Government

- purchases an **exogenous** amount G of this output with the remainder consumed by the representative consumer
- ***Government budget constraint:***

$$G = T$$

> *government purchases equal taxes*

Competitive Equilibrium

- ***Definition:***

  Given market prices, demand is equal to supply in each market in the economy.
- In this model:

  A competitive equilibrium is achieved when given the exogenous variables *G*, *z*, and *K*, the real wage *w* is such that, at that wage, *the quantity of labor the consumer wishes to supply is equal to the quantity of labor the firm wishes to hire.*

With the income-expenditure identity

$$Y = C + I + G + NX$$

and in this model, G=NX=0. We get:

$$Y = C + G$$

- Why it holds like this?

  The following gives the proof:

$$C = wN^s + \pi - T$$
$$\pi = Y - wN^d$$
$$N^d = N^s$$
$$T = G$$
$$\Rightarrow$$
$$Y = C + G$$

Optimality

- ***Pareto optimality***:

  A competitive equilibrium is **Pareto optimal** *if there is no way to rearrange production or to reallocate goods so that someone is made better off without making someone else worse off*

  For this model, the competitve equilibrium is identical to the Pareto optimum with

$$MRS_{l,c} = MRTl, c = MP_N$$

- ***The first fundamental theorem of welfare economics***:

  under certain conditions, a competitive equilibrium is Pareto optimal.

- ***The second fundamental theorem of welfare economics***:

  under certain conditions, a Pareto optimum is a competitive equilibrium.

- ***Three reasons that real market economics do not achieve efficiency:***

  1. Negative externalities and positive externalities
  2. Distorting taxes. For example, if imposed on an proportional tax, MRS becomes w(1-t) while MP=MRT=w
  3. Firms may not be price-takers.

Analysis of The Model

How changes in the ***exogenous variables G,z,K*** *affects the key* ***endogenous variables C,Y,N,w***

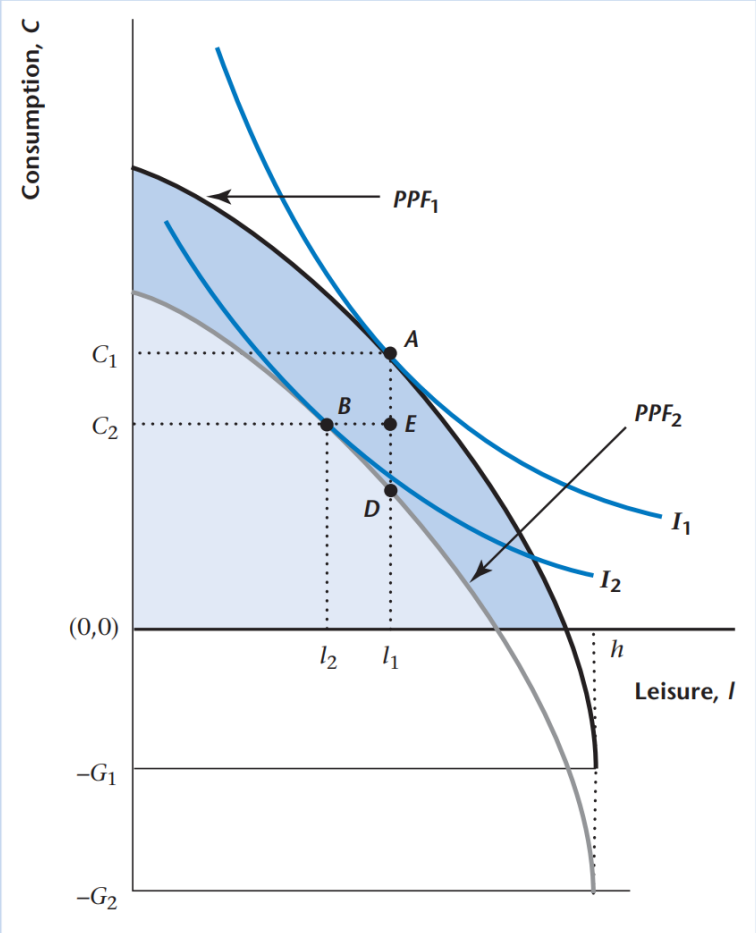
Change in Government Purchases

- Increasing G:
  - consumption and leisure decreases(because they are normal goods)
  - employment rises and output increases

