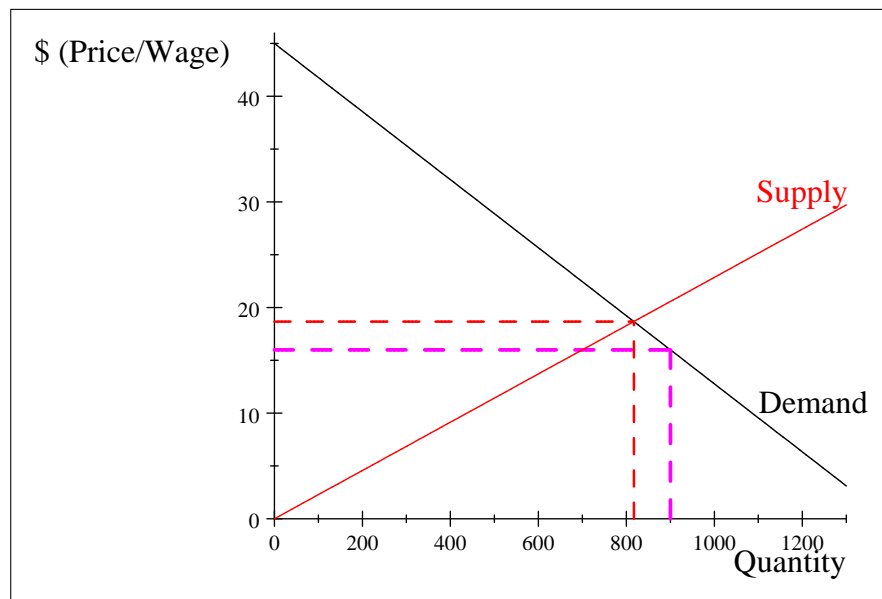


PPOL 8640 Assignment 1 Answers

Due: September 13, 2022 at beginning of class

1. (20 points) Consider the market for CMS school bus drivers. The current price (wage) offered by CMS is \$16. The figure shows the demand curve for school bus drivers. The dashed lines show the quantity demanded (900) at the current price (\$16).



- a** Currently the market is in disequilibrium as there is a shortage (less quantity supplied than quantity demanded at the offered wage) of 200 school bus drivers. Draw a supply curve that illustrates this shortage. Be precise.

Answer:

There are many supply curves that satisfy the criterion of passing through the point where there is a shortage of 200 school bus drivers; I've chosen the one that goes through the origin. The key is that at the wage of \$16 there should be a quantity demanded of 900 and a quantity supplied of 700 so that there is a gap of 200 drivers.

- b** Using the supply curve you have drawn, identify on the graph and (approximately) numerically the equilibrium price and quantity. Would the \$16 wage offer need to be raised or lowered to reach the equilibrium you have identified?

Answer:

The equilibrium price and quantity based on the supply curve I drew in part **a** is shown in the picture. The equilibrium quantity of drivers is approximately 817 and the equilibrium wage is approximately \$18.67. This answer will vary depending upon the slope of the supply curve drawn.

- c** Assume that CMS needs 900 school bus drivers but is unable to change the wage being offered (assume the slope of the demand curve cannot be changed nor can the demand curve be shifted). What changes to the potential employee's compensation package might CMS make in order to shift the supply curve? Explain how these changes shift supply.

Answer:

There are any number of answers here, which could be about better working hours (though probably not a flexible work schedule that allows remote work as they need to drive the bus), days off, benefits package, retirement package, etc. All these should increase the supply of individuals to get closer to the desired number of school bus drivers.

2. (35 points) Currently there is discussion about a policy to forgive \$10,000 of student loan debt. Assume that the debt will still be paid but the federal government is now paying the portion of the debt forgiven instead of the individual borrowers.¹
- a** If future borrowers believe that the federal government will implement similar forgiveness policies in the future, explain how those beliefs would affect the demand for student loans.

Answer:

If future borrowers believe that the federal government will implement similar forgiveness policies in the future, then the future consumer would expect to pay back a lower amount than the amount borrowed. This change in expectations should increase the demand for loans.

- b** If future lenders believe that the federal government will implement similar forgiveness policies in the future and is less likely to default on loans than any individual borrower, explain how those beliefs would affect the supply of student loans.

Answer:

If future lenders believe that the federal government will implement similar forgiveness policies in the future, then the future lender would expect an easier time in recovering the full loan amount. Currently, student loans are not dischargeable if an individual files for bankruptcy, so the lender should be able to collect the full amount of the loan today, but if the policy is implemented then they would likely need to spend less money on attempting to collect debts. This change in expectations should increase the supply of loans.

- c** Using your responses to parts **a** and **b**, would we expect to see an increase or decrease in the quantity of student loans? Explain.

Answer:

If the demand for a good increases and the supply of a good increases, then we should see an increase in the quantity of student loans.

