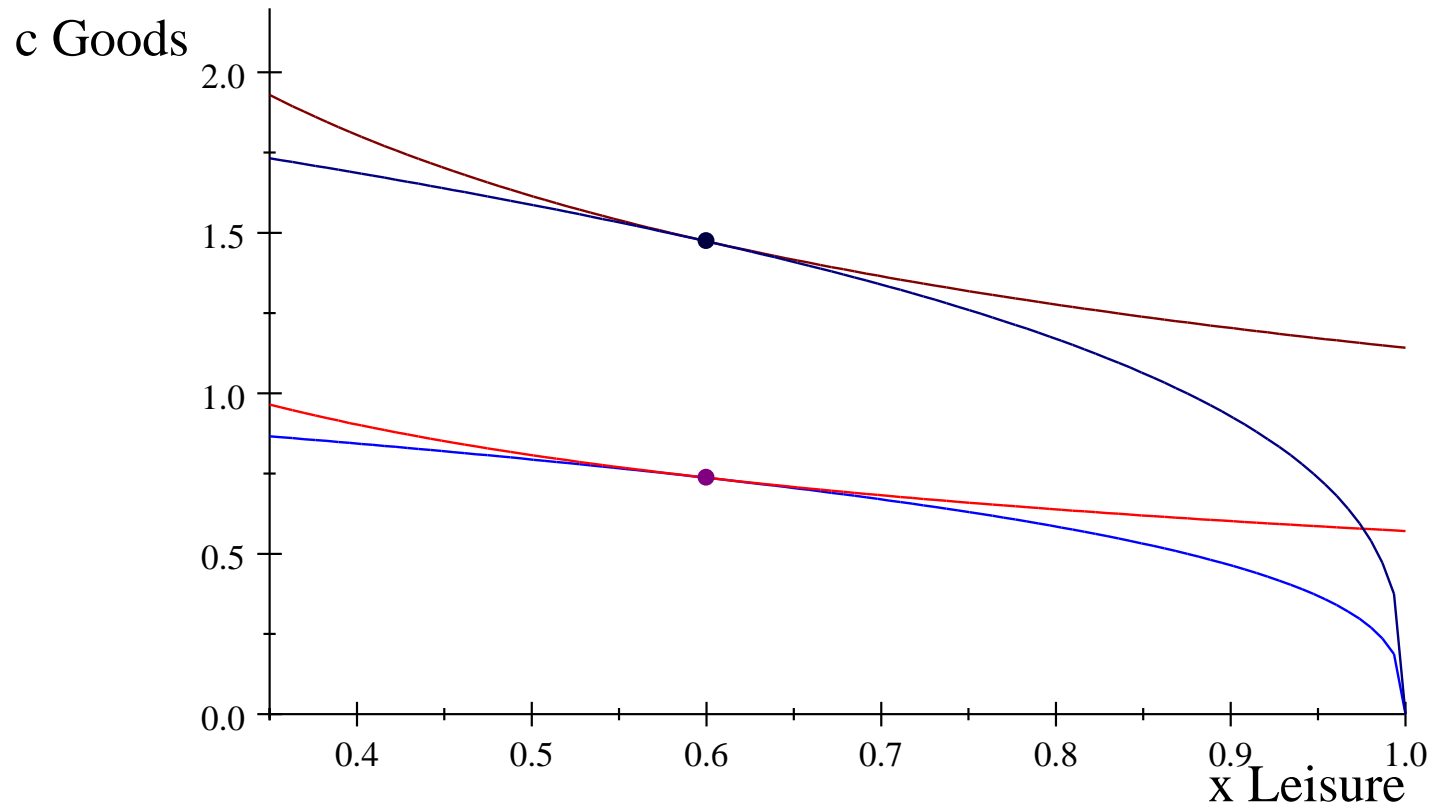


Finish Chapter 2 and Begin Chapter 3 (pp 118-159)

February 1, 2017

Figure 2.5 What Happens if Productivity Doubles?



Matlab program <figs2_5.m> output

```
var_names = l u c x
```

```
steady_state =
```

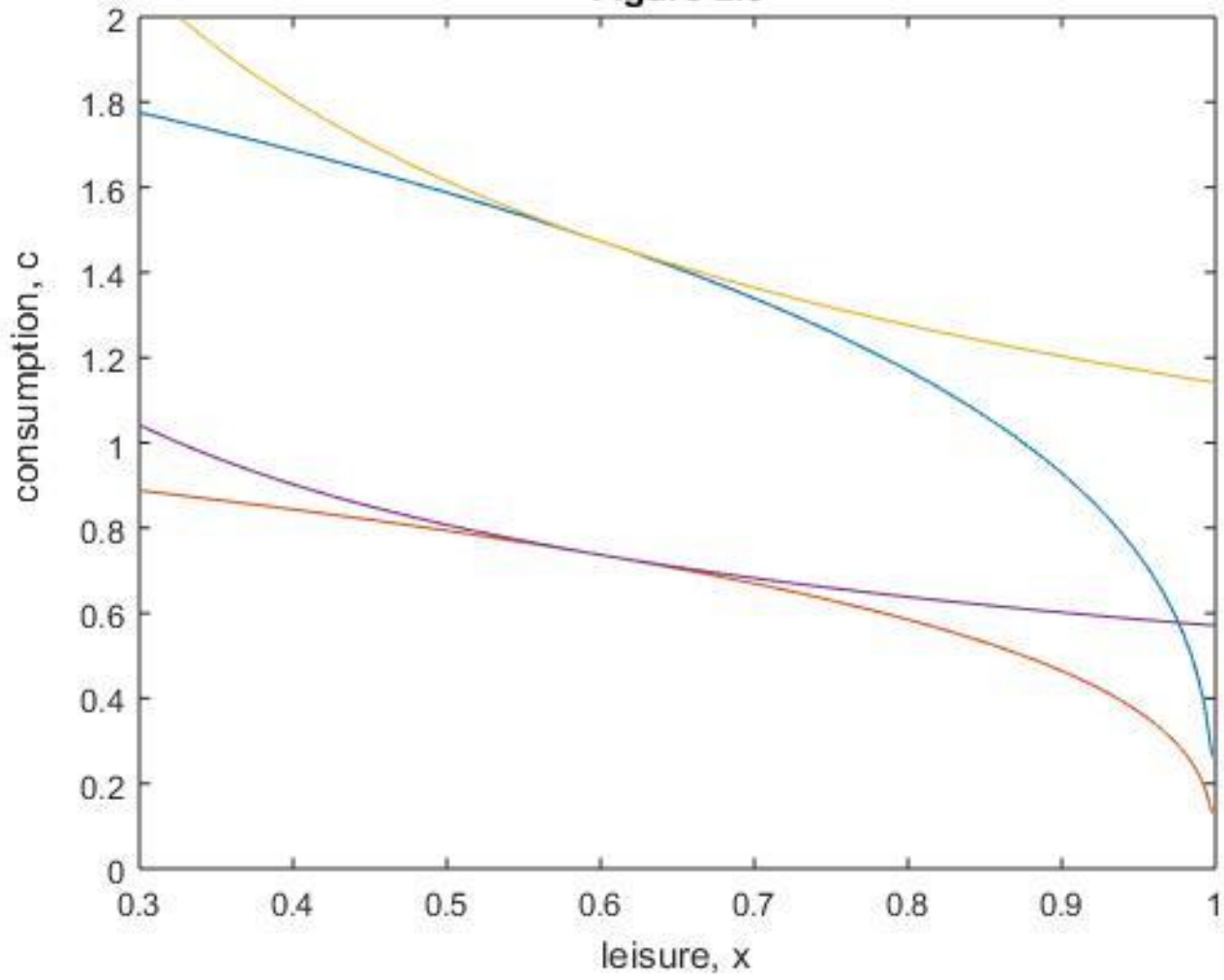
```
0.4000 -0.5608 0.7368 0.6000
```

```
var_names_B = l_B u_B c_B x_B
```

```
steady_state_B =
```

```
0.4000 0.1323 1.4736 0.6000
```

