TEMPTATION AND TAXATION

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PREFERENCE REVERSALS

- Kirby and Herrnstein (*Psychological Science*, 1995): "Of 36 subjects, 34 reversed preference from a larger, later reward to a smaller, earlier reward as the delays to both rewards decreased."
- This evidence is not consistent with the standard model of geometric discounting.
- Two theoretical responses:
  1. The Strotz/Phelps-Pollak/Laibson model of *hyperbolic*, or *quasi-geometric*, discounting. (Assume that the slope of the discount function is a decreasing function of time.)
  2. The Gul-Pesendorfer model of *temptation* and *self-control*. (Assume that utility depends not only on the choice but also on the set from which it is chosen.)

PREFERENCE REVERSALS IN THE LAIBSON MODEL

Preferences of self 0: $c_0 + \beta\delta c_1 + \beta\delta^2 c_2$

	Early reward	Late reward
c_0	0	0
c_1	a	0
c_2	0	b

Late reward chosen if $\beta\delta a < \beta\delta^2 b$.

	Early reward	Late reward
c_0	a	0
c_1	0	b
c_2	0	0

Early reward chosen if $a > \beta\delta b$.

Preference reversal if $\beta\delta b < a < \delta b$.

THE LAIBSON MODEL: QUASI-GEOMETRIC DISCOUNTING

Preferences:

Self 0: $$U_0 = u_0 + \beta\left(\delta u_1 + \delta^2 u_2 + \delta^3 u_3 + \cdots + \delta^T u_T\right)$$

Self 1: $$U_1 = u_1 + \beta\left(\delta u_2 + \delta^2 u_3 + \cdots + \delta^T u_T\right)$$

Self 2: $$U_2 = u_2 + \beta\left(\delta u_3 + \cdots + \delta^T u_T\right)$$

Behavior:

- The consumer cannot commit to future actions.
- The consumer is "sophisticated": he realizes that his preferences will change and makes the current decision taking this into account.
- The decision-making process is viewed as a dynamic game, with the agent's current and future selves as players.

MARKOV EQUILIBRIA IN THE LAIBSON MODEL

- Environment: A simple (finite-horizon) consumption-savings problem.
- Intrapersonal equilibrium: Iterate backwards (the current self correctly anticipates the decisions of his future selves).
- The period $T-t$ self solves:

$$\max_{k_{T-t}} u(f(k_{T-t}) - k_{T-t+1}) + \beta\delta W_{T-t+1}(k_{T-t+1}).$$

  This problem determines the period $T-t$ decision rule:

$$k_{T-t+1} = g_{T-t}(k_{T-t}).$$

- The "value function" of the period $T-t$ self is:

$$W_{T-t}(k_{T-t}) = u(f(k_{T-t}) - g_{T-t}(k_{T-t})) + \delta W_{T-t+1}(g_{T-t}(k_{T-t})).$$

THE LAIBSON MODEL WITH AN INFINITE HORIZON

- Perceptions: The consumer perceives that future savings decisions are determined by $k_{t+1} = g(k_t)$.
- The current self solves the "first-stage" problem:

$$\max_{k'} \; u(f(k) - k') + \beta\delta W(k').$$

- W is an "indirect" utility function: it must satisfy the "second-stage" functional equation

$$W(k) = u(f(k) - g(k)) + \delta W(g(k)).$$

- A Markov equilibrium obtains if $g(k)$ also solves the first-stage problem.

DRAWBACKS OF THE LAIBSON MODEL

- Difficult to do welfare analysis:
  1. Lack of axiomatic foundation.
  2. When we evaluate policy, which self's utility function do we use? (Krusell, Kuruşçu, and Smith (2000, 2001a) study time-consistent government policy in the Laibson model.)
- Multiplicity of equilibria: Laibson (1994) studies trigger-strategy equilibria; Krusell and Smith (2000) study Markov equilibria.
- Computation: Multiplicity makes computation difficult (recent progress: perturbation methods).

AN ALTERNATIVE APPROACH: GUL AND PESENDORFER'S MODEL

- This recent approach is axiomatically-based decision theory.
- It emphasizes *temptation* and *self-control*.
- It can address the experimental evidence.
- There is a dynamic version of the GP model that seems potentially useful for macroeconomic analysis.

BRIEF SUMMARY OF RESULTS

- Neoclassical growth analysis: We characterize steady states and dynamics. In general, the model with temptation is *not* observationally equivalent to a model without temptation. In addition, the curvature of the utility function plays a role in determining the steady state.

- Connection to Laibson: We develop a formulation in which the temptation is "quasi-geometric discounting". If this temptation is strong enough, our model coincides with the Laibson model. This view of the Laibson model says that period t utility should be evaluated from the perspective of self $t-1$!

- Taxation: Our policy analysis suggests that there should be a subsidy to investment.

- Asset Pricing: Krusell, Kuruşçu, and Smith (2001b) study equilibrium asset prices in a Mehra-Prescott model with GP consumers, some of whom have an "urge to save" rather than an "urge to consume". These compulsive savers play a dominant role in asset markets, driving down the risk-free rate.