- d** Suppose there are two individuals, one with \$8,000 of student loan debt (low balance person) and one with \$75,000 of student loan debt (high balance person). Both individuals currently pay \$750 each month as their student loan payment and both qualify for the loan forgiveness program. Assume that the loan forgiveness is like an early payment to the principal balance of the loan and that the early payment does not affect the monthly payment unless the remaining principal plus interest is less than the regular monthly payment. An argument in favor of the policy is that the forgiveness program will allow individuals to save money towards larger purchases, such as homes. Using these two individuals as representative of two extreme scenarios, with other individuals somewhere between those two extremes, explain whether or not the loan forgiveness is likely to have an immediate impact on savings towards larger purchases. If the immediacy differs among individuals, explain.

¹I know the policy being discussed has more detail than the one in the question, but we start with a simple model.

Answer:

For the individual with \$8,000 in outstanding loan balances, the forgiveness policy should have an immediate impact on the ability to save for larger purchases because the entire remaining loan balance will be paid for. So the monthly payment the low balance individuals are making can be used for savings/other purchases. For the individual with the high balance, it will likely be some time before they are able to begin saving additional funds for larger purchases because they will still have the same monthly payment. There is certainly a savings to that person, not just the \$10,000 but also the interest on the \$10,000, so they will be able to pay off the loan quicker, but the immediate impact will likely be negligible.

- e Currently there is a Public Service Loan Forgiveness program which allows for loan forgiveness for individuals employed by U.S., federal, state, local, or tribal government or not-for-profit organizations (public service jobs) if certain conditions are met. These jobs tend to be lower paying than similar private sector jobs, so loan forgiveness is one method of attracting employees. Explain how the broader forgiveness policy could affect the demand for public service jobs.

Answer:

If current borrowers are taking lower paying public service positions because of the Public Service Loan Forgiveness policy, and the benefit of that policy is somewhat reduced by a more general loan forgiveness policy, then I would anticipate that the demand for the public service positions would decrease. In essence, there is additional compensation from the public service position of reduced future loan payments. Practically, the \$10,000 forgiveness might not shift the demand for public service jobs that much because it might not be enough of a benefit compared to the entire student loan debt being forgiven.

3. (45 points) Consider a consumer with a utility function $u(x_1, x_2) = x_1^{2/3} x_2^{1/3}$, where x_1 is the quantity of Good 1 consumed and x_2 is the quantity of Good 2 consumed. Three indifference curves for this consumer are plotted below. The price of Good 2 is \$5.

- a Pick an indifference curve and label the following bundles. You do not have to use the same indifference curve for each question:

- i Label a bundle that is unaffordable as A.

Answer:

Using the indifference curve farthest from the origin, any bundle on that indifference curve is unaffordable. However, there are also unaffordable bundles on the other indifference curves. Every bundle on the middle indifference curve is unaffordable except for bundle D. Many bundles on the indifference curve closest to the origin are affordable, but any that lie beyond the budget constraint are not.

- ii Label a bundle that is affordable but not one on which the consumer spends all income as B.

Answer:

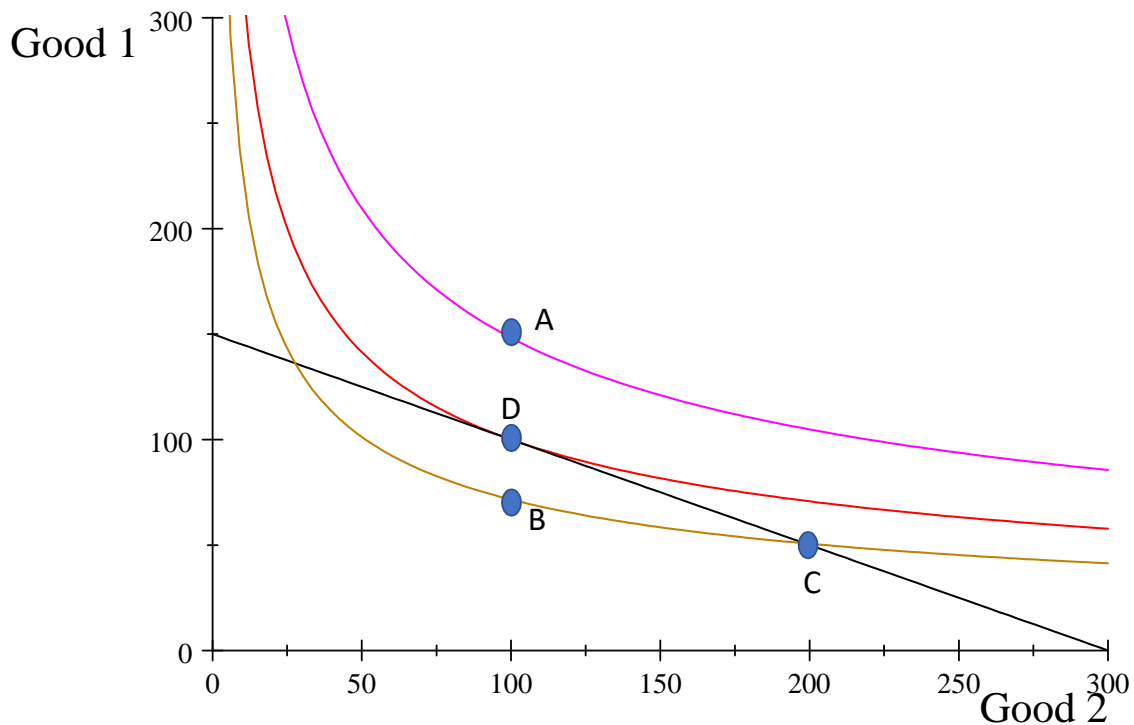
The only indifference curve pictured which has such a bundle is the indifference curve closest to the origin. The key is that the bundle has to be below the budget constraint.

