1 Where we are

- Last night was the Duke-UNC basketball game;
  as of yesterday afternoon, there were two single tickets available around $2,000,
  and more tickets starting at $2,500 each;
  Obama ended up at the game;
  Duke’s best player got injured in the first minute when he blew out his shoe,
  and Duke trailed the whole game and lost

- Reminder – HW2!

- Tuesday, we wrapped up thinking about the queuing model,
  using it to compare rationing-by-queuing to some plausible alternatives

- We discussed how real-world settings differ from our model,
  and the fact that many of our insights apply not only to actual waiting-in-line,
  but more generally to wasteful competition for rationed assets

- Today, we’ll mostly be talking about examples of rationing

- Any questions?
2 Other forms of rationing

2.1 Wartime rationing in the U.S.

- We focused on queuing, as one way to handle cases where price is too low to clear the market, but there are other ways one could ration things that are in short supply

- Many goods were rationed in the U.S. during World War II

- In 1941, car tires became the first good to be rationed, due to a shortage of rubber

- (Japan had control of the countries where most rubber was produced, and ships were being diverted to the war effort and couldn’t be used for importing rubber from South America; the U.S. had a pre-war rubber stockpile, but only enough for about a year’s normal use)

- Sales of tires were stopped, people were allowed to keep five tires per vehicle owned and had to turn in any excess beyond that

- New tires were limited to vehicles used for public health and safety, some essential trucking, and public transportation; recapping of old tires was allowed at the discretion of the local rationing board

- New car sales were similarly halted, with only certain professions – like doctors and clergymen – allowed to buy up the existing stock, and car factories were repurposed for the war effort

- Starting in 1942, gasoline was rationed, along with certain foods, starting with sugar, then coffee, meat, food oils, cheese, and butter

- Households got a “rationing book” based on the size of the household; the book contained stamps that entitled them to buy certain foods, when they were in stock, based on a points system

- This type of rationing continued throughout World War II
2.2 The 1970s gasoline crisis

- In the 1970s, the U.S. faced a gasoline shortage due to an OPEC embargo (against countries supporting Israel in the 1973 war).
- The U.S. responded to the shortage with price controls – while newly-discovered oil could be sold at high prices (to encourage new exploration), “old oil” could only be sold at the pre-crisis prices.
- This led to “old oil” being withheld from the market, further reducing supply, which led to rationing: long lines at gas stations were common.

- There’s a nice paper\(^1\) that looks at the distortion that occurs from needing to ration across markets.
- They find that the “time cost” of waiting in line for gas was a significant fraction of the total price – for example, in March 1974, the money price of gas was $1.15 per gallon, and the waiting time price was 57 cents per gallon in urban areas and 96 cents per gallon in rural areas.
- (So in rural areas, the “market-clearing price” was almost twice the official price!)

- The big takeaway from the paper is that, even taking as given the choice to control the price and ration gas by queuing, the outcome was much worse than it had to be.

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There’s a classic result in economics that when you want to raise revenue through taxes, it’s better to tax something which is inelastic – you want to raise the required money without changing behavior a lot, and without a large deadweight loss, which means you want people to pay the tax, not avoid it.

When rationing by queuing, however, the result is the opposite – you’re adding a tax to the price of the good, but the tax is wasteful, and your actual goal is to reduce consumption down to the required level – so you want people to avoid the tax, not pay it, and so the optimal way to do it is to impose the tax where behavior is elastic.
• It turns out that demand for gasoline is more elastic in urban areas – if you’re in a city, there are more alternatives to driving – and less elastic in rural areas.

• As a result, the “best” way to ration would have been to ration exclusively in cities, allowing rural gas stations to meet demand.

• But what happened was the opposite – the rationing was effectively more severe in rural areas:
  “Naturally arising uncertainties about supplies, short hours, and government-mandated Sunday closings led to far more severe rationing for rural travel.”

• And this led to a much larger welfare loss than was necessary.

• Looking only at California, they find that over the period of the 1973-74 gas crisis, the total welfare loss was about $1.2 billion dollars, of which $200 million was in urban areas and $1 billion in rural areas.

• If instead, rationing had been focused on urban areas, the total welfare loss would have been under $700 million – less than 60% of the actual experience.

• The 1979 crisis was similar, although the difference was not quite as stark – total welfare loss was $800 million, most of it in rural areas, while it would have been under $600 million if it was concentrated in urban areas.
3 Concert tickets

- We motivated our queuing model with the example of a free concert, where people had to wait in line to get in.

- In fact, for a long time, popular concerts and sporting events have priced tickets well below market clearing, so that popular events sell out quickly and resale prices are well above the face value.

