Plenary session IV:

Suggestions for estimating general-dataset elasticities for MAMS

Marco V. Sanchez

(UN-DESA/DPAD)

Presentation prepared for the second training workshop of the project "Assessing Development Strategies to Achieve the MDGs in Asia", Manila, 24-27 August, 2009. 1

What elasticities are defined in "test-data-general.xls"?

- ***savelas(ins):*** elasticity of savings rate with respect to per-capita income rate for institution *ins*
- ***tradelas(ac,trdelas):*** Armington-CET-export demand elasticities by commodity *c* ($c \in AC$) and (*sigmaq, sigmat, and rhoe* $\in$ *trdelas)*
  - *sigmaq(c)* = Armington-elasticity of substitution between imports and domestic output in domestic demand;
  - *sigmat(c)* = CET-elasticity of transformation for domestic marketed output between exports and domestic supplies;
  - *rhoe(c)* = constant price elasticity of export demand (<0).
- ***prodelasva(a)***: elasticity of substitution between factors at top (possibly only) level of VA nest of activity *a*

What elasticities (cont.)

- ***prodelasva2(ac,a)***: elasticity of substitution at (optional) lower levels of VA nest -- between factors aggregated to *ac* (=f) for use in activity *a*
- ***leselas1(c,h)***: expenditure elasticity of market demand for commodity *c* by household *h*
- ***leselas2(a,c,h)***: expenditure elasticity of home demand for commodity *c* produced by activity *a* by household *c*
- ***tfpelastrd0(a)*:** elasticity of TFP for activity *a* with respect to GDP trade share (weighted average of lagged values)
- ***tfpelasqg(a,f,t)*:** elasticity of TFP for activity *a* with respect to government capital stock *f*

Where does *savelas* become part of MAMS?

- Equation: savings rates for domestic non-government institutions

ρsav_i

$$MPS_{i,t} = mpsbar_{i,t} \cdot \left(\frac{\left(1 - TINS_{i,t}\right) \cdot YI_{i,t}}{\overline{POP}_{i,t}} \right)^{\rho sav_i - 1} \cdot \left(1 + \overline{MPSADJ}_t \cdot mps01_i\right)$$

$$\begin{bmatrix} marginal \\ propensity \\ to\ save \end{bmatrix} = \begin{bmatrix} exogenous \\ term \end{bmatrix} \cdot \begin{bmatrix} adjustment\ for \\ per\text{-}capita \\ post\text{-}tax\ income \end{bmatrix} \cdot \begin{bmatrix} scaling\ adjustment \\ for\ selected \\ institutions \end{bmatrix}$$

$$+ \overline{DMPS}_t \cdot mps01_i$$

$$+ \begin{bmatrix} point\text{-}change \\ adjustment\ for \\ selected\ institutions \end{bmatrix}$$

Where does *sigmaq* become part of MAMS?

- Equations: (a) Composite supply (*Armington*) function and (b) Import-domestic demand ratio

$$QQ_{c,t} = \alpha q_c \cdot \left(\delta q_c \cdot QM_{c,t}^{-\rho q_c} + (1 - \delta q_c) \cdot QD_{c,t}^{-\rho q_c} \right)^{-\frac{1}{\rho q_c}}$$

$$\begin{bmatrix} \text{composite} \\ \text{supply} \end{bmatrix} = f \begin{bmatrix} \text{import quantity, domestic} \\ \text{use of domestic output} \end{bmatrix}$$

$$\frac{QM_{c,t}}{QD_{c,t}} = \left(\frac{PDD_{c,t}}{PM_{c,t}} \cdot \frac{\delta q_c}{1 - \delta q_c} \right)^{\frac{1}{1+\rho q_c}}$$

$$\begin{bmatrix} \text{import-domestic} \\ \text{demand ratio} \end{bmatrix} = f \begin{bmatrix} \text{domestic-import} \\ \text{price ratio} \end{bmatrix}$$

$$\rho_{q_c} = \frac{1 + \sigma_{q_c}}{\sigma_{q_c}}$$

Where does *sigmat* become part of MAMS?

