More Heat than Light: Telework in Latin America during the COVID-19 Pandemic*

Gustavo Leyva and Israel Mora

August 18, 2021

Abstract

Using three alternative measures, we argue that the ability to work from home did (does) not matter much for the evolution of Latin American labor markets during the COVID-19 pandemic. Using a comprehensive dataset of labor market stocks for Brazil, Chile, Colombia, Mexico, and Peru, we document that employment in occupations less amenable to teleworking did not fall by much more than overall employment at the onset of the pandemic. The more recent data reveals that it is also bouncing back slightly faster than aggregate employment as the recovery continues. Though high informality rates, a defining feature of the Latin American region, correlate with low telework shares, we find that the contribution of the former to the dynamics of the latter has been minor. Using previous downturns for the two largest countries in the region as a placebo test, we conclude that the available telework measures do not seem to capture something intrinsically different in the pandemic recession.

JEL codes : J16, J46, J81

Keywords : COVID-19, teleworking, informality

*Leyva: Banco de México, Research Department (email: gleyvaj@banxico.org.mx); Mora: Banco de México, Research Department (email: ifmora@banxico.org.mx). We thank comments received from Ivonne Acevedo. We also thank personnel from IBGE (Brazil), DANE (Colombia), INE (Chile), and INEGI (Mexico), for kindly replying to our inquiries and doubts on methodological issues. All errors are our own. The views expressed in this paper do not necessarily reflect those of Banco de México or its Board of Governors.

1. Introduction

The ability to work from home with the aid of information and communication technologies (ICT), or telework, has received considerable attention in the aftermath of the COVID-19 pandemic. The share that these jobs claim in employment has been linked to economic development, with countries at the top of the ladder engaging a higher proportion of the workforce in remote jobs. We explore the role played by this dimension of employment in shaping the outlook of five Latin American countries (LA-5, thereafter, following IMF, 2020) during the pandemic recession, including the latest available data up to 2020.Q4.

There have been many efforts to measure the extent of teleworking at the country level, most notably Dingel and Neiman (2020) and Gottlieb et al. (2021). Dingel and Neiman (2020) extend their telework measure for the U.S (henceforth DN), based on O*NET questionnaires, to a large set of developed and developing countries, including Brazil, Chile, and Mexico, showing how telework shares correlate positively with GDP per capita. Gottlieb et al. (2021)'s measure (henceforth GGPS) represents a major downward revision of the former for a selected group of developing countries, including Colombia, using the STEP survey. In the same vein, in Leyva and Mora (2021), using a more granular classification of occupations, we calculate a telework measure for Mexico (henceforth LM) that is half the share reported by Dingel and Neiman (2020). Panel A of Table 1 summarizes these shares as reported originally and panel B provides a preview of our replication results for all LA-5.[1]

Despite differences in measurement, the real question is whether changes in these shares have been sufficiently meaningful to shape the outlook of labor markets at the onset of the pandemic recession and thereafter. Specifically, we ask whether, in LA-5, the burden of the pandemic recession has fallen disproportionally on jobs that cannot be done from home. To the best of our knowledge, this is the first paper arguing that it has not. We document declining non-telework shares but in a negligible order of magnitude.[2] What is more, employment in these jobs is bouncing back at a slightly faster pace than overall employment as the recovery continues (see Table 2). All

[1] Alfaro et al. (2020), following DN's classification but applied to GEIH data, the Colombian household survey, calculate that the telework share was 14.7 percent of employment in 2019. Two predecessors of Gottlieb et al. (2021) are Saltiel (2020) and Gottlieb et al. (2020). Gottlieb et al. (2020) display in their Figure 4 telework shares of urban employment for Brazil, Colombia, Mexico, and Peru similar to those reported by Dingel and Neiman (2020). Saltiel (2020) focuses on a set of heterogeneous developing countries, including Colombia, also reporting low working-from-home shares.

[2] In Peru, the sole exception, this share has increased and below we explain why.

Table 1: Telework and Informality in LA-5, 2019

	Brazil	Chile	Colombia	Mexico	Peru	LA-5
A. Telework Share, Original (Share of Overall Employment)						
DN	25.7	25.7	-	22.3	-	-
GGPS	-	-	5.8	-	-	-
LM	-	-	-	10.6	-	-
B. Telework Share, Replication (Share of Overall Employment)						
DN	20.1	27.6	20.3	22.4	16.0	20.7
GGPS	5.6	8.8	6.6	7.3	4.2	6.2
LM	14.2	14.3	8.3	10.6	9.8	12.2
C. Informality Rate (Share of Overall Employment)						
Baseline	52.7	27.7	58.6	54.4	71.0	54.3
D. Telework Share (Share of Informal Employment)						
DN	15.8	14.9	10.1	12.1	9.4	13.4
GGPS	4.3	4.5	2.9	3.8	2.2	3.8
LM	9.2	6.2	2.2	3.3	3.4	6.0

Notes: Shares in panel A are taken directly from Dingel and Neiman (2020), Gottlieb et al. (2021), and Leyva and Mora (2021). Shares in panels B and D are from this paper (section 2). Shares in panel C are from Leyva and Urrutia (2021). LA-5 is the weighted average of the numbers reported for the five countries.

in all, we view *measured* teleworking as a short-lived and inconsequential margin for the evolution of labor markets in LA-5 during the pandemic.

This outcome may lay on a feature that is the hallmark of LA-5's labor markets. Slightly more than half of employment in the region is informal (Table 1, panel C), including people working in unregistered businesses or lacking access to health care through social security. Unlike previous downturns, the share of informal workers in overall employment suffered a steep decline (except for Peru) as the pandemic and confinement policies hit particularly hard contact-intensive activities. Common to previous downturns, though, this share — the so-called informality rate — has been leading the recovery (see Table 2).[3] The joint dynamics of non-telework shares and informality rates during the pandemic suggests a close (positive) association, which could also be appreciated across countries in Table 1.[4]

[3] For a thorough account of this evidence, see Leyva and Urrutia (2021). For the role of informality over the business cycle in emerging economies, see Restrepo-Echavarria (2014), Finkelstein Shapiro (2014), Fernández and Meza (2015), Finkelstein Shapiro (2018), Horvath (2018), Leyva and Urrutia (2020), and Horvath and Yang (2021).

[4] This is also shown by Loayza (2020); see p. 3, Figures 3 and 4. In Table 1 above, we present telework shares instead of non-telework shares to conform to the literature and make comparisons more straightforward. However, in the rest of the document, we will refer almost exclusively to *non*-telework shares.

