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If time permits there may be opportunity for further questions at the end of the presentation.

There will be polls included in this presentation, you will have 1 minute per question to respond.

The speaker column can be minimized using the options in the top left corner of the tab.

This webinar will be recorded and the recording will be added on UNU-WIDER YouTube channel.

WIDER Webinar 7 July | Olivier Bargain | University of Bordeaux  
Discussant | Amina Ebrahim | UNU-WIDER  
Chair: Patricia Justino

## Poverty and COVID-19 in developing countries



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- *“At the same time while dealing with a COVID-19 pandemic, we are also on the brink of a hunger pandemic.”* (David Beasley, UN World Food Programme Executive Director).
- Strict lockdowns to fight the COVID-19 pandemic can put the lives of poor people at a significant risk (Egger et al.; 2020; Decerf et al.; 2020; Ravallion; 2020; Mobarak and Barnett-Howell; 2020; Piper; 2020).
- A large share of population in developing countries work informally and depend on daily incomes (Robalino; 2020).
- So far, no evidence on the effect of poverty on compliance with confinement rules in low-income countries during a massive health crisis.

# What We Do

- Examine whether **poor areas in developing countries** comply less with **social distancing rules** during a global pandemic.
- Use Google mobility indicators to measure compliance.
- Illustrate that **people in high-poverty regions** move significantly more after **lockdown**, compared to low-poverty regions.
- Check how the effect of poverty translates into a faster spread of COVID-19.

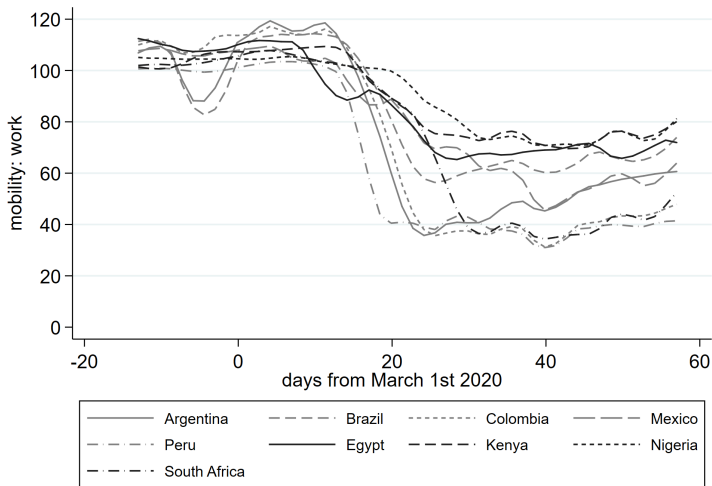
## Poverty

- Aim: to explore pre-pandemic and within-country variation in the level of poverty across regions
- Regional poverty measured as a share of population in region living below national or international poverty lines (e.g. World Bank's \$1.9, \$3.2, or \$5.5 PPP)
- Source: official poverty statistics or own estimations using household survey data
- Sample: 241 regions in 9 countries (Argentina, Brazil, Colombia, Mexico, Peru, Egypt, Kenya, Nigeria, South Africa)
- Regional poverty in three forms:
  - ▶ **Binary:** regional poverty rate below (**low poverty**) or above (**high poverty**) national average;
  - ▶ **Terciles:** regional poverty rate below country's 25th percentile (**low poverty**), between 25th and 75th percentile (**moderate poverty**), and above 75th percentile (**high poverty**);
  - ▶ **Continuous:** regional poverty rate standardized with respect to country-level mean and standard deviation (z-score).

## Google COVID-19 Mobility Reports

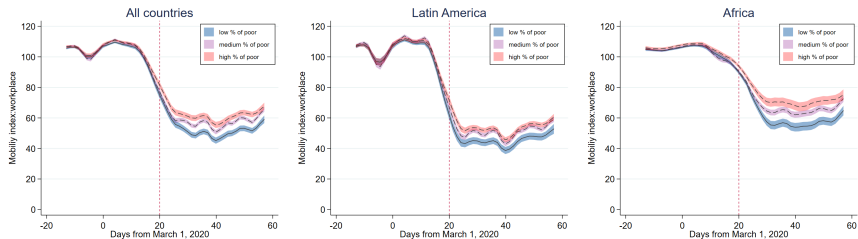
- Aggregated and anonymized data from user mobile devices' Location History.
- Measure of how the number of visits to, or length of stay at different locations change over time compared to baseline period of Jan. 3 - Feb. 6, 2020.
- Location categories:(i) retail and recreation, (ii) grocery and pharmacy, (iii) parks, (iv) transit stations, (v) workplaces, and (vi) residential areas.
- Overall time span: Feb. 16. - Apr. 26, 2020.

