Comments on "Estimating Welfare in Insurance Markets", by Einav, Finkelstein and Cullen, and on "Sufficient Statistics in Welfare Analysis" by Chetty.

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Goal is to work through the

- contributions of Einav Finkelstein, Cullen (EFC,2009) "Estimating Welfare in Insurance Markets",
- the limitations of the analysis,
- the relationship of those limitations to the limitations of sufficient statistics,
- the relationship of sufficient statistics to the causal (or structural) models that underlie them, and finaly
- the contribution of the models used in industrial organization to analysis that uses sufficient statistics.

EFC is a **methodological** paper. It provides a transparent framework for analyzing cost functions in markets where the price charged for the product influences the cost of supplying that product (as in insurance markets).

Let

- x_j =the non-price characteristics of an insurance plan (coverage, co-pay,...),
- realized s = sickness level of an individual,
- $e(s, x_j)$ expenditure of plan on individual with sickness level s.
- z = observed individual characteristics, $f(s|z)$ = the distribution of s given z,

Then the expected cost of insuring z is

$$c(z, x_j) = \sum_s e(s, x_j) f(s|z).$$

Consumers chose between plans, so the characteristics of the consumers who chose plan j (i.e. their likely sickness levels) depend on the prices and characteristics of that plan. Let

$$\sigma(j \,|x_j, p_j, x_{-j}, p_{-j}, z)$$

be the share of individuals with characteristic z who chose plan j .

The Plan's Cost Function. If M_z is the number of people with characteristics z who chose j the insurer's cost function is

$$c(p_j, x_j; p_{-j}, x_{-j}) \equiv$$

$$\sum_z M_z \sigma(j \mid x_j, p_j, x_{-j}, p_{-j}, z) c(z_i, x_j).$$

Notice that this cost function depends on the

- price the plan charges and
- the prices and characteristics of the competing plans

through the choice function that gives us $\sigma(\cdot)$.

That is

$$\frac{\partial c(p_j, x_j; p_{-j}, x_{-j})}{\partial p_j} =$$

$$\sum_z M_z \frac{\partial \sigma(j \mid p_j, x_j, p_{-j}, x_{-j}, z)}{\partial p_j} c(z_i, x_j)$$

Marginal cost. Divide the above derivative by the derivative of demand with respect to price.

EFC terminology: **adverse or advantageous selection** according as marginal cost is increasing or decreasing.

Is $\partial c(\cdot)/\partial p$, or its marginal analogue, a "sufficient statistic" of interest?

EFC think of estimating a whole cost curve, not just a local derivative (which one could think of as a sufficient statistic). Though this cost curve is central to the analysis of almost any issue, it is hard to think of a question where it would provide enough information to answer a question of policy interest, and the sufficiency of the **local** derivative is even less likely. This because this curve, or its derivative, is not sufficient to analyze

- responses at a different level of co-pay (an x_j),

- or a change in price (say induced by a tax on cadillac health plans).

The co-pay is also a price, so if people who react differently to one price (co-pays) also react differently to another (premiums), the response to premiums will differ with x_j. If we had the entire cost curve as a function of price could we use that curve to gain insight into the response of cost to an increase in co-pay $(\partial c(\cdot)/\partial x)$?

Not Likely. To analyze it we need, in addition to $\partial\sigma(\cdot)/\partial x$ (which might be similar), the effect of **moral hazard**, or

$$\int_z M_z\left(\int_s \frac{\partial e(s, x_j)}{\partial x_j} f(s|z)ds\right)\sigma(\cdot, z)$$

how the number of perscriptions filled, or doctor visits .... vary with co-pay; a term of independent **policy interest**.

What if the plan changed price?

Outcome depends on the response of competing plans. If they were at a "rest point" in the sense of being satisfied with their pricing policy before the price change, they are unlikely to be so afterwords.

Is the "indirect" effect (through other plans' prices) likely to be important? Yes, especially in these markets, as selection issues accentuate it.

E.g.; tax the "cadillac" plan (the most generous plan).

If the price of that plan increases only "expensive" consumers stay. Marginal cost rises, profits fall; the plan might exit.

People who were with the cadillac plan, who presumably were the sicker people, would go to the next most generous plan, its costs would also rise, and either its price would rise or it too would exit,..., and so on.

I have a student (Amanda Starc) who is analyzing the medi-gap market and gets just such a sequence of responses to a tax. Dan McFadden reports a similar phenomena generates exit of the "gold plans" in Medicare part D. Will we need to know how these responses are likely to play out to analyze the welfare effects of the tax? **Highly likely.** Consumers who were in generous plans will no longer have access to them.

What Have We Learned About Sufficient Statistics?

In order to know whether a statistic is sufficient for a particular policy question we have to write down a model which tells us what the answer to that question depends on (as Chetty's 2009, paper stresses). Perhaps the most contribution of IO to the rest of economics is to provide frameworks that allow one to figure out what the effects of interest depend upon.

Here are some examples from my own (mostly joint) work

- Using the implications of Nash pricing behavior to control for the selection induced by exiting goods in constructing the component indices that underlie the consumer price index (Pakes,2001; Erickson and Pakes, 2009).

- Using the implications of a consistent dynamic framework to correct estimates of the impact of environmental or policy changes (e.g. tariffs) on firm performance (or productivity) for; (i) the selection bias caused by firms exiting in response to the change and (ii) the simultaneity biases induced by the policy's impacts differing across firms (Olley and Pakes,1995).

- Having a consistent discrete choice framework that allows for heterogenous agents and unmeasured locational attributes in analyzing location choices in local public finance (Berry Levinsohn and Pakes, 1995).

Of course if we write down an appropriate model and realize that there is a function of the data that lets us answer the question of interest without filling in details of that model, that's

terrific. It is something we have been doing in IO for awhile (two of the examples above do it), and should be welcomed in other fields (e.g.; public finance).

One Final Point on "meta-research": (research papers about ways of doing research).

I want to point out that this kind of debate can quickly become counterproductive; dividing the profession into those that use different techniques, rather than combining people with different specialities in pursuit of answers to important questions facing society. The lack of "dogma" in the papers we saw today is both commendible and unusual.

Meta research can be productive: it can point out that particular ways of doing things might have applications to other problems. It should

be kept in mind, however, that to know whether the methodology does apply or not will require that the suggested application be done. People who think they know the answer without ever directly confronting the research question are typically severly limited in their understanding of the complexities of social science questions.

Bibligography.

· S. Berry, J. Levinsohn and A.Pakes, 1995; "Automobile Prices in Market Equilibrium", **Econometrica**.

· Chetty, R. 2009; "Sufficient Statistics for Welfare Analysis." **American Economic Review**.

· L. Einav, A. Finkelstein and M. Cullen, (forthcoming); "Estimating Welfare in Insurance Markets", **Quartlerly Journal of Economics**.

· T. Erickson and A. Pakes, 2009; "An Experimental Component Index for the CPI: From Annual Computer Data to Monthly Data on Other Goods", **mimeo** Harvard.

· S. Olley and A. Pakes, 1995; "The Dynamics of Productivity in the Telecommunications Equiptment Industry" **Econometrica**.

· A. Pakes, 2001; "A Reconsideration of Hedonic Price Indices With an Application to PC's" **American Economic Review**.