LECTURE 2.2

Consumption and Fiscal Policy

ECON42550 Macroeconomics

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Where We Are

1. Short-Run Fluctuations

1.1 The Keynesian Multiplier

1.2 Introducing IS-MP-PC

1.3 Analysing IS-MP-PC

1.4 The Zero Lower Bound

1.5 Banks, Runs, the Cycle

2. NK Building Blocks

2.1 Expectations, Investment

2.2 Consumption, Fiscal Policy

2.3 Sticky Prices and the NKPC

3. Long-Run Growth

3.1 Growth Facts, Solow

3.2 The Fundamental Causes

3.3 Endogenous Growth

3.4 Schumpeterian Growth

Last Week's Lecture

Last week we made expectations model-consistent, and turned the value of a firm into a theory of its investment.

1. **Rational Expectations.**
   Pin down what it means for expectations to be model-consistent.

2. **Asset Prices.**
   Derive what an asset is worth when expectations are rational.

3. **Tobin's q.**
   Turn the value of a firm into a theory of its investment.

Lecture Plan

1. **The Two-Period Model.**
   Derive consumption from a household choosing, rather than from a rule of thumb.

2. **The General Case.**
   Take the two-period result to many periods and to uncertainty.

3. **Evidence and Policy.**
   Test the theory, then use it on fiscal policy.

> **Whelan, Chapter 6**
> Reading: Whelan (2023, ch. 6).

SECTION 1

The Two-Period Model

Back to the Consumption Function

This section derives consumption from a household choosing, not from a rule of thumb. Lecture 1.1 fixed a marginal propensity to consume (c_1) and never defended it.

$$C = c_0 + c_1(Y - T) \tag{1}$$

> **Nobody Chose This**
> No household in that model decided anything. A euro of after-tax income buys c_1 euros today, whoever gets it, whenever it arrives, and whatever they expect next.

Three Questions the Rule of Thumb Cannot Answer

Ask the equation any of these and it has nothing to say:

- Does it matter whether a tax cut is **temporary or permanent**?
- Does it matter whether it was **announced a year ago**?
- Does it matter what the **real interest rate** is?

> **The Answer to All Three Is Yes**
> Today the household chooses, and the answer to all three is yes.

A Household That Chooses

The household lives for two periods and values consumption in each through a period utility function ($u(\cdot)$). It counts the second period for less.

$$U = u(C_1) + \beta\, u(C_2) \tag{2}$$

- C_1: consumption in period 1
- C_2: consumption in period 2
- β: the discount factor

> **Concavity Is the Whole Reason to Smooth**
> $u'(C) > 0$ and $u''(C) < 0$: more is better, each extra unit less than the last.

What the Household Can Afford

Income arrives in both periods (Y_1, Y_2). The household saves or borrows at r.

$$C_1 + \frac{C_2}{1+r} = \underbrace{Y_1 + \frac{Y_2}{1+r}}_{\text{lifetime resources}} \tag{3}$$

A Real Interest Rate, Not a Nominal One

r is the real interest rate: the goods next period from giving up one good today. Prices here are in goods, so inflation never appears.

The Household Cannot Tell Them Apart

Income paths with the same present value put the same consumption pairs within reach.

The Two-Period Problem, Drawn

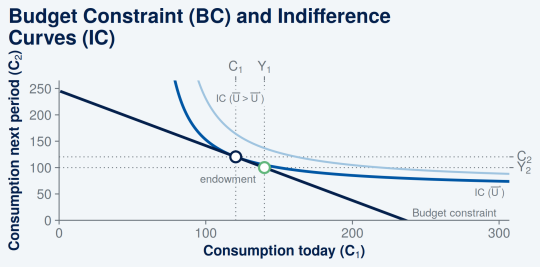

Figure 1: The intertemporal budget line drawn through the endowment point, with two indifference curves and the optimum marked where one of them is tangent to the line. C_1 and C_2 are read off the axes, and C_1 lies to the left of Y_1, so this household saves.

> **Choice Is a Tangency, Not the Endowment**
> The household saves or borrows along the budget line, whose slope is $-(1 + r)$.

Consumption Is a Fixed Share of Lifetime Resources

Choose C_1 and C_2 to make U as large as possible, subject to the budget constraint. Take the logarithm as the period utility function, $u(C) = \ln C$, and write W for lifetime resources. The solution is:

$$C_1 = \frac{1}{1+\beta} W, \qquad W = Y_1 + \frac{Y_2}{1+r} \tag{4}$$

- W: lifetime resources, in period-1 goods

A Fixed Share, Whatever the Split

Consumption in period 1 is a fixed **share** of lifetime resources, whatever the split between dates. Log utility makes the share independent of r as well.

