Income Inequality, Trade and Financial Openness

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Order of Presentation

- Introduction
- Empirical analysis
    - data set of low to middle income countries (based on GDP per capita)
    - panel data results
- Model: DSGE model with income distribution
    - small open economy with natural resources
    - labour-rich, capital poor
- Simulation analysis
    - insights into relationships between openness and Gini
    - role of labour intensities
- Concluding remarks

Income Inequality: Changing Tolerance

- Hirschman and Rothschild (1974): diminishing tolerance for the tunnel effect
- Kuznets: inverted U curve between inequality and growth. Dual economy hypothesis
- Kaldor: inequality helps development because rich save more
- Deaton and the Great Escape: some are left behind
- Dollar and Kray: growth is good for the poor
- Question: are trade and financial openness more effective for reducing inequality?
- Openness defines with respect to trade, foreign aid and FDI.

Globalization

- Jaumotte, Lall and Papageorgiou (2008): technology increases inequality
- Globalization has ambiguous effect.
- Trade reduces inequality while foreign investment increases inequality
- If openness does not matter, education and technology are the remaining options
- Which mechanisms ensure that growth (through trade or financial liberalization) reduce inequality?

Data Sets

- Poorest is Tanzania with 10% of world's mean per-capital GDP.
- Brazil has highest Gini, Bulgaria has lowest
- Brazil has the lowest index of openness (20.5%), Honduras the highest (120.3%)
- Bangladesh has virtually no foreign investment
- Foreign aid for Mozambique is more than 33% of GDP

Statistical Properties of Indices (Percentage)							
	Gini	*dy*	*ry*	*gy*	*op*	*ay*	*fy*
Full sample (42)							
mean	43.323	1.375	67.616	17.237	65.076	5.234	2.763
median	43.390	1.423	66.178	14.923	59.253	1.652	2.055
Low-Income Countries (12)							
mean	42.485	1.301	22.386	17.736	56.672	13.162	2.777
median	42.930	0.957	22.378	15.921	55.475	11.137	2.210
Lower-Middle Income Countries (20)							
mean	41.431	1.033	67.374	17.949	67.176	2.919	2.763
median	41.060	1.330	67.766	14.764	61.556	1.593	1.710
Upper-Middle Income Countries (10)							
mean	48.113	2.147	122.377	15.216	70.960	0.350	2.747
median	47.438	2.121	124.808	14.335	64.024	0.163	2.645

Correlation Coefficients with the Gini (Pooled Data Sets)						
	dy	ry	gy	op	ay	fy
Full-set	-0.048	0.165*	-0.142*	-0.132*	0.048	-0.015
Low	-0.208*	0.043	0.189*	-0.102	0.259*	0.185*
Lower-middle	0.001	-0.244*	-0.325*	-0.002	0.208*	-0.057
upper-middle	-0.299*	0.243*	0.500*	-0.726*	-0.378*	-0.141**
				Note:	* Significant at the 5% level	

Correlations with the Gini (summary of country-specific results)			
	Openness	FA	FDI
Full set of 42 countries			
mean	0.185	-0.099	0.082
minimum	-0.911	-0.887	-0.740
maximum	0.958	0.894	0.868
Low Income			
mean	0.049	0.034	0.088
minimum	-0.911	-0.887	-0.530
maximum	0.958	0.894	0.677
Lower-Middle			
mean	0.474	-0.119	0.088
minimum	-0.887	-0.689	-0.408
maximum	0.917	0.679	0.791
Upper-Middle			
mean	-0.229	-0.218	0.062
minimum	-0.885	-0.750	-0.740
maximum	0.952	0.607	0.868

- Panel estimation (with country and time specific fixed effects):

$$GN_{it} = \alpha_i + \alpha_t + \beta_1 dy_{it} + \beta_2 ry_{it} + \beta_3 gy_{it} + \beta_4 op_{it}$$
$$+ \beta_5 ay_{it} + \beta_6 fy_{it} + \epsilon_{it};$$
$$\epsilon_{it} \sim N(0, \sigma_\epsilon^2)$$

Fixed Effects Panel Estimates: 1992-2007						
	dy_{it}	ry_{it}	gy_{it}	op_{it}	ay_{it}	fy_{it}
Full-dataset	-0.197*	-0.033**	0.209*	0.051*	0.037	0.075
Low-Income	-0.429*	0.354*	-0.063	0.090*	0.023	0.084
Lower-Middle	-0.155*	-0.002	0.230*	0.099*	-0.189*	-0.049
Upper-Middle	0.039	-0.095*	-0.158	-0.068*	-1.176*	0.174**
Note: * Significant at 5% level;**Significant at 10% level						

