Heterogeneity and Aggregate Consumption: An Empirical Assessment *

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Abstract

We provide an empirical assessment of a central implication of models with idiosyncratic income risk and incomplete markets: the existence of a role for the distribution of wealth in shaping the dynamics of aggregate consumption. Estimates of consumption Euler equation models extended to include wealth distribution statistics show the latter to have a negligible quantitative impact on aggregate consumption. This contrasts with the important role played by current disposable income, even when we use data for households with (relatively) high liquid wealth. The latter finding suggests the presence of a significant behavioral component behind the high sensitivity of consumption to current income.

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1 Introduction

The recent literature on Heterogenous Agents New Keynesian (HANK) models has spurred a renewed interest on the role of heterogeneity in aggregate fluctuations, challenging the decades-long dominance of the representative consumer as a default assumption in business cycle models.[1] In the HANK literature heterogeneity is introduced by assuming that households experience idiosyncratic income shocks which cannot be insured against because of incomplete financial markets. On the other hand, the possibility of borrowing and lending (e.g. through riskless bonds), though subject to some constraints, allows households to partly smooth their consumption, while giving rise to a non-degenerate wealth distribution. As a result, the latter becomes a state variable of the model, shaping how the economy responds to different shocks at any point in time.[2] The presence of the wealth distribution as a state variable is, on the other hand, the main reason behind the need to use numerical methods to solve even the simplest versions of HANK models, an aspect which renders them somewhat of a black-box, limiting their use in certain contexts (e.g. in the classroom).

In earlier work (Debortoli and Galí 2025) we argued that a suitably designed Two-Agent New Keynesian (TANK) model can provide a good approximation to the predictions of different versions of HANK models regarding the response of *aggregate* variables to a variety of *aggregate* shocks. In TANK models, the absence of idiosyncratic income shocks and, hence, of a time-varying wealth distribution that acts as a state variable, renders those models as tractable as the benchmark representative agent model, simplifying considerably their analysis relative to their HANK counterparts.

Our aim in the present paper is to asses *empirically* the extent to which the observed distribution of wealth has some predictive power for aggregate consumption. Thus, while our previous work sought to assess the importance for aggregate economic fluctuations of idiosyncratic income shocks and the resulting time-varying wealth distribution *in the context of theoretical models*, the present paper seeks to uncover the relevance of those factors *in the data*.

Our empirical approach seeks to quantify the role of several wealth distribution statistics in shaping the dynamics of aggregate consumption, as well as average consumption of households classified as unconstrained. We construct our wealth distribution statistics using the "real-time inequality" dataset of Blanchet, Saez and Zucman (2022), which contains quarterly estimates of the distribution of wealth and disposable income obtained by combining several data sources. The same dataset allows us to identify financially (un)constrained households following criteria similar to Aguiar, Bils and Boar (2024).

We estimate both reduced form Granger causality regressions as well as theory-consistent Euler equations for both aggregate and unconstrained consumption, augmented to include wealth distribution statistics, in addition to dsiposable income measures as in Campbell and Mankiw (1989). Our estimates show the wealth distribution statistics to have a *negligible quantitative impact on aggregate consumption*. This contrasts with the *important role played by current disposable income*, *even when we restrict our analysis to households with (relatively) high liquid wealth*. We interpret the latter finding as suggesting the presence of a significant

[1] See, e.g. Kaplan et al (2018) and Auclert et al. (2023) for examples of such models.

[2] The previous features are then combined with a supply block that is similar (if not fully identical) to that characterizing the standard New Keynesian model. In particular, the supply block assumes monopolistically competitive firms as well as nominal rigidities, thus allowing monetary policy to have real effects.

behavioral component behind the high sensitivity of consumption to current income.

Related Literature. Our paper belongs to the large empirical literature on the determinants of *aggregate* consumption fluctuations, based on Euler equation estimations. Seminal contributions in this area include Hall (1988), who employs a representative agent framework, and Campbell and Mankiw (1989), who extend the analysis by incorporating a fraction of "rule-of-thumb" consumers. We depart from this literature by shifting the focus toward the role of wealth distribution, drawing on theoretical insights from the more recent Heterogeneous Agent New Keynesian (HANK) literature.

In recent years, a growing body of empirical research has sought to quantify the implications of household heterogeneity for aggregate economic fluctuations, using a variety of different approaches. Notable contributions include Auclert et al. (2021), Bayer, Born, and Luetticke (2024), and Acharya et al. (2024), who provide structural estimates of fully-fledged HANK models, while Bilbiie, Primiceri, and Tambalotti (2024) estimate a more tractable two-agent version of the HANK framework. Fernández-Villaverde, Hurtado, and Nuño (2019), Liu and Plagborg-Moeller (2023), Chan, Chen, and Schorfheide (2024) developed general empirical strategies that integrate macroeconomic time series and micro-level data into a single framework. Differently from these studies, we adopt a limited-information approach, exploiting a (generalized) Euler equation that is valid in a broad class of heterogeneous-agent models (with two or more households).

