CHAPTER 2: THINKING LIKE A POLICY ANALYST

How do you perform a policy analysis?

In this section, I'll try to explain how to perform a policy analysis. But I have bad news: there is no formula. There is no cookbook approach. Each policy analysis is different. Patton and Sawicki[1] have a good quote about performing a policy analysis.

> The principal tools of the policy planner are logic, common sense, and experience with particular substantive areas. It helps to be practiced in data analysis, rational problem solving, and other specific skills. But more often than not we design our own approach or methodology to policy problems.

So how do you get started. First, you need to identify a well-defined policy, the more detail the better. For example: Increase taxes on cigarettes from $1.50 to $2.00 per pack. Eliminate cost-sharing for colon cancer screening. Reduce the payment for imaging services performed on contiguous body parts when performed on the same day. Allow physicians to take ownership stakes in hospitals.

Second, you need to identify an outcome. A good place to start is to think about which outcome is of greatest interest to the people who will decide whether or not to adopt the policy. Which outcome is the most *salient*?

Third, draw a model of the connection between the policy and the outcome. For example:

> Increase in cigarette taxes => increase in the retail price of cigarettes => decrease in smoking => decrease in the incidence of lung cancer => decrease in spending on lung cancer

Sometimes, you might not be able to draw the connection between the outcome you really care about and the policy, in which case you can settle for predicting the impact of the policy on an intermediate outcome. You should not report this model in your analysis, unless it is especially complicated.

Fourth, with the model in-hand, think about the types of assumptions you need to make the links, represented above by =>. For example, you need an assumption about how much of any cigarette tax will be passed on to consumers in the form of higher prices. You need an assumption about how smoking behavior changes in response to retail prices.

Fifth, you should identify numerical values for each assumption from published studies or other sources. We'll spend a lot of time on this part. But for now, know that you should not try to perform an original data analysis.

[1] Patton CV, DS Sawicki. Basic Methods of Policy Analysis and Planning. Prentice hall, Englewood Cliffs, New Jersey. 1993.

Sixth, combine the assumptions in a table (or tables) and calculate the result. An analysis combines assumptions with your own calculations. A table just listing random statistics you collected is not an analysis.

And you're done. Easy!

Electric charging stations

A colleague tweeted this out in 2018:

Is building charging stations a good use of the funds? Many people think that funds obtained from legal settlements ought to be spent on related programs.[2] For example, funds from the 1998 Tobacco Master Settlement Agreement should be devoted to tobacco control. In the case of Virginia's electric charging stations, the funds were obtained from a settlement with Volkswagen. The company admitted to installing "cheat" software in its cars. During Environmental Protection Agency emissions tests, the software would activate emissions control equipment. Otherwise, the equipment was de-activated, allowing Volkswagen cars to get better gas mileage.

Here is the description of potential benefits from the press release[3] announcing the construction of the new stations.

[2] The idea that settlement funds ought to be used for remediation and prevention is appealing, but it violates a principal of public finance: funds should be spent so that the incremental benefit of spending is equalized across programs. Suppose that the benefit of spending an additional dollar on preventing smoking is $X and the benefit of spending an additional dollar on repairing roads is $X+1. Then we should spend an extra dollar of revenue on repairing roads, regardless of the revenue source.

[3] Office of the Governor, Virginia, Ralph Northam. *Governor Northam Announces Selection of EVgo to Develop Statewide Public Electric Vehicle Charging Network* August 9, 2018.

> Virginia is taking a leading role to develop and deliver a statewide electric vehicle charging network that is driver-focused, user-friendly, and promotes electric vehicle usage," said Governor Ralph Northam. "Through this partnership with EVgo, Virginia will accelerate electric vehicle adoption, generate more private investment in electric vehicle technology, and help provide citizens in the Commonwealth with cleaner air.

