Association between the availability and affordability of medicines under the uniform price regulation policy in low- and lower-middle-income countries

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1. Background

Uniform pricing:

- **Definition:** policy when manufacturers and suppliers are controlled to provide a medicine at the same retail price across all drug outlets and/or regions in the country.

  → *Technically, a specific cap is settled and medicine prices are restricted to cross this cap (neither increase, nor decrease)* [Watal, 2001].

- **Purpose**:
  1. Provide more transparency on prices and pricing process.
  2. Improve affordability of medicines by decreasing their prices [Kyle, 2007].

- **Potential consequences**:

  The affordability of medicines is expected to improve while their availability may decrease due to:

  affordability vs. availability

  1. The lost incentives among suppliers to provide medicines at uniform prices since production cost of the off-patent medicines in low- and lower-middle income countries (LICs & LMICs) is small and mark-ups, that are allowed to be imposed over the production price of the medicine are limited by the price cap [WHO, 2015].

  2. The potential to undermine higher prices in other markets (via reference pricing and/or parallel trade) [Danzon, 2003; Kyle 2007].
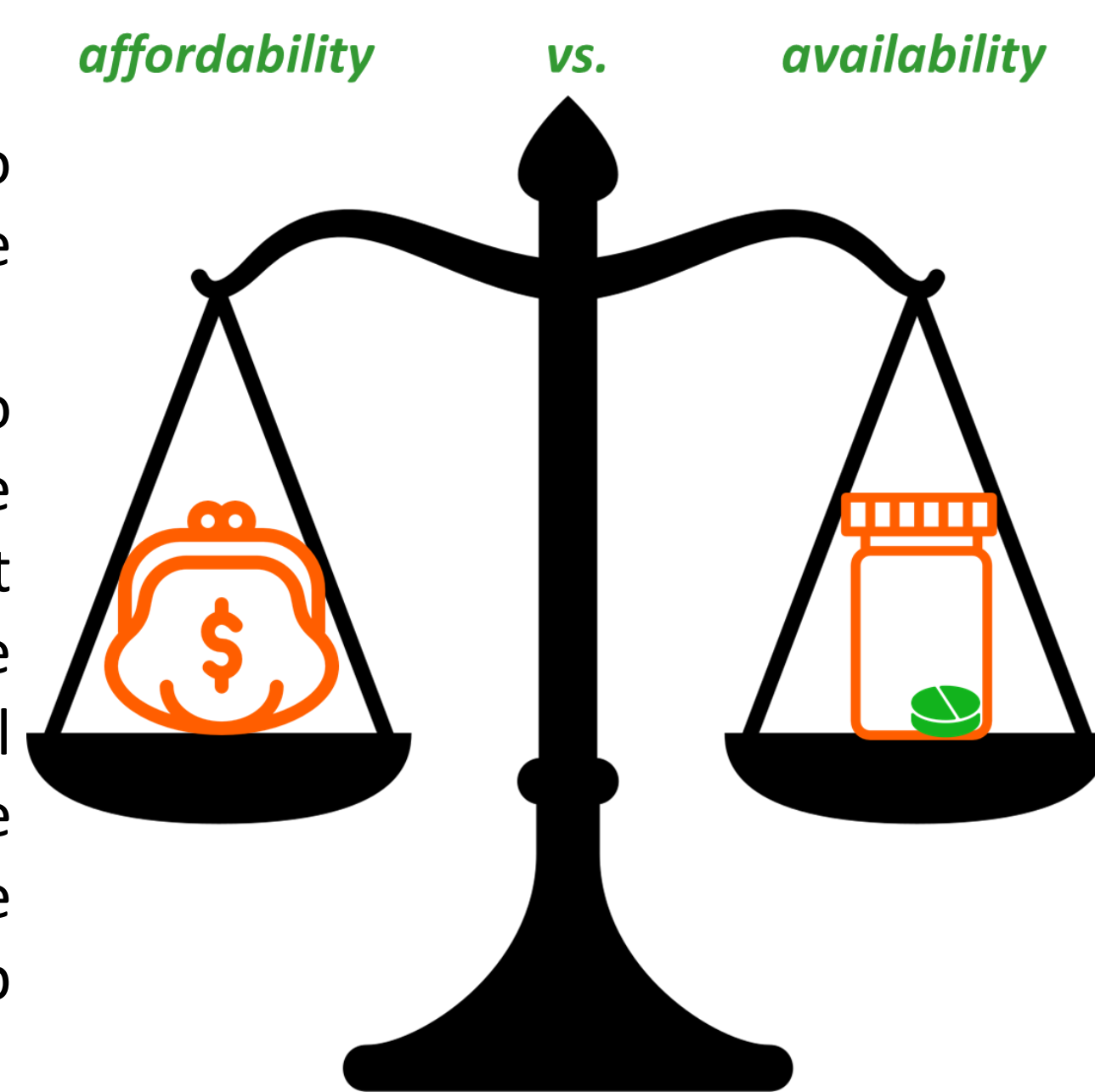
2. Research question

