Lecture 15: Public Debt

See Barro Ch. 14

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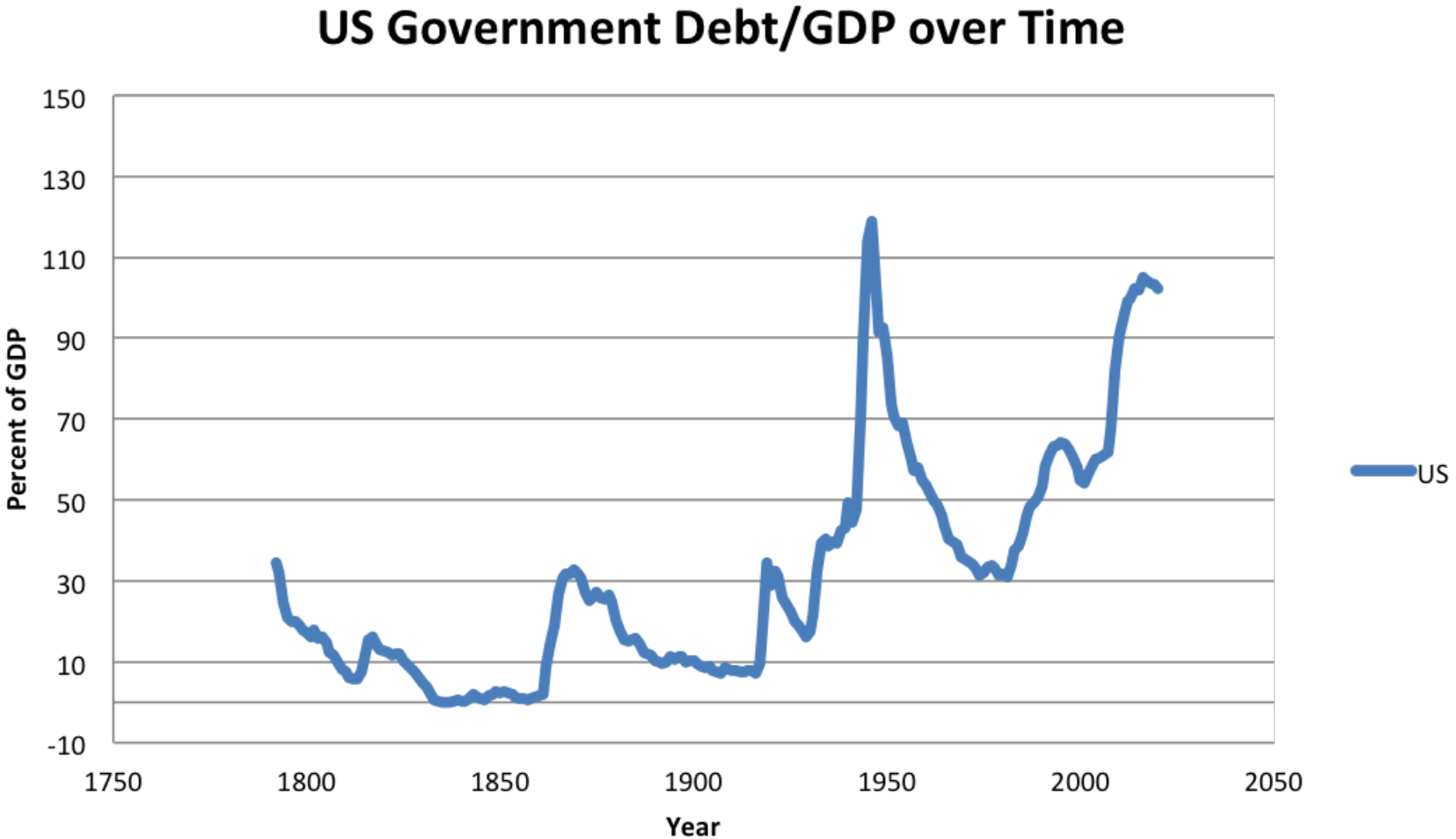
Introduction

