Economic Theory II
Lecture 5 [1]

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[1] Content of current lecture slides derives on slides prepared by Dr Valentin Jouvanceau previously.

Dynamic Consumption-Saving Model [2]

- Micro-founded macroeconomics! Introducing the two-period models. Everything is in real terms; no money yet.
- Focus on households in this lecture. No firms, so income exogenous.
- Household must choose how much to consume and how much to save.
- No firms, so no capital $\Rightarrow$ savings $\neq$ capital $\Rightarrow$ no firm optimisation $\Rightarrow$ return on savings r_t exogenous.
- For now, assume that future is known with certainty. This will change later in the course.
- Key insights:
  - Consumption depends on current as well as future income.
  - Household prefers smooth consumption over the periods.
  - Effect of interest rate on consumption is ambiguous: income vs. substitution.

[2] Chapter 9 of GLS.

Model Set-up

- Single representative household which lives two periods.
- Exogenous income each period: Y_t and Y_{t+1}.
- Saving in first period is S_t. In second period, no savings needed, as last period of life.
- S_t can be negative (borrowings), but household cannot die in debt! Needs to return borrowing in second period (with interest).
- Period budget constraints:

$$C_t + S_t = Y_t$$
$$C_{t+1} = Y_{t+1} + (1 + r_t)S_t$$

- Combining gives the *intertemporal budget constraint*:

$$C_t + \frac{C_{t+1}}{1 + r_t} = Y_t + \frac{Y_{t+1}}{1 + r_t} \tag{1}$$

Model Set-up

- Utility function has properties $u'(c) > 0$, meaning 'more is always better', and $u''(c) < 0$, meaning 'not as good as the previous unit', i.e. it has diminishing marginal returns.

- Household maximises its lifetime utility, subject to the constraint (1):

$$\max_{C_t, C_{t+1}} U = u(C_t) + \beta u(C_{t+1})$$

- We can rearrange (1) and substitute it into the above to get:

$$\max_{C_t} U = u(C_t) + \beta u((1 + r_t)(Y_t - C_t) + Y_{t+1})$$

- We know that to maximise C_t:

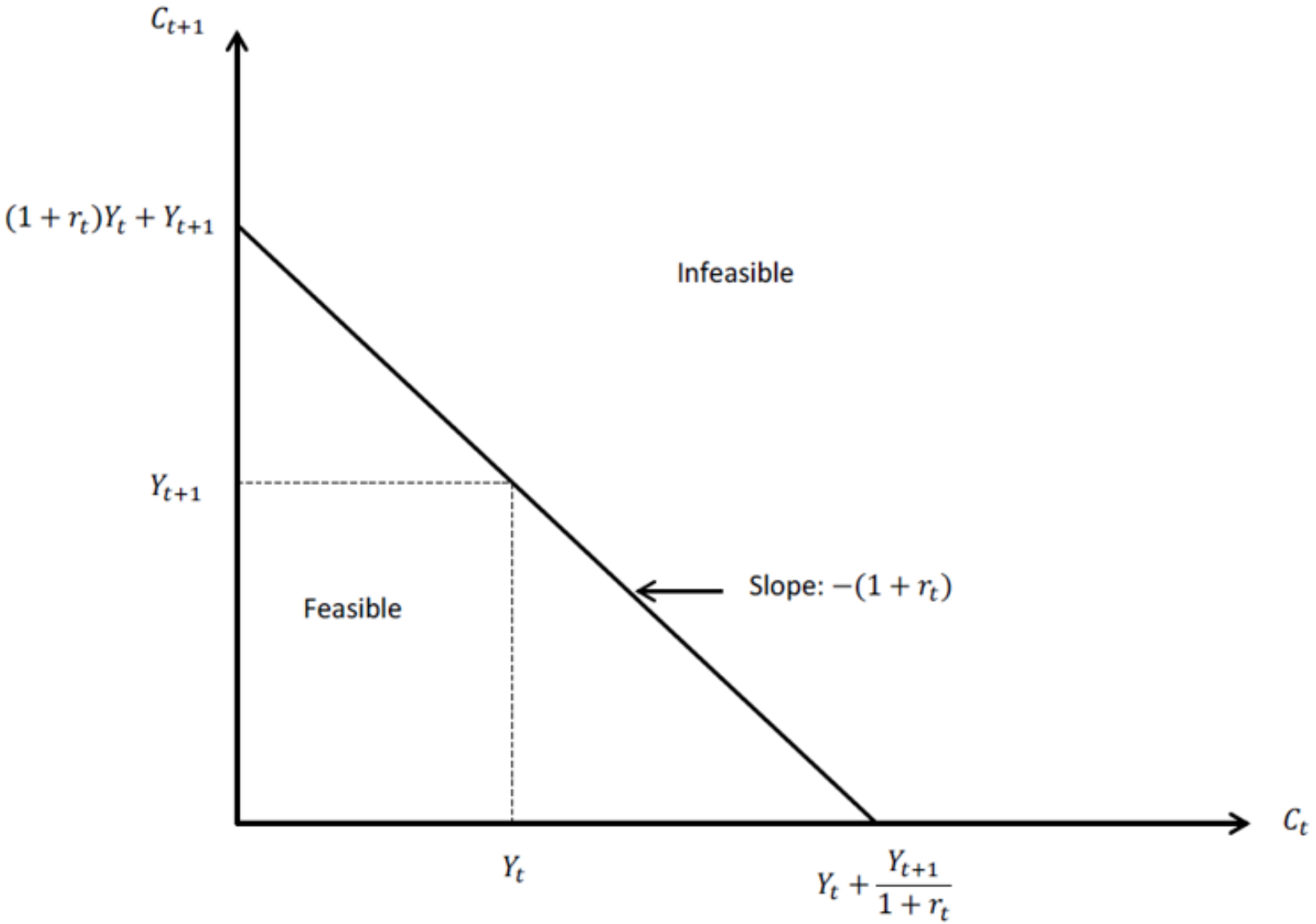
$$\frac{\partial U}{\partial C_t} = 0 \Leftrightarrow u'(C_t) = (1 + r_t)u'(C_{t+1}) \tag{2}$$