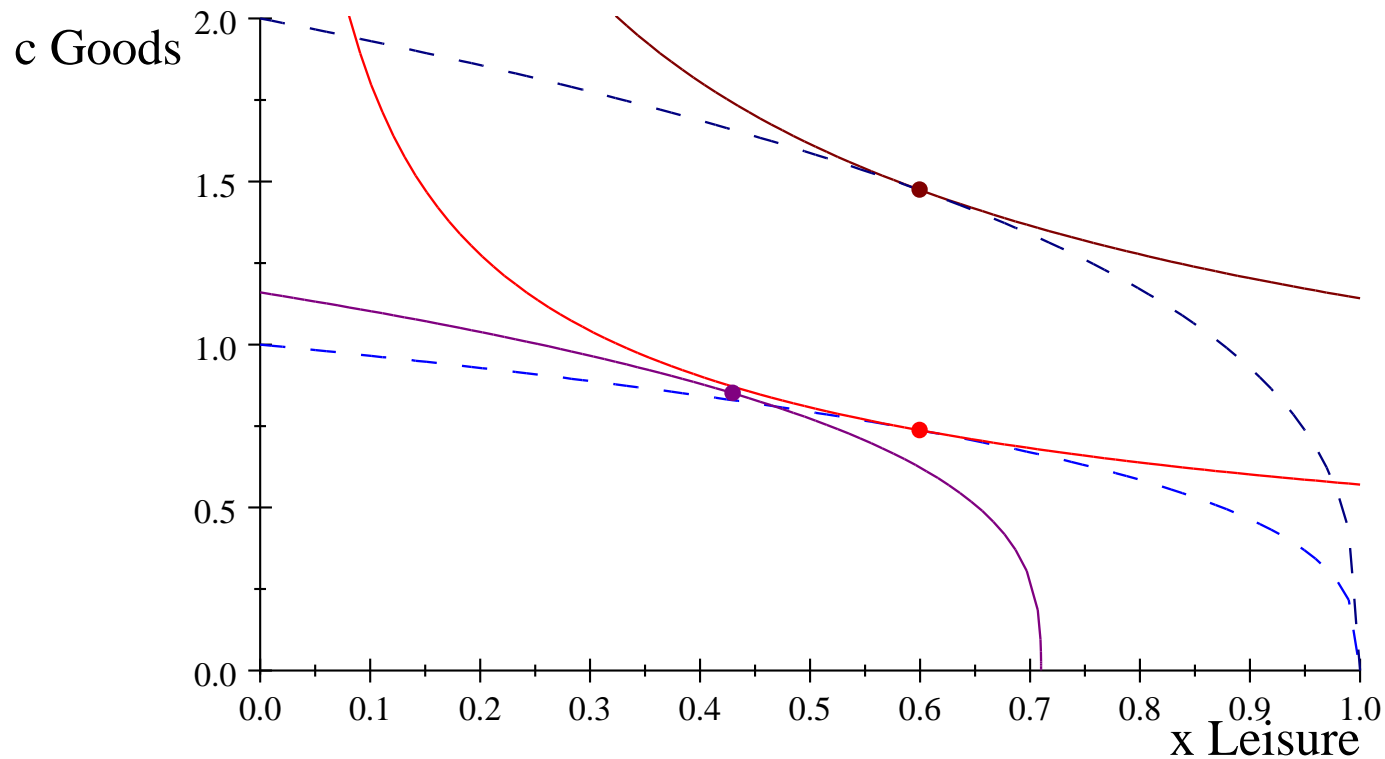
Figure 2.5



Income and Substitution Effects

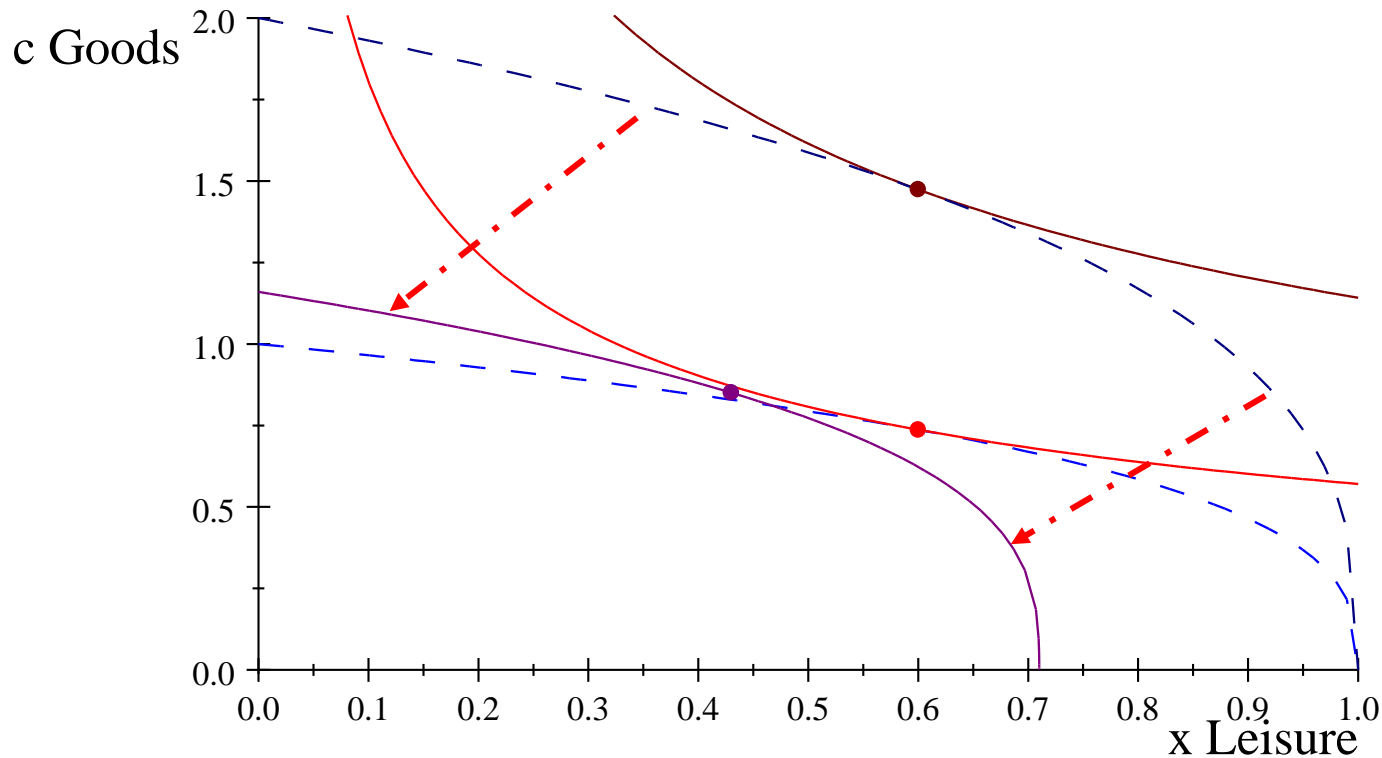
- What causes income effects of an increase in A_G ?
- What causes substitution effects of an increase in A_G ?
- See Figure 2.6

