1. Behavioral Public Economics

- The traditional economic approach taught in a standard economics class starts from a very simple model where we assume that all individuals are fully aware and optimize perfectly in response to the incentives they face. People make decisions that maximize their utility, perfectly considering all the different tradeoffs. Is that fundamental assumption, which is really the core of where economics has started from, true in practice? Do workers know what their marginal income tax rate is, or exactly how much they will end up paying to the government if they earn another dollar? This graph shows the marginal tax rate on income.

![Graph showing Federal Income Tax Rates for a Single Earner with 2 Children in 2006](image)

- Marginal tax rate refers to what workers give to the government for one more dollar earned at a given income level. This moves around tremendously. Initially, the marginal tax rate is negative. This is because of the earned income tax credit that the government is paying to individuals. It increases as they earn more money. They actually face their highest marginal income tax rate around an income of $35,000 or $40,000 because individuals are losing eligibility for these programs like the earned income tax credit as they earn more. Effectively, they face very high marginal tax rates.

- A person who is fully rational and abides by the traditional principles of economic optimization should know this schedule perfectly. Moreover, if someone are earning $37,000, they should recognize that the marginal tax rate is 51%, but if they are earning $43,000, the marginal tax rate is down to 30%. They should take an extra job or make decisions about retirement savings, which are going to be exempt from these taxes. That might be quite difficult to do. Just keeping track of the exact schedule is probably difficult. Figuring out how one should respond to it is another challenge.

2. Behavioral Public Economics Example 1: Sales Taxes

- To understand how people actually make decisions, we can turn first to sales tax. When someone goes to the grocery store, they pay 7% extra at the register for most purchases. In a
paper we wrote back in 2009, we test whether consumers are aware of and respond rationally to simple sales taxes. The key relevant feature of sales taxes is that they are not included in posted prices in the US. If you see a product for $5 on the shelf, you will actually pay roughly $5.25 when you check out. We test whether the fact that sales taxes are not included in the posted price affects the response to sales taxes using an experiment in a grocery store in Northern California. The idea here is that the rational economic model would predict that the fact that sales taxes are not included in the posted price is completely irrelevant. If consumers are optimizing perfectly, they will know that there is a 5% or 8% tax added at the register and take that into account when making purchasing decisions. The behavioral view might be that people are inattentive and might not pay attention to these taxes because they are not included in the posted price. We went about testing that in an extremely simple and somewhat crude way. We managed to partner with a large grocery chain in Northern California and ran the following experiment.

- First, we took the pre-tax prices that are listed. The original tag, for instance, for a particular hairbrush reads $5.79. Then, we printed a new tag with what the price would actually be including California sales tax, $6.22. We did this for about 1,000 products back in 2006. We focused on a set of hair brushes and other similar items because when we first made the pitch to the grocery store that we wanted to test this hypothesis, their reaction was “absolutely not” because they believed our hypothesis that people are going to buy less as a result of this intervention. However, we settled on not doing this with items that drive the volume of purchases and high revenue products. Instead, we focused on things like hair brushes and a set of cosmetic products, which were less important for the grocery stores. These products are also quite useful from a research perspective because they are “impulse purchases,” meaning they are very price elastic. If the price changes by $1, people are much less likely to buy these products, which is very useful. If we did this with a product like milk, where the elasticity of demand is going to be very low, it would be difficult to figure out whether the intervention actually did anything.

- We had a set of products that we put these tags on and a set of control groups. There were other products in the same aisle where we did not do this intervention, like shaving products. There were other stores that we identified before the experiment as being similar to this store and run by the same chain where there was no intervention. We think of these as control stores. We did this intervention for three weeks in early 2006. The below table summarizes results.
• This is a simple difference-in-difference analysis. We are looking at data on the number of units sold in the treatment store per category, like cosmetics and hair brushes. The number on the upper left shows that they were selling 26.4 units on average in the control categories before the experimental period. The data for the control categories is on the left and the treated categories are on the right. Focusing on the treated column, the number of units sold of those treated categories fell from 25.2 to 23.8, meaning that there was a reduction in sales during that period. That seems consistent with the view that perhaps showing people these taxes reduce the amount they want to buy of these products.

• However, anytime we do an intervention like this, we must account for the fact that other factors might have changed between the baseline and the experimental periods. For instance, in the case of grocery stores, there is a lot of volatility in demand and variation in foot traffic across weeks. For example, there is a huge spike in sales of soda around the Super Bowl. If we were to just do a comparison of data after versus before the Super Bowl, we would see fluctuations purely because of that variation. In order to account for that, we can compare changes in the treatment categories to what is going on in the control categories, where we should see the same foot traffic given that it is the same aisle in the same store. Here in the control categories, we see that the difference in sales from the pre-experimental baseline period to the experimental period was actually positive—sales went up by .8 units. We can then form the difference-in-difference estimate. That estimate takes the -1.3 and subtracts off the .8 increase that we saw in the control group. We end up with a difference-in-difference estimate of -2. That implies that there was a 2-unit relative reduction in sales in the treated categories relative to a base amount of roughly 25. There was around an 8% reduction in sales with the new tags.