Model Set-up

- Interpretation of *Euler* as cost and benefit.
- Increasing (marginal utility of) consumption today reduces (marginal utility of) consumption tomorrow by $(1 + r_t)$: the marginal rate at which consumption can be substituted between periods is $(1 + r_t)$.
- The MRS: $\frac{u'(C_t)}{\beta u'(C_{t+1})} = (1 + r_t)$.

Graphical Analysis

Plotting the relationship $C_{t+1} = (1 + r_t)(Y_t - C_t) + Y_{t+1}$:



Graphical Analysis

Indifference curves:

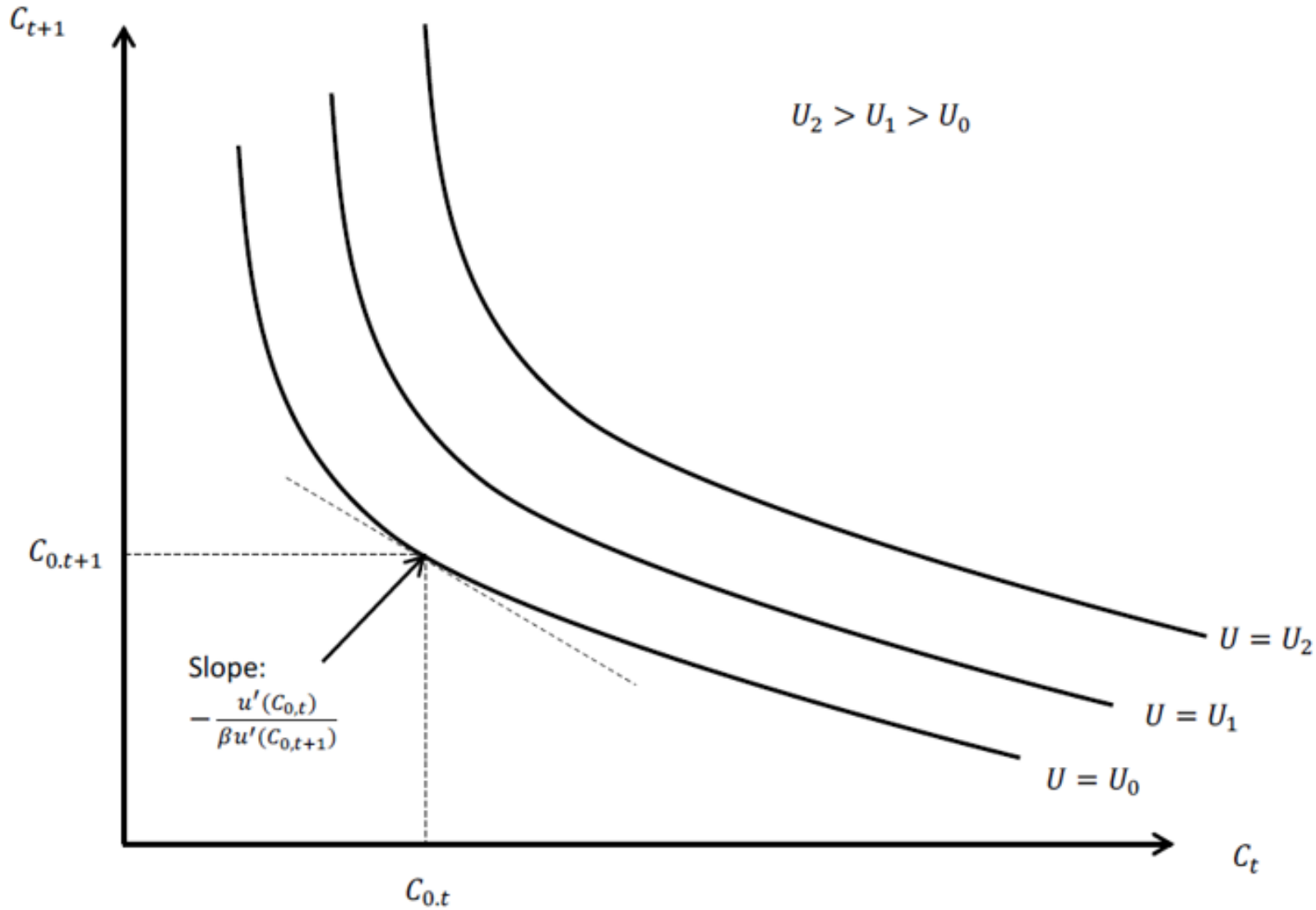
- Curves which show combinations of C_t and C_{t+1} yielding same utility.
- Higher the curve, more is the level of utility.
- For a given bundle $(C_{0,t}, C_{0,t+1})$, the utility level U_0 is $U_0 = u(C_{0,t}) + \beta u(C_{0,t+1})$.
- For indifference curve where U_0 is constant,

$$dU_0 = 0 \Leftrightarrow \frac{dC_{t+1}}{dC_t} = -\frac{u'(C_{0,t})}{\beta u'(C_{0,t+1})}$$