Figure 2.6. Substitution and Income Effects from a Productivity Doubling.



What is wrong with this figure and how would you fix it?

Figure 2.6. Substitution and Income Effects from a Productivity Doubling.

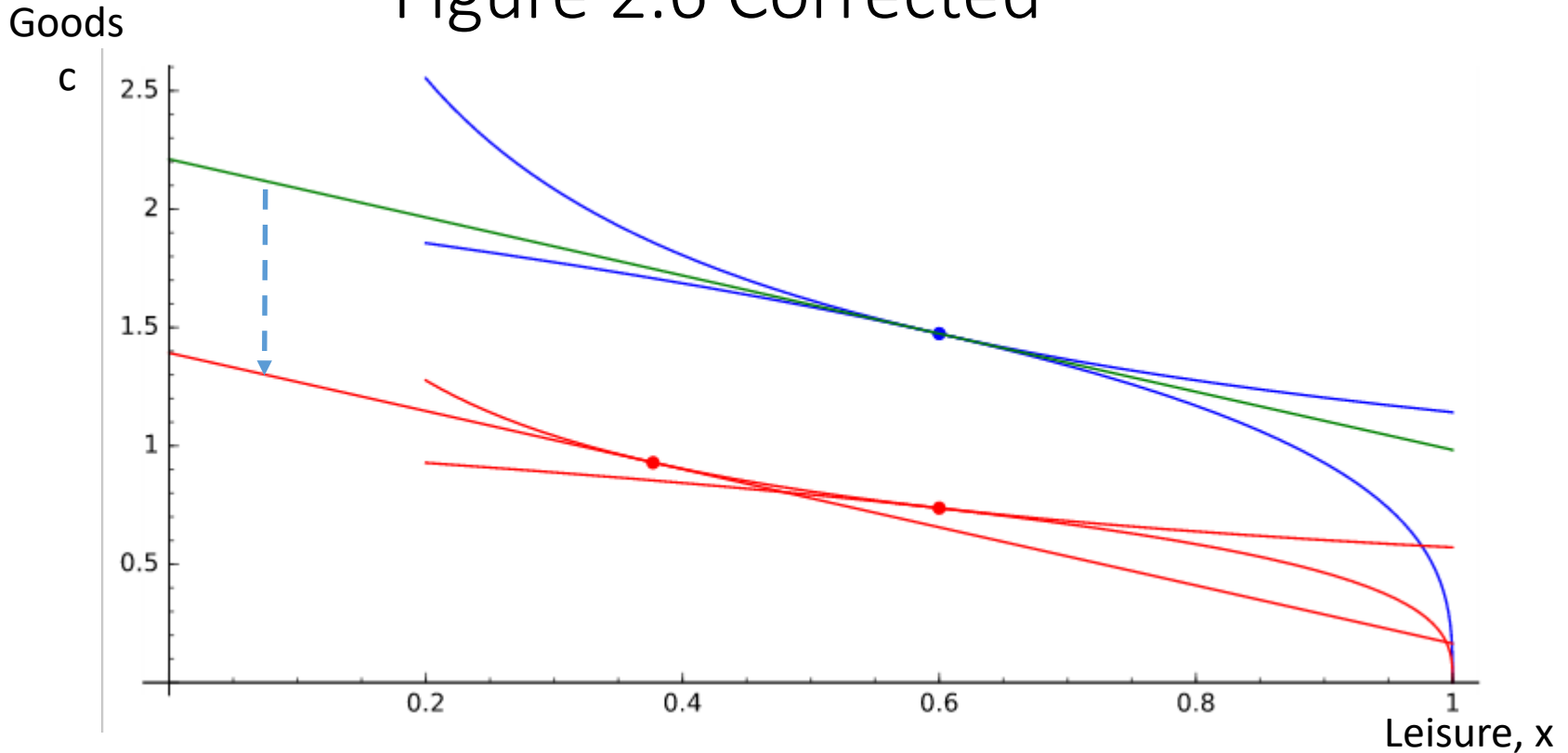


What is wrong? This shifted production function is not a well-defined object.

Figure 2.6 How to fix it.

- The substitution effect is caused by a change in the marginal product of labor. Calculate the MPL at the new equilibrium; that is, the slope of the tangent line through the equilibrium.
- Calculate value of x where the slope of the original utility function is equal to the new MPL.
- Then plot the tangent line when the new MPL touches the original utility function. The solution is given in Sage as:

Figure 2.6 Corrected



```

plot(e^(0.13257)/(x)^0.5, 0.2, 1)+plot(2*(1-x)^(1/3), 0.2, 1) + point( (0.6,1.474), size=30 ) +
plot(e^(-0.56058)/(x)^0.5, 0.2, 1, color='red')+plot((1-x)^(1/3), 0.2, 1, color='red') +
point( (0.6,0.737), size=30, color='red' )+
plot((-1.22801049954680)*x+ 2.21080629972808, 0 ,1, color='green')+
plot((-1.22801049954680)*x+1.39271, 0, 1, color='red')+
point( (0.377,0.929), size=30, color='red' )
    
```

Set up and solve the decentralized model

- Consumer demands goods and supplies labor
 - Maximizes utility
 - Budget constraint
 - Time constraint
 - What is profit?
- Producing agent is the firm which demands labor and supplies goods.
 - Maximizes profit
 - Production constraint
 - Fix capital, $k=1$
 - Where does 'profit' come from?