THE GUL-PESENDORFER MODEL: A QUICK-AND-DIRTY INTRODUCTION

- "Second-period" preferences defined over ordered pairs (A, x), where A is a choice set and $x \in A$.
- Definition: y tempts x if $(\{x\}, x)$ is preferred to $(\{x, y\}, x)$.
- Assumptions:
  1. Removing temptations cannot make the consumer worse off.
  2. If y tempts x, then x does not tempt y.
  3. Adding y to A does not make the consumer worse off unless y tempts every element in A.
- These assumptions imply that "tempts" is a preference relation. Moreover, the utility of a fixed choice is affected by the choice set only through its most tempting element.

PREFERENCES OVER CHOICE SETS

- Second-period preferences induce "first-period" preferences over choice sets themselves: $A \succeq B$ if and only if there is an $x \in A$ such that (A, x) is preferred to (B, y) for all $y \in B$.
- The above assumptions imply *set betweenness*:

$$A \succeq B \text{ implies that } A \succeq A \cup B \succeq B.$$

Choice sets cannot be compared simply by looking at their best elements.

PREFERENCE FOR COMMITMENT, SELF-CONTROL, AND SUCCUMBING TO TEMPTATION

Assume $A \succ B$. "Set betweenness" allows three possibilities:

1. Standard decision maker:

$$A \sim A \cup B \succ B$$

2. *Preference for commitment* and *self-control*:

$$A \succ A \cup B \succ B$$

3. *Preference for commitment* and *succumbing to temptation*:

$$A \succ A \cup B \sim B$$

A REPRESENTATION THEOREM FOR PREFERENCES OVER SETS

- Set betweenness (together with standard axioms) implies the following representation of preferences over sets:

$$W(A) = \max_{x \in A} \{U(x) + V(x)\} - \max_{\tilde{x} \in A} V(\tilde{x}).$$

- Second-period preferences are represented by:

$$W^*(A, x) = U(x) + V(x) - \max_{\tilde{x} \in A} V(\tilde{x}).$$

Interpretation:

- U determines the *commitment* ranking (i.e., the utility of singleton sets).
- V determines the *temptation* ranking (i.e., V gives higher values to more tempting elements).
- The second-period choice (given A) maximizes $W^*(A, x)$. That is, actual behavior maximizes $U(x) + V(x)$.
- $V(x) - \max_{\tilde{x} \in A} V(\tilde{x})$ is the disutility of self-control.

A SIMPLE EXAMPLE

- Two alternatives: x and y.
- x maximizes the commitment ranking: $U(x) > U(y)$.
- y maximizes the temptation ranking: $V(y) > V(x)$.

$$\begin{aligned} W^*(\{x\}, x) &= U(x) + V(x) - V(x) = U(x) \\ W^*(\{x, y\}, x) &= U(x) + V(x) - V(y) \\ W^*(\{x, y\}, y) &= U(y) + V(y) - V(y) = U(y) \\ W^*(\{y\}, y) &= U(y) + V(y) - V(y) = U(y) \end{aligned}$$

- The consumer has a *preference for commitment*.
- The consumer has *self-control* if

  $$U(x) + V(x) - V(y) > U(y).$$

  In this case, $W(\{x\}) > W(\{x, y\}) > W(\{y\})$.
- The consumer *succumbs to temptation* if

  $$U(x) + V(x) - V(y) < U(y).$$

  In this case, $W(\{x\}) > W(\{x, y\}) = W(\{y\})$.

THE TWO-PERIOD CONSUMPTION-SAVINGS MODEL

- Consumption today and tomorrow.
- Neoclassical production.
- Standard budget set (borrowing and lending at r).
- General equilibrium.
- With $\tilde{u}(c_1, c_2)$ playing the role of U and $\tilde{v}(c_1, c_2)$ the role of V, let the temptation function $\tilde{v}$ have a stronger preference for present consumption. For example, let

$$\tilde{u}(c_1, c_2) = u(c_1) + \delta u(c_2)$$

and

$$\tilde{v}(c_1, c_2) = \gamma \left(u(c_1) + \beta \delta u(c_2) \right),$$

with $\beta < 1$.

THE CONSUMER'S PROBLEM

- The consumer's budget set is:

$$\begin{aligned} B(k_1, \bar{k}_1, \bar{k}_2) \;\equiv\; \{(c_1, c_2) : \exists k_2 : \\ & c_1 = r(\bar{k}_1)k_1 + w(\bar{k}_1) - k_2 \\ & c_2 = r(\bar{k}_2)k_2 + w(\bar{k}_2)\} \end{aligned}$$

- The consumer solves:

$$\max_{c_1, c_2} \{(1+\gamma)u(c_1)+\delta(1+\gamma\beta)u(c_2)\} - \max_{\tilde{c}_1, \tilde{c}_2} \{\gamma u(\tilde{c}_1)+\gamma\beta\delta u(\tilde{c}_2)\}$$

subject to: $(c_1, c_2) \in B(k_1, \bar{k}_1, \bar{k}_2)$, $(\tilde{c}_1, \tilde{c}_2) \in B(k_1, \bar{k}_1, \bar{k}_2)$.