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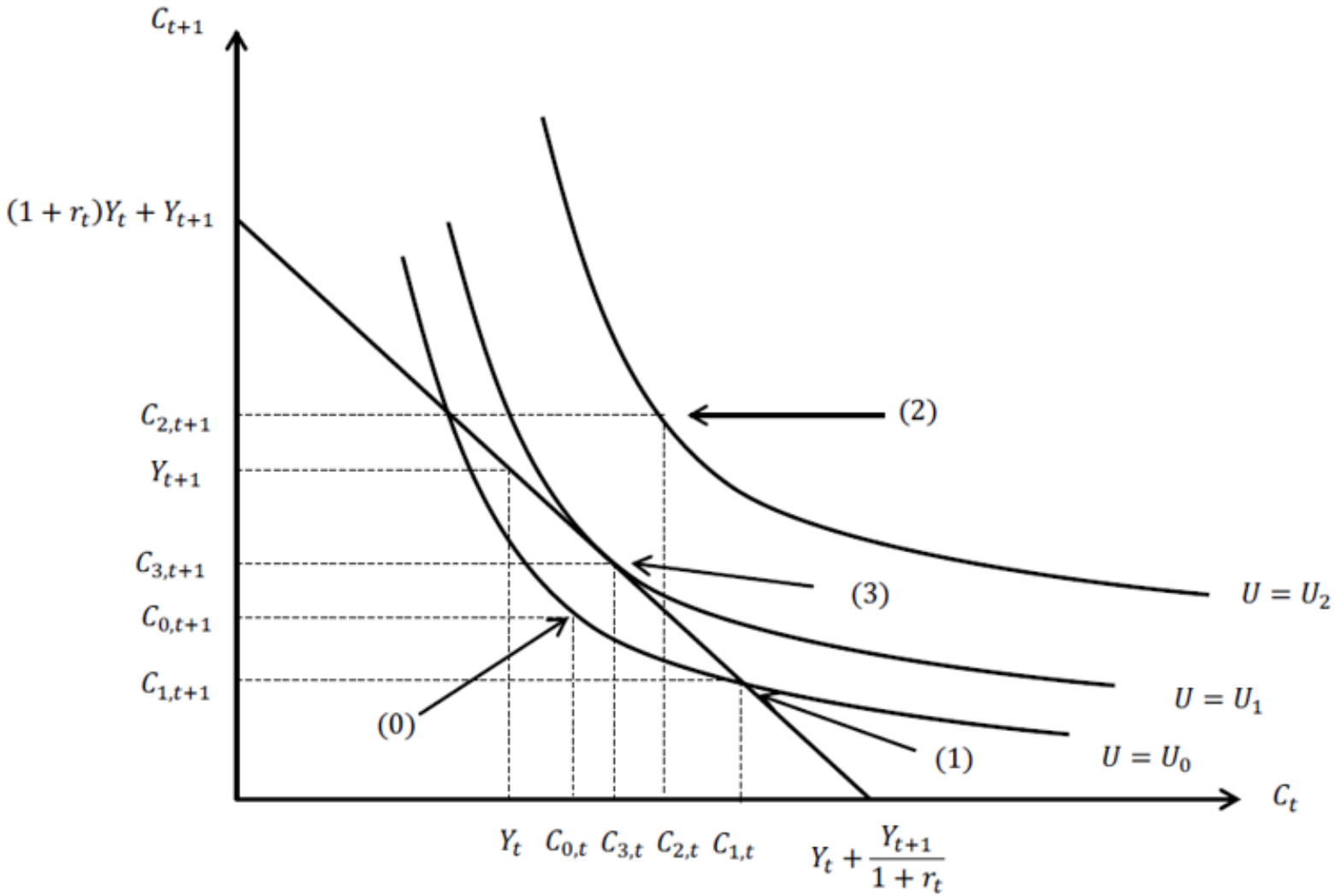
- Curve is downward sloping.