What the Share Does Not Depend On

The real interest rate prices consumption today in terms of consumption next period. Write lifetime resources out in full and r is still inside them:

$$C_1 = \frac{1}{1+\beta}\left[Y_1 + \frac{Y_2}{1+r}\right] \tag{5}$$

It has not dropped out of consumption, only out of the *fraction*. Setting $\beta = 1$ makes both periods count equally, so $C_1 = W/2$ at **any** real rate.

> **The Share, Not the Level**
> A higher r lowers C_1 by lowering W: it discounts Y_2 more heavily, so lifetime resources fall. Log utility fixes only the fraction $1/(1+\beta)$, where the income and substitution effects of r cancel exactly.

A Transfer of τ

The government hands every household τ euros, paid for by nobody in particular. Period-1 income rises by τ, period-2 does not, so lifetime resources rise by τ:

$$\Delta C_1 = \frac{\tau}{1+\beta} = \frac{\tau}{2} \quad \text{when } \beta = 1 \tag{6}$$

A household receiving €1,000 today spends €500 and saves €500 for next period.

> **A Longer Horizon Shrinks the MPC**
> Lecture 1.1 put c_1 at **0.55**, spent on arrival. Fifty years of life leave a few cents.

The Permanent Income Hypothesis

A household spending out of lifetime resources sorts income into a lasting part and a transitory part. Milton Friedman said it spends only out of the first, in 1957.

$$C_t = Y_t^P \tag{7}$$

- Y_t^P: permanent income

> **What You Could Spend Forever**
> Permanent income is the constant flow with the same present value as expected lifetime income: what the household could spend every year for life.

Windfalls Are Saved, Career News Is Spent

Transitory income is the gap between this year's income and the flow the household could sustain: a bonus, a bad harvest, a one-off transfer.

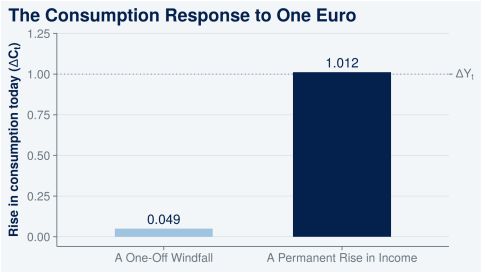

Figure 2: Extra consumption per euro of income: about 0.05 from a windfall, 1.0 from a raise.

Same Euro, Opposite Responses

Consumption tracks permanent income and **ignores** transitory income. A €1,000 windfall barely changes it; a €1,000 pay rise raises it one for one.

Why €1,000 Today Is Not €1,000 of Spending Today

The two-period household has just been handed €1,000 and has spent €500 of it.

> **Question**
> Why does a household that receives €1,000 today not spend €1,000 today?

Take answers from the room.

SECTION 2

The General Case

Nothing Changes Except the Number of Dates

This section takes the two-period result to many periods and to uncertainty.

Two periods was a device. A household lives for decades, its income arrives in a shape nobody chose, and next year's is not known. Three parts of the two-period set-up have to survive the move:

- **The Constraint:** a sum over a lifetime rather than over two dates.
- **The Optimality Condition:** a link between every neighbouring pair of dates.
- **The Certainty:** gone, and replaced by an expectation.

> **Uncertainty Is Why 2.1 Came First**
> The constraint and the optimality condition are bookkeeping. Uncertainty is what changes the theory's predictions, and why lecture 2.1 came first.

The Intertemporal Budget Constraint

Discounted lifetime spending (C_t) equals inherited assets plus lifetime earnings.

$$\sum_{t=1}^{N} \frac{C_t}{(1+r)^{t-1}} = (1+r)A_0 + \underbrace{\sum_{t=1}^{N} \frac{Y_t}{(1+r)^{t-1}}}_{\text{human wealth}} \tag{8}$$

- N: the last period of life
- A_0: assets carried in from before period 1

A Household Cannot Tell Its Two Wealths Apart

Both Count as Wealth

A_0 is financial wealth — what is in the account before period 1 opens, worth $(1 + r)A_0$ by the time it can be spent. Human wealth is the present value of future earnings.

A Euro Is a Euro Either Way

The household spends out of the **sum**, and nothing in the constraint separates financial from human wealth. A transfer and a pay rise differ in present value, not in which wealth they land in.