- Equations: (a) Output transformation (CET) function and (b) Export-domestic supply ratio

$$QX_{c,t} = \alpha t_c \cdot \left(\delta t_c \cdot QE_{c,t}^{\rho t_c} + (1 - \delta t_c) \cdot QD_{c,t}^{\rho t_c} \right)^{\frac{1}{\rho t_c}}$$

$$\begin{bmatrix} \text{aggregate marketed} \\ \text{domestic output} \end{bmatrix} = CET \begin{bmatrix} \text{export quantity, domestic} \\ \text{sales of domestic output} \end{bmatrix}$$

$$\frac{QE_{c,t}}{QD_{c,t}} = \left(\frac{PE_{c,t}}{PDS_{c,t}} \cdot \frac{1 - \delta t_c}{\delta t_c} \right)^{\frac{1}{\rho t_c - 1}}$$

$$\begin{bmatrix} \text{export-domestic} \\ \text{supply ratio} \end{bmatrix} = f \begin{bmatrix} \text{export-domestic} \\ \text{price ratio} \end{bmatrix}$$

$$\rho_{t_c} = \frac{1 - \sigma_{t_c}}{\sigma_{t_c}}$$

A quick note on the domestic price of imports and exports

- Equation: Import price

$$PM_{c,t} = pwm_{c,t} \cdot \left(1 + tm_{c,t} \right) \cdot EXR_t + \sum_{c' \in C} \left(PQ_{c',t} \cdot icm_{c',c,t} \right)$$

$$\begin{bmatrix} import\ price \\ (LCU) \end{bmatrix} = \begin{bmatrix} import\ price \\ (FCU) \end{bmatrix} \cdot \begin{bmatrix} tariff \\ adjustment \end{bmatrix} \cdot \begin{bmatrix} exchange\ rate \\ (LCU\ per\ FCU) \end{bmatrix} + \begin{bmatrix} transaction \\ costs \end{bmatrix}$$

- Equation: Export price

$$PE_{c,t} = \overline{PWE}_{c,t} \cdot \left(1 - te_{c,t} \right) \cdot EXR_t - \sum_{c' \in C} \left(PQ_{c',t} \cdot ice_{c',c,t} \right)$$

$$\begin{bmatrix} export\ price \\ (LCU) \end{bmatrix} = \begin{bmatrix} export\ price \\ (FCU) \end{bmatrix} \cdot \begin{bmatrix} tariff \\ adjustment \end{bmatrix} \cdot \begin{bmatrix} exchange\ rate \\ (LCU\ \ per\ FCU) \end{bmatrix} - \begin{bmatrix} transaction \\ costs \end{bmatrix}$$

Where does *prodelasva* become part of MAMS?

- Equations: (a) Value-added and (b) factor demand

$$QVA_{a,t} = ALPHAVA_{a,t} \cdot \left(\sum_{f \in F} \delta va_{f,a} \cdot \left(fprd_{f,a,t} \cdot QF_{f,a,t} \right)^{-\rho va_a} \right)^{-\frac{1}{\rho va_a}}$$

$$\begin{bmatrix} quantity\ of\ aggregate \\ value\text{-}added \end{bmatrix} = CES \begin{bmatrix} factor \\ inputs \end{bmatrix}$$

$$\rho_{va_c} = \frac{1 + \sigma_{va_c}}{\sigma_{va_c}}$$

$$WF_{f,t} \cdot \overline{WFDIST}_{f,a,t} = PVA_{a,t} \cdot \left(1 - tva_{a,t} \right) \cdot QVA_{a,t} \cdot \left(\sum_{f' \in F} \delta va_{f',a} \cdot \left(fprd_{f',a,t} \cdot QF_{f',a,t} \right)^{-\rho va_a} \right)^{-1} \cdot \delta va_{f,a} \cdot fprd_{f,a,t}^{-\rho va_a} \cdot QF_{f,a,t}^{-\rho va_a - 1}$$

$$\begin{bmatrix} marginal\ cost\ of \\ factor\ f\ in\ activity\ a \end{bmatrix} = \begin{bmatrix} marginal\ revenue\ product \\ of\ factor\ f\ \ in\ activity\ a \end{bmatrix}$$

Where does *leselas1* become part of MAMS?

