Chapter 15: Government and Public Policies

Graduate Macroeconomics Slides

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Outline

Chapter Overview

- The government has large impact on the economy via *fiscal*, *monetary*, and *regulatory* policies.
- This chapter focuses on **fiscal policy**: taxes, government spending, and debt.
- Main themes:
  - How governments tax, spend, and borrow in practice.
  - How fiscal policy choices shape competitive equilibrium allocations.
  - The trade-offs in optimizing over policy choices (*Ramsey* approaches, redistribution, *time consistency*, etc.).

Why Governments Intervene

Three main rationales for government intervention:

1. **Public Goods and Externalities**:
   - Public goods (e.g., national defense) cannot be well-excluded to non-payers.
   - Large positive externalities in education, healthcare, vaccinations, etc.
2. **Incomplete Markets and Information Frictions**:
   - Private insurance might be missing (e.g., unemployment insurance, annuities).
   - Government can provide social insurance or bailouts during crises (e.g., 2008 Global Financial Crisis).
3. **Redistribution**:
   - Markets can yield significant inequality.
   - Government taxes the rich to fund transfers to the poor.

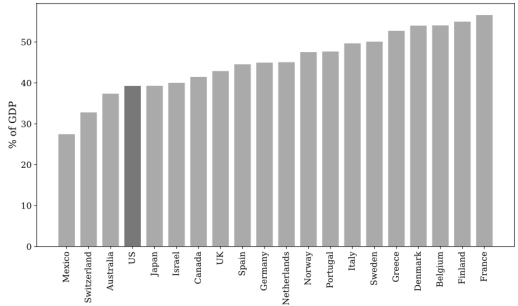


Figure 15.1: Government Spending across Countries (avg. 2010-2019).

Public Finance: An Overview of the Data

1. What the government does: spend, transfer, tax, borrow.
2. Budget identity and the definition of deficits/debt.
3. U.S. facts: revenues vs outlays; tax mix; deficits; debt.
4. Debt-to-GDP dynamics and a simple sustainability rule.
5. Composition of spending over time; automatic stabilizers.

Government budget identity

$$\underbrace{G_t + T_t}_{\text{primary outlays}} + \underbrace{i_t B_{t-1}}_{\text{interest}} = \underbrace{Rev_t}_{\text{taxes}} + \underbrace{B_t - B_{t-1}}_{\text{net borrowing}} \qquad \text{(Eq. 15.1)}$$

- **Primary deficit**: $D_t \equiv G_t + T_t - Rev_t$ (excludes interest).
- **Debt accumulation**: $B_t = (1 + i_t)B_{t-1} + D_t$.
- Read left-to-right: if outlays $>$ revenues, the gap is financed by new borrowing.

Revenues vs expenditures

- Both trend up to 1970, then roughly stabilize as % of GDP.
- Expenditures typically exceed revenues $\Rightarrow$ deficits on average.
- Large spikes in spending during wars and recessions.

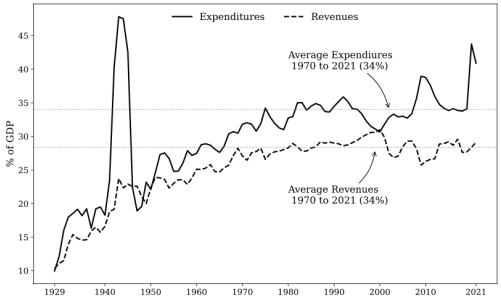


Figure 15.2: Revenues and Outlays, as percentages of GDP.

Where tax dollars come from

- Over the postwar era: income taxes and social insurance contributions rose.
- Sales/import taxes roughly flat; corporate tax share declined.
- Policy takeaway: different tax bases move differently with the cycle.

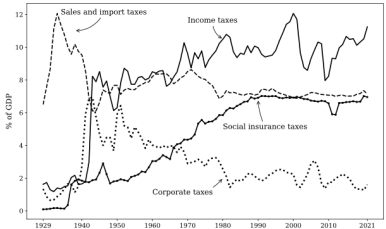


Figure 15.3: Taxes by Category, as percentages of GDP.

Deficits and debt over time

Left panel (deficits):

- Total deficit = primary deficit + net interest.
- Wars/recessions: deficits widen sharply.
- Evidence of *tax smoothing*: borrowing rises in bad times.