The Euler Equation

Take a euro away from today and save it. At the optimum the household is exactly indifferent between spending it now and spending it next period.

$$u'(C_t) = \underbrace{\beta(1+r)}_{\text{the reward for waiting}} E_t\left[u'(C_{t+1})\right] \tag{9}$$

- $u'(C_t)$: marginal utility of consumption at date t

The Same E_t as Lecture 2.1
E_t is the rational expectation of lecture 2.1: the model's own forecast from everything known at date t.

One Inequality Decides the Path
If $\beta(1+r) > 1$, waiting pays and consumption rises over time. If $\beta(1+r) < 1$, consumption falls. If $\beta(1+r) = 1$, the path is flat.

The Euler Equation With CRRA Utility

Marginal utility is not observable, so choose a functional form. Constant relative risk aversion gives $u'(C) = C^{-\sigma}$:

$$u(C) = \frac{C^{1-\sigma} - 1}{1 - \sigma} \quad \Longrightarrow \quad \left(\frac{C_{t+1}}{C_t}\right)^{\sigma} = \beta\,(1 + r) \tag{10}$$

$$\beta = \frac{1}{1 + \rho} \tag{11}$$

- σ: the coefficient of relative risk aversion
- ρ: the rate of time preference

Where the Expectation Went

An expectation does not pass through a power, so the tidy ratio above is the perfect-foresight case. Keep the E_t and it survives as an approximation.

What Decides How Fast Consumption Grows

The discount factor goes in on the right:

$$\left(\frac{C_{t+1}}{C_t}\right)^{\sigma} = \frac{1}{1+\rho}\,(1+r) \tag{12}$$

Take logarithms, with $\ln(1+x) \approx x$, and rearrange:

$$\Delta \ln C_{t+1} \approx \underbrace{\frac{1}{\sigma}}_{\text{the elasticity of intertemporal substitution}} (r-\rho) \tag{13}$$

Consumption Grows When r Exceeds ρ

Consumption grows when the real rate exceeds the rate of time preference, and $1/\sigma$ says by how much. A high σ leaves consumption growth almost flat whatever r is.

Consumption as a Random Walk

Set $\beta(1 + r) = 1$ and make marginal utility linear in consumption. What is left has no parameters in it at all:

$$E_t[C_{t+1}] = C_t \qquad \Longleftrightarrow \qquad C_{t+1} = C_t + \varepsilon_{t+1} \tag{14}$$

- ε_{t+1}: the innovation to consumption, unknown at date t

Consumption changes only when news arrives.

> **Risk Averse, but Not Prudent**
> Linear marginal utility means quadratic utility, with $u''' = 0$: the household is risk **averse** but not **prudent**, so income risk adds nothing to saving.

What the RE-PIH Implies

Robert Hall, in 1978, joined rational expectations from lecture 2.1 to the permanent income hypothesis. The pair yields a regression with an intercept (a). The null forbids a slope (b) on anything known at t.

$$\Delta C_{t+1} = a + b\, X_t + \nu_{t+1}, \qquad H_0 : b = 0 \tag{15}$$

- ΔC_{t+1}: the change in consumption between t and $t+1$
- X_t: any variable known at date t
- ν_{t+1}: the regression error

Nothing Known Today Should Predict a Change in Consumption

Everything on this list is known at t, so under the null none of it belongs in the equation:

- last year's income;
- the tax cut that was announced six months ago;
- the pension payment that arrives on a known date next Thursday.

> **Anticipated Is the Key Word**
> The theory does not say income cannot change consumption. It says a change **already known about** was spent on the day the household found out.

Announcement or Payment: Which Date Changes Consumption?

The government announces today that every household will receive €1,000 in twelve months' time.

> **Question**
> On what date does consumption change, and what does the RE-PIH predict happens on the date the money arrives?

Take answers from the room.

SECTION 3

Evidence and Policy

Testing the PIH

This section tests the theory, then uses it on fiscal policy. The test needs an income change **known in advance**, on a date you can observe:

- A tax rebate legislated months before the cheques are posted.
- A benefit or pension paid on a scheduled date each month.
- A pay rise agreed in a contract signed the year before.

Excess Sensitivity Is a Response on the Payment Date

Excess sensitivity is consumption changing when an anticipated payment arrives rather than when it was announced — a rejection of the random walk.

The Design Is the Whole Thing

Regressing consumption on income identifies nothing, because the same news changes both. You need a payment whose *timing* is arbitrary.

Consumption Rises When the Money Arrives

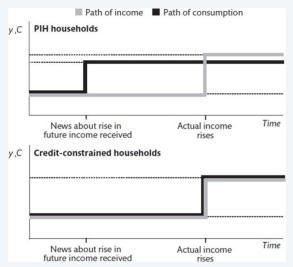

Figure 3: Income and consumption around an anticipated rise, for PIH households and for credit-constrained households.