In this respect, our approach is related to Berger, Bocola, and Dovis (2023), who employ detailed household survey data to quantify the role of precautionary savings and idiosyncratic income risk in shaping aggregate consumption volatility. However, while their focus lies primarily on income risk and precautionary motives, our analysis centers on disentangling the distinct roles of wealth distribution and hand-to-mouth behavior as drivers of aggregate consumption fluctuations.

The remainder of the paper is organized as follow. In section 2 we describe the data used in our empirical work. Section 3 presents some basic reduced form evidence. Section 4 describes the theoretical framework underlying our empirical consumption Euler equations, reports estimates of the latter based on both total wealth and liquid wealth, and discusses the findings and their interpretation. Section 5 concludes.

2 Data

Our empirical approach makes use of the household-level data on wealth and disposable income for the U.S. economy from the "Real-Time Inequality" data set described in Blanchet, Saez and Zucman (2022). That dataset combines the information contained in several high-frequency public data sources, as well as the quarterly national accounts statistics.[3]

The information contained in that dataset allows us to construct time series for a number of statistics describing the cross-sectional distribution of both total and liquid wealth, net of the corresponding liabilities, for all households, or for a subset of households meeting some criterion.

[3]Data can be downloaded from the *realtimeinequality.org* website.

In particular, we compute three statistics: mean (relative to lagged disposable income), standard deviation and skewness (the latter two relative to mean wealth).

We use criteria similar to those proposed in Aguiar, Boar and Bils (2024), to partition for each period the set of households into two groups: (financially) *constrained* and *unconstrained*, and compute for each group their average disposable income, as well as the three statistics introduced above describing their respective wealth distributions. The two criteria we use are, respectively: (1) net wealth greater or smaller than two months of disposable income, and (2) net liquid wealth (liquid assets minus non-mortgage debt) greater or smaller than one week of disposable income.

The previous approach allows us to measure, for each period, the fraction of constrained and unconstrained households, and to compute several statistics of interest regarding their disposable income and wealth.

In addition, and under the maintained assumption that financially constrained households consume their disposable income, we can use the previous data to construct measures of average consumption for unconstrained households, by subtracting total disposable income of constrained households from aggregate consumption and dividing the resulting value by the number of unconstrained households. We refer to the resulting variable as *unconstrained consumption*.

The data frequency is quarterly and spans the period 1976Q1-2029Q4. We leave out the COVID episode since it clearly distorts all of our estimates due to the unusual comovements between disposable income and consumption.

3 Wealth Distribution and Aggregate Consumption: Reduced Form Evidence

In this section we report some basic reduced form evidence regarding the role of the wealth distribution in shaping the dynamics of aggregate consumption. Table 1 focuses on Granger causality tests based on the OLS regression

$$\Delta c_t = \alpha + \sum_{k=1}^{K} (\beta_k \Delta c_{t-k} + \gamma_k \delta_{t-k}) + \varepsilon_t$$

where c_t is the log of (per capita) consumption and δ_t includes one or more statistics describing the cross-sectional distribution of wealth in period t. The Table reports the p-value corresponding to the null hypothesis that $\gamma_1 = ... = \gamma_K = 0$, as well as the increase in the R^2 resulting from the addition of wealth distribution statistics in the above regression. Results are reported using both aggregate consumption and unconstrained consumption. For each case, we report results based on wealth distribution statistics for both total wealth and liquid wealth. We set $K = 4$.

The null hypothesis of no predictive power for consumption growth of wealth distribution statistics cannot be rejected at a 5% significance level in any of the cases considered. Furthermore, the increases in the R^2 statistic are well below 0.1 in all cases, pointing to an effect of wealth distribution statistics that is an order of magnitude smaller than observed variations in per capita consumption.

4 Wealth Distribution and Aggregate Consumption: Empirical Euler Equations

In this section we revisit the existing evidence on empirical Euler equations and extend it to allow the wealth distribution to play a role as a factor underlying variations in aggregate consumption. Our objective is to test empirically the significance of that role and to quantify its importance. We start with a brief review of the theory underlying our empirical specification.