Figures 2.9 and 2.10

- AD/AS –the goods market
 - Aggregate demand = consumption demand
 - Aggregate supply = consumption supply
 - What is the price of consumption that is on the vertical axis?
- The labor market
 - Labor supply is calculated in the consumer optimization problem
 - Labor demand is determined in the firm's profit maximization calculation.
 - What is the price of labor on the vertical axis?

Figure 2.9. Aggregate Goods Demand and Supply as a Function of $(1/w)$ in Example 2.5.

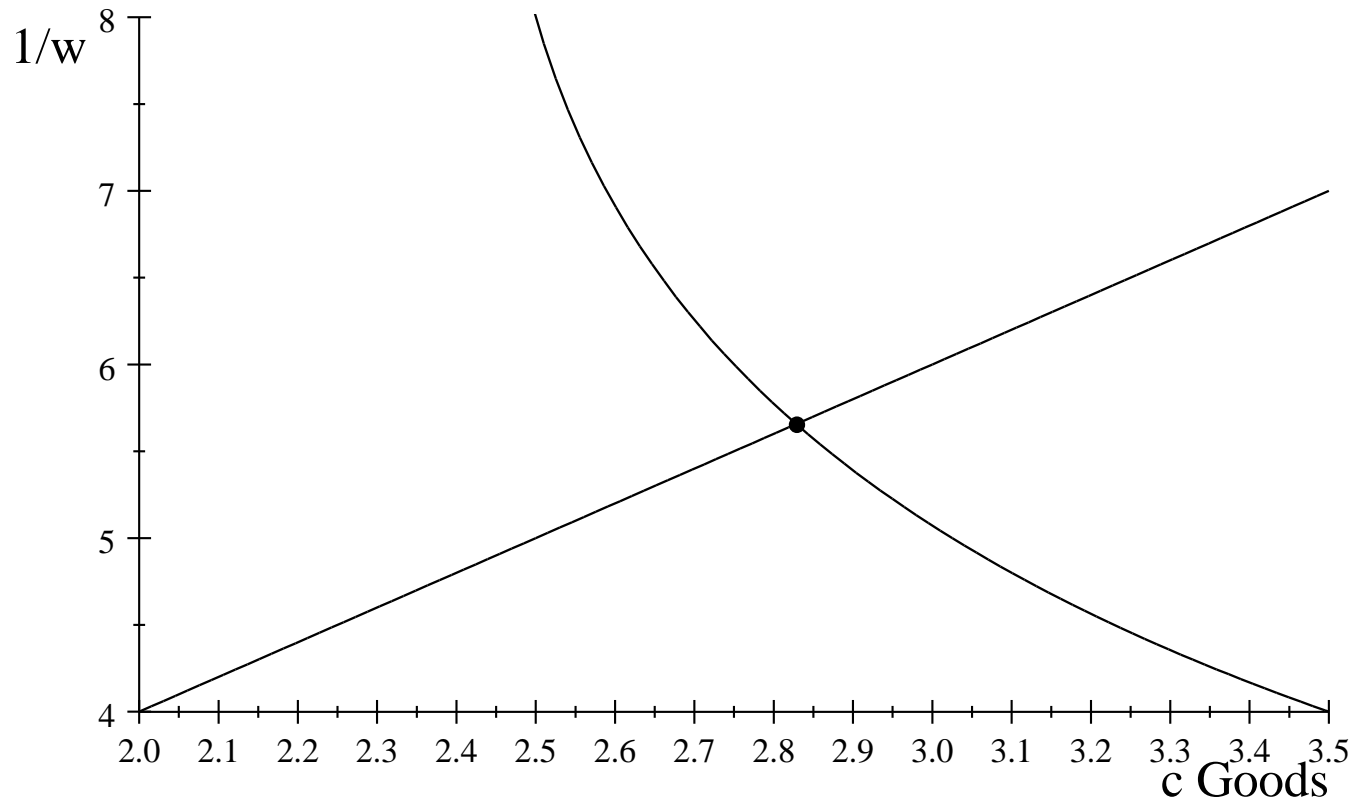


Figure 2.10. Aggregate Labor Demand and Supply as Function of w .