- Public debt (government debt) is so hot right now
- We'll sprint through this, sadly
- I encourage you to read this in Barro, as this lecture will be far less in depth
- Let's look at government debt as a fraction of GDP over time

Introduction



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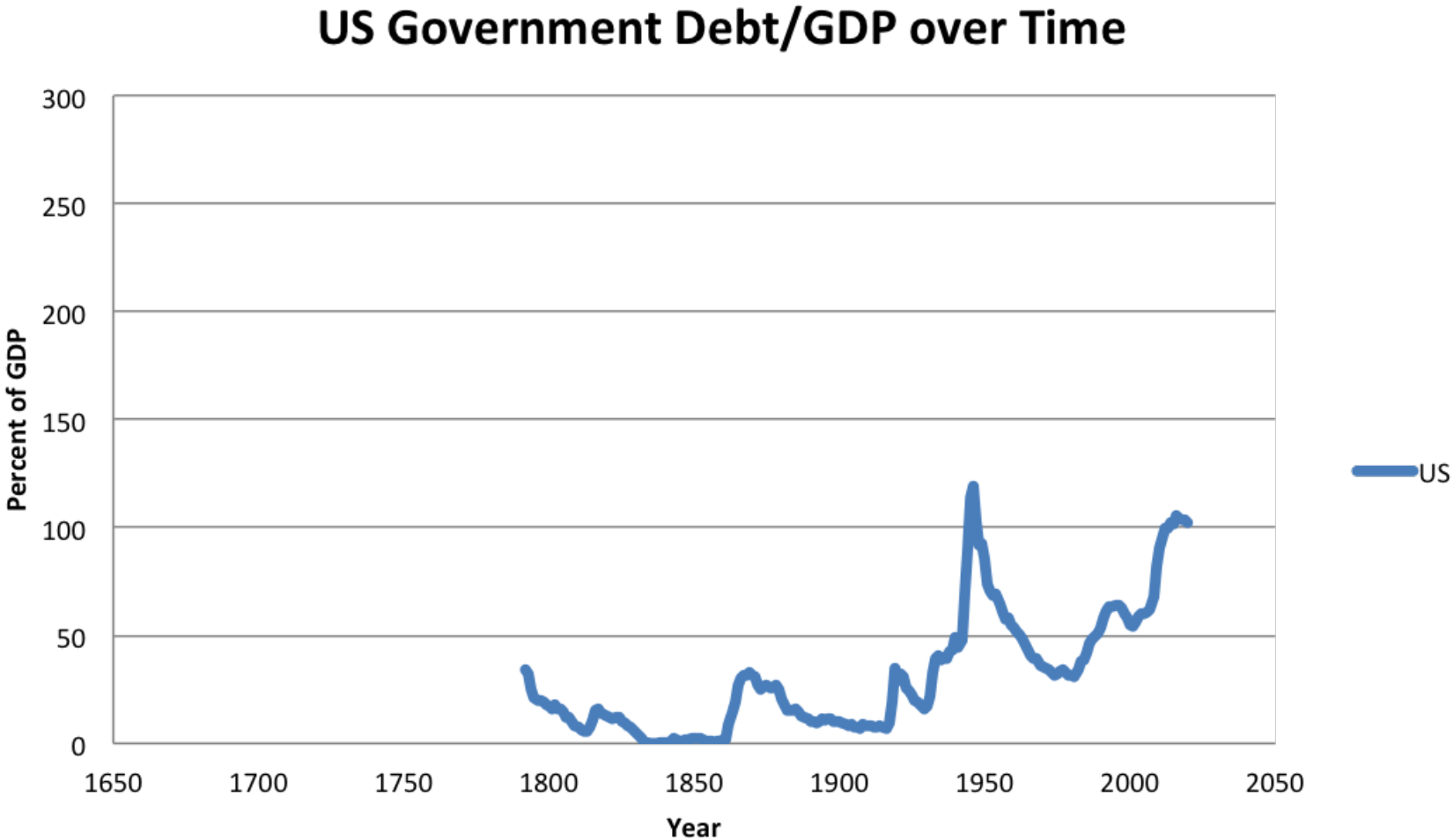