4.1 A Model of Aggregate Consumption and Idiosyncratic Income Shocks

Consider an economy with a continuum of infinitely-lived consumers, indexed by $j \in [0,1]$. Each consumer seeks to maximize utility $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t(j))$ where $C_t(j)$ is an index of the quantity of goods consumed. We assume $U(C) \equiv \frac{C^{1-\sigma}-1}{1-\sigma}$, where σ is the coefficient of relative risk aversion. The period budget constraint is given by:

$$C_t(j) + B_t(j) = R_{t-1} B_{t-1}(j) + X_t(j)$$

where $B_t(j)$ denotes the quantity of one-period riskless bonds yielding a gross real interest R_t and $X_t(j)$ combines all sources of disposable income other than the interest on bonds. $X_t(j)$ is assumed to have both an aggregate and an idiosyncratic component. We assume a borrowing constraint $B_t(j) \geq \underline{B}_t(j)$ where $\underline{B}_t(j) \leq 0$ for all t.

4.1.1 Unconstrained Consumers

Let $\mathcal{U}_t \equiv \{j \in [0,1] : B_t(j) > \underline{B}_t(j)\}$ denote the subset of consumers for whom the borrowing constraint is not binding in period t. Then

$$1 = \beta R_t \mathbb{E}_t\{(C_{t+1}(j)/C_t(j))^{-\sigma}\}$$

for all $j \in \mathcal{U}_t$. We assume $\mathcal{U}_t$ has measure $1-\lambda_t$. Henceforth we refer to these consumers as *the unconstrained*.

As shown in the Appendix, a second-order Taylor expansion of the previous equation yields

$$\mathbb{E}_t\left\{\frac{\Delta C_{t+1}(j)}{C_t(j)}\right\} \simeq \frac{1}{\sigma}\left(1-\frac{1}{\beta R_t}\right) + \frac{\sigma+1}{2} v_t(j) \tag{1}$$

where $v_t(j) \equiv \mathbb{E}_t\left\{\left(\frac{\Delta C_{t+1}(j)}{C_t(j)}\right)^2\right\} \simeq var_t\{c_{t+1}(j)\}$ with $c_t(j) \equiv \log C_t(j)$. Note that $v_t(j)$ is a measure of individual consumption risk. By including the "second order" term $v_t(j)$ we are implicitly allowing its variations to be of the same order of magnitude as variations in R_t and other aggregate variables. Note that in the absence of idiosyncratic income risk, $v_t(j) = v_t = var_t\{c_{t+1}\}$, which variations are an order of magnitude smaller than those in aggregate consumption, are are thus generally ignored.

Integrating (10) over $j \in \mathcal{U}_t$ we obtain:[4]

$$\mathbb{E}_t \left\{ \frac{C^U_{t+1|t} - C^U_t}{C^U_t} \right\} \simeq \frac{1}{\sigma}\left(1 - \frac{1}{\beta R_t}\right) + \frac{\sigma+1}{2} v^U_t$$

where $C^U_t = \frac{1}{1-\lambda_t}\int_{j\in\mathcal{U}_t} C_t(j)dj$, $C^U_{t+1|t} = \frac{1}{1-\lambda_t}\int_{j\in\mathcal{U}_t} C_{t+1}(j)dj$, and $v^U_t \equiv \frac{1}{1-\lambda_t}\int_{j\in\mathcal{U}_t} \frac{C_t(j)}{C^U_t} v_t(j)dj$. Note that v^U_t is a consumption-weighted average of individual consumption risk among unconstrained consumers, which in our earlier work we referred to as a *risk shifter*.

Equivalently, we can write:

$$\mathbb{E}_t \left\{ \frac{C^U_{t+1} - C^U_t}{C^U_t} \right\} \simeq \frac{1}{\sigma}\left(1 - \frac{1}{\beta R_t}\right) + \frac{\sigma+1}{2} v^U_t + h^U_t \tag{2}$$

where $h^U_t \equiv \mathbb{E}_t\left\{(C^U_{t+1} - C^U_{t+1|t})/C^U_t\right\}$. Note that h^U_t emerges as a result of changes in the composition of $\mathcal{U}_t$, which imply that some households who are unconstrained a t become constrained at $t+1$, and viceversa, so that in general we have $C^U_{t+1} \neq C^U_{t+1|t}$. In the absence of idiosyncratic shocks that would induce that reshuffling we would have $h^U_t = 0$, in addition to v^U_t (as argued above).

Note that variations over time in v^U_t and h^U_t will result from aggregate shocks interacting with the initial wealth distribution, since the latter determines (i) the proximity of each consumer to his borrowing constraint and hence the the marginal propensity to consume and the implied consumption risk, and (ii) the measure and identity of consumers that will switch from unconstrained to constrained or viceversa. In particular we would expect v^U_t to be decreasing in mean of wealth, and increasing in both its standard deviation and skewness.

