

Price Differentiation in Low and Middle Income Pharmaceutical Markets

Eric Keuffel

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International Health Systems and Medicines

- Overall health expenditures are limited in LMICs
($< \$100$ annual HE/capita in very low income countries)
- Share of spending on pharmaceuticals and share of private spending is relatively large in relation to high income context
- Prices and access to medicines matter a lot for achieving health outcomes
- Both infectious and, increasingly, chronic disease are important
- 2011 UN conference on non-communicable disease)

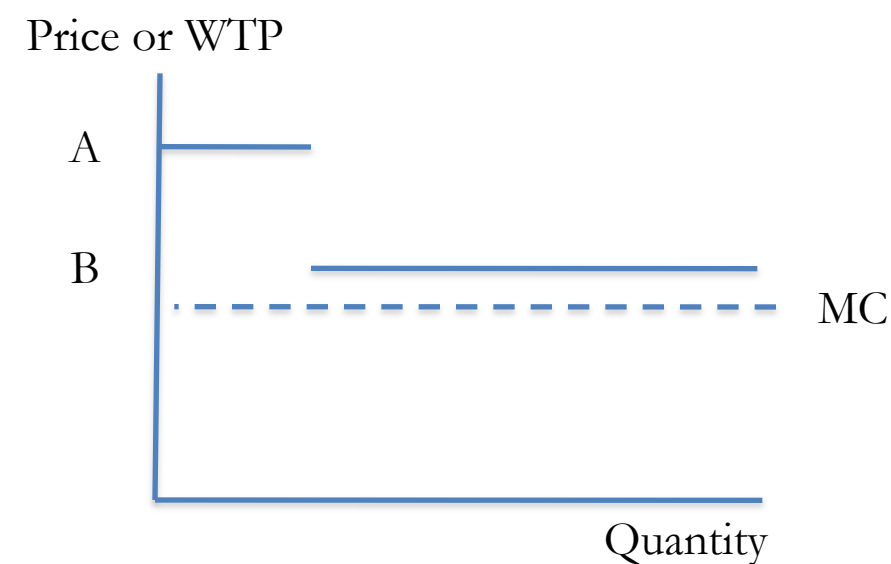
Important Differences between High vs. Low/Middle Income Pharmaceutical Systems

	High Income	Low/Middle Income
Primary Finance Source	Gov't Insurance	Individual (OOP)
Supply Chain	Competitive, Efficient	Limited Competition, Less Efficient, Bifurcated (Public vs. Private)
Regulatory Capacity	Strong: High Quality Medicines	Weaker Regulation and Governance: Lower quality

Cross-National Pharmaceutical Prices

- In high income countries, pharmaceutical prices generally are correlated with income per capita (Danzon and Furukawa 2006)
- In prior select comparisons with middle-income countries, the prices in the middle income countries are sometimes relatively high in relation to income per capita (e.g. US vs. Mexico)
- One possible explanation: Profit maximizing prices (especially in the private sector) focus on the upper income strata within these middle income countries

Pharmaceutical Price Setting Choice Simple “One Price” Case (On Patent, OOP Market)



- Given marginal cost of production and distribution (MC) and distribution of consumer demand, profit-maximizing firm sets price at A rather than B (volume vs. price tradeoff)

Recent Evidence on LMICs

- Danzon, Mulcahy, Towse (2011, NBER) examine TB, Malaria, AIDS product markets at the *ex-manufacturer level*. Significant positive effects of income concentration.

....but prices change between the manufacturer and the consumer

- Yadav (2007, CGD) map the complexities of the supply chain between manufacturer and consumer
- Goodman et al. (2009, HE) finds a positive effect of retailer concentration on consumer price for anti-malarials (Tanzania).
Downstream structure of market affects price to consumer.

Key Questions

1) Does more recent, extensive data (inclusive of chronic and infectious disease) indicate that cross national prices in low and middle income countries are sensitive to:

- A) GDP per capita?
- B) Income Concentration Measures?
- C) Market Size?

2) If yes, which product types (generic vs. originator) and market segments (private sector, public sector) appear to be most sensitive to these factors?

Hypotheses

Private Market and Income Concentration

H1: Retail prices for originator drugs in the private market (or more specifically the degree of deviation relative to international public sector tender prices) will be higher in countries with relatively more concentrated income (e.g. higher GINI index or greater share of income to top 10% or 20% of population)

H2: Relative retail prices for generic medicines in the private market will be less responsive to income concentration than relative retail prices for originator drugs in the private market.