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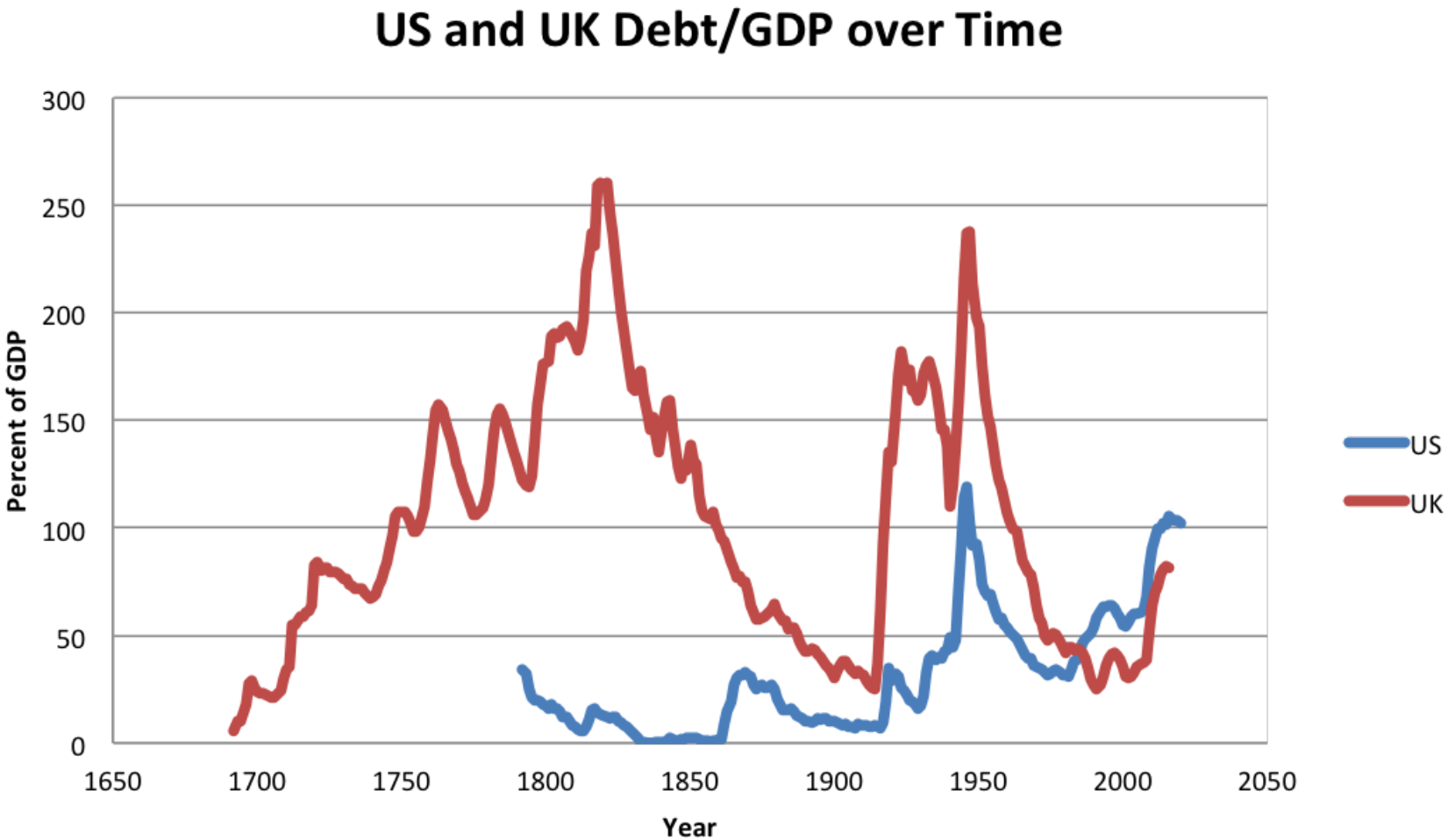

Government debt is important

- Government debt is a pretty big deal
- Especially for war
- May have helped UK/hurt France in Napoleonic wars (UK could borrow, France couldn't)
- Mismanaged debt an even bigger deal, can trap countries in bad cycles for decades
- What does it look like?

