Economic Models of COVID-19: Taxes and Cigars

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Health economists have worked for many years in interdisciplinary teams with epidemiologists and sociologists to look at the implications of epidemics and pandemics. Working together we have constructed simple, yet powerful, analytic models that can provide insights into the transmission, immediate impact, and long-term consequences of epidemics. This essay provides such models to look at the economic impacts of COVID-19, as well as some policy prescriptions that follow directly. We present two models that refer to:

- Epidemics as "taxes"
- External transmission of epidemics, or "cigars"

Taxes

Economists have argued that epidemics constitute taxes on communities. The COVID-19 virus regrettably fits this model too well. For us, it has features of a sales tax AND an income tax.

Suppose that a taxing authority suddenly levied a sales tax of 100%, effectively doubling the prices of all goods and services. People would:

- pay more for what they buy;
- purchase less of what they buy, and switch to substitutes (which would also be taxed);
- "do without" entirely;
- buy goods or services on the "black market" or engage in other sorts of activities to avoid the tax.

Such a tax would severely damage commerce and lead to short-term economic hardship. We have already seen this type of impact with the COVID-19 virus. Consumers have stopped traveling, going out for dinner, buying large-ticket items, and going to sporting events. Consumers have changed food-shopping habits. More affluent people can dip into savings and "ride out the storm", at least in the short term. The poor have few such options.

COVID-19 also acts as an income tax. People's incomes and wealth fall, activities slow, and there is decreased demand for goods and services. We have already seen this as well. Canceled activities and canceled purchases of both big and small ticket items all have major macroeconomic impacts. In the short term this has already meant pay cuts, and unprecedented lay-offs, further reducing incomes. Some, especially women, must stop working in order to take care of children and other family members. Many workers currently earn below the minimum wage and do not have paid sick leave, vacation benefits, adequate health insurance, or the option to work from home. The reduction in income for minority group members and poor people is exacerbated by the recent rules to

"shelter in place", which make it difficult for them to meet their basic needs. The reduced expenditures are not always offset by increased subsequent expenditures. China has seen this already, and we will see it soon.

Transmission

Transmission of COVID-19 introduces the concept of *economic externalities*. Most economic analysis starts with individuals who make decisions on buying and selling. People's market decisions involve someone on the other side, but they don't usually affect parties other than those doing the transacting. In contrast, a smoker lighting up a cigar alone in a desert bothers no one else; in a crowded room the smoker becomes a pariah because of the pollution. The pollution is an economic externality, impacting others who are not involved in the transaction. Epidemics such as COVID-19 provide just this kind of externality. "Social distancing" (now in place in most of the United States) is designed to mitigate this externality.

Epidemics can be addressed *only* by public health methods. Although a vaccination for COVID-19 is nowhere near, it is useful to look at models that apply vaccinations to influenza. Epidemiologists start with the Susceptible-Infective-Removed (SIR) model originally developed by Kermack and McKendrick and reinterpreted mathematically by Hethcote.(Hethcote 2000, Kermack and McKendrick 1927) This model relates the disease incidence to its (1) *infectiousness*, (2) *the size of the population*, and (3) the *percentage of the population that is susceptible*. R_0, or reproductive rate is the number of susceptible people that one infected person can infect. The higher the reproductive rate, the more quickly an infection can spread.(Van den Driessche and Watmough 2002)

Public health alleviation activities must target the three incidence factors above. Epidemic-related public health (i.e. government) interventions such as information, quarantine policies, or vaccines produce profound economic good. Sufficient vaccine coverage is needed to protect the population to attain "herd immunity", which once achieved, will cause the rate of new cases to fall. The equation for vaccine coverage indicated by reproductive rate is $1 - 1/R_0$.(Scherer and McLean 2002) The 1918 influenza had an R_0 value of about 2, implying that about 50 percent of the population would have required inoculation. Interestingly, those who would be vaccinated last "don't need" to be vaccinated because there is no one to infect them.(Coburn, Wagner and Blower 2009)

Policy

Given what we know about the "tax" and the "transmission" issues, what short-term policy implications follow?

Tax

- Sales Tax Response – Reduce state sales taxes to 0. Make commerce easier with drive-through and on-line shopping methods. These interventions (some already implemented) will effectively lower the COVID-19 tax, although they will not reduce it to zero.

- Income Tax Response – Restore demand by putting purchasing power in the hands of consumers. The Coronavirus Aid, Relief, and Economic Security Act (H.R. 748, passed on March 25, 2020) provides for one such payment to households. One check will not do it! Our proposal is for the government to send a $1,000 check EACH MONTH for six months to each of the approximately 130,000,000 households in the United States. The "back of the envelope" cost of this is $780 billion.

Transmission

Institute broad public health measures to reduce the infectiousness, the size of the at-risk population, and the percentage of the population that is susceptible. Such measures include:

- Testing extensively for COVID-19 and isolating the affected population.

- Implementing broad public health measures to reduce the infectiousness including "shelter in place" and "social distancing".

- Assume responsibility at the federal level. Only the federal government has the financial resources to support these activities. The federal government can print money, borrow on international markets, and organize resources at the national level – options that are simply not available to even the most capable state and local officials.

We have variously characterized COVID-19 as either a "tax" or a "cigar". We are circumspect in our claims. Economic models cannot cure COVID-19, nor can they alleviate pain and suffering, but they can provide valuable insights into characterizing diseases, proposing policies, and measuring the accompanying costs of disease-related policies and interventions.

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