tobacconomics

Economic Research Informing Tobacco Control Policy

A Toolkit on Using Household Expenditure Surveys for Research in Economics of Tobacco Control

University of Illinois at Chicago
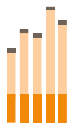## March 20, 2019

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Senior Fellow
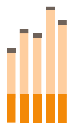Centre for Public Policy Research, India
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Outline of the presentation

- Economics of tobacco control
- Purpose of the toolkit
- Overview of the content of toolkit
- Introduction to household expenditure surveys
- Estimating own- and cross-price elasticities
- Estimating crowding out effect of tobacco spending
- Quantifying impoverishing effect of tobacco use
- Stata code appendix

Economics and tobacco control

- Worldwide, 12% of all adult deaths (30 years and older) are attributed to tobacco (16% among men, 7% among women), according to WHO

- Globally tobacco is expected to kill about a billion people this century, mostly in low- and middle-income countries (LMICs)

- Total economic cost of smoking estimated at US$ 1.4 trillion in 2012   (1.8% of world's annual Gross Domestic Product (GDP))

- "Tobacco – a threat to development" was the theme of the 2017 World No Tobacco Day

- Economists have a lot to do in the area of public policies to aid tobacco control
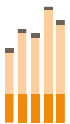
Toolkit overview

Purpose of this toolkit

- Guide research on economics of tobacco control especially in LMICs where household expenditure surveys (HES) on consumption of different tobacco products exist

- Demonstrate the use of HES and econometric tools to explain some of the important issues in economics of tobacco control with step-by-step guide for econometric analysis

- Simplify some of the complex issues around tobacco control for easy understanding by policymakers and civil society organizations
  - advanced knowledge in econometrics and Stata is not expected to follow the topics discussed

How to use this toolkit

- The toolkit can be downloaded from the link:

https://tobacconomics.org/research/a-toolkit-on-using-household-expenditure-surveys-for-research-in-the-economics-of-tobacco-control/

- Each chapter deals with a different topic in economics of tobacco control with the following overall structure
  - Basic principles behind the topic along with its rationale
  - Brief technical discussion on the econometric methods
  - Preparation of necessary data for the analysis
  - Detailed step-by-step explanation of Stata code
  - A country case study and interpretation of results
- *Stata commands* placed in angle brackets < > and italicized
- Variable names in examples are italicized
- Separate text boxes for special examples
- A code appendix with chapter-wise Stata codes

Content overview

- An introduction to HES focusing on surveys in LMICs (Chapter 2)

- Useful tips on using Stata to work with HES (Chapter 2)

- Technical guidance on studying three important topics in the area of economics of tobacco control
  - Estimating own- and cross-price elasticities and income elasticities (chapter 3)
  - Estimating the crowding out nature of tobacco spending (chapter 4)
  - Quantifying the impoverishing effect of tobacco use (chapter 5)

- Stata code appendix with do-files
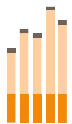
Household Expenditure Surveys
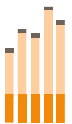
Household Expenditure Surveys (HES)

- The International Household Survey Network (IHSN) documents metadata from 201 countries (137 are LMICs)

- Information on more than 1,000 HES (700 from LMICs) http://catalog.ihsn.org/index.php/catalog

- Data can be usually obtained directly from Statistical agencies with a nominal fees

- A two-stage design is often implemented in the selection of households in HES
  - First stage: selection from a list of "clusters" of households (villages in rural areas or urban blocks in urban centers)
  - Second stage: households selected from each clusters

- Stratification to select households based on relevant attributes such as geographical area, ethnic affiliation, level of living, gender or race
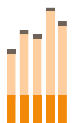
Content of HES

- Information on households and individuals

- Demographic and socioeconomic information about the household

- Village or district level variables

- Consumption data including expenditures spent and quantity consumed for different commodities

- Some times, with different recall periods

- Some surveys also collect consumption information at individual level
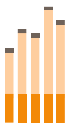
Some econometric issues with HES

Working with HES involves several econometric issues

- Use of survey weights
  - descriptive statistics
  - in regressions
- Inflated standard errors due to cluster design effects
  - More homogeneity within clusters than between them
- Heteroskedasticity of regression residuals
  - Distributions of income and consumption not normal in most HES
- Endogeneity - One or more of the explanatory variables is correlated with the error term, resulting in biased and inconsistent OLS estimates
  - Simultaneity
  - Omitted explanatory variables
 - Measurement errors
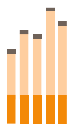
Useful tips on Stata

Toolkit provides some general guidelines and tips on working with Stata.

Includes brief discussions on:

- – Creating do-file and log file
- – Stata resources: built-in resources and Statalist
- – Using logical operators
- – Using macros and loops
- – Returning stored results
- – Use of add-ons in Stata
- – Techniques for extracting HES data with Stata
- – Data cleaning strategies
- – Generating basic descriptive statistics from survey data
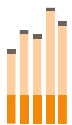
# Estimating Own- and Cross-Price Elasticities

Price elasticities from HES data

- Increased prices, through higher tax, is the most effective public policy tool for decreasing tobacco use and its adverse health consequences

- Price elasticity is an important parameter in taxation policy

- Many LMICs do not have access to good time-series data, whereas HES is more commonly available

- Price, an important variable to estimate demand, is often not directly available in HES

- HES typically reports quantity consumed and expenditures incurred from which one can estimate unit values (UVs)

- Several methods estimate demand using UVs as proxies

- These models give biased estimates since UVs suffer from quality substitution and measurement errors
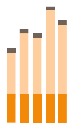
Deaton's model

- A method that corrects the elasticity estimates for measurement errors and quality substitution in UVs
  - Deaton A. Quality, Quantity, and Spatial Variation of Price. Am Econ Rev. 1988;78(3):418-430