- Key result of panel: growth and relative income have significant effects on inequality
- For relatively more prosperous, relative income more important
- For low-income countries, growth of income reduces inequality
- In these countries, widespread increase in income needed to reduce poverty and inequality.
- Higher government spending as a share of GDP, increases inequality (Rudra 2004)
- She argued that spending programs in the lower income countries have much greater political lobbying
- There are thus little redistributive effects of public spending

- Positive effect of FDI on Gini
- Corroborates positive results of Feenstra and Hanson (1997) on wage inequality in Mexico
- Basu and Guarigliab (2007) : FDI reduces agricultural share of GDP

Gini and AID

- Little evidence that aid reduces inequality, similar to Calderón and Chong (2006)
- Deaton: aid which reduces mortality rates increases the population of poor people.
- Perverse effects: access to foreign aid flows makes governments less accountable to domestic constituents,

Gini and Trade Openness

- Trade openness has negligible effects for low income countries, but has significant negative effects for the middle income countries
- Gourdon, Maystre, and de Melo (2008): initial endowments with respect to skilled labour, matter most.
- Acar and Dogruel (2010) for MENA: openness reduces inequality
- Munschi (2012) on Bangladesh: greater openness led to increase in labour intensive industries
- Turnovsky (2013): many stories to tell based on empirical results
- Ehrlich and Kim (1997), these empirical results provide evidence of empirical associations,

DSGE Model: Key Features

- Stylised low-income economy
- Households
    - heterogenous agents with different labour endowments
    - Gorman polar form utility function
- Production of Two Types of Goods
    - tradeables with prices determined globally
    - non-tradeables with market-clearing prices
- Financial sector
    - accepts deposits from households, borrows from foreigners
    - lends to public sector and firms
- Public sector
    - manages government expenditures
    - taxes labour income and consumption
    - sets exchange rate

- Heterogeneous agents with one unit of time, for work and leisure
- Gorman Polar Form Utility:

$$\max_{C,L,K^h,M} \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{1}{\eta} \left(C_t \right)^{\eta} \left(V_t \right)^{\omega\eta} G_t^{\chi\eta} \right) \tag{1}$$

- Consumption is a basket of traded and non-traded goods
- Households accumulate capital and rent to firms:

$$K_t^h = (1-\delta)K_{t-1}^h + I_t^h \tag{2}$$

- Investment is imported
- Parameter δ determines the replacement rate of imported capital goods

Budget Constraint and Euler Equations

- Household budget constraint:

$$(1 - \tau^w)W_t(H - V_t) + (1 + R^m_{t-1})M_{t-1} + \quad (3)$$

$$R^k_t K^h_t + \Pi_t = (1 + \tau^c)P^c_t C_t + M_t + P^k_t I_t \quad (4)$$

- Euler Equations:

$$\omega C_t = \frac{(1 - \tau^w)W_t V_t}{(1 + \tau^c)P^c_t} \quad (5)$$

$$\frac{(C_t)^{\eta-1}(V_t)^{\omega\eta}G^{\chi\eta}_t}{(1 + \tau^c)P_t} = \mathbf{E}_t\left[\beta(1 + R^m_t)\frac{(C_{t+1})^{\eta-1}(V_{t+1})^{\omega\eta}G^{\chi\eta}_{t+1}}{(1 + \tau^c)P^c_{t+1}}\right] \quad (6)$$

$$(1 + R^m_t)\left(P^k_t - R^k_t\right) = \mathbf{E}_t\left[P^k_{t+1}(1 - \delta)\right] \quad (7)$$

- Exports: natural resource products

$$Y_t^x = C_t^x + X_t \tag{8}$$

$$\ln(X_t) = \rho^x \ln(X_{t-1}) + (1 - \rho^x)\ln(\overline{X}) + \epsilon_t^x, \qquad \epsilon^x \sim N(0, \sigma^x) \tag{9}$$

- Production function:

$$Y_t^x = \overline{Z^x}\,(K_t^x)^{\alpha^x}\,(L_t^x)^{1-\alpha^x} \tag{10}$$

- Price of export goods:

$$\ln(P_t^{x*}) = \rho^p \ln(P_{t-1}^{x*}) + (1 - \rho^p)\ln(\overline{P^{x*}}) + \epsilon_t^p, \qquad \epsilon^p \sim N(0, \sigma^p) \tag{11}$$