- Equation: Household consumption demand for commodities from market

$$QH_{c,h,t} = \overline{POP}_{h,t} \cdot \left(\gamma m_{c,h} + \frac{\beta m_{c,h} \cdot \left(\left[\frac{EH_{h,t}}{POP_{h,t}} \right] - \sum_{c' \in C} PQ_{c',t} \cdot \gamma m_{c',h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{a,c',t} \cdot \gamma h_{a,c',h} \right)}{PQ_{c,t}} \right)$$

$$\begin{bmatrix} \text{quantity of} \\ \text{household demand} \\ \text{for commodity } c \end{bmatrix} = f \begin{bmatrix} \text{household} \\ \text{consumption} \\ \text{spending, prices} \end{bmatrix}$$

$$\beta m_{c,h} = \xi m_{c,h} \cdot \sigma m_{c,h}$$

ξ: expenditure elasticity of market demand for commodity *c* by household *h* (Engel elasticity).

Where do *tfpelastrd0* and *tfpelasqg* become part of MAMS?

- Equation: Efficiency (TFP) by activity

$$ALPHAVA_{a,t} = ALPHAVA2_{a,t} \cdot \prod_{f \in FCAP} \left[\frac{\sum_{i \in INS} QFINS_{i,f,t}}{\sum_{i \in INS} QFINS^{0}_{i,f}} \right]^{tfpelasqg_{a,f,t}} \cdot \left(\frac{\sum_{t' \in T} tfptrdwt_{t,t'} \cdot TRDGDP_{t'}}{TRDGDP^{0}} \right)^{tfpelastrd_{a}}$$

$$\begin{bmatrix} \text{efficiency} \\ \text{term for} \\ \text{activity } a \end{bmatrix} = \begin{bmatrix} \text{trend} \\ \text{term for} \\ \text{activity } a \end{bmatrix} \cdot \begin{bmatrix} \text{product of: ratio of all} \\ \text{current real capital} \\ \text{endowment } f \text{ to inital} \\ \text{value, raised} \\ \text{to the relevant elasticity} \end{bmatrix} \cdot \begin{bmatrix} \text{weighted avg. (over time)} \\ \text{of ratios of openness} \\ \text{to initial value, raised} \\ \text{to the relevant elasticity} \end{bmatrix}$$

How about the elasticity values for the country database?

- Most desirable practices
  - Use values already estimated and available
    - Make sure that estimation was up to econometric standard
    - Make sure disaggregation is useful
  - Estimate them subject to data availability

- Les desirable practices (in the absence of previous estimations or elasticity data)
  - borrow elasticity values from published data for countries at a similar level of development
  - use ‘educated’ guesses

Some widely known evidence

- *tfpelastrd*: elasticity of TFP for activity *a* with respect to GDP trade share
  - The existence of this effect, its strength, and the relevant definition of openness (exports, imports, their total, or some policy indicator) are all controversial issues.
  - Cross-country analysis reported in Dessus *et al*. (1999, pp. 27-29) find an elasticity of 0.09.
  - Given the above, and if not already available, it is better to estimate them for your country!

Some widely (cont.)

- *tfpelasqg*: elasticity with respect to changes government capital stocks
  - It is determined by the parameters *mpcapgov* and *tfp010*, as well as the sizes of initial capital stocks.
  - *mpcapgov*: marginal product of government capital of type *f*. Exogenous value for the total change in GDP per unit of extra government capital *f* in the base year. On the basis of a cross-country analysis, Dessus and Herrera (2000, p. 413) generate a value of 0.142; this may be a reasonable starting point.
  - *tfp010(a,t1)*: parameter for selecting activities for TFP growth given a GDP target which takes values larger than or equal to zero –depending on the relative value of all activities.