• Any difference-in-difference comparison like this relies on the fundamental identification assumption that absent this intervention, there would have been a similar trend in the control and treatment categories. If we make that assumption, we can interpret -2.1 as the causal effect of our intervention. A natural way to evaluate that assumption is to turn to data from the control stores and compare sales in the same set of control and treated categories. We see that there is no differential trend in sales between the treated and control categories in the control stores, and the difference-in-difference estimate is basically zero. That supports the assumption that there are parallel trends in the treated store. It also
supports the view that showing people this information about sales taxes does actually change the amount that they buy nontrivially. We showed them a sales tax of 8%, the California sales tax, and they reduced the amount they bought by about 8%. That is an elasticity of 1, which is quite large. This implies that people are deviating substantially from the benchmark that this intervention should have no impact at all.


- Returning to the earned income tax credit (EITC) which is the largest cash transfer anti-poverty program in the United States. We spend about $70 billion per year on the EITC. One of the main goals of the earned income tax credit is to subsidize income for low-income individuals. It is structured in that way because people want to increase the incentive for low-income individuals to start working and increase the amount they work in order to pull them into the labor force. This program has tremendous bipartisan support because it both redistributes income towards the bottom of the income distribution and increases the amount people are working. Our focus here is whether the EITC is actually successful at increasing the amount people are working. In a paper with John Friedman and Emmanuel Saez, we study this question using a big data approach with data from tax records.

Above is the earned income tax credit schedule. If you have no earnings, you get no EITC. As you earn more, you get a larger EITC. At some point, the EITC caps out and gets phased out. If you were to pick a point in the income distribution where you would get the biggest possible EITC refund and minimize the other taxes you have to pay, you would pick the line shown in blue for a person with one child and the line shown in red for a person with two or more kids. Many people have figured out that this is the right thing to do in order to maximize the refund that they are getting from the government. If we plot the fraction of people who list various levels of income on their tax returns, we can see that there are spikes in the number of people who report incomes exactly at the refund maximizing level. In Texas, there is a pattern that looks slightly more accentuated than in the nation as a whole.
Going back to the previous chart, we are subtracting actual income from the value of the dashed line, depending upon the number of kids someone has. For people with one kid, we are subtracting $9,000. For people with two kids, we are subtracting $12,000. In Texas, lots of people cluster right around that refund maximizing point, which is shown at zero by the red line. If we do the same exact exercise in Kansas a very different picture emerges.

In Kansas, people are not responding almost at all to the EITC. This is surprising because the EITC is a federal policy, meaning incentives do not actually vary between Texas and Kansas.

We can generalize from that and look at how responsiveness to the EITC varies across places in the United States and how it has changed over time.
We are plotting the fraction of people who report income at that EITC refund maximizing point. Looking at the scale on the right, the dark red means that 4.1% of people are reporting incomes exactly at that refund maximizing point to the dollar. We call it sharp bunching exactly at the refund maximizing point. We start in 1996 because that is the earliest point at which we have tax data, and because the EITC was expanded to its current structure in 1994. Looking at the map above, it looks all yellow. People across the U.S. are not responding very much to the EITC. There are very few people clustered at the refund maximizing point. There are few exceptions to that. For instance, the color is quite red in the southern tip of Texas, meaning that many people there in 1996 were responding to the EITC. Looking at this data over time, this behavior seems to emanate from the southern tip of Texas and spread across the United States.

More and more people across the US are starting to respond to the EITC by having a level of income that is exactly around that $12,000 range that maximizes their refund. What might be going on in driving this pattern? One intuitive explanation is that this is about differences in knowledge and the spread of information. If we think about any simple model of information diffusion, we might expect to see a spatial diffusion pattern. As more and more people learn about the EITC, they tell their neighbors, the knowledge spreads, and we start to see more and more people responding.
4. Behavioral Economics Example 3: Retirement Savings

- We will now turn to retirement savings, motivated by the fact that there is widespread concern that many families in the U.S. and other countries are not saving enough in general, and particularly for retirement. In order to address that issue of under saving, the U.S. effectively spends about $100 billion per year on programs to increase savings for retirement in the form of IRAs and 401(k)s, which are tax subsidized accounts to save for retirement. If someone earns $100,000 and put $10,000 of that in a 401(k), they get to subtract $10,000 from their current tax bill, and only pay taxes on $90,000. The $10,000 in the 401(k) accumulates interest and capital gains without taxation. It is a tax preference for savings, and it effectively costs the government lost tax revenue of about $100 billion a year. Is this an effective way to increase retirement saving? Are people actually saving more, or are there other policy instruments that might be more effective? This is a case where insights from behavioral economics have shifted policy approaches to increasing savings dramatically in the past 15 years.