- The consumer's first-order condition:

$$\frac{1+\gamma}{\delta(1+\gamma\beta)} \frac{u'(c_1)}{u'(c_2)} = r(\bar{k}_2)$$

- Compare to:

$$\frac{1}{\delta} \frac{u'(c_1)}{u'(c_2)} = r(\bar{k}_2) \quad \text{and} \quad \frac{1}{\beta\delta} \frac{u'(c_1)}{u'(c_2)} = r(\bar{k}_2)$$

- Note that:

$$\frac{1}{\beta\delta} \geq \frac{1+\gamma}{\delta(1+\gamma\beta)} \geq \frac{1}{\delta}$$

COMPETITIVE EQUILIBRIUM VS. AUTARKY

- In equilibrium, $k = \overline{k}$ and $r(\overline{k}) = f'(\overline{k})$.
- Consumer's first-order condition becomes:

$$\frac{1+\gamma}{\delta(1+\gamma\beta)} \frac{u'(\bar{c}_1)}{u'(\bar{c}_2)} = f'(\bar{k}_2).$$

- This is the same first-order condition as in autarky. (In this case, the "budget set" is the production possibility set determined by $c_1 = f(k_1) - k_2$ and $c_2 = f(k_2)$.)
- BUT: the consumer is better off in autarky because the temptation is weaker (the disutility of self-control is higher in competitive equilibrium).

POLICY IN THE TWO-PERIOD MODEL

- Command policy: The government chooses *for* the consumer, eliminating self-control problems. The command policy is therefore first-best: it maximizes $u(c_1) + \delta u(c_2)$ and there is no disutility of self-control.

- Taxation policy in competitive equilibrium: The gov't taxes income and investment (savings) in the first period. It chooses the tax rates to maximize welfare given a budget-balancing constraint. *Result*: The gov't subsidizes investment and taxes income. Given "log-Cobb" assumptions, the optimal allocation is the same as under the command policy. But welfare is lower because of the self-control cost.

OPTIMAL PROPORTIONAL TAXES

- The consumer's budget set is:

$$\begin{aligned}&\{(c_1, c_2) : \exists k_2 :\\ &\quad c_1 = [r(\bar{k}_1)k_1 + w(\bar{k}_1)](1 - \tau_y) - (1 + \tau_i)k_2\\ &\quad c_2 = r(\bar{k}_2)k_2 + w(\bar{k}_2)\}\end{aligned}$$

- The government budget constraint is:

$$\tau_y f(\bar{k}_1) + \tau_i \bar{k}_2 = 0.$$

- Should investment be subsidized? Yes! The representative consumer's (indirect) utility is a decreasing function of τ_i at $\tau_i = 0$.

WHY SUBSIDIZE INVESTMENT?

- At $\tau_i = 0$, there is no first-order effect on max $U + V$ of changing τ_i.
- So τ_i should be decreased (from 0) if doing so *decreases* temptation utility (i.e., if doing so decreases max V).
- The effect of increasing τ_i on temptation utility is twofold:

  (i) $\tilde{c}_1$ *increases*, by the amount $\bar{k}_2 - \tilde{k}_2$;

  (ii) $\tilde{c}_2$ *decreases*, by the amount $(\bar{k}_2 - \tilde{k}_2) r'(\bar{k}_2) \frac{d\bar{k}_2}{d\tau_i}$.

  In utility terms, this means that an increase in τ_i increases temptation utility if

$$(\bar{k}_2 - \tilde{k}_2) \left(1 - (\widetilde{\text{MRS}}) r'(\bar{k}_2) \frac{d\bar{k}_2}{d\tau_i} \right) > 0,$$

  i.e., if

$$(\text{MRS}) r'(\bar{k}_2) \frac{d\bar{k}_2}{d\tau_i} < 1.$$

- Equilibrium requires: $\text{MRS}(\tau_i) r(\bar{k}_2(\tau_i)) = 1 + \tau_i$.

  This means that:

$$(\text{MRS}) r'(\bar{k}_2) \frac{d\bar{k}_2}{d\tau_i} + r(\bar{k}_2) \frac{d\text{MRS}}{d\tau_i} = 1.$$

  Since $\frac{d\text{MRS}}{d\tau_i} > 0$ (increasing τ_i lowers savings, thereby decreasing c_2 and increasing c_1), it must be that $(\text{MRS}) r'(\bar{k}_2) \frac{d\bar{k}_2}{d\tau_i} < 1$.

