Measuring the Welfare Impact of Public Policy Reforms

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From evidence to policy – Innovation in shaping reforms in Africa

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Presentation

- Taxonomy of public policies
- Introduction to the microeconomic foundations of welfare measurement
- Introduction to the main models used to estimate the welfare impact of public policies
- Example: SUBSIM

Public Policies

Price regulations

Interest rates, market prices of consumption goods (subsidies or quotas)

Public revenues

Tax rates, tax deductions, tax breaks

Public expenditure

Household transfers

Cash transfers, in-kind transfers,

Sector transfers

Education, health, housing, transport, …

=> <u>All these policies can be monetized and their welfare effect can be simulated or evaluated</u>

Microeconomic Foundations

The Central Question

- **Question**: *What is the impact of a price change on household welfare?*

- It is one of the most complex and controversial questions in microeconomic theory

- It is one of the major sources of errors in empirical studies

Microeconomics Foundations

- Marshall (1890) and Hicks (1942)

- Five methods:
  - Consumer Surplus (CV)
  - Equivalent Variation (EV)
  - Compensated Variation (CV)
  - Laspeyers Variation (LV)
  - Paasche Variation (PV)

Demand and Utility

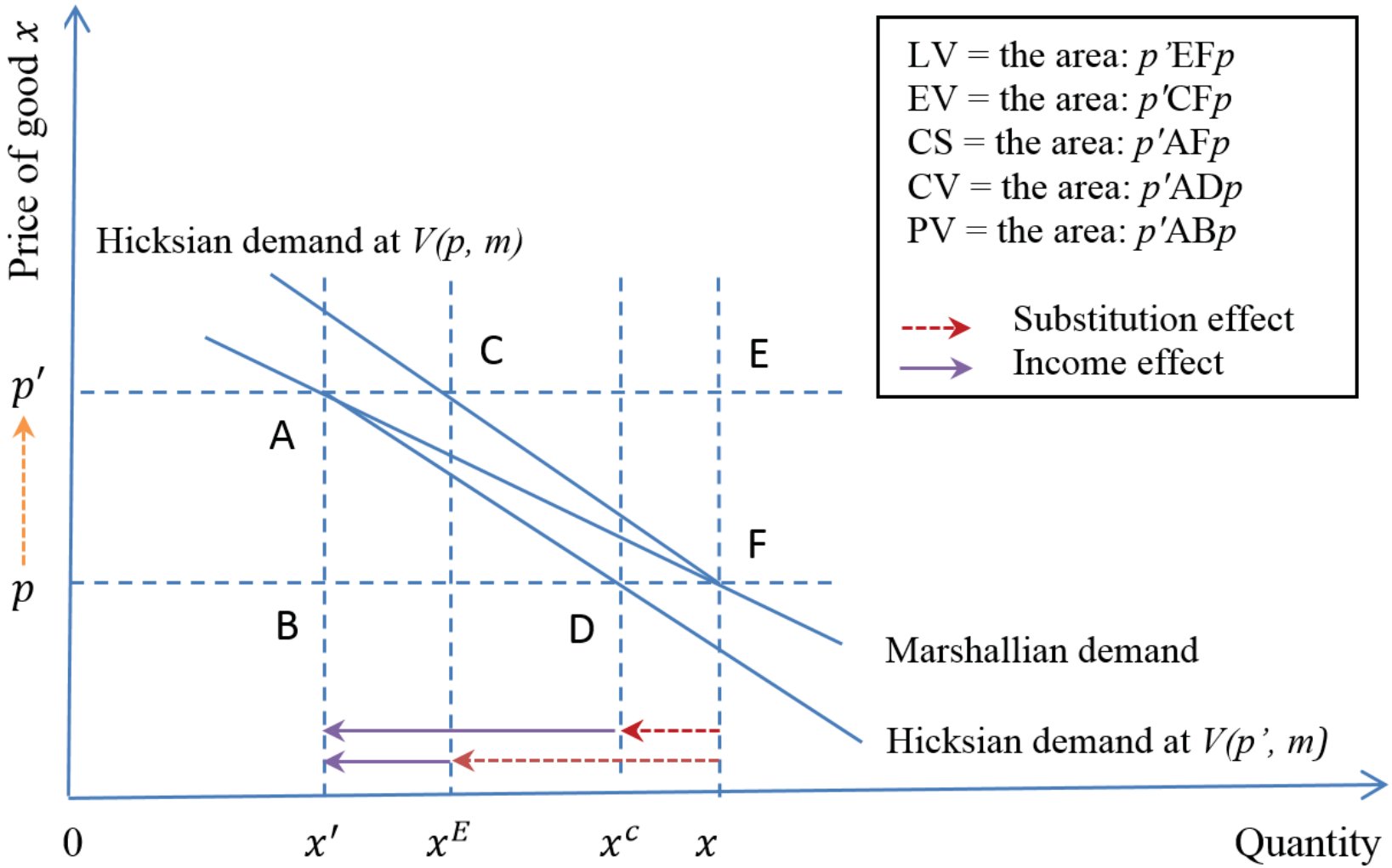
Demand

- Marshallian demand curves simply show the relationship between the price of a good and the quantity demanded of it. Maximizes utility.

- Hicksian demand curves show the relationship between the price of a good and the quantity demanded of it *assuming that the prices of other goods and our level of utility remain constant.* Minimizes cost to obtain a fixed utility.