Log-linearizing (2) around a balanced growth path we can write:

$$\mathbb{E}_t\{\Delta c^U_{t+1}\} = \frac{1}{\sigma}\widehat{r}_t + \frac{\sigma+1}{2}\widehat{v}^U_t + \widehat{h}^U_t \tag{3}$$

where $c^U_t \equiv \log C^U_t$ and $\widehat{\ }$ denotes deviations from steady state values. Note that we can rewrite (3) more conveniently as

$$\Delta c^U_t = \frac{1}{\sigma}\widehat{r}_{t-1} + z_{t-1} + \xi^U_t \tag{4}$$

where $z_{t-1} \equiv \frac{\sigma+1}{2}\widehat{v}^U_{t-1} + \widehat{h}^U_{t-1}$ and $\xi^U_t \equiv c^U_t - \mathbb{E}_{t-1}\{c^U_t\}$ is the innovation in unconstraied consumption. Below we use the previous equation as a benchmark in some of our empirical work.

4.1.2 Constrained Consumers

Let $\mathcal{K}_t \equiv \{j \in [0,1] : B_t(j) = \underline{B}_t(j)\}$ denote the subset of consumers who are against their borrowing constraint in period t. Henceforth we refer to these consumers as *constrained*.[5] The measure of $\mathcal{K}_t$ is denoted by λ_t. For $j \in \mathcal{K}_t$ we have

[4]Before integrating we multiply both sides of (1) by $C_t(j)$.

[5]It will be clear below why we choose not to refer to this groups of consumers as *the* hand-to-mouth

$$C_t(j) = Y_t(j) + S_t(j)$$

where $Y_t(j) \equiv (R_{t-1} - 1)B_{t-1}(j) + X_t(j)$ denotes disposable income and $S_t(j) \equiv B_{t-1}(j) - \underline{B}_{t-1}(j) \geq 0$ measures the slack in the previous period's borrowing constraint. Note that $S_t(j) = 0$ for a consumer who is constrained in both t and $t+1$. Integrating over $j \in \mathcal{K}_t$ we have:

$$C_t^K = Y_t^K + S_t^K$$

where $C_t^K = \frac{1}{\lambda_t}\int_{j\in\mathcal{K}_t} C_t(j)dj$, $Y_t^K = \frac{1}{\lambda_t}\int_{j\in\mathcal{K}_t} Y_t(j)dj$ and $S_t^K = \frac{1}{\lambda_t}\int_{j\in\mathcal{U}_{t-1}\cap\mathcal{K}_t} S_t(j)dj$. Under the plausible assumption that both the measure of $\mathcal{U}_{t-1}\cap\mathcal{K}_t$ (relative to λ_t) and the average size of $S_t(j)$ for $j \in \mathcal{U}_{t-1}\cap\mathcal{K}_t$ are small, variations in S_t^K will be of second order relative to C_t^K. Accordingly, and with little loss of generality, in what follows we assume $C_t^K \simeq Y_t^K$ or equivalently

$$\Delta c_t^K \simeq \Delta y_t^K$$

4.1.3 Aggregation

Aggregate consumption $C_t = \int_0^1 C_t(j)dj$ can be written as:

$$C_t = \lambda_t C_t^K + (1-\lambda_t)C_t^U$$

Letting $\Theta_t \equiv C_t^K/C_t$ and $\Phi_t \equiv (C_t^U - C_t^K)/C_t$, we can derive the approximate log-linear relationship

$$\Delta c_t = \lambda\Theta\Delta y_t^K + (1-\lambda\Theta)\Delta c_t^U - \gamma\Delta\lambda_t \tag{5}$$

where Θ and Φ are the constant values taken by Θ_t and Φ_t along a balanced growth path. Though not required in what follows tt is plausible to assume $\Theta < 1$ and $\Phi > 0$.

Combining (3) and (5) we can write:

$$\Delta c_t = \alpha + \lambda\Theta\ \Delta y_t^K + \frac{1-\lambda\Theta}{\sigma}\ r_{t-1} + w_t + (1-\lambda\Theta)\xi_t^U \tag{6}$$

where $\alpha \equiv \frac{1-\lambda\Theta}{\sigma}r$ and $w_t \equiv (1-\lambda\Theta)z_t - \gamma\Delta\lambda_t$. Note that variable w_t collects all the terms tied to the presence of idiosyncratic shocks. Variations over time in the wealth distribution resulting from idiosyncratic income shocks should affect aggregate consumption through their impact on v_t^U, h_t^U and λ_t and, hence, on w_t.

