\theta_0)}{\partial \beta} &= -\frac{\alpha_g\alpha_f(1-\alpha_g)(1+\gamma)}{((1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma))^2} - \frac{-\alpha_g(1-\alpha_g)(1+\gamma)}{((1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma))^2} \\
&= \frac{\alpha_g(1-\alpha_f)(1-\alpha_g)(1+\gamma)}{((1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma))^2} > 0
\end{aligned}$$

■

The equations above show that ϕ_0 and θ_0 depend on β (and the other preference parameters) and that $\frac{\partial \phi_0}{\partial \beta} > 0$ and $\frac{\partial \theta_0}{\partial \beta} < 0$. Intuitively, a more forward-looking consumer spends more of their income on food and less of their income on the temptation good, since the consumer more strongly internalizes the future negative health consequences from consuming the temptation good when β is higher. Going forward, we will suppress the dependence of ϕ_0 and θ_0 on the preference parameters.

Proposition 2. $\frac{\partial \phi}{\partial \beta} > 0$, $\frac{\partial \theta}{\partial \beta} < 0$, *and* $\frac{\partial (1-\phi-\theta)}{\partial \beta} > 0$.

Proof (Sketch): We can use the same arguments for proving that phi^* is strictly increasing in κ by showing that $d\phi^*/d\beta = -\frac{d^2U}{d\phi d\beta} / \frac{d^2U}{d\phi^2}$

Since $\frac{d^2U}{d\phi^2} < 0$, then this means that we need to prove $\frac{d^2U}{d\phi d\beta} > 0$

We have

$$\begin{aligned}
\frac{d^2U}{d\phi d\beta} &= \frac{\alpha_g\alpha_f}{\phi} - \frac{\alpha(1-\alpha_f)}{1-\phi} + \frac{\gamma(1-\alpha_g)}{1-\phi} \\
&= \frac{\alpha_g\alpha_f(1-\phi)}{\phi(1-\phi)} - \frac{\phi\alpha_g(1-\alpha_f)}{\phi(1-\phi)} + \frac{\phi\gamma(1-\alpha_g)}{\phi(1-\phi)} \\
&= \frac{\alpha_g\alpha_f(1-\phi) - \phi\alpha_g(1-\alpha_f) + \phi\gamma(1-\alpha_g)}{\phi(1-\phi)} \\
&= \frac{\alpha_g\alpha_f - \phi\alpha_g + \phi\gamma(1-\alpha_g)}{\phi(1-\phi)} \\
&= \frac{\alpha_g(\alpha_f - \phi) + \phi\gamma(1-\alpha_g)}{\phi(1-\phi)} \\
&> 0
\end{aligned}$$

Recall the relationship derived between ϕ and θ:

$$\theta(y,b) = \frac{(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}(1-\phi(y_1,b_1))$$

The equation above implies that $d\phi^*/d\beta > 0$ implies that $d\theta^*/d\beta < 0$. Additionally, since the magnitude of $d\phi^*/d\beta$ is larger than the magnitude of $d\theta^*/d\beta$ this implies that $d(1-\phi^*-\theta^*)/d\beta > 0$. ■

B.2 Deriving the $MPCF$ and $MPCB$ Expressions

At an interior optimum, the individual equalizes the ratios of marginal utilities to price:

$$\frac{MU_f}{p_f} = MU_n = \frac{MU_b}{p_b}$$

Differentiating the utility function gives the following marginal utilities:

$$\begin{aligned} MU_f &= \frac{(1+\beta)\alpha_g\alpha_f}{f} + 2\kappa p_f(\phi_0 y_1 + b - p_f f) \\ MU_n &= \frac{(1+\beta)\alpha_g(1-\alpha_f)}{n} \\ MU_b &= \frac{(1-\alpha_g)(1-\beta\gamma)}{c_1^b 1} \end{aligned}$$

We define ϕ as the share of the individual's total income spent on food expenditures ($\phi = \frac{p_f f}{y_1+b_1}$) and θ as the share of expenditures on the temptation good ($\theta = p_b c_1^b 1 y_1 + b_1$). This (further) reduces the problem to two unknown parameters: ϕ and θ. We can then re-write the individual's consumption decisions as follows:

$$\begin{aligned} f &= \frac{\phi(y_1+b_1)}{p_f} \\ c_1^b &= \frac{\theta(y_1+b_1)}{p_b} \\ n &= (1-\phi-\theta)(y_1+b_1) \end{aligned}$$

We then re-write the marginal utilites in terms of θ and ϕ, noting that ϕ_0 is the constant function of the individual's preference parameters defined in the main text:

$$\begin{aligned} \frac{MU_f}{p_f}(\phi) &= \frac{(1+\beta)\alpha_g\alpha_f}{\phi(y_1+b_1)} + 2\kappa[(\phi_0-\phi)y_1 + (1-\phi)b] \\ \frac{MU_b}{p_b}(\theta) &= \frac{(1-\alpha_g)(1-\beta\gamma)}{\theta(y_1+b_1)} \\ MU_n(\theta,\phi) &= \frac{(1+\beta)\alpha_g(1-\alpha_f)}{(1-\phi-\theta)(y_1+b_1)} \end{aligned}$$

Setting the last two equal gives:

$$\theta = \frac{(1-\phi)(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}$$

Plugging this into $\frac{MU_b}{p_b}(\theta)$ gives:

$$\frac{MU_b}{p_b}(\phi) = \frac{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}{(1-\phi)(y_1+b_1)}$$

Setting this equal to $MU_f(\phi)/p_f$ gives:

$$\frac{(1+\beta)\alpha_g\alpha_f}{\phi(y_1+b_1)} + 2\kappa[(\phi_0-\phi)y_1+(1-\phi)b] = \frac{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}{(1-\phi)(y_1+b_1)}$$

Rearranging gives the following

$$\begin{aligned} &\frac{(1+\beta)(1-\phi)\alpha_g\alpha_f}{\phi} + 2(1-\phi)(y_1+b_1)\kappa[(\phi_0-\phi)y_1+(1-\phi)b] - \\ &(1+\beta)\alpha_g(1-\alpha_f)-(1-\alpha_g)(1-\beta\gamma) \\ =\ &0 \end{aligned}$$

We define the equation (4) above as $G(\phi, y, b)$ from now on, and we implicitly differentiate this function to derive expressions for the $MPCF$s and $MPCB$s:

$$\begin{aligned} \frac{\partial G}{\partial \phi} &= \frac{-(1+\beta)\phi a_g a_f - (1+\beta)(1-\phi)a_g a_f}{\phi^2} - 2[(\phi_0-\phi)y_1+(1-\phi)b](y_1+b_1)\kappa - 2\kappa(1-\phi)(y_1+b_1)^2 \\ &= \frac{-(1+\beta)\alpha_g\alpha_f}{\phi^2} - 2\kappa(y_1+b_1)[(1+\phi_0-2\phi)y_1+2(1-\phi)b] \end{aligned}$$

The optimal choice for food is always bounded by $f < \phi_0 y_1 + b_1$, because as $\kappa \to \infty$ the individual's optimal food spending approaches the mental account $f = \phi_0 y_1 + b_1$ from below. Plugging in this upper bound, we then know:

$$\frac{\partial G}{\partial \phi} < -\frac{(1+\beta)\alpha_g\alpha_f}{\phi^2} - 2\kappa(y_1+b_1)(1-\phi_0)y_1 < 0$$

Differentiating G with respect to y_1:

$$\frac{\partial G}{\partial y_1} = 2\kappa(1-\phi)[(\phi_0-\phi)y_1+(1-\phi)b] + 2\kappa(\phi_0-\phi)(1-\phi)(y_1+b_1)$$

Differentiating G with respect to b_1:

$$\frac{\partial G}{\partial b_1} = 2\kappa(1-\phi)[(\phi_0-\phi)y_1+(1-\phi)b] + 2\kappa(1-\phi)^2(y_1+b_1)$$

From here, we can derive how expenditure shares change with changes in b_1 or y_1. We can

translate these to the difference in the $MPCF$ in the following way:

$$\begin{aligned} f &= \phi(y_1, b_1)(y_1 + b_1) \\ \frac{df}{dy_1} &= \frac{d\phi}{dy_1}(y_1 + b_1) + \phi \\ \frac{df}{db_1} &= \frac{d\phi}{db_1}(y_1 + b_1) + \phi \\ MPCF^{SNAP} - MPCF^{cash} &= \left(\frac{d\phi}{db_1} - \frac{d\phi}{dy_1}\right)(y_1 + b_1) \end{aligned}$$

We can get $(\frac{d\phi}{db_1} - \frac{d\phi}{dy_1})$ as:

$$\frac{d\phi}{db_1} - \frac{d\phi}{dy_1} = -\frac{\frac{\partial G}{\partial b_1} - \frac{\partial G}{\partial y_1}}{\frac{\partial G}{\partial \phi}} = \frac{2\kappa(1-\phi)(1-\phi_0)(y_1+b_1)}{\frac{(1+\beta)\alpha_g\alpha_f}{\phi^2} + 2\kappa(y_1+b_1)[(1+\phi_0-2\phi)y_1 + 2(1-\phi)b]}$$

Recall the relationship derived between ϕ and θ:

$$\theta(y, b) = \frac{(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}(1 - \phi(y_1, b_1))$$

Taking the derivative with respect to y_1:

$$\frac{d\theta}{dy_1} = -\frac{d\phi}{dy_1}\frac{(1-\alpha_g)(1-\gamma)}{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\gamma)}.$$

We have an analogous result when we differentiate with respect to b_1:

$$\frac{d\theta}{db_1} - \frac{d\theta}{dy_1} = \frac{(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}\left(\frac{d\phi}{dy_1} - \frac{d\phi}{db_1}\right)$$

This can be translated to the differences in $MPCB$s as follows:

$$\begin{aligned} &MPCB^{SNAP} - MPCB^{cash} = \left(\frac{d\theta}{db_1} - \frac{d\theta}{dy_1}\right)(y_1 + b_1) \\ &= \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}(MPCF^{SNAP} - MPCF^{cash}) \end{aligned}$$

Characterizing Food Spending as κ Varies

It is useful to think of the individual's optimal food spending for any $\kappa \geq 0$ as falling between the food spending characterized by the $\kappa = 0$ and $\lim_{\kappa\to\infty}$ cases:

- When $\kappa = 0$, the individual chooses the optimal food consumption absent mental accounting. This is the lower bound on the individual's food consumption: $f^*_{\kappa=0} = \phi_0(y_1 + b)$.
- As $\kappa \to \infty$, the individual's optimal food consumption approaches exactly the "target" in the mental accounting term in the utility function. This is the upper bound on food consumption: $f^*_{\kappa\to\infty} = \phi_0 y_1 + b$

- Optimal food consumption increases monotonically in κ, so that κ pins down a unique food consumption in between these two bounds; i.e., $f^* \in [\phi_0(y_1+b_1), \phi_0 y_1 + b_1)$, with $\frac{\partial f}{\partial \kappa} > 0$.