Table 2: Selected Labor Market Stocks in LA-5, Percentage Changes Relative to 2019.Q2

	2020.Q2	2020.Q3	2020.Q4
Brazil			
overall employment rate	−13.1	−14.9	−11.2
non-telework employment rate			
DN	−14.5	−15.9	−12.2
GGPS	−13.4	−15.1	−11.4
LM	−14.5	−16.2	−12.5
informality rate	−4.7	−2.8	−0.5
Chile			
overall employment rate	−24.4	−21.7	−13.5
non-telework employment rate			
DN	−27.6	−24.3	−14.8
GGPS	−25.2	−22.4	−13.8
LM	−25.9	−23.0	−14.1
informality rate	−21.2	−16.2	−2.3
Colombia			
overall employment rate	−26.3	−13.4	−5.8
non-telework employment rate			
DN	−27.2	−13.7	−6.1
GGPS	−26.5	−13.4	−5.8
LM	−27.3	−14.1	−6.5
informality rate	−2.9	0.1	0.1
Mexico			
overall employment rate	−21.1	−10.0	−5.6
non-telework employment rate			
DN	−23.0	−11.1	−6.1
GGPS	−21.7	−10.2	−5.8
LM	−21.5	−10.9	−6.0
informality rate	−10.0	−4.0	−1.1
Peru			
overall employment rate	−52.2	−19.8	−6.0
non-telework employment rate			
DN	−51.7	−17.7	−4.2
GGPS	−51.8	−19.3	−5.6
LM	−50.9	−17.4	−4.3
informality rate	4.0	5.0	4.6

Notes: Own calculations based on the dataset constructed by Leyva and Urrutia (2021). Overall and non-telework employment rates are calculated as a percentage of the working-age population. The informality rate is calculated as a percentage of overall employment. Percentage changes are log changes.

We develop a decomposition to see to what extent the behavior of informality could have overshadowed the role of teleworking in LA-5. By exploiting the cross-state variation from 27 Brazilian federal units and 32 Mexican federal entities, which together account for 75 percent of

employment in LA-5, we find that informality is responsible for up to 10 percent of changes in telework shares. Since informality does not drive the bulk of these changes, we conclude that teleworking per se does not seem to offer further insights into the unequal burden of the pandemic.

To further test whether the available telework shares have captured something intrinsically different in the current pandemic recession, we calculate those shares in previous, non-pandemic downturns. Taking Brazil and Mexico as representative cases, for which two of these episodes are covered in our sample, we find that the non-telework share also fell during the protracted recession of 2014-16 in Brazil and the Great Recession (2008-9) in Mexico. For this, we complement our short time-series dimension with variation at the state level.

Our first contribution is tracking the evolution of employment in occupations more or less amenable to teleworking since the start of the pandemic. Given that all telework measures have been devised as tools for evaluating the economic consequences of social distance policies, we undertake the natural next step, namely, assessing whether such a margin of employment has made (is making) a difference after a year in lockdown. For this, unlike previous work, we directly exploit household and employment surveys of each country, with the advantage of working with more granular (roughly 400-500) occupational classifications.[5]

Another contribution is taking stock of the measures available in the literature, exploiting their methodological differences, and applying them to a set of Latin American countries. As is well known, LA-5 has been particularly hard hit by the pandemic, with varied consequences in lives and livelihoods across countries. Confinement and social distancing policies have differed, too, being more lenient and making telework less binding in some countries than in others.

Yet another contribution is the treatment of informality in the region. This is the first paper, to the best of our knowledge, linking informality and telework explicitely.[6] In circumstances where informality is expected to impose challenges in compliance to lockdown and confinement policies (Loayza, 2020), it is worth exploring the role that it has been playing (is playing) in both the willingness and possibilities to work from home. Though informality's contribution is more important in this pandemic recession than in previous downturns, its current role has been limited.

[5] This applies to Brazil, Mexico, and Peru only. Occupational classifications for Chile and Colombia are available at the one digit (10 occupations) and two digits (83 occupations).

[6] Gottlieb et al. (2021) also explore that connection by showing that the work from home share is lower for the self-employed than for wage-earners. Here we provide that connection for a broader notion of informality, including those wage-earners who do not have access to health care through social security. Besides, we explicitly explore the role of informality in driving changes in telework shares. See also Loayza (2020).

The literature concerned with the economic impact of COVID-19 has partly been focused on the classification of jobs according to their suitability to be done from home, physical contact, and essentialness, as a first step towards capturing the impact of social distancing and confinement policies. A handful of papers have explored the role of these policies in employment outcomes in the developing world.

Famiglietti et al. (2020) quantify the immediate impact of lockdown policies in the U.S. by distinguishing between essential and non-essential industries and by identifying contact-intensive activities. They show that the employment loss in non-essential contact-intensive industries was larger than the decline in employment in either essential or non-contact-intensive industries in a factor of 3.5 to 1. Instead of combining these dimensions, here we focus exclusively on teleworking, documenting a much lower decline in non-telework employment relative to telework employment.

On the measurement of the ability to work from home with an emphasis on developing countries, Saltiel (2020), Gottlieb et al. (2020), and Gottlieb et al. (2021) stand out. They show that such an ability is even more elusive in countries with a still important fraction of workers engaged in agriculture and self-employment.[7] In an attempt to go beyond measurement and validate their measure, Gottlieb et al. (2021) associates it with employment outcomes using a Peruvian employment survey covering the capital, metropolitan Lima only, finding that such an ability helped at keeping a job in non-essential activities during the pandemic.[8] In this paper, we complement this analysis by quantifying the differential impact of teleworking on employment outcomes of five Latin American countries, obtaining fairly close shares to those reported by Gottlieb et al. (2021) when replicating their telework measure.[9]

Finally, Alfaro et al. (2020) develop a framework to account for the employment loss in Colombia, exploiting its variation across sectors. Besides contact-intensity and teleworking (adapted from Dingel and Neiman, 2020), they include key dimensions for a developing country, namely, informality and the prevalence of micro-entrepreneurship. Together, these dimensions account for roughly half of the employment loss. Though, in principle, the ability to work from home may still prove informative in combination with any of the other dimensions, which will certainly require

[7] For additional telework measures, we refer the reader to Dingel and Neiman (2020) and Gottlieb et al. (2021).

[8] This latter result is intriguing given the blanket lockdown policy undertaken by Peru, by far the more draconian in the region, which in turn may help explain the massive slash in employment experienced at the onset of the pandemic (see Leyva and Urrutia, 2021).

[9] Regarding their validation exercise, below we find the opposite outcome applying their telework classification to Peruvian data coming from a nationally representative survey. We make sense of this finding when we analyze the joint dynamics of telework and informality shares in section 3.

Table 3: LA-5 Household and Employment Surveys

	Brazil	Chile	Colombia	Mexico	Peru
Survey	PNAD-C	ENE	GEIH	ENOE	ENAHO
Start	2012.Q1	2010.M1	2007.M1	2005.Q1	2011.Q1
End	2020.Q4	2020.M12	2020.M12	2020.Q4	2020.Q4
Occupational Classification	COD-10	ISCO-88 ISCO-08	CNO-70	CMO SINCO-11	CO-95 CNO-15
Length	36 quarters	44 quarters	56 quarters	64 quarters	40 quarters

Notes: PNAD-C is Pesquisa Nacional por Amostra de Domicílios Contínua, ENE is Encuesta Nacional de Empleo, GEIH is Gran Encuesta Integrada de Hogares, ENOE is Encuesta Nacional de Ocupación y Empleo, and ENAHO is Encuesta Nacional de Hogares. ENE data is released as moving quarters. For Mexico, ENOE is for 2020.Q1 and before, ETOE (Encuesta Telefónica de Ocupación y Empleo) for 2020.Q2, and ENOE^{N} (Nueva Edición), thereafter.