Hypotheses

Public Market and Income Concentration

H3: For both originator products and generic products there will be no effect of income concentration on relative prices in the public market.

Hypotheses

Market Size Effects

H4: After controlling for income concentration, relative retail prices for originator and generic products in **the private market** should be lower in larger countries. (Larger penalty for setting price too high in larger countries)

H5: Relative public market prices for originator and generic products will be lower in larger countries also (due to greater monopsony power). The effects of population likely are more influential in decreasing price ratios in the public market relative to the private market.

Hypotheses

Income Effect

H6: Relative prices will be higher in countries with larger GDP/capita, but this effect will be economically more significant in public market segments.

Data

Health Action International (HAI) Surveys

- 72 Surveys, 49 Countries
- Global and Regional Medicines (branded and generic)

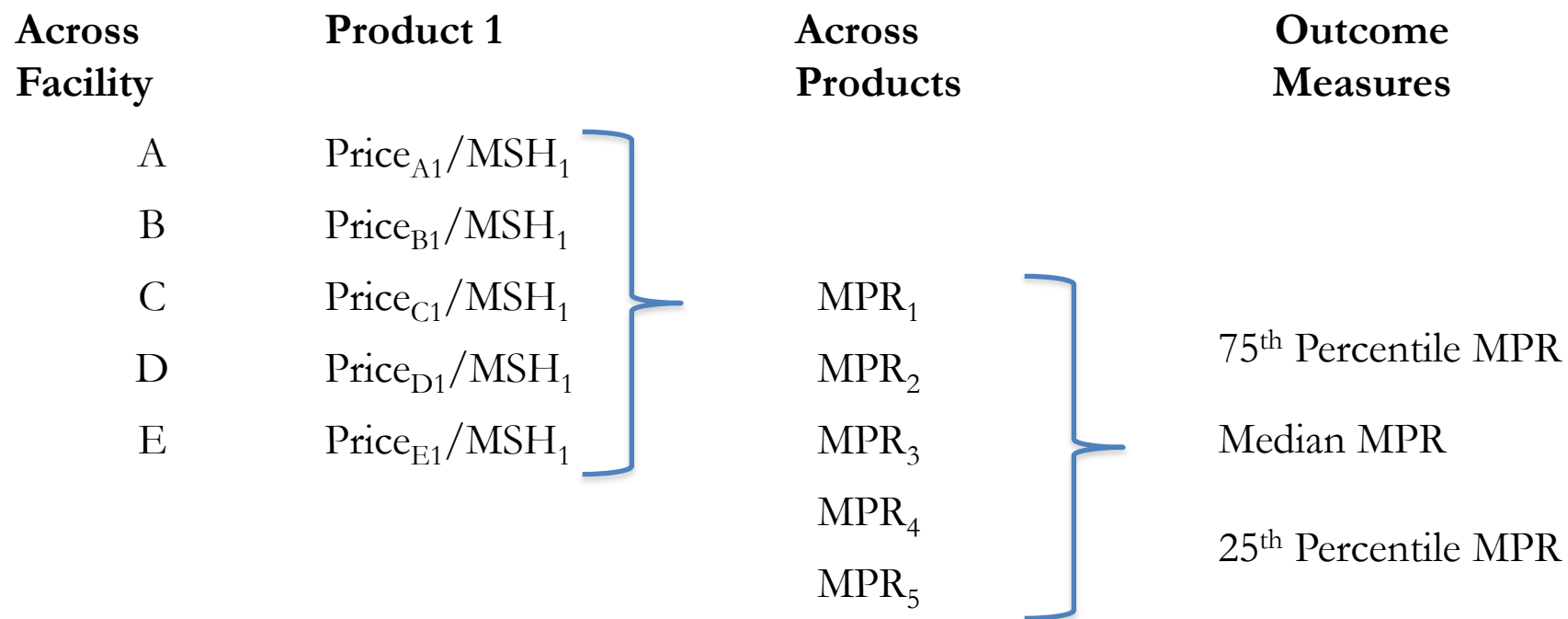
Price Data

- 50th Percentile Median Price Ratios (Relative to MSH reference price) for Originator and Generic Medicines by Sector (75th percentile, 25th percentile also reported)
- Private Sector (retail only) and Public Sector (retail and procurement price)