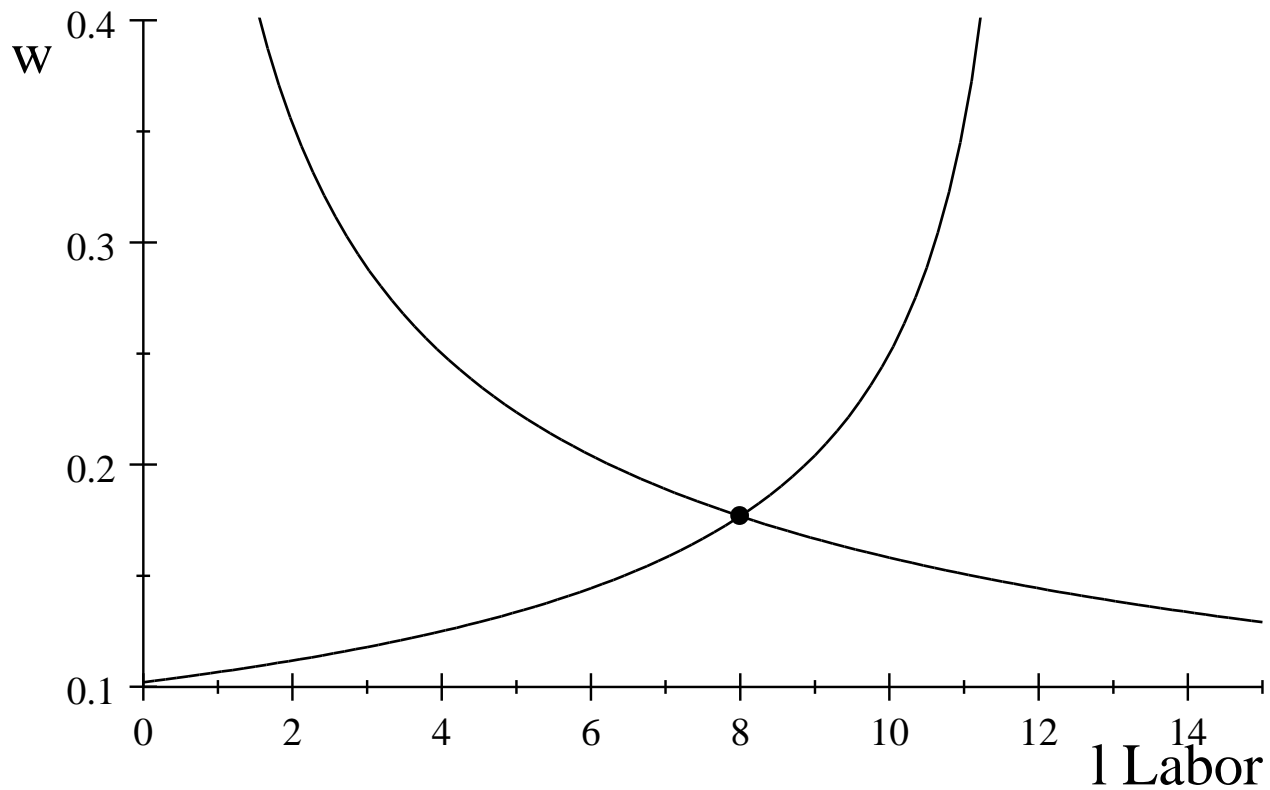
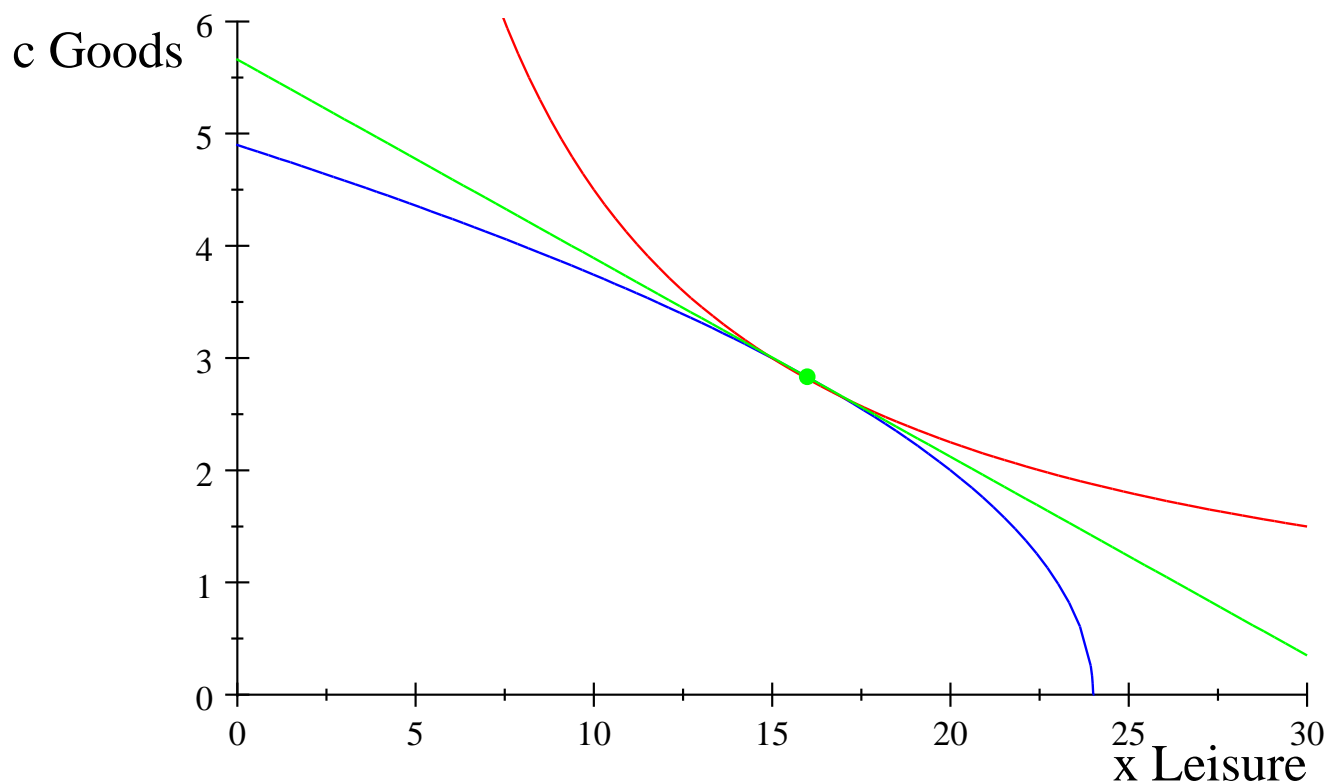


Figure 2.11. General Equilibrium Goods and Labor Market with Budget/Profit Line in Example 2.5.



Review: The decentralized model

- What is a representative agent model?
- How many agents in the centralized model?
- How many agents in the baseline decentralized model?
- Why could we construct Figure 2.11, but not Figures 2.9 and 2.10, using the centralized model?

Quiz 4

1. Set up and solve the baseline model (decentralized). Use back of this page and solve using parameter values for $T=24$, $A_G=1$, $\alpha=1$ and $\gamma=1/2$. Fix the capital stock at $k = 1$. Write equations for labor supply, labor demand, consumption supply and consumption demand.
2. What are the ways that the labor input can be measured?
3. What is the internal versus external margin of labor supply?
4. Is it likely that the business cycle is caused by changes in labor supply? Why or Why not?
5. What is the most significant aspect of the Keynesian macroeconomic model, both old and new versions.

Chapter 3: The business cycle and taxes

- The model is calibrated to match long run trends in the data. How do we introduce short run fluctuations?
- Keynesian Macroeconomics
- We introduce taxes without having a government that behaves as an optimizing agent. Government policies are constraints faced by the other agents.
 - Tax firms on each good produced
 - Tax households labor income