- iii Label a bundle on which the consumer spends all income but is not utility maximizing as C.

Answer:

Using the indifference curve closest to the origin, either of the two points where the indifference curve intersects the budget constraint satisfies these criteria. At every point on the budget constraint the consumer spends all income, but if the indifference curve intersects the budget constraint then the consumer can move to a higher utility level by moving to an indifference curve further from the origin.

- iv Label the bundle that is utility maximizing as D.



Answer:

The optimal bundle is where the indifference curve is tangent to the budget constraint. The exact answer is the bundle (100, 100).

b How much income does this consumer have? Explain.

Answer:

We can see that if the consumer purchases zero of Good 1, then the consumer can purchase 300 units of Good 2. As the price of Good 2 is \$5, the consumer must have an income of $300 * \$5 = \1500 .

c What is the price of Good 1? Explain. Note that the budget constraint intersects the Good 1 axis at 150.

Answer:

With an income of \$1500, the consumer is purchasing 150 units of Good 1 if zero units of Good 2 are purchased. So the price of Good 1 must be $\frac{\$1500}{150} = \10 .

d Set up, but do not solve, the Lagrangian for this consumer using the numerical values you found for income and prices.

Answer:

The general Lagrangian is:

$$\mathcal{L}(x_1, x_2, \lambda) = u(x_1, x_2) + \lambda(y - p_1x_1 - p_2x_2)$$

Substituting in for the known values we have:

$$\mathcal{L}(x_1, x_2, \lambda) = x_1^{2/3}x_2^{1/3} + \lambda(1500 - 10x_1 - 5x_2)$$

- e The marginal utility of Good 1 at the optimal bundle is $\frac{2}{3}$. What is the marginal utility of Good 2 at the optimal bundle? Explain. Note: You can solve the entire optimization problem if you like but there is an easier way.

Answer:

At the optimal bundle, the slope of the budget constraint needs to be equal to the slope of the indifference curve, which leads to the result that $\frac{MU_1}{p_1} = \frac{MU_2}{p_2}$. We know $MU_1 = \frac{2}{3}$, $p_1 = 10$, and $p_2 = 5$. Substituting we have:

$$\begin{aligned} \frac{MU_1}{p_1} &= \frac{MU_2}{p_2} \\ \frac{\frac{2}{3}}{10} &= \frac{MU_2}{5} \\ \frac{10}{3} &= 10MU_2 \\ \frac{10}{3} * \frac{1}{10} &= MU_2 \\ \frac{1}{3} &= MU_2 \end{aligned}$$

Alternatively, the price of Good 1 is twice the price of Good 2, so $MU_1 = 2 * MU_2$ at the optimal bundle.

- f Assume the price of both goods double but income also doubles. Does the choice of optimal bundle change? Explain by comparing the original budget constraint to the new budget constraint.

Answer:

The picture will not change at all if all prices and income increase or decrease at the same rate (double, increase by 10%, cut in half, etc.) First, note that the ratio of prices is the same – originally $\frac{p_2}{p_1} = \frac{5}{10} = \frac{1}{2}$. If prices double, then $\frac{p_2}{p_1} = \frac{10}{20} = \frac{1}{2}$. So the slope, if we make the price ratio negative, of the budget constraint is the same. Then note that when income doubles, the consumer can still purchase the same amount of a single good if they purchase zero of the other good. When income doubles to \$3,000 and the price of Good 1 doubles to \$20, the consumer can still purchase 150 units of Good 1 when no Good 2 is purchased; similarly, when income doubles and the price of Good 2 doubles, the consumer can still purchase 300 units of Good 2 when no Good 1 is purchased. The slope of the budget constraint when all prices and income double is the same, as are the intercepts on both axes. So this "new" budget constraint is the same line as the original budget constraint.

Alternatively, in general the budget constraint is:

$$y = p_1x_1 + p_2x_2$$

If we double income and all prices, we have:

$$\begin{aligned} 2y &= 2p_1x_1 + 2p_2x_2 \\ \frac{2y}{2} &= \frac{2p_1x_1 + 2p_2x_2}{2} \\ y &= p_1x_1 + p_2x_2 \end{aligned}$$

So we are right back to the original budget constraint.