Below we use equations (4) and (6) as the theoretical benchmarks for our empirical work. In particular, we seek to uncover the role of variations in the wealth distribution as a factor behind fluctuations in aggregate consumption by examining the significance of several statistics describing the evolution of that distribution in estimated versions of Euler equations (4) and (6).

4.2 Empirical Euler Equations: Aggregate Consumption

In this subsection we report estimates of alternative versions of the following equation for aggregate consumption:

$$\Delta c_t = \alpha_0 + \alpha_r \ (i_{t-1} - \pi_t) + \alpha_y \ \Delta y_t + \alpha_\delta \ \delta_{t-1} + \varepsilon_t \tag{7}$$

where c_t denotes (log) per capita consumption, y_t denotes (log) per capita disposable income, i_t is the interest rate on 3-month Treasury Bills, π_t is CPI inflation between $t-1$ and t, and δ_t includes one or more statistics describing the cross-sectional distribution of wealth. The latter will show to be significant if (i) the wealth distribution statistics are correlated with the variables in w_t and (ii) variations in those variables capturing the role of idiosyncratic shocks have a non-negligible role in aggregate consumption fluctuations.

Given the likely endogeneity, we instrument $i_{t-1} - \pi_t$ and Δy_t using four lags of each variable. This is justified under the model since ξ_t^U is uncorrelated with information available in period $t-1$ or earlier.

Table 2 reports coefficient estimates (with standard errors in brackets) for several specifications nested in (7). Column (1) corresponds to a version of (7) with $\alpha_y = \alpha_\delta = 0$. This is consistent with a representative consumer model of consumption, i.e. with $\lambda_t = 0$ and no idiosyncratic shocks (implying $v_t^U = h_t^U = 0$). See, e.g., Hall (1988) for an early empirical analysis of that model. The estimates of α_r ara positive and significant at a 5% level, in a way consistent with the theory. Under the representative agent model the observed estimate implies a relatively low elasticity of substitution, consistent with a value for σ around 5.

Column (2) reports estimates of (7) with $\alpha_\delta = 0$ but including disposable income growth Δy_t as an explanatory variable. This was the baseline specification used by Campbell and Mankiw (1989; henceforth CM) in their celebrated paper. It is consistent with a TANK model with with no idiosyncratic shocks and a constant fraction λ of constrained consumers, together with the (strong) assumption that the disposable income of constrained consumers is proportional to aggregate disposable income, i.e. $\Delta y_t^K = \Delta y_t$. As in CM, the estimates reported in column (2) point to a large and significant estimate of α_y, close to 0.5. This implies a clear rejection of the representative consumer model. Under the plausible assumption that $\Theta \leq 1$, that estimate should be interpreted as a lower bound on the fraction of constrained households. Interestingly the estimate of α_r is little affected by the inclusion of Δy_t in the estimated equation. Yet, through the lens of the TANK model, α_r no longer corresponds to the elasticity of intertemporal substitution $1/\sigma$. The latter is given instead by $\alpha_r/(1-\alpha_y)$ which is roughly 0.4, corresponding to $\sigma = 2.5$, a more conventional value.

The remaining columns of Table 2 report estimates of (7) after including the (normalized) mean, standard deviation and skewness of the wealth distribution as an explanatory variable, one at a time (columns (3)-(5)) and jointly (column (6)). Panel A reports estimates using statistics based on the distribution of net wealth. None of the added variables is statistically significant. This is true for each variable individually, but also jointly. Furthermore the introduction of the wealth related variables does not change significantly the estimates of α_r and α_y, except in columns (4) and (6), which show an estimate of the former that remains positive but statistically insignificant and considerably smaller relative to the remaining specifications.

Panel B reports the corresponding findings using statistics for the distribution of net liquid wealth. In this case there are two instances in which the variables pertaining to the wealth distribution show some significance. It is the case of skewness (column 5) which is significant at the 10% level and the three variables jointly (column 6), which are significant at the 5% level. Note, however, that the statistical significance uncovered in those two instances coexists with a very limited quantitative contribution to the variance of consumption growth, with the corresponding R^2 remaining nearly unchanged relative to the Campbell-Mankiw specification in column (2).[6]

4.3 Empirical Euler Equations: Unconstrained Consumption

Next we present and discuss estimates of an empirical Euler equation for the average consumption of *unconstrained* households, where the latter are identified following criteria similar to Aguiar et al. (2024). Our general specification is:

$$\Delta c_t^U = \alpha_0 + \alpha_r \ (i_{t-1} - \pi_t) + \alpha_y \ \Delta y_t^U + \alpha_\delta \ \delta_{t-1} + \varepsilon_t \tag{8}$$

where Δy_t^U denotes the growth rate of average disposable income for unconstrained households. We use the same estimation approach as described in the previous subsection. Note that under our baseline consumption model we have $\alpha_y = 0$, as implied by (4).