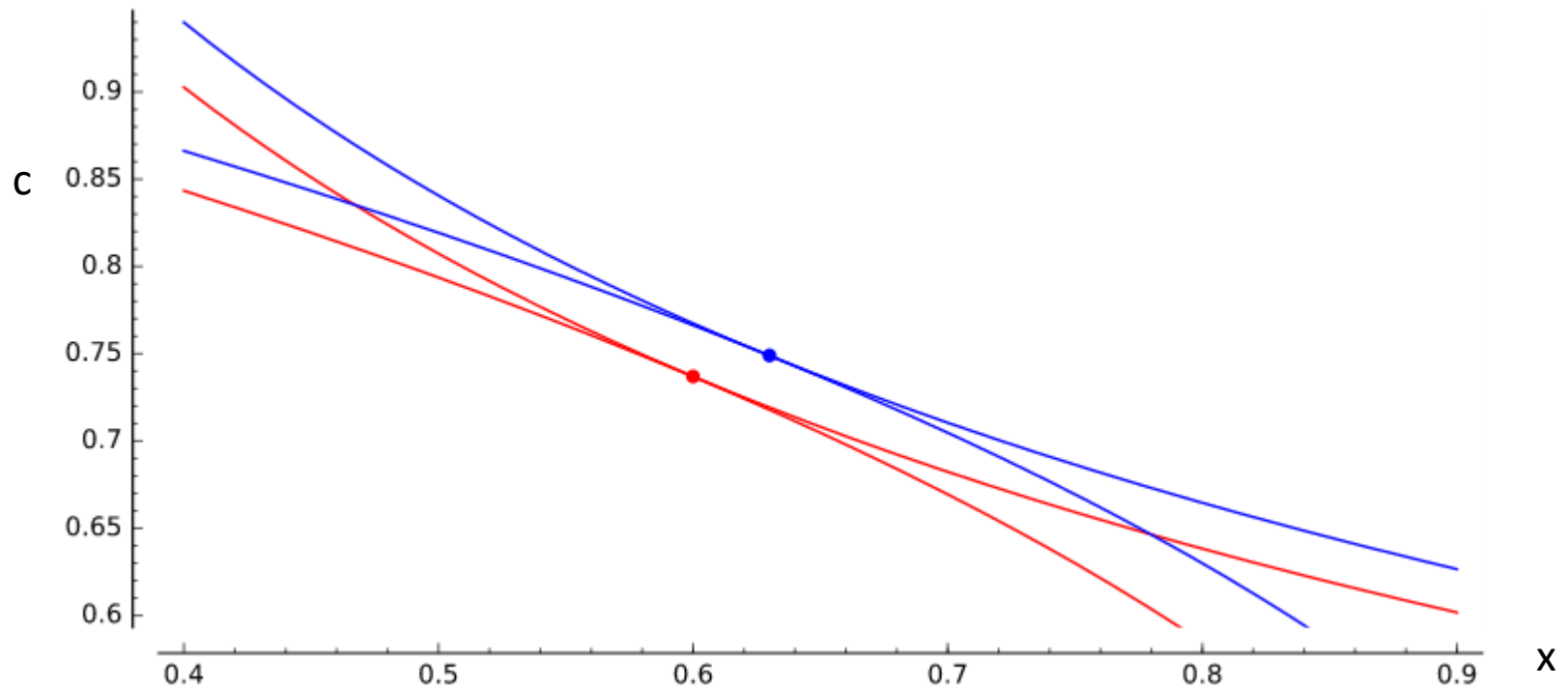
Homework for Feb 1, 2017

- Read AMM, pages 118 – 140
- Replicate Figures 3.1 through 3.4
- Send figures with programming (Sage or Matlab) electronically to wmgavin@gmail.com

Homework for Feb 6, 2017

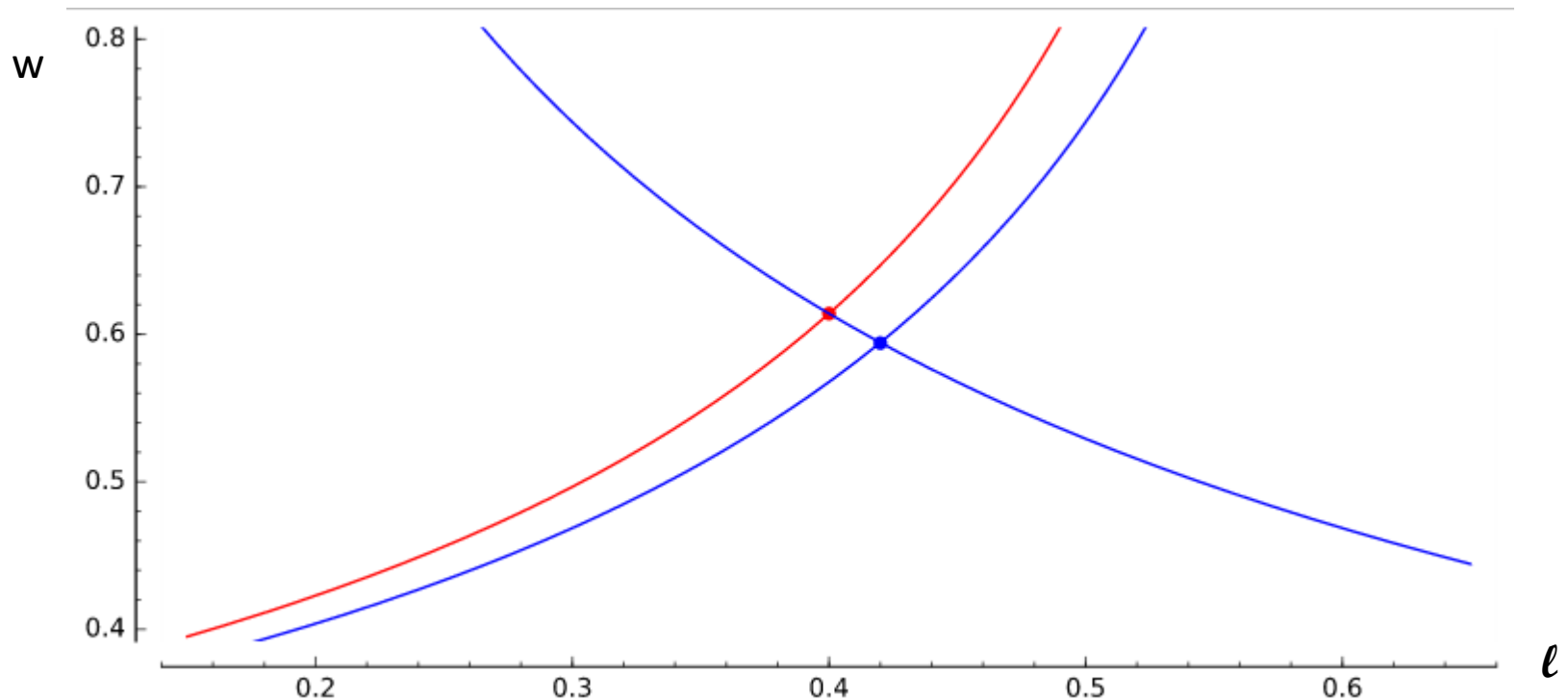
- Read AMM, pages 66 – 140
- Replicate Figures 2.12, 2.13, and 2.14
- Send figures with programing (Sage or Matlab) electronically to wmgavin@gmail.com

Figure 3.1 5% increase in time endowment



```
plot(e^(-0.56058)/(x)^0.5, 0.4, 0.9, color='red',ymin=0.6)+plot((1-x)^(1/3), 0.4, 0.9, color='red',ymin=0.6) + point( (0.6,0.737), size=30, color='red' )+plot(e^(-0.52018)/(x)^0.5, 0.4, 0.9,ymin=0.6)+plot((1.05-x)^(1/3), 0.4, 0.9,ymin=0.6) + point( (0.63,0.749), size=30)
```