Graphical Analysis

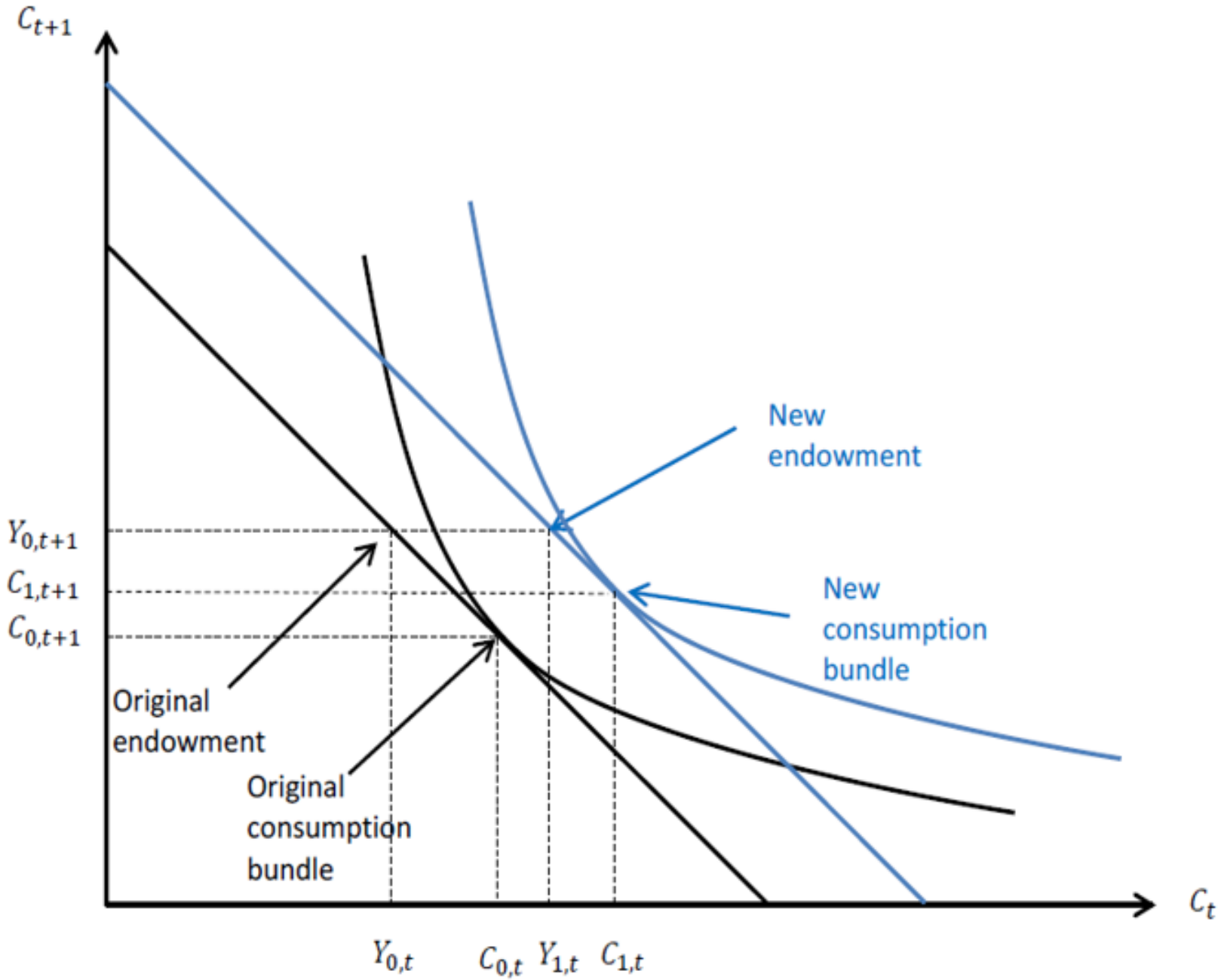


Graphical Analysis

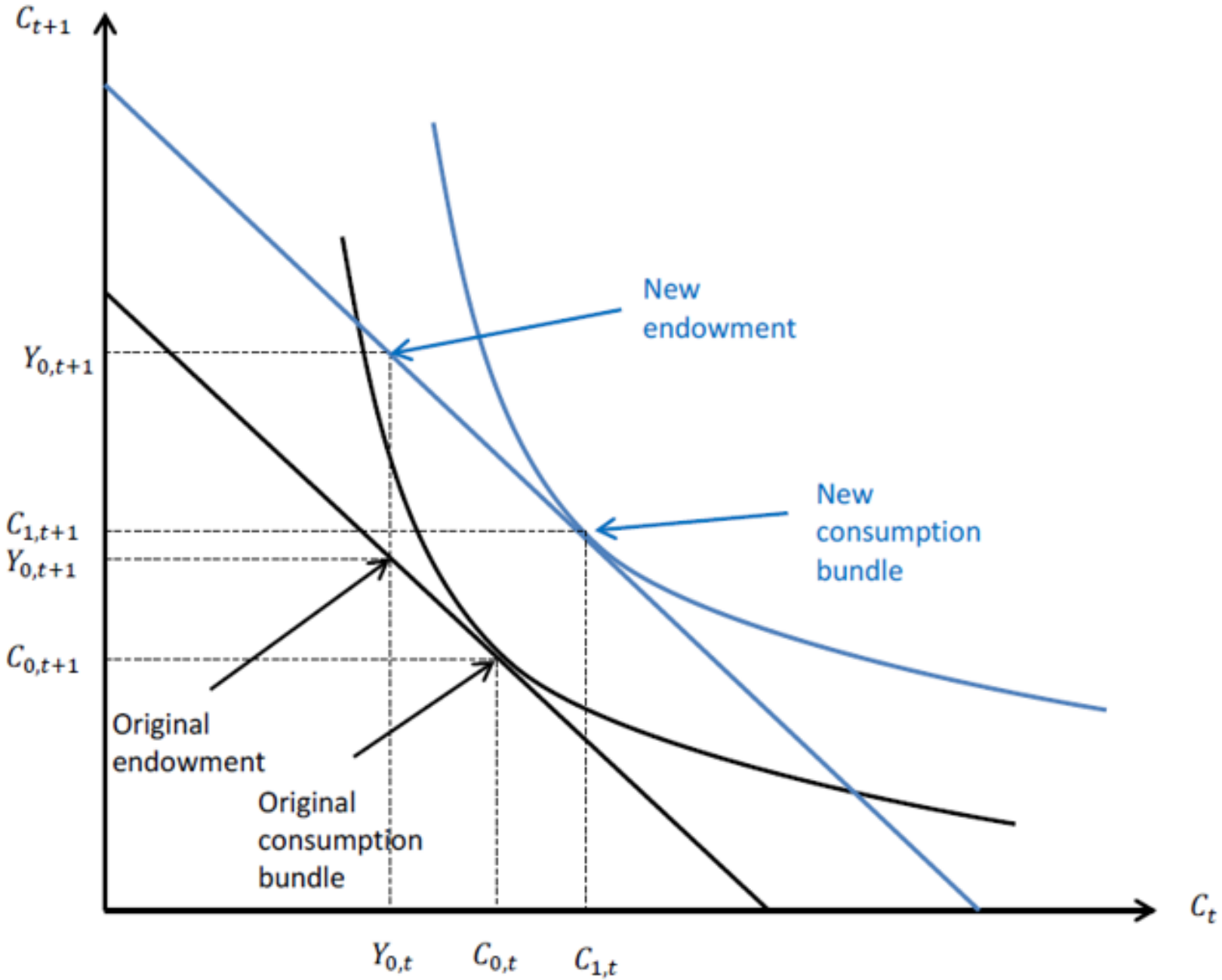
Optimisation:



Increase in Y_t

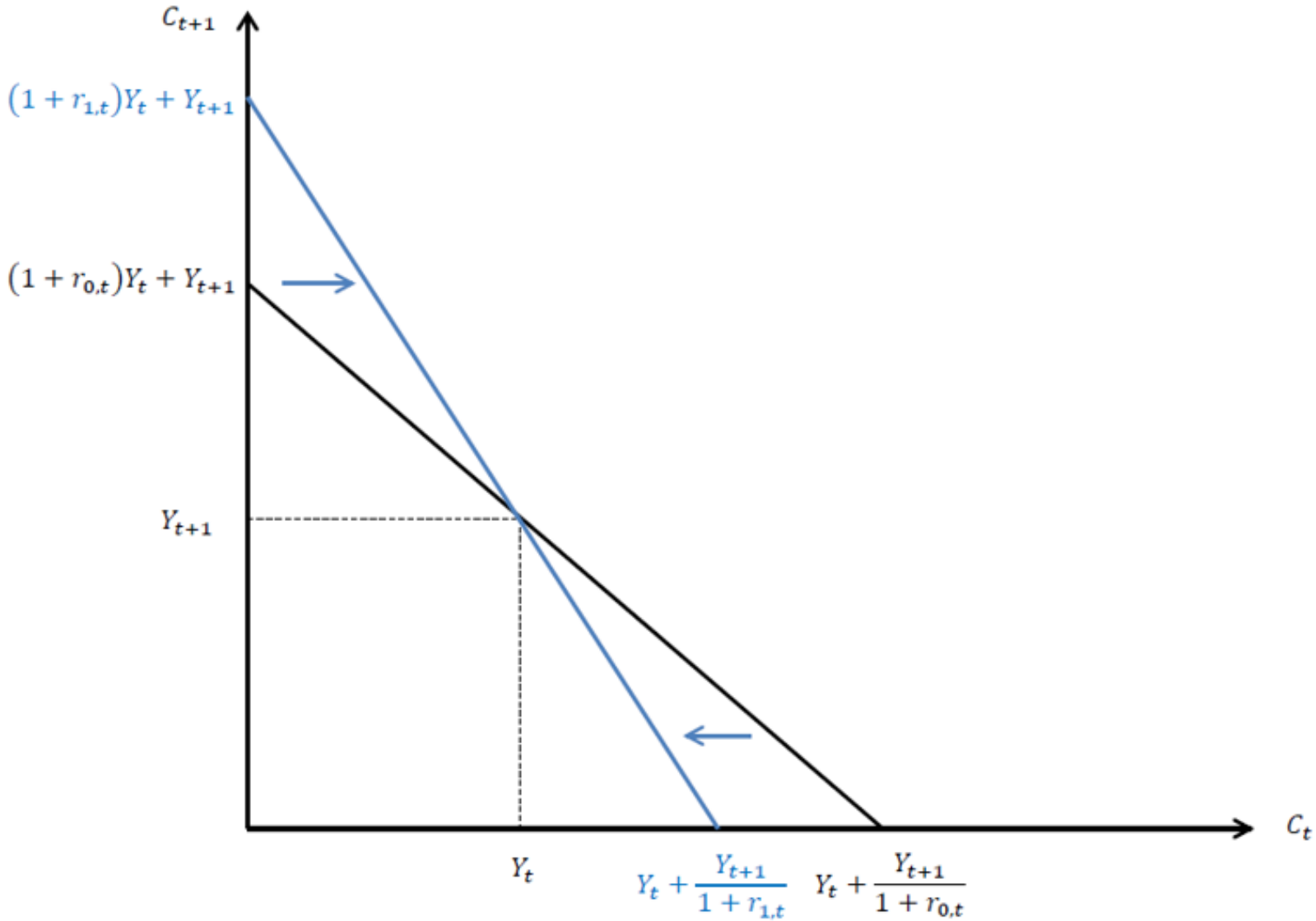


Increase in Y_{t+1}



Increase in r_t

Final effect:

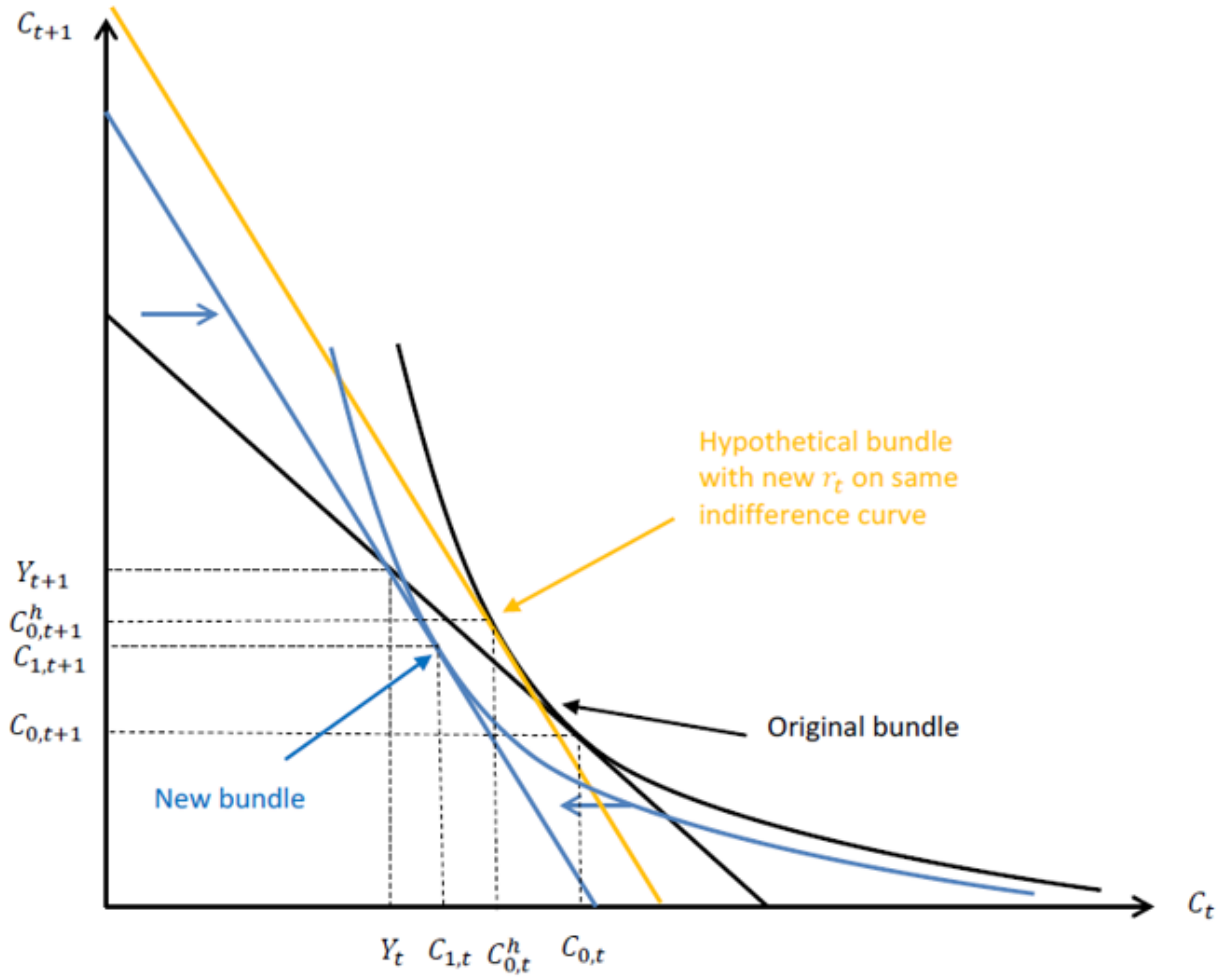


Increase in r_t

- Substitution effect: as r_t changes, for the same income, price of current consumption C_t, $(1 + r_t)$, changes. Agent chooses a different C_t.
- Income effect: because of a change in r_t, future income $\frac{Y_{t+1}}{1 + r_t}$ changes, which causes a further change in C_t and C_{t+1}.
- Final effect will depend on whether agent is borrower or saver.