- The most influential study in this literature was a paper by Brigitte Madrian and John Shea, where they analyzed the impacts of employer defaults on individuals’ 401(k) retirement account contributions. The idea here is that many employers offer retirement savings plans, and some of them default employees into a particular savings plan. The default could be that unless employees fill out the paperwork, they do not have any retirement savings or contributions at all. On the other hand, the default could be that if they do not do anything, the employer will take 2% of their paycheck and put it in their 401(k) account. Importantly, the only thing the default changes is whether employees have to opt in or out of retirement saving. Either way, the incentives are exactly the same. In the traditional economic model where people are optimizing perfectly, the default should be completely irrelevant. In this paper, they analyze whether that is the case by looking at data from an employer where they have information on who is contributing to retirement accounts. This employer switched from having no default into the retirement savings account to having a default contribution. This chart shows what happens as a result of this automatic enrollment or default policy.

![Effects of Automatic Enrollment on 401(k) Participation](image)

- The green series shows the fraction of employees who participate in the 401(k) plan based on the number of years they have been working at the company, and it is gradually increasing over time. Initially about 20% of people signed up for the 401(k). For people who have been working...
at the company for four years, around 40% of them have signed up for the 401(k). At some point, the company decided to switch their policy such that everyone got automatically enrolled in the same 401(k) plan when they started working at the company. Employees could opt out of it if they wanted to. The incentives remained the same as they were for the green series. The result is shown in the orange. The fraction of people contributing to the 401(k) is immediately at 80% and remains at 80% throughout. Just the simple switch to an opt out instead of opt in plan raises the fraction of people saving for retirement from around 20% to 80% without spending any money. They then decided to stop the automatic enrollment program. The result is shown in the blue. The results go exactly back to what we had before. That is pretty convincing evidence that the default itself has extremely large effects on whether people save for retirement or not. Moreover, it has a very large effect on how much they save for retirement.

- This simple fact is a strong challenge to the traditional optimizing view in economics and potentially suggests a very different direction for retirement savings policy. Instead of spending $100 billion a year on these incentives, perhaps we should just default people into saving for retirement and achieve similar goals at much lower cost. However, before we jump to that conclusion, there is one additional issue to resolve. Do defaults increase total savings or do they simply lead to a shifting of assets from non-retirement to retirement accounts?

- The Madrian and Shea evidence above shows that people save more in their 401(k)s when they are defaulted into a retirement savings plan. However, it is not immediately obvious what impact that default will have on total levels of savings in both retirement and non-retirement accounts. Even if someone is completely inattentive and passive, they still have to satisfy their budget constraint. If someone earns $100,000 a year, they have $100,000 to work with. If they did not pay attention to the fact that $5,000 of that $100,000 got put into a retirement account, they now have $95,000 left. They can either cut the amount that they consume or the amount that they are saving in other accounts. They might have been saving $5,000 a year in their bank account, but with this retirement account contribution, maybe they cut the amount that they are saving in their non-retirement account from $5,000 to $0. Why is that important? If the default is just getting individuals to save more in their retirement account at the expense of saving less in their non-retirement account, then we are not changing anything in terms of overall savings rates. Getting at that issue is difficult in the United States because we do not have data that gives us information on everyone’s accounts. We tend to know what is in someone’s retirement account at a given employer, but we may not know what is in their other accounts.

- We wrote a paper looking at this issue using data from Denmark. Because Denmark has a wealth tax, they have a full record of everyone’s different accounts. Thus, it is better suited to analyze this question. We look at the impacts of defaults in Denmark. Our approach is very much inspired by Madrian and Shea’s work. In Denmark, like in the US, employers make pension contributions on workers’ behalf automatically. However, the level of the contributions varies significantly across employers. We do an event study design where we look at people who switch firms. For instance, suppose I switch from one university to another. Harvard might have a contribution rate of 10%, but Stanford might have a contribution rate of 5%. When I move from Stanford to Harvard, does that change the amount that I am saving in my retirement account? Does that change total savings rate?
We are focusing on a set of people who switch firms in year zero and move to a firm with a 3% or greater increase in the employer contribution. The series plotted with squares shows that when people move to a firm where the employer is contributing more to their retirement account, they have higher employer contributions. The key question is whether people offset that increased retirement saving by saving less in other accounts. For instance, we can look at whether people are contributing less themselves to their own individual retirement accounts. The question here is, when someone’s employer is putting more in their 401(k), do they respond rationally by putting less in their own individual retirement account? The red line shows that individuals do not offset any of that increase when they move to an employer that is contributing more for retirement. Moreover, they do not cut back on any of their other savings and other taxable accounts either, as shown in the graph below.

The consequence of this is that when someone moves to an employer that is contributing more for retirement, they end up having more total savings. We then show that when we track these people over many years, they have substantially more wealth accumulated for retirement. When they retire, they do so with a lot more money than people who were not defaulted into these higher retirement contribution levels. From a behavioral economics perspective, we can see here that we can actually shift the amount that people are saving for retirement just by changing these automatic enrollment plans and without bothering with tax incentives. That is an illustration of how behavioral economics potentially brings new tools to the table that can be much more effective as we think about tax policy.