Table 3 reports coefficient estimates for several specifications nested in (8). We start discussing the estimates reporten in Panel A, based on total wealth data. Column (1) corresponds again to a version of (7) with $\alpha_y = \alpha_\delta = 0$. The estimates of α_r are positive and significant at a 1% level. Compared to the corresponding column of Table 2, the point estimates are substantially higher, suggesting a higher elasticity of substitution for this subset of consumers, consistent with a value for σ close to 3.

Column 2 reports the coefficient estimates for the Campbell-Mankiw specification, which now includes Δy_t^U as an explanatory variable, properly instrumented. Here we uncover what we view as one of the most interesting findings of our paper: the estimate of α_y is positive, large (0.40), and significant at the 5% level. That finding deems itself to a natural interpretation: a large fraction of consumers identified as unconstrained using the Aguiar et al. (2024) criteria do not behave as optimizing consumers. Instead *they appear to behave in a hand-to-mouth fashion*, as we assume it is the case for all of the constrained consumers. That finding is in principle consistent with the arguments and evidence put forward by Kaplan, Violante and Weidner (2014). Those authors propose the term *wealthy hand-to-mouth* to refer to those consumers.

Under the (conservative) assumption that the average consumption of the wealthy hand-to-mouth is not significantly different from that of the unconstrained consumers as a whole, our estimate of α_y suggests that 40% of consumers classified as financially unconstrained behave in a hand-to-mouth fashion. If, instead, their average consumption is assumed to be lower than the average consumption of the unconstrained –which will be the case, for instance, if the incidence of hand-to-mouth behavior is decreasing in wealth– then that value should be interpreted as a lower bound for the fraction of wealthy hand-to-mouth among the financially unconstrained. When wealth distribution statistics are included as explanatory variables in the estimated equation (columns 3 through 6), the associated coefficients are statistically insignificant at the

[6] Even though the R^2 statistic in an IV regression lacks the clear interpretation it has under OLS, its differences across specifications can still be viewed as a useful measure of the contribution of one or more variables to variations in the dependent variable.

10% level, with the exception of skewness which is shown to be significant (and with the expected sign) in column (5). Once again, however, and the statistical significance notwithstanding, the quantitative impact on the measured R^2 of adding skewness as an explanatory variable is very small (an increase of 0.03 relative to column (2)).

The estimates reported in Panel B, based on liquid wealth, show a similar broad picture. In particular, the estimate of α_y is large, positive and highly statistically significant in all the specifications considered. The fact that the previous finding is obtained using data for consumers with (relatively) high liquid wealth questions an interpretation of the high sensitivity of consumption to income among (relatively) wealthy consumers reported in Panel A based on the presence of wealthy consumers who behave in a hand-to-mouth fashion *because the bulk of their wealth is illiquid*. Instead it favors a *behavioral* interpretation of that finding, one that points to hand-to-mouth behavior among a broader set of consumers, including many with high liquid wealth.

With regard to the role of the wealth distribution as a factor behind consumption dynamics, Panel B shows that the main qualitative findings discussed in PAnel A for total wealth carry over to the case of consumers with (relatively) high liquid wealth. In particular, now both the standard deviation and the skewness are shown to be statistically significant explanatory factors of average unconstrained consumption, with their associated coefficients displaying the expected sign. Yet, the quantitative impact of those variables is negligible, with the R^2 increasing by less than 0.03 relative to the baseline Campbell-Mankiw specification.

5 Concluding Remarks

In the present paper we have provided an empirical assessment of a central implication of models with idiosyncratic income risk and incomplete markets: the existence of a role for the distribution of wealth in shaping the dynamics of aggregate consumption. Estimates of consumption Euler equation models extended to include wealth distribution statistics show the latter to have a negligible quantitative impact on aggregate consumption. This contrasts with the important role played by current disposable income, even when we use data for households with (relatively) high wealth, total and liquid.

Some our findings point to a behavioral interpretation of hand-to-mouth consumption, as opposed to one that can be reconciled with optimizing behavior through the distinction between liquid and illiquid wealth. In relation to the previous point it is interesting to note that the generalized TANK model proposed in our ealier work (Debortoli and Galí 2025) can be easily accommodate that empirical evidence, since it does not impose any particular link between hand-to-mouth behavior and underying wealth or income.