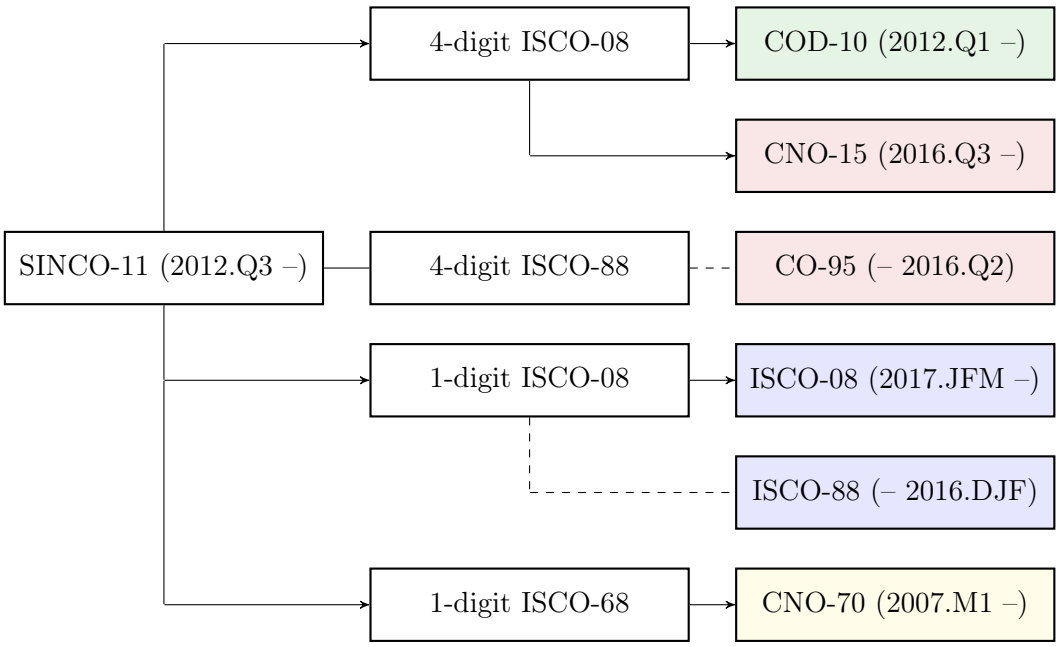
assessing their contribution separately, at least the interaction between informality and telework does not seem to be promissory either.

In section 2, we describe the dataset and the procedure to calculate three telework measures for LA-5. In section 3, we explore the link between telework and informality. Continuing with the evaluation of measured teleworking, in section 4, we conduct a placebo test by examining the cyclical variation in telework shares in two non-pandemic recessions. In section 5, we compare the dynamics of measured telework with actual telework, as calculated on data specifically designed to survey working conditions during the COVID-19 pandemic.

2. The Dataset and Telework Measures for LA-5

Borrowing on Leyva and Urrutia (2021), we exploit a comprehensive dataset on (quarterly) labor market stocks for five Latin American countries, spanning slightly more than a decade. For details on the construction of these labor market stocks, see Leyva and Urrutia (2021). In Table 3, we summarize the characteristics of all household and employment surveys employed in this paper. Importantly, this dataset includes the measurement of informal employment, covering people working in unregistered businesses or lacking access to health care through social security. For this, Leyva and Urrutia (2021) rely on official definitions from each statistical agency. Table 1, panel C, shows the average informality rate for LA-5 in 2019. Except for Chile, in all countries, this share places above half the employed population.

Figure 1: Mapping of Occupational Classifications in LA-5



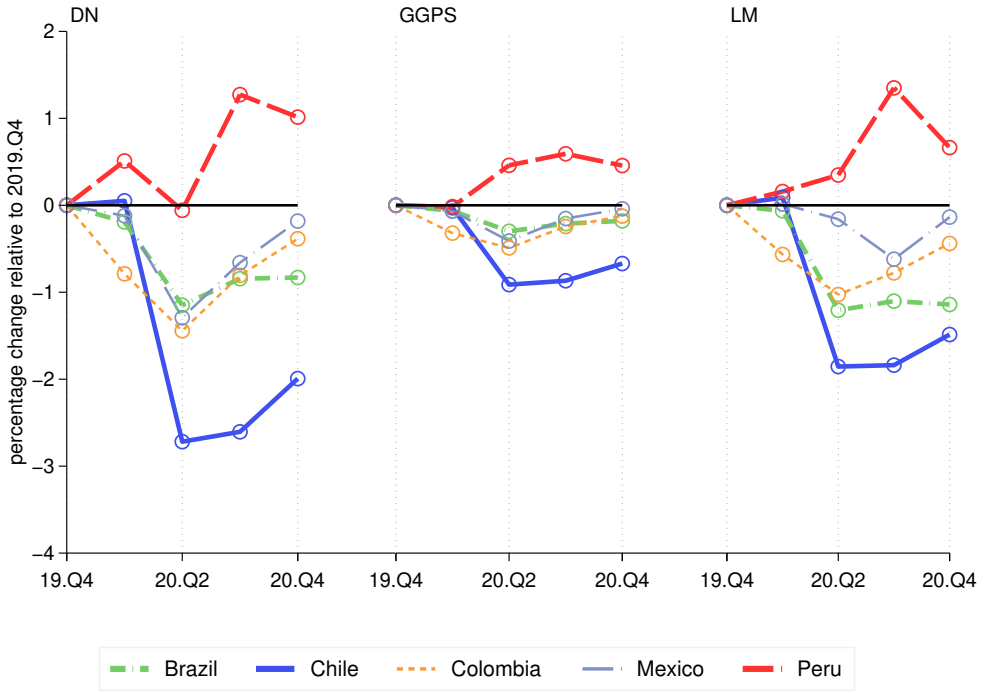
Notes: SINCO is Sistema Nactional de Clasificación de Ocupaciones, COD is the Classificação de Ocupações para Pesquisas Domiciliares (Brazil), CNO for Peru is Clasificador Nacional de Ocupaciones, CO is Código de Ocupaciones (Peru), CNO for Colombia is Clasificación Nacional de Ocupaciones. These classifications are adaptations of the respective ISCO codes (see arrows), except for Chile, where ISCO-88 and ISCO-08 (since 2017.JFM) are used directly. Chilean data is released as moving quarters. JFM stands for the January-February-March quarter. The dashed line corresponds to the occupational mapping not undertaken in this paper. Adapted from Dominik Hausmann's Latex code https://texample.net/tikz/examples/observer-estimator/.

We build on Leyva and Mora (2021), who propose an alternative telework classification for Mexico based on the job description of (4-digit) 468 occupations taken from the national classification system. They conclude that about 10.6 percent of jobs could be done from home, half the measure reported for Mexico by Dingel and Neiman (2020). Moreover, using cross-state variation, they show that LM measure correlates well with GDP per worker, employment share in services more amenable to teleworking, and access to the internet or a computer at the household level.[10] Another advantage is that Leyva and Mora (2021) replicate DN's measure for Mexico in 2019, so we can extend it to other countries and downturn episodes with confidence.