Proof: In the case where $\kappa = 0$, there is no mental accounting. Food consumption is exactly the Cobb-Douglas share multiplied by total income:

$$f^* = \frac{(1+\beta)\alpha_g\alpha_f}{(1+\beta)\alpha_g + (1-\alpha_g)(1-\beta\gamma)}(y_1+b_1) = \phi_0(y_1+b_1)$$

For the $\kappa \to \infty$ case, recall the following:

$$\begin{aligned}
\frac{MU_{\bar{f}}}{p_f}(\phi) &= \frac{(1+\beta)\alpha_g\alpha_f}{\phi(y_1+b_1)} + 2\kappa[(\phi_0-\phi)y_1 + (1-\phi)b] \\
\frac{MU_{b_1}}{p_b}(\phi) &= \frac{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}{(1-\phi)(y_1+b_1)}
\end{aligned}$$

Since $\frac{MU_{\bar{f}}}{p_f} = \frac{MU_b}{p_b}$, we can divide both sides by κ and use $\frac{MU_{\bar{f}}}{p_f\kappa} = \frac{MU_b}{\kappa p_b}$:

$$\begin{aligned}
\frac{MU_F}{p_f\kappa} &= \frac{MU_b}{\kappa p_b} \\
\frac{(1+\beta)\alpha_g\alpha_f}{\kappa\phi(y_1+b_1)} + 2[(\phi_0-\phi)y_1 + (1-\phi)b] &= \frac{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}{(1-\phi)(y_1+b_1)\kappa}
\end{aligned}$$

As $\kappa \to \infty$, this collapses to

$$2[(\phi_0-\phi)y_1 + (1-\phi)b_1] = 0 \implies \phi = \frac{\phi_0 y_1 + b_1}{y_1+b_1}$$

Note that food consumption when $\kappa \to \infty$ is always greater than that when $\kappa = 0$, since

$$f^*_{\kappa\to\infty} - f^*_{\kappa=0} = \phi_0 y_1 + b_1 - \phi_0(y_1+b_1) = (1-\phi_0)b_1 > 0.$$

We can also show that food consumption will never be higher than $f^*_{\kappa\to\infty}$ and never be lower than $f^*_{\kappa=0}$. Recall that the consumer's "simplified" utility function is:

$$\begin{aligned}
U(f,n,c_1^b) = {} & \alpha_g\alpha_f\left[\log\left(\frac{f}{1+\beta}\right) + \beta\log\left(\frac{\beta f}{1+\beta}\right)\right] + \\
& \alpha_g(1-\alpha_f)\left[\log\left(\frac{n}{1+\beta}\right) + \beta\log\left(\frac{\beta n}{1+\beta}\right)\right] + \\
& (1-\alpha_g)(1-\beta\gamma)\log(c_1^b) - \kappa(\phi_0 y_1 + b - p_f f)^2
\end{aligned}$$

We can define two helpful (partially optimized) sub-utility functions, U_A and U_B:

$$\begin{aligned} U_A(f) \equiv \max_{n,c_1^b 1} \Bigg\{ & \alpha_g \alpha_f \left[\log\left(\frac{\bar{f}}{1+\beta} \right) + \beta \log\left(\frac{\beta \bar{f}}{1+\beta} \right) \right] + \\ & \alpha_g (1-\alpha_f) \left[\log\left(\frac{\bar{n}}{1+\beta} \right) + \beta \log\left(\frac{\beta \bar{n}}{1+\beta} \right) \right] + \\ & (1-\alpha_g)(1-\beta\gamma) \log(c_1^b) \Bigg\} \\ & \text{subject to } p_f f + n + p_b c_1^b = y_1 + b_1 \end{aligned}$$

The sub-utility $U_A(f)$ takes in a value of f, and returns the maximum possible utility (over all possible choices of n and c_1^b) that the consumer can achieve given that choice of f and no mental accounting. That is, $U_A(f)$ is the utility achieved if the consumer chooses (the possibly non-optimal) f, then makes the optimal (n, c_1^b) choices conditional on f, all when there is no mental accounting.

The optimal n and c_1^b conditional on f are the choices which allocate the share of the budget not spent on f such that the ratio of the marginal utilities of c_1^b and n is equal to the price ratio p_b (since p_n normalized to 1). Since utility is additively separable in food and other consumption, this is equivalent to finding the (n, c_b^1) that maximizes

$$\alpha_g (1-\alpha_f) \left[\log\left(\frac{n}{1+\beta} \right) + \beta \log\left(\frac{\beta n}{1+\beta} \right) \right] + (1-\alpha_g)(1-\beta\gamma) \log(c_1^b)$$

subject to $p_b c_1^b + n = (1-\phi)(y_1 + b_1)$. This gives the following choices of $p_b c_1^b$ and n:

$$\begin{aligned} p_b c_1^b &= \frac{(1-\alpha_g)(1-\beta\gamma)(y_1+b_1)(1-\phi)}{(1-\alpha_g)(1-\beta\gamma) + \alpha_g(1-\alpha_f)(1+\beta)} = \frac{\theta_0(1-\phi)(y_1+b_1)}{(1-\phi_0)} \\ n &= \frac{\alpha_g(1-\alpha_f)(1+\beta)(y_1+b_1)(1-\phi)}{(1-\alpha_g)(1-\beta\gamma) + \alpha_g(1-\alpha_f)(1+\beta)} = \frac{(1-\phi_0-\theta_0)(1-\phi)(y_1+b_1)}{(1-\phi_0)} \end{aligned}$$

We can now write U_A fully in terms of (the possibly non-optimal) ϕ:

$$\begin{aligned} U_A(\phi) = \quad & \alpha_g \alpha_f \left[\log\left(\frac{\phi(y_1+b_1)}{p_f(1+\beta)} \right) + \beta \log\left(\frac{\beta\phi(y_1+b_1)}{p_f(1+\beta)} \right) \right] + \\ & \alpha_g(1-\alpha_f) \left[\log\left(\frac{(1-\phi)(1-\phi_0-\theta_0)(y_1+b_1)}{(1-\phi_0)(1+\beta)} \right) + \right. \\ & \left. \beta \log\left(\beta \frac{(1-\phi)(1-\phi_0-\theta_0)(y_1+b_1)}{(1-\phi_0)(1+\beta)} \right) \right] + \\ & (1-\alpha_g)(1-\beta\gamma) \log\left(\frac{(1-\phi)\theta_0(y_1+b_1)}{(1-\phi_0)p_b} \right) \end{aligned}$$

Next, we define $U_B(f) \equiv -(\phi_0 y_1 + b - p_f f)^2$, which is simply the mental accounting term without the κ term multiplying the quadratic utility cost. This can also be written in terms of ϕ:

$$U_B(\phi) = -(\phi_0 y_1 + b - \phi(y_1 + b_1))^2$$

Then, for a given ϕ (or equivalently, a given f), a consumer who makes choices that are utility-maximizing conditional on (the possibly non-optimal) ϕ has utility:

$$U(\phi) = U_A(\phi) + \kappa U_B(\phi)$$

Differentiating U_A with respect to ϕ:

$$\frac{\partial U_A}{\partial \phi} = \quad \frac{\alpha_g \alpha_f (1+\beta)}{\phi} - \frac{\alpha_g (1-\alpha_f)(1+\beta)}{1-\phi} - \frac{(1-\alpha_g)(1-\beta\gamma)}{1-\phi}$$

This shows that $\frac{dU_A}{d\phi} = 0$ (i.e., U_A is maximized) at $\phi = \phi_0$. For $\phi < \phi_0$, $\frac{dU_A}{d\phi} > 0$, and for $\phi > \phi_0$, $\frac{dU_A}{d\phi} < 0$.

Writing U_B in terms of ϕ and differentiating:

$$\begin{aligned} \frac{dU_B}{d\phi} &= 2(\phi_0 y_1 + b - \phi(y_1 + b_1))(y_1 + b_1) \\ &= 2((\phi_0 - \phi)y_1 + (1-\phi)b)(y_1 + b_1) \end{aligned}$$

So U_B is maximized at $\phi = \frac{\phi_0 y_1 + b_1}{y_1 + b_1}$. For $\phi < \frac{\phi_0 y_1 + b_1}{y_1 + b_1}$, $\frac{dU_B}{d\phi} > 0$, and for $\phi > \frac{\phi_0 y_1 + b_1}{y_1 + b_1}$, $\frac{dU_B}{d\phi} < 0$.

For $\phi < \phi_0$, both $dU_A/d\phi > 0$ and $dU_B/d\phi > 0$. It will never be optimal to choose $\phi < \phi_0$ because the consumer can instead increase food consumption (i.e., increase ϕ) and achieve higher utility from both U_A and U_B. Similarly, for any choice of $\phi > \frac{\phi_0 y_1 + b_1}{y_1 + b_1}$, both $dU_A/d\phi < 0$ and $dU_B/d\phi < 0$ and the consumer is made strictly better off by choosing $\phi = \frac{\phi_0 y_1 + b_1}{y_1 + b_1}$. This shows that for any $\kappa \geq 0$, the optimal food expenditure falls within the interval: $\phi^* \in [\phi_0, \frac{\phi_0 y_1 + b_1}{y_1 + b_1})$. Determining where food expenditure lies within that interval requires evaluating the tradeoff between lower U_A and higher U_B. Note that when $b_1 = 0$ there is no trade-off: the optimum for U_A is at $\phi = \phi_0$, and the optimum for U_B is $\phi = \phi_0$.

Differentiating the overall utility function and evaluating at the optimum ϕ^*:

$$\frac{\partial U}{d\phi}(\phi^*) = \frac{\partial U_A}{\partial \phi}(\phi^*) + \kappa \frac{\partial U_B}{\partial \phi}(\phi^*) = 0$$

Since $\phi^* \in [\phi_0, \frac{\phi_0 y_1 + b_1}{y_1 + b_1}]$, $\frac{dU_A}{d\phi}(\phi^*) \leq 0$ and $\frac{dU_B}{d\phi}(\phi^*) \geq 0$. We can also show that ϕ^* is strictly increasing in κ, using implicit differentiation on the first order condition on U:

$$\frac{d\phi^*}{d\kappa} = -\frac{d^2U}{d\phi d\kappa} \Big/ \frac{d^2U}{d\phi^2}$$

The numerator is given by

$$\frac{d^2U}{d\phi d\kappa} = \frac{dU_B}{d\phi} > 0$$

The denominator is given by

$$\begin{aligned} \frac{d^2U}{d\phi^2} &= \frac{d^2U_A}{d\phi^2} + \kappa \frac{d^2U_B}{d\phi^2} \\ &= -\frac{(1+\beta)\alpha_g \alpha_f}{\phi^2} - \frac{\alpha_g(1-\alpha_f)(1+\beta) + (1-\alpha_g)(1-\beta\gamma)}{(1-\phi)^2} - 2\kappa(y_1 + b_1)^2 < 0 \end{aligned}$$

Putting these two together gives $\frac{d\phi^*}{d\kappa} > 0$. Food consumption is strictly increasing in κ, so κ exactly pins down food consumption in the interval $\bar{f}^* \in [\phi_0(y_1+b), \phi_0 y_1 + b)$. It is also worth noting that the optimal food consumption ϕ^* depends on y_1 and b_1 only through U_B.

