A Pandemic Crossing the Border: The Impact of Covid-19 in the US on the Mexican Labor Market

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Abstract

The labor markets in the US and Mexico are closely linked through migrant workers and remittances. In this paper, we investigate how the prevalence of the Covid-19 epidemic in the US affected the Mexican labor market. We construct a Mexican municipality-level measure of the exposure to Covid-19 in the US using migration data. We find a positive effect of the Covid-19 exposure in the US on work hours among workers in Mexico. We also find that the effect varies across subgroups which indicates that the responses in worked hours depend on the household dynamics, employment opportunities, and the nature of the occupation-specific tasks.

1 Introduction

The negative effect of Covid-19 on the global economy is hard to overstate. After the outbreak of Covid-19, countries around the World implemented a series of non-pharmaceutical interventions to contain the contagion of the virus (Haug et al., 2020; Bonaccorsi et al., 2020) provoking substantial economic damages (Polyakova et al., 2020). The economic effects of the epidemic are amplified not only because of human mobility (Hâncean et al., 2020), but also because of the interconnected nature of the global economy. Recent estimates indicate that a substantial share of global population are migrants (Azose and Raftery, 2019). This begs the question on how the local prevalence of the virus or the local economic restrictions can be translated to other countries via altering income-generating opportunities in the locations where migrants move to.

The Mexican economy is highly integrated to that of the US. It is estimated that 11 million Mexicans live in the US, sending over 40 billion USD annually to Mexico in the form of remittances (Li, 2021). The Covid-19 prevalence and the restrictions in the US potentially affecting the Mexican local labor market mainly by altering the income-generating opportunities among migrants in the US. As an important fraction of households depend on the migration to the US, an important piece for characterizing the effects of the pandemic is to understand how the disruption in the US's production affected the Mexican labor market.

In this paper, we investigate how the Covid-19 prevalence in the US affected the local labor markets in Mexico. To do so, we construct Mexican municipality-level measures of the exposure to the Covid-19 prevalence in the US using the data on migration flows. Covid-19 cases prevalence in the US represents a measure of the intensity of economic disruption across states, and thus, a shock to Mexican labor markets through the opportunities available for migrants. We use this local exposure variable to assess how the prevalence of Covid-19 across the US states affected individuals' worked hours and hourly wages. We further investigate the different effects of Covid-19 prevalence in the US between male and female, between rural and urban municipalities, and between agricultural and non-agricultural sectors.

We relate to the literature on the economic effects of migration on the sending households. From the perspective of the New Economics of Labor migration (Stark and Bloom, 1985; Taylor, 1986), households use migration as part of their income generating activities portfolio, arranging informal contracts within household members in a way that different income generating activities and household's outcomes depend on migration decisions. For the recent papers on the interactions between migration and economic outcomes see for example Mora-Rivera and van Gameren (2021) and López-Feldman and Escalona (2017).

Our paper relies also on the literature of migration networks to provide a measure of the exposure to the intensity of Covid-19 in the US to Mexican municipalities. Migration to US destinations is not random, but rather follows historical patterns and is responsive to previously established migration networks (Munshi, 2003; McKenzie and Rapoport, 2010). Migration networks create differentiated exposure to economic conditions in the US for locations in Mexico with similar migration intensities.

Our paper also relates to the empirical literature on the economic effects of Covid-19. The epidemic has disrupted labor markets and the entire households' dynamics in Mexico, reducing (at least temporarily) labor demand (Campos-Vazquez et al., 2020), reducing labor force participation disproportionately for women (Monroy-Gómez-Franco, 2021), worsening food insecurity (Gaitán-Rossi et al., 2021), and generating not hopeful prospects for the near future in terms on poverty and inequality (Lustig et al., 2020).

One of the key challenges in estimating the effect of the exposure to Covid-19 in the US on the Mexican local labor market is to map the US state-level Covid-19 cases to Mexican municipalities. To do so, we combine information on migration intensity at the municipality level, migrants' geographical distribution, and Covid-19 prevalence in the US states. We measure migration intensity and migration destinations at a fixed period and use them to weight how time-varying Covid-19 cases across the US states are distributed across Mexican municipalities. This strategy is based on the concepts from the "shift-share" research designs (e.g. Goldsmith-Pinkham et al., 2020; Borusyak et al., 2018) as we can think of the migration

intensity and migrants distribution fixed weights as "sectoral shares" and of the Covid-19 prevalence in the US as "shocks".