The crosswalk between DN and LM at the 2-digit level used in Leyva and Mora (2021) for Mexico is pivotal not only for extending DN to the other countries (see Figure 1). We also use it to calculate GGPS measures, also available at the 2-digit level, for all LA-5 (Gottlieb et al.,

[10]We also show that LM compares favorably to telework shares calculated with data specifically designed to survey working conditions in the aftermath of the COVID-19 pandemic.

Figure 2: Three Non-Telework Measures during the Pandemic in LA-5, 2019.Q4-2020.Q4



Notes: Time series are reported as percentage changes relative to 2019.Q4.

2021, p. 13, Table A3). Unlike Dingel and Neiman (2020), we then take the Mexican telework classification as the starting point, with the benefit of using Mexican instead of U.S. employment weights when mapping all telework classifications to the rest of LA-5.[11]

In Figure 2 we depict the evolution of three non-telework measures during the pandemic recession. We plot these shares as changes relative to 2019.Q4, immediately before the pandemic.[12] Though the mid of 2020 stands out as the turning point, notice that the magnitude of the decline (or rise for Peru) is negligible, reaching a maximum drop by three percent when the non-telework share in Chile is measured according to Dingel and Neiman (2020). Thus, even though the ability to work from home has cushioned the employment loss (except for Peru), its contribution has been meaningless. What is more, in some countries, these measures are quickly regaining their pre-pandemic levels, suggesting that the ability to work from home is a temporary phenomenon.[13]

[11] Dingel and Neiman (2020) point out that their classification differs across countries to the extent that U.S. employment weights differ when mapping SOC onto ISCO (Dingel and Neiman, 2020, p. 6, section A.1). The correlation of DN's (weighted) telework shares for occupations at the 2-digit ISCO level between Mexico and the other two LA-5 countries available in their dataset (Brazil and Chile) is virtually one.

[12] In some countries, confinement policies were adopted during March 2020.

[13] The case of Peru is revealing enough. Just as the non-telework share rose, the informality rate surged at the onset

Table 4: Contributions to the Variance of Non-Telework Employment μ^0 during the Pandemic, 2020.Q1-2020.Q4

	Brazil						Mexico					
	DN		GGPS		LM		DN		GGPS		LM	
	base	controls	base	controls	base	controls	base	controls	base	controls	base	controls
A. Pooled Regressions												
$\hat{\gamma}^{\mu}$	96.2	103.4	101.7	104.5	96.4	105.4	73.8	64.4	101.3	97.1	94.3	89.3
SE	(3.9)	(4.0)	(1.1)	(1.2)	(4.5)	(4.8)	(10.4)	(9.1)	(4.0)	(4.2)	(8.0)	(7.8)
$\hat{\gamma}^{\omega}$	3.8	−3.4	−1.7	−4.5	3.6	−5.4	26.3	35.4	−1.2	2.8	5.7	10.6
SE	(3.9)	(4.0)	(1.1)	(1.2)	(4.5)	(4.8)	(10.3)	(9.0)	(3.9)	(4.2)	(8.0)	(7.8)
T	4	4	4	4	4	4	4	4	4	4	4	4
N	27	27	27	27	27	27	32	32	32	32	32	32
B. Panel Regressions												
$\hat{\gamma}^{\mu}$	80.2	81.0	96.0	96.6	81.1	80.7	88.8	78.9	107.2	101.8	106.4	101.5
SE	(3.4)	(4.0)	(1.3)	(1.4)	(4.9)	(5.2)	(15.4)	(7.9)	(2.3)	(3.2)	(6.6)	(6.5)
$\hat{\gamma}^{\omega}$	19.8	19.0	4.0	3.4	18.9	19.3	11.7	21.3	−7.0	−1.8	−6.3	−1.6
SE	(3.4)	(4.0)	(1.3)	(1.4)	(4.9)	(5.2)	(15.2)	(8.1)	(2.2)	(3.2)	(6.7)	(6.7)
T	4	4	4	4	4	4	4	4	4	4	4	4
N	27	27	27	27	27	27	32	32	32	32	32	32

Notes: Estimation results by Ordinary Least Squares. Standard errors (SE) clustered by state. All regressions include time fixed effects. "Base" refers to baseline, unconditional estimates and "controls" refers to conditional estimates after including the state employment share of prime-age (aged 25-54) workers, female workers, and workers occupied in "accommodation and food service" and "arts, entertainment and recreation" activities. Data for Mexico in 2020.Q2 is not representative at the state level.

We weigh the quantitative relevance of teleworking is by explicitly paying attention to the number of non-telework jobs (with superscript 0), which can be decomposed as follows:

$$\frac{e^0}{p} = \left(\frac{e^0}{e}\right)\left(\frac{e}{p}\right) \quad \text{or} \quad \mu^0 = \omega\mu, \tag{1}$$

where μ is the employment to population ratio (e divided by p) and ω is the non-telework share (e^0 divided by e). With only three quarters of the pandemic recession, we also exploit the cross-state variation from Brazil and Mexico, with survey data representative at the state level every

of the pandemic (Leyva and Urrutia, 2021). We explore the connection between the two variables in section 3.

quarter.[14] The decomposition in (1) motivates the following regression equations:

$$\begin{aligned} \log \omega_{st} = &\quad \alpha_s^{\omega} + \gamma^{\omega} \log \mu_{st}^0 + \varepsilon_{st} \\ \log \mu_{st} = &\quad \alpha_s^{\mu} + \gamma^{\mu} \log \mu_{st}^0 + \eta_{st}, \end{aligned} \tag{2}$$

which we use to calculate the share of the variance in μ^0 accounted for by ω and μ, by estimating γ^{ω} and γ^{μ}, respectively.[15]

Table 4 displays OLS estimates for these parameters for three telework measures and each country, separately. For either the pooled (panel A) or the panel regressions (panel B), changes in overall employment μ are responsible for the lion's share of the variance in the number of non-telework jobs μ^0. We note few exceptions depending on the telework measure. In these cases, the contribution of ω could be about 20 percent in both countries, mainly when telework measurement follows Dingel and Neiman (2020). These results align with those reported before in Table 2, in that the ability to work from home seems to have cushioned the fall in employment but on a minor scale, not even comparable to the differentiating effects caused by explicit and deliberate lockdown policies elsewhere (see Famiglietti et al., 2020).