QUASI-GEOMETRIC TEMPTATION

- Idea: temptation can only occur if it involves the immediate present.
- The two-period model determines preferences over two-period choice problems.
- Longer-horizon choice problems are defined recursively: every choice problem requires choosing today's consumption and tomorrow's choice problem.
- Iterating backwards, one obtains:

$$\begin{aligned} W_{T-t}(k_{T-t}) \; = \; & \max_{k_{T-t+1}} \{u(f(k_{T-t}) - k_{T-t+1}) + \\ & \qquad \delta W_{T-t+1}(k_{T-t+1}) + \\ & \qquad V_{T-t+1}(k_{T-t}, k_{T-t+1})\} \\ & - \max_{\tilde{k}_{T-t+1}} \{V_{T-t+1}(k_{T-t}, \tilde{k}_{T-t+1})\}, \end{aligned}$$

  where

$$\begin{aligned} V_{T-t}(k_{T-t}, k_{T-t+1}) \; \equiv \; & \gamma\{u(f(k_{T-t}) - k_{T-t+1}) + \\ & \qquad \beta\delta W_{T-t+1}(k_{T-t+1})\}. \end{aligned}$$

- *Notice*:

  1. When $\gamma = 0$ or $\beta = 1$, the consumer does not have self-control problems: standard model.
  2. When $\beta = 0$: temptation by *immediate* consumption as in Gul and Pesendorfer (2000b).

THE LAIBSON LIMIT CASE

- If $\beta \neq 1$ and γ goes to infinity, we move toward the Laibson case: (i) the agent puts so much weight on the temptation that he succumbs to $\beta\delta$ behavior; and (ii) he views the future period utils as being compared with δ's alone. (Gul and Pesendorfer (2001) also study this case.)
- Focusing on the Laibson limit case, this approach tells us how to evaluate policy (which "self's" utility function to use): the current self maximizes V, but W corresponds to his utility over sets. This is effectively utility as perceived by his most recent self.

PREFERENCE REVERSALS IN THE GUL-PESENDORFER MODEL

Let $u(c) = c$ and $v(c) = \gamma c$. Set $\beta = 0$ for simplicity.

	Early reward	Late reward
c_0	0	0
c_1	a	0
c_2	0	b

Late reward chosen if $\delta a < \delta^2 b$. (No self-control problems since both rewards occur after the current period.)

	Early reward	Late reward
c_0	a	0
c_1	0	b
c_2	0	0

Early reward chosen if $a > \delta b + \gamma(0 - a)$.

Preference reversal if $\delta b - \gamma a < a < \delta b$.

EULER EQUATIONS

- There is a pair of Euler equations, one for *realized behavior* and one for *temptation behavior*:

$$u'(c_t) = \delta \frac{1+\beta\gamma}{1+\gamma} f'(k_{t+1}) \left\{ u'(c_{t+1}) + \gamma [u'(c_{t+1}) - u'(\tilde{c}_{t+1})] \right\}$$

$$u'(\tilde{c}_t) = \delta\beta\gamma f'(k_{t+1}) \left\{ u'(\tilde{c}_{t+1}) + \gamma [u'(\tilde{c}_{t+1}) - u'(\tilde{\tilde{c}}_{t+1})] \right\}$$

- These are functional equations in a "realized" decision rule $k' = g(k)$ and a "temptation" decision rule $\tilde{k}' = \tilde{g}(k)$:

- Compare and contrast with the generalized Euler equation in the Laibson model:

$$u'(c_t) = \beta\delta u'(c_{t+1}) \{ f'(k_{t+1}) + (1/\beta - 1) g'(k_{t+1}) \}.$$

MACROECONOMIC APPLICATIONS

- We consider long horizons: the limit of the finite-horizon problems.
- We study competitive equilibrium under two kinds of parametric restrictions:
  1. *Isoelastic utility and no restrictions on technology*: characterization and existence in the neighborhood of a steady state.
  2. *Logarithmic utility, Cobb-Douglas production, and full depreciation*: full analytical solution of recursive competitive equilibria.

BARRO ANALYSIS: COMPETITIVE EQUILIBRIUM

- The consumer takes as given: factor prices and a law of motion $\bar{k}' = G(\bar{k})$.

- The consumer's problem in recursive form:

$$\begin{aligned} W(k,\bar{k}) \;=\; & \max_{k'} \{u(r(\bar{k})k + w(\bar{k}) - k') + \delta W(k',\bar{k}') + \\ & \gamma\left(u(r(\bar{k})k + w(\bar{k}) - k') + \beta\delta W(k',\bar{k}')\right)\} - \\ & \gamma \max_{\tilde{k}'} \{u(r(\bar{k})k + w(\bar{k}) - \tilde{k}') + \beta\delta W(\tilde{k}',\bar{k}')\}, \end{aligned}$$

  given $\bar{k}' = G(\bar{k})$.

- This problem determines:
  1. A "realized" savings rule $k' = g(k,\bar{k})$.
  2. A "temptation" savings rule $\tilde{k}' = \tilde{g}(k,\bar{k})$.

- Equilibrium requires $g(\bar{k},\bar{k}) = G(\bar{k})$.