Our results show that exposure to Covid-19 in the US across Mexican municipalities increased the worked hours, controlling for the effect of local Covid-19 prevalence. That is, once taking into account the negative effect on worked hours due to the economic restrictions in Mexico, workers that were exposed to high levels of US Covid-19 worked more, compared to similar workers that were less exposed.

2 Data

2.1 Labor Market Outcomes

Our main data source for the labor market outcomes in Mexico is the National Employment and Occupations Surveys (ENOE), collected quarterly by the Mexican National Institute for Geography and Information (INEGI). The ENOE quarterly samples are representative for the Mexican population and are used to estimate the official labor market outcomes, such as the official employment figures and participation rates. The survey is designed as a rotating panel in which a fifth of the surveyed households is replaced each quarter.

About 60% of individuals 15 years of age and older participated in the labor market before the pandemic, out of which 3.45% were unemployed. By Q3-2020, there was a drop of 4.35 percentage points in the active population, due to the economic restrictions provoked by Covid-19. The unemployment rate rose by 1.7 percentage points from Q1 to Q3-2020. Since our main outcomes of interest are the hourly wage and the number of worked hours, we restrict our sample to those classified as active.

As the local exposures to Covid-19 in the US and the Covid-19 prevalence in Mexico are at the municipality-level, our cross-sectional unit of analysis is the municipality. Moreover, as the ENOE surveys are collected quarterly, the time unit in our analysis is a quarter. Therefore, we aggregate the labor market outcome variables by taking the weighted average

of the individuals who are active in the labor market at the municipality level for a given quarter, using ENOE's sampling weights. We restrict our analysis to the period from Q1-2019 to Q4-2020.

Table 1 provides summary statistics for the municipality level data described previously. Comparing the periods before and after Q2 of 2020, we observe the increases in the Covid-19 exposure in both the US and Mexico as the pandemic started in Q1 and Q2 of 2020. Wages went up by about 4 pesos and the worked hours decreased by about an hour.

Table 1: Summary statistics: Municipality-level

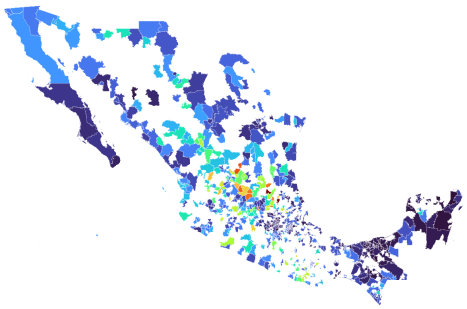
	All quarters			Q1-2019 to Q1-2020			Q3-2020 to Q4-2020		
	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
	Full sample								
US Covid-19 exposure	15.14	54.22	6163	0.17	2.23	4976	77.90	101.85	1187
Covid-19 prevalence in Mexico	0.06	0.22	6163	0.00	0.00	4976	0.33	0.41	1187
Hourly wage	32.67	14.44	6155	31.88	13.56	4969	35.99	17.26	1186
Worked hours	38.95	5.10	6163	39.18	4.98	4976	37.97	5.48	1187

Notes: Aggregation of wages and worked hours at the municipality level is restricted to individuals 15 years of age and older, classified as active (either employed or unemployed), and for whom we can calculate the Covid-19 exposure. ENOE's sampling weights are used in the aggregation. Hourly wage is in Mexican pesos of August, 2018.

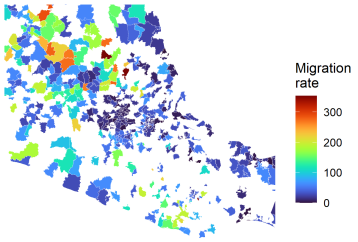
2.2 Local Exposure to the Covid-19 Prevalence in the US

We construct a time-varying municipality-level measure of exposure to Covid-19 in the US. Our indicator captures the fact that exposure to Covid-19 in the US varies because migration intensity (the share of the population that migrates to the US) is different across Mexican municipalities, and because the mix of US' destination states differs across municipalities with similar migration intensities, responding to location patterns extensively studied in the migration network literature.

To measure the intensity of migration at a given municipality, we rely on data from the 2020 Population Census. For each municipality, we the calculate the US migration rate, defined as the number of individuals that moved to the US from 2015 to 2020 per 1,000 municipality inhabitants (Panel A, figure 1).

