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Keeping up with the Joneses and the effect of income inequality on consumption inequality

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Abstract

Different measures show that income inequality has been rising in the US in the recent decades. However, in a recent paper, Krueger and Perri (2006) document that consumption inequality has not grown to the same extent. They also show that a standard incomplete market model overstates the extent of rise in consumption inequality, and suggest that market completeness in the form of state-contingent securities can help bridge the gap between data and model. Differently from them, we propose an alternative mechanism to explain the lack of rise in consumption inequality. In particular, we incorporate household preferences that depend on consumption relative to average consumption levels (also known as "keeping up with the Joneses" preferences) in a standard incomplete markets model. Using numerical examples, we find that this channel can potentially explain the pattern of consumption inequality observed in the data.

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1 Introduction

Using the Consumer Expenditure Survey, Krueger & Perri (2006) document that consumption inequality didn't mirror the rise of income inequality in the US between 1980 and 2003. In their analysis, Krueger & Perri (2006) make the distinction between between-group and within-group inequality. Between-group inequality stems from variation in fixed, observable household characteristics including sex, race, years of education, experience, occupation type, and region of residence. Within-group inequality is a residual that encompasses idiosyncratic shocks. Although between-group inequality can change overtime as the returns to the aforementioned characteristics change, it is unlikely that households can insure against such changes, so changes in between-group income inequality likely translate into similar changes in between-group consumption inequality. For that reason, Krueger & Perri (2006)'s quantitative analysis focuses primarily on the more interesting relationship between within-group income and consumption inequality. They document a change in within-group variance of log-income of around 15% and a change in the variance of log-consumption by around 2% between 1980 and 2003. Additionally, they find that a standard incomplete market (SIM) model (e.g. Huggett (1993), Aiyagari (1994)), where agents insure against idiosyncratic shocks using a single asset, overstates growth in consumption inequality. As an explanation, they conjecture that allowing agents to trade a larger set of state-contingent assets in an incomplete markets model can match the trend on consumption inequality better. In this paper, we analyze an alternative mechanism to explain the fact. In particular, we augment the standard incomplete market model with household preferences that depend on consumption relative to economy-wide average consumption. Numerical experiments using our model and the same data collected by Krueger and Perri (2006) show that, when households care about their relative position in terms of consumption, change in consumption inequality is less pronounced, and can match the data better.

The literature acknowledging peer effects and consumption externalities is vast, and utility functions that incorporate reference dependent preferences can be found in all subdisciplines of economics ranging from Finance to Health to Economic Growth. In general, individuals characterized by such functions derive utility from own consumption but also from their relative positions with respect to some benchmark level of societal consumption such as consumption per capita. The relevant benchmark level could be either contemporaneous or lagged, leading to the phrases “keeping up with the Jones” (KUJ) or “catching up with Jones” (CUJ), respectively.

Some of the earliest literature incorporating reference dependent preferences relates to asset pricing and portfolio choice. Abel (1990) introduced a utility function dependent on lagged per capita consumption and showed that CUJ consumption externalities help explain the equity premium puzzle. The same topic was explored by Gali (1994), but he used KUJ preferences and found that a greater share of risky assets was predicted to be held by agents with these preferences. Numerous asset pricing models acknowledging consumption externalities build on these two foundational studies. Campbell & Cochrane (1999) and Chan & Kogan (2002) implement CUJ preferences in similar spirit to Abel (1990). Abel (1999), Shore & White (2002), Gómez & Zapatero (2003), Lauterbach & Reisman (2004), Gómez (2007),

Gómez et al. (2009) and Levy & Levy (2015) implement either KUJ or a combination of KUJ and CUJ preferences.