THE LOG-COBB MODEL

Parametric assumptions: logarithmic u, full depreciation, Cobb-Douglas production.

1. Autarky

   Realized savings rule:

$$g(k) = \frac{\alpha\delta}{\alpha\delta + (1 - \alpha\delta)\,\frac{1+\gamma}{1+\beta\gamma}}\,Ak^{\alpha}$$

   Temptation savings rule:

$$\tilde{g}(k) = \frac{\alpha\delta\beta}{1 - \alpha\delta + \alpha\delta\beta} Ak^{\alpha}$$

2. Competitive Equilibrium

   Realized savings rule:

$$g(k, \bar{k}) = \frac{\delta}{\delta + (1 - \delta)\,\frac{1+\gamma}{1+\beta\gamma}}\,r(\bar{k})k$$

   Temptation savings rule:

$$\tilde{g}(k, \bar{k}) = \frac{\delta\beta}{1 - \delta + \delta\beta}\left(r\left(\bar{k}\right)k + w\left(\bar{k}\right)\right) - \frac{\varphi\left(1 - \delta\right)}{1 - \delta + \delta\beta} G(\bar{k})$$

ISOELASTIC UTILITY AND ANY CONVEX TECHNOLOGY

One can show that the following properties hold:

$$\begin{aligned} g(k,\overline{k}) &= \lambda(\overline{k})k + \mu(\overline{k}) \\ \tilde{g}(k,\overline{k}) &= \tilde{\lambda}(\overline{k})k + \widetilde{\mu}(\overline{k}) \end{aligned}$$

where $(\lambda(\overline{k}), \mu(\overline{k}), \tilde{\lambda}(\overline{k}), \widetilde{\mu}(\overline{k}))$ solves the following functional equations:

$$\mu(\overline{k}) + \frac{w(\overline{k}') - \mu(\overline{k}')}{r(\overline{k}') - \lambda(\overline{k}')} = \frac{w(\overline{k}) - \mu(\overline{k})}{r(\overline{k}) - \lambda(\overline{k})}\lambda(\overline{k})$$

$$\widetilde{\mu}(\overline{k}) + \frac{w(\overline{k}') - \mu(\overline{k}')}{r(\overline{k}') - \lambda(\overline{k}')} = \frac{w(\overline{k}) - \widetilde{\mu}(\overline{k})}{r(\overline{k}) - \tilde{\lambda}(\overline{k})}\tilde{\lambda}(\overline{k})$$

$$\frac{1+\gamma}{\delta\left(1+\beta\gamma\right)r\left(\overline{k}'\right)} =$$

$$\left\{(1+\gamma)\left[\frac{(r(\overline{k}') - \lambda(\overline{k}'))\lambda(\overline{k})}{r(\overline{k}) - \lambda(\overline{k})}\right]^{-\sigma} - \gamma\left[\frac{(r(\overline{k}') - \tilde{\lambda}(\overline{k}'))\lambda(\overline{k})}{r(\overline{k}) - \lambda(\overline{k})}\right]^{-\sigma}\right\}$$

$$\frac{1+\gamma}{\delta\beta r\left(\overline{k}'\right)}$$

$$= \left\{(1+\gamma)\left[\frac{(r(\overline{k}') - \lambda(\overline{k}'))\tilde{\lambda}(\overline{k})}{r(\overline{k}) - \tilde{\lambda}(\overline{k})}\right]^{-\sigma} - \gamma\left[\frac{(r(\overline{k}') - \tilde{\lambda}(\overline{k}'))\tilde{\lambda}(\overline{k})}{r(\overline{k}) - \tilde{\lambda}(\overline{k})}\right]^{-\sigma}\right\}$$

STEADY STATE

- The steady-state interest rate is unique and given by:

$$\frac{1+\gamma}{r(\bar{k}_{ss})\delta(1+\beta\gamma)} = 1+\gamma-\gamma\left(1-\frac{1-\left(\frac{\beta(1+\gamma)}{1+\beta\gamma}\right)^{1/\sigma}}{r(\bar{k}_{ss})}\right)^{\sigma}.$$

Table 1:
Steady-State Interest Rate

	$\sigma = 0.5$	$\sigma = 1$	$\sigma = 2$	$\sigma = 3$	$\sigma = 5$	$\sigma = 10$
$\beta = 0.4$	8.724%	7.519%	7.123%	7.012%	6.930%	6.872%
$\beta = 0.7$	6.303%	6.192%	6.142%	6.127%	6.114%	6.105%

- As $\gamma \to \infty$, the steady state converges to that of the Laibson model (and σ no longer matters).

- When $\beta = 0$ (myopic temptation), $\tilde{g}(k, \bar{k}) = \frac{-w(\bar{k})}{r(\bar{k})-1}$ and the steady state interest rate is given by:

$$\frac{1}{\delta r(\bar{k}_{ss})} = 1 - \frac{\gamma}{1+\gamma}\left[\frac{r(\bar{k}_{ss})}{r(\bar{k}_{ss})-1}\right]^{-\sigma}.$$

- The linearity of the savings rules implies that the steady-state wealth distribution is indeterminate (contrast with Gul and Pesendorfer (2000b)).