Right panel (debt stock):

- Debt-to-GDP rises in major crises; falls in booms/inflationary eras.
- State vs federal composition varies by country; U.S. mostly federal.

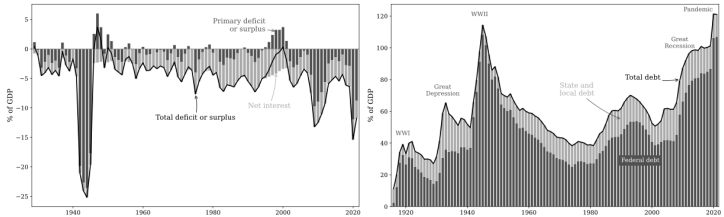


Figure 15.4: Left: Total Deficits, Primary Deficits, and Net Interest Outlays. Right: Total Debt. All as percentages of GDP.

From nominal debt to debt/GDP dynamics

Start with *levels*:

$$B_t = (1 + i_t)B_{t-1} + D_t.$$

Divide by nominal GDP, $P_t Y_t$; define $b_t \equiv B_t/(P_t Y_t)$, $d_t \equiv D_t/(P_t Y_t)$, $\pi_t \equiv P_t/P_{t-1} - 1$, $\gamma_t \equiv Y_t/Y_{t-1} - 1$:

$$\boxed{b_t = \frac{1 + i_t}{(1 + \pi_t)(1 + \gamma_t)} b_{t-1} + d_t}$$

Using the ex post real interest factor $1 + r_t = \frac{1+i_t}{1+\pi_t}$:

$$\boxed{b_t = \frac{1 + r_t}{1 + \gamma_t} b_{t-1} + d_t}$$

Plain English: debt/GDP rises when interest beats growth and/or when the primary deficit is large.

Simple sustainability rule-of-thumb

Hold r, γ and target a constant ratio $b_t = b_{t-1} = \bar{b}$. Solve

$$\bar{b} = \frac{1+r}{1+\gamma}\bar{b} + \bar{d} \quad \Rightarrow \quad \boxed{\bar{d} = \frac{\gamma - r}{1+\gamma}\,\bar{b}} \qquad \text{(Eq. 15.2)}$$

Numerical example:

$$r = 0.02, \quad \gamma = 0.03, \quad \bar{b} = 1.00 \Rightarrow \bar{d} = \frac{0.03 - 0.02}{1.03} \times 1 \approx 0.0097 \ (\approx 1\% \text{ of GDP}).$$

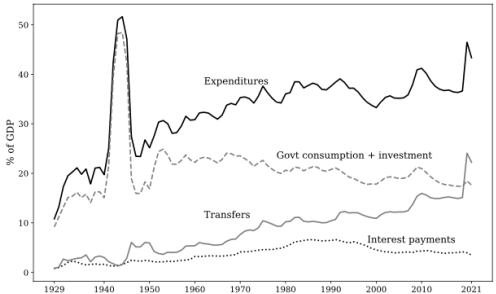
Cautions: if b rises, r may rise (risk premia/market depth); if $r > \gamma$ later, stabilizing requires primary *surpluses*.

How much debt is “too much”?

- When $r < \gamma$, constant *fractional* primary deficits can stabilize even high $\bar{b}$ (arithmetic), but market responses can flip $r - \gamma$.
- Sustainability depends on future r, γ paths, tax capacity, political economy, and rollover risk.
- Use rule-of-thumb for *ballpark*, not a guarantee.

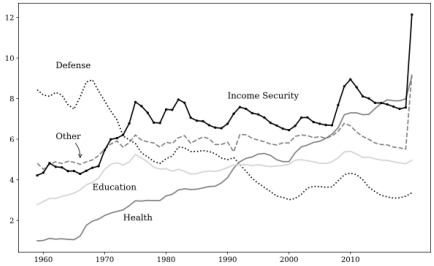
Where the money goes by economic category

Early postwar: government consumption & investment dominated; later: transfers surged (e.g., Social Security, UI), interest varies with r and b.