It will also be useful to sign $\frac{d\phi^*}{db_1}$ and $\frac{d\phi^*}{dy_1}$

$$\begin{aligned}\frac{d\phi^*}{db_1} &= -\frac{d^2U}{d\phi db_1}\Big/\frac{d^2U}{d\phi^2},\\ \frac{d\phi^*}{dy_1} &= -\frac{d^2U}{d\phi dy_1}\Big/\frac{d^2U}{d\phi^2}\end{aligned}$$

$$\frac{d^2U}{d\phi db_1} = \kappa\frac{dU_B}{db_1} = 2\kappa[(1+\phi_0-2\phi)y_1 + 2(1-\phi)b] > 0$$

$$\frac{d^2U}{d\phi dy_1} = \kappa\frac{dU_B}{dy_1} = 2\kappa[(\phi_0-\phi)(y_1+b_1) + (\phi_0 y_1 + b - \phi(y_1+b_1))] \lesseqgtr 0$$

so $\frac{d\phi^*}{db_1} > 0$ and $\frac{d\phi^*}{dy_1}$ could be positive or negative. $\frac{d\phi^*}{db_1} - \frac{d\phi^*}{dy_1} = 2\kappa(1-\phi_0)(y_1+b_1) > 0$: an increase in SNAP always increases ϕ^* more than an increase in cash.[37]

B.3 Proofs of Results in Main Text

Proposition 3. *If $\kappa = 0$ and $b_1 < \frac{\phi_0}{1-\phi_0}y_1$, then $MPCF^{cash} = MPCF^{SNAP} = \phi_0$, $MPCB^{cash} = MPCB^{SNAP} = \theta_0$, and $MPCN^{cash} = MPCN^{SNAP} = 1-\phi_0-\theta_0$.*

Proof: When $b_1 < \frac{\phi_0}{1-\phi_0}y_1$, SNAP benefits are ***inframarginal***, which means that we can use the first-order approach to solve for the optimal consumption choices.

When $\kappa = 0$, we can equate the marginal utilities and find optimal choices of ϕ and θ:

$$\begin{aligned}\phi^* = \phi_0 &= \frac{(1+\beta)\alpha_g\alpha_f}{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)} > 0\\ \theta^* = \theta_0 &= \frac{(1-\alpha_g)(1-\beta\gamma)}{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)} > 0\end{aligned}$$

Since ϕ^* does not depend on y_1 or b_1, then

$$\frac{d\phi}{db_1} - \frac{d\phi}{dy_1} = 0$$

Thus $MPCF^{SNAP} - MPCF^{cash} = 0$ and $MPCB^{SNAP} - MPCB^{cash} = 0$, which implies that $MPCF^{SNAP} = MPCF^{cash}$ and $MPCB^{SNAP} = MPCB^{cash}$.

We can solve for the $MPCF$ and $MPCB$ terms immediately:

$$MPCF^{SNAP} = \frac{d\phi^*(y_1+b_1)}{db_1} = \frac{d\phi^*}{db_1}(y_1+b_1) + \phi^*$$

Since $\phi^* = \phi_0$, which is a constant, then we have $MPCF^{SNAP} = \phi_0$. Therefore, $MPCF^{SNAP} =$

[37] In B.XXX, we explain why it is possible for $\frac{\partial\phi^*}{\partial y_1} < 0$, which is a consequence of the "quadratic" mental accounting functional form.

$MPCF^{cash} = \phi_0$.

Similarly,

$$MPCB^{SNAP} = \frac{d\theta^*(y_1 + b_1)}{db_1} + \theta^* = \frac{d\theta^*}{db_1}(y_1 + b_1) + \theta^*$$

Since $\theta^* = \theta_0$, which is a constant, then we have $MPCB^{SNAP} = \theta_0$. Therefore, $MPCB^{SNAP} = MPCB^{cash} = \theta_0$.

Lastly, since $MPCF + MPCN + MPCB = 1$, then $MPCN = 1 - MPCF - MPCFB$, which implies that $MPCN^{cash} = MPCN^{SNAP} = (1 - \phi_0 - \theta_0)$. ■

Proposition 4. *If $\kappa > 0$ and $b_1 < \frac{\phi_0}{1-\phi_0} y_1$, then $MPCF^{cash} < MPCF^{SNAP}$, $MPCN^{cash} > MPCN^{SNAP}$, and $MPCB^{cash} > MPCB^{SNAP}$. The differences $(MPCF^{SNAP} - MPCF^{cash})$ and $(MPCB^{cash} - MPCB^{SNAP})$ are decreasing in β and increasing in κ, and the difference $(MPCN^{cash} - MPCN^{SNAP})$ is increasing in κ.*

Proof: As in Proposition 2, if $b_1 < \frac{\phi_0}{1-\phi_0} y_1$, then SNAP benefits are ***inframarginal***, which means that we can use the first-order approach to solve for the optimal consumption choices. As a result, for $\kappa > 0$, we have the following:

$$\frac{d\phi}{db} - \frac{d\phi}{dy} = -\frac{\frac{\partial G}{\partial b_1} - \frac{\partial G}{\partial y_1}}{\frac{\partial G}{\partial \phi}} = \frac{2\kappa(1-\phi)(1-\phi_0)(y_1 + b_1)}{\frac{(1+\beta)\alpha_g \alpha_f}{\phi^2} + 2\kappa(y_1 + b_1)[(1 + \phi_0 - 2\phi)y + 2(1-\phi)b]} > 0$$

This implies that $MPCF^{SNAP} - MPCF^{cash} > 0$, or $MPCF^{SNAP} > MPCF^{cash}$. From equation (4) above, we also have that $MPCB^{SNAP} - MPCB^{cash} < 0$, which implies that $MPCB^{SNAP} < MPCB^{cash}$. This proves the first half of the proposition.

To prove that $(MPCF^{SNAP} - MPCF^{cash})$ is decreasing in β, we differentiate with respect to β:

$$\frac{d}{d\beta}(MPCF^{SNAP} - MPCF^{cash}) = \frac{-2\alpha_g \alpha_f \kappa(1-\phi)(1-\phi_0)(y_1 + b_1)}{\phi^2 \left(\frac{(1+\beta)\alpha_g \alpha_f}{\phi^2} + 2\kappa(y_1 + b_1)[(1 + \phi_0 - 2\phi)y + 2(1-\phi)b] \right)^2} < 0$$

Thus, as β increases towards 1, the gap between $MPCF^{SNAP}$ and $MPCF^{cash}$ decreases.

To prove that $(MPCB^{SNAP} - MPCB^{cash})$ is decreasing in β, we use equation (4):

$$MPCB^{SNAP} - MPCB^{cash} = \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\beta\gamma)}(MPCF^{SNAP} - MPCF^{cash})$$

We then differentiate with respect to β:

$$\begin{aligned}
&\frac{d}{d\beta}(MPCB^{SNAP} - MPCB^{cash}) \\
= \quad & \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\frac{d}{d\beta}(MPCF^{SNAP} - MPCF^{cash}) + \\
& (MPCF^{SNAP} - MPCF^{cash})\frac{d}{d\beta}\left(\frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\right)
\end{aligned}$$

We can sign each of the terms in the previous expression:

$$\begin{aligned}
\frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)} &< 0 \\
\frac{d}{d\beta}(MPCF^{SNAP} - MPCF^{cash}) &< 0 \\
\frac{d}{d\beta}\left(\frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\right) &= \\
\frac{\alpha_g(1-\alpha_g)(1-\alpha_f)(\gamma+1)}{((1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma))^2} &> 0 \\
(MPCF^{SNAP} - MPCF^{cash}) &> 0
\end{aligned}$$

This gives:

$$\frac{d}{d\beta}(MPCB^{SNAP} - MPCB^{cash}) > 0$$

To prove that $(MPCF^{SNAP} - MPCF^{cash})$ is increasing in κ, we differentiate with respect to κ:

$$\begin{aligned}
&\frac{d}{d\kappa}(MPCF^{SNAP} - MPCF^{cash}) = \\
&\frac{d}{d\kappa}\left(-\frac{\frac{\partial G}{\partial b_1} - \frac{\partial G}{\partial y_1}}{\frac{\partial G}{\partial \phi}}\right) = \frac{2(1-\phi)(1-\phi_0)(y_1+b_1)\cdot\frac{(1+\beta)\alpha_g\alpha_f}{\phi^2}}{\left(\frac{(1+\beta)\alpha_g\alpha_f}{\phi^2} + 2\kappa(y_1+b_1)\left[(1+\phi_0-2\phi)y + 2(1-\phi)b\right]\right)^2} > 0
\end{aligned}$$

Lastly, to prove that $(MPCB^{cash} - MPCB^{SNAP})$ is increasing in κ, we use equation (4) again and differentiate with respect to κ:

$$\begin{aligned}
&MPCB^{SNAP} - MPCB^{cash} \\
&= \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}(MPCF^{SNAP} - MPCF^{cash})
\end{aligned}$$

We then differentiate with respect to κ:

$$\begin{aligned}
& \frac{d}{d\kappa}(MPCB^{SNAP} - MPCB^{cash}) \\
= \quad & \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\frac{d}{d\kappa}(MPCF^{SNAP} - MPCF^{cash}) + \\
& (MPCF^{SNAP} - MPCF^{cash})\frac{d}{d\kappa}\left(\frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\right) \\
= \quad & \frac{-(1-\alpha_g)(1-\beta\gamma)}{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}\frac{d}{d\kappa}(MPCF^{SNAP} - MPCF^{cash})
\end{aligned}$$

In the last line above, the first term is negative, and the second term is positive, so the entire term is negative, which means that $\frac{d}{d\kappa}(MPCB^{cash} - MPCB^{SNAP}) > 0$, completing the proof. ■

Theorem 1. *If $\beta = 1$, then the social planner maximizes (3) by choosing $y_1 = \bar{y}$ and $b_1 = 0$.*

Before writing out the proof, we provide an overview of its logic, which proceeds by considering two separate cases: $\kappa = 0$ and $\kappa > 0$. In the $\kappa = 0$ case, the social planner's objective and the individual's objective are identical, so there is no reason for the planner to use SNAP. When $\kappa = 0$, SNAP is fungible with cash if SNAP benefits are inframarginal, so SNAP and cash have the same effects on consumption, which means there is no reason for the planner to prefer to use SNAP. If SNAP benefits are not inframarginal, then they generate a kink in the individual's budget constraint which cannot increase the individual's utility. Therefore, the planner can do no better by substituting cash for SNAP when $\kappa = 0$.

If $\kappa > 0$, then the consumer engages in mental accounting, which means that SNAP benefits will lead to different consumption responses than cash even when SNAP benefits are inframarginal. However, the planner still prefers cash to SNAP in this case because SNAP leads to larger increases in food spending compared to cash, but when $\beta = 1$, the consumer does not under-consume food from the planner's perspective. So, again, there is no reason for the planner to prefer to use SNAP instead of cash.