Economic / Market Data

- World Bank (Gini Index, % share inc measures for top 10 or 20 percent of population, GDP/cap, Population)

Outcome Measures: How to Generate Country-Level MPRs



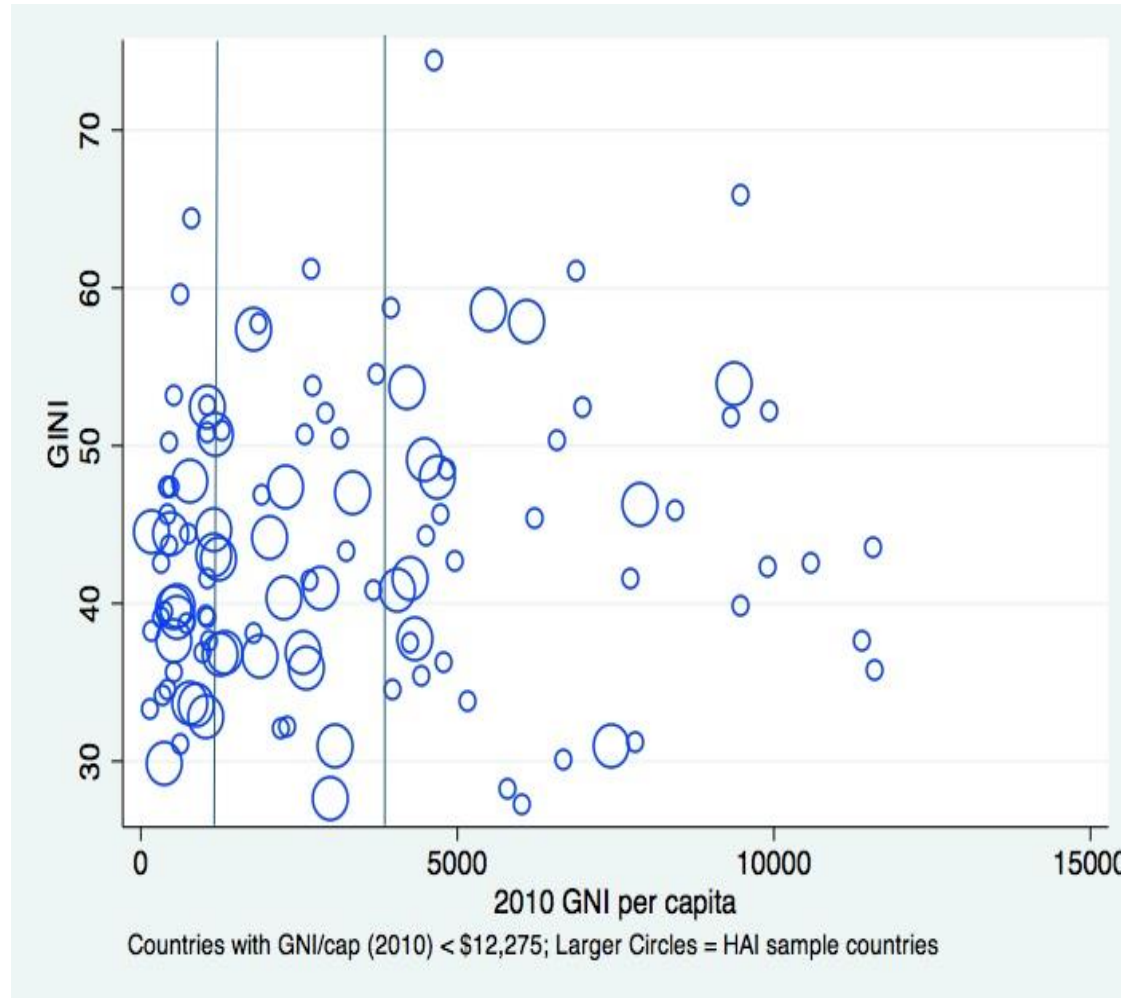
Summary Statistics (Outcomes)

