

Digital development and employment gender gaps during the COVID-19 pandemic: evidence from Latin America and the Caribbean

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Outline

- 1 Motivation
- 2 Where do we stand? Literature review
- 3 Data
 - Data sources
 - Descriptive statistics
- 4 Methodology
- 5 Results
- 6 Conclusions
- 7 Appendix

Motivation

- Digital development is critically important as it significantly impacts the economy and society.
- Despite its negative effects, the COVID-19 pandemic has accelerated digital development in Latin America and the Caribbean.
- The rapid increase in connectivity and digital services helped mitigate the pandemic's negative impact on the labor markets, especially for those with enough flexibility to continue working from home.
- This shift has the potential to narrow gender employment gaps, as women previously excluded from traditional job markets due to caregiving and household responsibilities can now access these emerging opportunities.

Digital development in LAC

- While the LAC region has made progress in this area, it still lags behind other regions, such as Western Europe and Asia
- By 2021, the LAC region had 46% fixed broadband access, compared to 57% in Eastern Europe, 87% in Western Europe, and 59% in Asia Pacific
- Regarding digital financial transactions, the LAC region still faces challenges:
 - Growth is lower than in other regions, such as Western Africa.
 - LAC experienced the lowest growth rate in the number of registered mobile money accounts (2.5% vs Western Africa 14.5%) and the lowest growth rate in transaction value (1.4%, Western Africa 34.9%)

Digital development and Labor Markets

- Technological progress related to digital development has the potential to impact labor market outcomes ([Bakker, 2023](#); [Loko and Yang, 2022](#))
- Digital Development enhance labor market efficiency [Autor \(2001\)](#) and reduce gender gaps [Klonner et al. \(2010\)](#)
- Internet access increase labor force participation by 4.1 % [Dettling \(2017\)](#)
- The COVID-19 pandemic impacted women's employment more than men increasing the gender disparities during the pandemic. [Alon et al. \(2020\)](#) and [Adams-Prassl et al. \(2020\)](#)
- The COVID-19 crisis also brought historically high levels of absences from work ([Mejía-Mantilla et al., 2021](#))

Empirical strategies

We use two approaches to examine the relationship between digital development and employment gaps:

- 1 We exploit data from household surveys developed by the World Bank and UNDP to capture variation across households and countries. This allows us to identify the effects of digital availability on employment and job losses.
- 2 Robustness: We employ cross-country panel data to understand the effects of expanding internet availability on employment rates by gender in LAC.

We will be **focusing on the first approach.**

Data

- The database is from the second phase of the **High-Frequency Phone Survey (HFPS)**, wave 2 for LAC.
- The information was collected between **October and December of 2021**, covered **22 countries in LAC**, and included questions regarding individual and household demographics, income, employment, health, and education, among other topics.
- The data is part of a global-scale effort to better understand the pandemic's effects and their mechanisms. In LAC this effort was coordinated between the World Bank Group and the UNDP.

Variables used

Two main outcome variables:

- **Job loss:** defined as a binary variable that takes a value of one for individuals who reported they are not currently working and that they lost their pre-pandemic job
- **Employed:** a binary variable that takes a value of one if the individual reported having worked in the last week.

The main independent variable is called "**Women with Internet**", which is the interaction of the dummy variables:

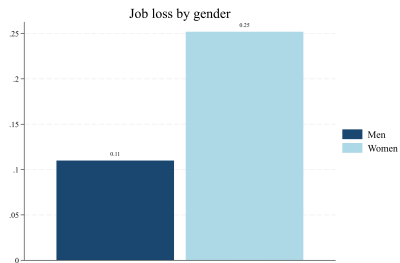
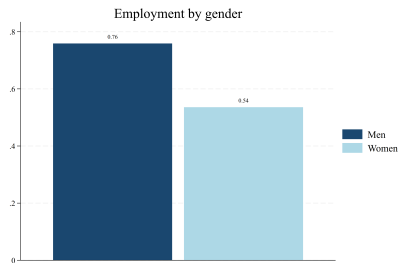
- **Women:** takes value one if the individual is a woman and zero otherwise
- **Internet:** takes value one if they have Internet access in their household, and zero otherwise

The analysis also includes control variables such as country, state, education level, and marital status.