# Data: Mobility to Workplaces around March-April 2020



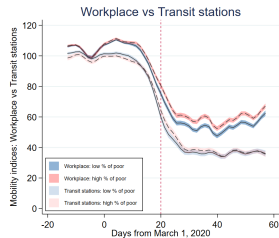
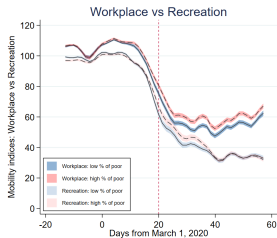
Source: Google mobility data.

# Graphical Analysis: Mobility to Workplaces by Poverty Groups



Source: author's calculations based on Google mobility data (mobility for workplace) and poverty data from national statistics offices and authors' estimations using household surveys. Local polynomial fit with 95% CI of daily mobility across regions, weighted by  $(1/n)$  of regions in the corresponding country. Poverty is measured as the share of people in region living below national/international poverty lines. % of poor is defined as low if region's poverty rate is below 25th percentile of regional poverty rates within country, medium if between 25th and 75th percentile, and high if above 75th percentile.

## Mobility to Workplaces vs. Other Locations



Source: author's calculations based on Google mobility data and poverty data from national statistics offices and authors' estimations using household surveys. Local polynomial fit with 95% CI of daily mobility across regions, weighted by (1/N of regions in the corresponding country). Poverty is measured as the share of people in the region living below national/international poverty lines. % of poor is defined as low (high) if region's poverty rate is below (above) country's average poverty rate.



# Estimation: Difference-in-Differences

$$Mobility_{it}^j = \alpha + \gamma Post_t \times Poverty_i + \mu_i + \theta_t + \varepsilon_{it} \quad (1)$$

- $Mobility_{it}^j$ : mobility of type  $j$  in region  $i$  on day  $t$
- $Post_t = 1 * (t > \text{March 20})$ 
  - ▶ March 20 - average lockdown date in our sample.
  - ▶ Results are robust to national or continent-specific lockdown dates.
  - ▶ Common trends assumption confirmed (i) visually and (ii) with estimations using sample from Feb. 16 - Mar. 10 and placebo cutoff date of March 1.
- $Poverty_i$ : poverty in region  $i$  (binary, terciles or continuous measure of poverty)
- $\mu_i$ : region dummies
- $\theta_t$ : day dummies
  
- Final sample: panel of 241 regions over 57 days starting from March 1.