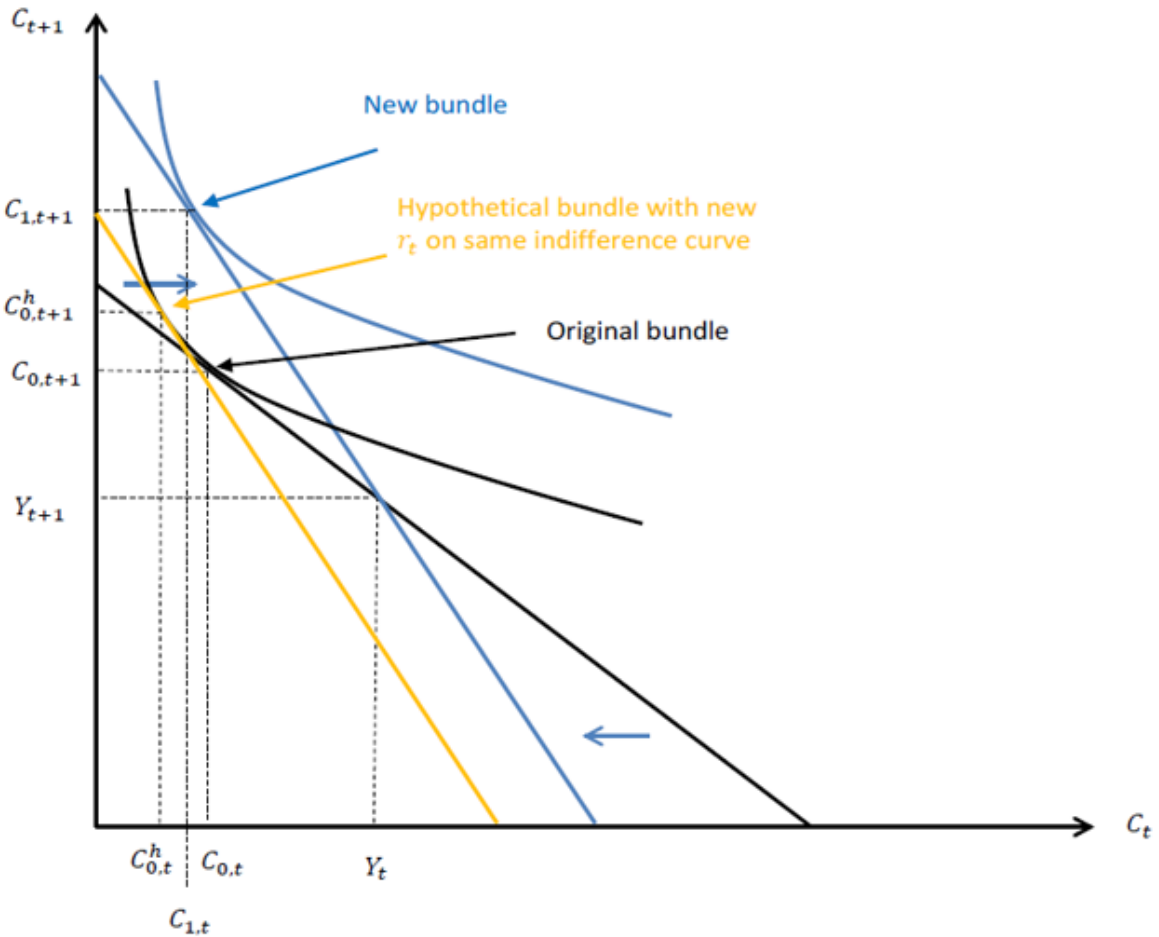
Increase in r_t

Borrower:



Increase in r_t

Saver:



Increase in r_t

Summary:

Table 9.1: Income and Substitution Effects of Higher r_t

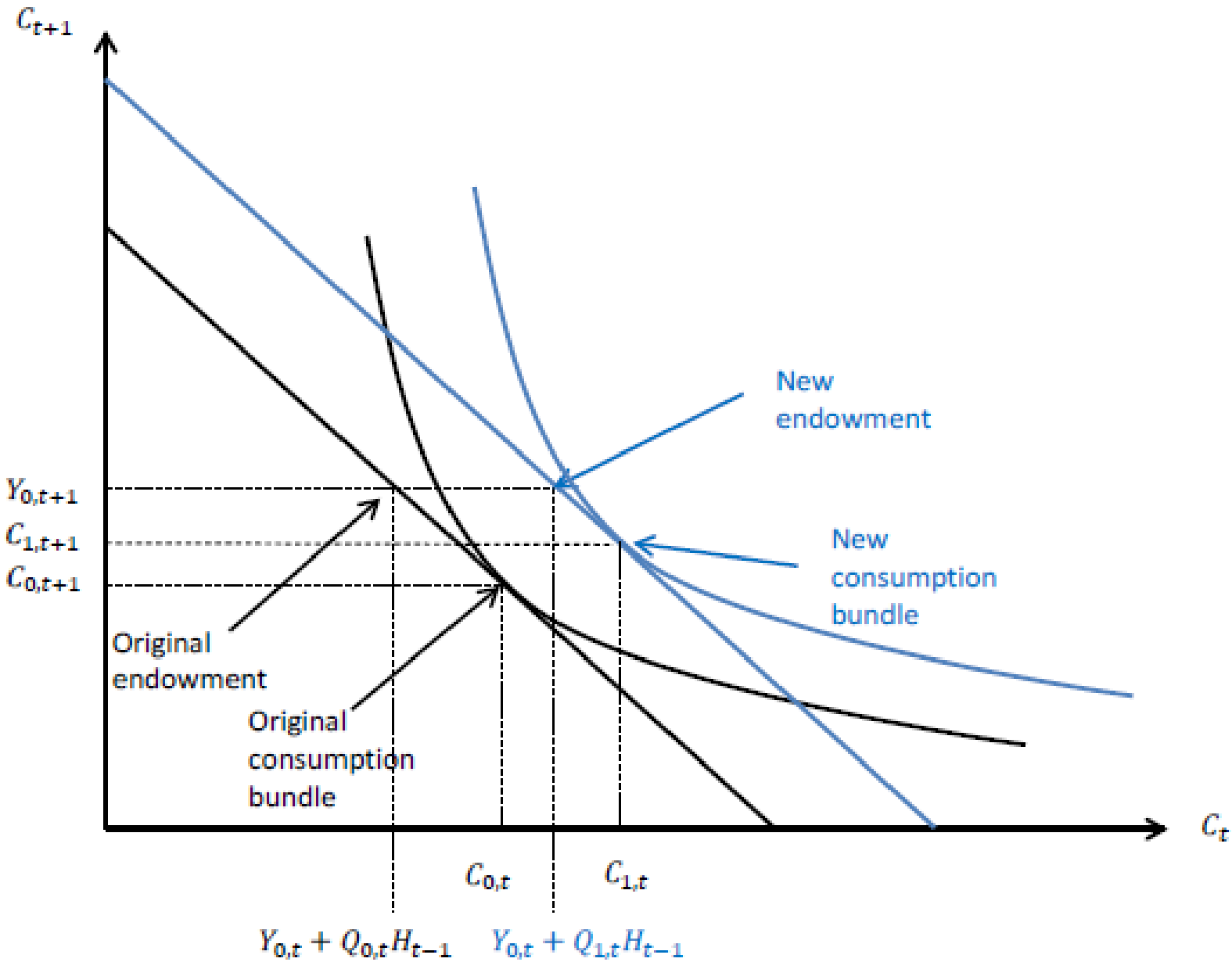
	Substitution Effect	Income Effect	Total Effect
C_t			
Borrower	-	-	-
Saver	-	+	?
C_{t+1}			
Borrower	+	-	?
Saver	+	+	+

Model Extensions - Wealth

- Households inherit exogenous stock of wealth H_{t-1}.
- In addition to S_t, households can now also buy more H_t at price Q_t in period t to save.
- In period t;
$$C_t + S_t + Q_t H_t \leq Y_t + Q_t H_{t-1}$$
- In period $t+1$;
$$C_{t+1} \leq Y_{t+1} + Q_{t+1} H_t + (1 + r_t) S_t$$
- Combining;
$$C_t + \frac{C_{t+1}}{1 + r_t} + Q_t H_t = Y_t + \frac{Y_{t+1}}{1 + r_t} + Q_t H_{t-1} + \frac{Q_{t+1} H_t}{1 + r_t}$$
- Assume household doesn't buy asset in t: $H_t = 0 \Rightarrow$ $C_t + \frac{C_{t+1}}{1+r_t} = Y_t + \frac{Y_{t+1}}{1+r_t} + Q_t H_{t-1}$

Model Extensions - Wealth

Stock market boom of the 90s: $Q_t \uparrow$.