3. Telework and Informality

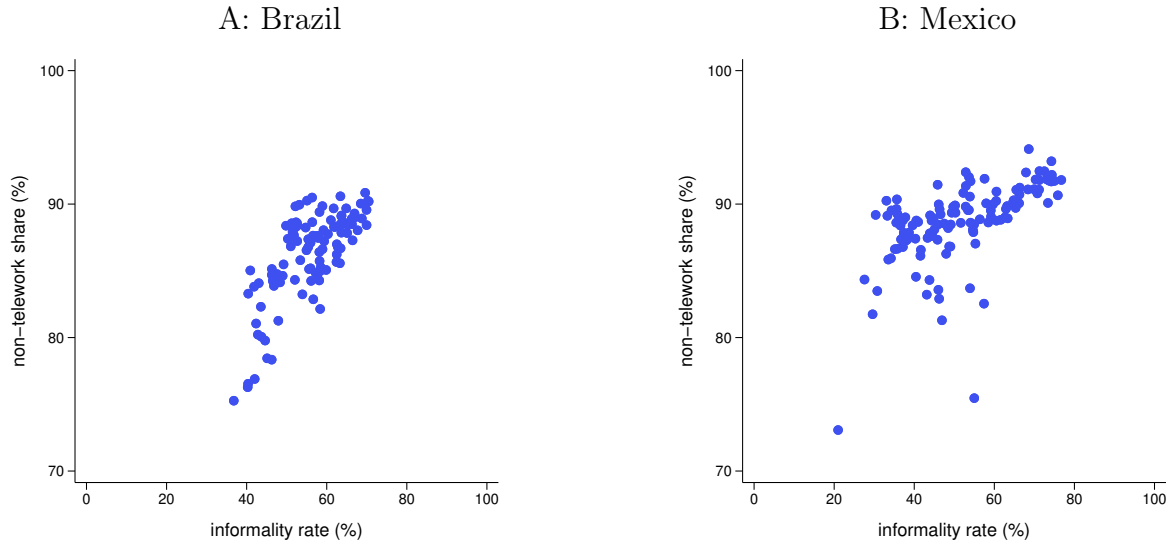
Understandably enough, given the nature of informal work, one would expect a positive association between informality and non-telework employment (see Figure 3), so it may be that the minor role attributed to teleworking may be rooted in the dynamics of the informality rate. For this purpose, consider decomposing the non-telework share as follows:

$$\frac{e^0}{e} = \left(\frac{i}{e}\right)\left(\frac{i^0}{i}\right) + \left(\frac{f}{e}\right)\left(\frac{f^0}{f}\right),$$

[14] Cross-department variation in Colombia and Peru could only be exploited at the annual frequency. Though we could have exploited the cross-region variation in Chile at the quarterly frequency, this country did not experience deep downturns during the period covered in our sample like those experienced by Brazil and Mexico.

[15] This is only an accounting device, devoid of any causal interpretation.

Figure 3: Telework and Informality, 2020.Q1-2020.Q4



Notes: Telework shares are calculated according to Leyva and Mora (2021) for the period 2020.Q1-2020.Q4. Informality rates are from Leyva and Urrutia (2021).

where employment e is now disaggregated into informal (i) and formal employment (f). Let ω^j denote the non-telework share in employment $j = \{e, i, f\}$ and ϕ denote the informality rate, thus

$$\begin{aligned} \omega^e &= \phi\omega^i + (1-\phi)\,\omega^f, \text{or} \\ \omega^e &= \phi\left(\omega^i - \omega^f\right) + \omega^f. \end{aligned}$$

The drop in the informality rate ϕ observed at the onset of the pandemic recession could thus be partly responsible for the decline in the share of jobs less amenable to teleworking ω^e, the other two determinants being the non-telework share in informal ω^i and formal employment ω^f.[16] To explore this possibility, consider the following first-order approximation:

$$\tilde{\omega}^e \approx \left(1 - \frac{\bar{\omega}^f}{\bar{\omega}^e}\right)\tilde{\phi} + \left(\frac{\bar{\phi}\bar{\omega}^i}{\bar{\omega}^e}\right)\tilde{\omega}^i + \left(\frac{\left(1-\bar{\phi}\right)\bar{\omega}^f}{\bar{\omega}^e}\right)\tilde{\omega}^f, \tag{3}$$

where $\tilde{x}$ denotes the log change of x and $\bar{x}$ its average value. To assess the individual contribution of each of the three determinants above in the variance of the observed non-telework share,

[16] Put differently, we are allowing for movements in non-telework shares to be driven by compositional changes reflected in the behavior of the informality rate.

Table 5: Role of Informality in Changes of Non-Telework Shares during the Pandemic, 2020.Q1-2020.Q4

	Brazil						Mexico					
	DN		GGPS		LM		DN		GGPS		LM	
	base	controls	base	controls	base	controls	base	controls	base	controls	base	controls
A. Pooled Regressions												
$\hat{\beta}^1$	22.8	25.6	20.4	22.7	23.0	24.3	30.1	26.1	35.2	32.0	24.7	21.4
SE	(4.7)	(4.8)	(3.1)	(2.8)	(2.9)	(2.7)	(8.2)	(8.6)	(6.4)	(7.0)	(8.2)	(6.9)
$\hat{\beta}^2$	43.4	38.5	48.6	45.3	39.3	39.8	36.1	38.5	28.8	31.0	21.3	22.6
SE	(4.7)	(4.8)	(4.0)	(3.9)	(4.2)	(3.5)	(9.3)	(7.8)	(6.0)	(6.5)	(4.8)	(4.5)
$\hat{\beta}^3$	32.1	34.3	30.0	31.1	36.4	34.7	26.9	27.8	31.0	31.5	31.7	38.5
SE	(6.7)	(8.1)	(5.3)	(5.7)	(5.2)	(4.9)	(6.7)	(6.6)	(7.5)	(10.1)	(7.0)	(6.7)
T	4	4	4	4	4	4	4	4	4	4	4	4
N	27	27	27	27	27	27	32	32	32	32	32	32
B. Panel Regressions												
$\hat{\beta}^1$	6.8	7.4	4.2	4.5	7.1	7.8	11.3	4.5	12.5	6.6	7.3	3.7
SE	(3.3)	(3.5)	(2.7)	(2.9)	(2.3)	(2.1)	(7.3)	(4.9)	(4.4)	(3.3)	(6.1)	(3.7)
$\hat{\beta}^2$	40.7	39.9	39.8	39.8	33.7	32.5	40.0	45.8	40.5	51.3	27.3	21.3
SE	(6.2)	(6.6)	(7.5)	(6.4)	(5.1)	(5.8)	(13.2)	(8.5)	(13.1)	(9.2)	(8.4)	(6.5)
$\hat{\beta}^3$	50.4	50.3	54.3	53.9	54.8	54.9	43.6	43.5	41.0	33.5	35.3	52.5
SE	(8.3)	(8.7)	(7.8)	(7.3)	(6.9)	(7.7)	(9.2)	(7.1)	(10.1)	(8.0)	(7.1)	(7.1)
T	4	4	4	4	4	4	4	4	4	4	4	4
N	27	27	27	27	27	27	32	32	32	32	32	32

Notes: Estimation results by Ordinary Least Squares. Standard errors (SE) clustered by state. All regressions include time fixed effects. "Base" refers to baseline, unconditional estimates and "controls" refers to conditional estimates after including the state employment share of prime-age (aged 25-54) workers, female workers, and workers occupied in "accommodation and food service" and "arts, entertainment and recreation" activities. Data for Mexico in 2020.Q2 is not representative at the state level.