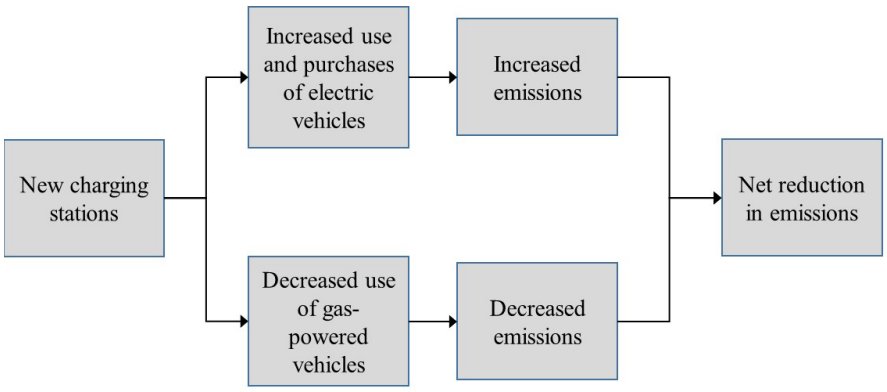
The goal is to increase the use of electric vehicles and ultimately decrease harmful emissions.

An outline of a policy analysis

Let's sketch out a policy analysis of the impact of funding more charging stations. All we know (or knew at the time) is that Virginia will spend $14 million on charging stations. There are a lot of potentially useful details missing: How many stations? Where will they be placed (according to the press release, "The network will prioritize some of the most heavily traveled corridors in the Commonwealth.")? Are they rapid-charging? Since the press release is silent on these issues, we can either try to fill in the details ourselves using common sense or by making some arbitrary assumptions. Or, we can try to construct our analysis in such a way that we do not need to make assumptions about these details.

Ultimately, policymakers probably care about the impact of charging stations on global warming or health. But creating a model to capture these downstream outcomes may be difficult, especially global warming. For now, let's focus on emissions.

Here is a model connecting the policy to the outcome.



New charging stations will offer a number of conveniences for electric car owners, which will make using an existing electric car or buying a new car more attractive. Electric cars generate pollution indirectly – the electricity has to come from somewhere – but reduce the use of polluting gas-powered cars. Using this framework, we can start to answer the question: How will Virginia's construction of new charging stations affect emissions?

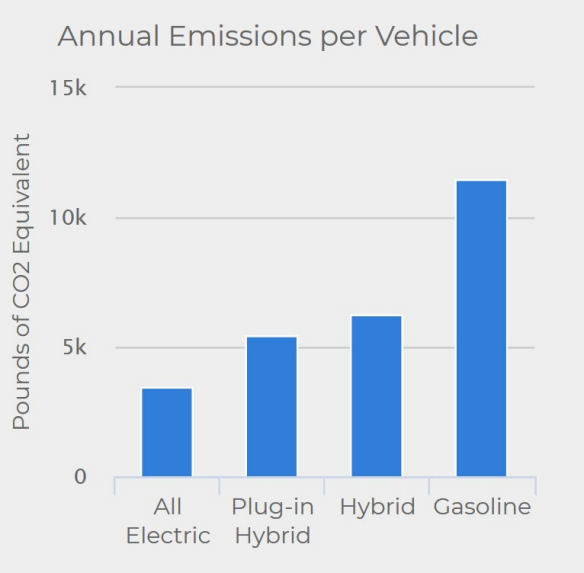
Impact of charging stations on electric vehicle adoption. There are many studies that examine the factors associated with the adoption of electric cars. Not all of these papers

contain estimates that are relevant or usable, but many do. Here is a summary[4] of one paper[5]:

> One additional installation of a public charging station per capita is associated with a 7.2 percent increase in battery electric car purchases and a 2.6 percent increase in hybrid cars (when they run on battery power), while it weakens with increasing ranges of battery electric vehicles. This suggests that hybrid owners tend to account for the availability of free charging stations when they calculate total cost of ownership. On the other hand, according to the researchers, owners of short-range battery vehicles tend to have more "range anxiety.

An estimate like this could serve as the basis for a policy analysis. And because it is a state-level analysis, we do not have to worry about making assumptions about where the charging stations are located, though obviously it would matter a great deal in practice.