We plan to extend our empirical framework to allow for alternative definitions of financially constrained households to shed further light on the extent and nature of hand-to-mouth behavior.

APPENDIX

Derivation of the Approximate Individual and Aggregate Euler Equations
Our starting point is the individual Euler equation

$$C_t(j)^{-\sigma} = \beta R_t \mathbb{E}_t\{C_{t+1}(j)^{-\sigma}\} \tag{9}$$

Substituting a second order approximation of $C_{t+1}(j)^{-\sigma}$ around $C_t(j)$ into (9) yields

$$C_t(j)^{-\sigma} \simeq \beta R_t \mathbb{E}_t \left\{ C_t(j)^{-\sigma} - \sigma C_t(j)^{-\sigma} \left(\frac{\Delta C_{t+1}(j)}{C_t(j)} \right) + \frac{\sigma(\sigma+1)}{2} C_t(j)^{-\sigma} \left(\frac{\Delta C_{t+1}(j)}{C_t(j)} \right)^2 \right\}.$$

Rearranging terms,

$$\mathbb{E}_t \left\{ \frac{\Delta C_{t+1}(j)}{C_t(j)} \right\} \simeq \frac{1}{\sigma} \left(1 - \frac{1}{\beta R_t} \right) + \frac{\sigma+1}{2} v_t(j)$$

where $v_t(j) \equiv \mathbb{E}_t \left\{ \left(\frac{\Delta C_{t+1}(j)}{C_t(j)} \right)^2 \right\} \simeq \mathbb{E}_t\{\xi_{t+1}(j)^2\}$, with $\xi_t(j) \equiv c_t(j) - \mathbb{E}_{t-1}\{c_t(j)\}$ being the innovation in individual consumption.

Rearranging terms, we have:

$$\mathbb{E}_t\{\Delta C_{t+1}(j)\} \simeq \frac{1}{\sigma} \left(1 - \frac{1}{\beta R_t} \right) C_t(j) + \frac{\sigma+1}{2} C_t(j) v_t(j) \tag{10}$$

When all households are unconstrained (as in HANK-I), we can integrate the previous equation over $j \in [0,1]$ and divide the resulting by expression by C_t to obtain:

$$\mathbb{E}_t \left\{ \frac{\Delta C_{t+1}}{C_t} \right\} \simeq \frac{1}{\sigma} \left(1 - \frac{1}{\beta R_t} \right) + \frac{\sigma+1}{2} v_t$$

where

$$v_t \equiv \int \frac{C_t(j)}{C_t} v_t(j) dj$$

The previous equation can be approximated around the stochastic steady state to yield equation (**??**) in the text. Note that in the stochastic steady state

$$\frac{1}{\sigma} \left(1 - \frac{1}{\beta R} \right) + \frac{\sigma+1}{2} v = 0$$

thus implying $\beta R < 1$. Wealthy households (with high consumption) will have $v_t(j) > v$ and hence will experience a decline in consumption (on average). The opposite will be true for poor households, whose consumption will tend to increase. Consistently with that property, the stochastic steady state is characterized by a well defined distribution of consumption across households (which also corresponds to the ergodic distribution of individual consumption).

When the individual Euler equation only holds for a subset of households $\mathcal{U}_t$ in period t, we can integrate (10) over that subset and rearrange terms to obtain:

$$\mathbb{E}_t \left\{ \frac{C^U_{t+1|t} - C^U_t}{C^U_t} \right\} \simeq \frac{1}{\sigma} \left(1 - \frac{1}{\beta R_t} \right) + \frac{\sigma+1}{2} v^U_t$$

where $C_t^U = \frac{1}{1-\lambda_t^H}\int_{j\in\mathcal{U}_t} C_t(j)dj$, $C_{t+1|t}^U = \frac{1}{1-\lambda_t^H}\int_{j\in\mathcal{U}_t} C_{t+1}(j)dj$, and $v_t^U \equiv \frac{1}{1-\lambda_t^H}\int_{j\in\mathcal{U}_t} \frac{C_t(j)}{C_t^U} v_t(j)dj$. Equivalently, we can write:

$$\mathbb{E}_t\left\{\frac{C_{t+1}^U - C_t^U}{C_t^U}\right\} \simeq \frac{1}{\sigma}\left(1 - \frac{1}{\beta R_t}\right) + \frac{\sigma+1}{2} v_t^U + h_t^U \tag{11}$$

where $h_t^U \equiv \mathbb{E}_t\left\{c_{t+1}^U - c_{t+1|t}^U\right\}$. Note that h_t emerges as a result of changes in the composition of $\mathcal{U}_t$, which imply that some households who are unconstrained a t become constrained at $t+1$, and viceversa, so that in general we have $C_{t+1}^U \neq C_{t+1|t}^U$. Approximating (11) around the stochastic steady state yields equation (3) in the text.

