Falling Behind the Joneses:

Relative Consumption and the Growth-Savings Paradox

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Abstract

Concern for individual consumption relative to per capita consumption can induce a fear of falling behind which increases precautionary savings. This fear intensifies as societal income growth increases, allowing for a positive effect of growth on savings rates.

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1 Introduction

Consumers in rapidly growing economies should borrow against future earnings to smooth consumption, or at least should save at a lower rate than consumers in countries with stagnant or falling incomes. Instead, multi-country studies show a strong positive correlation between income growth and savings rates (Bosworth, 1993). Such a correlation could result from high savings rates inducing high growth rates (Lucas, 1998), but the pattern in most rapid-growth economies has been for rapid income growth to precede sharp increases in household savings rates.[1] Of the possible explanations for this growth-savings paradox, the Duesenberry (1949) relative consumption model, which assumes utility comes from individual consumption relative to societal per capita consumption, seems an unlikely candidate.[2] Rising incomes would appear to induce excessive consumption as consumers attempt to "keep up with the Joneses". This notion is examined with a simple two-period model. Rather than increasing consumption, concern for relative consumption can induce a fear of falling behind which raises precautionary savings. As societal income growth increases this fear intensifies, allowing for a positive effect of growth on savings rates and potentially explaining the growth-savings paradox.

2 Savings in a Relative Consumption Model

Using a relative consumption model, Duesenberry attempted to explain why the savings rates of individuals rose with income but the national savings rate did not. He argued that an increase in a consumer's income relative to her peers would affect her savings decision, but an increase in the whole society's average income would leave every consumer in the same relative position, not affecting anyone's savings decision. Though popular for many years, Duesenberry's model fell victim to its own analytic gaps and to competition from the simpler explanations offered by Modigliani and Brumberg (1954) and Friedman (1957). This note reconsiders Duesenberry's model,[3] assuming income is subject to uninsurable, idiosyncratic shocks and concentrating on the model's implications for the growth-savings paradox.

Assume there are an infinite number of consumers indexed by i who choose consumption c_{it} over two periods. Letting tildes designate societal averages, with a time-separable utility function the

[1] Carroll and Weil (1994) confirm that causality runs from growth to savings in Hong Kong, Japan, Singapore and South Korea. Such a relation is also apparent in Taiwan and reform-era China.

[2] Harbaugh (1991) notes several other explanations.

[3] In addition to its historical importance in the savings literature, the relative consumption model is appealing because of the simplicity with which it captures status concerns. Consumer interest in status can be rationalized in a number of ways (Frank, 1985; Cole et al., 1992), but this note takes such interest as given.

maximization problem for each consumer is

$$\max_{\{c_{i1},c_{i2}\}} U\left(\frac{c_{i1}}{\tilde{c}_1^{\delta}}\right) + \beta E_1 U\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right) \tag{1}$$