Proof: We first define the following changes in utility:

$$\begin{aligned}
dU^{SNAP} &= \frac{dU}{db_1} \\
dU^{cash} &= \frac{dU}{dy_1} \\
dU(\beta = 1, \kappa = 0)^{SNAP} &= \frac{dU_{\beta=1,\kappa=0}}{db_1} \\
dU(\beta = 1, \kappa = 0)^{cash} &= \frac{dU_{\beta=1,\kappa=0}}{dy_1}
\end{aligned}$$

We previously showed that the optimal n and c_1^b conditional on the consumer's share of income

spent on food ϕ are:

$$\begin{aligned} c_1^b &= \frac{\theta_0(1-\phi)(y+b)}{(1-\phi_0)p_b} \\ \bar{n} &= \frac{(1-\phi_0-\theta_0)(1-\phi)(y+b)}{(1-\phi_0)} \end{aligned}$$

Substituting these into the utility function, we can write the consumer's decision utility in terms of ϕ:

$$\begin{aligned} U(\phi) = \quad & \alpha_g\alpha_f\left[\log\left(\frac{\phi(y+b)}{p_f(1+\beta)}\right)+\beta\log\left(\frac{\beta\phi(y+b)}{p_f(1+\beta)}\right)\right]+ \\ & \alpha_g(1-\alpha_f)\left[\log\left(\frac{(1-\phi)(1-\phi_0-\theta_0)(y+b)}{(1-\phi_0)(1+\beta)}\right)+\right. \\ & \left.\beta\log\left(\beta\frac{(1-\phi)(1-\phi_0-\theta_0)(y+b)}{(1-\phi_0)(1+\beta)}\right)\right]+ \\ & (1-\alpha_g)(1-\beta\gamma)\log\left(\frac{(1-\phi)\theta_0(y+b)}{(1-\phi_0)p_b}\right)- \\ & \kappa(\phi_0 y+b-\phi(y+b))^2 \end{aligned}$$

Let ϕ^* denote the consumer's decision utility-maximizing choice of ϕ given (κ,β,y,b):

$$\phi^*(\kappa,\beta,y,b) = \arg\max_{\phi} U(\phi;\kappa,\beta,y,b)$$

From the envelope theorem, we only need to focus on the direct effects on utility from margina changes in b and y and not indirect effects through changes in ϕ:

$$\begin{aligned} dU^{SNAP} = \frac{dU}{db} &= \frac{\partial U}{\partial b_1} \\ dU^{cash} = \frac{dU}{dy} &= \frac{\partial U}{\partial y_1} \end{aligned}$$

As a result, we can derive the following expressions:

$$\begin{aligned} dU^{SNAP}(\phi^*) &= \frac{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{y+b} - 2\kappa((\phi_0-\phi^*)y+(1-\phi^*)b)(1-\phi^*) \\ dU^{cash}(\phi^*) &= \frac{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{y+b} - 2\kappa((\phi_0-\phi^*)y+(1-\phi^*)b)(\phi_0-\phi^*) \end{aligned}$$

However, we cannot use the same envelope theorem argument when it comes to evaluating the social planner's utility, because ϕ^* is not optimally chosen given the social planner's objective function, so the social planner *does* care about changes in ϕ and the resulting effects on utility.

$$dU^{SNAP}(\kappa=0,\beta=1) = \frac{dU_{(\kappa=0,\beta=1)}}{db} = \frac{\partial U_{(\kappa=0,\beta=1)}}{\partial b_1} + \frac{\partial U_{(\kappa=0,\beta=1)}}{\partial \phi}\frac{d\phi^*}{db}$$
$$dU^{cash}(\kappa=0,\beta=1)\frac{dU_{(\kappa=0,\beta=1)}}{dy} = \frac{\partial U_{(\kappa=0,\beta=1)}}{\partial y_1} + \frac{\partial U_{(\kappa=0,\beta=1)}}{\partial \phi}\frac{d\phi^*}{dy}$$

From before, when $\kappa > 0$:

$$\frac{\partial \phi^*}{\partial b_1} > 0, \;\; \frac{\partial \phi^*}{\partial b_1} - \frac{\partial \phi^*}{\partial y_1} > 0$$

We can now complete the proof consider two cases: $\kappa = 0$ and $\kappa > 0$.

Case 1: $\kappa = 0$

When $\kappa = 0$ and $\beta = 1$, we have the following:

$$dU^{SNAP} = dU(\beta=1,\kappa=0)^{SNAP}$$
$$dU^{cash} = dU(\beta=1,\kappa=0)^{cash}$$

Additionally, when $\kappa = 0$ we have the following:

$$dU^{SNAP} = dU^{cash} = \frac{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{y_1+b_1}$$

Because changes in y_1 and b_1 have the same effects on the individual's utility and the social planner's objective function, the social planner cannot do better by choosing SNAP instead of cash.

Case 2: $\kappa > 0$

First, we can show $dU^{SNAP} < dU^{cash}$ as follows:

$$dU^{SNAP} - dU^{cash} = -2\kappa((\phi_0-\phi^*)y + (1-\phi^*)b)(1-\phi_0) < 0.$$

Second, We can show that $dU(\beta=1,\kappa=0)^{SNAP} < dU(\beta=1,\kappa=0)^{cash}$:

$$dU(\beta=1,\kappa=0)^{SNAP} - dU(\beta=1,\kappa=0)^{cash}$$
$$= \frac{\partial U_{\kappa=0,\beta=1}}{\partial b_1} - \frac{\partial U_{\kappa=0,\beta=1}}{\partial y_1} + \frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi}\left(\frac{\partial \phi^*}{\partial b_1} - \frac{\partial \phi^*}{\partial y_1}\right).$$

When $\kappa = 0$, y and b enter symmetrically in the utility function, so

$$\frac{\partial U_{\kappa=0,\beta=1}}{\partial b_1} = \frac{\partial U_{\kappa=0,\beta=1}}{\partial y_1}$$

and the first two terms cancel out. Earlier, we showed:

$$\frac{\partial \phi^*}{\partial b_1} - \frac{\partial \phi^*}{\partial y_1} > 0$$

The only thing remaining is to find the sign of $\frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi}$. We can prove that for $\kappa > 0$ and $\beta = 1$, $\frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi} < 0$.

We can prove this by comparing the first-order conditions between the consumer's decision

utility and social planner's utility. Rewriting utility in terms of U_A and U_B sub-utility functions as we did before, at the individual's optimum we have:

$$\frac{\partial U}{\partial \phi}(\phi^*) = \frac{\partial U_A}{\partial \phi}(\phi^*) + \kappa \frac{\partial U_B}{\partial \phi}(\phi^*) = 0$$

For the social planner, $\kappa = 0$, so

$$\frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi}(\phi^*) = \frac{\partial U_{A\beta=1}}{\partial \phi}(\phi^*)$$

The social planner's first-order condition in general will not equal 0 since ϕ^* is not chosen at the social planner's optimum. Helpfully, however, U_A is the same for both the social planner and the consumer since $\beta = 1$ for both, and U_A does not involve κ. Since $\frac{\partial U_B}{\partial \phi} > 0$ for any ϕ^* (show above), the individual's first -order condition gives:

$$\frac{\partial U_A}{\partial \phi}(\phi^*) = -\kappa \frac{\partial U_B}{\partial \phi}(\phi^*) < 0$$

This implies that $\frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi}(\phi^*) < 0$. Putting this all together:

$$\begin{aligned} &dU(\beta = 1, \kappa = 0)^{SNAP} - dU(\beta = 1, \kappa = 0)^{cash} \\ &= \frac{\partial U_{\kappa=0,\beta=1}}{\partial \phi}\left(\frac{\partial \phi^*}{\partial b_1} - \frac{\partial \phi^*}{\partial y_1}\right) < 0 \end{aligned}$$

So, $dU(\beta = 1, \kappa = 0)^{SNAP} < dU(\beta = 1, \kappa = 0)^{cash}$. This implies that if the individual engages in mental accounting ($\kappa > 0$) but the planner evaluates the individual's utility at $\kappa = 0$, then the planner will strictly prefer cash to SNAP. ■

The intuition for this result is that while SNAP and cash enter the planner's utility function identically, they differ in their indirect effects on utility through the individual's mental accounting behavior. When $\kappa > 0$, the individual's U_A (consumption sub-utility) pulls ϕ^* lower, while U_B (the mental accounting term) pulls ϕ^* higher. When $\beta = 1$, U_A does not pull ϕ^* below what the social planner would prefer. The only divergence between the social planner and the individual comes from the individual's mental accounting, which pulls ϕ^* higher than what the planner would prefer. An increase in SNAP therefore increases ϕ^* through mental accounting more than an increase in cash does, and the increase in ϕ^* from SNAP is worse for the planner than an increase in cash.

Theorem 2. *If $\beta < 1$, then the social planner maximizes (3) by choosing $0 < y_1^* < \bar{y}$ and $0 < b_1^* < \bar{y}$, with $y_1^* + b_1^* = \bar{y}$.*

Proof: The planner's problem is to choose y_1, b_1 such that:

$$y_1^*, b_1^* = \arg\max_{y_1, b_1} U^{SP}(\phi^*, y, b)$$

subject to:

$$\phi^* = \arg\max_{\phi} U(\phi, y^*, b^*)$$

and

$$y_1^* + b_1^* = \bar{y}$$

where U^{SP} is the individual's optimized utility evaluated at $\kappa = 0$ and $\beta = 1$. As we describe in the main text, Theorem 1 can be re-written as

$$0 < \frac{b_1^*}{\bar{y}} < 1$$

We solve the planner's problem using the following three first-order conditions. First, we have the standard first-order condition for ϕ^* being the consumer's optimal choice:

$$\frac{\partial U}{\partial \phi}(\phi^*) = \frac{\alpha_g \alpha_f (1+\beta)}{\phi^*} - \frac{\alpha_g(1-\alpha_f)(1+\beta) + (1-\alpha_g)(1-\beta\gamma)}{1-\phi^*} + 2\kappa\bar{y}(\phi_0 y^* + b^* - \phi^*\bar{y}) = 0$$

Second, we have that the social planner must choose y_1 and b_1 to maximize their own utility. Note that in any place in which the planner cares about $(y_1 + b_1)$ together (rather than just y_1 or just b_1 separately), the choice of y_1^* versus b_1^* does not matter because we are holding $y_1 + b_1 = \bar{y}$ fixed.[38]

Given this, we can re-write the planner's utility to make this more explicit:

$$\begin{aligned} U^{SP} &= 2\alpha_g\alpha_f\left(\log\frac{\phi^*\bar{y}}{2p_f}\right) \\ &+ 2\alpha_g(1-\alpha_f)\left(\log\frac{(1-\phi^*)(1-\phi_0-\theta_0)\bar{y}}{2(1-\phi_0)}\right) \\ &+ (1-\alpha_g)(1-\gamma)\log\left(\frac{(1-\phi^*)\theta_0\bar{y}}{(1-\phi_0)p_b}\right) \end{aligned}$$