Putting government debt into our model-I

- Before, all households had to hold zero net bonds
- This isn't true of government bonds! All households have to hold net positive government bonds.
- Call private (net zero) bonds B_t and government (net nonnegative) bonds B_t^g.
- Government is typically a debtor to the private sector (households)
- Just like how $V + T$ were income to the private sector and expenditures to the government, bonds bind the two together as well

Putting government debt into our model-II

- Government budget constraint before:

$$G_t + V_t = T_t + \frac{M_t - M_{t-1}}{P_t}$$

- Now:

$$V_t + G_t + i_{t-1}\frac{B^g_{t-1}}{P_t} = T_t + \frac{B^g_t - B^g_{t-1}}{P_t} + \frac{M_t - M_{t-1}}{P_t}$$

  - Real transfers
  - Real spending
  - Real net interest payments
  - Real taxes
  - Real net (new) borrowing/debt issue
  - Real seniorage revenue/money creation

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  - Which is (real) debt? B^g_{t-1}
  - Which is (real) deficit?

The Deficit and the Debt

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  - Which is (real) debt? B^g_{t-1}
  - Which is (real) deficit? $\frac{B^g_t - B^g_{t-1}}{P_t}$
- If revenues (RHS, other than new debt) are greater than LHS, then surplus
- If revenues (RHS, other than new debt) are less than LHS, then surplus
- If revenues (RHS, other than new debt) are equal to LHS, then balanced budget

Public and private saving

- We can flip around the deficit and call it real government saving

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- This turns out to give us a wild and crazy result! (Ricardian equivalence)

Ricardian equivalence: assumptions

- Let's assume real interest rate r_t is fixed
- Assume money stock and price level aren't changing
- Real transfers V_t are zero in all years
- Government starts out with no debt
- Government has already picked out path of expenditures, G_t (it doesn't change after we pick the path)

Ricardian equivalence: budget constraints

- Under the assumptions we've made, government budget constraint is:

$$G_t + r\left(\frac{B^g_{t-1}}{P}\right) = T_t + \frac{B^g_t - B^g_{t-1}}{P}$$

- And in period 1, because they start out with no debt:

$$G_1 = T_1 + \frac{B^g_1}{P}$$

- Imagine a world in which the government has balanced its budget in every year: $B^g_t = 0$
- Then, it decides to run a budget deficit: because G_t is fixed, it cuts T_t (deficit-financed tax cut)
- We'll assume that $\frac{B^g_1}{P} = 1$ and $\frac{B^g_2 - B^g_1}{P} = -1$, the government runs a budget deficit and then pays it all back
- So we can write, because the government also pays interest r:

$$G_2 + r = T_t - 1 \quad \text{or} \quad T_2 = G_2 + 1 + r$$

Ricardian equivalence: budget constraints

- Government ran a budget deficit in period 1 and paid it back in period 2:
  - T_1 decreased by 1
  - T_2 increased by 1+r
- Plug this into the household's budget constraint:

$$C_1 + \frac{C_2}{1+r} + ... = \left(\frac{w}{P}\right)_1 L_1 + \frac{\left(\frac{w}{P}\right)_2 L_2}{1+r_1} + \frac{\left(\frac{w}{P}\right)_3 L_3}{1+r_2} + ...$$

$$+ (1+r_0)\left(\frac{B_0}{P} + \frac{B^G}{P} + K_0\right) + V_1 - T_1 + \frac{V_2 - T_2}{1+r_1} + \frac{V_3 - T_3}{1+r_2}$$

- So how does the government budget deficit impact households?

- $-T_1 \downarrow$ by 1
- $-\frac{T_2}{1+r} \uparrow$ by 1+r
- They exactly cancel!