Some widely (cont.)

- Trade elasticities: substitution (*sigmaq*) and transformation *(sigmat)*
  - They should be based on country-relevant evidence.
  - A developing country survey of trade elasticities in Annabi et al. (2006, esp. pp. 23-29) indicates that the values used tend to be in the range of 0.5-2.0
  - McDaniel and Balistreri (2003) find that long-run substitution elasticities and more disaggregated elasticities tend to be higher. The values they report (which tend to be from developed countries) are much higher than in Annabi et al.
  - The Armington elasticities in the GTAP model are also higher, mostly in the range of 2.0-4.0 (Huff et al., 1997, p. 125).

Some widely (cont.)

- Elasticities of substitution (*prodelasva*) in the value-added production function
  - The survey of Annabi et al. (2006, esp. pp. 30-31) indicates that estimated elasticities of substitution between labor and capital in developing countries tend to be smaller than unity, with 0.3-0.9 as an approximate range.
  - In the GTAP model, the elasticities used tend to be in the range of 0.6-1.3 (Huff et al., 1997, p. 125).

What if we want to estimate?

- Very simple econometric techniques can be used and reduced specifications can be estimated
  - Mostly through time series, using OLS or a generalized difference equation (to correct autocorrelation)
  - Also cross-section analysis and survey data
- The key is to have access to data

Estimation of elasticities of substitution

- A demand equation system can be derived as a first order approximation of the CES function:

$$\log \Phi_c = a + b \log p_c + ct$$

Φ: quantity ratio in the CES function
p: relative price index that measures the ratio of the implicit price deflators of the quantities in Φ (in inverted order)
t: time trend term.

- For example (without some subscripts to simplify):

$$\log QM/QQ = a + b \log [(PQ/PQ_{cons})/(PM/PM_{cons})] + ct$$

$$\log QFS_{flab}/QVA = a + b \log [(PVA/PVA_{cons})/(WFA/WFA_{cons})] + ct$$

Estimation of (cont.)

- The estimate of the coefficient of the relative price plus one yields the estimated value of the elasticity of substitution (that is, $\sigma = b + 1$)
- The estimate of *a* captures the combined effect of the elasticity of substitution, the function shift parameter, the function share parameter and relative prices.
- The time trend term is a continuous ordinary variable that improves the estimation of σ by taking into account changing tastes over time (Hickman and Lau, 1973: 349). It somehow allows for omitted variables that are correlated with time and should also reduce the misspecification bias in estimates of σ.

Estimation of (cont.)

- The quantity ratio is basically the following:
  - In Armington function: the ratio of imports at constant prices to total supply at constant prices
    - implicitly accounts for the share of domestic market output at constant prices in gross output at constant prices.
    - Total supply: gross output + imports
  - In value-added function: the ratio of total employee compensation in real terms to value added at constant prices
    - implicitly accounts for the share of operating surplus at constant prices (for all other factors) in value added at constant prices

Estimation of (cont.)

- The relative price index is basically the following:
  - In Armington function: the ratio of the implicit price deflator of imports to the implicit price deflator of total supply (gross output + imports).
  - In value-added function: the ratio of a labour-income deflator to the implicit price deflator of value added.
- Implicit price deflator:
  - price index with a particular baseyear: for example, the average compensation of employees at current prices divided by the average compensation of employees for a particular base year
  - easily estimated by dividing the variable (for example, imports) expressed in current prices by the same variable expressed in constant prices.