Utility=Welfare=Household expenditure

Geometric Interpretation

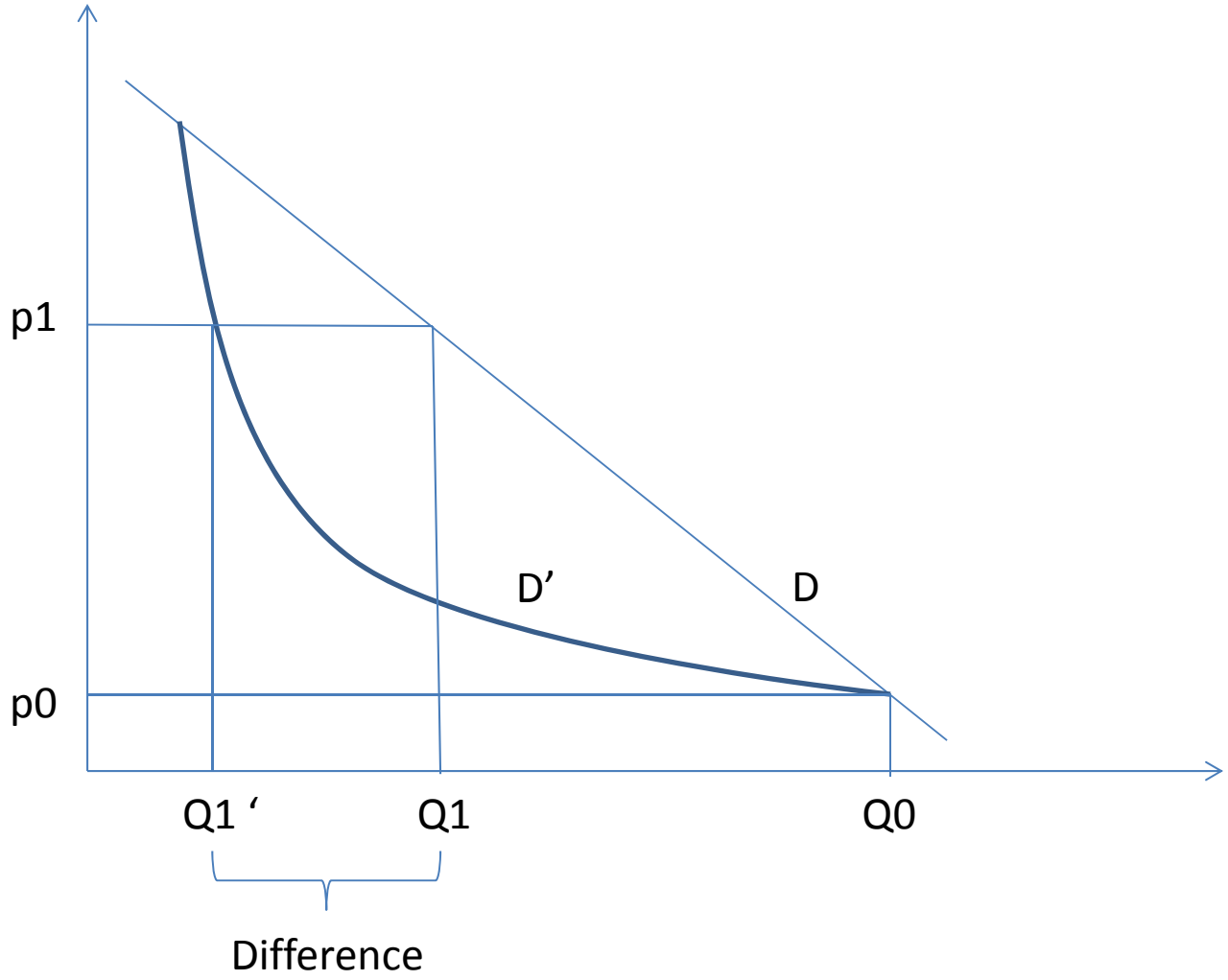


Small and Large Price Variations

- All estimation methods tend to converge for small price changes
- By small price changes we mean changes in between 0 and 5% and, under certain conditions, up to 10%.
- For small price changes, the simplest of the formulae can be used: $-x\Delta p$. This corresponds to the Laspeyers formula, also known as the "marginal" approach.
- Most people working on subsidies use this formula (including WB and IMF)
- For large price changes (>10%) the different methods provide increasingly different results and the difference increases for larger price changes
- For example: One of the peculiarities of subsidies is that changes can be very large. Up to ten times (+1000%) the original price. In these cases, the different estimation methods provide VERY different results and the Laspeyers formula grossly OVER estimates the welfare effects

  => Most subsidies studies grossly over estimate the welfare effects.

Large Price Changes, Demand Curves and Elasticities



Large Price Changes Strategies

- **Demand modelling**: Try different sets of demand schedules: Linear, Quasi-linear, Cobb-Douglas, IDEAL, etc. and test differences

- **Iterative methods**: Taylor's approximations, Vartia's method, Breslaw and Barry

- **Elasticity methods**. Sometime information on own price elasticity at the market price is known. This can be used to derive own price elasticity at the subsidized price. But you cannot use local elasticity as global elasticity when price changes are large!

Public Policy Models

Classes of models

- Computerized General Equilibrium (CGE) models
- Microeconomic Partial Equilibrium Models (MPE)
- Spreadsheet General Models (SGM)
- Econometric Static Models (ESM)
- Econometric Time-series Models (ETM)

General Equilibrium Models (CGEs)

- Consider all markets (commodities, financial, labor)
- Constituted by a system of multiple equations
- Solvers for systems of multiple equations
- Specific software (ex: GAMS)
- Inputs: Macroeconomic and microeconomic data, equations' parameters including elasticities
- Outputs: Impact on household welfare, GDP, government budget, demands and quantities, forecasts for major macroeconomic indicators

General Equilibrium Models

Pros

- Consider all markets
- Account for direct (first round) and indirect (second and plus rounds) effects
- Provide output results on all markets including labor market
- They are dynamic and can forecast results on multiple years

Cons

- Assume that all markets clear
- Do not distinguish between direct and indirect effects
- Heavy on macro and micro data requirements
- Heavy on baseline assumptions including elasticities
- Use gross approximations for households and welfare
- Require time to calibrate to country contexts

Microeconomic Partial Equilibrium Models

- Based on microeconomic theory
- Static models, short-term effects
- Based on household budget surveys
- Focus on household welfare and derive social welfare by aggregating households
- Require common statistical software for micro data analysis (Stata, SPSS)
- Inputs: micro data, can be complemented with macro data
- Outputs: Impacts on household welfare, social welfare, poverty, inequality and government budget

Microeconomic Partial Equilibrium Models

Pros

- Once the model is prepared, it is quick to apply in any country or context
- Requires a minimum amount of data (one HBS)
- Measures more precisely than macro models short-term and direct effects
- With I/O tables, it is possible to estimate indirect effects separately from direct effects
- Allow for accurate distributional analyses

Cons

- The initial model requires time to be programmed
- Not suitable for medium and long-term dynamic estimations
- Considers only one market at the time, usually only the goods market
- Requires some knowledge of specific statistical software for microeconomic analysis

Spreadsheet General Models (SGMs)

- Require any spreadsheet (ex: Excel)
- Constituted by a series of sheets connected by formulae
- Each sheet usually covers an agent (households, government, financial sector, production sector)
- Relations between agents and markets are dictated by static formulae, not inter-related dynamic functions
- There is no system of multiple equations, no solvers
- Inputs: macro and micro data, assumed elasticities
- Outputs: Impact on household welfare, GDP, government budget, forecasts for major macroeconomic indicators

Spreadsheet General Models

Pros

- Once constructed, relatively easy to adapt to a new country
- Cover all markets or some markets as required
- Provide macro and micro outputs
- They can be constructed and provide results for several years
- Suitable for any user, no need for specific software training