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	All countries				Africa	Latin America	Latin America (excl. Brazil)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
<i>Binary Poverty</i>							
Post x Poverty	4.035*** (0.512)	4.018*** (0.500)	4.033*** (0.500)	3.331*** (0.528)	6.643*** (0.584)	3.509*** (0.570)	4.187*** (0.655)
R-squared	0.766	0.806	0.806	0.812	0.773	0.885	0.884
<i>Terciles of Poverty</i>							
Post x Moderate Poverty	4.079*** (0.615)	4.070*** (0.606)	4.077*** (0.606)	4.395*** (0.640)	6.149*** (0.708)	3.423*** (0.723)	3.964*** (0.822)
Post x High Poverty	7.819*** (0.709)	7.798*** (0.700)	7.798*** (0.699)	7.447*** (0.745)	10.816*** (0.813)	5.972*** (0.808)	7.353*** (0.927)
R-squared	0.769	0.807	0.807	0.813	0.775	0.885	0.885
<i>Continuous Poverty: z-score</i>							
Post x Poverty	3.179*** (0.248)	3.174*** (0.245)	3.175*** (0.245)	2.933*** (0.261)	4.564*** (0.288)	2.097*** (0.278)	2.542*** (0.317)
R-squared	0.773	0.808	0.808	0.814	0.778	0.885	0.885
Observations	13,664	13,664	13,664	13,664	6,140	7,524	5,985
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Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged cum. COVID-19 cases	No	Yes	Yes	No	No	No	No
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<i>Binary Poverty</i>							
Post x Poverty	4.035*** (0.512)	4.018*** (0.500)	4.033*** (0.500)	3.331*** (0.528)	6.643*** (0.584)	3.509*** (0.570)	4.187*** (0.655)
R-squared	0.766	0.806	0.806	0.812	0.773	0.885	0.884
<i>Terciles of Poverty</i>							
Post x Moderate Poverty	4.079*** (0.615)	4.070*** (0.606)	4.077*** (0.606)	4.395*** (0.640)	6.149*** (0.708)	3.423*** (0.723)	3.964*** (0.822)
Post x High Poverty	7.819*** (0.709)	7.798*** (0.700)	7.798*** (0.699)	7.447*** (0.745)	10.816*** (0.813)	5.972*** (0.808)	7.353*** (0.927)
R-squared	0.769	0.807	0.807	0.813	0.775	0.885	0.885
<i>Continuous Poverty: z-score</i>							
Post x Poverty	3.179*** (0.248)	3.174*** (0.245)	3.175*** (0.245)	2.933*** (0.261)	4.564*** (0.288)	2.097*** (0.278)	2.542*** (0.317)
R-squared	0.773	0.808	0.808	0.814	0.778	0.885	0.885
Observations	13,664	13,664	13,664	13,664	6,140	7,524	5,985
Day Fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	No	No	No	No	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged cum. COVID-19 cases	No	Yes	Yes	No	No	No	No
Region reweighting	No	No	No	Yes	No	No	No

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

# Estimation: Poverty Effect by Mobility Types

	Work	Retail & Recreation	Grocery & Pharmacy	Transit Stations
	(1)	(2)	(3)	(4)
Post x Poverty (bin.)	4.018*** (0.500)	0.821 (0.673)	1.490*** (0.559)	2.086*** (0.655)
P-value: coef. equal to that of Work		0.00	0.00	0.00
Observations	13,664	12,506	12,173	11,359
R-squared	0.806	0.838	0.846	0.722

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

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Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

# Estimation: Robustness Checks

	All countries				Africa	Latin America	Latin America (excl. Brazil)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
<i>March 11th as Cutoff Date</i>							
Post x Poverty (bin.)	4.327*** (0.599)	4.322*** (0.608)	4.334*** (0.607)	3.883*** (0.590)	6.771*** (0.660)	3.852*** (0.658)	4.346*** (0.741)
<i>Extreme Poverty</i>							
Post x Extreme Poverty (bin.)	3.540*** (0.522)	3.555*** (0.510)	3.595*** (0.510)	2.298*** (0.537)	6.682*** (0.595)	2.150*** (0.569)	1.774*** (0.665)
Observations	13,664	13,664	13,664	13,664	6,140	7,524	5,985
Day Fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	No	No	No	No	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged cumulated COVID-19 cases	No	No	Yes	No	No	No	No
Region reweighting	No	No	No	Yes	No	No	No

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

# Estimation: Robustness Checks

	All countries				Africa	Latin America	Latin America (excl. Brazil)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
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Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged cumulated COVID-19 cases	No	No	Yes	No	No	No	No
Region reweighting	No	No	No	Yes	No	No	No

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

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	All countries				Africa	Latin America	Latin America (excl. Brazil)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
<i>March 11th as Cutoff Date</i>							
Post x Poverty (bin.)	4.327*** (0.599)	4.322*** (0.608)	4.334*** (0.607)	3.883*** (0.590)	6.771*** (0.660)	3.852*** (0.658)	4.346*** (0.741)
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Day Fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	No	No	No	No	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged cumulated COVID-19 cases	No	No	Yes	No	No	No	No
Region reweighting	No	No	No	Yes	No	No	No