we calculate counterfactual non-telework shares in overall employment

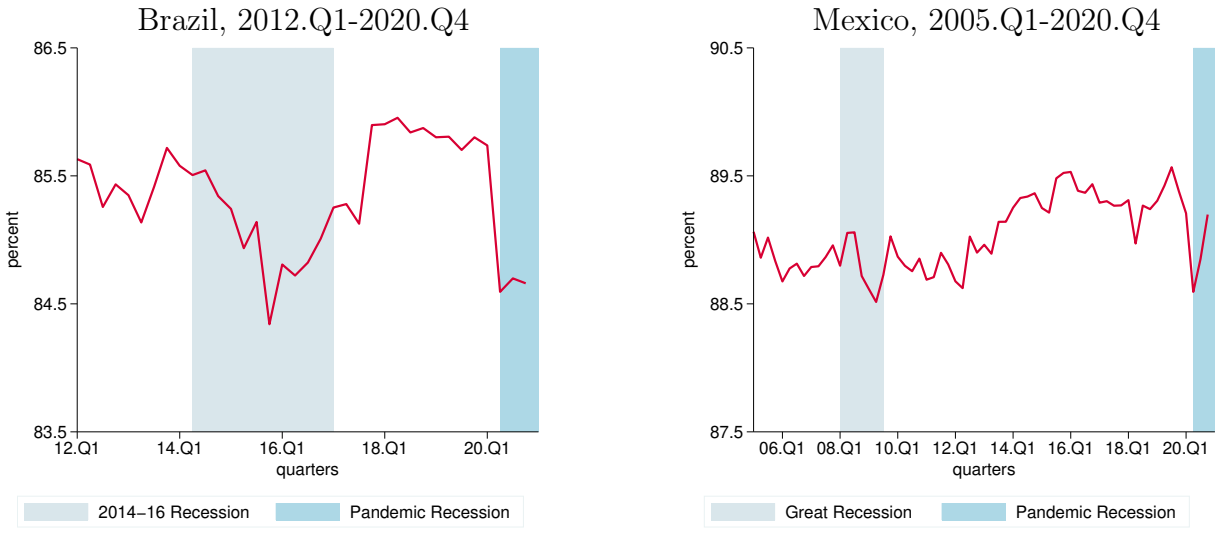
$$\tilde{\omega}^{e,1} = \left(1 - \frac{\bar{\omega}^f}{\bar{\omega}^e}\right)\tilde{\phi}, \qquad \tilde{\omega}^{e,2} = \left(\frac{\bar{\phi}\bar{\omega}^i}{\bar{\omega}^e}\right)\tilde{\omega}^i, \qquad \tilde{\omega}^{e,3} = \left(\frac{\left(1-\bar{\phi}\right)\bar{\omega}^f}{\bar{\omega}^e}\right)\tilde{\omega}^f.$$

The individual contributions are then measured by regressing the observed non-telework share on these counterfactual shares

$$\beta^1 = \frac{\text{Cov}(\tilde{\omega}^e, \tilde{\omega}^{e,1})}{\text{Var}(\tilde{\omega}^e)}, \qquad \beta^2 = \frac{\text{Cov}(\tilde{\omega}^e, \tilde{\omega}^{e,2})}{\text{Var}(\tilde{\omega}^e)}, \qquad \beta^3 = \frac{\text{Cov}(\tilde{\omega}^e, \tilde{\omega}^{e,3})}{\text{Var}(\tilde{\omega}^e)}. \tag{4}$$

Given the short time-series dimension, we again complement it with variation at the state level for Brazil and Mexico. We estimate parameters in (4) by using a version of equation (3) in logs.

Figure 4: Placebo Test: Non-Telework Shares in Previous Downturns for Brazil and Mexico



Notes: Own calculation based on PNAD-C for Brazil and ENOE/ETOE/ENOE^{N} (Nueva Edición), for Mexico, using appropriate survey weights. For Brazi, the previous downturn corresponds to the period 2014.Q2-2016.Q4, following the Brazilian Business Cycle Dating Committee or Comitê de Datação de Ciclos Econômicos (CODACE) and for Mexico, the previous downturn is the Great Recession (2008.Q1-2009.Q2), dated according to Leyva and Urrutia (2020). Both time series follow the LM telework classification. For Mexico, the time series corresponds to the classification of Leyva and Mora (2021) applied to a harmonized occupation variable available in the ENOE survey for the entire sample period.

In Table 5, we report OLS estimates of pooled (panel A) and panel regressions (panel B).

The role played by informality in changes in non-telework shares seems to be limited. The informality rate accounts for about 10 percent of these changes after controlling for state fixed effects. These results cast doubt on the possibility that teleworking could have been overshadowed by changes in the informality rate during the pandemic.

4. A Placebo Test: Telework in Non-Pandemic Downturns

As a placebo test, we calculate all telework measures for the two largest countries in the region (75 percent of LA-5 employment in 2019), namely, Brazil and Mexico, in two deep recessions. For Brazil, we use the 2014-16 downturn and for Mexico, we focus on the Great Recession of 2008-9.[17]

In Figure 4, we display the time series of the non-telework share covering the period available in the household surveys. In previous recessions, this share has moved procyclically, too. The decline

[17]For Brazil, see Bonelli, R. and F. Veloso (Eds.) (2016) for a discussion around this episode and for Mexico, see Leyva and Urrutia (2020). It has been argued that Latin America was not hard hit during the global financial crisis (De Gregorio, 2014), but Mexico certainly was an exception. Leyva and Urrutia (2020), Online Appendix, compare this crisis with previous episodes, like the Tequila crisis of 1994-95.

Table 6: Placebo Test: Procyclical Non-Telework Shares in Non-Pandemic Downturns

	Brazil						Mexico	
	DN		GGPS		LM		LM	
	base	controls	base	controls	base	controls	base	controls
A. Pooled Regressions								
$\hat{\gamma}^{\mu}$	99.7	103.1	104.2	106.8	97.0	99.9	101.8	85.3
SE	(5.0)	(6.1)	(1.4)	(1.4)	(7.7)	(8.8)	(6.1)	(6.0)
$\hat{\gamma}^{\omega}$	0.3	−3.1	−4.2	−6.8	3.0	0.1	−1.8	14.7
SE	(5.0)	(6.1)	(1.4)	(1.4)	(7.7)	(8.8)	(6.1)	(6.0)
T	12	12	12	12	12	12	8	8
N	27	27	27	27	27	27	32	32
B. Panel Regressions								
$\hat{\gamma}^{\mu}$	79.6	78.2	97.2	96.7	74.1	72.3	89.5	89.6
SE	(4.7)	(4.9)	(1.1)	(1.3)	(6.8)	(6.4)	(1.2)	(1.3)
$\hat{\gamma}^{\omega}$	20.4	21.8	2.8	3.3	25.9	27.7	10.5	10.4
SE	(4.7)	(4.9)	(1.1)	(1.3)	(6.8)	(6.4)	(1.2)	(1.3)
T	12	12	12	12	12	12	8	8
N	27	27	27	27	27	27	32	32

Notes: Estimation results by Ordinary Least Squares. Standard errors (SE) clustered by state. All regressions include time fixed effects. "Base" refers to baseline, unconditional estimates and "controls" refers to conditional estimates after including the state employment share of prime-age (aged 25-54) workers, female workers, and workers occupied in "accommodation and food service" and "arts, entertainment and recreation" activities. The non-pandemic period for Brazil is 2014.Q1-2016.Q4 and for Mexico is 2008.Q1-2009.Q4. For Mexico, we only report results for LM because there was a change in the classification system in 2012. Numbers reported under LM correspond to the classification of Leyva and Mora (2021) applied to a harmonized occupation variable available in the ENOE survey for the entire sample period.