Cons

- Take time to construct
- Markets are not entirely correlated through behavioral equations
- Rely heavily on input assumptions (elasticities)
- Easy to make mistakes during use
- Develop quickly in complex web of relations difficult to manage
- Economic foundations not always clear

Econometric Static Models (ESM)

- Based on a general econometric equation (usually OLS)

$$y = \alpha + \beta X + \epsilon$$

- Need only one set of cross-section data
- It is possible to model parameters by keeping household characteristics fixed or model household characteristics by keeping parameters fixed
- Ex: cross-survey imputations, poverty mapping

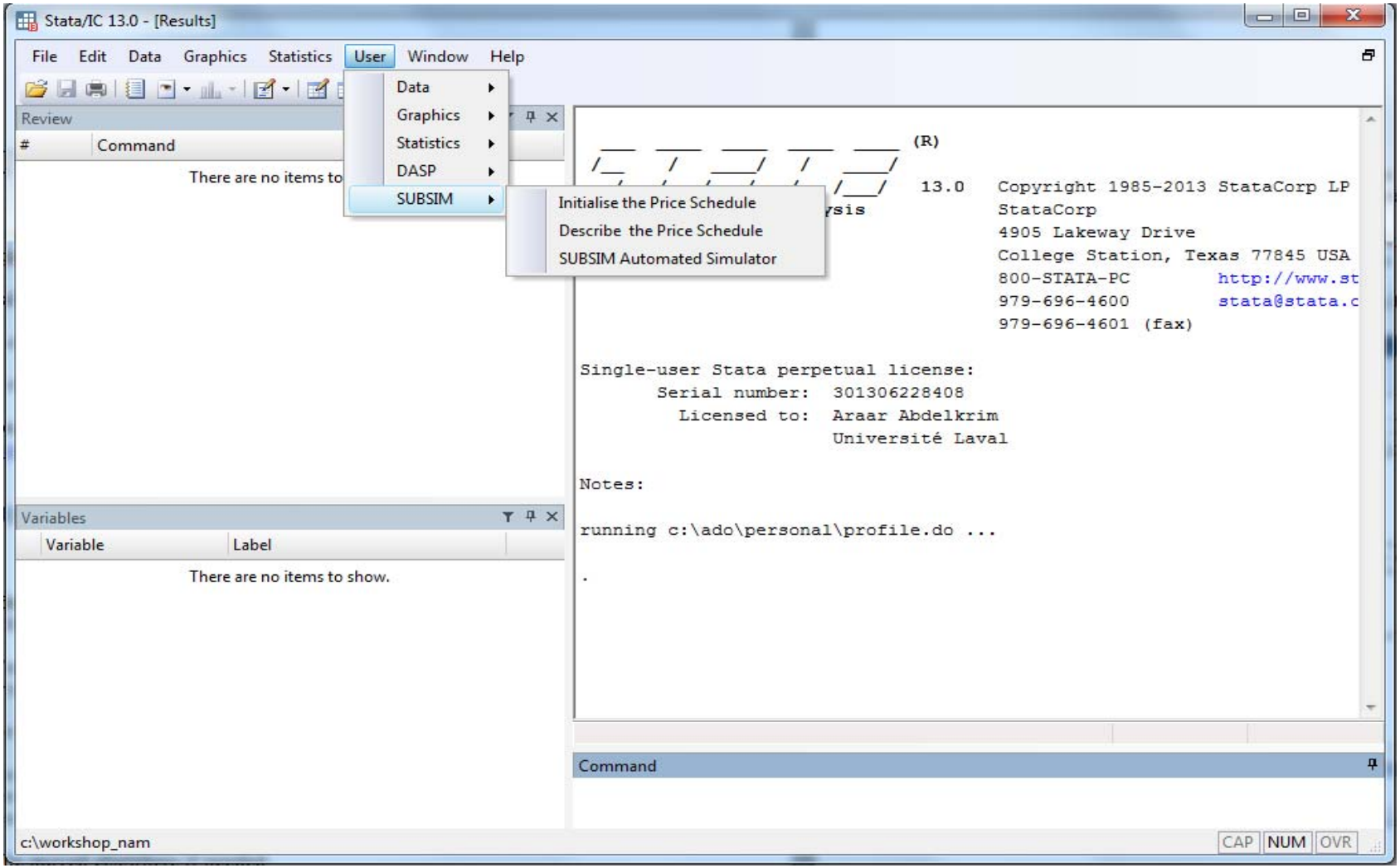
Econometric Time-series Models (ETM)

- Designed to forecast the future based on the past
- Need long time-series data
- Specific software (e-views)
- Based on underlying assumptions of econometric models
- Can be used for price simulations
- Can be used for welfare projections based on price changes