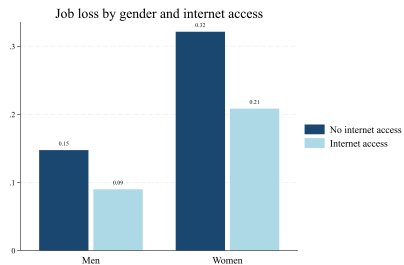
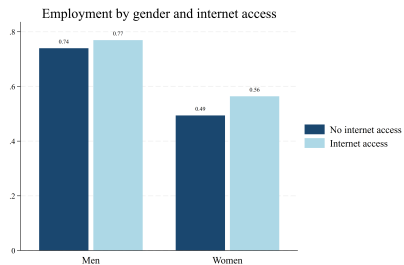
Descriptive statistics

	No. Obs.	Job loss	Employed	Women	Internet access	Women with internet access	Increased household chores	Household with children
Belize	898	22.9%	57.7%	50.3%	69.3%	34.3%	31.3%	67.1%
Guatemala	1,521	15.9%	66.9%	51.9%	33.3%	17.1%	20.6%	72.7%
El Salvador	812	13.7%	66.1%	55.3%	47.3%	24.8%	20.3%	63.5%
Honduras	1,004	21.2%	57.8%	52.5%	42.1%	20.1%	20.3%	76.2%
Nicaragua	865	13.2%	67.5%	51.8%	32.6%	15.9%	23.4%	72.5%
Costa Rica	905	18.7%	60.8%	49.9%	62.2%	31.1%	28.2%	50.2%
Panama	986	25.6%	53.1%	50.3%	58.3%	29.8%	26.4%	60.3%
Haiti	2,361	33.3%	46.2%	51.6%	9.0%	3.9%	35.4%	74.8%
Peru	1,302	21.9%	67.7%	50.7%	48.9%	24.0%	33.2%	69.0%
Mexico	2,511	14.7%	66.0%	52.0%	68.6%	34.0%	30.4%	58.1%
Argentina	1,321	13.1%	65.6%	51.8%	76.9%	39.3%	25.8%	49.4%
Chile	1,329	13.1%	62.5%	51.1%	73.6%	32.9%	37.9%	45.2%
Colombia	1,376	26.5%	58.9%	52.1%	58.5%	30.1%	27.9%	64.5%
Bolivia	1,183	13.7%	74.0%	50.3%	59.9%	30.6%	22.9%	67.8%
Guyana	875	16.3%	63.1%	49.8%	70.3%	34.2%	37.7%	61.6%
Ecuador	1,615	17.3%	64.7%	50.6%	74.2%	36.6%	25.8%	71.8%
Paraguay	1,061	10.9%	77.4%	50.0%	51.9%	22.2%	20.7%	61.8%
Uruguay	930	16.8%	61.0%	52.3%	72.4%	35.9%	22.6%	42.8%
St Lucia	860	13.2%	69.1%	50.7%	81.5%	42.4%	31.0%	47.2%
Dominica	879	15.1%	66.0%	49.6%	83.2%	43.8%	37.7%	51.6%
Dominican Republic	1,197	20.8%	61.4%	50.5%	57.0%	29.1%	28.8%	63.5%
Jamaica	871	14.4%	65.7%	51.0%	71.0%	36.2%	35.4%	57.2%
Total	26,662	17.4%	64.4%	51.7%	62.4%	31.0%	28.7%	60.5%

Descriptive statistics



Descriptive statistics



Methodology

We use a fixed effects model, in a diff in diff spirit, to estimate how being a woman and having internet connectivity affects labor outcomes. This specification is represented in the following equation:

$$Y_i = \alpha + \beta_1 \text{Female}_i * \text{Internet}_i + \beta_2 \text{Female}_i + \beta_3 \text{Internet}_i + \delta_c + \delta_{\text{Marital}} + \delta_{\text{Educ}} + \varepsilon_i \quad (1)$$

Where:

- Y_i is either the outcome variables “employment” or “job loss”
- δ_c is the country-state fixed effects
- δ_{Marital} is marital status fixed effects
- δ_{Educ} is level of education fixed effects

The coefficient of interest is β_1 , it represents the effect of being female and having internet access on the labor market outcomes compared to women without internet access

Methodology

In addition, to study the heterogeneity of these correlations, we apply the main model to a sample split by the group variable. These analyses can be represented as:

$$Y_i = \alpha + \beta_1 \mathit{Female}_i * \mathit{Internet}_i + \beta_2 \mathit{Female}_i + \beta_3 \mathit{Internet}_i + \delta_c + \delta_{\mathit{Marital}} + \delta_{\mathit{Educ}} + \varepsilon_i$$

if group_i = 1 and if group_i = 0

Where $group_i$ represents the binary variables “High COVID-19 level”, “Decreased income”, “Increased household chores”, and “Household with children”.