DYNAMICS: NUMERICAL RESULTS

- Given isoelastic utility, dynamics can be computed using numerical methods.
- On observational equivalence: varying β and σ, while adjusting δ to keep the steady-state interest rate constant:

Table 2:
Speed of adjustment to the steady state

	$\beta = 0.25$	$\beta = 0.5$	$\beta = 0.75$	$\beta = 1$
$\sigma = 0.5$	0.79093	0.79757	0.80155	0.80477
$\sigma = 1$	0.86039	0.86039	0.86039	0.86039
$\sigma = 3$	0.93254	0.93075	0.92854	0.92643

POLICY IN THE INFINITE-HORIZON MODEL

For the log-Cobb model:

- The first-best is (again) the command policy: give the consumer the consumption path that he would choose given no self-control problems and a discount rate equal to δ.

- If the government chooses tax rates to maximize the welfare of the representative agent in a competitive equilibrium, then it will subsidize investment: $\tau_y^* > 0$ and $\tau_i^* < 0$.

  The realized savings decision in equilibrium is:

  $$G(\bar{k}, \tau^*) = \alpha\delta A\bar{k}^\alpha g\left(k, \bar{k}, \tau^*\right) = \delta r(\bar{k})k.$$

  This is the same allocation as under the command policy, but with lower welfare because of the self-control cost.

- When $\gamma > 0$, the savings rate is higher in competitive equilibrium than in autarky. This is a dynamic response to the larger temptation faced by a consumer in competitive equilibrium.

- The gap between the two savings rates is increasing in γ. Consequently, for low values of γ, autarky is better than a laissez-faire competitive equilibrium (without taxation); for high values of γ, competitive equilibrium dominates.

PRELIMINARY CONCLUSIONS

- The Gul-Pesendorfer framework is in some ways more attractive as a vehicle for addressing preference reversals and a "bias toward the present".
- We to develop the Gul-Pesendorfer model toward non-standard discounting and connect it to the Laibson model.
- The Laibson model appears as a limit case. This case implies that utility should be interpreted as that perceived by one's previous self.
- In a neoclassical growth setup, we characterize steady states and local dynamics. Observational equivalence does not hold in general.
- We characterize optimal policy: the government should restrict the agent's choices as much as possible subject to not eliminating those choices that are "good".
    1. Informed command policy is best.
    2. Taxation policy in a competitive equilibrium involves subsidizing investment.
    3. If the government can influence the extent of price-taking behavior, then perhaps it should.
- In separate but related work, we show how to compute asset prices in a Mehra-Prescott economy with GP consumers. This model can help to explain the low risk-free rate.