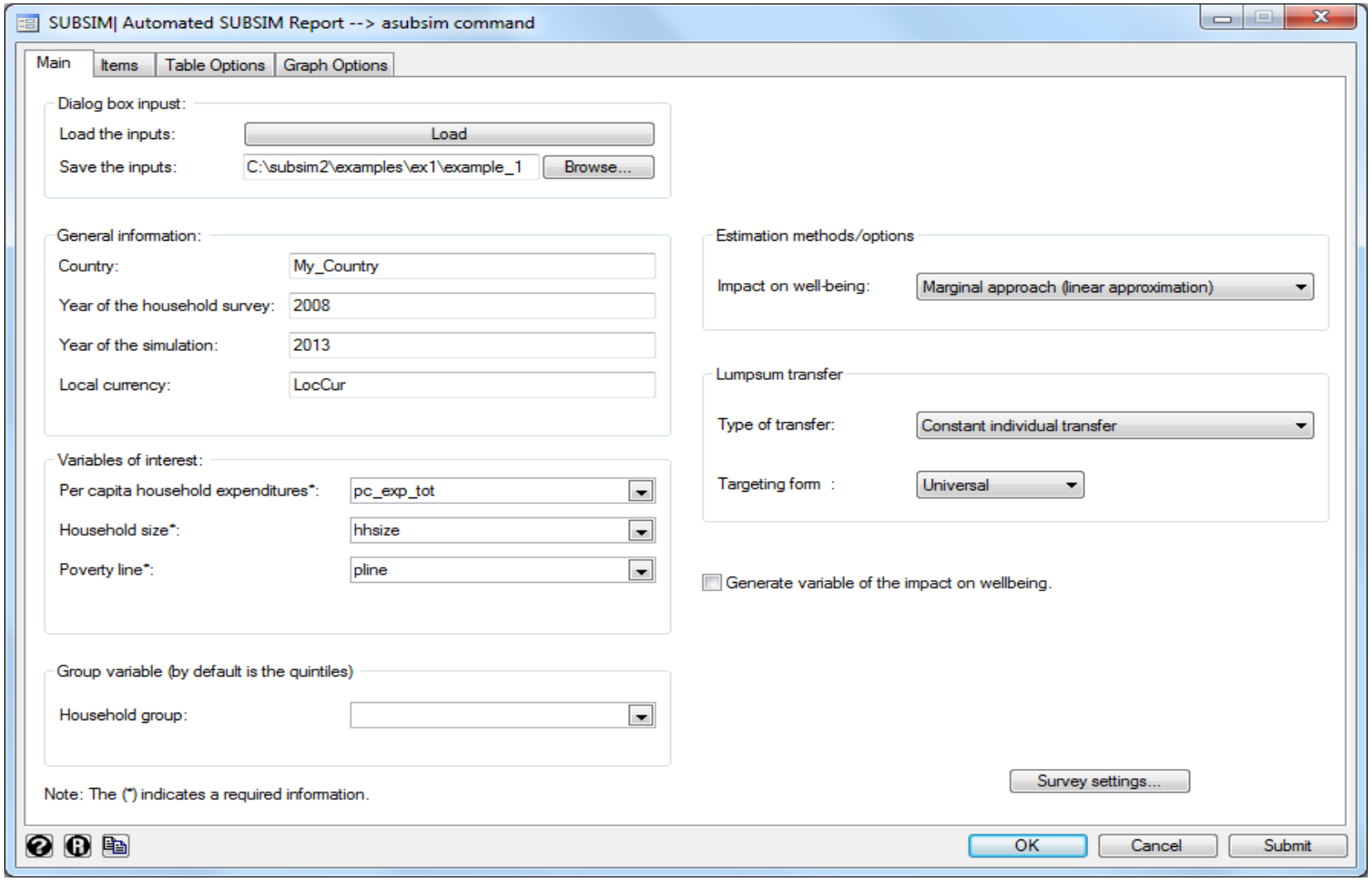
SUBSIM
A SUBsidies SIMulation Model

www.subsim.org

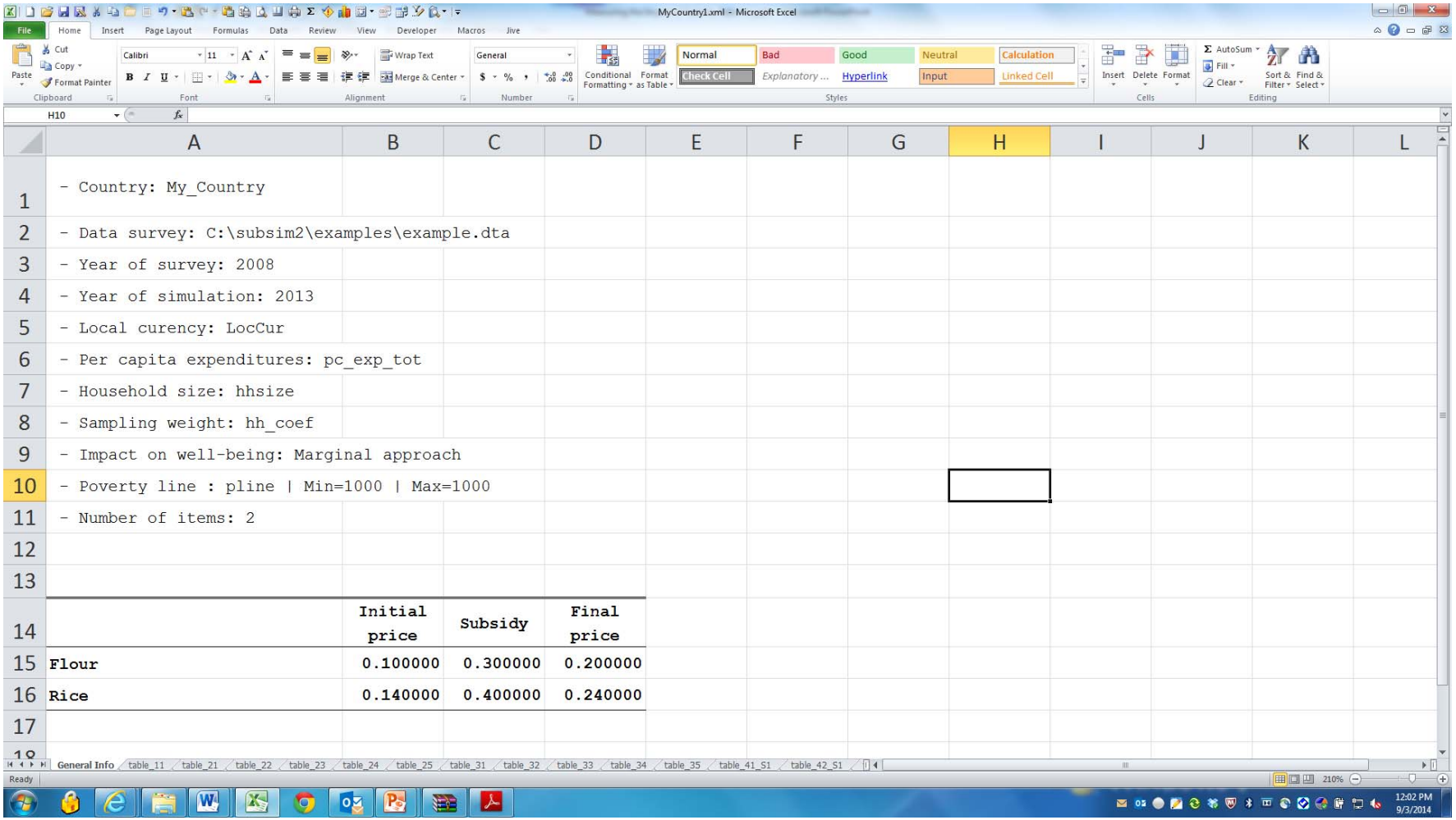
SUBSIM Interface



SUBSIM Interface



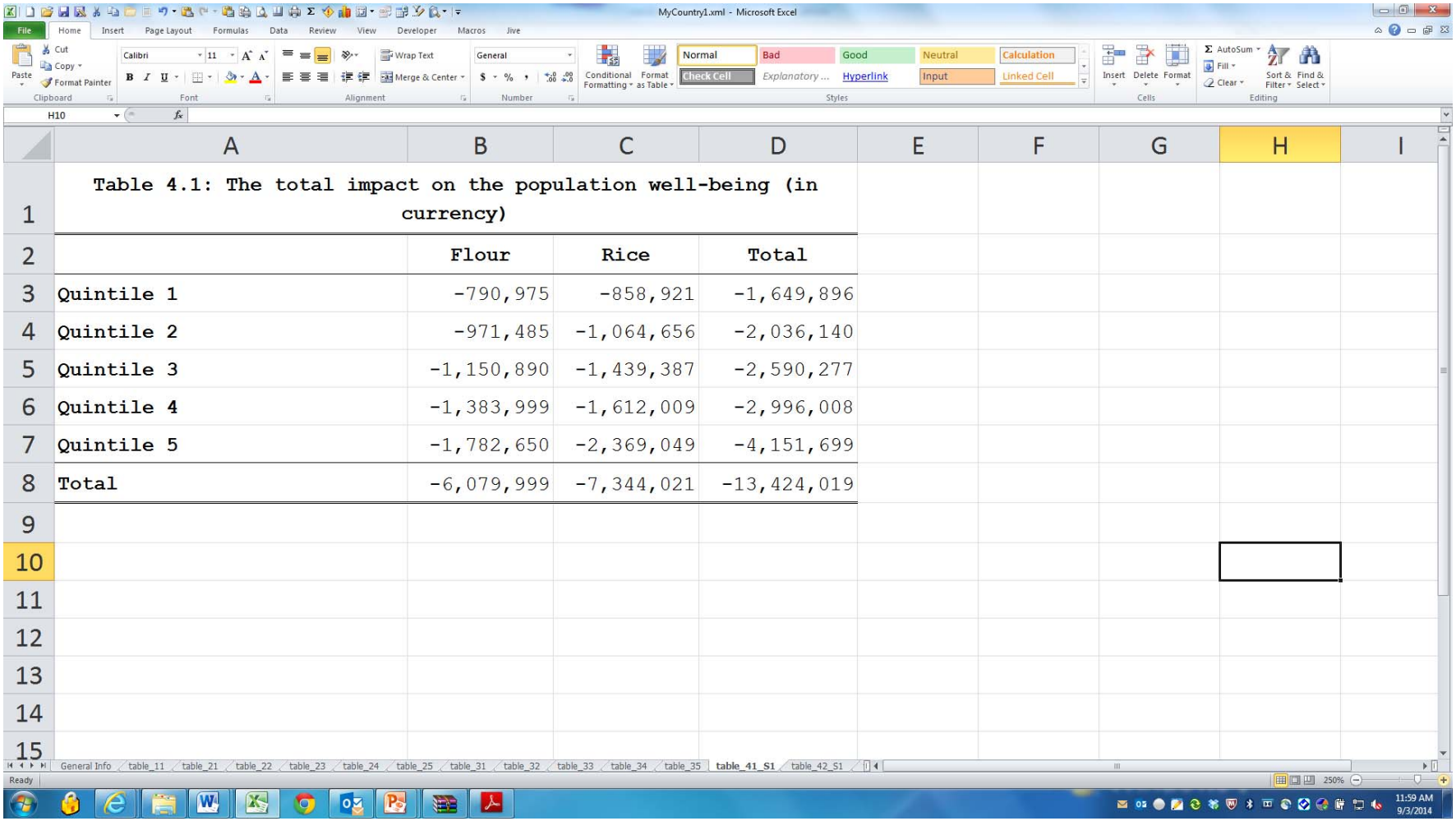
SUBSIM Output



- Country: My_Country
- Data survey: C:\subsim2\examples\example.dta
- Year of survey: 2008
- Year of simulation: 2013
- Local curency: LocCur
- Per capita expenditures: pc_exp_tot
- Household size: hhsize
- Sampling weight: hh_coef
- Impact on well-being: Marginal approach
- Poverty line : pline | Min=1000 | Max=1000
- Number of items: 2

	Initial price	Subsidy	Final price
Flour	0.100000	0.300000	0.200000
Rice	0.140000	0.400000	0.240000