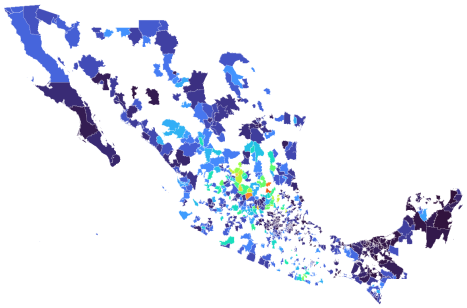


(a) All municipalities

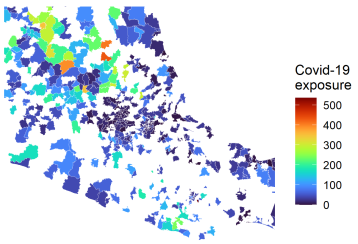


(b) Zoom-in to central states

Panel A: Migration rate to US from Mexican municipalities (MR_m)

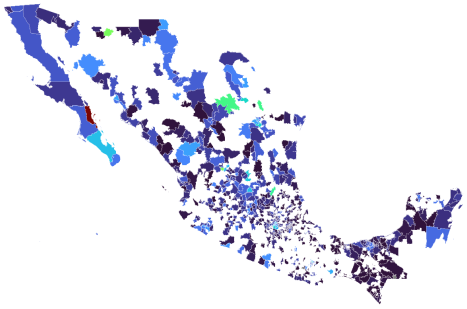


(c) All municipalities

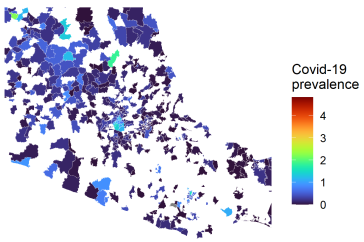


(d) Zoom-in to central states

Panel B: US Covid-19 exposure to Mexican municipalities ($Covid_{mt}^{US} = MR_m \sum_s \theta_{sm} Covid_{st}$)



(e) All municipalities



(f) Zoom-in to central states

Panel C: Covid-19 prevalence in Mexican municipalities

Figure 1: Migration rate, US Covid-19 exposure and Covid-19 prevalence in Mexican municipalities

Notes: Municipality migration rate is defined as the number of migrants to the US from 2015 to 2020 per 10,000 inhabitants. The figure shows the migration rate in municipalities with employment data in Q3-2020 . Data from the 2020 Mexican Population Census. $Covid_m^{US}$ measures exposure to Covid-19 in the US weighted by the municipality migration rate and by the geographic distribution of migrants' destination states in the US. The figure shows $Covid_m^{US}$ as of September 30th, 2020. Covid-19 prevalence in Mexican municipalities is the 7-day moving average of confirmed cases per 10,000 inhabitants as of September 30th, 2020. The figure shows the prevalence in municipalities with employment data in Q3-2020. (Secretaría de Salud, 2021)

We then construct municipality level weights for the distribution of migrants from Mexico using data from the Surveys on Migration at the Mexico's Northern Border (EMIF). These surveys capture migration flows from Mexico to the US and records travelers' residing municipality in Mexico and the US destination state. We use the EMIF rounds from 2011 to 2020 and follow Fajardo et al. (2017) to compute the share of migrants to each US state as:

$$\theta_{sm} = \frac{\text{Number of travelers from municipality } m \text{ to state } s}{\text{Total number of travels from municipality } m},$$

which is time invariant, but varies across municipalities as their total migration flow to the US and on their destinations mix differ. Our final regression sample only consists of the municipalities with the travelers that are surveyed in any of the EMIF rounds between 2011 and 2020 and for which we can compute the exposure variable.

For Covid-19 cases in the US states, we rely on data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (Dong et al., 2020). We calculate the 7-day moving average of daily new cases per 10,000 inhabitants at the state level. This is aimed to capture the variations in i) the economic effect of the Covid-19 prevalence in the US and ii) the economic restrictions infringed by policies implemented by sub-national US' governments aimed to reduce contagion of Covid-19. These policies varied in the restrictions they imposed on economic activity and were adopted and lifted at staggered times (Singh et al., 2021).

Using the migration intensity, the weights for migrants' geographical distribution, and the Covid-19 prevalence in the US, we construct, for each Mexican municipality, a measure of exposure to Covid-19 in the US, $Covid^{US}_{mt}$, as follows:

$$Covid^{US}_{mt} = MR_m * \sum_s \theta_{sm} * Covid_{st} \tag{1}$$

where MR_m is the number of migrants per 10,000 inhabitants, and $Covid_{st}$ is the 7-day moving average of Covid-19 cases per 10,000 people in state s and time t. Panel B in figure 1 displays the variation of the exposure variable across destinations.