- Some examples, from Bhave and Budish, “Primary-Market Auctions for Event Tickets: Eliminating the Rents of ‘Bob the Broker’?”:
  - in 1868, Charles Dickens read from *A Christmas Carol* in New York City; tickets quickly sold out at $2 each, and resold for as much as $20.
  - When Miley Cyrus toured in 2007-08, tickets sold for $64 and sold out in 12 minutes, with some immediately being offered for sale on eBay and StubHub for prices up to and over $2000.
  - This is definitely something I remember from the days before the internet: we knew when tickets would go on sale, we’d call up and wait on hold, the good tickets would be gone fast, and we’d be happy to get seats at all.

- In some cases – the Dickens reading – people really did line up to get the tickets, and one young boy supposedly sold his place in line for $30, fifteen times what a ticket cost.

- More recently, though, since most tickets are bought online, there’s more a problem of rent-seeking behavior: whoever gets to buy tickets on the “primary market” gets a valuable asset they can resell for more, leading to costly competition to capture those rents.

- (This is mostly speculators – ticket resellers – investing in technology to buy up as many tickets as possible on release, and then reselling them on eBay, StubHub, and elsewhere.)
As long as tickets are sold below market value, this type of rent-seeking is pretty unavoidable.

One could always ban resale – Hamilton assigns a few $10 tickets to each show by lottery, and makes those tickets non-transferrable.

Or one could try to actually set the price correctly to clear the market.

As we noted last time, though, figuring out the “correct” price for each seat is a hard problem.

A fairly recent innovation is to try to use auctions to “find” those prices.

The paper by Bhave and Budish is primarily about one of these experiments.

In 2007, Ticketmaster used auctions for a small-ish number of “premium” seats for a bunch of concerts.

I won’t go into the details of how the auctions were run –
we’ll say a lot more on auctions later in the semester.

They find that these auctions did do a pretty good job of finding the market-clearing price for each seat –
those seats that resold on eBay, on average sold for about the price they were originally bought for.

In contrast, for seats that were not sold by auction,
when they resold, they typically resold for a lot more money.

(Specifically, the tickets sold by auction, on average resold for $6 more than originally paid; for tickets bought at face value, they resold on average for $136 more than originally paid.)

(In fact, for the tickets sold by auctions, they resell on average for about $19 more when they were bought by an experienced buyer – possibly a ticket broker – and $2 more otherwise.)
• A pair of economists at Northwestern, Sandeep Baliga and Jeff Ely, introduced a similar auction for Northwestern basketball tickets, called Purple Pricing

• There’s a short Harvard Business Review article explaining how it works, and it’s similarly been successful in sniffing out the market-clearing ticket price

• The Bhave and Budish paper, however, notes that even though they seemed to work well, auctions like these never really caught on

• They note a couple of possibilities for why

• First, venues are finally getting better at pricing tickets correctly without using an auction, based partly on the availability of data from the resale market

• For example, Hamilton recently sold some high-quality tickets for about $900 per ticket, a Broadway record, based on observed resale values; baseball teams have started varying pricing based on time and opponent

• They suspect that some customers prefer posted prices to auctions

• They note that some artists have experimented with non-transferable tickets

• But they note that banning resale can have an unintended consequence: empty seats

• The 2012 Olympics in London allocated lots of tickets to corporate sponsors, leading to lots of empty seats, which looked bad on TV

• They also note that Ticketmaster has acquired a ticket reselling website, and many sports leagues have official partnerships with resellers such as StubHub, so to some degree, ticket sellers have decided not to pre-empt resale but to profit from it
Finally, I mentioned last time, there’s a paper\(^2\) that thinks about cases where some customers with a high value for receiving a ticket are budget-constrained.

They assume customers have different valuations for the good, and different budgets, and want to maximize Utilitarian welfare, i.e., the sum of everyones’ cardinal utilities.

They compare the outcomes of three allocation procedures:
- a competitive market (market-clearing price),
- random assignment without resale,
- and random assignment with resale allowed.

They show quite generally that random assignment with resale gives higher welfare than the competitive market, but random assignment without resale does not.

Still, it’s at least one way to make an argument for using something other than the market-clearing price to allocate concert tickets.