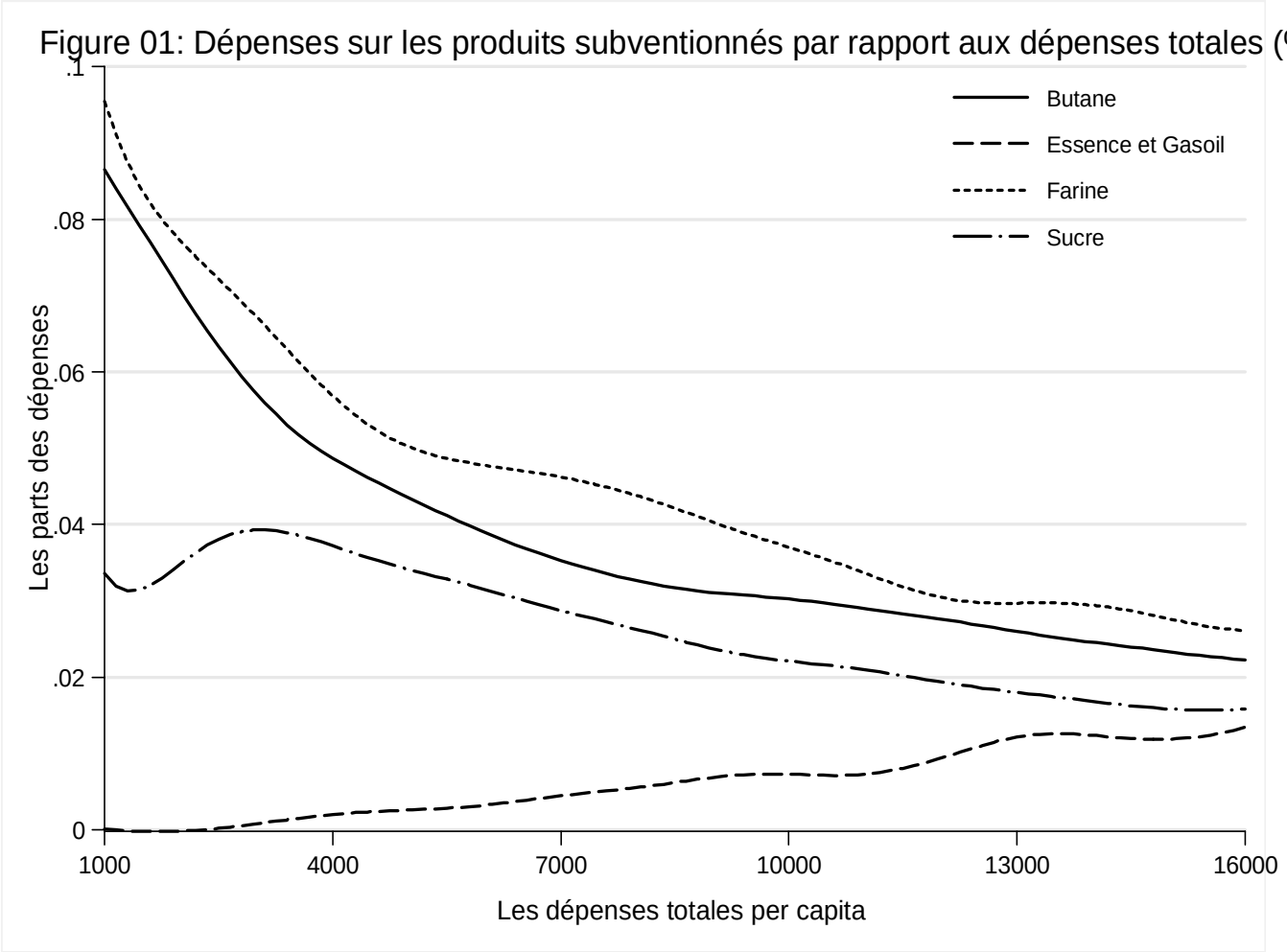
SUBSIM Output



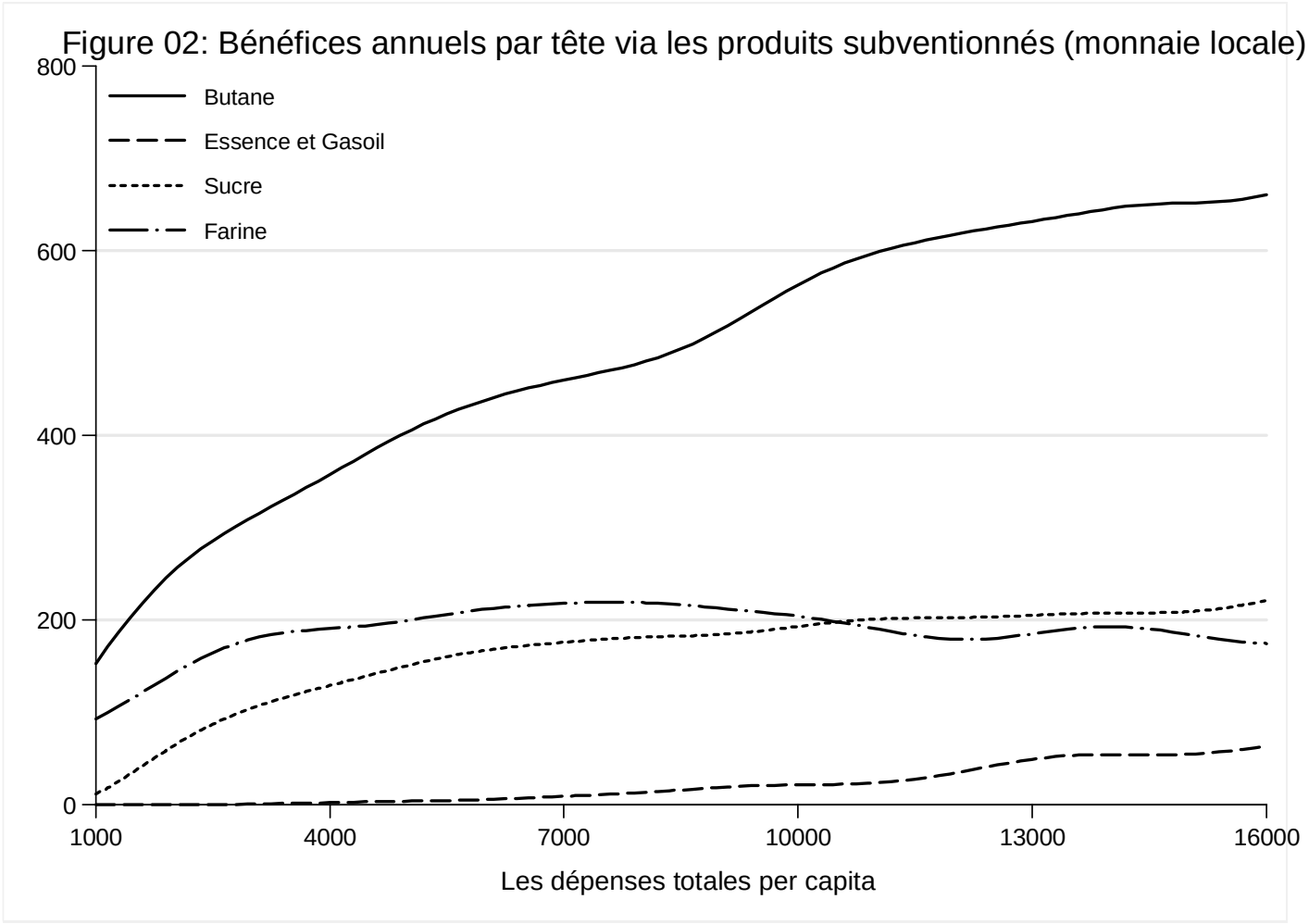
MyCountry1.xml - Microsoft Excel

	A	B	C	D
1	Table 4.1: The total impact on the population well-being (in currency)			
2		Flour	Rice	Total
3	Quintile 1	-790,975	-858,921	-1,649,896
4	Quintile 2	-971,485	-1,064,656	-2,036,140
5	Quintile 3	-1,150,890	-1,439,387	-2,590,277
6	Quintile 4	-1,383,999	-1,612,009	-2,996,008
7	Quintile 5	-1,782,650	-2,369,049	-4,151,699
8	Total	-6,079,999	-7,344,021	-13,424,019