subject to the lifetime budget constraint

$$(w_{i1} + y_{i1} - c_{i1})R + y_{i2} - c_{i2} \geq 0 \tag{2}$$

where the discount factor $\beta > 0$ captures the degree of consumer patience and $R \geq 1$ equals the exogenous gross interest rate.[4] This utility function encompasses the usual absolute consumption model ($\delta = 0$) and Duesenberry's relative consumption model ($\delta = 1$). First period income and wealth are assumed to be identical for all consumers, $y_{i1} = \tilde{y}_1$ and $w_{i1} = \tilde{w}_1$, but second period income is subject to an idiosyncratic multiplicative shock, $y_{i2} = \epsilon_i \gamma \tilde{y}_1$, where ϵ_i is an i.i.d., non-negative, non-degenerate random variable with $E[\epsilon_i] = 1$.[5] Since income shocks are purely idiosyncratic,[6] as the number of consumers n goes to infinity $\tilde{c}_2 = \lim_{n\to\infty}(\Sigma_i c_{i2}/n) = (\tilde{w}_1 + \tilde{y}_1 - \tilde{c}_1)R + \lim_{n\to\infty}(\Sigma_i \epsilon_i \gamma \tilde{y}_1/n) = (\tilde{w}_1 + \tilde{y}_1 - \tilde{c}_1)R + \gamma\tilde{y}_1$. Hence $\tilde{c}_2$ will be treated as deterministic rather than stochastic in this note's calculations. Societal income growth, which equals individual expected income growth, is represented by $\gamma > 1$ and societal income decline by $0 < \gamma < 1$.[7] The utility function is assumed to exhibit constant relative risk aversion with relative risk aversion parameter $\alpha = -U''(c_{it}/\tilde{c}_t^{\delta})(c_{it}/\tilde{c}_t^{\delta})/U'(c_{it}/\tilde{c}_t^{\delta})$, corresponding to the power utility function $U(c_{it}/\tilde{c}_t^{\delta}) = (c_{it}/\tilde{c}_t^{\delta})^{1-\alpha}/(1-\alpha)$. Note that $\alpha > 0$ implies $U''' > 0$, which is a necessary condition for the existence of precautionary savings (Leland, 1968). We assume the slightly stronger condition that $\alpha > 1$, which is consistent with most empirical estimates.

Noting that the budget constraint will be met with equality and individual consumption has no appreciable impact on aggregate consumption, the first order condition can be written

$$U'\left(\frac{c_{i1}}{\tilde{c}_1^{\delta}}\right)\frac{1}{\tilde{c}_1^{\delta}} = R\beta E_1 U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\frac{1}{\tilde{c}_2^{\delta}}. \tag{3}$$

Under the assumption $\delta = 1$, Duesenberry (1949, p. 27) concluded that when average consumption

[4] Assuming an exogenous interest rate, which simplifies the model, is appropriate if the economy is a small open economy or the government controls interest rates. Note that the strong demand for savings predicted by the relative consumption model might explain why governments in most rapid-growth economies have been able to set near-zero real interest rates on savings deposits and still enjoy high savings rates.

[5] Solution of a model with more than two periods is complicated by the divergence in incomes and wealth starting in the second period. Interpreting the two periods as the first and second halves of a consumer's working life, a two-period model is still relevant since most rapid-growth economies have gone from poverty to affluence in the space of a single lifetime.

[6] Inclusion of aggregate risk does not change the results qualitatively, but complicates the model.

[7] Note that income here refers to non-interest income. As happened in most rapid-growth economies, exogenous changes in income could result from government policies encouraging integration into the world economy.

rises there is a "demonstration effect" which induces an individual to consume more. This claim is true for $\alpha > 1$.

Proposition 1 *The demonstration effect (i) raises the marginal utility of consumption in a period when average consumption in a period rises, and (ii) is stronger when individual consumption is uncertain.*

Proof: (*i*) From the LHS of equation (3), when $\delta = 1$ the effect of an increase in average consumption in period one on the marginal utility of consumption in that period is

$$\left(-U''\left(\frac{c_{i1}}{\tilde{c}_1}\right)\frac{c_{i1}}{\tilde{c}_1} - U'\left(\frac{c_{i1}}{\tilde{c}_1}\right)\right)\tilde{c}_1^{-2} \tag{4}$$

or, using the definition of relative risk aversion,

$$(\alpha - 1)U'\left(\frac{c_{i1}}{\tilde{c}_1}\right)\tilde{c}_1^{-2} > 0. \tag{5}$$

Similarly, the effect of an increase in average consumption in period two on expected marginal utility is

$$(\alpha - 1)R\beta E_1 U'\left(\frac{c_{i2}}{\tilde{c}_2}\right)\tilde{c}_2^{-2} > 0. \tag{6}$$

(*ii*) Since U' is convex, *i.e.* $U''' > 0$, the uncertainty of consumption strengthens this positive effect. ■