But just because it is in print doesn't mean it's right. The authors of this analysis used state-level data to regress electric vehicle adoption on the availability of charging stations and other state characteristics. They interpret the results as showing that charging stations increase adoption, but the causality could run the other way. Companies and businesses find it more profitable to install charging stations if more people own electric vehicles. If I was doing this analysis for real, I would probably review other studies of the impact of station availability on electric vehicle use and adoption to find an estimate that I thought captured the causal relationship.



Impact of adoption on use of gas-powered cars. I might assume that every time a consumer buys a new electric car, one gas car is taken out of commission. There is a one-to-one tradeoff between miles driven in an electric car and miles driven in a gas car.

Impact of the switch from gas-powered to electric cars on emissions. Estimates of the annual carbon dioxide emissions from gas and electric vehicles are available from the Department of Energy.[6] These can be used in the policy analysis assuming that every purchase of an

[4] Shen, Xufei. With the Right Government Incentives, Electric Vehicle Adoption Could Rise. *Chicago Policy Review* February 15, 2019. http://chicagopolicyreview.org/2019/02/15/with-the-right-government-incentives-electric-vehicle-adoption-could-rise/

[5] Narassimhan, Easwaran, and Caley Johnson, "The Role of Demand-Side Incentives and Charging Infrastructure on Plug-in Electric Vehicle Adoption: Analysis of US States." *Environmental Research Letters* 13, no. 7 (2018): 074032.

[6] Department of Energy. *Emissions from Hybrid and Plug-In Electric Vehicles.* https://afdc.energy.gov/vehicles/electric_emissions.html

electric vehicle takes one gas-powered car off the road. Virginia generates more than 80% of its electricity from so-called clean sources, like natural gas and nuclear. The benefits of promoting adoption of electric vehicles in West Virginia are much lower, which generates over 90% of electricity using coal.

Possible limitations

Policy analyses cannot examine every possible effect of a policy change. Here are some of effects the analysis described above ignores.

Additional environmental benefits. Cars emit hydrocarbons, nitrogen oxide, and particulate matter in addition to carbon dioxide.

Increase in miles driven. The cost of driving a mile in an electric car is lower than the cost of driving a mile in a gas-powered car. According to a 2017 estimate, the average cost per mile driven is 3.7 cents for an electric car and 10 cents a mile for gas-powered cars, though there is a large range.[7] When driving becomes cheaper, people drive more. An analysis that ignores this effect would overstate the environmental benefits of electric vehicle adoption. You could incorporate this effect without too much additional work using estimates of the price elasticity of gasoline. Most estimates are around -0.3, meaning that a 10% decrease in the price of gas leads to a 3% increase in gasoline consumption.

Age of abandoned gas vehicles. The figures shown in the graph are for the average gas-powered car. Newer cars are more efficient than older cars. If drivers who switch to electric vehicles as a result of the policy get rid of older cars, an analysis based on the data in the graph will understate the environmental benefits.

Effects of new stations on electric vehicle adoption. Most studies of the impact of the availability of charging stations on electric vehicle adoption estimate the average effect of charging stations. But not all stations will have an equal effect. A station that is built in a densely-populated area that is not near another station will have a larger effect on consumers' decisions than a station that is built in a rural area or a station built near many others. Does the fact that Virginia will build stations where there are not already privately-operated stations tell us something about their impact?

All analyses have limitations. The point of this exercise is that we should avoid overly-simplistic judgements about policies, like "electric cars good-gas cars bad." We need to think carefully about the likely effects of proposed policies and try to predict their effects quantitatively.

A closing thought

If electric vehicle stations are so valuable, why aren't private companies rushing to open them? Why aren't vehicle owners willing to pay a price that will cover the costs of building

[7] Edmonds, Ellen. *AAA Reveals True Cost of Vehicle Ownership*. August 23, 2017. https://newsroom.aaa.com/tag/driving-cost-per-mile/

and operating them? Gas stations are built and run by private companies. Same for some electric vehicle charging stations. Is there a market failure?