> **Two Dates, and Only One Matters to Each Household**
> PIH consumption steps up at the **news**. Constrained consumption steps up at the **arrival**.

A Fifth to Two Fifths of a Rebate, Spent on Arrival

Households spent roughly **20–40%** of the 2001 US tax rebate in the quarter the cheque arrived, not in the quarter it was announced. Campbell and Mankiw put the share of *households* behaving this way at about **a half**.

> **Most of the Rebate Was Not Spent on Arrival**
> The surviving fiscal multiplier comes from the households whose spending tracks current income.

Two Reasons a Household Cannot Smooth

Four explanations, and they are not rivals. These two are limits the world imposes:

1. **Liquidity Constraints:**
   A household that would like to borrow against future income and cannot must spend what arrives when it arrives.

2. **Precautionary Saving:**
   Uncertain future income makes a household hold a buffer, so its consumption tracks current income in a way the certainty model rules out.

> **Who Gets the Money Decides**
> Liquidity constraints carry the sharpest policy implication: a transfer to a constrained household is spent, a transfer to an unconstrained one saved.

Two Reasons a Household Does Not Try

Myopia and buffer-stock behaviour are about what a household does with the freedom it has:

1 Myopia and Rules of Thumb.
Some households simply spend their income, because computing a lifetime plan is hard and the rule is cheap.

2 Buffer-Stock Behaviour:
Impatient households with a target level of savings behave like permanent-income households when rich and like hand-to-mouth households when poor.

> **One Household, Two Theories**
> Buffer-stock behaviour makes one household look like two theories, depending on how much it happens to hold. The share of *households* tracking current income is therefore no constant of nature: it rises in a recession.

The Lucas Critique

Fitted behavioural parameters are not structural: they summarise behaviour under the regime that generated the data. Robert Lucas objected in 1976 that a new regime gives new parameters. Estimate what a new regime leaves fixed: preferences and constraints.

> **A Fitted MPC Breaks on a One-Off Rebate**
> Estimate c_1 where income changes were almost all **permanent** and it comes out near one; on a **one-off** rebate, today's theory says half or less.

The Government Budget Constraint

The state faces the same arithmetic as the household. Start with one period: debt at the end of the year is last year's debt with interest on it, plus this year's deficit.

$$B_t = (1 + r)B_{t-1} + G_t - T_t \tag{16}$$

- B_t: government debt outstanding at the end of period t
- G_t: government spending at date t

The Debt Is the Running Total
$G_t - T_t$ is the primary deficit: the gap before interest is counted.

The Constraint Binds Later, Not Now
Nothing in this equation stops a government borrowing this year. What stops it is that the equation holds again next year, and the year after.

What the Government Must Eventually Pay

Roll the flow constraint forward; the no-Ponzi condition rules out paying interest by borrowing for ever:

$$\sum_{t=1}^{\infty} \frac{T_t}{(1+r)^{t-1}} = \underbrace{(1+r)B_0}_{\text{inherited debt, with interest}} + \sum_{t=1}^{\infty} \frac{G_t}{(1+r)^{t-1}} \tag{17}$$

A Government Chooses When to Tax, Not Whether

Borrowing changes the date of the taxes, never their present value.

Ricardian Equivalence

The government cuts taxes by τ today, borrows, and raises taxes by $(1 + r)\tau$ next period:

$$\begin{aligned} W &= (Y_1 - T_1 + \tau) + \frac{Y_2 - T_2 - (1 + r)\tau}{1 + r} \\ &= (Y_1 - T_1) + \frac{Y_2 - T_2}{1 + r} + \tau - \tau \\ &= (Y_1 - T_1) + \frac{Y_2 - T_2}{1 + r} \end{aligned} \tag{18}$$

The τ Terms Cancel Exactly
Spending never changed, so lifetime resources and consumption are unchanged.

Debt Is Deferred Taxation

The household is not fooled by the timing of taxes, because the government's budget constraint tells it what the taxes will be. A household that can see the deferral treats it as taxation, saves the whole tax cut, and pays the bill out of the saving when it arrives.

> **A Bond Is Not Net Wealth**
> Private saving rises by exactly what the government borrowed, so national saving is unchanged. Deficits do not crowd out investment.

What Ricardian Equivalence Assumes

The result is exact, and four assumptions hold it up. Break any one and the tax cut changes consumption again. These two are about the household's horizon and its access to credit:

1. **Households Live as Long as the Debt.**
   If the taxes fall due after you are dead, the tax cut is a transfer from your children to you — unless you care about your children enough to leave the difference as a bequest.