We can define two opposing effects on the marginal utility of consumption in a period when average consumption in the period rises. First, there is a "deprivation effect" due to a loss in status (where status is defined as individual consumption relative to average consumption). For instance, a person with only 1/10th of the average consumption in society has higher marginal utility from additional status than a person with ten times the average consumption. This effect is captured by a rise in the denominator in the left factor on each side of equation (3), a rise which increases the marginal utility of extra consumption as seen in the first term of equation (4). Second, there is a "price effect" since the price of status in terms of consumption increases. For instance, a Japanese consumer must purchase far more or far better goods in 1990 than in 1950 to achieve the same increase in status. This effect is captured by a rise in the denominator of the right factor on each side of equation (3), a rise which decreases the marginal utility of extra consumption as seen in the second term of equation (4).[8] If consumers are sufficiently risk averse, $\alpha > 1$, then the deprivation

[8] These two effects are also present in other status models. Consider a model where utility comes from status in society as represented by a cumulative density function for consumption in the population, $U_{it} = U(F(c_{it}))$. Marginal utility is then $U'(F(c_{it}))f(c_{it})$, where the two effects of an upward shift in the distribution of consumption can be derived from the two factors.

effect dominates and the net impact from an increase in average consumption in a period is to increase the marginal utility from consumption in that period.[9]

The demonstration effect refers only to the impact of higher per capita consumption on a single individual in one period. To see whether it implies lower societal savings as each consumer attempts to "keep up with the Joneses",[10] two factors must be considered. First, average consumption is endogenously determined by the maximizing behavior of all consumers. Second, forward-looking consumers face the demonstration effect in both periods, not just one.[11] Considering both these factors, the demonstration effect can induce a fear of falling behind in the second period which raises rather than lowers savings.

Proposition 2 *The savings rate is higher (lower) in a relative consumption model than an absolute consumption model if average consumption is increasing (decreasing).*

Proof: Individuals are identical in the first period and face identical prospects in the second period so $c_{i1} = \tilde{c}_1$. From equation (3) the Nash Equilibrium is just[12]

$$U'\left(\frac{\tilde{c}_1}{\tilde{c}_1^{\delta}}\right)\tilde{c}_1^{-\delta} = R\beta E_1 U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\tilde{c}_2^{-\delta}. \tag{7}$$

Totally differentiating,

$$\frac{d\tilde{c}_1}{d\delta} = \frac{(\ln\tilde{c}_1)\tilde{c}_1^{-\delta}\left(\tilde{c}_1^{1-\delta}U''(\tilde{c}_1^{1-\delta}) + U'(\tilde{c}_1^{1-\delta})\right) - R\beta(\ln\tilde{c}_2)\tilde{c}_2^{-\delta}E_1\left[\frac{c_{i2}}{\tilde{c}_2^{\delta}}U''\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right) + U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\right]}{(1-\delta)\tilde{c}_1^{-2\delta}U''(\tilde{c}_1^{1-\delta}) - \delta\tilde{c}_1^{-\delta-1}U'(\tilde{c}_1^{1-\delta}) - R^2\beta\tilde{c}_2^{-\delta-1}E_1\left[\frac{\delta c_{i2}-\tilde{c}_2}{\tilde{c}_2^{\delta}}U''\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right) + \delta U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\right]}. \tag{8}$$

The demonstration effects in the two periods are represented in the two terms of the numerator. Using the assumption of constant relative risk aversion and substituting from the Nash Equilibrium,

[9] Such jealousy or status consciousness does not preclude altruistic feelings, which could be represented by an additively separable term for societal consumption.

[10] Veblen (1931, p. 88) argues "...in the struggle to outdo one another the city population push their normal standards of conspicuous consumption to a higher point..."

[11] Frank (1985) and others consider the case where status is important for some goods (positional goods) but not for others (non-positional goods), implying consumers distribute consumption both across time and across the two types of goods. "Keeping up with the Joneses" can then refer to excessive consumption of positional goods rather than excessive consumption generally. Savings is usually treated as a non-positional good in this literature, rather than as a means to adjust consumption across time. Neglecting the role that savings plays in ensuring adequate future consumption of positional goods leads to the conclusion that concern for status necessarily lowers savings rates.