Main results

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Job loss						
Women with internet			-0.0515*	-0.0523**	-0.0510*	-0.0524**
			(0.0263)	(0.0262)	(0.0264)	(0.0264)
Women			0.185***	0.187***	0.178***	0.186***
			(0.0228)	(0.0225)	(0.0227)	(0.0228)
Internet	-0.0798***	-0.0585***	-0.0290	-0.0281	-0.0288	-0.0250
	(0.0153)	(0.0152)	(0.0186)	(0.0185)	(0.0188)	(0.0189)
Household with children				-0.0164		
				(0.0123)		
Increased household chores					0.0589***	
					(0.0137)	
Has an smartphone						-0.0642
						(0.0442)
Constant	0.225***	0.212***	0.125***	0.134***	0.111***	0.184***
	(0.0130)	(0.0122)	(0.0162)	(0.0191)	(0.0173)	(0.0442)
Observations	26,662	26,507	26,507	26,507	26,507	14,217
R-squared	0.012	0.087	0.135	0.137	0.137	0.143
Country FE	YES	YES	YES	YES	YES	YES
State FE	NO	YES	YES	YES	YES	YES
Education FE	NO	YES	YES	YES	YES	YES
Marital status FE	NO	YES	YES	YES	YES	YES

Main results

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B. Employment					
Women with internet			0.0403*	0.0425*	0.0397	0.0427*
			(0.0245)	(0.0244)	(0.0245)	(0.0245)
Women			-0.241***	-0.248***	-0.236***	-0.244***
			(0.0189)	(0.0187)	(0.0189)	(0.0189)
Internet	0.0612***	0.0315**	0.00223	-0.000671	0.00331	-0.00793
	(0.0144)	(0.0141)	(0.0190)	(0.0189)	(0.0190)	(0.0190)
Household with children				0.0558***		
				(0.0124)		
Increased household chores					-0.0533***	
					(0.0140)	
Has an smartphone						0.143***
						(0.0383)
Constant	0.605***	0.623***	0.754***	0.725***	0.766***	0.623***
	(0.0105)	(0.0105)	(0.0150)	(0.0169)	(0.0157)	(0.0390)
Observations	26,662	26,507	26,507	26,507	26,507	14,217
R-squared	0.012	0.087	0.135	0.137	0.137	0.143
Country FE	YES	YES	YES	YES	YES	YES
State FE	NO	YES	YES	YES	YES	YES
Education FE	NO	YES	YES	YES	YES	YES
Marital status FE	NO	YES	YES	YES	YES	YES

Main results

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel C. Hours worked					
Women with internet			0.0403*	0.0425*	0.0397	0.0427*
			(0.0245)	(0.0244)	(0.0245)	(0.0245)
Women			-0.241***	-0.248***	-0.236***	-0.244***
			(0.0189)	(0.0187)	(0.0189)	(0.0189)
Internet	0.0612***	0.0315**	0.00223	-0.000671	0.00331	-0.00793
	(0.0144)	(0.0141)	(0.0190)	(0.0189)	(0.0190)	(0.0190)
Household with children				0.0558***		
				(0.0124)		
Increased household chores					-0.0533***	
					(0.0140)	
Has an smartphone						0.143***
						(0.0383)
Constant	0.605***	0.623***	0.754***	0.725***	0.766***	0.623***
	(0.0105)	(0.0105)	(0.0150)	(0.0169)	(0.0157)	(0.0390)
Observations	26,662	26,507	26,507	26,507	26,507	14,217
R-squared	0.012	0.087	0.135	0.137	0.137	0.143
Country FE	YES	YES	YES	YES	YES	YES
State FE	NO	YES	YES	YES	YES	YES
Education FE	NO	YES	YES	YES	YES	YES
Marital status FE	NO	YES	YES	YES	YES	YES

Additional results

	(1)	(2)
	Household chores increased	Household with children
Panel A. Job loss		
Women with internet	-0.0904* (0.0481)	-0.0631** (0.0292)
Women	0.217*** (0.0390)	0.225*** (0.0234)
Internet	0.00182 (0.0379)	-0.00649 (0.0190)
Constant	0.131*** (0.0293)	0.0944*** (0.0149)
Observations	5,402	10,982
R-squared	0.191	0.173
Panel B. Employment		
Women with internet	0.0555 (0.0441)	-0.0009 (0.0281)
Women	-0.219*** (0.0353)	-0.252*** (0.0210)
Internet	-0.0309 (0.0369)	0.0131 (0.0216)
Constant	0.727*** (0.0290)	0.784*** (0.0163)
Observations	8,147	16,594
R-squared	0.187	0.169
Country FE	YES	YES
State FE	YES	YES
Education FE	YES	YES
Marital status FE	YES	YES