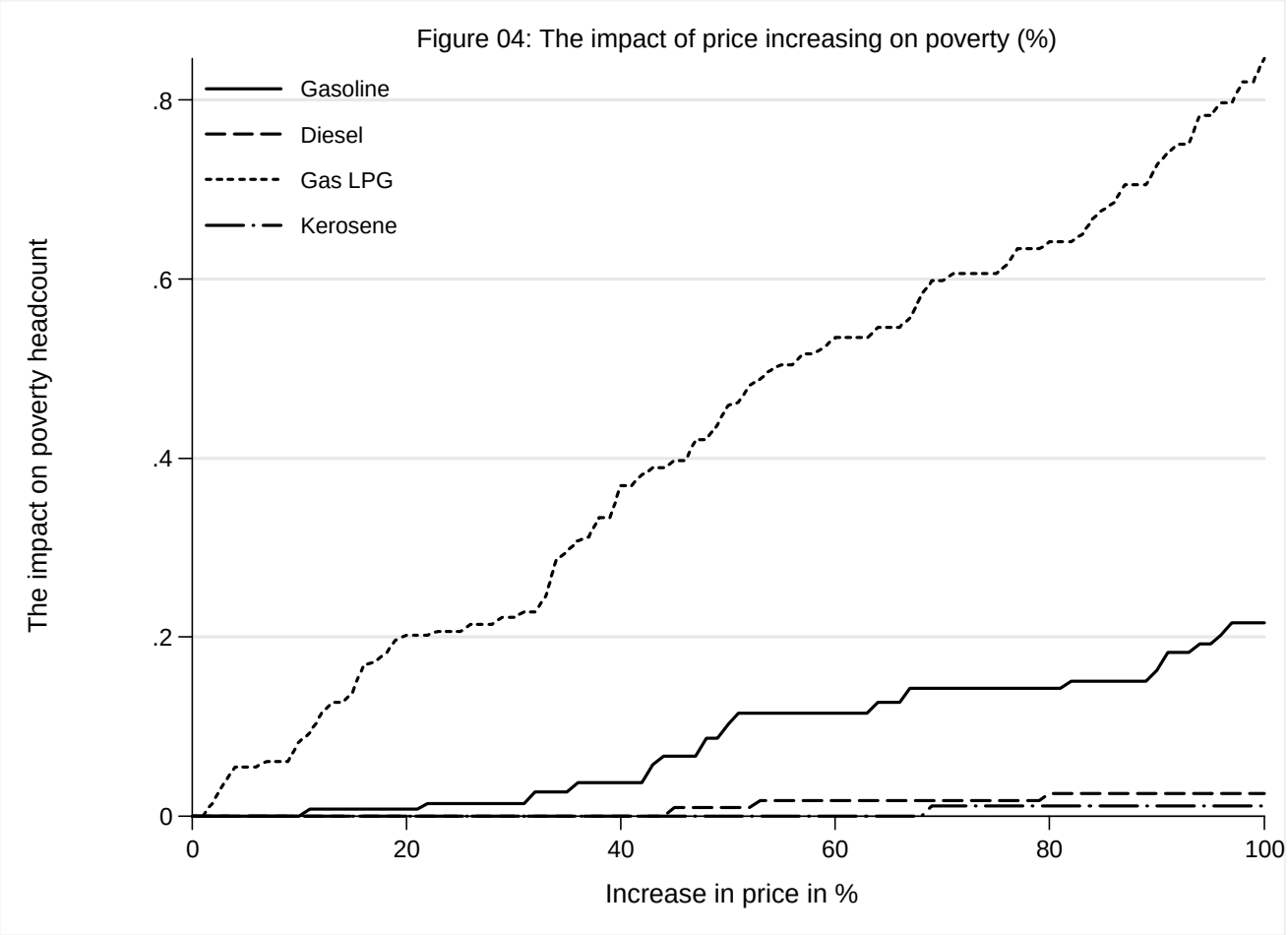
Subsidies are important for the poor (Morocco, Dirham/person/year)



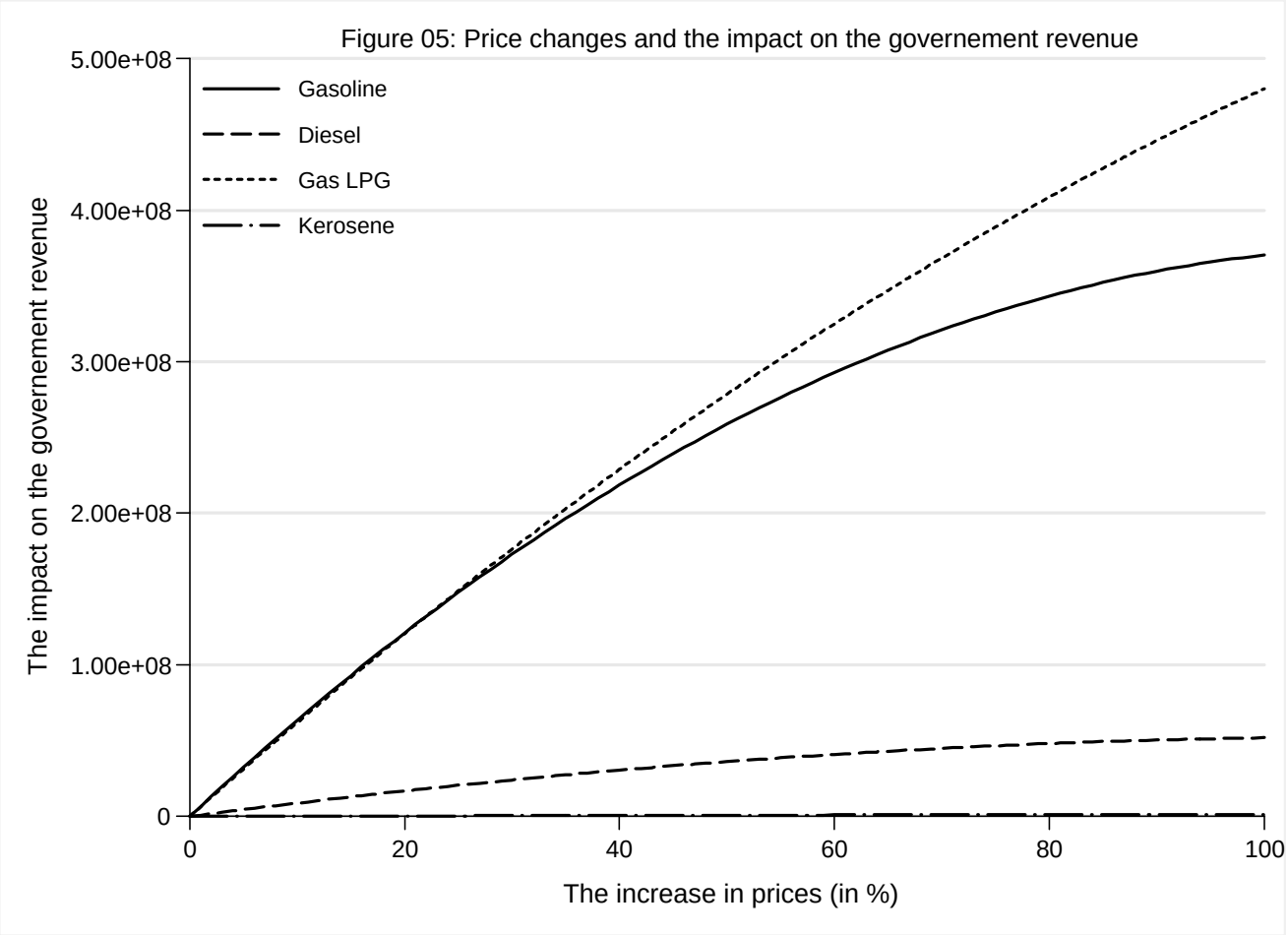
Energy subsidies are pro-rich (Morocco, Dirham/person/year)