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Table 1: Granger Causality Test

Panel A: Evidence Based on Total Wealth

	Aggregate Consumption		Unconstrained Consumption	
	p-value	change in R^2	p-value	change in R^2
$mean(W)$	0.39	0.01	0.12	0.03
$sd(W)$	0.065	0.03	0.03	0.04
$sk(W)$	0.88	0.004	0.90	0.004
all	0.32	0.05	0.11	0.06

Panel B: Evidence Based on Liquid Wealth

	Aggregate Consumption		Unconstrained Consumption	
	p-value	change in R^2	p-value	change in R^2
$mean(W)$	0.39	0.01	0.08	0.05
$sd(W)$	0.75	0.01	0.11	0.03
$sk(W)$	0.12	0.025	0.04	0.04
all	0.29	0.05	0.01	0.09

Notes: The Table reports p-value for the null hypothesis $\gamma_1 = ... = \gamma_K = 0$, as well as the increase in the R^2 corresponding to the addition of different wealth statistics in the regression of eq. (1).

Table 2: Empirical Euler Equation: Aggregate Consumption

Panel A: Evidence Based on Total Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
r_{t-1}	0.207**	0.171**	0.190**	0.111	0.219**	0.135
	(0.082)	(0.080)	(0.087)	(0.114)	(0.104)	(0.113)
Δy_t		0.485***	0.479***	0.474***	0.477***	0.462***
		(0.161)	(0.162)	(0.159)	(0.162)	(0.159)
$mean(W)_{t-1}$			0.00045			-0.00068
			(0.00066)			(0.00099)
$sd(W)_{t-1}$				-0.502		-2.181**
				(0.686)		(1.032)
$sk(W)_{t-1}$					0.358	1.691
					(0.434)	(0.864)
R^2	0.058	0.536	0.537	0.513	0.530	0.522
H_0: all $\alpha_\delta = 0$ (p-value)						0.144

Panel B: Evidence Based on Liquid Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
r_{t-1}	0.207**	0.170**	0.190**	0.232**	0.305***	0.408***
	(0.082)	(0.079)	(0.087)	(0.116)	(0.118)	(0.142)
Δy_t		0.485***	0.479***	0.478***	0.464***	0.438***
		(0.161)	(0.162)	(0.163)	(0.163)	(0.162)
$mean(W)_{t-1}$			0.00045			-0.00232*
			(0.00066)			(0.00134)
$sd(W)_{t-1}$				0.064		-0.369**
				(0.075)		(0.178)
$sk(W)_{t-1}$					0.188*	0.975***
					(0.309)	(0.310)
R^2	0.058	0.536	0.537	0.539	0.546	0.553
H_0: all $\alpha_\delta = 0$ (p-value)						0.018

Notes: Standard errors in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Empirical Euler Equation: Unconstrained Consumption

Panel A: Evidence Based on Total Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
r_{t-1}	0.341***	0.265***	0.291**	0.315***	0.333***	0.318**
	(0.098)	(0.100)	(0.114)	(0.116)	(0.105)	(0.125)
Δy_t^U		0.407**	0.400**	0.384**	0.403***	0.383**
		(0.183)	(0.185)	(0.185)	(0.183)	(0.186)
$mean(W)_{t-1}$			0.00044			-0.00040
			(0.00072)			(0.00101)
$sd(W)_{t-1}$				1.286		-0.539
				(1.581)		(2.095)
$sk(W)_{t-1}$					1.262*	1.580
					(0.678)	(1.051)
R^2	0.112	0.384	0.382	0.365	0.410	0.383
H_0: all $\alpha_\delta = 0$ (p-value)						0.297

Panel B: Evidence Based on Liquid Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
r_{t-1}	0.241*	0.240*	0.257*	0.613***	0.640***	0.620***
	(0.125)	(0.129)	(0.151)	(0.225)	(0.203)	(0.219)
Δy_t^U		0.563***	0.563***	0.506**	0.486**	0.450**
		(0.214)	(0.214)	(0.216)	(0.215)	(0.210)
$mean(W)_{t-1}$			0.0004			-0.005**
			(0.0016)			(0.0021)
$sd(W)_{t-1}$				1.741**		-1.925
				(0.771)		(1.829)
$sk(W)_{t-1}$					0.991***	2.524***
					(0.350)	(0.924)
R^2	0.034	0.454	0.454	0.467	0.472	0.476
H_0: all $\alpha_\delta = 0$ (p-value)						0.002

Notes: Standard errors in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.