The long-run macroeconomic literature is filled with analyses acknowledging the quest for social status. Rauscher (1997), Alvarez-Cuadrado et al. (2004) and Liu and Turnovsky & Monteiro (2007), among others, incorporate consumption externalities into neo-classical growth models. In most cases, the findings reveal that KUJ or CUJ preferences may have only modest impacts on the long-run growth rate but more substantial impacts on transitional dynamics. However, endogenous growth models incorporating reference dependent preferences more often find permanent long-run growth effects due to the interaction of consumption externalities, the saving rate, and increasing returns to production factors. The short-run macroeconomic literature acknowledges such preferences too, but there are fewer studies. Ljungqvist & Uhlig (2000), Jung (2004) and Tervala (2012) all consider closed economy business cycle models that incorporate consumption externalities for purposes of studying monetary and fiscal policy. Liu & Chang (2011) incorporate these externalities in a small open economy to study optimal tax policy.

Studies considering the relationship between income distribution and reference dependent preferences as well as those that consider the empirical relevance of such preferences are especially relevant for the forthcoming analysis. Kawamoto (2009) uses an overlapping generations model to study the effects of reference dependent preferences on the evolution of income inequality. He finds that income inequality may shrink in an economy with KUJ preferences but could increase if the preferences lead to decreased learning incentives for young people in poorer households. Barnett et al. (2010) also incorporate KUJ preferences and find that increases in ability-inequality may lead to reductions in average income and leisure and increases in the dispersion of incomes and leisure. Empirically, the status of others seems to matter quite a bit. Guven & Sørensen (2012), using data from the US General Social Survey, find that reference group income is negatively related to own happiness. In addition, high perceptions about own relative income and social class are positively related to happiness. Ravina (2019) estimates Euler equations for a representative sample of U.S. credit-card holders and finds evidence that the consumption of others is an important determinant of own consumption. Specifically, regression coefficients indicate that the consumption of one's neighbors represents about 30% of what enters the utility function. Daly & Wilson (2006) use suicide data to examine the relationship between group-specific suicide rates and income-dispersion. Their results provide strong evidence that individuals consider relative income when evaluating their own utility.

2 Quantitative Analysis

2.1 Model

We model household preference following Barnett et al. (2010). In addition to valuing own consumption, household preferences reflect their desire to keep up with average consumption in the economy. In particular, if c is personal consumption and $\bar{c}$ is average consumption, household utility is given by

$$u(c, \bar{c}) = \begin{cases} \log(c + \gamma(c - \bar{c})) & \text{if } c > \bar{c}, \\ \log(c), & \text{if } c \leq \bar{c}. \end{cases}$$

The piecewise utility function depends on how own consumption compares with average consumption in the economy. In particular, if own consumption is lower than average consumption, the utility function is the standard log utility from own consumption. If own consumption is higher than average consumption, the household gains utility from the consumption gap, $c - \bar{c}$. Thus, households obtain additional utility from ‘keeping up’ with the rest of the economy. This premium from matching average consumption is governed by the parameter $\gamma \geq 0$.

Besides the preferences, the economy is a standard incomplete markets model (e.g. Aiyagari (1994)). Following Krueger & Perri (2006), we divide the households into groups $i \in \{1, 2, \dots, M\}$. Households maximize their lifetime utility function

$$\sum_{t=0}^{\infty} \beta^t u(c_t, \bar{c}_t)$$

subject to the budget constraint

$$c_t + a_{t+1} = w_t \alpha_{it} y_t + (1 + r)a_t$$

where a is a risk-free asset. r is the rate of return on capital, and w_t is the wage rate. $\alpha_{it} y_t$ represents labor endowment of household i , where α_{it} is the time-varying deterministic mean labor endowment. y_t represents idiosyncratic part, which follows a Markov process with transition probabilities $\pi_t(y'|y)$.

In addition to the budget constraint, households also face an ad-hoc borrowing constraint given by

$$a_{t+1} \geq -\phi$$

where $\phi \geq 0$.