Ricardian equivalence: the story

- If the government has a deficit financed tax cut, it has to pay it off sometime, either through interest payments or by actually paying it off
- Two things happen today: less taxes for HH (-1), government borrows more (1)
- Two things happen tomorrow: more taxes for HH (1+r), government pays off debt -(1+r)
- I see that when I get \$1 today I'll have to pay 1+r taxes tomorrow
- Then I can just save that \$1 today and have 1+r tomorrow
- Households buy the new bonds government issued, then pay the taxes that pay their bonds
- Deficit-financed tax cut changed nothing!

Ricardian equivalence: another story

- There's nothing special about the government paying it all off next period
- It could just pay the interest in every other period: taxes go down by 1 next period, and up by interest payment in all future periods
- So, $T_1 \downarrow 1$
- $T_2 \uparrow r$, $T_3 \uparrow r$, $T_4 \uparrow r$,...
- NPV budget constraint: $+1 - \frac{r}{1+r} - \frac{r}{(1+r)^2} - \frac{r}{(1+r)^2} - \ldots$
- It turns out that $r \sum_{t=1}^{\infty} \frac{1}{(1+r)^t} = r \cdot \frac{1}{r} = 1$.
- So the budget constraint: goes up by 1 and down by 1 in NPV...
- Again, the budget constraint didn't change!