Costa Rica: Estimation results for the import demand function by commodity group, 1966-2000 (t-values in parentheses)

Commodity group	0>*a*>0	0>*b*>0	0>*c*>0	0>d_1	0>d_2>0	R^2	DW*	$\sigma = b + 1$
Domestic-consumption agriculture	-11.7417 (-1.6119)	-0.0460 (-9.5402)	0.0064 (1.6208)	-0.0797 (-1.7178)	-0.1948 (-2.0885)	0.96	1.98	0.9540
Traditional export agriculture	-85.9972 (-1.9300)	0.4155 (1.8173)	0.0432 (1.9253)	-1.3613 (-2.4269)	-0.9366 (-2.4918)	0.24	1.93	1.4155
Non-traditional export agriculture	-24.1522 (-4.5511)	0.8382 (1.7687)	0.1086 (4.5618)	-0.2166 (-1.7040)		0.98	1.84	1.8382
Food industries	-12.9477 (-1.9314)	-0.1841 (-2.4647)	0.0065 (1.9298)	-0.0428 (-1.7010)	0.0922 (1.8941)	0.32	1.80	0.8159
Oil and chemicals	-10.4864 (-1.7029)	0.0282 (1.3221)	0.0053 (1.7027)	-0.0589 (-1.9769)	0.2047 (2.6089)	0.44	1.90	1.0282
Manufacturing (other)	-17.9709 (-2.4826)	0.1966 (1.7977)	0.0091 (2.4891)		0.0114 (1.6993)	0.49	1.87	1.1966
Transport	9.3524 (4.8013)	-0.0498 (-1.3488)	-0.0047 (-4.8707)			0.46	1.69	0.9502
Financial services[2/]	22.8217 (6.6606)	-0.5246 (-2.7171)	-0.0115 (-6.6868)			0.62	1.91	0.4754
Other services	-47.2174 (-2.7834)	-0.5117 (-1.3146)	0.0239 (2.9223)			0.46	1.94	0.4883

Costa Rica: Estimation results for the labour demand function by activity group, 1976-2000 (t-values in parentheses)

Activity group	0>*a*>0	0>*b*>0	0>*c*>0	0>d_1	0>d_2>0	R^2	DW*	$\sigma = b + 1$
Agriculture	19.5930 (5.9944)	-0.5780 (-11.6791)	-0.0093 (-5.8090)		0.0673 (3.7788)	0.92	1.78	0.4220
Manufacturing	0.9557 (7.4575)	-0.4959 (-10.8559)			0.0164 (1.7480)	0.84	1.80	0.5041
Construction	-17.1997 (-3.7349)	-0.5051 (-12.7371)	0.0095 (4.0402)		0.0498 (1.7802)	0.91	1.77	0.4949
Basic services	30.2910 (13.7542)	-0.4695 (-18.3524)	-0.0148 (-12.9880)		0.0511 (3.3149)	0.99	1.88	0.5305
Trade and services	-6.3211 (-2.1018)	-0.5995 (-6.6087)	0.0034 (2.2947)			0.77	1.80	0.4776
Other services	40.0637 (5.6398)	-0.5920 (-13.6558)	-0.0198 (-5.4984)	0.0659 (1.7635)	0.1957 (3.0414)	0.95	1.98	0.4080

Estimation of elasticities of transformation

- Based on the CET transformation function, whereby producers maximize per unit revenue from domestic and export sales, a restricted form for the export supply can be estimated as follows (omitting superscripts):

$$\log(QE/QX) = a \log \delta 0 - b \log(PD/PE) + c\varepsilon t$$

QE: quantity of exports (or exports at constant prices)
QX: quantity of output produced by the economy (or gross output at constant basic prices)
PD: wholesale price index
PE: implicit price deflator of exports
b: elasticity of transformation
a: captures effect of the function share parameter over time
t: time trend term that captures exogenous change in time and reduces misspecification

Costa Rica: Estimation results for the export-supply function by commodity group, 1966-2000 (t-values in parentheses)