Where the money goes by function

- Education roughly stable around 5% of GDP.
- Defense peaked near 1959 then declined to $\sim$3%.
- Health (Medicare/Medicaid) rose steadily to $> 8\%$.
- **Income security** (UI, retirement, disability, welfare) $\sim$7% and *countercyclical* $\Rightarrow$ "automatic stabilizers."



Summary of Public Debt and Public Finance

- Budget identity is an accounting truth; dynamics of b_t hinge on $(r - \gamma)$ and the primary balance.
- U.S. runs deficits on average; debt rises in wars/recessions; transfers and health have grown over time.
- Rule-of-thumb: with $r \approx 2\%$, $\gamma \approx 3\%$, and $b \approx 100\%$, a $\sim 1\%$ primary deficit stabilizes b — *subject to market feedbacks*.
- Automatic stabilizers (UI, safety net) drive countercyclical outlays without new legislation.

First Welfare Theorem and Market Failures

- Recall from Chapter 6: **First Welfare Theorem** requires complete markets, no externalities, no public goods.
- If these conditions fail, *competitive equilibria* may *not* be Pareto efficient.
- Government interventions then can improve welfare via:
  - Provision of public goods / correction of externalities.
  - Insurance where private markets fail.
  - Redistribution for equity considerations.

A Neoclassical Framework with Taxes

Setup:

- Households: infinitely-lived, discount factor β, utility $u(c_t, l_t)$.
- Production: $y_t = f(k_t, l_t)$, with competitive factor prices w_t, r_t.
- Govt. finances G_t and T_t (transfers) via taxes:

$$\tau_{c,t} \text{ (consumption)}, \quad \tau_{l,t} \text{ (labor income)}, \quad \tau_{k,t} \text{ (capital income)}.$$

- No government debt here (introduced later). The budget:

$$G_t + T_t = \tau_{c,t}\, C_t + \tau_{l,t}\, w_t L_t + \tau_{k,t}\, (r_t - \delta)\, K_t.$$

- Household budget constraint:

$$(1 + \tau_{c,t})\, c_t + k_{t+1} = (1 - \tau_{l,t})\, w_t\, l_t + (1 - \tau_{k,t})(r_t - \delta)\, k_t + T_t.$$

Distortionary Effects

Household's FOC for saving:

$$\frac{1+\tau_{c,t+1}}{1+\tau_{c,t}}\, u_c(c_t, l_t) = \beta\left[1+(1-\tau_{k,t+1})(r_{t+1}-\delta)\right] u_c(c_{t+1}, l_{t+1}).$$

Household's FOC for labor:

$$-\,u_l(c_t, l_t) \;=\; \frac{1-\tau_{l,t}}{1+\tau_{c,t}}\, w_t\, u_c(c_t, l_t).$$

- Capital tax $\tau_{k,t+1}$ depresses after-tax return to saving $\Rightarrow$ less capital accumulation, lower growth.
- Labor tax $\tau_{l,t}$ lowers after-tax wage $\Rightarrow$ discourages work effort.
- Consumption tax $\tau_{c,t}$ also distorts both saving and labor decisions.

Long-Run Distortions (Steady State)

Assume constant tax rates and a standard Cobb-Douglas $f(k, l) = k^{\alpha} l^{1-\alpha}$.

- Steady state capital satisfies

$$1 = \beta\big[\,1 + (1 - \tau_k)(r - \delta)\big], \quad \text{where } r = \alpha\, k^{\alpha-1} l^{1-\alpha}.$$

- Higher τ_k implies lower k in steady state and higher r.
- In GHH-type preferences (no income effect), labor depends negatively on *both* τ_l and τ_k (through wages).
- Overall, higher distortionary taxes reduce output below the efficient (planner) level.

Tax Incidence in a Worker-Capitalist Economy

- Split agents into *workers* (own labor, no capital) and *capitalists* (own capital, no labor).
- Labor tax τ_l directly affects workers' consumption; capital tax τ_k directly hits capitalists. But *all* taxes affect equilibrium wages and rental rates, hence indirect effects on both groups.
- A key question: *Which types of taxes can raise how much revenue, and at what distortionary cost?*