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$



# Poverty, Mobility and Spread of COVID-19

- Estimated elasticity of **mobility** with respect to **poverty**: around 0.17
  - ▶ 1% (1 standard deviation) increase in regional poverty leads to a 0.17% (10.4%) increase in work-related mobility.
- Estimated elasticity of **the upcoming growth rate of COVID-19 cases** with respect to **mobility**: 0.40-0.47.
  - ▶ **The upcoming growth rate of COVID-19 cases** is calculated as daily average of two-week growth rate, using the data on cumulative COVID-19 cases for the period March 20 - May 3.
  - ▶ 10% increase in mobility leads to a 4%-4.7% increase in the epidemic growth rate
- Estimated elasticity of **the upcoming growth rate of COVID-19 cases** with respect to **poverty**: 0.08.
  - ▶ 10% (1 standard deviation) higher rate of regional poverty is associated with a 0.8% (5%) higher growth rate of COVID-19;
  - ▶ 190 cumulative cases recorded (on average) by March 20th and around 22,500 cases by May 3.
  - ▶ One-standard deviation difference in poverty between two regions correspond to a difference of 11% on May 3 (around 2,500 cases).

# Concluding Remarks

- Poor people whose livelihoods depend on casual labor are likely to comply less with social-distancing requirements in the times of a global pandemic.
- Lockdowns without income support are less likely to elicit broad compliance and can have serious consequences for the poor, especially in low-income countries.
- Our estimated effect of poverty on compliance is certainly a lower bound, yet large enough to underline the urgency of the problem.
  - ▶ Using Google mobility data may lead to underestimation of mobility in high-poverty regions given that less poor are more likely to own smartphone in these regions.
- Future research should:
  - ▶ examine whether social assistance provided by governments helps to ensure a desired level of compliance with containment policies;
  - ▶ extend the sample of countries;
  - ▶ explore disaggregated variation in mobility and poverty;
  - ▶ and account for potential sample representation problem stemming from using aggregated mobile phone data.

▶ Country-Level Graphs: Extended Sample

▶ Social Assistance, Poverty and Compliance

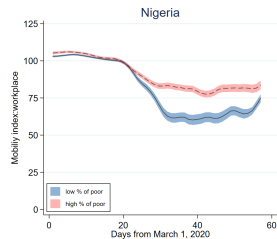
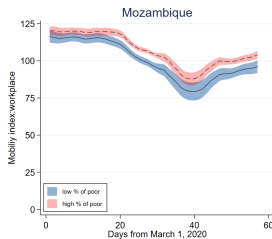
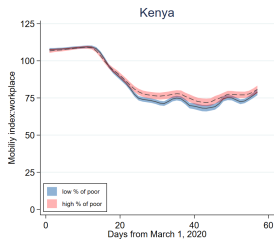
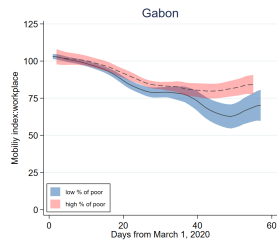
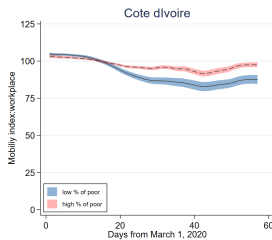
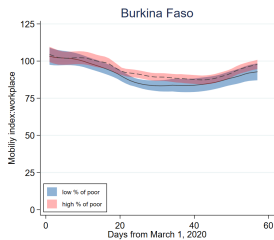
▶ Mobile Penetration Rates

Thank you!