What is the joint association between the uniform pricing with the availability and affordability of medicines across LICs and LMICs?

→ **Hypothesis**: *Despite improving affordability, uniform pricing may lead to a poorer supply of medicines and result in their lower availability.*

3. Data

- This analysis is based on *Health Action International (HAI/WHO) data* that provides information on the availability and affordability of medicines as well as their prices.
- HAI/WHO data is complemented with other data sets that provide information on the demand and supply determinants of availability and affordability of medicines:

  Global burden of disease, Global Health Expenditure Database, the World Bank, Transparency international and the WHO Pharmaceutical country profiles.

- The analysis captures **26 LICs and LMICs**, **38 medicines** used to treat/control **14 diseases**.

Low-income countries | Lower-middle-income countries
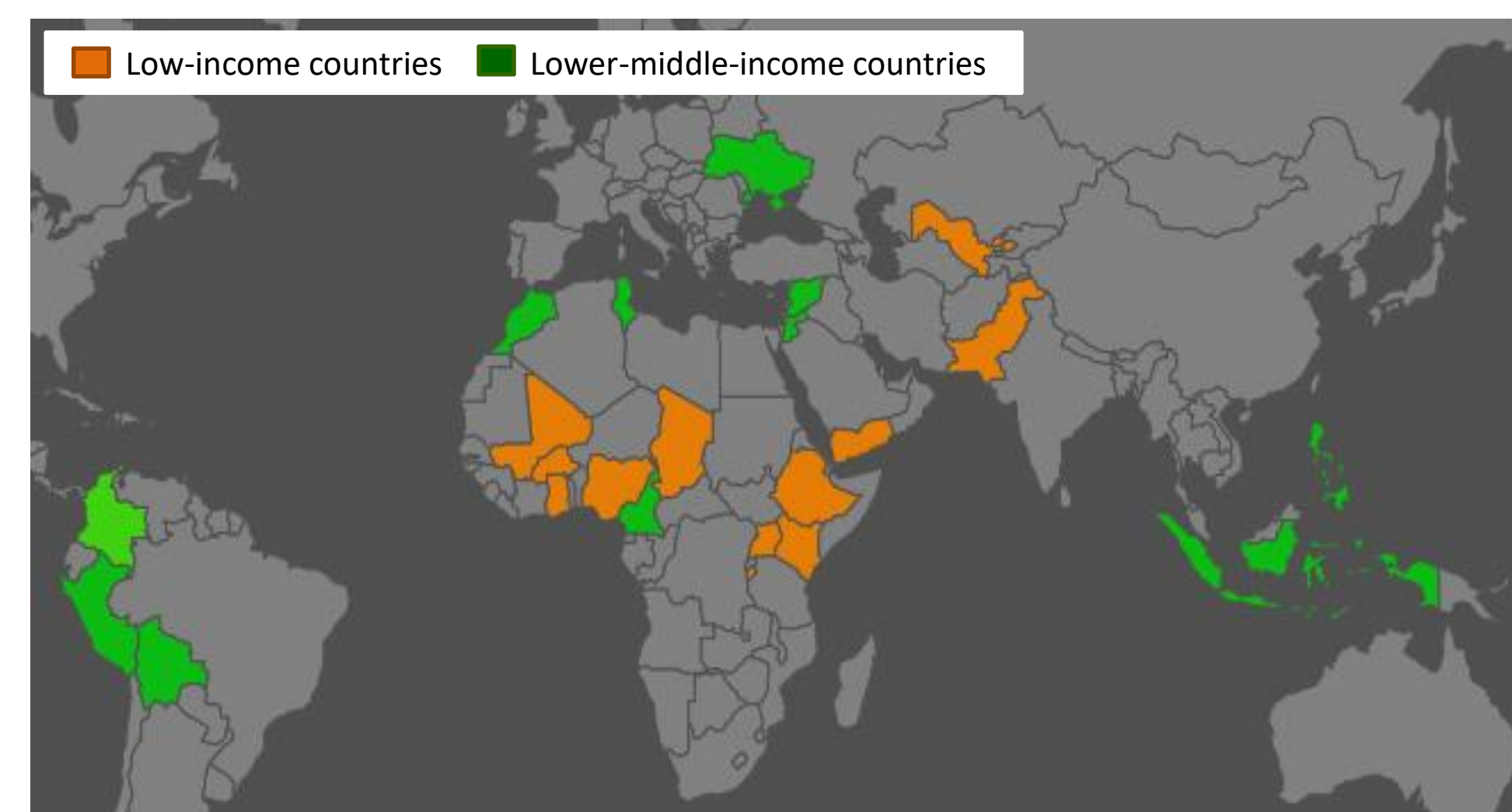
4. Variables