[12] If there is no uninsured idiosyncratic risk, individual consumption equals per capita consumption and this equation reduces to $\tilde{c}_1^{-1} = R\beta E_1\tilde{c}_2^{-1}$ when $\delta = 1$. A logarithmic utility function in a standard absolute consumption model generate this same condition. In their analyses of the equity-premium puzzle using representative agent models, Abel (1990), Gali (1994), and Kocherlakota (1996) avoid this equivalence by using utility functions based on but in varying ways different from Duesenberry's formulation.

these effects can be directly compared by rewriting the numerator as

$$(\alpha - 1)U'(\tilde{c}_1^{1-\delta})\tilde{c}_1^{-\delta}\ln(\tilde{c}_2/\tilde{c}_1) \tag{9}$$

which, since $\alpha > 1$, is positive for $\tilde{c}_2 > \tilde{c}_1$ and negative for $\tilde{c}_2 < \tilde{c}_1$. Regarding the denominator, $0 \leq \delta \leq 1$, $U' > 0$ and $U'' < 0$ imply each term is non-positive except

$$-R^2\beta\tilde{c}_2^{-\delta-1}E_1\frac{\delta c_{i2} - \tilde{c}_2}{\tilde{c}_2^{\delta}}U''\left(\frac{c_{i2}}{\tilde{c}_2}\right). \tag{10}$$

For $\delta \leq 1$ this is negative if $E_1(c_{i2} - \tilde{c}_2)U''(c_{i2}/\tilde{c}_2) > 0$, which follows from $U''' > 0$. ■

This proposition shows that any consumption trend present in an absolute consumption model is magnified in a relative consumption model by the demonstration effects. For instance, if consumers are sufficiently patient or risk averse to choose higher expected consumption in the second period than in the first period if $\delta = 0$, they consume even less in the first period if $\delta = 1$. Since each consumer expects other consumers to consume more on average in the second period, the second period demonstration effect is stronger than the first period demonstration effect, inducing each individual to save even more in the first period. At the Nash Equilibrium savings are therefore higher in a relative consumption model than an absolute consumption model. In contrast, if consumers are very impatient and not too risk averse then savings may be lower in a relative consumption model. Since each consumer expects other consumers to dissave and consume more in the first period than in the second, the demonstration effect acts to further increase consumption in the first period.

These differences between savings in relative consumption and absolute consumption models raise the possibility that differences in national savings rates can be explained by the varying importance of relative consumption in consumers' utility functions. For instance, the United States with its cultural emphasis on individualism might have a low savings rate because consumers are less afraid of "falling behind the Joneses" than consumers in more status-conscious countries. This is an intriguing possibility, but the following suggests that the observed pattern of high savings rates in rapid-growth economies and lower savings rates in less dynamic economies might be due to the effect of growth on savings rather than preference differences between countries.

Totally differentiating equation (7),

$$\frac{d\tilde{c}_1}{d\gamma} = \tilde{y}_1\frac{R\beta E_1\left[\epsilon_i\tilde{c}_2^{-2\delta}U''\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right) - \delta\tilde{c}_2^{-\delta-1}\left(U''\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\frac{c_{i2}}{\tilde{c}_2^{\delta}} + U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\right)\right]}{(1-\delta)\tilde{c}_1^{-2\delta}U''(\tilde{c}_1^{1-\delta}) - \delta\tilde{c}_1^{-\delta-1}U'(\tilde{c}_1^{1-\delta}) - R^2\beta\tilde{c}_2^{-\delta-1}E_1\left[\frac{\delta c_{i2}-\tilde{c}_2}{\tilde{c}_2^{\delta}}U''\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right) + \delta U'\left(\frac{c_{i2}}{\tilde{c}_2^{\delta}}\right)\right]} \tag{11}$$