Commodity group	0>*a*>0	0>*b*	0>*c*>0	0>d_1	0>d_2>0	R^2	DW*
Domestic-consumption agriculture	88.8301 (6.2939)	-1.9199 (-12.5401)	-0.0447 (-6.2388)	-0.4164 (-3.5143)	-0.9109 (-5.7686)	0.99	1.83
Traditional export agriculture	99.3825 (7.8291)	-1.6825 (-3.4903)	-0.0497 (-7.8929)	-0.3441 (-6.3942)	-0.5142 (-5.1631)	0.97	1.81
Non-traditional export agriculture	74.7054 (3.9404)	-1.5075 (-1.7544)	-0.0389 (-4.1751)	(-)	0.2463 (1.7653)	0.78	1.98
Food industries	95.9466 (32.1503)	-0.8075 (-1.7886)	-0.0485 (-32.7979)	-0.0790 (-1.8640)	(-)	0.97	1.99
Oil and chemicals	73.5254 (6.9427)	-4.0300 (-7.8313)	-0.0355 (-6.7443)	-0.0918 (-1.7503)	(-)	0.75	1.85
Manufacturing (other)	73.0299 (9.5055)	-1.7856 (-1.7151)	-0.0354 (-8.6787)	-0.2447 (-1.8638)	(-)	0.76	1.87
Transport	83.6617 (14.5071)	-0.4099 (-3.3881)	-0.0424 (-14.7123)	-0.1418 (-3.3851)	-0.2173 (-3.8675)	0.99	1.86
Financial services	-96.9942 (-3.5512)	-0.7987 (-1.7617)	0.4856 (3.5514)	-2.0114 (-1.9816)	-9.4855 (-3.2608)	0.34	2.06
Other services	40.0692 (8.7285)	-0.4231 (-6.4205)	-0.0203 (-8.7778)	-0.1052 (-2.7455)	-0.0848 (-1.7863)	0.95	1.84

Estimation of elasticity of savings rate

- The following simple logarithmic equation can be estimated:

$$\log S_t = a + b \log Y_t + \varepsilon t$$

S_t: per capita savings at time t, calculated using an historical series of total saving from the NA which is divided by the total population (of the institution *ins*).
Y_t: disposable income from the NA divided by the total population.
t: time trend term

- Some results for Jordan's economy (1976-2006):

$$\log S_t = \mathbf{0.69} \log Y_t + \mathbf{0.93}\ \varepsilon t\text{-}1 \mathbf{- 1.39}\ D95 \mathbf{- 0.83}\ D90$$

Estimation of TFP elasticities

- Start by generating a series for TFP.
- We use a standard Cobb-Douglas production function:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad (1)$$

Y_t: sector's gross domestic product
A_t: technological constant (between 0 and 1)
K_t: stock of capital input
L_t: amount of labour used as input
t: time subscript.

- Assumptions
  - Returns to scale between capital and labour are constant
  - The economy fully employs all factors under perfect competition.

Estimation of TFP (cont.)

- Solow decomposition to construct a time series for TFP:

$$y_t = \theta_t + \alpha k_t + (1-\alpha) l_t \quad (2)$$

  y: growth rate of output
  k: growth rate of capital
  l: growth rate of labour inputs
  α: share of capital
  $(1-\alpha)$: share of labour
  θ: constant TFP grow rate (ie., the Solow residual).

- TFP growth is obtained residually after feeding equation (2) with historical growth rates of capital and labour inputs and technological factor shares.

- Get factor shares from the NA $\rightarrow$ but a potential problem is the measurement of compensation to labour

Estimation of TFP (cont.)

- Example of a semi-logarithmic function to estimate TFP elasticities:

$$\varphi = b0 + \varsigma \log hk + \tau \log to + d1cri + d2ref + \varepsilon \quad (3)$$

  θ: TFP growth rate
  hk: stock of human capital
  to: measure of trade openness
  cri: dummy variable for debt crisis period.
  ref: dummy variables for reform period.

- In the case of MAMS a similar approach could be used. Instead of *hk*, though, one would like to use government infrastructure.