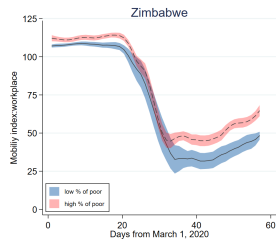
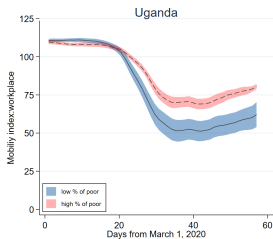
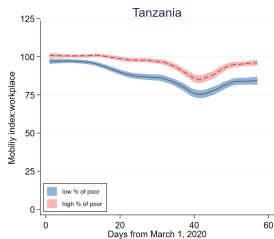
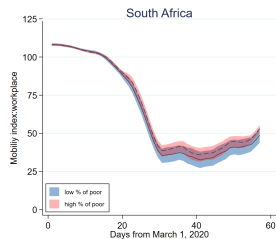
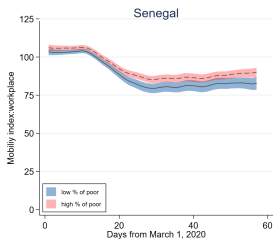
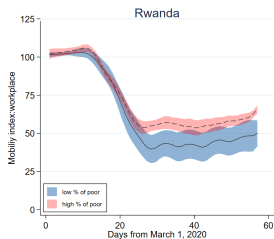
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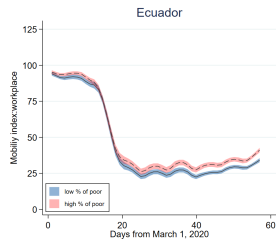
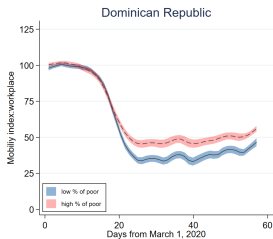
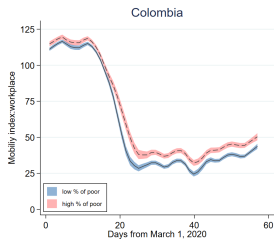
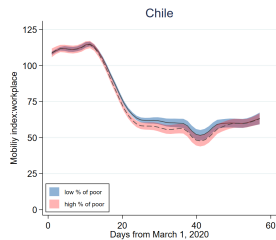
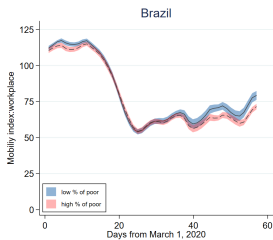
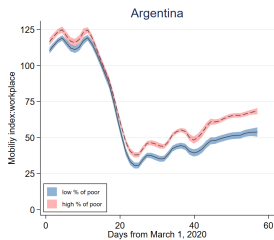
## Graphical Analysis by Country: Africa (i)



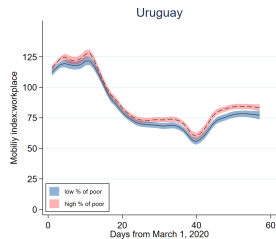
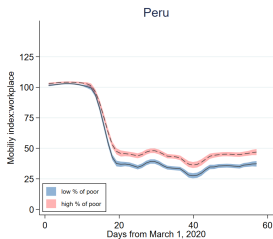
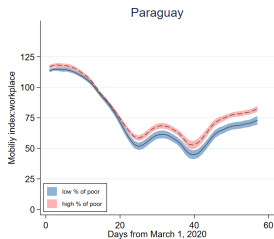
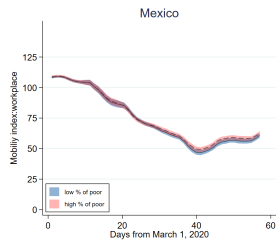
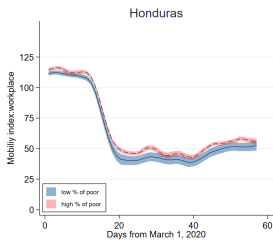
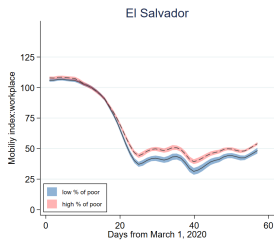
## Graphical Analysis by Country: Africa (ii)



## Graphical Analysis by Country: Latin America (i)

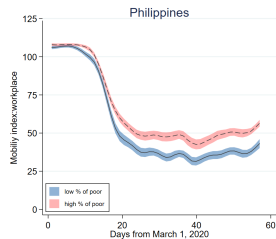
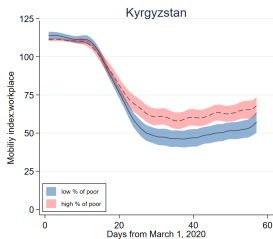
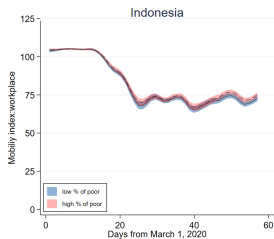
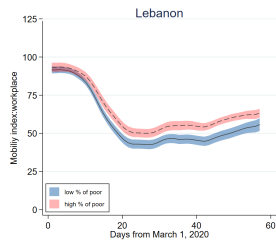
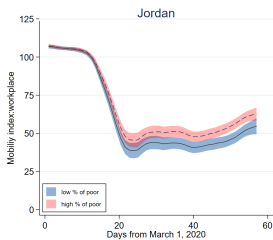
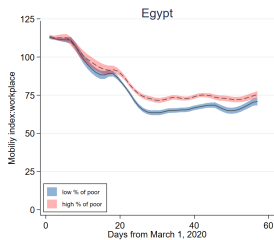