- Wage bill (financed by borrowing from banks):

$$N_t = W_t L_t^x \tag{12}$$

$$Y_t^h = G^k \overline{Z^h} \left(K_t^h \right)^{\alpha^h} \left(L_t^h \right)^{1-\alpha^h} \tag{13}$$

$$Y_t^h = C_t^h + G_t \tag{14}$$

$$G_t = G_t^c + G_t^k \tag{15}$$

$$G_t^k = \varsigma G \tag{16}$$

- Government spending is for consumption and for infrastructure

Pricing, labour Mobility

- Flexible prices for home goods

$$\Pi_t^h = P^h Y^h - W_t L_t^h - R_t^k K_t$$

- First order conditions:

$$\frac{(\alpha^h) W_t}{(1 - \alpha^h) R_t^k} = \frac{K_t^h}{L_t^h}$$

- Labour is mobile across the two sectors
- Marginal costs:

$$P_t^h = \frac{(W_t)^{1-\alpha^h} (R_t^k)^{\alpha^h}}{Z_t^h G_t^k} \cdot \left(\frac{1}{(\alpha^h)^{\alpha^h} (1 - \alpha^h)^{1-\alpha^h}} \right) \qquad (17)$$

Banks and Financial Sector

- Reserves and Lending Costs:

$$\Phi_t^m = \overline{\Phi}^m + \varphi^m(M_{t-1} - \overline{M}) \qquad (18)$$

$$\Phi_t^n = \overline{\Phi}^n + \varphi^n(N_{t-1} - \overline{N}) \qquad (19)$$

- Risk premium on foreign borrowing:

$$\Phi_t^s = \overline{\Phi}^s + \varphi^s(F_{t-1} - \overline{F}) \qquad (20)$$

Interest Rates and Macroeconomic Identities

- FOC's of banks:

$$(1 + \Phi_t^n)(1 + R_t) = (1 + R_t^n) \tag{21}$$

$$(1 - \Phi_t^m)(1 + R_t) = (1 + R_t^m) \tag{22}$$

$$(1 + R_t)S_t = (1 + R_t^* + \Phi_t^s)S_{t+1} \tag{23}$$

- Foreign Debt

$$\overline{S}F_t = (1 + R_{t-1}^* + \Phi_{t-1}^s)\overline{S}F_{t-1} + \overline{S}P_t^{m*}I_t - \overline{S}P_t^{x*}X_t \tag{24}$$

- Domestic Debt:

$$B_t = (1 + R_{t-1})B_{t-1} + P_t^h G_t - \tau_t^w W_t L_t - \tau_t^c P_t C_t - Q_t - P_t^z K_t^x \tag{25}$$

$$Q_t = \Phi_t^m M_t + \Phi_t^n N_t + (1 + R_t^n)N_t - (1 + R_{t-1}^n)N_{t-1} \tag{26}$$

- Openness and GDP

$$\Phi_t = \frac{S_t P_t^{m*} I_t + S_t P_t^{x*} X_t}{Y_t}$$

$$Y_t = P_t^h Y_t^h + P_t^x Y_t^x \tag{27}$$

- FDI Modification
  - foreigners own capital
  - capital disappears from household budget constraint
  - investment decision is discounted by return to portfolio investment

- AID Modification:
  - foreigners pay for investment goods
  - funds go to the government

- funds going to government sector

Initial Endowments

- Each agent receives a share of initial deposits (money endowments) and share of profits:

$$\Pi_t^i = h^i \Pi_t \tag{28}$$

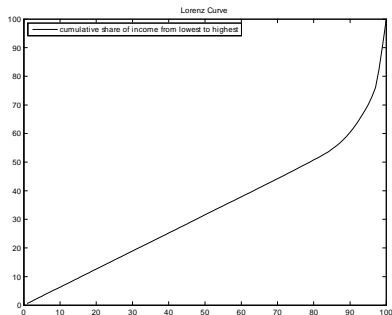$$M_t^i = (1 + R_{t-1}^m)M_{t-1}^i + (1 - \tau_t^w)W_t \left[1 - \frac{(1+\omega)\rho^i V_t}{\omega}\right] \tag{29}$$

$$+ h^i \Pi_t + h^i \left[R_t^k K_t^h - P_t^k I_t\right] \tag{30}$$

$$y_t^i = (1 - \tau^w)W_t(1 - \rho^i V_t) + (1 + R_{t-1}^m)M_{t-1}^i + h^i R_t^k K_t^h + h^i \Pi_t \tag{31}$$

- Money endowments and leisure relation:

$$\rho^i = \frac{1}{\overline{V}} \frac{\omega}{(1+\omega)} \frac{\overline{R^m}\overline{M^i} + (1 - \tau^w)\overline{W} + h^i\overline{\Pi} + h^i \left[R^k - P^k\delta\right]\overline{K^h}}{(1 - \tau^w)\overline{W}} \tag{32}$$

Lorenz Curve

Cumulative Share of Income from Lowest to Highest

- Implication: richer members of the economy work less.
- Income of about 90 per cent of workers is through the provision of labour services.