- **Dependent variables:**

  Affordability - number of daily wages a lowest paid individual has to spend so that to pay for a one-month course of medicine treatment out-of-pocket.

  Availability - proportion of drug stores/pharmacies where medicine is on stock at the time of data collection.

- **Core explanatory variable:**

  Price regulation - medicine used to treat/control a selected disease in a selected country is governed by the uniform or differential prices.

- **Other explanatory variables:**

  Demand factors: diseases prevalence, out-of-pocket payments for health, aged population (65+), GINI index.

  Supply factors: ease of doing business index, corruption perception index, medicine production (raw materials, formulations, R&D), logistics performance index and parallel trade provision in the law.

5. Methods

To measure the simultaneous effect of the uniform pricing policy on the availability and affordability of medicines, seemingly unrelated regression models are estimated (SUR).

$$\begin{cases} \text{Affordability} = b_1 - \mathbf{b_{1k}}\text{Price regulation} + b_{1i}\text{Demand}_i + b_{1j}\text{Supply}_j + c_{1m}\text{Control}_m + u_{1n} \\ \text{Availability} = b_2 - \mathbf{b_{2k}}\text{Price regulation} + b_{2i}\text{Demand}_i + b_{2j}\text{Supply}_j + c_{2m}\text{Control}_m + u_{2n} \end{cases}$$

SUR1: Price regulation is expressed via a binary variable:
  no medicine price variability [$p25^{th} = p75^{th}$] → uniform price
  medicine price variability [$p25^{th} \neq p75^{th}$] → differential price

SUR2: Price regulation is expressed via a continuous variable:
  no medicine price variability [IQR= 0] → uniform price
  medicine price variability [IQR ≠ 0] → differential price

Outcomes of interest: 1) The association between the uniform pricing and the affordability of medicine; 2) The association between the uniform pricing and medicine's availability.

Interpretation of the expected outcomes of interest:

  → Negative coefficient b_{1k} would indicate lower number of daily wages that are required to pay for a one-month course of medicine treatment (*i.e. a more affordable medicine*).
  → Negative coefficient b_{2k} would indicate lower proportion of drug stores/pharmacies with a medicine on stock (*i.e. a less available medicine*).

