

ECON 107

First Midterm

Be sure to show your work for all answers, even if the work is simple.
This exam will last 100 minutes.

1. (21 points) **Honor Statement:** Please read and sign the following statement:

I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person. I will also neither help others nor use a calculator or other electronic aid for calculation.

Name and Surname: _____
Student ID: _____
Signature: _____

2. (12 points total) About *rationality*

- (a) (6 points) Define what it means when we assume decision makers are rational.

Solution 1 *The simplest definition is that they optimize, to be more precise given their information and beliefs they make the best choice for themselves at all times.*

- (b) (4 points) Why is it important for all social scientists to assume their subjects are rational?

Solution 2 *In the simplest terms? Humility. It is the height of arrogance to assume that the people you are studying—whose life might be on the line if they make a mistake—are less sensible than you—an academic living in an ivory tower—about the decisions they make. It will also lead to mistakes, which will lead to embarrassment on your part.*

- (c) (2 points) Give an example where not accepting people are rational could lead to bad policy.

Solution 3 *As I stated, I expected essentially nobody to get this right. Thus let me give two answers.*

The first is dear to my heart. It has been a long accepted belief in the United States that slavery was an antiquated production system, that indeed the Northern (anti-slave) states were doing the Southern (slave) states a favor by abolishing slavery. Naturally, of course, the South disagreed and the only possible outcome was war.

Consider the different approach taken in England, there they paid the slave owners for their slaves and slavery was abolished without any

loss of life—though the UK government took on a debt that they have only recently repaid. This approach made no sense in the United States because of our beliefs.

Of course given the abuse of former slaves after their freedom, it is clear they should have been given a larger payment than the slave owners, but perhaps the abuse would not have been as bad if the Southerners had (mostly) voluntarily given up their slaves. But probably it still would have been, racism is an ugly word.

Let me make clear that this belief is deeply held by many Americans to this day. It was with great shock and disgust that I read "Time on the Cross: The Economics of American Negro Slavery" by Fogel and Engerman. This work merely summarized and expanded on the work of Economic Historians about how productive and profitable slavery was. Though I must admit the recognition that perhaps the modern economy would be stronger with slavery still shocks me to the core.

The second example is from the professor who first taught me the empirical importance of rationality. During the development of South-east Asia at first they could not get enough workers for their factories, even though they were offering a better living than the farming most of the pool of workers were doing. The conclusion was that the rural folk simply were not motivated by money, and therefore development would have to rely on the urban workforce. Fortunately, however, someone went against this wisdom and located a factory in the countryside—where these people would not have to give up farming to take advantage of the opportunity. The result was a resounding success.

It was not that they did not want more money, it was that the amount offer was not sufficient for them to relocate to the cities and take the risk on a job they knew nothing about.

c	d	a	b	τ	P^*	Q^*	$P_d(t)$	$P_s(t)$	$Q(t)$	Tax Burden, S
5	1	40	2	6	15	10	17	11	6	$\frac{2}{3}$
4	1	40	1	8	22	18	26	18	14	$\frac{1}{2}$
24	2	36	1	6	20	16	24	18	12	$\frac{1}{3}$
25	3	35	1	8	15	20	21	13	14	$\frac{1}{4}$
$d\rho - \chi$	d	$\chi + b\rho$	b	$(b + d)\mu$	ρ	χ	$\rho + d\mu$	$\rho - b\mu$	$\chi - bd\mu$	$\frac{b}{b+d}$

3. (33 points total) In a given market the supply curve is given by $Q_s = -c + dP_s$ and the demand curve is given by $Q_d = a - bP_d$ where $Q_s > 0$ is the quantity supplied, $Q_d > 0$ is the quantity demanded, $P_s > 0$ is the per-unit price the sellers receive and $P_d > 0$ is the per-unit price the buyers pay.

- (a) (4 points) In a competitive equilibrium what do we know about the relationship between P_s , P_d , Q_d , and Q_s ?

Solution 4 The answer was very simple, in equilibrium we know that $P_d = P_s$ because in equilibrium people should all have the same beliefs, and then $Q_d = Q_s$.

It is surprising how many of you had no idea what the answer was and then went on to answer the rest of this question correctly.

- (b) (8 points) Find the competitive equilibrium in this economy.

$$\begin{aligned} -c + dP &= a - bP \\ P &= \frac{a + c}{b + d} \end{aligned}$$

$$\begin{aligned} Q_s &= -c + d \left(\frac{a + c}{b + d} \right) = \frac{ad - bc}{b + d} \\ Q_d &= a - b \left(\frac{a + c}{b + d} \right) = \frac{ad - bc}{b + d} \end{aligned}$$

Remark 5 As always in a case like this where I have multiple versions I will give answers in terms of abstract coefficients and for your version you should refer to the table above.