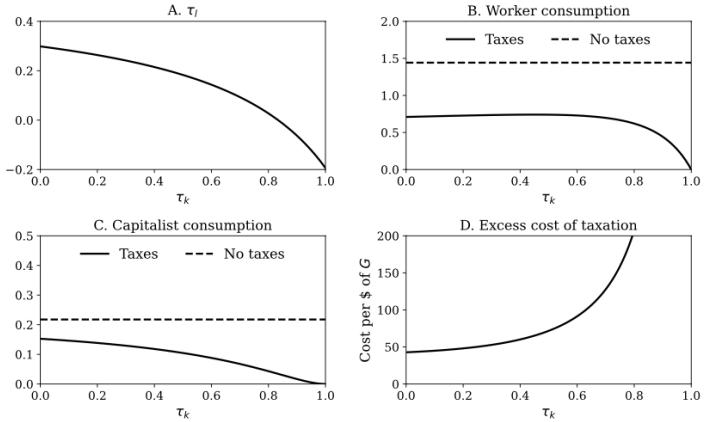


Figure 15.6: How Allocations Vary with τ_k.

Excess Cost of Taxation

- The **excess burden** or **deadweight loss** of taxes is how much private consumption falls per dollar of government revenue raised.
- Simulations often reveal that **capital taxes** can be especially distortionary in the long run (discouraging capital accumulation), leading to potentially large deadweight losses.
- But short-run and transition effects matter too.

Tax Reform Example: Cutting Capital Taxes to Zero

- A known result: In the steady state, a **zero capital tax** ($\tau_k = 0$) can be optimal (in a variety of models).
- **But**: Eliminating τ_k might require *raising* τ_l, which can *hurt* workers, especially in the short run.
- The **transition** may involve higher investment, lower consumption in the near term, and a slow buildup of capital. Long-run efficiency can rise, but short-run costs can be significant.
- *Distributional impacts*: capitalists gain immediately, workers face higher labor taxes. Final welfare effect depends on details (e.g., whether G is valued by all, etc.).

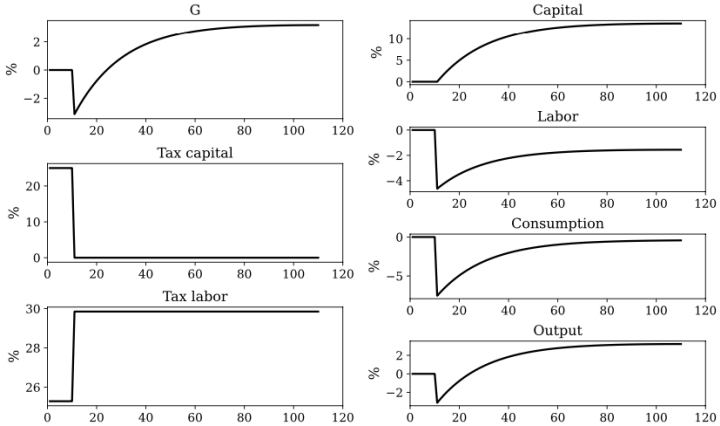


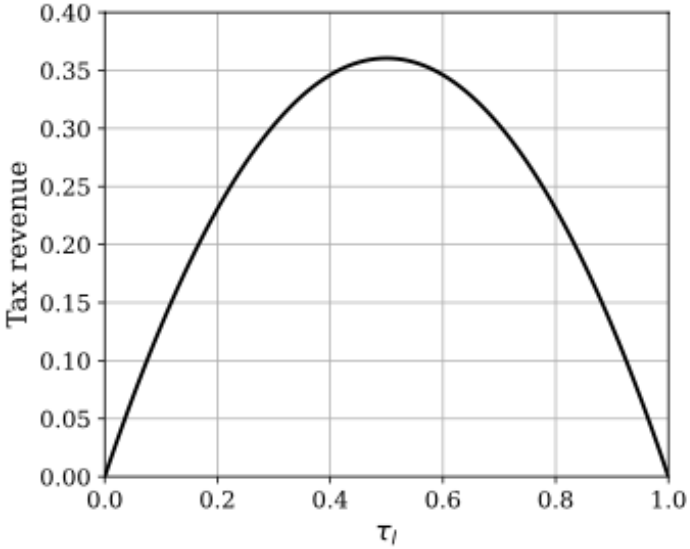
Figure 15.7: Eliminating capital income taxes.