(There’s another, more recent paper\(^3\) that also finds that price caps and rationing can make sense from a utilitarian point of view;
they’re thinking of a situation where there is substantial wealth inequality, and you want to try to achieve redistributive goals through an individual market (rather than by some other means)
but this paper is pretty massively complicated and I wouldn’t necessarily recommend jumping into it)


\(^3\)Dworczak, Kominers and Akbarpour (2018), “Redistribution through Markets” (working paper)
4 Uber

- There’s a Freakonomics podcast titled, “Why Uber is an economist’s dream”\[4\]

- To begin with, Uber more or less does what markets are supposed to do:
  uses price to balance supply and demand

- Traditional taxi services control quantity – by limiting the number of cabs operating –
  and also regulated prices, with only small adjustments for peak hours

- This leads to excess demand at peak hours –
  it’s hard to get a cab at rush hour, or on New Years Eve

- Demand is greater than supply, so the product is rationed –
  either by having to wait a long time for a cab,
  or by some people randomly getting lucky and others not getting cabs at all

- Uber, on the other hand, increases the price when there’s more demand than supply –
  which reduces demand (some people don’t want to pay the higher price)
  and increases supply (by encouraging more drivers to drive),
  allowing the market to clear

- (HOW UBER SURGE PRICING WORKS)

- So as a starting point, most economists think Uber is a good idea,
  simply because we’ve already seen price is a much better way to clear a market than rationing

\[4\]http://freakonomics.com/podcast/uber-economists-dream/
There’s a nice short case study on how Uber’s surge pricing works.\(^5\)

(It’s by two Uber people and a former econ professor who’s now at Amazon, so you can treat it partly as propaganda, but it’s written by people who are serious economists)

They look at a particular example of surge pricing – the end of an Ariana Grande concert in New York, when a lot of people wanted to leave Madison Square Garden at the same time.

Demand spiked, and surge pricing turned on for about an hour and fifteen minutes, with price being between 100% and 180% of the normal rate.

The paper shows that drivers responded, increasing supply to meet the demand.

As a result, while the number of requests for rides was well above normal, the average wait time initially went up and then pretty quickly came back down to normal, and the “ride completion rate” stayed at 100% – everyone who wanted a ride (at the surge price) got one.

They contrast this with an event three months earlier, when a technical glitch caused surge pricing to shut off when it should have been on – between 1 a.m. and 2 a.m. on New Year’s Eve.

A little after 1 a.m., the surge multiplier was at 2.7, and then accidentally dropped down to 1 (normal price).

In that case, requests for rides shot up, the expected wait time also went way up, and the ride completion rate dropped – lots of people wanted rides and didn’t get them.

(When the glitch was fixed, just before 2 a.m., the multiplier shot up to 6 for a little while)

\(^5\)Hall, Kendrick and Nosko, “The Effects of Uber’s Surge Pricing: A Case Study”
• So, if you buy the simple story (based on two data points),
the system does what it’s supposed to do –
adjusts price to match supply and demand

• There’s another paper which gathers data on both taxi and Uber drivers in several big cities,
and finds that Uber drivers typically have better utilization rates –
that is, they spend more time transporting passengers, and less time empty

• They attribute the difference to four sources:
better matching technology through the app,
the larger scale which creates a thicker market (faster matching),
inefficient taxi regulations (for example, a cab who drops off a customer outside of their
jurisdiction can’t pick up another customer in that location),
and the “flexible labor supply model” and surge pricing, which better equate supply to demand

• Of course, it’s not all good news.
There are stories of drivers gaming the surge pricing rules –
shutting off the app to simulate low supply and trigger surge pricing,
then turning it back on once the price has gone up.

• And Uber has also been criticized for using surge pricing after violent attacks,
when people are trying to get away from something

• Putting aside whether it’s done deliberately –
the surge pricing is done by algorithm, not by hand –
some people compare this to price gouging,
such as raising the price of essentials (gas, bottled water, food) after a natural disaster

• Price gouging like that is often illegal,
but it’s kind of an open question among economists whether it should be

• There’s a nice discussion of it on the podcast, between Steven Levitt and Stephen Dubner

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DUBNER: Levitt, talk for just a second about surge pricing generally as an economic concept. So lets say there’s a big storm forecast and a hardware store triples the price of flashlights and batteries, which in a lot of places is not allowed. There are, what are called, anti-gouging laws and people get really upset about that. But how does that kind of price spike look to an economist and not someone who just wants to buy a flashlight?

LEVITT: So economists don’t mind those kind of price spikes at all. Because what actually happens when a hurricane is coming is the hardware stores run out of batteries and flashlights, because they’re not allowed to raise prices, there is a run on the stores, people buy lots of flashlights and batteries, and then there are none left. And that, to an economist, is a failure, because what markets are supposed to do is to use prices to allocate things like flashlights and batteries to the people who are willing to pay the most for the flashlights and batteries. So what happens in disaster situations, where there is a limited supply and no real way to get extra flashlights and batteries is that I go to the store and I buy way more flashlights and way more batteries than I really want or need just to be on a safe side. But then you, Dubner, you show up an hour later and they’re all gone. And you really need that first flashlight and you really need the batteries and they aren’t there for you. So that’s a breakdown of markets.