6. Results

Table 1a. SUR1: The association between uniform pricing and access to medicines (pooled data) – all results

	Coef.	Std.Err	Coef.	Std.Err
	Log affordability		Availability	
Price regulation policy[i]	-0.484***	[0.104]	15.344***	[3.115]
Disease prevalence (%)	0.184	[0.579]	-1.532	[17.303]
OOP payments in total health exp. (%)	-0.022***	[0.005]	0.566***	[0.141]
Population at the age of 65+ (%)	0.127***	[0.049]	1.718	[1.470]
GINI coefficient	-0.307***	[0.076]	3.661	[2.266]
Ease of doing business index	-0.231	[0.151]	-11.479***	[4.515]
Corruption perception index	0.705	[0.712]	23.407	[21.278]
Production [raw materials]	-0.473***	[0.107]	1.466	[3.186]
Production [formulations]	-0.495***	[0.235]	20.447***	[7.010]
Production [R&D]	0.607***	[0.106]	-6.990**	[3.180]
Parallel trade	-0.563***	[0.121]	22.204***	[3.614]
Logistic performance index	0.125	[0.385]	-6.598	[11.520]
Controls	*yes*		*yes*	
Constant	1.948**	[0.860]	40.564	[25.700]
R-squared	0.656		0.399	
Correlation matrix of residuals		-0.338***		
N obs.		617		

demand factors; *supply factors*

*p<0.1, **p<0.05, ***p<0.01. [i] a binary variable (1 – uniform pricing, 0 – differential pricing).

- On average **48.4%** fewer daily wages are required for the lowest paid individual to buy a one-month course of medicine treatment when paying a uniform price compared to buying these medicines at prices that differentiate across regions/pharmacies.
- Simultaneously, when medicines are provided at uniform prices they are on stock in on average **15.3%** more pharmacies compared to when they are provided at prices that differentiate.

Table 1b. SUR2: The association between uniform pricing and access to medicines (pooled data) – results on the outcomes of interest

	Coef.	Std.Err	Coef.	Std.Err
	Log affordability		Availability	
Price regulation policy[ii]	0.077**	[0.038]	-2.581**	[1.131]
Correlation matrix of residuals		-0.357***		
N obs.		617		

*p<0.1, **p<0.05, ***p<0.01. [ii] a continuous variable (IQR).

- One additional unit of price differentiation is associated with the increase of the mean number of daily wages required to buy a medicine by **7.7%**.
- Simultaneously, every additional unit of price differentiation is associated with a decrease of the mean proportion of pharmacies with medicine on stock by **2.6%**.

Table 2. The association between uniform pricing and access to medicines (data samples) - results on the outcomes of interest

	Coef.	Std.Err	Coef.	Std.Err	Corr. matrix of residuals	N obs.
	Log affordability		Availability			
SUR 1						
Low-income countries	-0.194	[0.165]	-5.829	[4.972]	-0.247***	371
Lower-middle income countries	-0.726***	[0.119]	25.289***	[3.590]	-0.361***	246
SUR2						
Low-income countries	-0.030	[0.143]	3.655	[4.297]	-0.240***	371
Lower-middle income countries	0.077*	[0.040]	-2.759**	[1.222]	-0.420***	246
SUR1						
Originator branded medicines	-0.470***	[0.111]	19.837***	[4.020]	-0.280***	226
Generic medicines	-0.457***	[0.137]	13.294***	[4.265]	-0.350***	391
SUR2						
Originator branded medicines	0.014	[0.032]	-1.417	[1.170]	-0.340***	226
Generic medicines	0.731***	[0.185]	-13.341**	[5.799]	-0.354***	391

*p<0.1, **p<0.05, ***p<0.01.
SUR1: Price reg. policy – a binary variable (1 – uniform pricing, 0 – differential pricing). SUR2: Price reg. policy – a continuous variable (IQR).

According to both SUR models uniform pricing policy is statistically significantly associated with access to medicines **only in LMICs and only for generics**.

Conclusion:

1. As expected, medicines provided at uniform prices are more affordable compared to medicines provided at prices that differentiate across regions and drug stores/pharmacies in the country.

2. Unexpectedly, medicines provided at uniform prices are found to be more available compared to medicines provided at prices that differentiate (*reject the hypothesis*).

3. Medicines provided at uniform prices compared to medicines sold at the prices that differentiate are more affordable and more available in LMICs but not in LICs.

4. Uniform pricing policy is associated with both better availability and better affordability of generic medicines but not of the originator branded medicines.