Laffer Curve

- **Laffer curve**: relationship between tax rate and total *tax revenue*.
- Often hump-shaped:

$$\text{Revenue}(\tau_l) = \tau_l \cdot (\text{tax base})(\tau_l).$$

- As $\tau_l \to 1$, labor supply collapses, so revenue $\to 0$.
- Tax rate that *maximizes* revenue is not necessarily the same that maximizes *welfare*.


Tax revenue
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
0.2
0.4
0.6
0.8
1.0
τ_l

Public Goods and Public Capital

- So far, we treated G_t as exogenous or "thrown into the ocean."
- In reality, G_t can represent valuable **public goods** in utility:

$$u(c_t, g_t), \quad \text{with } g_t \text{ provided by the government.}$$

- Or **public investment** $k_{g,t}$ in infrastructure (roads, schools):

$$y_t = f(k_t, l_t, k_{g,t}), \quad k_{g,t+1} = i_{g,t} + (1 - \delta_g)\, k_{g,t}.$$

- Optimal policy would weigh marginal benefit of public vs. private capital, net of depreciation.

Debt Irrelevance with Lump-Sum Taxes

- **Ricardian Equivalence**: If taxes are lump-sum, the timing of taxes vs. debt is irrelevant for consumption and labor.
- Example: A two-period model with a representative household. A tax cut today financed by new govt debt implies higher taxes tomorrow, leaving the household's lifetime budget constraint the same.
- Households save the exact amount needed to pay future tax. No effect on real allocations or interest rates.

When Ricardian Equivalence Fails

- **Distortionary taxes**: Timing *does* matter (e.g., capital vs. labor taxes).
- **Heterogeneity**: Some agents credit-constrained, or different generations (overlapping generations).
- **Finite lifetimes or incomplete markets**: May break the equivalence, as not all face the same future tax burdens.

Ramsey Problem: Setup

Key Idea:

- A **benevolent government** chooses *paths* of taxes $(\tau_{l,t}, \tau_{k,t}, \ldots)$ to maximize social welfare.
- Subject to resource constraints, equilibrium conditions, and no-lump-sum restriction.
- Typically yields two **classic** results in infinite-horizon settings:
  1. **Zero capital income tax** in the long run (Chamley-Judd).
  2. **Smooth labor taxes** over time (tax-smoothing).

Ramsey in a Simple Two-Period Model

Household:

$$\max \; u(c_0, l_0) + \beta\, u(c_1, l_1).$$

Subject to:

$$c_0 = (1 - \tau_0)\, w_0\, l_0 - b_0, \quad c_1 = (1 - \tau_1)\, w_1\, l_1 + (1 + r(1 - \tau_{b,1}))\, b_0.$$

Government: finances g_0, g_1 with $\tau_0, \tau_1, \tau_{b,1}$. Chooses to commit at $t = 0$.
Result:

- No capital tax in equilibrium, $\tau_{b,1} = 0$ (if feasible).
- Constant labor tax rate $\tau_0 = \tau_1$ = "tax smoothing."

Time Inconsistency

- If the government *cannot commit* to future policies:
  - Ex post, it's tempting to heavily tax capital once it's installed (a lump-sum in the short run).
  - This leads to *time-inconsistent* plans: the government would deviate from the Ramsey plan if it could re-optimize in period 1.
- Institutional constraints or reputational mechanisms may help sustain commitment.
- Alternatively, *time-consistent* policy design has become an active research area.

PAYG Pensions as Government Debt

Two-Period OLG Model with population growth n:

$$N_t = (1+n)^t.$$

- Only the young work, endowment grows at rate γ: $y_t = (1+\gamma)^t\,\bar{y}$.
- Government runs a **Pay-As-You-Go** (PAYG) pension: p_t to old, financed by tax τ_p on the young's labor.
- Also finances **public good** $G_t = g\,Y_t$ and possibly issues debt B_t.

$$p_t = (1+n)\,\tau_p\,y_t.$$

Why Ricardian Equivalence May Fail in OLG

- **Different cohorts** exist simultaneously:
  - Shifting taxes from the current young to future young is *not* neutral because they are different people.
- Debt-financed tax cut for current young implies higher taxes for future young.
- Overlapping generations $\Longrightarrow$ **timing of taxes** matters for distribution and macro aggregates.