## Graphical Analysis by Country: Latin America (ii)

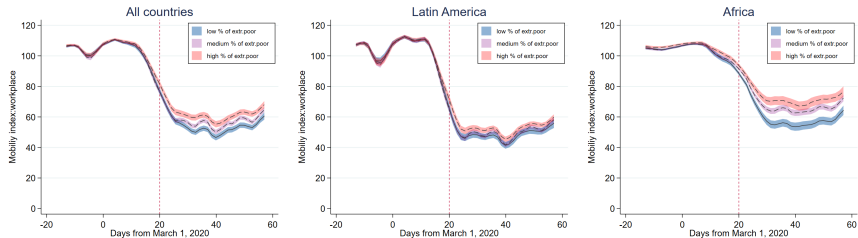




## Graphical Analysis by Country: Middle East &amp; Asia



## Graphical Analysis by Extreme Poverty Groups



Source: author's calculations based on Google mobility data (mobility for workplace) and poverty data from national statistics offices and authors' estimations using household surveys.  
 Local polynomial fit with 95% CI of daily mobility across regions, weighted by  $(1/n)$  of regions in the corresponding country. Extreme poverty is measured as the share of people in region living below national/international extreme poverty lines. % of extremely poor is defined as low if region's poverty rate is below 25th percentile of regional poverty rates within country, medium if between 25th and 75th percentile, and high if above 75th percentile.

# Appendix: Mobile Penetration Rates

Country	Penetration Rate	Indicator	Source	Reporting period
Argentina	126	# accesses per 100 inhabitants	Ente Nacional de Comunicaciones	4th quarter 2019
Brazil	90.63	density of mobile telephony per 100 inhabitant	National Telecommunications Agency	March 2020
Colombia	129.26	# accesses per 100 inhabitants	Ministry of Information Technologies and Communications	3rd quarter 2019
Egypt	95.59	# accesses per 100 inhabitants	Ministry of Communications and Information Technology	February 2020
Kenya	114.8	# SIM per 100 inhabitants	Communications Authority of Kenya	December 2019
Mexico	95.7	# service lines per 100 inhabitants	Federal Telecommunications Institute	3rd quarter 2019
Nigeria	98.9	# active telephone connections per 100 inhabitants	Nigerian Communications Commission	February 2020
Peru	127.6	# mobile phone lines per 100 inhabitants	National Institute of Statistics and Informatics	September 2018
South Africa	159.93	# cellular phone subscriptions per 100 inhabitants	ITU World Telecommunication/ICT Indicators database	2018

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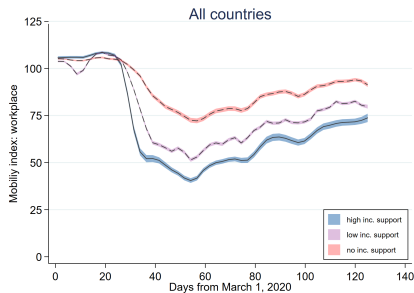
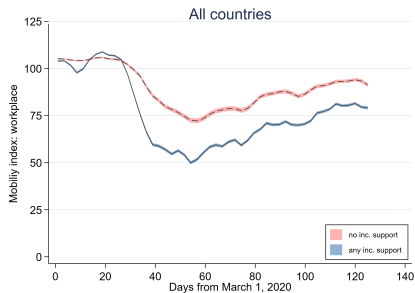
## Social Assistance during COVID-19

- The Oxford COVID-19 Government Response Tracker (OxCGRT)
- Data on whether government is providing income support to those who lost jobs or cannot work (country X day):
  - ▶ 0 - no income support
  - ▶ 1 - income support covering less than 50% of lost income
  - ▶ 2 - income support covering more than 50% of lost income
- In **binary** form: a dummy indicating whether government is providing no (0) or any income support (1)