Conclusions

- Our findings suggest that higher levels of digital development are associated with higher employment and lower job loss in the LAC region, and this effect is accentuated for women.
- Digital development has the potential to significantly alleviate the impact of shocks on employment and job loss, especially for women, as evidenced by the COVID-19 crisis.
- The effect of digital development is stronger when there are larger household burdens, highlighting the potential of digital development to help alleviate the burden of childcare and household responsibilities for women and promote their participation in the labor market.
- Our findings contribute to the growing literature on the relationship between digital development and female employment and provide important insights for policymakers seeking to promote gender equality and economic development.
- With the causal effects of digital development on employment, in general, being highly uncertain, future research should try to disentangle the role of digitalization and current AI from other factors affecting employment and female employment by applying perhaps a modeling approach or a scenario analysis

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Appendix. Country-level analysis

Using World Bank indicators we create two indicators to measure digital development:

- 1 We define *Digitalization* as the percentage of internet users in the total population
- 2 We collect data on the natural logarithm of the number of individuals using the internet in each country as an alternative measure

We define women's labor force participation rate, *Female LFPR*, as the ratio of the female population aged 15 and older that is economically active. We use the female employment to population ratio as an alternative measure.

To establish the relationship between digital development and female employment, we control for various variables that reflect a country's economic, social, and institutional status.

Appendix. Country-level analysis

Empirical strategy

We estimate the following model:

$$\text{FemaleLFPR}_{it} = \beta_0 + \beta_1 \text{Digitalization}_{t-1} + \beta_2 X_{it-1} + \theta_i + \mu_t + \varepsilon_{it}$$

Where X_i is a set of country-level control variables:

- *GDP Per Capita* is the natural logarithm of a country's per capita GDP, indicating the level of economic development.
- *Account* is the proportion of women owning an account at a financial institution
- *Schooling*, defined as the average year of total school for population above 15, to account for a country's human capital
- *Women law*, is a score ranging from 0 to 100, measures the level of female protection in a country. The higher the score, the more effective the legal system is at safeguarding women's rights

Appendix. Country-level analysis

Variables	(1) Female LFPR	(2) Female LFPR	(3) Male LFPR	(4) Male LFPR	(5) Female to male LFPR	(6) Female to male LFPR
Percent of internet users	0.073*** (0.013)	0.065*** (0.013)	0.028*** (0.009)	0.025** (0.011)	0.085*** (0.017)	0.074*** (0.015)
GDP per capita		-3.895*** (1.073)		-0.536 (0.995)		-3.630*** (1.258)
Account		0.753** (0.306)		0.120 (0.183)		1.102*** (0.418)
Schooling		0.196 (0.344)		-0.258 (0.273)		0.249 (0.459)
Women law		0.011 (0.022)		-0.011 (0.011)		0.022 (0.025)
Constant	48.895*** (0.320)	77.702*** (9.440)	71.866*** (0.232)	79.188*** (8.427)	68.013*** (0.406)	91.787*** (11.418)
Observations	4,216	4,036	4,216	4,036	4,162	4,036
R-squared	0.970	0.971	0.948	0.945	0.971	0.973
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Appendix. Robustness checks: Logit

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Job loss						
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio
Women with internet					-0.0235 (0.195)	0.977 (0.190)
Women					1.203*** (0.158)	3.331*** (0.527)
Internet	-0.543*** (0.0993)	0.581*** (0.0577)	-0.416*** (0.103)	0.659*** (0.0677)	-0.384** (0.173)	0.681** (0.118)
Constant	-0.849*** (0.132)	0.428*** (0.0566)	-1.140 (0.835)	0.320 (0.267)	-2.037** (0.863)	0.130** (0.113)
Panel B. Employment						
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio
Women with internet					0.134 (0.124)	1.144 (0.142)
Women					-1.135*** (0.0954)	0.321*** (0.0307)
Internet	0.268*** (0.0630)	1.307*** (0.0824)	0.148** (0.0643)	1.159** (0.0746)	0.0372 (0.105)	1.038 (0.109)
Constant	0.124 (0.0940)	1.132 (0.106)	0.263 (0.452)	1.301 (0.589)	1.010** (0.421)	2.746** (1.157)
Observations	26,662	26,662	26,448	26,448	26,448	26,448
Country FE	YES	YES	YES	YES	YES	YES
State FE	NO	NO	YES	YES	YES	YES
Education FE	NO	NO	YES	YES	YES	YES
Marital status FE	NO	NO	YES	YES	YES	YES