The single good in the economy is produced by a profit-maximizing representative firm using capital and labor. The production function is given by

$$Y_t = AK_t^\alpha L_t^{1-\alpha}$$

2.2 Stationary competitive equilibrium

The set of state variables for households is given by $\mathbf{x} = (a, \alpha, y)$. The household problem can be written recursively as follows:

$$V(\mathbf{x}) = \max_{c, a'} u(c, \bar{c}) + \beta \mathbb{E} V(\mathbf{x}') \quad (1)$$

subject to

$$\begin{aligned} c + a' &= w\alpha y + (1 + r)a \\ a' &\geq -\phi \end{aligned}$$

A stationary competitive equilibrium is given by policy functions $(c(\mathbf{x}), a'(\mathbf{x}))$, prices (w, r) and distribution $\mu(\mathbf{x})$, such that

1. The policy functions $(c(\mathbf{x})$ and $a'(\mathbf{x}))$ solve the household's optimum problem given by (1).
2. The prices (w, r) satisfy conditions for the firm's profit maximization, namely

$$\begin{aligned} w &= \frac{\partial Y}{\partial L} \\ r &= \frac{\partial Y}{\partial K} \end{aligned}$$

3. The distribution $\mu(\mathbf{x})$ is a stationary distribution associated with the Markov process governing the transition of (α, y) and the policy function $a'(\mathbf{x})$.
4. Markets clear

$$\begin{aligned} L &= \int \alpha y \, \partial\mu \\ K &= \int \alpha a'(\mathbf{x}) \, \partial\mu \\ Y &= \int c(\mathbf{x}) \, \partial\mu + \delta K \end{aligned}$$

We are interested in understanding the effect of rising income inequality on consumption inequality when $\gamma > 0$. We begin by parameterizing the model. We then document, for different levels of γ , changes in consumption inequality in response to a change in income inequality observed in the data collected by Krueger & Perri (2006) for the period between 1980 and 2003.

2.3 Calibration

A model period is one year in the data. The calibration of household income process follows Krueger & Perri (2006). Household labor income, $w_t\alpha_{it}y_t$ consists of the wage rate w_t , group-specific deterministic endowment $\alpha_{i,t}$ and the idiosyncratic endowment shock y_t . We begin by taking the logarithm of the income process.

$$\ln(w_t\alpha_{it}y_t) = \ln(w_t) + \ln(\alpha_{it}) + \ln(y_t)$$

$\sigma_{\alpha t}^2 = \text{Var}[\ln(\alpha_{it})]$ and $\sigma_{y t}^2 = \text{Var}[\ln(y_t)]$. Krueger & Perri (2006) provide estimates of these variances for the years 1980 and 2003.

Households are divided into two groups of measure 0.5. $\alpha_{1,1980}$ and $\alpha_{2,1980}$ are set at $e^{-\sigma^{1980}}$ and $e^{\sigma^{1980}}$, so that $\text{Var}[\ln(\alpha_{i1980})] = \sigma_{\alpha 1980}^2$. Using $\sigma_{\alpha 2003}$, average group incomes are computed for the final steady state.

The idiosyncratic part of income has a persistent (z_t) and a transitory component (ϵ_t), and is given by

$$\ln(y_t) = z_t + \epsilon_t$$

The persistent component follows an AR(1) process,

$$z_t = \rho z_{t-1} + \eta_t$$

ϵ_t and η_t are normally distributed independent random variables with mean 0 and variances $\sigma_{\epsilon t}^2$ and $\sigma_{\eta t}^2$. We set $\rho = 0.9989$ following Storesletten et al. (2004). The parameter values related to the income process are all taken from Krueger & Perri (2006) and are summarized in table I¹.

Parameters for income process

Parameters	$\sigma_{\alpha 1980}^2$	$\sigma_{\alpha 2003}^2$	$\sigma_{y 1980}^2$	$\sigma_{y 2003}^2$	$\sigma_{\eta 1980}^2$	$\sigma_{\eta 2003}^2$	$\sigma_{\epsilon 1980}^2$	$\sigma_{\epsilon 2003}^2$	ρ
Values	0.0658	0.1304	0.2672	0.3776	0.1928	0.2598	0.0744	0.1178	0.9989

Table I.

Next, we assign values to the preference and technology parameters. We pick these parameters to match data moments from 1980.

There are two preference parameters, β and γ . In the benchmark case, γ is set to equal 0, and the discount factor, β is chosen to obtain a capital-output ratio of 2.6. On the technology side, we set $\alpha = 0.3$ and $\delta = 7.54\%$, following Krueger & Perri (2006). TFP (A) is chosen so that the wage rate equals 1. Table (II) summarizes the preference and technology parameters used in the model.