- (c) (10 points) Now the government imposes a per-unit tax of $t = \tau$. Find the price the sellers now receive, the price the demanders now pay, and the equilibrium quantity.

$$\begin{aligned} Q_s &= -c + dP_s \\ Q_d &= a - bP_d \\ P_d &= P_s + \tau \\ -c + dP_s &= a - b(P_s + \tau) \\ P_s &= \frac{1}{b + d} (a + c - b\tau) \\ P_d &= P_s + \tau = \left(\frac{1}{b + d} (a + c - b\tau) \right) + \tau \\ &= \frac{1}{b + d} (a + c + d\tau) \\ Q_s &= -c + d \left(\frac{1}{b + d} (a + c - b\tau) \right) \\ &= -\frac{1}{b + d} (bc - ad + bd\tau) \\ Q_d &= a - b \left(\frac{1}{b + d} (a + c + d\tau) \right) \\ &= -\frac{1}{b + d} (bc - ad + bd\tau) \end{aligned}$$

- (d) (4 points) What fraction of the tax burden do sellers pay? What fraction do buyers pay?

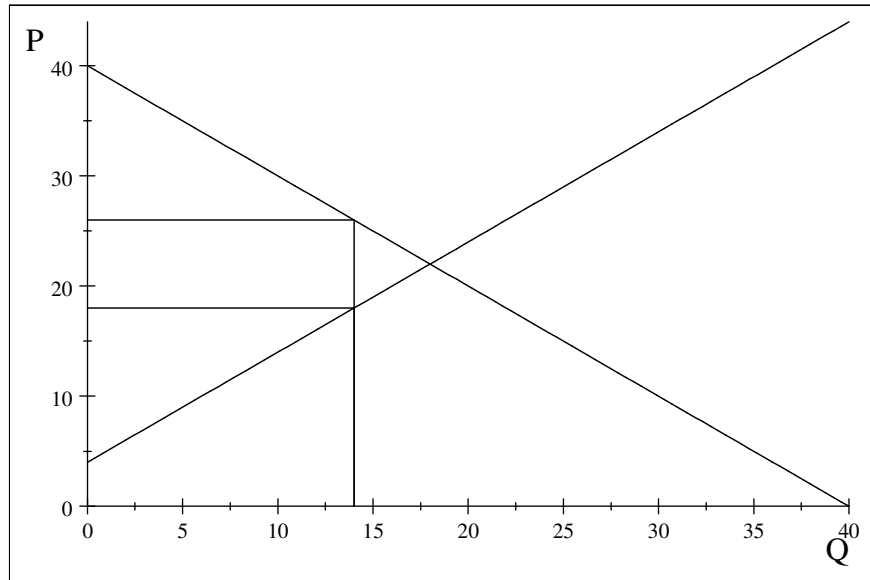
Solution 6 The seller's share is:

$$\frac{P^* - P_s(t)}{\tau} = \frac{\frac{a+c}{b+d} - \frac{1}{b+d}(a+c-b\tau)}{\tau} = \frac{b}{b+d}$$

The demander's share is:

$$\frac{P_d(t) - P^*}{\tau} = \frac{\frac{1}{b+d}(a+c+d\tau) - \frac{a+c}{b+d}}{\tau} = \frac{d}{b+d}$$

- (e) (7 points) In the graph below draw the supply and demand curve, and show the equilibrium after the government imposes the per-unit tax. In this graph indicate the consumer surplus, producer surplus, and the deadweight loss.



Solution 7 Being unable to label my graph, let me say the upper left hand triangle would be consumer surplus, the rectangle below it would be government revenue (not required) and the triangle below that (between the price sellers receive and the supply curve) would be producer surplus. That would leave the triangle to the right (below demand, above supply, and to the left of the efficient quantity) as deadweight loss.

4. (10 points) Your friend Nehir is very excited, she is considering opening a business after graduating and her retired Uncle Ata has just agreed to work for her for 50K TL a year for a while. When you ask her why she's

so excited she explains that hiring someone with his skills would cost at least 100K TL a year. She says that only because of her Uncle's kindness she thinks she will be able to open a business, if she had to hire someone she's sure her business would fail. Using the appropriate technical terms explain why she might want to consider not opening her business.

Solution 8 *First of all, as stated during the exam the amount was per month, not per year. Currently 100,000 a year would be below minimum wage.*

For simplicity let $\Pi|_{ata}$ be the profit Nehir expects conditional on Ata working for her. What she has said is that

$$\Pi|_{ata} - 50 \geq 0$$

and

$$\Pi|_{ata} - 100 < 0$$

and thus we can expect that $\Pi|_{ata} < 50$. However Ata has only committed to "a while" and thus might quit after a year or two, leaving her making an economic loss. (One expects she is including a reasonable salary for herself in her costs, however the point remains.)