- Sums of Labour, Income and Money equal Aggregate Steady States:

$$\sum_{i=1}^{H} M_t^i = \overline{M} \tag{33}$$

$$\sum_{i=1}^{H} V_t^i = H - \overline{L} \tag{34}$$

- Deaton modified Gini index:

$$DG = \frac{H+1}{H-1} - \frac{2}{(H-1)} \frac{\sum_{i=1}^{H} p^i y_i}{\sum_{i=1}^{H} y_i}$$

| Parameter Specification		
Parameters	Definitions	Calibrated Values
β	discount factor	$1/1.04$
η	relative risk aversion	-0.5
ω	labour supply elasticity	0.5
χ	government spending in utility	0.15
γ	share of tradeables in consumption bundle	0.5
θ	intratemporal substitution elasticity	2.5
$\varphi^m, \varphi^n, \varphi^s$	risk premium parameters	0.01, 0.01, 0
ρ^x, ρ^p	autoregressive terms for shock processes	0.5, 0.5
σ^x, σ^p	standard deviation for shocks to X, P^{x*}	$0.1\overline{X}$, $0.1\overline{P^{x*}}$
τ^w, τ^c	tax rates	0.1, 0.05
ς	share of public capital expenditure in G	0.012
δ	share of import replacement in capital	
α^h, α^x	parameters in production function	0.5, 0.5

Implications of Parameter Calibration

- Calibration is set so that the index of openness is .513, close to observed mean in the data
- Ratio of government spending to GDP is .31.
- Deaton-adjusted Gini is .49, within the range of the reported sample.
- Share of labour in non-traded sector is 65%, share of labour income is 50%,
- Consumption spent on traded goods is 10%, proportion of non-traded G is 39%
- Most traded goods sold overseas: 87%
- Arellano (2009) parameterizes the non-traded sector as more capital intensive.
- Kuralbayeva and Vines (2008) assume the reverse
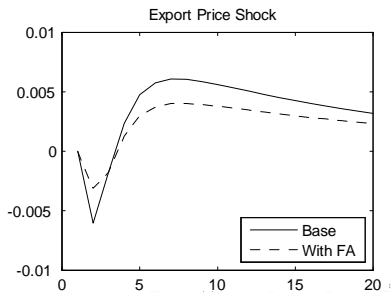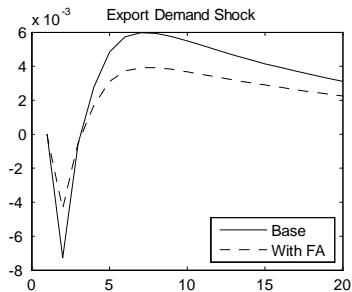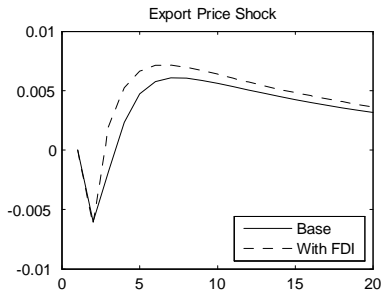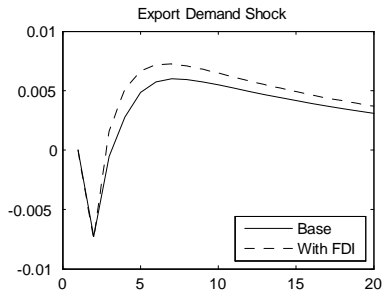
- Impulse Response: Export Demand Shock
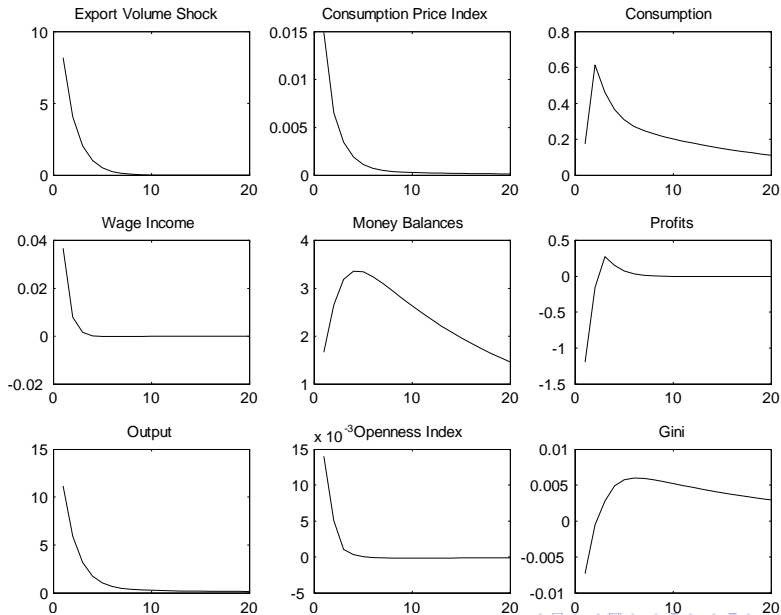
- Impulse Response: Terms of Trade Shock:
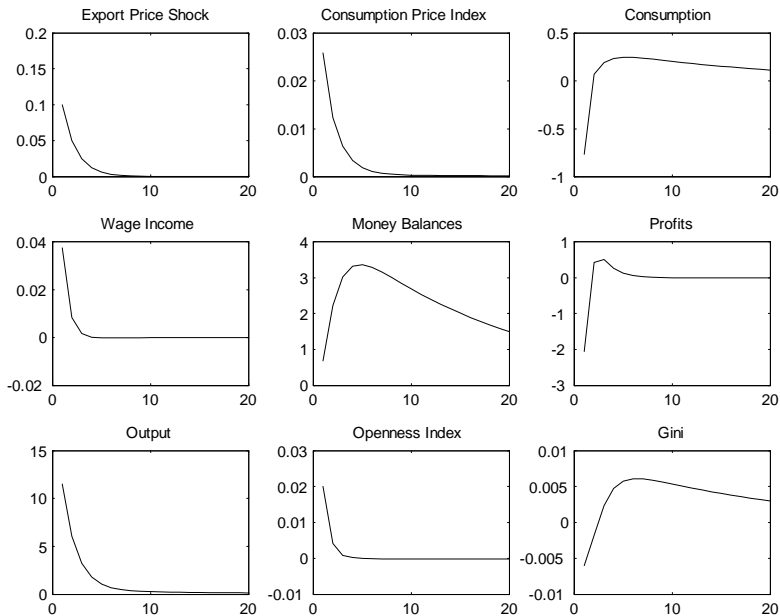
Impulse Responses following a shock to Export Price