The expression above shows that y_1 and b_1 never appear separately from $\bar{y}$ in the planner's problem, which implies that the choice of y_1 versus b_1 does not have a direct effect on the social planner's utility. The social planner only cares about the choice of (y_1, b_1) indirectly through effects on the consumer's chosen consumption ϕ^*. As before, we *cannot* use the envelope theorem to ignore these indirect effects because ϕ^* is not optimally chosen from the perspective of the planner. Differentiating the planner's utility with respect to y and b, respectively, gives:

$$\frac{\partial U_{(\beta=1,\kappa=0)}}{\partial y_1}(y^*) = \left(\frac{2\alpha_g\alpha_f}{\phi^*} - \frac{2\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\gamma)}{1-\phi^*}\right)\frac{\partial\phi^*}{\partial y_1} = 0$$

$$\frac{\partial U_{(\beta=1,\kappa=0)}}{\partial b_1}(b^*) = \left(\frac{2\alpha_g\alpha_f}{\phi^*} - \frac{2\alpha_g(1-\alpha_f) + (1-\alpha_g)(1-\gamma)}{1-\phi^*}\right)\frac{\partial\phi^*}{\partial b_1} = 0$$

With $\kappa > 0$, $\frac{\partial\phi^*}{\partial y_1} \neq \frac{\partial\phi^*}{\partial b_1}$ (since $MPCF^{SNAP} > MPCF^{cash}$). Therefore, the only way these two

[38] Another way to put this is that $\frac{\partial\bar{y}}{\partial y_1} = \frac{\partial\bar{y}}{\partial b_1} = 0$, since the conceptual experiment is to replace cash with SNAP dollar-for-dollar without reducing the overall resource level of the consumer $\bar{y}$.

first-order conditions can both hold is if:

$$\frac{2\alpha_g\alpha_f}{\phi^*} - \frac{2\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\gamma)}{1-\phi^*} = 0$$

Rearranging:

$$\phi^* = \frac{2\alpha_g\alpha_f}{2\alpha_g+(1-\alpha_g)(1-\gamma)} = \phi^{SP}$$

Intuitively, the planner is choosing y_1^* and b_1^* such that the optimal choice for the individual is to choose the planner's optimal food consumption. Given this, we can find the conditions under which the individual's chosen food consumption ϕ^* is equal to the planner's preferred consumption ϕ^{SP}. Plugging ϕ^{SP} into the first-order condition for the consumer:

$$\frac{\alpha_g\alpha_f(1+\beta)}{\phi_{SP}} - \frac{\alpha_g(1-\alpha_f)(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{1-\phi_{SP}} + 2\kappa\bar{y}\bigg(\phi_0(\bar{y}-b^*)+b^*-\phi_{SP}\bar{y}\bigg) = 0$$

Dividing through by $\bar{y}$ and rearranging:

$$\frac{\alpha_g\alpha_f(1+\beta)}{\phi_{SP}\bar{y}} - \frac{\alpha_g(1-\alpha_f)(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{(1-\phi_{SP})\bar{y}} + 2\kappa\bar{y}\bigg(\phi_0-\phi_{SP}+\frac{b^*}{\bar{y}}(1-\phi_0)\bigg) = 0$$

To simplify further, divide by $\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)$ and shift terms to the other side:

$$\frac{2\kappa\bar{y}}{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}\bigg(\phi_0-\phi_{SP}+\frac{b^*}{\bar{y}}(1-\phi_0)\bigg) = \frac{1-\phi_0}{(1-\phi_{SP})\bar{y}} - \frac{\phi_0}{\phi_{SP}\bar{y}}$$

Which gives the following expression for $\frac{b^*}{\bar{y}}$:

$$\frac{b^*}{\bar{y}} = \frac{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{2\kappa\bar{y}^2(1-\phi_0)}\left[\frac{1-\phi_0}{1-\phi_{SP}} - \frac{\phi_0}{\phi_{SP}}\right] + \frac{\phi_{SP}-\phi_0}{1-\phi_0}$$

Using the expression above, we can prove that for any $\beta < 1$ that $\frac{b^*}{\bar{y}} > 0$. To see this, note that for any $\beta < 1$, $\phi_0 < \phi_{SP}$. This implies $\frac{1-\phi_0}{1-\phi_{SP}} > 1$ and $\frac{\phi_0}{\phi_{SP}} < 1$, so $[\frac{1-\phi_0}{1-\phi_{SP}} - \frac{\phi_0}{\phi_{SP}}] > 0$. In addition, $\frac{\alpha_g(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{2\kappa\bar{y}(1-\phi_0)} > 0$, and since $1 > \phi_{SP} > \phi_0$, $\frac{\phi_{SP}-\phi_0}{1-\phi_0} > 0$. Therefore, $\frac{b^*}{\bar{y}} > 0$.

The final part of the proof is to prove that $\frac{b^*}{\bar{y}} < 1$. This can be reasoned through contradiction. If the planner converts all income to SNAP, then the consumer can only purchase food, but this cannot be optimal choice for planner because $n = 0$ leads to $U = -\infty$, and the planner can do strictly better by reduce SNAP and transferring at least some small positive amount of cash.

In fact, the first-order approach assumes that the individual is not making choices at kinks in the budget constraint. Since SNAP can only be spent on food, the consumer is restricted to $\phi^* \geq \frac{b_1^*}{\bar{y}}$. Suppose the planner is unable to achieve $\phi^* = \phi_{SP}$ by using the individual's mental accounting behavior. Then, the planner can still set $\frac{b_1^*}{\bar{y}} = \phi_{SP}$ and therefore achieve the planner's preferred allocation directly by manipulating the kink in the budget constraint so that when the individual chooses to locate on the kink this matches the planner's preferred food consumption.

To see this formally, suppose the planner cannot choose $\frac{b^*}{\bar{y}}$ that leverages mental accounting to

achieve $\phi^* = \phi^{SP}$. Then, $\phi^* = \arg\max U(\phi, y^*, b^*) < \phi_{SP}$ for all $\frac{b^*}{\bar{y}} \in [0,1]$. Since $0 < \phi^{SP} < 1$, at $\frac{b^*}{\bar{y}} = \phi^{SP}$, $\phi^* < \phi^{SP}$. Setting $\frac{b^*}{\bar{y}} = \phi^{SP}$ forces the consumer to consume $\phi \geq \phi_{SP}$. Because the individual's preferred $\phi^* < \phi^{SP}$, this restriction on the budget set forces $\phi^* = \phi^{SP}$. Because the individual is already over-consuming food from their own perspective, the split the remaining $(1 - \phi^{SP})$ of their income between non-food and the bad such that the ratio of their marginal utilities equals the price ratio. This is exactly the allocation the social planner *would have achieved* were it feasible to leverage mental accounting to achieve $\phi^* = \phi^{SP}$.

This completes the proof because it shows that $0 < \frac{b^*}{\bar{y}} < 1$ whether the planner uses the first-order approach or manipulates the individual's food consumption directly through kink in the budget constraint. ■

Proposition 5. *When $\beta < 1$, the optimal SNAP share $\frac{b_1^*}{\bar{y}}$ is constant for all $0 \leq \kappa < \kappa^*$ and is strictly decreasing in κ for all $\kappa^* \leq \kappa < \infty$.*

Proof: TO BE COMPLETED.

If κ is high, mental accounting is an effective lever: increasing SNAP is effective at increasing food consumption to the desired level (recall that $MPCF^{SNAP} - MPCF^{cash}$ was increasing in κ), so less SNAP is required. If κ is very low, relatively more SNAP is required to increase food consumption.

Proposition 6. *If $\beta < 1$, then the optimal SNAP share $\frac{b_1^*}{\bar{y}}$ is strictly decreasing in β for all κ.*

Proof: TO BE COMPLETED.

B.4 Derivations for Results Comparing SNAP to Taxes and Subsidies

Optimal Pigouvian Tax

In the main text we claim that the optimal Pigouvian tax on the temptation good is given by the following:

$$\tau_b = \frac{(1-\beta)(1+\gamma)}{(1+\beta)(1-\gamma)}$$

If we have tax/subsidy instruments for any two of the goods (plus a lump-sum tax/transfer so we can compare welfare), then the social planner can always implement their optimal allocation across $\bar{f}, \bar{n}, c_1^b$. We only need two taxes because only relative prices matter.[39]

Consider the case in which the government can tax/subsidize both food and bads. Let $q_f = (1+\tau_f)p_f$ and q_b be the post-tax prices for food and the bad, respectively, that are faced by the consumer when the consumer chooses the consumption bundle. The planner wants change prices to induce (using first-order conditions):

$$\frac{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{f}}}{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{n}}} = p_f, \quad \frac{\frac{\partial U_{\kappa=0,\beta=1}}{\partial c_1^b}}{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{n}}} = p_b$$

[39] In theory, the social planner could do *even better* if they could price separately in each period since they also differ in weights for period 1 versus period 2 consumption. We abstract from that here.

subject to the choice constraint

$$\frac{\frac{\partial U}{\partial \bar{f}}}{\frac{\partial U}{\partial \bar{n}}} = q_f, \quad \frac{\frac{\partial U}{\partial c_1^b}}{\frac{\partial U}{\partial \bar{n}}} = q_b.$$

The optimal Pigouvian tax on food is then given by:

$$\begin{aligned}
\tau_f &= \frac{q_f}{p_f} - 1 = \frac{\frac{\partial U}{\partial \bar{f}}}{\frac{\partial U}{\partial \bar{n}}} \Big/ \frac{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{f}}}{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{n}}} - 1 \\
&= \frac{\frac{(1+\beta)\alpha_g\alpha_f}{\bar{f}}}{\frac{(1+\beta)\alpha_g\alpha_f}{\bar{n}}} \Big/ \frac{\frac{2\alpha_g\alpha_f}{\bar{f}}}{\frac{2\alpha_g\alpha_f}{\bar{n}}} - 1 = 0
\end{aligned}$$

and the optimal Pigouvian tax on the bad is then given by:

$$\begin{aligned}
\tau_b &= \frac{q_b}{p_b} - 1 = \frac{\frac{\partial U}{\partial c_1^b}}{\frac{\partial U}{\partial \bar{n}}} \Big/ \frac{\frac{\partial U_{\kappa=0,\beta=1}}{\partial c_1^b}}{\frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{n}}} - 1 \\
&= \frac{\frac{(1-\alpha_g)(1-\beta\gamma)}{c_1^b}}{\frac{(1+\beta)\alpha_g\alpha_f}{\bar{n}}} \Big/ \frac{\frac{(1-\alpha_g)(1-\gamma)}{c_1^b}}{\frac{2\alpha_g\alpha_f}{\bar{n}}} - 1 \\
&= \frac{2(1-\beta\gamma)}{(1+\beta)(1-\gamma)} - 1 = \frac{(1-\beta)(1+\gamma)}{(1+\beta)(1-\gamma)} > 0.
\end{aligned}$$

The optimal tax on food is zero and the optimal tax on the bad is positive. This is intuitive: the "internality" the social planner is concerned with is the over-consumption of the bad. Government revenue from such a tax is $\tau_b c_1^b$, the size of the tax times the consumption of the after-tax consumption of the temptation good.