In economic terms, the opportunity cost of hiring Ata should be 100 thousand, even though he is agreeing to work for a lower wage.

After clarifying this, Nehir might respond with she expects to be making more in a year or two, that she just wants the experience of running her own business, or many other things, but as it stands she is opening a business she expects to be marginally profitable, and she should consider the opportunity cost of labor when making her decisions, not the actual cost.

Several of your answers boiled down to "Nehir is a stupid diddy." This, of course, is an insult and I as your professor felt insulted when I read your answers. Of course her profit estimates would consider the cost of office, office equipment, other laborers, and etcetera. She is not stupid. Of course her estimates will also consider her inexperience running a company (if she is inexperienced). She is not stupid.

Indeed I am embarrassed that students that I have tried to convince of the importance of rationality could write such answers. At the same time I must also mention that calling someone you are trying to convince stupid is also a bad tactic. I must assume these were intended as snide comments to your friends about how much you were going to enjoy her failing.

5. (12 points total) About equilibrium

(a) (5 points) Define what it means for a system to be in equilibrium.

Solution 9 *That the system is in balance, or in economic terms what people expect others to do is exactly what they will do, and at the same time they are doing what is best for themselves.*

Several of you argued for "stability" as a requirement, for example a ball at the bottom of a bowl. As mentioned in class this is not required, certainly not in Physics and absolutely not in Economics where we are not certain of dynamics in the first place. In both disciplines if you turn the bowl upside down and carefully balance the ball on top it is still an equilibrium, just perhaps not one you expect to last.

- (b) (4 points) Give an example of equilibrium in an economic model.

Solution 10 *I gave very few to no points for an answer that said "see question 3," however I did give meaningful points if you actually repeated the answer to 3a: namely $Q_d = Q_s$ and $P_d = P_s$.*

I was really intending for you to give a wider ranging answer. To give a specific example, when buying a used car I know that there is probably some problem with it that I am not aware of. This problem could make the car worthless and thus make buying it a waste. Since all consumers are aware of this, this must be factored into the price of a used car. Thus the supply of used cars will be reduced to reflect this, meaning the better cars will not be offered for sale.

You could also use an example I gave in class, namely the side of the road game. There are clearly two equilibria there—everyone drives on the right or everyone drives on the left—and in different nations different equilibria are required.

- (c) (3 points) It should be clear that only rarely are systems in equilibrium, why is it important in economics to assume they are regardless of this fact?

Solution 11 *A question directly from a quiz and yet few of you got it right? Wow.*

As I said in my answers to that quiz, it is a final test of the model. If the model makes a prediction that is clearly falsified by reality, then the model is wrong. (For example if I suggested in the side of the road game the only equilibrium was to drive on the right.)

Another important reason to assume equilibrium is because it allows us to make clear and simple predictions about how the economy will fare in the future. If we cannot predict what will happen, then our discipline is little more than a Philosophy, but thanks to repeated application of this algorithm our predictions are usually fairly accurate. (Counter examples like the 2008 economic crisis are just that, and may I point out the reaction of central banks to this crisis is the reason that you did not grow up in a depression worse than the 1930s—reactions ruled by the predictions of economic models.)

6. (12 points) As a government employee you have been asked to raise revenue by imposing a sales tax. You are considering two markets that are essentially identical except that in market *A* the own price elasticity of demand is very elastic and in market *B* the own price elasticity of demand is very inelastic.

Which market should you impose the sales tax on? For simplicity you can consider a per-unit tax but it will not change your answer.

Solution 12 *The answer is B, but that was worth at most two points.*

The explanation was the rest of the points, it is simply that what you want to do is maximize revenue, or tQ , and to achieve this you want to minimize the amount that Q changes in response to t —or in other words in response to price.

If a demand curve is more elastic, it means that Q changes drastically with regard to P (and thus t), if a demand curve is inelastic Q changes only a little with regard to t .

As an aside, several of you argued that choosing the elastic market would have less impact on welfare because people could switch to other goods. While worth significant points, this answer is wrong for two reasons.

First I stated your objective was to maximize revenue—not minimize the impact on welfare. Changing the objective will never result in a correct answer.

Second welfare is determined by quantity, thus a radical change of quantity will have a large impact on welfare. Indeed in a careful theoretic analysis of this point it was found that choosing markets with a low elasticity would be the optimal strategy. This is why most governments use some variety of income tax as their primary revenue tool, and also why the Trump administration's idea of changing this to a sales tax (or tariff) is not recommended.