$$\Delta C = \Delta Y - \Delta G$$
$$\Delta Y > 0$$
$$\Rightarrow \Delta C > -\Delta G$$

Figure 5.6 Equilibrium Effects of an Increase in Government Spending

An increase in government spending shifts the *PPF* down by the amount of the increase in *G*. There are negative income effects on consumption and leisure, so that both *C* and *l* fall, and employment rises, while output (equal to $C + G$) increases.



- ***real wage:***

  real wage w falls as a result of the increase in government spending.

- ***Is it a likely cause of business cycle?***
  - If fluctuations in government spending are important in causing business cycles, then it should be the case that our model can replicate these key business cycle facts in response to a change in G.
  - The model predicts that, when government spending increases, aggregate output and employment increase, and consumption and the real wage decrease.
  - One of our key business cycle facts is that employment is procyclical. This fact is consistent with government spending shocks causing business cycles, because employment always moves in the same direction as aggregate output in response to a change in *G*.
  - **Additional business cycle facts are that consumption and the real wage are procyclical, but the model predicts that consumption and the real wage are countercyclical in response to government spending shocks.**

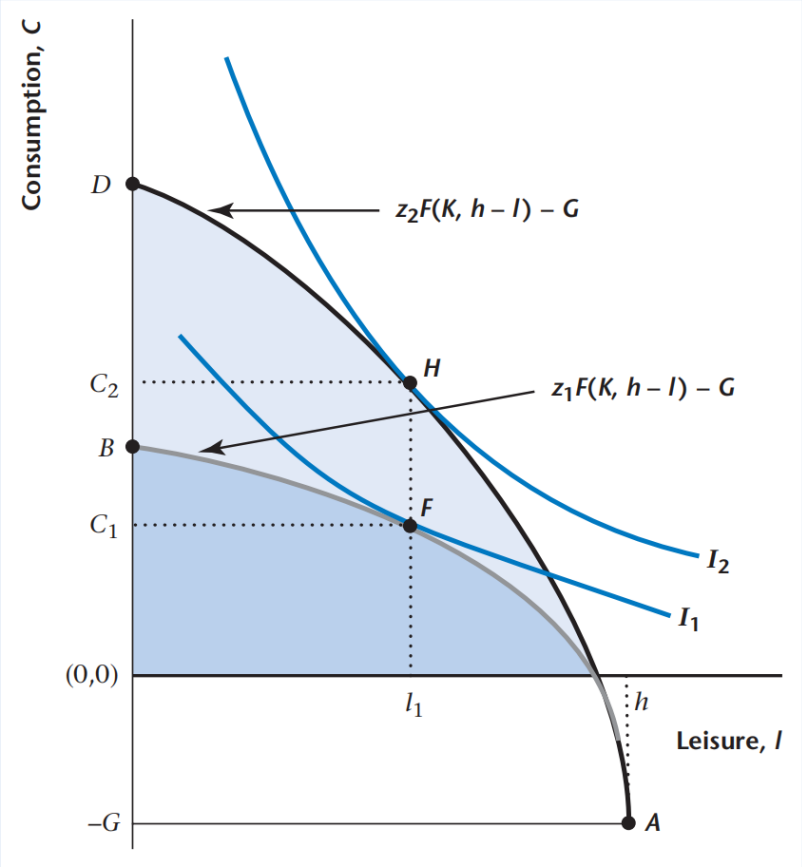
  Therefore, government spending shocks do not appear to be a good candidate as a cause of business cycles.