Returns in a PAYG System

- A PAYG system effectively yields a rate of return $n + \gamma$ if each generation invests "contributions" and obtains "benefits" in old age.
- If $r > n + \gamma$, then forced contributions have lower return than private saving $\Rightarrow$ future generations may be worse off under a PAYG expansion.
- If $r < n + \gamma$ (dynamic inefficiency), a PAYG system can *raise* welfare for *all* generations.

Tax Progressivity and Inequality

- U.S. tax/transfer system is often approximated by

$$y - T(y) = \lambda y^{1-\tau},$$

  where $\tau > 0$ indicates progressivity (higher marginal tax rates at higher incomes).
- The net result: the after-tax income distribution is *compressed* relative to pre-tax distribution.
- *Trade-off*: Higher progressivity can reduce inequality but can also reduce incentives (labor, investment).

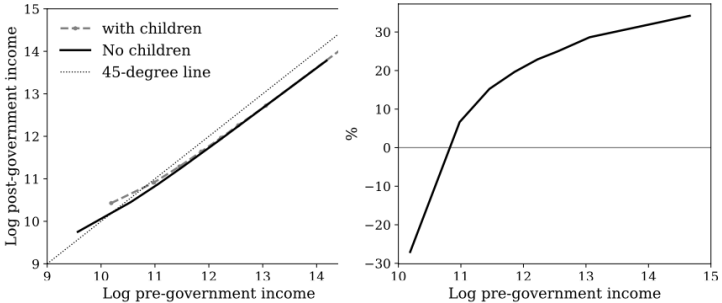


Figure 15.9: Left plot: Scatter plot of pre-government income against and post-government income for percentiles of U.S. households. Right plot: Average net tax rates by household income, defined as taxes minus transfers as a share of income, for households with children.

A Simple Static Model of Progressivity

$$\text{Utility:} \quad u(c_i,\, l_i) = \ln(c_i) \;-\; \frac{l_i^{1+1/\phi}}{1+\frac{1}{\phi}}, \quad i \in [0,1].$$

- Individuals differ in productivity w_i.
- Disposable income: $c_i = \lambda\,(w_i\, l_i)^{1-\tau}$.
- **Equilibrium results**:
  - Hours chosen to balance marginal benefit vs. net-of-tax wage. Certain preferences imply l_i is the same across i or might vary; typically progressivity τ reduces average labor supply.
  - Consumption inequality dampened if $\tau > 0$ since $c_i \propto {w_i}^{1-\tau}$.

Key Trade-Off: Equity vs. Efficiency

- More progressive taxes $\Rightarrow$ more **redistribution**, less disposable-income inequality.
- But also $\Rightarrow$ **higher distortions**: lower labor supply, reduced capital accumulation in dynamic settings, etc.
- Policymakers weigh these pros and cons when designing tax/transfer systems.

Chapter Conclusions

- Fiscal policy (taxes, spending, debt) has **deep implications** for efficiency and distribution.
- **Distortionary taxes** shape labor supply, savings, investment decisions.
- **Debt** policy: timing and composition of taxes, *tax smoothing*, potential *time inconsistency*.
- In **OLG** settings, debt and pensions alter intergenerational distribution (Ricardian Equivalence may not hold).
- **Redistribution** is central: progressive taxation can reduce inequality but may dampen incentives.

Further Reading

- (Chamley, 1986)*Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives*, Econometrica.
- (Judd, 1985). *Redistributive Taxation in a Simple Perfect Foresight Model*, Journal of Public Economics.
- (Barro, 1979) *On the Determination of Public Debt*, Journal of Political Economy.
- (Lucas and Stokey, 1983) *Optimal Fiscal and Monetary Policy in an Economy without Capital*, Journal of Monetary Economics.
- (Heathcote et al., 2017)*Optimal Tax Progressivity: An Analytical Framework*, QJE.

References to Data (U.S. Focus)

- **Bureau of Economic Analysis (BEA)**, NIPA Tables 3.1, 3.16, etc.
- **Flow of Funds** (Federal Reserve) for debt series.
- **OECD** dataset for cross-country comparisons of government spending.
- **CBO** for household-level data on pre-/post-government income and average tax rates.

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Thank you!

Questions or comments?

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