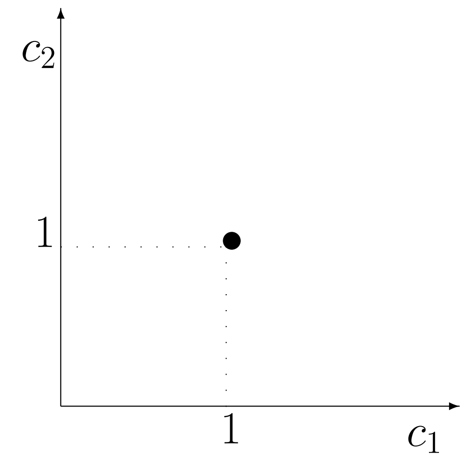

Figure 1

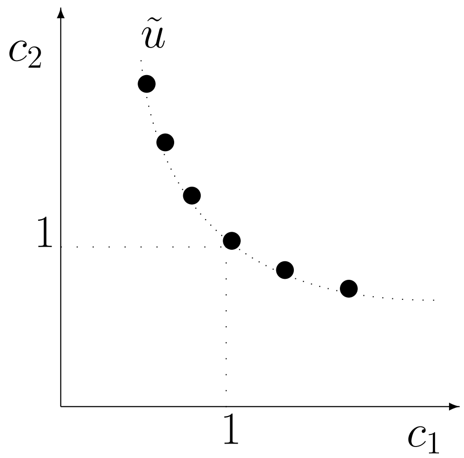

Figure 2

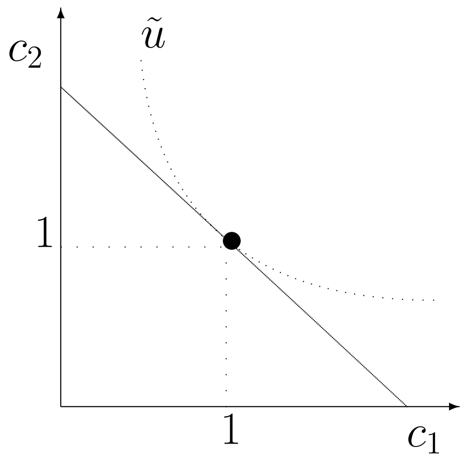

Figure 3

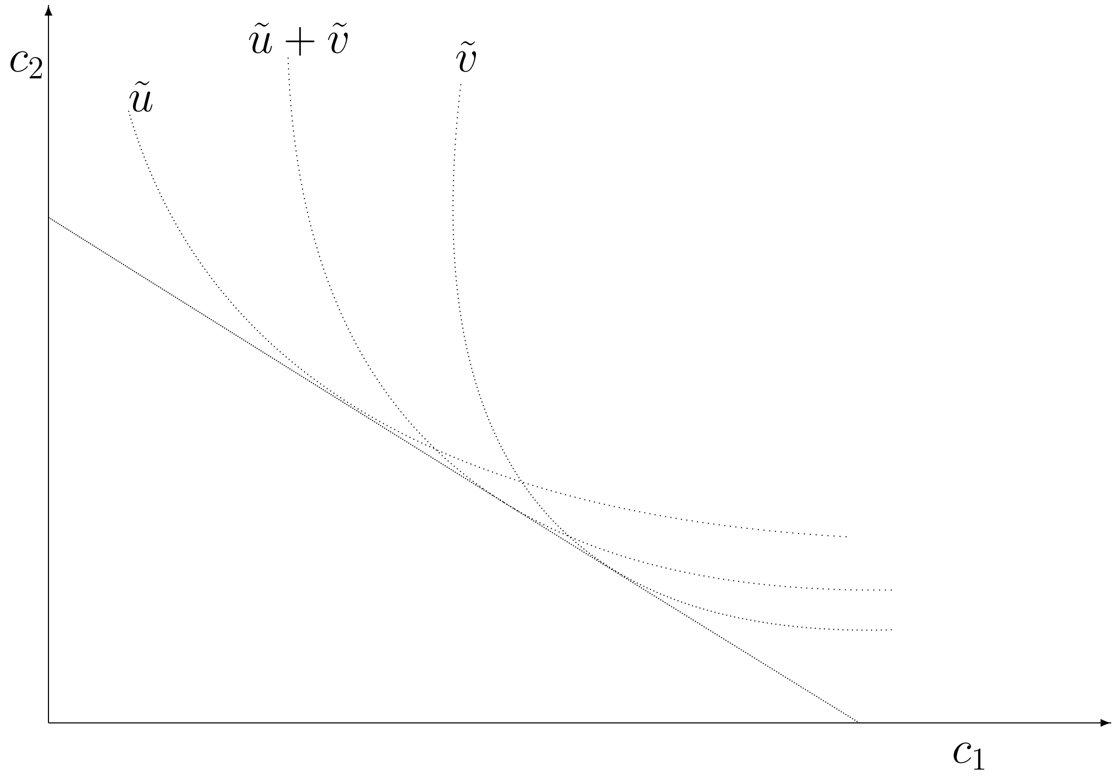