The other reason that you want prices to rise when there is lots of demand, lets say a hurricane is coming. And its conceivable, that you and I, Dubner, as entrepreneurs and knowing that hurricane is coming, could start in New York, fill up our car with flashlights and batteries and we would drive to New Orleans with the hope that we could sell our flashlights and our batteries at a higher price. That’s great because the flashlights and the batteries are worth a lot more in New Orleans right before the hurricane than they are in New York. And if we were willing to take that trouble, it would be great for the people of New Orleans, even though they’d have to pay a higher price. But if you don’t let the price rise well, were not going to do that. And so really the price rising, just like higher prices make more Uber drivers stay on the road or get on the road, in general, when there is a lot of demand for something, its great to let the price rise because that stimulates supply and makes everybody better off.
• One other thing I’ll mention about Uber, because it’s kind of analogous to the rent dissipation idea we discussed in queuing

• When Uber first introduced tipping, my favorite econ blog, Marginal Revolution, had a post about why this was a bad idea.\footnote{https://marginalrevolution.com/marginalrevolution/2017/11/uber-tipping-equilibrium.html} 7

• The objection was that this would not end up increasing Uber drivers’ earnings

• They point out that every person with a decent car is a potential Uber driver, and that as a good approximation, we can imagine the supply of Uber driver hours as being pretty perfectly elastic at a fixed wage

• So if the rate that they get when driving goes up, more people will become Uber drivers, or existing drivers will supply more hours, which will make it harder for them to find passengers

• This will happen up to the point where drivers’ hourly wage is right back where it started

• So, customers will pay more, drivers will get the same hourly wage, but drivers will spend more time driving around without passengers

• This is exactly what we saw when we raised $V$ in our queuing model – even though increased the “rents” from getting into the concert, these got competed away and nobody was made better off

\footnote{Aside from what I discuss in lecture, they also discuss Levitt’s ability to use Uber data to actually construct an “entire” demand curve and therefore calculate consumer surplus; that paper is \url{here}}
• Then they point out there’s a paper showing this actually happens


• They don’t look at tipping specifically, but at situations where Uber raised the base rate charged to customers (and therefore earned by drivers) in a city

• What they found:
  “...when Uber raises the base fare in a city, the driver hourly earnings rate rises immediately as drivers make more money per trip. However, the hourly earnings rate begins to decline shortly thereafter, and after about 8 weeks, there is no detectable difference in the driver average hourly earnings rate compared to before the fare increase. ...The main reason... is that the fraction of hours-worked that are spent with paying customers – which we call “utilization” – falls; ... the effect of a 10% fare increase is to eventually lower utilization by 10% in the long-run.”

• With a fare increase, there’s both a reduction in demand, and an increase in driver hours supplied, pushing utilization down;
  there’s also a reduction in how often surge pricing is used

• So the net effect may be OK for riders, although they are paying a higher base rate;
  and it doesn’t really help drivers at all

• Again from the article: “When driving with Uber temporarily becomes a better deal, drivers work more hours and push down the hourly earnings rate through lowered utilization and somewhat less surge. The adjustment process tends to push the driver hourly earnings to a fixed level, and so Uber faces a de facto horizontal labor supply curve with respect to the hourly earnings rate, at least within the range of fares and driver hourly earnings rates seen in our data.”

• (Note that the same argument could be used to argue against giving Uber drivers benefits like health insurance,
  or really having the company treat them better in any way;
  as long as there’s free entry, anything that makes it better to be an Uber driver will increase entry to “compete away” those extra rents)
5 Before we move on...

- Before we move on, good time to summarize what we’ve done so far this semester

- We started off with “why markets work” –
  
  simple supply/demand curves, the First Welfare Theorem, and Coase Theorem
  
  are all different ways to formalize the idea that we expect markets to lead to Pareto-efficient outcomes,
  
  but they depend on strong assumptions – price-taking behavior, the lack of externalities, the lack of informational frictions, and/or the lack of transaction costs

- We discussed commodity goods, and Walrasian-style markets:
  
  stock markets, but we found that arbitrage opportunities created an “arms race” for speed,
  
  and proposed batch auctions as a possible fix;
  
  and electricity markets, which actually use auctions like those to clear the market

- We noted that in multi-unit auctions,
  
  firms have an incentive to “shade” their bids if they’re bidding to buy or sell more than a single unit,
  
  and we could observe that behavior in the data –
  
  power generators bid above marginal cost to supply more electricity,
  
  and below marginal cost to buy back supply they had promised,
  
  although the effects on the efficiency of production were not enormous

- Then we talked about markets that don’t use price to clear,
  
  and introduced queuing – allocating the good based on waiting in line – as an example

- We saw this led to rent dissipation, and outcomes much worse than if price was used to clear the market,
  
  but also saw reasons to defend some form of rationing

- Next week, we’ll start fresh with a new type of market,
  
  and a new way of thinking about modeling it