is even comparable to, though lengthier than, the fall observed at the onset of the pandemic recession. Given the nature of this recession, a health rather than an economic shock in origin together with the attendant confinement policies, it is surprising that the evolution of telework and non-telework employment, summarized in the telework share, looks similar then and now.[18]

We complement this by exploiting the cross-state variation during the respective previous downturns in a way similar to the discussion in section 3. In particular, we estimate equations in (2) with data from 2014 to 2016 for Brazil and from 2008 to 2009 for Mexico. In these periods, the employment to population ratio plummeted by 5.2 and 2.3 percent in Brazil and Mexico, respectively. The cyclicality of the non-telework share could indirectly be appreciated from its measured contribution to the variance in the employment to population ratio, following the argument summarized in equation (1).

[18]The key, bold assumption here is that the telework classification has not changed in 10-15 years.

Results in Table 6 look similar to those reported in Table 4. At best, changes in the telework share across states seem to have a greater contribution in the variance of the number of non-telework jobs then than in the pandemic recession (see panel B of Table 6).[19] This evidence speaks to the low ability of these telework measures to capture something intrinsically different in the current pandemic recession.

5. Telework Measures versus Actual Teleworking

This section compares the three telework measures used so far with telework shares calculated using survey responses. We focus again on Brazil and Mexico. For Brazil, we use the PNAD-COVID19, designed to survey health and employment conditions in the aftermath of the COVID-19 pandemic, conducted during May-November of 2020.[20] For Mexico, we use the ECOVID-ML, from which we can gather information not only on whether the respondent is working from home but also whether she has access to ICT and the tools and equipment to perform her job at home. This survey was conducted by telephone during April-June of 2020.[21]

In Table 7 we follow the dynamics of the non-telework shares since the start of the pandemic (columns 3-5), including the survey-based share. As a reference, we also report these shares for 2020.Q1 (pre-pandemic) and 2019.Q1 to see how the pandemic recession has made an impact, though negligible, on non-telework shares. Notice how the decline at the onset of the pandemic (column 6) is more significant than the difference experienced by these shares between 2019.Q1 and 2020.Q1 (columns 1 and 2). More important, like the three non-telework measures, the survey-based share also increased during the pandemic recession, which could be interpreted as part of the recovery from an initial drop that we, unfortunately, cannot observe (column 6).

[19] Another way to assess how the non-telework share moves over the cycle would be focusing on the informality rate in these non-pandemic recessions. Leyva and Urrutia (2020) and Leyva and Urrutia (2021) argue that in these downturns the informality rate surged rather than fell. An accounting exercise like the one introduced in equation (3) should then deliver a non-significant contribution of the informality rate to changes in the non-telework shares. Panel B in Table B.1, in the appendix, supports this reasoning.

[20] The PNAD-COVID19 is a subsample of respondents, with a registered telephone number, interviewed for the 2019.Q1 regular PNAD-C survey. The sample is fixed throughout the period coverage of the survey. Gottlieb et al. (2021) compare their telework share with the share of employed respondents who are in "remote work (home office or teleworking)" in the PNAD-COVID19 during May-June. They report a telework share of 13.3 percent for urban workers aged 18-59. We use the same survey to track the dynamics of that share since the onset of the pandemic, from May to November, the latest available month.

[21] Using the same survey, Leyva and Mora (2021) show that the work from home share exceeds by eight percentage points the same share conditioned to ICT (15.5 percent in April 2020), highlighting the conceptual difference between working from home and teleworking. In Table 7 we report the more stringent measure.

Table 7: Non-Telework Shares, including Survey-Based, in Percent

		Pre-Pandemic	Pandemic Recession			Difference (percentage points) Relative to 2020.Q1	Relative to 2020.Q2	
	2019.Q1	2020.Q1	2020.Q2	2020.Q3	2020.Q4	2020.Q2	2020.Q3	2020.Q4
	1	2	3	4	5	6	7	8
A. Brazil								
DN	79.9	79.7	78.8	79.1	79.1	-0.9	0.3	0.3
GGPS	94.4	94.4	94.1	94.2	94.3	-0.3	0.1	0.2
LM	85.8	85.7	84.6	84.7	84.7	-1.1	0.1	0.1
Survey	-	-	90.0	90.5	91.6	-	0.5	1.6
B. Mexico								
LM	89.3	89.2	88.6	88.8	89.2	-0.6	0.2	0.6
Survey	-	-	85.8	89.4	-	-	3.6	-

Notes: For Brazil, 2020.Q2 and 2020.Q4 is only May-June and October-November. For Mexico, 2020.Q3 is only July. Own calculations based on the PNAD-COVID19 and the ECOVID-ML. The least working-age is 14 and 18 for Brazil and Mexico, respectively. For Mexico, numbers reported under LM correspond to the classification of Leyva and Mora (2021) applied to a harmonized occupation variable available in the ENOE survey for the entire sample period.

As shown before in Figure 2, not all non-telework measures agree at the speed with which they appear to be regaining their pre-pandemic levels. Table 7 suggests a faster recovery for the survey-based share. To see this, we compare columns 6 with columns 7 and 8. These columns track the recovery by displaying the difference between the non-telework share and its value at the trough (2020.Q2). For instance, if columns 6 and 8 agree, like in LM for Mexico, we would have that the share has reached its pre-pandemic level by 2020.Q4.[22]

If non-telework shares are expected to revert to their pre-pandemic levels after 2020.Q2, in consonance with the general recovery (columns 7 and 8), one would conclude that all the measures are underestimating that reversion and the initial drop as well. Then, it may well be that *actual* teleworking mattered, to the extent that this is well-approximated by survey data. Unfortunately, since both surveys were conducted after the pandemic, we will never know the initial drop. If additional efforts were made to survey working conditions more regularly, we would judge its role during the pandemic better.[23]

[22] In column 8, we use 2020.Q2 as the reference period instead of 2020.Q1 so we can track the recovery using the survey-based telework shares.

[23] The availability of vaccines has not rendered this analysis less timely, as the delay in their administration, especially in the developing world, the rise of new waves, and the identification of new coronavirus strains could attest.

6. Conclusions

Regardless of how telework has been approximated in the literature, this paper argues that *measured* telework does not seem to offer new insights on the impact of the COVID-19 pandemic. We calculate three telework measures for five Latin American countries and conclude that employment in non-telework jobs has not fallen by much more than overall employment. We document instant slight declines in non-telework shares and rapid recoveries across countries. In some countries, these shares have regained their pre-pandemic levels by 2020.Q4, suggesting that their (minor) differentiating effects have dissipated. That non-telework shares also fell during non-pandemic recessions only adds further doubts on the ability of these measures to shape the outlook in LA-5's labor markets during the pandemic.