Change in Total Factor Productivity

As we see in this section, increases in total factor productivity increase consumption and aggregate output, but there is an ambiguous effect on employment. This ambiguity is the result of opposing income and substitution effects on labor supply. While an increase in government spending essentially produces only an income effect on consumer behavior, an increase in total factor productivity generates both an income effect and a substitution effect.

Figure 5.9 Competitive Equilibrium Effects of an Increase in Total Factor Productivity

An increase in total factor productivity shifts the *PPF* from *AB* to *AD*. The competitive equilibrium changes from *F* to *H* as a result. Output and consumption increase, the real wage increases, and leisure may rise or fall. Because employment is $N = h - l$, employment may rise or fall.

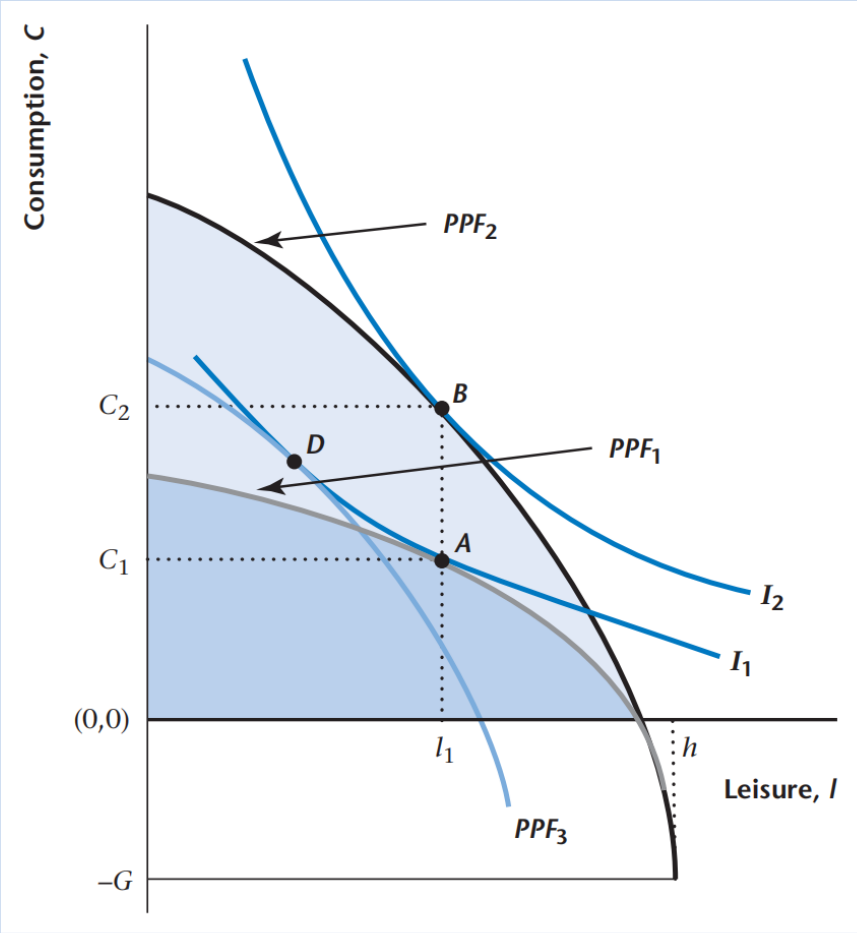


Results:

- consumption increases
- output increases
- real wage increases
- leisure may rise or fall(employment is uncertain)

Figure 5.10 Income and Substitution Effects of an Increase in Total Factor Productivity

Here, the effects of an increase in total factor productivity are separated into substitution and income effects. The increase in total factor productivity involves a shift from PPF_1 to PPF_2. The curve PPF_3 is an artificial PPF, and it is PPF_2 with the income effect of the increase in z taken out. The substitution effect is the movement from A to D, and the income effect is the movement from D to B.