Figure 4

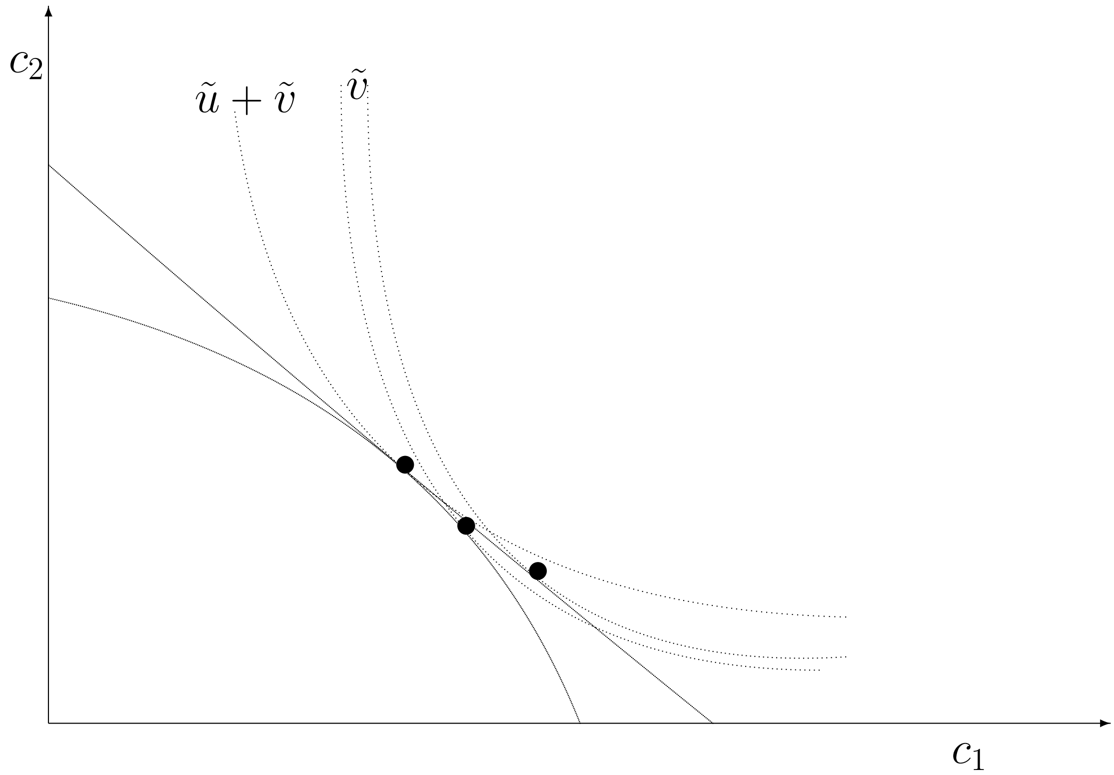

Figure 5

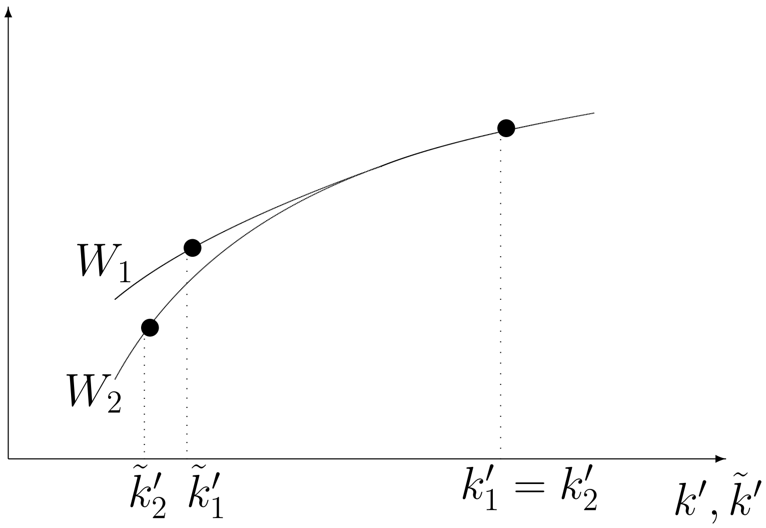

Figure 6

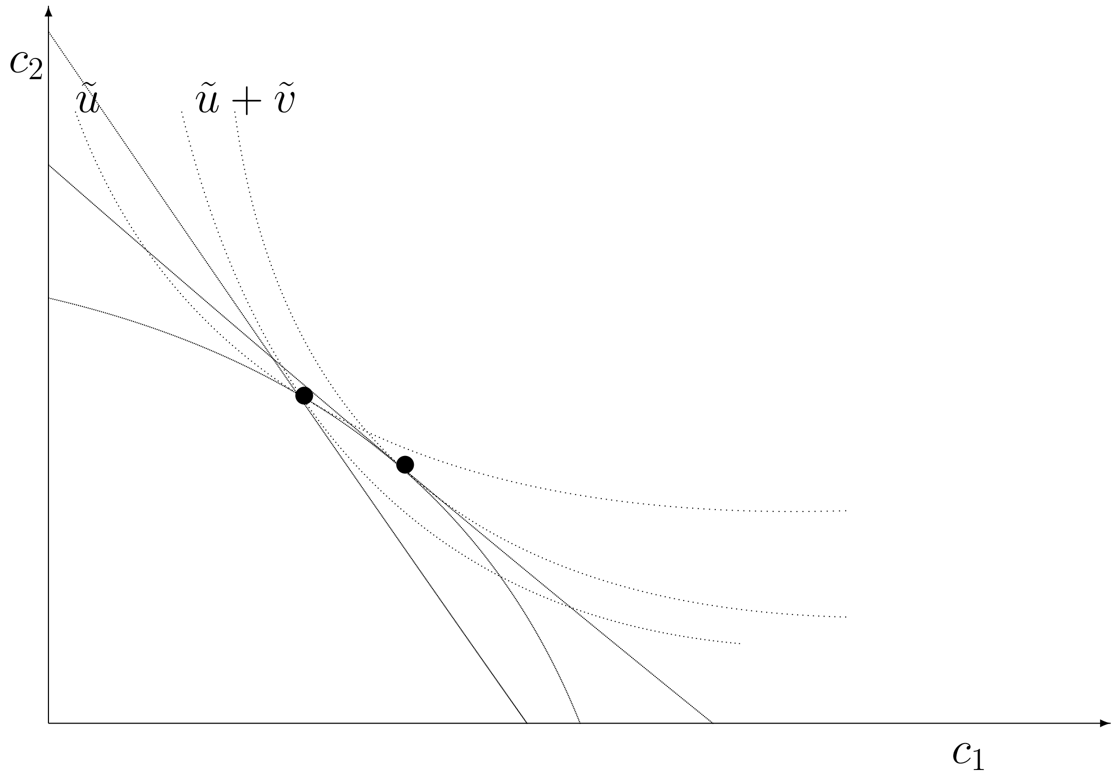

Figure 7