Preference and technology parameters

Parameters	β	γ	α	δ	A	ϕ
Values	0.954	0	0.3	7.54%	9.9637	0

Table II.

2.4 Experiment

Krueger & Perri (2006) document a change in within-group variance of log-income of around 15% between 1980 and 2003. During the same time, the variance of log-consumption in-

¹For details on how these parameter values were inferred, see Krueger & Perri (2006)

creased by around 2%. They also find that the standard incomplete markets model overstates this inequality level. We are interested in finding whether our model with different values of γ , can quantitatively produce a change in within-group consumption inequality like in the data. To do this, we compute two steady states of the model - one using the income process from 1980, and the other using the income process from 2003. Then we compute the difference in within-group variance of log-consumption for different levels of γ . Table (III) reports change in within-group variance of log-consumption for different levels of γ .²

Changes to income inequality

Values of γ	Change in within-group consumption inequality (1980 - 2003)
0	0.0539
1	0.0512
3	0.0414
5	0.0317
7	0.0247
8	0.0203
9	0.0179

Table III.

The case of $\gamma = 0$, where households care only about their own consumption, corresponds to the standard incomplete-markets model. Consistent with Krueger & Perri (2006), we find that the model overstates the increase in consumption inequality. In the standard incomplete-markets model, the precautionary saving motive is strong, which leads to a greater dispersion in consumption than observed.

With $\gamma > 0$, households care about relative consumption in addition to their own consumption. In contrast to the standard model, this creates an incentive to smooth consumption across the cross-section as well. Falling behind is costly, so households are willing to lower their savings to keep consumption above average consumption. As a result, when income inequality rises, the rise in consumption inequality is attenuated as households raise their own consumption by reducing their savings. This mechanism is consistent with the decline in the U.S. household saving rate documented by Parker (1999).

Table (III) reports the change in consumption inequality for several values of γ . The results indicate that a γ of around 8 is consistent with the increase in income inequality of 2% observed in the data, i.e., a one-unit gap between own and average consumption has the same utility impact as an eight-unit increase in own consumption alone. This parameterization implies that households place substantial weight on relative consumption, which limits divergence of consumption over time.

Our results suggest that preferences based on average consumption levels might be one of the reasons why rising income inequality has not translated into a similar rise in consump-

²The increase in between-group consumption inequality is less interesting in the model, because it simply follows the increase in between-group income inequality, which is modeled using a deterministic process.

tion inequality. The social comparison motive disincentivizes savings and compresses the consumption dispersion relative to the income dispersion.

3 Concluding remarks

Relationship between γ and the reference level of consumption

The model in the paper uses the average level of consumption as a reference point. Households receive a utility premium for matching the average level of consumption. With this specification, a γ of around 8 is required to replicate the increase in consumption inequality observed in the data. However, the value of γ is dependent on the reference level of consumption. A full-length article, where the reference level of consumption and γ are jointly estimated/calibrated is the next step in this research project.

Relaxing borrowing constraint

We also run the experiment with a relaxed borrowing constraint. We set $\phi = 0.5$, which means households are able to borrow up to fifty percent of the wage rate. The quantitative results are similar to those in table (III).

Summary

Krueger & Perri (2006) document that consumption inequality did not rise as much as income inequality between 1980 and 2003. They also find that a standard incomplete markets model overstates the rise in consumption inequality. To explain the data better, we propose modifying the standard incomplete markets model by incorporating preferences in which households care about their consumption levels relative to average consumption in the economy. Our results show that “keeping up with the Joneses” preferences can be an important channel in understanding consumption behavior across the income distribution and explain the discrepancy between the changes in income and consumption inequality. In future research we plan to compile an updated data set for the period 2004 through the present. The analysis herein reveals that relative consumption is important, so using our newly proposed model to investigate income and consumption inequality for a more recent period is warranted and will shed light on the evolution of the ability of preferences dependent on relative consumption to explain differences in the behavior of income and consumption inequality.

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