Optimal Food Subsidy

In the main text, we claim that the optimal food subsidy is given by the following:

$$\tau_f = \frac{-(1-\alpha_g)(1-\beta)(1+\gamma)}{2(1+\beta)\alpha_g(1-\alpha_f) + 2(1-\alpha_g)(1-\beta\gamma)}$$

Now, suppose the planner can only change food prices but cannot tax/subsidize non-foods or bads separately. In this case, they can only affect the tradeoff of food versus other goods (but cannot directly remedy overconsumption of the bad). In the full tax-instruments case, we saw that in the first-best, the social planner wants to tax the bad. Because we are not able to affect the relevant tradeoff, food subsidies will not be able to totally correct the behavioral internality, but can skew consumption towards food and away from the non-food and the bad.

We want to calculate the food subsidy that is optimal for the social planner holding fixed the prices of the non-food versus the bad. To hold fixed the non-food versus bad tradeoff faced by the consumer, we can write c_1^b in terms of $\bar{n}$:

$$p_b = \frac{\frac{\partial U}{\partial c_1^b}}{\frac{\partial U}{\partial \bar{n}}} = \frac{\frac{(1-\alpha_g)(1-\beta\gamma)}{c_1^b}}{\frac{\alpha_g(1-\alpha_g)(1+\beta)}{\bar{n}}} \implies c_1^b = \frac{\bar{n}}{p_b}\frac{(1-\alpha_g)(1-\beta\gamma)}{\alpha_g(1-\alpha_f)(1+\beta)}$$

This makes the social planner's utility function

$$\begin{aligned} U_{\kappa=0,\beta=1}(\phi^*) &= 2\alpha_g\alpha_f \log\left(\frac{\bar{f}}{2}\right) + 2\alpha_g(1-\alpha_f)\log\left(\frac{\bar{n}}{2}\right) \\ &+ (1-\alpha_g)(1-\gamma)\log\left(\frac{\bar{n}}{p_b}\frac{(1-\alpha_g)(1-\beta\gamma)}{\alpha_g(1-\alpha_f)(1+\beta)}\right) \end{aligned}$$

Setting the social planner's ratio of marginal utilities equal to the pre-tax price ratio:

$$\begin{aligned} p_f &= \frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{f}} \Big/ \frac{\partial U_{\kappa=0,\beta=1}}{\partial \bar{n}} \\ &= \left(\frac{2\alpha_g\alpha_f}{\bar{f}}\right) \Big/ \left(\frac{2\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\gamma)}{\bar{n}}\right) \end{aligned}$$

Analogously setting the consumer's ratio of marginal utilities equal to the post-tax price ratio gives:

$$q_f = \frac{\partial U}{\partial \bar{f}} \Big/ \frac{\partial U}{\partial \bar{n}} = \left(\frac{(1+\beta)\alpha_g\alpha_f}{\bar{f}}\right) \Big/ \left(\frac{(1+\beta)\alpha_g(1-\alpha_f)+(1-\alpha_g)(1-\beta\gamma)}{\bar{n}}\right)$$

Setting the tax to correct the wedge between the marginal utility of consumption for the consumer versus the planner gives:

$$\begin{aligned} \tau_f &= \frac{q_f}{p_f} - 1 = \frac{2(1+\beta)\alpha_g(1-\alpha_f)+(1+\beta)(1-\alpha_g)(1-\gamma)}{2(1+\beta)\alpha_g(1-\alpha_f)+2(1-\alpha_g)(1-\beta\gamma)} - 1 \\ &= \frac{-(1-\alpha_g)(1-\beta)(1+\gamma)}{2(1+\beta)\alpha_g(1-\alpha_f)+2(1-\alpha_g)(1-\beta\gamma)} \end{aligned}$$

When only the price of food can be manipulated, the optimal policy is a subsidy of size τ_f on each unit of food consumed. The government's revenue is $\tau_f f < 0$.

B.5 Technical Notes on "Quadratic" and "Absolute Value" Functional Forms for Mental Accounting

In the proofs, we found that $\frac{\partial \phi^*}{\partial y_1} < \frac{\partial \phi^*}{\partial b_1}$ for all $\kappa > 0$, and that $\frac{\partial \phi^*}{\partial b_1} > 0$. However, we also have the somewhat counter-intuitive result that at low ϕ, $\frac{\partial \phi^*}{\partial y_1} > 0$. The reason for this lies in our quadratic mental accounting formula.

Recall that the consumer's optimality condition is:

$$\frac{\partial U}{\partial \phi}(\phi^*) = \frac{\alpha_g\alpha_f(1+\beta)}{\phi^*} - \frac{\alpha_g(1-\alpha_f)(1+\beta)+(1-\alpha_g)(1-\beta\gamma)}{1-\phi^*} + 2\kappa(y+b)(\phi_0 y + b - \phi^*(y+b)) = 0$$

Rewriting to put the mental accounting component of utility ($\kappa\frac{\partial U_B}{\partial \phi}$) on the LHS and neoclassical

utility ($\frac{\partial U_A}{\partial \phi}$) on the RHS:

$$2\kappa((\phi_0 - \phi^*)y + (1-\phi^*)b)(y+b) = \frac{\alpha_g(1-\alpha_f)(1+\beta) + (1-\alpha_g)(1-\beta\gamma)}{1-\phi^*} - \frac{\alpha_g\alpha_f(1+\beta)}{\phi^*}$$

From the LHS, we can see that an increase in y does two things:

1. Pulls mental accounting towards ϕ_0 (this is the $(y+b)$ term)
2. Increases the absolute size of the mental accounting penalty (this is the $((\phi_0-\phi^*)y+(1-\phi^*)b)$ term)

The RHS doesn't depend on y because Cobb-Douglas implies constant expenditure shares.

Holding fixed ϕ^*, the derivative of the LHS with respect to y is :

$$\begin{aligned}\frac{\partial}{\partial y_1}[2\kappa((\phi_0-\phi^*)y+(1-\phi^*)b)(y+b)] &= 2\kappa[(\phi_0-\phi^*)y+(1-\phi^*)b+(\phi_0-\phi^*)(y+b)] \\ &= 2\kappa[2(\phi_0-\phi^*)y+(1+\phi_0-2\phi^*)b]\end{aligned}$$

1. If $\phi^* = \frac{1}{2}[\phi_0 + \frac{\phi_0 y+b}{y+b}]$, then $\frac{\partial LHS}{\partial y_1} = 0$: ϕ^* does not have to adjust to an incremental change in y, and $\frac{\partial \phi^*}{\partial y_1} = 0$.
2. If $\phi^* < \frac{1}{2}[\phi_0 + \frac{\phi_0 y+b}{y+b}]$, $\frac{\partial LHS}{\partial y_1} > 0$. In words, a marginal increase in y increases the marginal utility of food consumption through mental accounting without changing the consumer's neoclassical utility. The consumer adjusts ϕ upwards to reach the new equilibrium ϕ^*, and $\frac{\partial \phi^*}{\partial y_1} > 0$ (this was the puzzling result from before). The increase in the overall importance of mental accounting $(y+b)$ outweighs the importance of the pulling the mental account back towards ϕ_0 $((\phi_0-\phi^*)y+(1-\phi^*)b)$
3. If $\phi^* < \frac{1}{2}[\phi_0 + \frac{\phi_0 y+b}{y+b}]$, we have the opposite of the previous bullet point, and $\frac{\partial \phi^*}{\partial y_1} < 0$, which is what we expected/what we find with absolute value mental accounting.

Note that this same thing doesn't happen under absolute value mental accounting (as in Farhi-Gabaix or Hastings-Shapiro). If we rewrite the mental accounting component of utility as $-\kappa|\phi_0 y + b - \phi^*(y+b)|$, the consumer's optimality condition becomes:

$$\frac{\partial U}{\partial \phi}(\phi^*) = \frac{\alpha_g\alpha_f(1+\beta)}{\phi^*} - \frac{\alpha_g(1-\alpha_f)(1+\beta) + (1-\alpha_g)(1-\beta\gamma)}{1-\phi^*} + \kappa(y+b) = 0$$

Rearranging as before:

$$\kappa(y+b) = \frac{\alpha_g(1-\alpha_f)(1+\beta) + (1-\alpha_g)(1-\beta\gamma)}{1-\phi^*} - \frac{\alpha_g\alpha_f(1+\beta)}{\phi^*}$$

The LHS no longer has a squared term in y, so everything is monotonic and we don't have to do all the gymnastics from before.

Main Takeaways

- Quadratic mental accounting unexpectedly generates that $\frac{\partial \phi^*}{\partial y_1} > 0$ for small ϕ. For small ϕ, $MPCF^{cash} > \phi$, which is greater than $MPCF^{cash} = \phi$ that log utility would generate. This

does not happen with absolute value mental accounting.

- However, we always have $\frac{\partial \phi^*}{\partial b_1} > \frac{\partial \phi^*}{\partial y_1}$ when $\kappa > 0$ ($MPCF^{SNAP} > MPCF^{cash}$). For the social planner who is considering the tradeoffs of SNAP vs Cash, this doesn't substantively change any of the points we are trying to make about cash vs. in-kind transfers.

- The functional form of mental accounting matters beyond first derivatives.

B.6 Dynamic Model to Compare Within-Month Effects to Effects of Permanent Policy Changes

Our empirical results are based on estimating individuals' responses to *anticipated* transfers each month (either cash transfers or in-kind transfers). The two-period model in the main text makes it difficult to distinguish inter-temporal responses to anticipated transfers from uncompensated responses that would arise from permanent policy changes that would provide recurring cash transfers and/or in-kind transfers each month.

This section clarifies the mapping between the "within-month" estimated effects that represent the behavioral response to an anticipated transfer (which is what we estimate in the empirical analysis) and the "total" uncompensated effects of permanent policy changes. To do this, we extend the two-period model to a four-period model so that the consumer can respond to anticipated future transfers while receiving (and consuming) transfers in the current period.

Model setup

As in the main model, we allow for self-control problems ($\beta < 1$) as well as mental accounting ($\kappa > 0$). There are four periods $t = 1...4$. The consumer receives either cash transfers y_t in periods $t = 1$ and $t = 3$ or SNAP benefits b_1 and b_3 in $t = 1$ and $t = 3$, and receives a constant wage $w_t = w$ every period. The purpose of the wage income is so the consumer can have baseline consumption prior to the transfer to study the impact of introducing the tranfer.

We will work with a β-δ utility function and will assume $\delta = 1$ so that the individual at the start of period 1 maximizes the following:

$$\begin{aligned} U &= U_1 + \beta * (U_2 + U_3 + U_4) \\ &\quad -\kappa * (\phi_0(4 * w + y_1 + y_3) + b_1 + b_3 - (f_1 + f_2 + f_3 + f_4))^2 \end{aligned}$$

where κ governs the strength of mental accounting as in the main model, and $U_1, ...U_4$ are the per-period utility functions. The per-period utility functions are defined as follows:

$$\begin{aligned} U_1 &= \alpha_g \alpha_f \log(f_1) + \alpha_g(1-\alpha_f)\log(n_1) + (1-\alpha_g)\log(c_1^b) \\ U_2 &= \alpha_g \alpha_f \log(f_2) + \alpha_g(1-\alpha_f)\log(n_2) + (1-\alpha_g)\log(c_2^b) - \gamma(1-\alpha_g)\log(c_1^b) \\ U_3 &= \alpha_g \alpha_f \log(f_3) + \alpha_g(1-\alpha_f)\log(n_3) + (1-\alpha_g)\log(c_3^b) - \gamma(1-\alpha_g)\log(c_2^b) \\ U_4 &= \alpha_g \alpha_f \log(f_4) + \alpha_g(1-\alpha_f)\log(n_4) - \gamma(1-\alpha_g)\log(c_3^b) \end{aligned}$$

where the α_g and α_f parameters are the same share parameters as in the main model. In each period except in the last period the consumer can consume the temptation good, with a future negative health consequence in the following period.