Though this disappointing result may be due to the high rates of informality in the region, we conclude that the latter is a minor contributor to the dynamics of non-telework shares. Extending our analysis to developed countries, less affected by informality, will certainly shed more light on its role. We leave this for future research.

Going forward, paying attention to deliberate policies that shut down specific activities, i.e., discriminating between essential and non-essential activities, should be more informative in assessing how disproportionately the burden of the pandemic has been heaped onto the economy. In this sense, telework measures would be expected to act as a residual once sectoral policies of this sort are taking into account in assessing the unequal burden of the pandemic.

Results presented in this paper raise doubts on the ability of the available telework measures to capture such an unequal burden but not of actual teleworking. If the "new normal" after COVID-19 would be characterized by a major prevalence of telework than before, perhaps we would be better prepared to assess the merits (and costs) of working from home.

References

Alfaro, L., O. Becerra, and M. Eslava (2020): "EMEs and COVID-19: Shutting Down in a World of Informal and Tiny Firms," Working Paper 27360, National Bureau of Economic Research.

Bonelli, R. and F. Veloso (Eds.) (2016): "A Crise de Crescimento do Brasil," Elsevier, FGV/IBRE, Rio de Janeiro.

De Gregorio, J. (2014): *How Latin America weathered the Global Financial Crisis*, Peter Institute for International Economics, 1 ed., Washington, DC.

Dingel, J. and B. Neiman (2020): "How Many Jobs Can Be Done at Home?" *Journal of Public Economics*, 189.

Famiglietti, M., F. Leibovici, and A. M. Santacreu (2020): "The Decline of Employment During COVID-19: The Role of Contact-Intensive Industries," Economic Synopses, Federal Reserve Bank of St. Louis.

Fernández, A. and F. Meza (2015): "Informal employment and business cycles in emerging economies: The case of Mexico," *Review of Economic Dynamics*, 18, 381–405.

Finkelstein Shapiro, A. (2014): "Self-Employment and Business Cycle Persistence: Does the Composition of Employment Matter for Economic Recoveries?" *Journal of Economic Dynamics and Control*, 46, 200–218.

——— (2018): "Labor force participation, interest rate shocks, and unemployment dynamics in emerging economies," *Journal of Development Economics*, 133, 346–374.

Gottlieb, C., J. Grobovsek, and M. Poschke (2020): "Working from Home across Countries," *Covid Economics*, 7, 87–105.

Gottlieb, C., J. Grobovsek, M. Poschke, and F. Saltiel (2021): "Working from Home in Developing Countries," *European Economic Review*, 133.

Horvath, J. (2018): "Business Cycles, Informal Economy, and Interest Rates in Emerging Countries," *Journal of Macroeconomics*, 55, 96–116.

Horvath, J. and G. Yang (2021): "Unemployment Dynamics and Informality in Small Open Economies," Manuscript.

IMF (2020): "Latin American Labor Markets during COVID-19, Chapter 3," Regional Economic Outlook for Western Hemisphere, October 2020, International Monetary Fund, Washington D.C.

Leyva, G. and I. Mora (2021): "How High (Low) are the Teleworking Possibilities in Mexico?" Manuscript.

Leyva, G. and C. Urrutia (2020): "Informality, labor regulation, and the business cycle," *Journal of International Economics*, 126.

——— (2021): "Informal Labor Markets in Times of Pandemic: Evidence from Latin America and Policy Options," Manuscript.

Loayza, N. V. (2020): "Costs and Trade-Offs in the Fight against the COVID-19 Pandemic: A Developing Country Perspective," Research & Policy Briefs 35, World Bank Group.

Restrepo-Echavarria, P. (2014): "Macroeconomic Volatility: The Role of the Informal Economy," *European Economic Review*, 70, 454–469.

Saltiel, F. (2020): "Who Can Work From Home in Developing Countries?" *Covid Economics*, 7, 104–118.

A. Additional Details

1. For Colombia and Chile, we use the 2-digit LM classification, mapped into the 1-digit classification for these two countries, using the Mexican employment as weights. We do this by establishing a correlation, at the 1-digit level, between the SINCO-11 and the ISCO-68 (ISCO-08) for Colombia (Chile).

2. For Brazil and Peru, we first establish a correlation between SINCO-11 and ISCO-08 at the 4-digit level. We use the mapping developed by INEGI, available at https://www.inegi.org.mx/contenidos/clasificadoresycatalogos/doc/sinco_tablas_comparativas.xlsx, as a guide only since the mapping is not intended to ponder any teleworking criteria. We then correlate the ISCO-08 and the respective national classifications, COD-10 for Brazil and CNO-15 for Peru, both adaptatons of the former.

B. Additional Tables

Table B.1: Role of Informality in Changes of Non-Telework Shares during Non-Pandemic Recessions

	Brazil						Mexico	
	DN		GGPS		LM		LM	
	base	controls	base	controls	base	controls	base	controls
A. Pooled Regressions								
$\hat{\beta}^1$	33.8	29.5	28.9	26.6	27.0	23.0	56.2	38.7
SE	(5.8)	(5.2)	(2.8)	(2.7)	(4.4)	(4.6)	(15.0)	(9.1)
$\hat{\beta}^2$	38.6	40.3	46.6	48.3	35.3	40.8	43.8	41.0
SE	(4.5)	(4.8)	(4.0)	(3.9)	(4.5)	(3.8)	(5.5)	(5.5)
$\hat{\beta}^3$	25.4	28.1	23.3	23.8	36.4	34.9	−8.0	8.1
SE	(8.0)	(8.1)	(4.6)	(4.7)	(6.5)	(6.7)	(11.7)	(6.7)
T	12	12	12	12	12	12	8	8
N	27	27	27	27	27	27	32	32
B. Panel Regressions								
$\hat{\beta}^1$	1.5	1.8	1.9	2.0	−0.3	−0.2	3.9	4.5
SE	(2.6)	(2.4)	(1.7)	(1.6)	(1.8)	(1.7)	(3.1)	(2.9)
$\hat{\beta}^2$	53.6	54.4	53.1	53.1	54.5	54.7	25.4	26.1
SE	(3.1)	(3.2)	(3.1)	(3.4)	(4.2)	(4.1)	(3.3)	(3.3)
$\hat{\beta}^3$	43.0	41.9	43.1	43.0	43.6	43.1	57.3	56.3
SE	(5.1)	(4.4)	(2.6)	(2.7)	(5.9)	(5.5)	(4.7)	(4.5)
T	12	12	12	12	12	12	8	8
N	27	27	27	27	27	27	32	32

Notes: Estimation results by Ordinary Least Squares. Standard errors (SE) clustered by state. All regressions include time fixed effects. "Base" refers to baseline, unconditional estimates and "controls" refers to conditional estimates after including the state employment share of prime-age (aged 25-54) workers, female workers, and workers occupied in "accommodation and food service" and "arts, entertainment and recreation" activities. The non-pandemic period for Brazil is 2014.Q1-2016.Q4 and for Mexico is 2008.Q1-2009.Q4. For Mexico, we only report results for LM because there was a change in the classification system in 2012. Numbers reported under LM correspond to the classification of Leyva and Mora (2021) applied to a harmonized occupation variable available in the ENOE survey for the entire sample period.