Model Extensions - Wealth

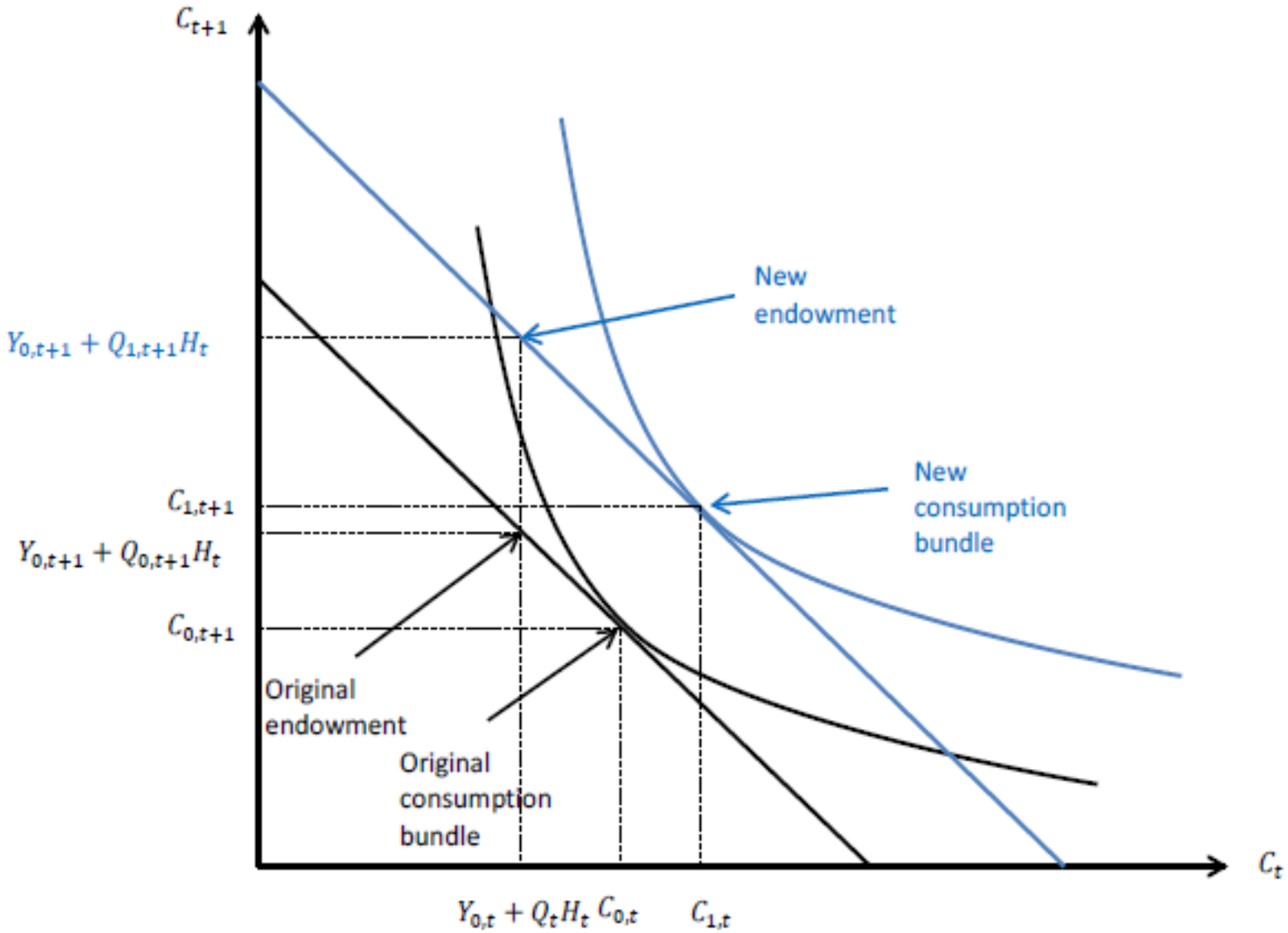
- What if there is no inherited wealth ($H_{t-1} = 0$), but households need to buy wealth in t ($H_t > 0$)?
- The lifetime budget constraint now becomes;

$$C_t + \frac{C_{t+1}}{1 + r_t} + Q_t H_t = Y_t + \frac{Y_{t+1}}{1 + r_t} + \frac{Q_{t+1} H_t}{1 + r_t}$$

- What if future price of asset $Q_{t+1} \uparrow$?

Model Extensions - Wealth

Housing boom of the mid-2000s: $Q_{t+1} \uparrow$.



Model Extensions - Others

- Permanent vs. Transitory income changes: Permanent changes to income cause a bigger impact.
- Taxes: Permanent changes to tax impact consumption to a greater extent.
- Uncertainty: Higher is the uncertainty about future income, more is the reduction in current consumption, and higher is the increase in savings. This is known as *Precautionary Savings*.
- Predictable changes in income: Consumption should not respond to such changes, since these predictable changes are already taken on board when forming the optimal consumption plan.
- Borrowing constraints: Introduce a 'kink' in the budget constraint, generating interesting implications for dynamics and for policy.

End