2.3 Covid-19 Prevalence in Mexico

Throughout our analysis, we control for the Covid-19 prevalence at the municipality level in Mexico. These data come from the daily official records of Covid-19 cases collected by the Mexican Health Secretary (Secretaría de Salud, 2021). We use these data to construct the 7-day moving average of cases per 10,000 inhabitants in each Mexican municipality (Panel C, figure 1).

3 Empirical Approach

We estimate the following regression:

$$y_{mt} = \beta_{Covid,US} Covid^{US}_{mt} + \beta_{Covid,MX} Covid^{MX}_{mt} + u_m + v_t + \varepsilon_{mt} \tag{2}$$

where y_{mt} is the outcome variable in municipality m and quarter t, and $Covid^{US}_{mt}$ is our measure of the US Covid-19 exposure in quarter t for Mexican migrants from municipality m (as defined by equation 1). The 7-day moving average of cases per 10,000 inhabitants in municipality m at quarter t, $Covid^{MX}_{mt}$, controls for the local effects of Covid-19 in Mexico. We estimate equation 2 for two outcome variables, averaged at the municipality level: the hourly wage and the amount of worked hours.

Our key variable of interest is the exposure to Covid-19 in the US. The construction of this variable follows the concepts from the "shift-share" designs. Goldsmith-Pinkham et al. (2020) and Borusyak et al. (2018) provide an intuitive understanding on the identifying assumptions of the shift-share approach, which can be summarized as the exogeneity of either the "initial shares" or the "shocks". In the context of our analysis, the initial shares

correspond to the set of θ_{sm} and the shocks correspond to $Covid_{st}$. Consistency relies on the large number of municipalities m. As discussed by Goldsmith-Pinkham et al. (2020), identification of the Covid-19 exposure measure requires assuming θ_{sm} is exogenous.

The share of migrants to each US state, θ_{sm}, mainly depends on the historical migration patterns or the peers of potential migrants. The work of Munshi (2003) identifies how previously established migration networks affect the probability of migration, while Rojas et al. (2021) analyse the role of migrants' migration decisions on the decisions of other agents within the community. Therefore, conditional on the municipality and quarter fixed effects, we argue that the share of migrants to each US state is exogenous to the "contemporaneous" local labor market outcomes such as hourly wages and worked hours.

4 Labor Market Impacts of Covid-19 Exposures among Mexican Migrants in the US

Table 2 reports the effect of US Covid-19 exposure on wages and worked hours for the full sample of municipality averages of active individuals. Columns (1) and (3) show the effect on wages and worked hours, controlling only for municipality and time fixed effects. Columns (2) and (4) also control for the prevalence of Covid-19 in Mexican municipalities.

Overall, we find that the localized exposure to the Covid-19 in the US has no impact on the local wages in Mexico but affects the average worked hours. We observe that the average worked hours in a municipality at a given quarter increases as the localized exposure to Covid-19 in the US increases.

To interpret the estimated coefficient, consider a municipality with 40 migrants per 10,000 inhabitants.[1] Suppose these 40 migrants all migrated to California. Just after the first wave of contagion, California had a 7-day average of 0.82 cases per 10,000 inhabitants, on

[1]The median of migrants per 10,000 inhabitants in our sample is 40. The 1st and 3rd quartiles are 15 and 89, respectively.

Table 2: Effects of US covid exposure on wages and worked hours

	(1) All Wages	(2) All Wages	(3) All Hours	(4) All Hours
US Covid-19 exposure	-0.001	-0.000	0.005***	0.005***
	(0.003)	(0.003)	(0.002)	(0.002)
Mexico's Covid-19 prevalence		2.488***		-0.986**
		(0.905)		(0.411)
Constant	32.747***	32.577***	38.886***	38.953***
	(0.048)	(0.076)	(0.023)	(0.035)
Municipality FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
N	6,053	6,053	6,061	6,061

Notes: Sample is restricted to employed individuals 15 years of age and older. All monetary values are in real Mexican pesos of August 2018. All regressions use ENOE's sampling weights. Standard errors clustered at the municipality level in parentheses. Significance codes are * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

September 14, 2020. By December 21, California reached 11.63 cases per 10,000 inhabitants. This increase of 10 cases per 10,000 inhabitants would have increased weekly worked hours by about 2 (=0.005 x 10 x 40) hours in such municipality. For a municipality with 89 migrants per 10,000 inhabitants, the effect would be 4.45 (=0.005 x 10 x 89) extra hours of weekly work.