	Measure	Mean	SD	n
Private Market (Retail)	50th Percentile MPR	16.9	12.1	71
Originator Drugs	75th Percentile MPR	35.2	23.6	71
	25th Percentile MPR	8.5	5.7	71
Private Market (Retail)	50th Percentile MPR	5.5	5.1	68
Generic Drugs	75th Percentile MPR	9.9	9.1	68
	25th Percentile MPR	3.5	3.6	68
Public Market (Retail)	50th Percentile MPR	6.7	10.3	44
Originator Drugs	75th Percentile MPR	12.7	20.2	44
	25th Percentile MPR	4.7	7.3	44
Public Market	50th Percentile MPR	1.8	1.9	62
Generic Drugs	75th Percentile MPR	3.1	3.1	62
	25th Percentile MPR	1.2	1.2	62
Public Market	50th Percentile MPR	7.9	10.9	30
Originator Drugs	75th Percentile MPR	13.8	13.2	30
	Procurement	25th Percentile MPR	4.9	10.5
Public Market	50th Percentile MPR	1.39	0.96	61
Generic Drugs	75th Percentile MPR	2.6	2.7	61
	Procurement	25th Percentile MPR	0.85	0.57

Summary Statistics (Covariates)

	Measure	Mean	SD	n
Measures of Income Concentration	Gini Coefficient	41.5	7.8	67
	SH10	33.1	6	67
	SH20	47.9	6.5	67
Income	GDP/Capita (\$US '000)	2.049	3.88	72
	Market Size	Population (Mill.)	212.5	408.8

Income Concentration in Low and Middle Income Countries



- Low and middle income countries exhibit a wide variation in degree of income concentration

Gini Index Summary Statistics (n=121)

Median	41.5
Min	27.2
Max	74.3
25 th Percentile	36.7
75 th Percentile	49.0

Methods

Basic Model:

$$\ln(\text{Median MPR}_{ist}) = \alpha + \beta_{it} \text{GDP} / \text{cap} + \beta_{it} \text{Gini} + \beta_{it} \text{Pop} + \varepsilon_{ist}$$

Alternative Dependent Variables:

A) 75th percentile MPR

B) 25th percentile MPR

Initial Results: Private Market 50th Percentile MPRs

Market Covariate	Private - Originator Drugs (n=66)		Private - Generic Drugs (n=63)	
	Exp(Coef)	p value	Exp(Coef)	p value
Income Share Top 10%	1.036*	0.02	1.035**	<.01
Population (Mil.)	.9989**	<.01	.9991**	<.01
GDP/Capita (\$,000)	1.021	0.75	1.111	0.15
R ²	0.49		0.46	

Initial Results: Public Market 50th Percentile MPRs

Market Covariate	Public - Originator Drugs (n=44)		Public - Generic Drugs (n=40)	
	Exp(Coef)	p value	Exp(Coef)	p value
Income Share Top 10%	0.9956	0.9	1.003	0.81
Population (Mil.)	.9992*	0.02	.9994*	0.01
GDP/Capita (\$,000)	0.829	0.461	1.017	0.86
R ²	0.17		0.14	

Price Ratio Elasticities

Income Concentration and Price Ratio Elasticities for Private Market (H1/H2)

Each 1% increase in income share among the Top 10% of the population increases 50th percentile median price ratio for originator products by 3.6% . Similar effect in generics market.

Income Concentration and Price Ratio Elasticities for Public Market (H3)

There is *no effect* of income concentration on public market 50th Percentile MPR for either originators or generics

Price Ratio Elasticities

Market Size and Price Ratio Elasticities (H4/H5)

For each 10 million increase in population size the public (private) sector 50th percentile MPRs decreases by 0.8% (1.1%) in the originator-public market and 0.6% (0.9%) in the generic-public market.

While the magnitudes are small, it is somewhat surprising that the public sector effect is smaller than the private sector effects.

Price Ratio Elasticities

Income per Capita and Price Ratio Elasticities (H6)

No effect detected in either public or private markets for both product types (originator and generics)

....Similar results at the 25 percentile and 75 percentile levels as well.

Important Caveats

- Potential for differential product selection across countries to influence results
- Aggregation Bias (Median of Medians)
- Compare specific products, not median levels across all products (product level analysis ongoing)
- Ideal price differentiation evidence relies on *within* country analysis (...also working on this).
- No quantity information (just price)
- 0's in the public sector retail level (public subsidy for product)

Initial Conclusions

Given prior caveats,

- A) In low and middle income markets, income concentration appears to be the more relevant factor than income level in price setting for both originator and generic products in the private sector
- B) No effect of income concentration for public sector pricing.
- C) Volume-price tradeoff (Larger populations → Slightly lower prices) in both public and private sector.

Thank You