Benchmark: Permanent Income Hypothesis (PIH)

If $\kappa = 0$ and $\beta = 1$ and the consumer can freely borrow and save at an exogenous interest rate $r = 0$ between periods, then the individual will have constant consumption for all of the goods in every period because of full consumption smoothing for all vlues of y, b, and w. This means there would be no observed change in consumption in any of the goods following the transfer in $t = 3$ relative to $t = 2$.

Benchmark: Present Bias With Saving and Borrowing

If we now assume $\beta < 1$ but continue to assume $\kappa = 0$ and $r = 0$, then instead of observing constant consumption as in the PIH benchmark above, the individual will instead choose strictly declining consumption for all goods over time. In other words, whether the consumer receives a cash transfer (y) or SNAP (b) or both, the individual will not increase consumption between $t = 2$ and $t = 3$ because the present-biased consumer chooses to borrow in anticipation of the receipt of future transfer income. In other words, present bias alone is not sufficient to observe an increase in consumption between $t = 2$ and $t = 3$.

Present Bias With Saving But No Borrowing

We now introduce strict borrowing constraints, so that the consumer can save between periods but cannot borrow, and we continue to assume $\beta < 1$.

If $y_1 = y_3 = b_1 = b_3 = 0$, then in this case we have perfect consumption smoothing because the individual is consuming hand-to-mouth and wage income is constant. The consumer would prefer to borrow from future wage income because of present bias, but is unable to do so because of the strict borrowing constraints.

Now suppose that a cash transfer program is introduced ($y_1 = y_3 = \bar{y}$) which is assumed to be small relative to the wage income (i.e., $\bar{y} << \bar{w}$). In this case, the consumer will increase consumption in $t = 3$ relative to $t = 2$ for all goods. If β is sufficiently low and the transfer is small, then the consumer will continue to be hand-to-mouth because they would prefer to borrow from the future transfer income to finance consumption, but the consumer is unable to borrow.

Finally, suppose that SNAP transfers are introduced instead ($b_1 = b_3 = \bar{b}$) which are also assumed to be small relative to the wage income (i.e., $\bar{b} << \bar{w}$). In this case, the consumer will again increase consumption in $t = 3$ relative to $t = 2$. If $\kappa = 0$ and SNAP is infra-marginal (which is likely to be the case when $\bar{b}$ is small), then SNAP has the same effect on consumption as the cash transfer program. If $\kappa > 0$, however, then the consumer will increase food consumption between $t = 2$ and $t = 3$ by relatively more than the consumer would if the same amount had been transferred as cash. The consumer will also increase consumption of the temptation good between $t = 2$ and $t = 3$ by relatively less than the consumer would if the same amount had been transferred as cash.

In simulations, we find that the $t = 2$ to $t = 3$ increase in consumption of each good (after introduction of cash tranfser program or SNAP benefit) is related to the "lifetime" MPC from the introduction of the cash transfer program or SNAP benefit, which provides the mapping between the within-month estimates and the total uncompensated effects that are needed for the optimal policy calibrations. In the special case where $w_t = w$ for all periods prior to the introduction of the recurring cash transfer or SNAP benefit, the $t = 2$ to $t = 3$ increase in consumption for each good is identical to the "lifetime" MPC for each good; that is, the change in consumption is exactly equal

to the marginal propensity to consume each good across all periods relative to the total transfer across distributed across all periods.

Intuitively, if the reason why consumption "spikes" immediately after receipt of cash transfer or SNAP comes from a combination of present bias and borrowing constraints, then our "within-month" estimates are informative about the degree of mental accounting as well as the extent to which cash and SNAP have "permanently" different effects of consumption.

Dynamic Model Simulation

To quantitatively illustrate the results described above, we simulate the dynamic model with the following parameters:

- $w_t = w = 10$
- $\beta = 0.7$, $\delta = 1$
- $\alpha_g = 0.8$, $\alpha_f = 0.15$
- $\gamma = 0.75$

We solve the model assuming the consumer is a naive hyperbolic discounter, which means solving the model sequentially.[40] Solving the model gives the following consumption choices:

- $f_1 = f_2 = f_3 = 1.34$, $f_4 = 1.5$
- $n_1 = n_2 = n_3 = 7.60$, $n_4 = 8.5$
- $c_1^b = c_2^b = c_3^b = 1.06$

Note that there is full consumption smoothing (except for the fact that the temptation good is not consumed in the last period and that amount is then proportionally divided between food and non-food consumption based on α_f).

Cash transfers. Now we introduce a recurring cash transfer $y_1 = y_3 = 1$. We re-solve the model and find the following consumption choices:

- $f_1 = f_3 = 1.47$, $f_2 = 1.34$, $f_4 = 1.5$
- $n_1 = n_3 = 8.36$, $n_2 = 7.60$, $n_4 = 8.5$
- $c_1^b = c_3^b = 1.17$, $c_2^b = 1.06$

The change in consumption between $t = 2$ and $t = 3$ are given by the following:

- $f_3 - f_2 = 0.13$ (equal to lifetime $MPCF$)

[40] Specifically, we have the consumer maximize $U = U_1 + \beta * (U_2 + U_3 + U_4) - \kappa(\cdot)^2$ and make period 1 consumption choices. Then with remaining income, the consumer maximizes $U = U_2 + \beta * (U_3 + U_4) - \kappa(\cdot)^2$ and then maximizes $U = U_3 + \beta * U_4 - \kappa(\cdot)^2$. One technical issue is how to model mental accounting considerations dynamically. We assume that the consumer only cares about mental accounting during the periods that the SNAP benefits are distributed (in $t = 1$ and $t = 3$). This corresponds to the consumer spending all of their SNAP benefits in $t = 1$ and $t = 3$ and then no longer considering mental accounting in $t = 2$ and $t = 4$.

- $n_3 - n_2 = 0.76$ (equal to lifetime $MPCN$)
- $c_3^b - c_2^b = 0.11$ (equal to lifetime $MPCB$)

It is straightforward to show that these consumption changes are the same as the implied "lifetime" marginal propensities to consume each good out of the additional cash transfers.

SNAP Transfers. Now we introduce a recurring SNAP transfer $b_1 = b_3 = 1$, and assume $\kappa = 0.025$ so that the consumer engages in mental accounting. We re-solve the model and get the following:

- $f_1 = f_3 = 1.93$, $f_2 = 1.34$, $f_4 = 1.5$
- $n_1 = n_3 = 7.96$, $n_2 = 7.60$, $n_4 = 8.5$
- $c_1^b = c_3^b = 1.11$, $c_2^b = 1.06$

The change in consumption between $t = 2$ and $t = 3$ are given by the following:

- $f_3 - f_2 = 0.59$ (equal to lifetime $MPCF$)
- $n_3 - n_2 = 0.36$ (equal to lifetime $MPCN$)
- $c_3^b - c_2^b = 0.05$ (equal to lifetime $MPCB$)

As with the cash transfer, it is straightforward to show that these consumption changes are exactly the same as the implied "lifetime" marginal propensities to consume each good out of the SNAP transfers. This shows that the "within-month" ($t = 2$ to $t = 3$) increases in consumption following receipt of cash transfer or SNAP benefit are exactly the same as the "lifetime" MPCs in the special case of hand-to-mouth consumption with otherwise smooth consumption in the absence of the transfers.

In additional simulations, we generally that the $t = 2$ to $t = 3$ increase in food consumption and consumption of temptation good is larger when the "lifetime" MPCF and MPCB values are larger, respectively, so that even when two values are not exactly the same they are generally informative about the relative magnitudes. That is, when the $t = 2$ to $t = 3$ increase in food consumption is larger for SNAP than for cash, the simulation also shows that $MPCF^{SNAP} > MPCF^{cash}$. Additionally, absent mental accounting the $t = 2$ to $t = 3$ increases in consumption of all goods is the same for cash and SNAP, which is what we expect when SNAP benefits are non-fungible.

Intuitively, the reason why the within-month estimate is identical to the total uncompensated effect in the simulation is that there is no effect of the cash transfer or SNAP benefits on consumption of any good in the period prior to the receipt of the transfer. This is because the transfer from the prior period (in $t = 1$) is already fully "spent" in $t = 1$ and none of it saved for $t = 2$, because the consumer consumes out of their wage income in $t = 2$. Additionally, consumption would otherwise be constant in absence of the transfer, so that the $t = 2$ to $t = 3$ increase is entirely coming from the transfer. This would be violated if, for example, there were other sources of income that also arrived in $t = 3$ that did not arrive $t = 2$. In our empirical work, both the SSI and SNAP research designs address potential confounding effects of other income arriving at the same time. The issue of the recurring transfers affecting consumption throughout the month, there is an existing literature on the "food stamp nutrition cycle" that generally finds that SNAP affects

food consumption much more immediately after benefits are distributed and much less towards the end of each SNAP benefit monthly cycle. In this case, our within-month estimates may be quite close to the total uncompensated effects of introducing or increasing the value of recurring monthly transfers (whether cash or in-kind).

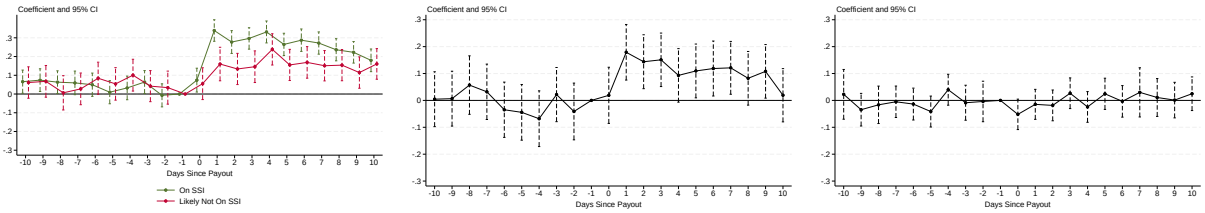
B.7 Welfare Calibration Details

B.8 Allowing for Heterogeneity

C Appendix Figures

Figure OA.1: Effects of SSI and SNAP on Drug-and-Alcohol-related ER Visits, Overlap Sample

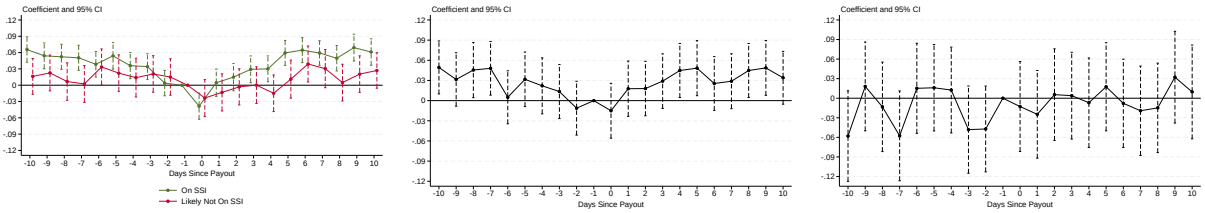
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is drug-and-alcohol-related ER visits per 10,000 individuals. In (a)-(b), N person-months on SSI = 9,738,800 and N person-months not likely on SSI = 12,908,794. In (c), N person-months on SNAP = 22,647,594. Standard errors are heteroskedasticity-robust.