Figure 3.2 5% increase in time endowment

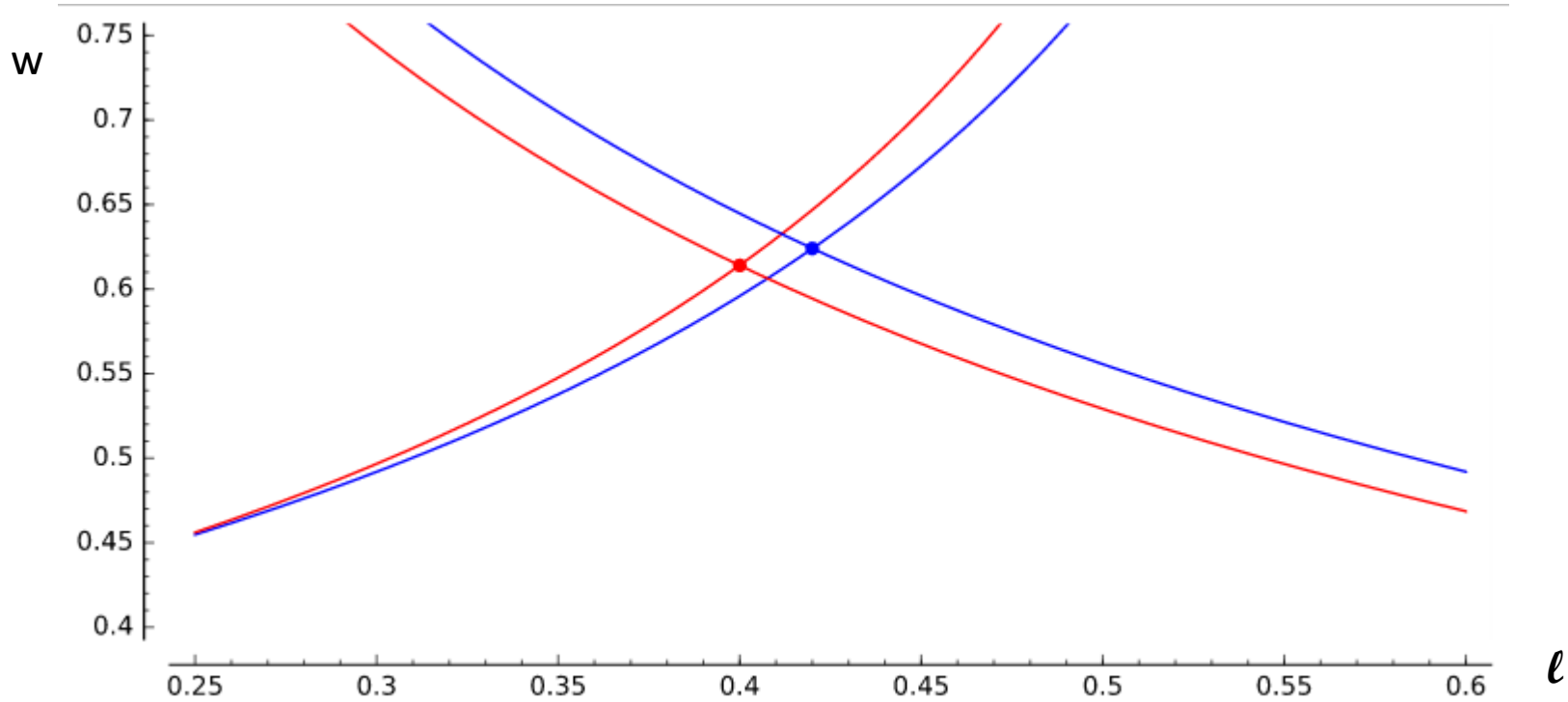


```
# plot(.491/(2-3*l), 0.15, 0.8, ymin=0.4, ymax=0.7) + plot(1/(3*(l)^(2/3)), 0.15,
0.8, ymin=0.4, ymax=0.7)+point((0.4,.614), size=30, color='red')
plot((2/((0.7-x)*9*3^.5))^(2/3), 0.15, 0.65, ymax=0.8)+plot((.385/(2-
3*x))^(2/3), 0.15, 0.65, ymax=0.8, color='red')+point((0.4,.614), size=30,
color='red')+ plot(1/(3*(l)^(2/3)), 0.15, 0.65, ymin=0.4,
ymax=0.8)+point((0.42,.594), size=30, color='red')
```

Questions associated with Figures 3.1, 3.2

- What if the household had more time?
What happens to utility, output, and labor?
- What about climate? Does a household in temperate climate have more time than a household in very cold or very hot climates?
- What will the household do with the time?
- Why did Milton Friedman advise his students not to take a job at Stanford?

Figure 3.3 Expansion of both time and technology

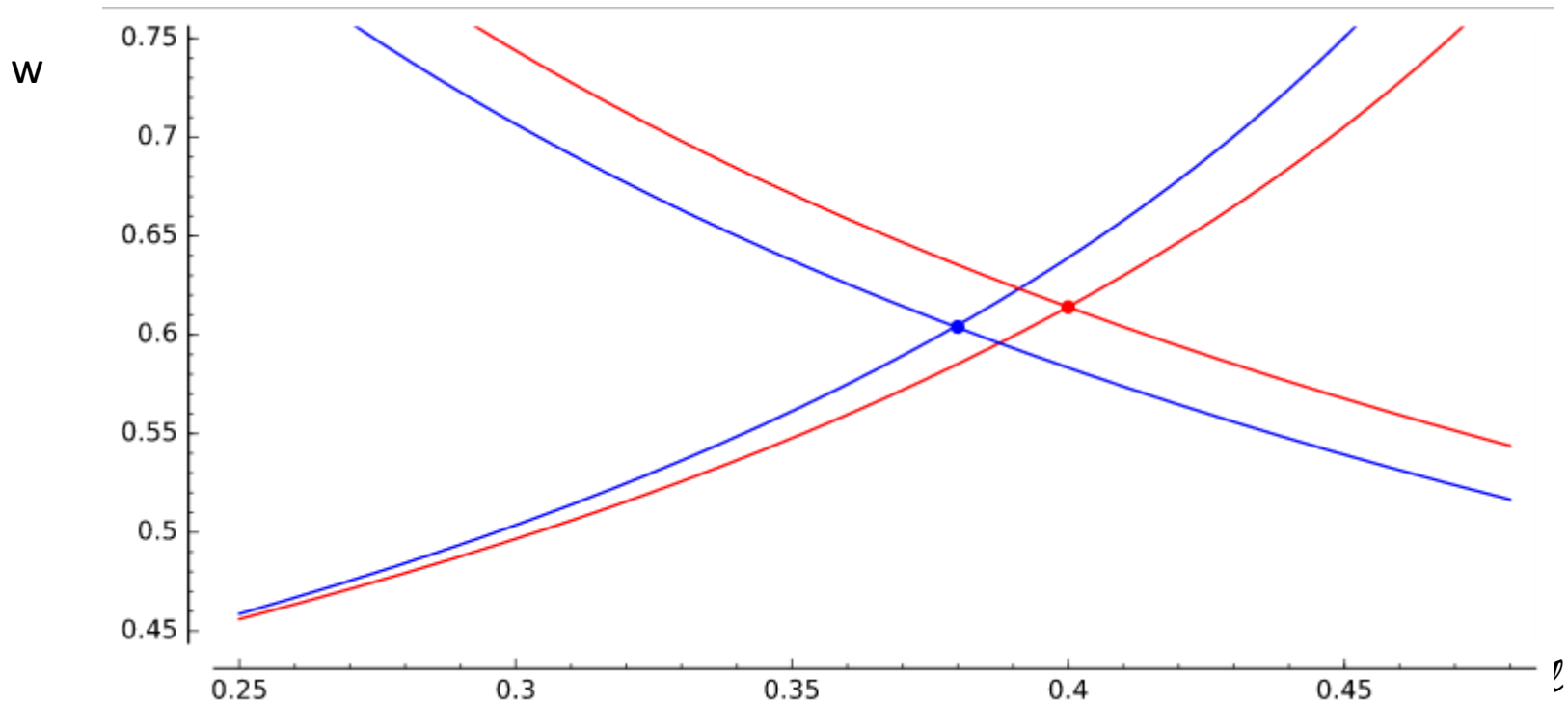


```

plot((0.138/(0.7-x))^(2/3), 0.25, 0.6, ymax=0.75)+plot((.385/(2-3*x))^(2/3),
0.25, 0.6, ymax=0.75, color='red')+point((0.4,.614), size=30, color='red')+
plot(1/(3*(l)^(2/3)), 0.25, 0.6, ymin=0.4, ymax=0.75, color='red')+
plot(1.05/(3*(l)^(2/3)), 0.25, 0.6, ymin=0.4, ymax=0.75) +point((0.42,.624),
size=30)