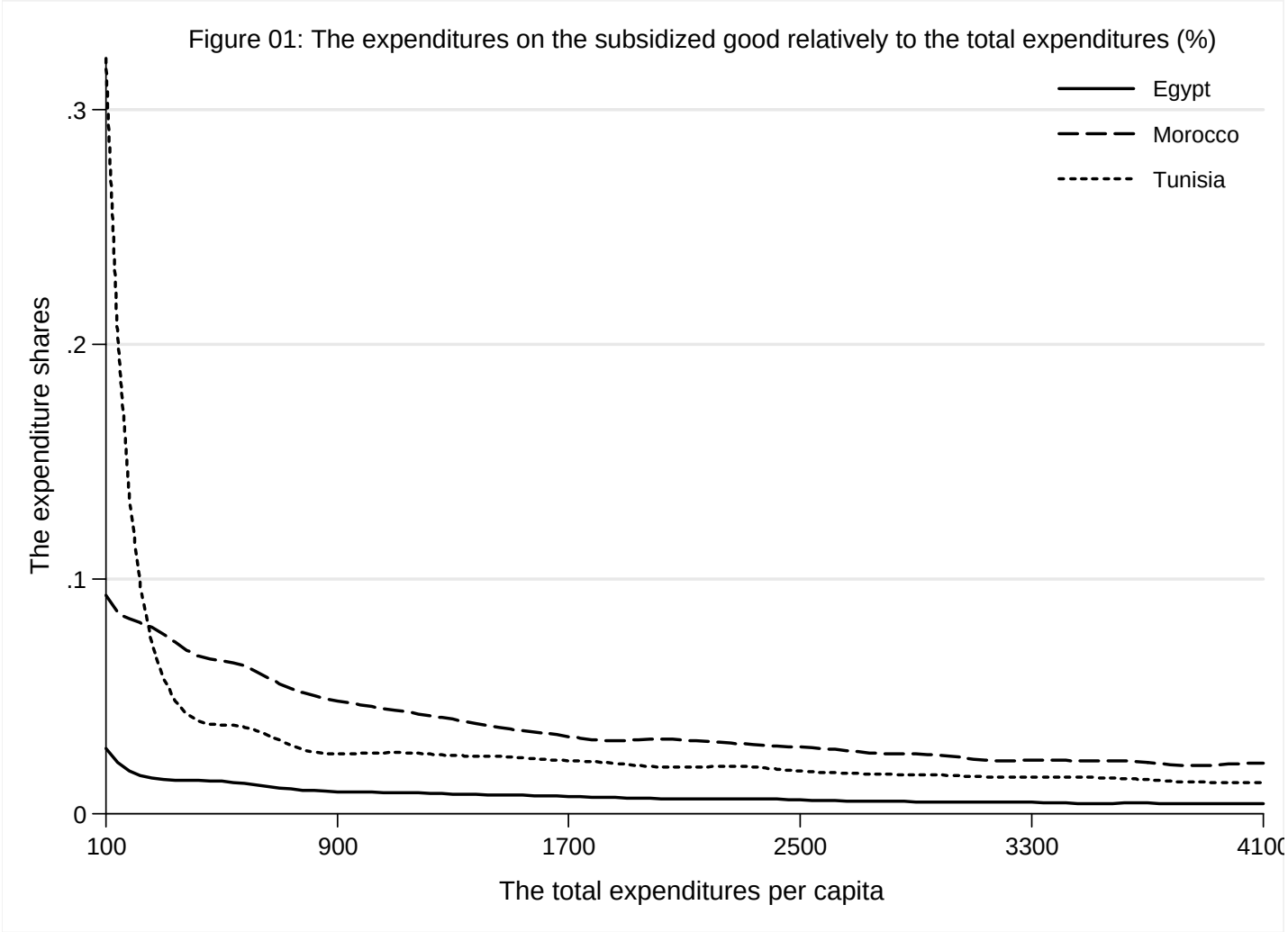
Removing Subsidies Increases Poverty but not always, equally or linearly (Tunisia)



Removing Subsidies Benefits the Budget but not always, equally or linearly (Tunisia)

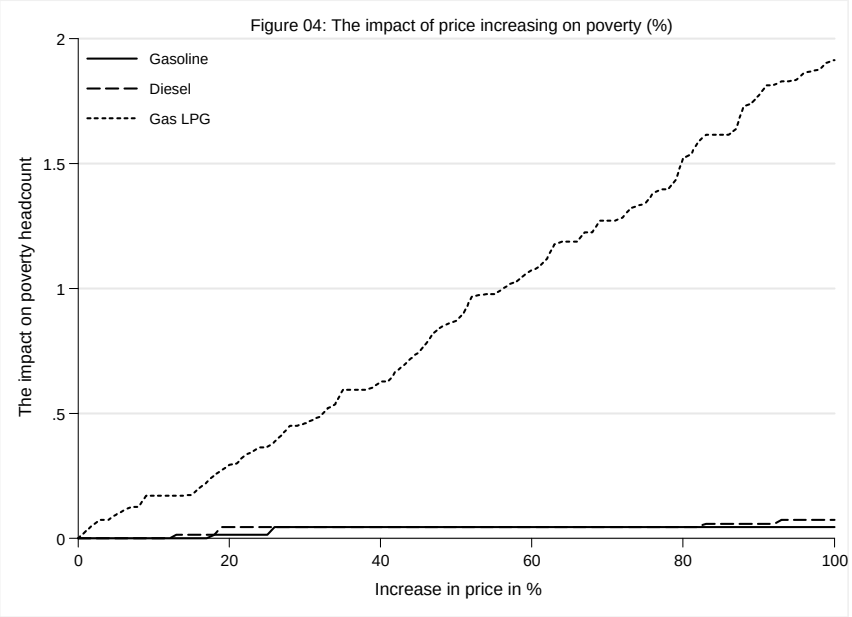


Same products, different incidence across countries (Gas GPL, USD/PPP)



Same products, different impacts across countries

Morocco



Tunisia