- Uses an *errors-in-variable* technique to correct for the measurement errors and the structure imposed by a *weak separability* assumption to correct for quality substitution

- The model relies on genuine between-cluster variation in price and assumes that the price within a cluster are not determined by the demand within it, but by the differences in costs of transportation or other factors across clusters

- HES in general, and the conditions in LMICs in particular, fit these prerequisites for implementing Deaton's model

- Geographical proximity and time of survey of households within a cluster
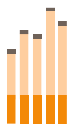
Deaton's model – Key points

- Consistency properties of the model parameters depend on the number of clusters (and not on the number of households)

- Experiments show that the estimator performs adequately even when there only two observations in each cluster

- If clusters are artificially aggregated it can bias elasticity estimates as intra-regional variation in UVs due to spatial price variation will be wrongly treated as measurement error

- Increasing the number of clusters is more important than increasing the number of observations within each cluster
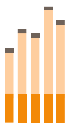
Generating relevant variables and doing the analysis

- Main variables of interest
  - Unit values
  - Budget shares
  - Total household consumption expenditures
  - Household demographic and socioeconomic characteristics
  - A variable identifying cluster
- Stata code for single commodity in Chapter 3 and do-files for both single and multiple goods in separate appendix
- Country case study from Uganda using Uganda National Panel Survey (UNPS)
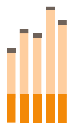- Estimating price elasticities when unit values are not available in HES
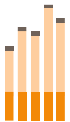
Estimating Crowding out Effect
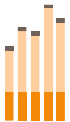
Crowding out effect of tobacco spending

- Expenditure on tobacco accounts for a significant portion of household budget in many countries: from 1% (Mexico and Hong Kong) to 10% (Zimbabwe and China)

- The idea that households who spent money on consuming tobacco, divert funds from the consumption of other commodities, is called "crowding out" effect of tobacco spending

- Studies find that spending on tobacco crowds out expenditures on necessary items of household consumption such as food, clothing, housing and education among others implying that tobacco spending can have developmental and inter-generational impacts

Estimating crowding out effect

- Two ways to empirically examine crowding out
  1. Comparison of mean budget shares between tobacco spenders and non-spenders
  2. Use a conditional demand framework like Quadratic Almost Ideal Demand System (QAIDS)
- Current generation of crowding out studies:
  - Most use an instrumental variable (IV) approach and employ a Three Stage Least Squares (3SLS) method to estimate QAIDS
- The traditional 3SLS estimator is less efficient and its variance estimator is inappropriate if errors are heteroskedastic
- This toolkit proposes use of GMM 3SLS estimator which allows for heteroskedasticity and different IVs for different equations to estimate QUAIDs
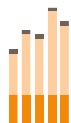
Generating relevant variables and doing the analysis

- Budget shares for different groups of items for which we need to examine crowding out
- Total household consumption expenditures
- Household demographic and socioeconomic characteristics
- IVs to instrument for tobacco spending

  - Correlated with the endogenous RHS variable (tobacco spending) and do not have a direct effect on the dependent variable (budget shares)

  - e.g., adult sex ratio
- Toolkit provides detailed Stata code to do the analysis in each step and a separate do-file in code appendix
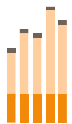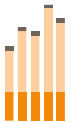
Extending crowding out analysis to relevant subgroups

- Crowding out analysis can be extended to include subgroups such as:
  - Income groups
  - Severity of tobacco spending
  - SES groups
  - Tobacco use type
- Country case study from Turkey using Turkish Household Budget Survey is discussed to help with interpretation of results
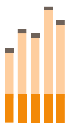
Estimating Poverty Impact

Impoverishing effect of tobacco use

- National poverty estimates are an important political and economic variable in many countries

- Tobacco use and poverty are part of a vicious circle that hinders a nations' ability to achieve poverty reduction goals

- Three major channels through which increased consumption of tobacco use can effectively diminish a household's income and push it into poverty:

  1. Forgone income from tobacco purchase
  2. Forgone income from treating tobacco related morbidity
  3. Forgone income from treating tobacco related mortality

- Estimates of Head Count Ratio (HCR) only capture those in primary poverty

- Households in secondary poverty not meeting their basic needs due to their wasteful consumption on tobacco
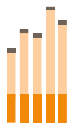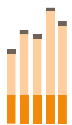
Estimation method

Involves the following steps:

- Identify National Poverty Line (NPL)
- Estimate the HCR
- Estimate income forgone due to tobacco purchase
- Estimate the income forgone due to tobacco use and SHS attributable direct healthcare costs
  - Assess attributable expenditures with the help of Smoking Attributable Fraction (SAF)
  - See: WHO (2011), "Economics of tobacco toolkit: assessment of the economic costs of smoking", for more details
- Subtract the income forgone and attributable expenses from the household expenditures and re-estimate HCR
- Multiply the change in HCR with the national population to arrive at the number of people impoverished
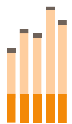
Generating relevant variables and doing the analysis

- Total household consumption expenditures
- Household size
- Population at the national level
- Expenditure on tobacco purchase
- Health care expenditures
- National Poverty Line
- Smoking attributable Fraction
- Stata user written programs like *povdeco* or customised Stata code in Chapter 5 and appendix
- Country case study from India using National Sample Survey data

Additional details

Stata code appendix

- Stata do-file for estimating own-price elasticity using Deaton method for a single commodity
- Stata do-file for estimating own- and cross-price elasticity using Deaton method for multiple good
- Stata do-file for estimating crowding out effect of tobacco spending
- Stata do-file for estimating impoverishing effect of tobacco use
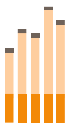
Thank you!
For your comments and questions, please contact us at
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