Another way of the interpreting the results is to compare across similar municipalities with different migrant destinations. Suppose another municipality with the same 40 migrants per 10,000 inhabitants, but now all migrating to Texas. The 7-day average of new cases on September 14, 2020 in Texas was 1.79 per 10,000. Compared to the municipality with same number of migrants but with California as the destination, the US Covid-19 exposure would have made the workers in this municipality worked 0.19 hours (=0.005 x (1.79-0.82) x 40) more.

We further investigate the differential effects of the US Covid-19 exposure across subgroups. The effect of the exposure to Covid-19 in the US on males' worked hours is more than twice as large than the effect on females' worked hours (Panel A in table 3). We suspect this is possibly due to the greater flexibility of males in labor market participation, consistent

with Hoehn-Velasco et al. (2022), who find a greater growth in the employment rate of males compared to females after the pandemic.

Table 3: Effects of US covid exposure on worked hours by subgroups

Panel A: By gender

	(1) Males Hours	(2) Males Hours	(3) Females Hours	(4) Females Hours
US Covid-19 exposure	0.006***	0.006***	0.003	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Mexico's Covid-19 prevalence		-0.849**		-1.550**
		(0.406)		(0.659)
Constant	41.704***	41.762***	34.192***	34.297***
	(0.028)	(0.039)	(0.034)	(0.056)
N	6,059	6,059	6,033	6,033

Panel B: By sector

	(1) Agriculture Hours	(2) Agriculture Hours	(3) Non-agriculture Hours	(4) Non-agriculture Hours
US Covid-19 exposure	0.001	0.000	0.005**	0.005**
	(0.003)	(0.003)	(0.002)	(0.002)
Mexico's Covid-19 prevalence		-0.465		-1.454**
		(1.019)		(0.574)
Constant	38.398***	38.424***	38.997***	39.096***
	(0.043)	(0.067)	(0.031)	(0.048)
N	5,286	5,286	6,049	6,049

Panel C: By migration intensity

	(1) High migration Hours	(2) High migration Hours	(3) Low migration Hours	(4) Low migration Hours
US Covid-19 exposure	0.004**	0.004**	-0.002	-0.001
	(0.002)	(0.002)	(0.011)	(0.011)
Mexico's Covid-19 prevalence		-0.879		-1.057*
		(0.573)		(0.555)
Constant	38.515***	38.569***	39.236***	39.306***
	(0.051)	(0.063)	(0.059)	(0.064)
N	2,639	2,639	3,422	3,422

Notes: Sample is restricted to employed individuals 15 years of age and older. All monetary values are in real Mexican pesos of August 2018. All regressions use municipality and quarter fixed effects and ENOE's sampling weights. Standard errors clustered at the individual level in parentheses. Significance codes are * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We also find that the negative effect of exposure to Covid-19 in the US is present for non-agricultural occupations only (Panel B in table 3). Agriculture, typically less flexible and with minor affectations during the social restrictions, does not respond to the exposure to Covid-19 in the US nor to the Covid-19 prevalence in Mexico. Finally, We find that

the effect of the US Covid-19 exposure is significantly different from zero only for the high migration municipalities (Panel C in table 3).

5 Concluding Remarks

We find the positive effect of localized exposure to the prevalence of Covid-19 in the US on the municipality averages of weekly worked hours. Our results also suggest that the effects on hours worked vary across subgroups. The positive effect on worked hours is stronger on males than on females, in non-agricultural occupations rather than in agricultural ones, and in high migration municipalities than in low migration municipalities. The differentiated effects stem from the household dynamics, the employment opportunities, and the nature of the occupation-specific tasks.

Our finding can be extended to other contexts where two or more economies are linked via migration. A disruption in a destination country can increase the supply of labor in the local economies of the origin countries. While the degree to which the effects differ across gender, sectors, or regions may vary across the contexts, we show that documenting such differential effects sheds light on the labor market flexibility.

We conclude by highlighting the need of investigating the mechanisms behind the positive effect of the localized exposure to the US Covid-19 on worked hours in Mexico. While we argue that the main channel is via the remittance flows, empirical evidence needs to be documented. The further investigation on the mechanism can help expanding the current finding and possibly extending to the case of the economic boom in a destination country.

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