2. **Nobody Is Credit-Constrained.**
   A household that wanted to borrow and could not has just been lent money by the state, and it will spend it.

The Taxes Must Be Lump-Sum and Foreseen

Both remaining assumptions are about the taxes that repay the debt:

1. **Taxes Are Lump-Sum.**
   If future taxes distort labour supply or saving, deferring them changes behaviour as well as timing.

2. **Households See the Future Taxes Coming.**
   They need to know the government's budget constraint binds, and to believe it will be honoured by taxation rather than by inflation or default.

> **A Benchmark, Not a Prediction**
> Ricardian equivalence is a benchmark, not a prediction. It names which of the four assumptions any given fiscal multiplier is violating.

The Offset Is Real, Partial, and Nowhere Near One for One

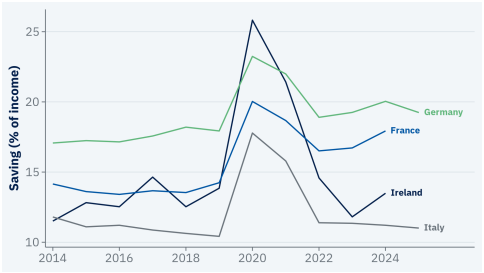

Figure 4: Household saving rates around the fiscal transfers of 2020 and 2021.

> **The Jump Falls Short of the Transfers**
> A full Ricardian offset raises saving by a euro for every euro of transfer.

Three Explanations Fit the Same Jump

Saving did rise sharply in 2020, which is the direction the theory predicts. Three explanations fit that jump:

- **Ricardian Foresight:** Households saved because they expected the taxes.
- **Nothing to Spend It On:** Shops, restaurants and travel were closed.
- **Precaution:** A buffer against record income risk is not fiscal foresight.

> **Not Identified by This Chart**
> All three predict the same picture. Separating them needs household-level variation the aggregate series does not have.

What This Does to the Multiplier

Lecture 1.1 asked what €1bn of government spending buys, and the answer was $1/[1 - c_1(1 - t)]$, about **1.6** on the Irish calibration. That multiplier came from a household that spends c_1 of every euro in the year it arrives.

1 **A Transfer Is Spread over a Lifetime.**

A household with fifty years left spends a windfall over fifty years, so its marginal propensity to consume out of that windfall is a few cents, not 0.55. The long horizon is what collapses the transfer multiplier, on the assumption that the household does not expect to fund the transfer itself.

2 **A Debt-Financed Tax Cut Does Nothing at All.**

Once the household does expect to fund it, and under the assumptions of the previous slide, private saving rises by exactly what the government borrows.

What Survives Is Purchases and Constrained Households

Two parts of the 1.1 multiplier survive the optimising household:

- **Government Purchases:** A euro the state spends on a **temporary** purchase is a euro of output, whatever households do.
- **Constrained Households:** About half of households spend a transfer in full.

> **Not a Retraction, an Explanation**
> Lecture 1.1 is not retracted; its consumption function is now derived. What survives depends on who spends the euro.

Where the Consumption Function Comes From

1. **The Two-Period Model.**
   A household that chooses spends a fixed share of lifetime resources.

2. **The General Case.**
   Under rational expectations, consumption changes are unforecastable.

3. **Evidence and Policy.**
   About half of households fail the prediction; debt-financed tax cuts do nothing.

> **Lecture 1.1 Assumed What Today Derived**
> The multiplier in lecture 1.1 was built on a household that does none of this.

Before Lecture 2.3

1. **Play:**
   Run stage 5 of the consumption toy model twice, once with credit-constrained households switched on and once without.

2. **Apply:**
   Work the two-period transfer and the CRRA Euler equation by hand, from sample question sheet 2. No problem set is issued today.

3. **Review:**
   Whelan, chapter 8, on sticky prices, before next week.

Next Week

Every price in today's lecture was in goods, so inflation never appeared. Lecture 2.3 turns to how nominal prices are set, in Whelan, chapter 8.

Thank you

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BACKUP

Appendix

Notes and Tools

- **Whelan's lecture notes** — the notes for this module. Chapter 6 goes with today.
- **The toy models** — the two-period consumption model, in your browser, nothing to install.

> **Only Whelan Is Required**
> Whelan is the only required reading.

References

Whelan, K. (2023). *Lecture notes on macroeconomics*. University College Dublin. https://www.karlwhelan.com/Macro2/Whelan-Lecture-Notes.pdf