Costa Rica: Estimation results for the semi-logarithmic TFP growth equation by activity group, 1977-1997 (t-values in parentheses)

Activity group	$0>b_0>0$	$\varsigma>0$	$0>\tau$	$0>d_1$	R^2	DW*
Agriculture	-0.1519 (-1.8735)	0.0133 (2.8157)	-0.2065 (-2.8302)	-0.0700 (-2.3799)	0.55	1.92
Manufacturing	-0.0986 (-0.6012)	0.0109 (0.9200)	0.0144 (0.6842)	-0.0700 (-2.1642)	0.43	2.13

Estimation of expenditure elasticities of demand

- These elasticities are most likely estimated using data from an income an expenditure household survey.
- The following logarithmic commodity-wise expenditure demand function can be estimated using the OLS method:

$$\log C_{ch} = b_0 + b_1 \log Y_h + \varepsilon$$

C_{ch}: total consumption of commodity c in household h
b_1: Engel elasticity
Y_h: total income of household type h (excl. taxes and savings)

- Most likely, household income data need to be corrected
  - to remove excesses over consumption expenditure
  - to impute incomes when expenditure exceed income

Costa Rica: OLS estimation results for the commodity-wise expenditure demand function (t-values in parenthesis)

Consumption commodity group	Urban households			Rural households		
	$0>b_0>0$	$b_1>0$	R^2	$0>b_0>0$	$b_1>0$	R^2
Food industries	0.2067 (2.1243)	0.7529 (33.1814)	0.42	0.0123 (2.1561)	0.7963 (41.3753)	0.43
Textiles, clothing and leather fabrics	-1.2055 (-6.7165)	1.0225 (24.6085)	0.30	-1.2161 (-9.6669)	1.0271 (33.5733)	0.36
Wood products and furniture	-0.4735 (-1.7796)	0.6962 (8.1113)	0.21	0.7050 (4.9909)	0.6861 (13.1110)	0.29
Oil, chemicals, and rubber and plastic products	-0.2933 (-3.3298)	0.9673 (39.6761)	0.50	-0.0459 (-1.7318)	0.9642 (49.5076)	0.51
Paper, non-metallic minerals and basic metals	-1.8212 (-11.5448)	1.0322 (27.6028)	0.34	-1.4174 (-10.8551)	1.1266 (28.1588)	0.28
Other manufacturing	-2.8593 (-10.7168)	1.4896 (20.7281)	0.25	-2.6238 (-13.1137)	1.4327 (24.8964)	0.25
Restaurants, hotels and lodgings	-1.4492 (-5.9441)	1.4399 (18.8066)	0.28	-0.9407 (-4.4243)	1.6598 (18.3899)	0.22
Transport, storage and communication	-1.4254 (-6.8514)	1.2400 (20.9668)	0.27	-0.5084 (-2.7506)	1.5477 (18.0555)	0.21
Electricity, gas and water	1.1967 (10.7240)	0.7594 (17.3146)	0.16	0.4040 (3.7814)	0.6979 (19.9541)	0.18
Financial services and insurance	0.7385 (1.6670)	0.9912 (3.5808)	0.09	1.0306 (2.8709)	1.5866 (5.8605)	0.11

Suggested references

- Annabi, J., J. Cockburn and B. Decaluwé. 2006. "Functional Forms and Parametrization of CGE Models", PEP MPIA Working Paper 2006-04, Poverty and Economic Policy (PEP) Research Network.
- Lofgren Hans. 2008. "MAMS – A Guide for Users". October 7 (unprocessed).
- Sánchez, M.V. 2004. Rising inequality and falling poverty in Costa Rica's agriculture during trade reform. A macro-micro general equilibrium analysis, Maastricht: Shaker. Chapter 7 & Appendix I.
- Sánchez, M.V. and Rob Vos. 2007. "Informative note on elasticities and calibration of MAMS", Development Policy and Analysis Division, Department of Economic and Social Affairs, New York.