- Impulse Response with and without FDI and Foreign Aid

Stochastic Simulation Experiments: Design

- We are interested in the relations between the Gini and openness
- Model re-parameterized for varying degrees of productive activity.
- Shocks processes remained the same
- Deep parameters fixed, as well as tax policy and risk premia parameters.
- Generate a number of stylised economies with varying degrees of openness
- We varied the factor share of capital in the production functions α^h, α^x, as well as δ
- These parameters affected the import content and degree of openness.

Sensitivity Analysis

			Sensitivity Analysis			
	Average		Correlation	parameters		
case	Gini	Φ_t^o	$\{\text{Gini},\Phi_t^o\}$	δ	α^h	α^x
1	0.277	0.255	0.398	0.1	0.2	0.2
2	0.215	0.257	0.599	0.1	0.2	0.8
3	0.469	0.541	0.779	0.1	0.5	0.5
4	0.293	0.303	-0.156	0.5	0.2	0.2
5	0.229	0.307	-0.190	0.5	0.2	0.8
6	0.489	0.626	-0.023	0.5	0.5	0.5
7	0.692	0.859	0.383	0.5	0.8	0.8
8	0.295	0.310	-0.068	0.9	0.2	0.2
9	0.231	0.313	-0.204	0.9	0.2	0.8
10	0.492	0.637	-0.207	0.9	0.5	0.5
11	0.609	0.851	-0.491	0.9	0.8	0.2
12	0.696	0.872	-0.621	0.9	0.8	0.8

Simulation Insights

- For economies with a high degree of openness, there is a negative correlation between the Gini and the index of openness, for high depreciation and high capital intensity in production
- For high openness and low capital intensity, and depreciation, there is a positive but small correlation between openness and the Gini.
- Despite high capital intensity in both sectors, the economy with the higher import content in the non-traded sector, opens the economy to more international shocks and the gains from trade are distributed more broadly.

Concluding Remarks

- Empirical results
  - growth reduces inequality
  - trade openness can increase or decrease the Gini
  - FDI and AID have negligible effects for low-income countries but reduce inequality in middle-income countries

- Simulation results
  - Key channel from open to Gini: distribution to labour income, with high capital intensities and high capital-replacement rates
  - Under high openness and low capital intensity, and import-replacement rates, there is a positive but small correlation between openness and the Gini.