- A->D: substitution effect
- D->B: income effect
- The real wage must increase because

$$|k_B| > |k_D| > |k_A|$$

Intepretation of the Model's Predictions

- Could fluctuations in total factor productivity be an important cause of business cycle?
    - Three key business cycle facts:
        1. consumption is procyclical
        2. employment is procyclical
        3. real wage is proocyclical
    - For the model to be consistent with the data requires that ***the substitution effect dominate the income effect***.

- It's possible that total factor productivity shocks could be a primary cause of business cycles.

A Distorting Tax on Wage Income, Tax Rate Changes, and the Laffer Curve

To keep things simple, we assume

$$Y = zN^d$$
$$N^d = h - l, C + G = Y$$
$$so \quad that \quad PPF : C = z(h - l) - G$$

Supposing there are no lump-sum taxes, T=0. Then the consumer's budge constraint is:

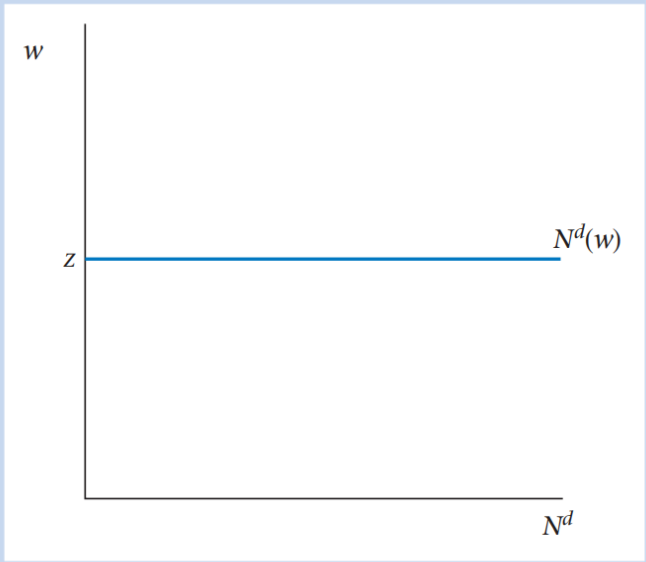
$$C = w(1 - t)(h - l) + \pi$$

The maximization problem for the representative firm is:

$$\pi = Y - wN^d = (z - w)N^d$$

- Indifferent concerning how much labor to hire if z=w. So that Nd is infinitely elastic at the wage w=z

Figure 5.16 The Labor Demand Curve in the Simplified Model
Since productivity is constant at z, the representative firm's demand curve for labor is infinitely elastic at $w = z$.



Therefore, in equilibrium, the wage must be w=z. So that profits of the firm must be zero

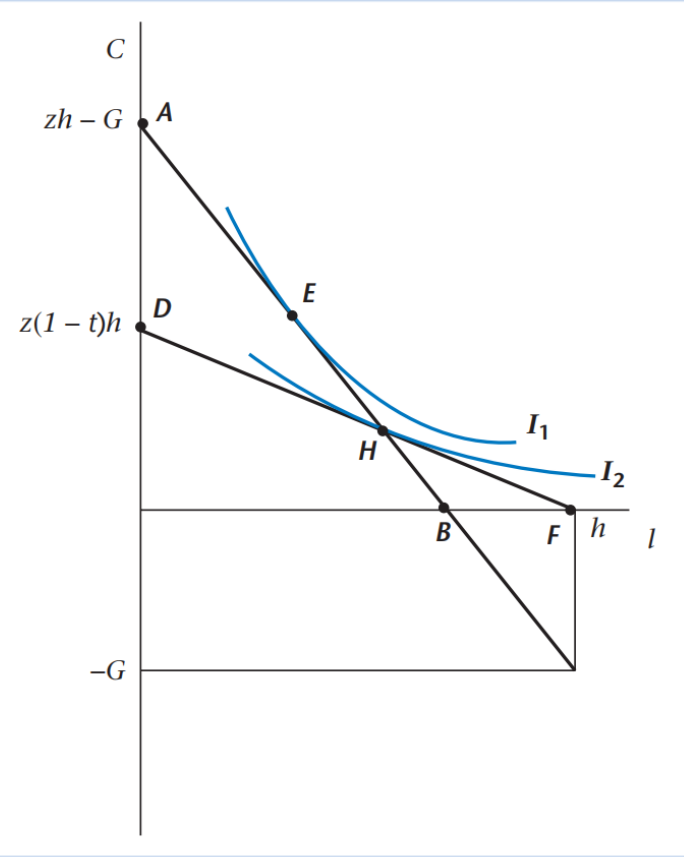
In equilibrium, the consumer's budget constraint:

$$\pi = 0, w = z$$
$$\Rightarrow C = z(1 - t)(h - l)$$

Markets clear->

$$C = z(h - l) - G = z(1 - t)(h - l)$$

Figure 5.17 Competitive Equilibrium in the Simplified Model with a Proportional Tax on Labor Income
The competitive equilibrium is point *H*, and the Pareto optimum is point *E*.



- ***Conclusions***:
  1. Pareto optimum , at E, is different from the competitive equilibrium, at H.
  2. consumption and output must be hight and leisure lower at point E than at point H.

Income Tax Revenue and the Laffer Curve

- Government revenue from tax is

$$REVENUE = tz[h - l(t)]$$

- ***Laffer curve***: denotes any curve that shows the quantity of tax revenue generated by the government as a function of a tax rate.
- In equilibrium, we have

$$G = REVENUE = tz[h - l(t)]$$

-

Figure 5.18 A Laffer Curve

The Laffer curve is the relationship between income tax revenue and the income tax rate. Tax revenue must be zero when $t = 0$ (the tax rate is zero) and $t = 1$ (because no one will work if all income is taxed away). The government can maximize tax revenue by setting $t = t^*$. If the government wishes to finance government spending equal to G, it can set a tax rate of t_1 (on the good side of the Laffer curve) or t_2 (on the bad side of the Laffer curve).

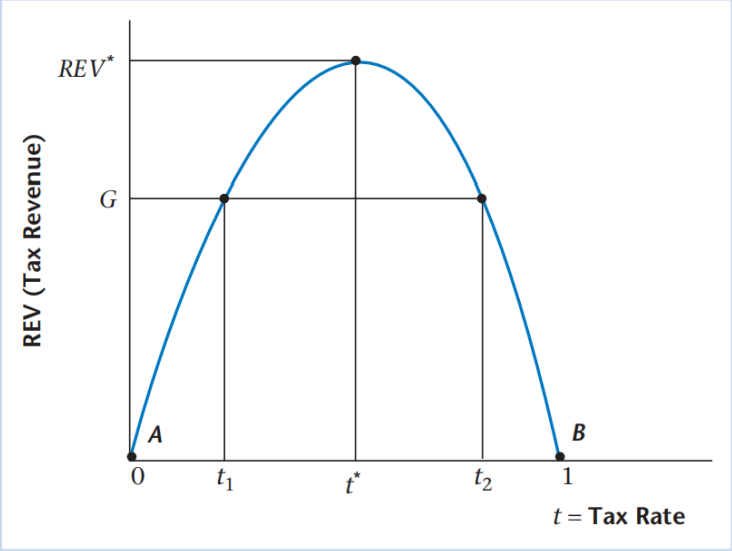


Figure 5.19 There Can Be Two Competitive Equilibria

Given government spending equal to G, as in Figure 5.16, there are two equilibrium tax rates. The low-tax-rate (high-tax-rate) equilibrium is at point $F(H)$. In the low-tax-rate equilibrium consumption and output are higher, and leisure is lower, than in the high-tax-rate equilibrium.