Figure OA.2: Effects of SSI and SNAP on Nutrition-Sensitive ER Visits, Overlap Sample

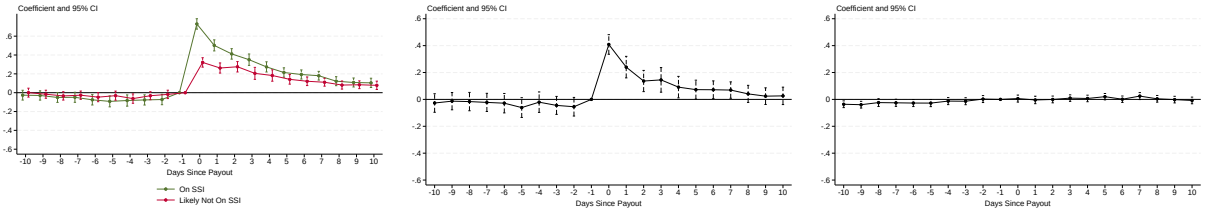
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is nutrition-sensitive ER visits per 10,000 individuals. In (a)-(b), N person-months on SSI = 9,738,800 and N person-months not likely on SSI = 12,908,794. In (c), N person-months on SNAP = 22,647,594. Standard errors are heteroskedasticity-robust.

Figure OA.3: Effects of SSI and SNAP on First Fills, Overlap Sample

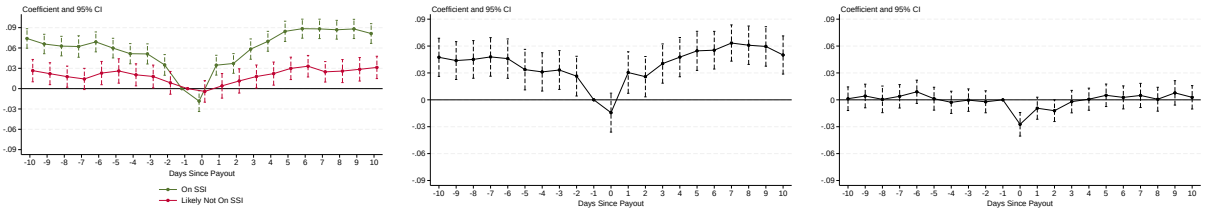
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is "first fills" per 10,000 individuals. In (a)-(b), N person-months on SSI = 4,726,243 and N person-months not likely on SSI = 2,731,964. In (c), N person-months on SNAP = 7,458,207. Standard errors are heteroskedasticity-robust.

Figure OA.4: Effects of SSI and SNAP on All ER Visits

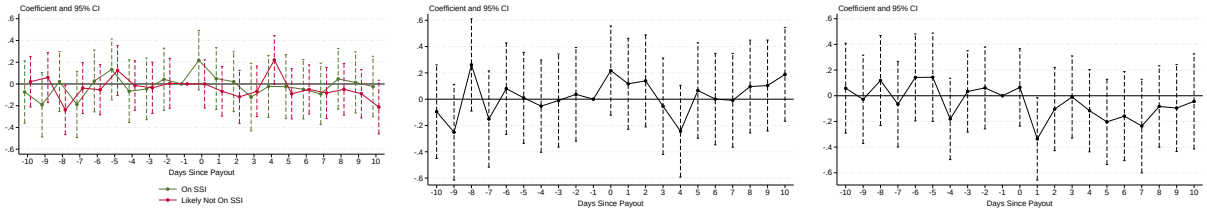
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is ER visits for any reason per 10,000 individuals. In (a)-(b), N person-months on SSI = 19,122,759 and N person-months not likely on SSI = 133,056,093. In (c), N person-months on SNAP = 29,223,459. Standard errors are heteroskedasticity-robust.

Figure OA.5: Effects of SSI and SNAP on Hypoglycemia ER Visits

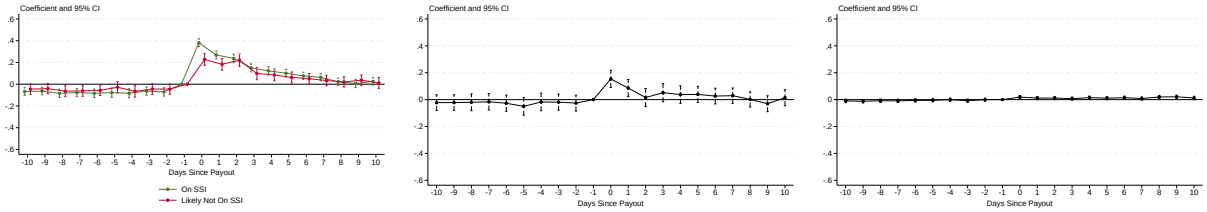
(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is hypoglycemia ER visits per 10,000 individuals. In (a)-(b), N person-months on SSI = 19,122,759 and N person-months not likely on SSI = 133,056,093. In (c), N person-months on SNAP = 29,223,459. Standard errors are heteroskedasticity-robust.

Figure OA.6: Effects of SSI and SNAP on Re-Fills

(a) SSI Cycle (Equation 1) (b) SSI Cycle, DD (Equation 1) (c) SNAP Cycle (Equation 2)



Notes: This figure shows estimates of (a) α_l (in red) overlaid with $\alpha_l + \beta_l$ (in green) from equation 1, (b) β_l from equation 1, and (c) β_r from equation 2. The outcome variable is re-fills (i.e. fills that are not first fills of a therapeutic class) per 10,000 individuals. In (a)-(b), N person-months on SSI = 9,744,088 and N person-months not likely on SSI = 8,402,170. In (c), N person-months on SNAP = 8,498,230. Standard errors are heteroskedasticity-robust.

D Appendix Tables

Table OA.1: SNAP Payout Day Schedule

Last Digit of Case Number	Day of the Month (before 9/1/2012)	Day of the Month (before 9/1/2012)
1	1	11
2	2	2
3	3	13
4	4	4
5	5	15
6	6	6
7	7	17
8	8	8
9	9	19
0	10	10

Notes: This table shows conversion between last digit of a SNAP recipient's case number and SNAP payout day. In 9/12/2012, SNAP recipients beginning a new SNAP spell, whose case number ended with an odd digit, were assigned different payout days than previously, as noted by the difference in columns 2 and 3.

Table OA.2: Sample Restrictions

		On SSI	Likely Not On SSI	On SNAP
	Original	20,113,228	184,884,368	36,735,361
SNAP Restrictions	SNAP Benefit Amount > 0	20,113,228	184,884,368	36,560,144
	Unique Benefit Amount and Benefit Type	20,113,228	184,884,368	35,020,822
	One Case Number per Spell	20,113,228	184,884,368	34,730,779
SSI Restrictions	No Treated Observations from Year After Death	20,080,211	184,884,373	34,730,779
	Control Households Never on SSI	20,080,211	133,976,304	34,730,779
Restrictions on All Samples	Spells 12+ Months Long	19,642,819	133,976,304	30,505,480
	Person-Months not on TANF	19,122,759	133,056,093	29,223,459
Drug Fills Restrictions	Person-Months on Medicaid	19,122,759	27,443,672	19,346,825
	Not Dual After 2006	11,436,710	16,040,795	10,414,339
	Can Observe Drug Fill Dates	9,744,088	8,402,170	8,498,230

Notes: This table show the changes in number of person-months in the on-SSI, likely-not-on-SSI, and SNAP samples, as we sequentially restrict the samples. A "spell" is defined as a set of consecutive months on or off SSI, or on SNAP. Within the drug fills restrictions, the restriction "Not Dual After 2006" entails dropping the following: (1) any person-years after 2006 in which a person is age 65+ and on Medicaid and (2) all person-years after 2006 if a person is ever a dual from 2006-2019 when they are age 64 or below. The restriction "Can Observe Drug Fill Dates" refers to the fact that we do not directly observe drug fill dates in the Medicaid pharmacy files; we use an algorithm which matches Medicaid pharmacy data to the all-payer hospital and ED records, allowing us to back out the dates of fills, and in the process drop individuals who do not match across the files.

Table OA.3: Summary Statistics, Prescription Drug Fills Samples

	SNAP Sample	SSI Sample		Overlap Sample: On SNAP and Either On or Likely Not On SSI		
	On SNAP	On SSI	Likely Not On SSI	Full	On SSI	Likely Not On SSI
Panel A: Demographics						
Mean Age	53.341	56.329	53.040	53.966	57.167	48.429
Share 65+	0.175	0.225	0.259	0.187	0.224	0.124
Share 40-64	0.694	0.690	0.500	0.691	0.729	0.626
Share less than 40	0.131	0.085	0.241	0.122	0.048	0.250
Share Female	0.696	0.639	0.726	0.702	0.656	0.758
Share White	0.381	0.341	0.510	0.382	0.327	0.447
Share Black	0.477	0.472	0.434	0.484	0.478	0.491
Share Other	0.142	0.187	0.056	0.134	0.195	0.062
Share Missing	0.000	0.000	0.000	0.000	0.000	0.000
Panel B: Outcomes per Month						
All Drug Fills	2.596	3.155	1.671	2.636	3.200	1.745
First Fills	0.447	0.435	0.358	0.442	0.464	0.404
Panel C: Share Receiving Benefits						
Person-Months on SNAP	1.000	0.521	0.376	1.000	1.000	1.000
Person-Months on SSI	0.561	1.000	0.000	0.634	1.000	0.000
People ever on SNAP	1.000	0.732	0.605	1.000	1.000	1.000
People ever on SSI	0.523	1.000	0.000	0.543	1.000	0.000
N Person-Months	8,498,230	9,744,088	8,402,170	7,458,207	4,726,243	2,731,964
N Unique Individuals	168,468	121,464	141,246	148,572	80,614	67,958

Notes: This table presents descriptive statistics for the SNAP drug fills sample (column (1)), the SSI drug fills sample (columns (2) and (3)), and the overlap drug fills sample (columns (4)-(6)), derived from the Medicaid data. Mean age is calculated as the average age across person-months in each sample defined by the column headers. Drug fills per month are calculated by averaging number of drug fills to the month level, then averaging across months. "Other" nests all non-Black, non-white, and non-missing racial categories. As of 2014, filling out the race field was no longer required on the South Carolina Medicaid application form.