```

Figure 3.4 Contraction of both time and technology



```

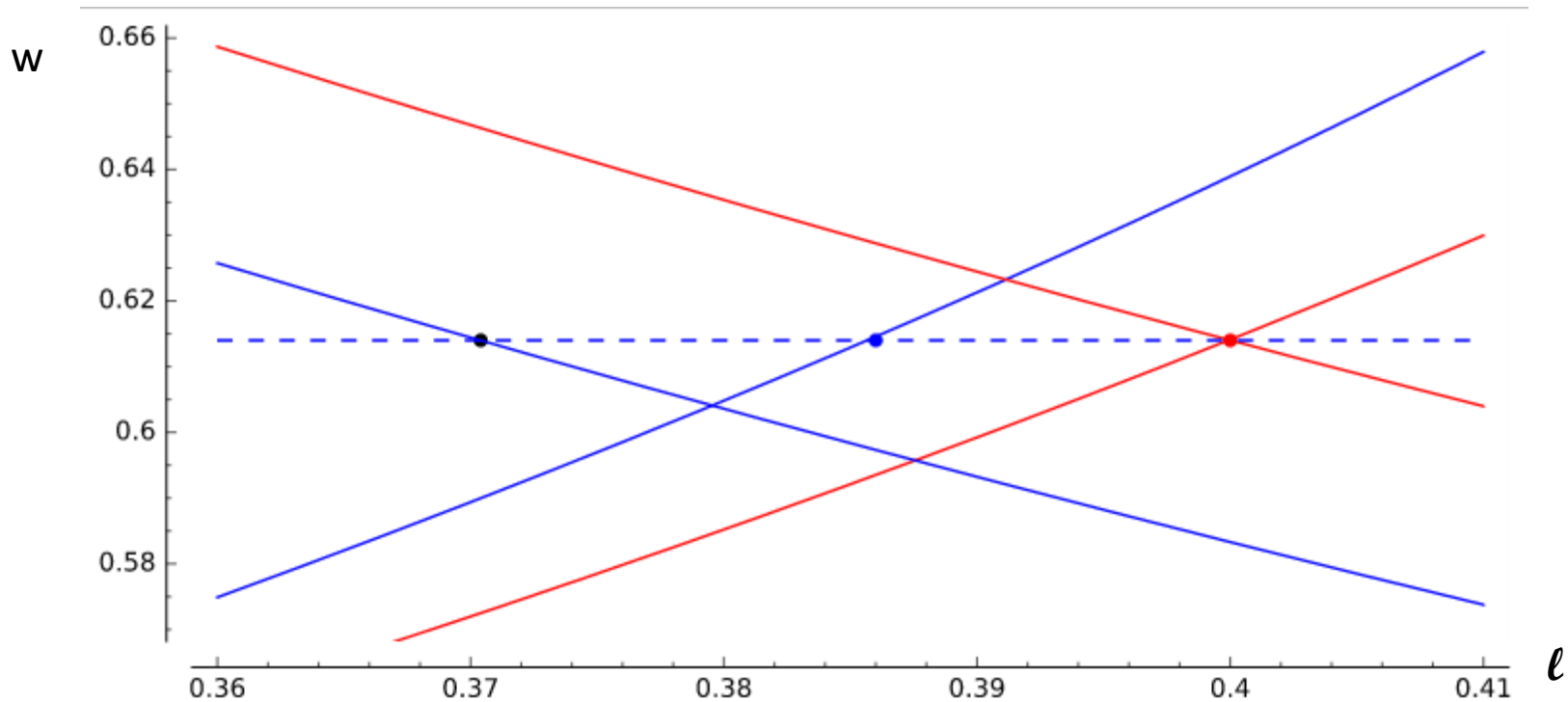
plot((0.119/(0.633-x))^(2/3), 0.25, 0.48, ymin=0.45, ymax=0.75)+plot((.385/(2-
3*x))^(2/3), 0.25, 0.48, ymin=0.45, ymax=0.75, color='red')+point((0.4,.614),
size=30, color='red')+ plot(1/(3*(l)^(2/3)), 0.25, 0.48, ymin=0.45, ymax=0.75,
color='red')+ plot(0.95/(3*(l)^(2/3)), 0.25, 0.48, ymin=0.45, ymax=0.75)
+point((0.38,.604), size=30)

```


The 'Keynesian Story'

- What is the Keynesian story?
- Why don't wages fall? Or do they sometimes fall?
 - What about real versus nominal wages?
 - What about a workers lifetime 'productivity profile?'

Figure 3.5 The 'Keynesian Story'



```

plot((0.119/(0.633-x))^(2/3), 0.36, 0.41, ymin=0.57, ymax=0.66)+plot((.385/(2-
3*x))^(2/3), 0.36, 0.41, ymin=0.57, ymax=0.66, color='red')+point((0.4,.614),
size=30, color='red')+ plot(1/(3*(l)^(2/3)), 0.36, 0.41, ymin=0.57, ymax=0.66,
color='red')+ plot(0.95/(3*(l)^(2/3)), 0.36, 0.41, ymin=0.57, ymax=0.66)
+point((0.386,.614), size=30)+point((0.3704,0.614), size=30,
color='black')+plot(0.614, 0.36, 0.41, linestyle='--')
    
```

Homework for February 8, 2017

- Read Chapter 3, pages 140-159—Taxes
- Find data on the web for Mexico and the United States for 1990 to present
 - level of real consumption,
 - labor supply, wage rate, unemployment rate, and
 - the population.
- You can find Mexican data on the Fed's website, F.R.E.D, under the category of international data