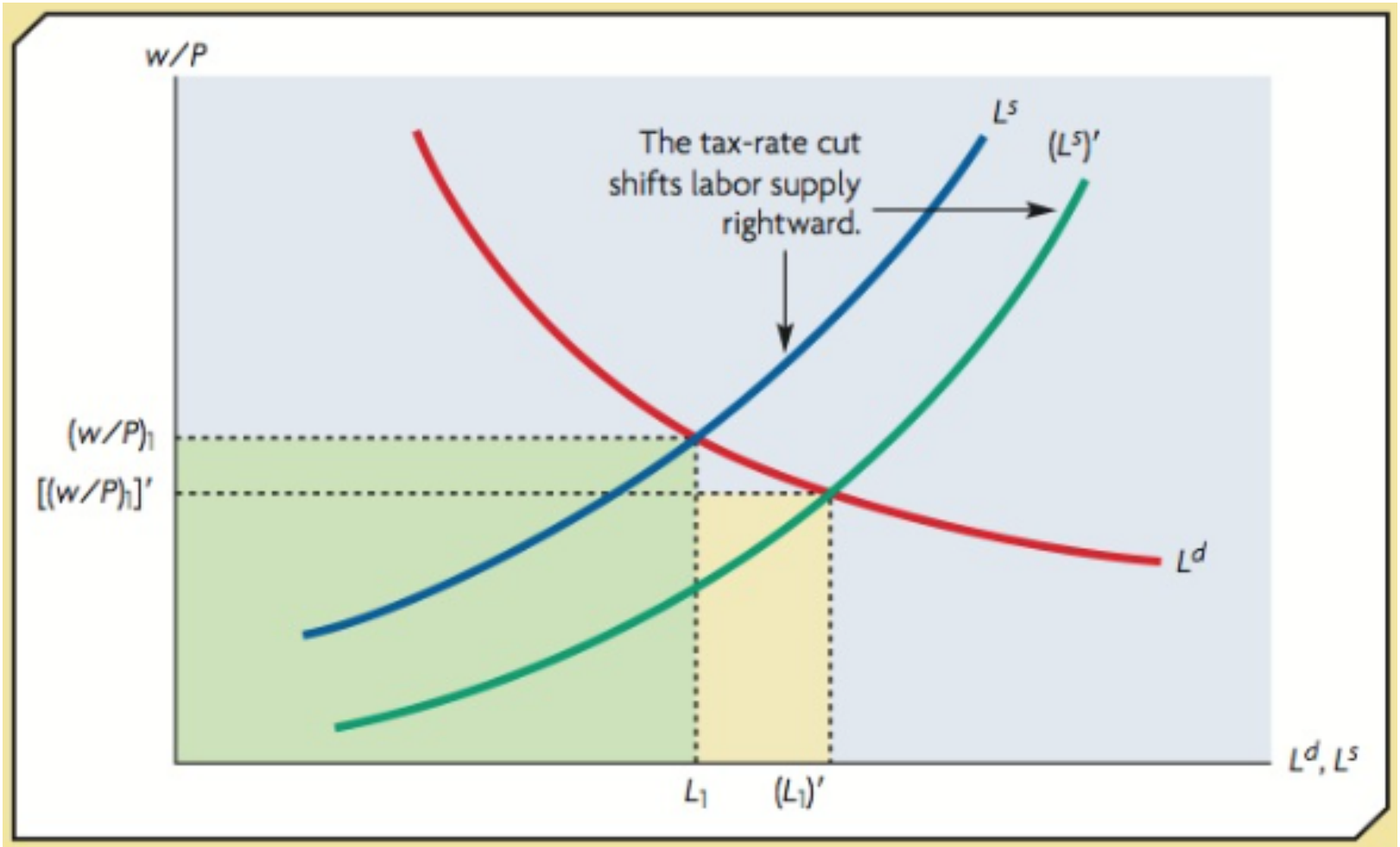
Ricardian Equivalence: The Point

- Few think Ricardian Equivalence would hold perfectly
- The point is that it's a first-order effect
- In a simple world, we wouldn't think deficit-financed lump-sum tax cuts would have any effect on activity!
- In other words, people aren't animals who just consume what they make that period: they save and think about future taxes and income
- But this doesn't mean deficit-financed tax cuts should have *no* effect!
- After all, if it's a deficit-financed labor tax cut, people will make hay when the sun shines (work when taxes are low, not work when they're high)

Deficit-Financed Labor Income Tax Cut

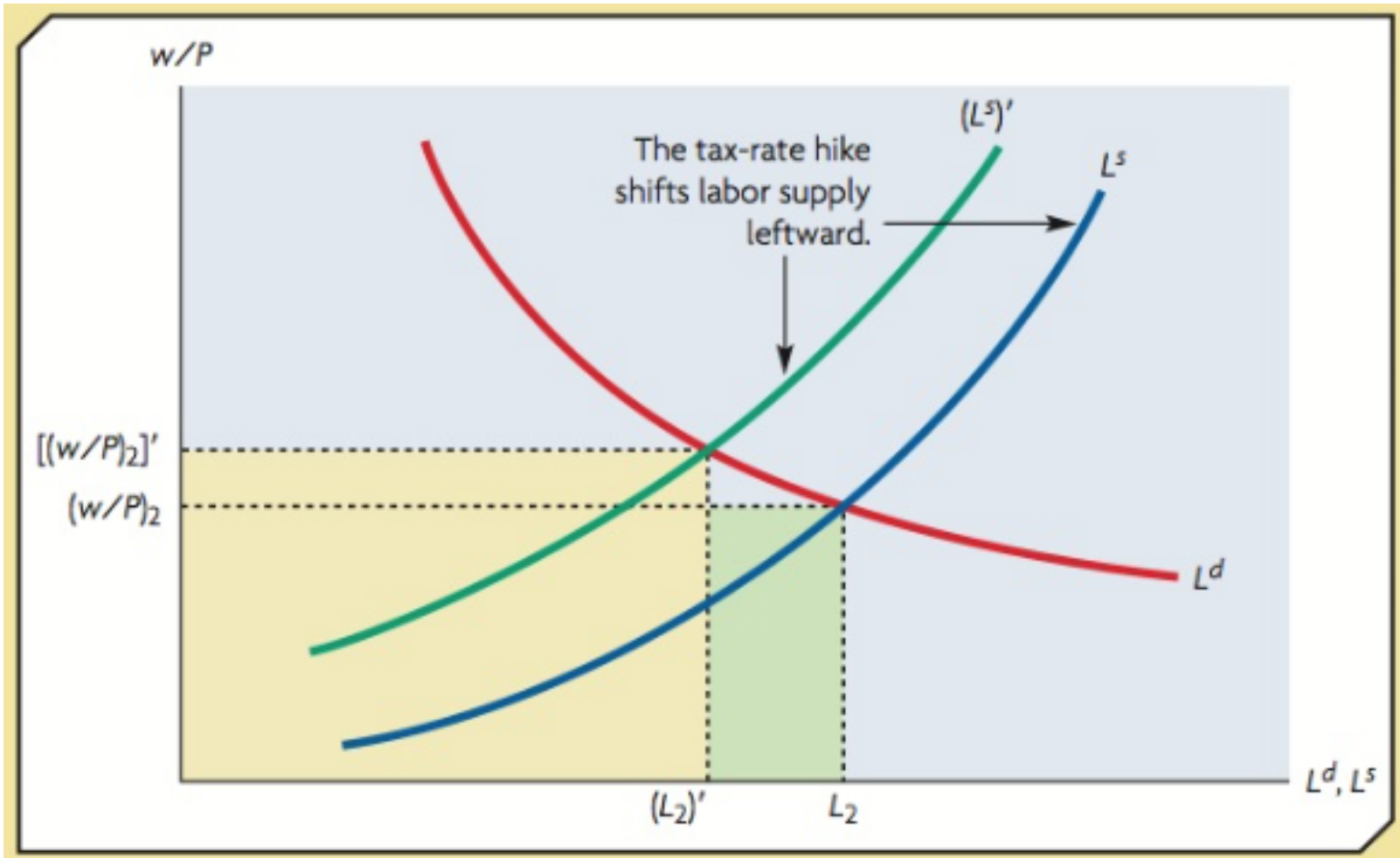
- A labor income tax cut would increase wage today and lower wage tomorrow
- People make hay when the sun shines: work when wage is high, leisure when it's low
  - Just like a temporary wage hike due to productivity increasing temporarily
- Lower taxes today will increase then decrease labor