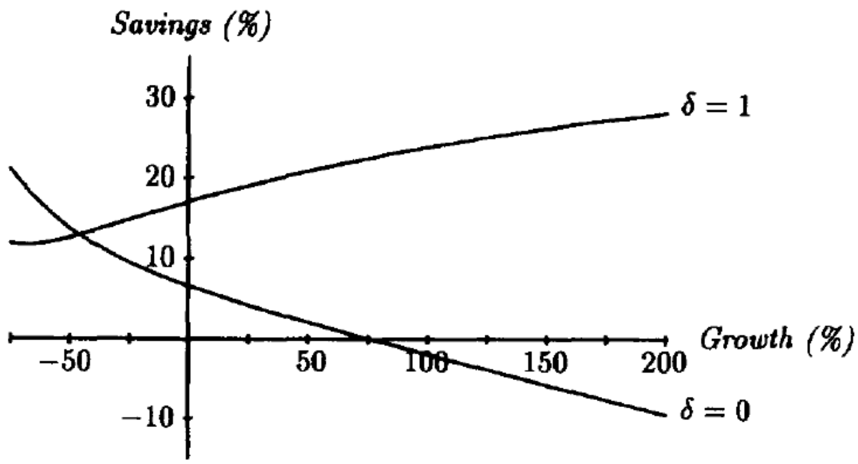

Figure 1: Savings and growth rates

If income is certain then for any δ this reduces to

$$\frac{d\tilde{c}_1}{d\gamma} = \tilde{y}_1 \frac{\tilde{c}_1}{R\tilde{c}_1 + \tilde{c}_2} > 0, \tag{12}$$

indicating that savings fall as income growth increases. This effect on savings also holds if income is uncertain and $\delta = 0$. The numerator of the RHS of equation (11) is clearly negative in this case and the denominator is always negative as shown in equation (8). The interesting case arises when income is uncertain and $\delta = 1$. Rewriting the numerator,

$$\tilde{y}_1 \tilde{c}_2^{-2} R\beta E_1 \left[\epsilon_i U'' \left(\frac{c_{i2}}{\tilde{c}_2} \right) + (\alpha - 1) U' \left(\frac{c_{i2}}{\tilde{c}_2} \right) \right], \tag{13}$$

indicating that for $\alpha > 1$, which is the condition for the existence of the demonstration effect from Proposition 1, it may be true that the numerator is positive, implying $\partial c_1 / \partial \gamma < 0$. The following is proven by way of the example shown in Figure 1.

Proposition 3 *In a relative consumption model the savings rate can be increasing in societal income growth.*

Numerical solutions are shown in Figure 1 for different societal income growth rates when an individual's second period income equals average income with 80% probability, equals 0.1 times average income with 10% probability, and equals 1.9 times average income with 10% probability. Since the two periods are meant to correspond to the first and second halves of a consumer's working life, this income shock is equivalent to a permanent shock in a multi-period model. Consumers each start out with wealth equal to 20% of first period income, the interest rate is zero, $\alpha = 3$, the discount factor is $\beta = 0.5$, and average income in the second period ranges from one-fourth to three times first period income.[13]

Looking at this figure, when societal income growth is significantly negative savings are higher in a relative consumption model than an absolute consumption model because second period average consumption is low and consumers can protect against low relative consumption with comparatively little savings. As income growth increases each consumer desires to consume more in each period, taking the behavior of other consumers as given. Since income is stochastic this increased consumption is weighted towards the second period if consumers are not too impatient. The demonstration effect is therefore stronger in the second period than the first period, inducing each consumer to further increase second period consumption in accordance with Proposition 2. The relative strength of the demonstration effect in the second period is amplified by the uncertain nature of second period consumption as shown in Proposition 1(ii), and in this example is so strong that consumption in the first period falls even as income rises.

3 Conclusion

Contrary to common presumptions, the demonstration effect in a relative consumption model does not generally decrease savings. Instead, it induces a fear of falling behind which increases savings as long as average consumption in society is rising. This fear can lead to a causal relationship from income growth to savings rates, a relationship which may help explain the pattern of savings behavior in rapid-growth economies. Young Japanese and Taiwanese had little idea in the 1950s that a large-scale wedding banquet, a fully-equipped new home, a new car, and many other "luxury" goods would be the consumption norm of the 1980s and 1990s. But by the 1960s and 1970s sustained rapid growth had made it clear that extreme resources would be required to maintain status in the coming decades. The relative consumption model suggests that savings then soared as risk averse consumers accumulated wealth to help protect against any fall in relative consumption due to a decline in relative income.

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