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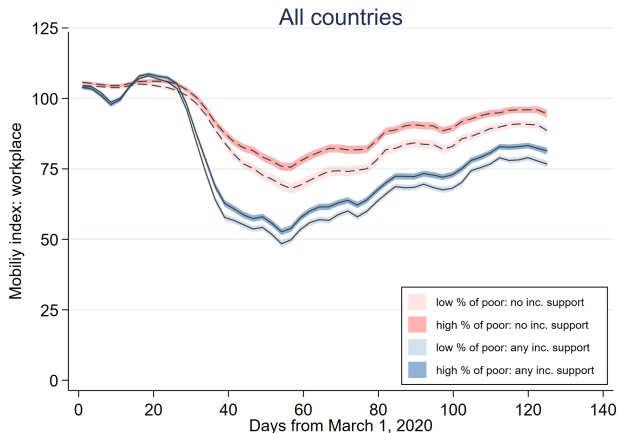
# Appendix:

## Social Assistance and Compliance

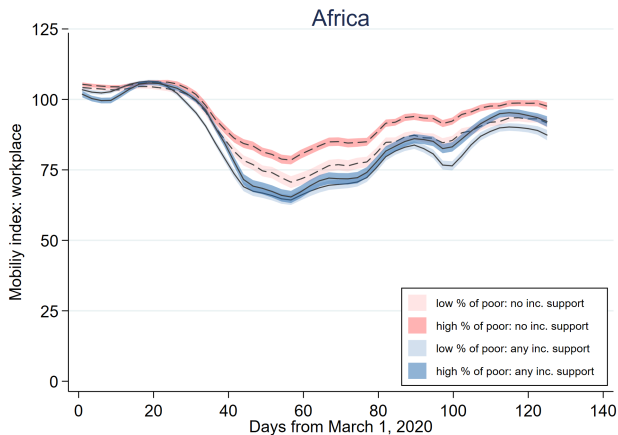


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## Social Assistance, Poverty and Compliance



## Social Assistance, Poverty and Compliance



# Social Assistance, Poverty and Compliance

## Difference-in-Differences: Baseline Model

$$Mobility_{it}^j = \alpha + \beta IncomeSupport_{ct} + \gamma Post_t \times Poverty_i + \delta Poverty_i \times IncomeSupport_{ct} + \mu_i + \theta_t + \varepsilon_{it}$$

- $Mobility_{it}^j$ : mobility of type  $j$  in region  $i$  on day  $t$
- $IncomeSupport_{ct}$ : income support status in country  $c$  on day  $t$  (binary)
- $Post_t = 1 * (t > \text{March 20})$
- $Poverty_i$ : poverty in region  $i$  (binary)
- $\mu_i$ : region dummies
- $\theta_t$ : day dummies
  
- Final sample: panel of 35 countries in Latin America and Africa, 524 regions over 111 days starting from March 1 (unbalanced panel).



## Social Assistance, Poverty and Compliance

	All countries					
	(A)	(B)	(C)	(D)	(E)	(F)
Income Support (bin.)	-5.482*** (0.243)	-4.598*** (0.274)	-5.465*** (0.227)	-4.940*** (0.292)	-4.862*** (0.292)	-7.003*** (0.379)
Poverty (bin.)		1.970*** (0.309)				
Post X Poverty (bin.)		4.228*** (0.368)		3.859*** (0.422)	3.845*** (0.422)	4.484*** (0.560)
Poverty (bin.) X Income Support (bin.)		-1.871*** (0.253)		-1.122*** (0.391)	-1.068*** (0.391)	-0.943* (0.494)
R-squared	0.714	0.725	0.789	0.790	0.791	0.786
Obs.	53,840	53,094	53,094	53,094	53,094	53,094
Day Fe	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	No	No	No	No
Region FE	No	No	Yes	Yes	Yes	Yes
Lagged cumulated COVID-19 cases	No	No	No	No	Yes	No
Region reweighting	No	No	No	No	No	Yes

Note: Robust standard errors in parentheses. Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$