Deficit-Financed Labor Income Tax Cut-I



Increases labor supply in period 1

Deficit-Financed Labor Income Tax Cut-II



Decreases labor supply in period 2

Deficit-Financed Labor Income Tax Cut

- So we can use deficit-financed labor income tax cuts to intertemporally move labor around
- Some might want to do this during recessions...
- But it's important to note you're losing something when you shift taxes around: people move to avoid them
- Imagine, at an extreme, I don't care when I work: then as soon as taxes aren't equal between periods, I work all in one period
- Then the government earns no tax revenue!
- While this is an exaggeration, it's good to have pretty smooth taxes

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- Trade off more consumption today with less consumption tomorrow

Thinking about open market operations

- The government can change money M, bonds B^g, and taxes T
- Let's think of three scenarios
  1. $M \uparrow$ and $T \downarrow$: Printing more money to reduce taxes
  2. $T \uparrow$ and $B^g \downarrow$: Raise taxes and reduce public debt
  3. $M \uparrow$ and $B^g \downarrow$: Print money to buy bonds (OMO)

Thinking about open market operations

Understanding Open Market Operations

Action	Change Money M	Government Bonds B^g	Taxes T
Print more money and reduce taxes	$\uparrow$	$\cdot$	$\downarrow$
Raise taxes and reduce public debt	$\cdot$	$\downarrow$	$\uparrow$
Print money to buy bonds (OMO)	$\uparrow$	$\downarrow$	$\cdot$

Open Market Operations

- So you can think of open market operations as a combination of two policies: print more money to reduce taxes (which we can analyze) and raising taxes to reduce the public debt (which we can analyze).
- Print more money to reduce taxes:
  - Increases inflation, doesn't change real variables
  - Decrease in (lump-sum) taxes have no real effect
- Raising (lump-sum) taxes to reduce public debt:
  - Increase in (lump-sum) taxes have no real effect
  - Changing timing of paying off public debt (paying off now) has no real effect
- So increase in inflation, no other changes.

Takeaway

- Public debt is important
- We can analyze it within our model: it's linked to households through the government's budget constraint
- The government and household sector are linked by:
  - Money M (revenue for government, loss via price increase to households)
  - Expenditures G (cost to government, revenue to firms)
  - Transfers V (cost to government, revenue to households)
  - Taxes T (revenue for government, cost to households)
  - Bonds B^g (issued by government, bought by households)
- All your analysis can be done by looking at their budget constraints and thinking about household behavior