

# Remote Work and High Proximity Employment in Mexico

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## 1 Introduction

The COVID-19 pandemic deeply affected service sectors that require high physical proximity between consumers. In an attempt to curb the spread of the coronavirus, many governments imposed restrictions to the capacity at which restaurants, bars, and entertainment venues could operate - and, simultaneously, consumers lowered demand for services that involved crowds in order to decrease their risk of infection. As a consequence, employment in these sectors decreased strongly during the first months of the pandemic. However, even as rising vaccination rates in many countries of the world have lowered the likelihood of contagion, and despite eased government restrictions, employment in high proximity sectors has not fully returned to its pre-pandemic levels. Lower employment in high proximity sectors is worrisome, as service sector jobs provide income for a large group of generally lower skilled workers (Nayyar et al., 2021).

In this paper we show evidence that remote work, likely a common feature of some occupations after the pandemic, is related to enduring lower employment in high proximity sectors in Mexico. We define high proximity sectors as services that involve close physical contact between people, and specifically, classify food and beverage services and entertainment under this label. Through a triple difference event study design, we find that 1 percentage point more remote employment at the municipal level decreases high proximity employment by 0.4 to 0.6 percentage points. The results are consistent with evidence for the United States, where the pandemic sharply reduced employment in service sectors that involve greater proximity to consumers, with particularly strong effects where a greater proportion of the jobs could be performed remotely at the beginning of the pandemic (Althoff et al., 2021, Chetty et al., 2020). By showing that these mechanisms are also at play in a middle income country, our work highlights that cities in the developing world may face challenges in the post-COVID era due to their specialization in services. As an example, we show that the effects of remote work help explain the muted recovery of employment in Mexico's central region, where a large proportion of both high proximity and remote work were present before the pandemic.

Finally, to better understand the underlying demand and supply effects related to remote work, we study wages in high proximity sectors. We find very small wage effects, which suggests that the pandemic mainly imposed costs on workers that left the sector as opposed to those that still remain. The evidence seems to support decreases both in demand and supply of labor to these sectors. Wages likely faced a binding lower bound in the face of a drop in demand, which firms seem to have translated towards lower employment and larger prices.

## 2 Remote Work and High Proximity Employment during the COVID-19 pandemic

For the purposes of this paper, we consider a job to be high proximity if it belongs to food and drink services, entertainment, or recreation subsectors. While some tourism-related sectors (such as air transport and accommodation) may also be classified as high proximity, we do not include them in the analysis because we take them to be less susceptible to the effects of remote work. By February 2020, following these groupings, 4.5% of national formal employment was high proximity, 93.2% low proximity, and 2.3% was in tourism-related subsectors. Over 910 thousand formal workers worked in high-proximity sectors before the pandemic. Monthly formal employment is observed in Mexico's social security records (from Instituto Mexicano del Seguro Social, IMSS) at the municipality level.

Employment has fared worse in high-proximity sectors than in low-proximity sectors throughout the pandemic, as shown in Figure 1. The figure shows the percentage based gaps compared to February 2020 in formal employment, separated by low and high proximity sectors. In low-proximity sectors, employment fell at a more moderate rate than in high-proximity sectors, and by October of 2021 it had returned to its pre-pandemic level. High-proximity sectors, on the other hand, as of February 2022, still showed a gap of 10% compared to February 2020.

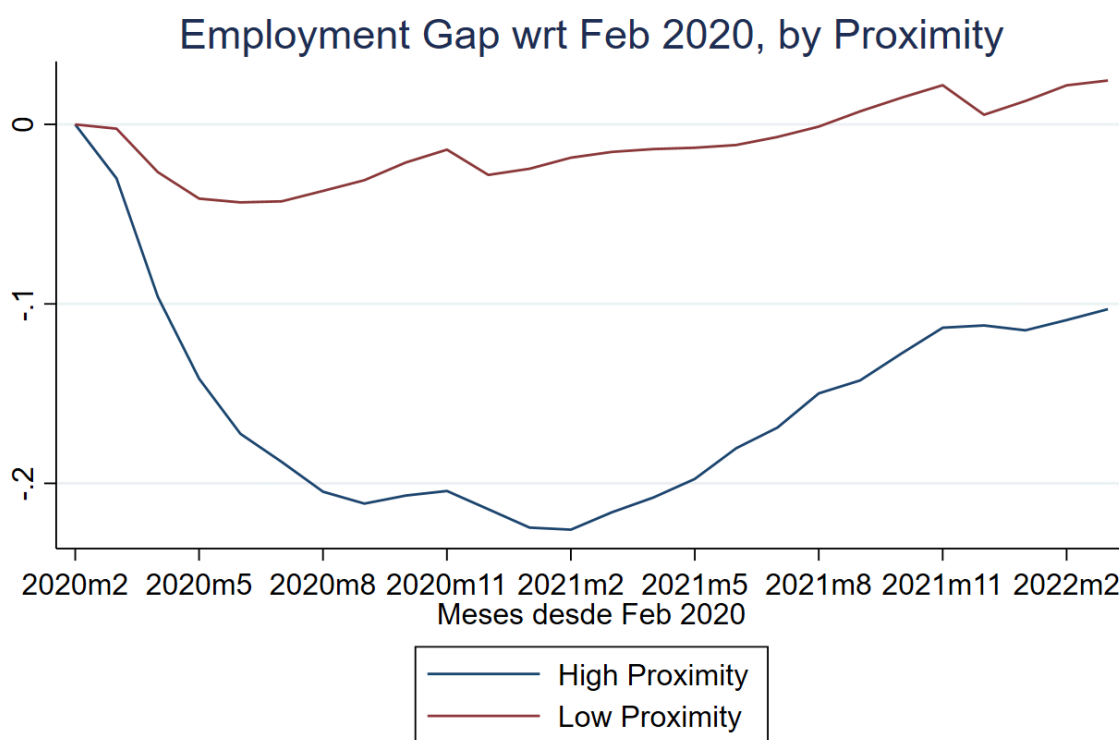


Figure 1: Formal employment, by proximity

To study whether greater feasibility of remote work influenced the evolution of employment in high-proximity sectors, first we generated an indicator that shows to what extent working remotely in any municipality was viable before the pandemic. For each municipality, we categorized the occupations in the 2020 Census of Population and Housing using the catalog in Leyva & Mora(2021). The classification is based upon whether the occupations can be performed remotely.

Potential remote work is defined as the percentage of municipal employment that could be performed remotely according to this classification.

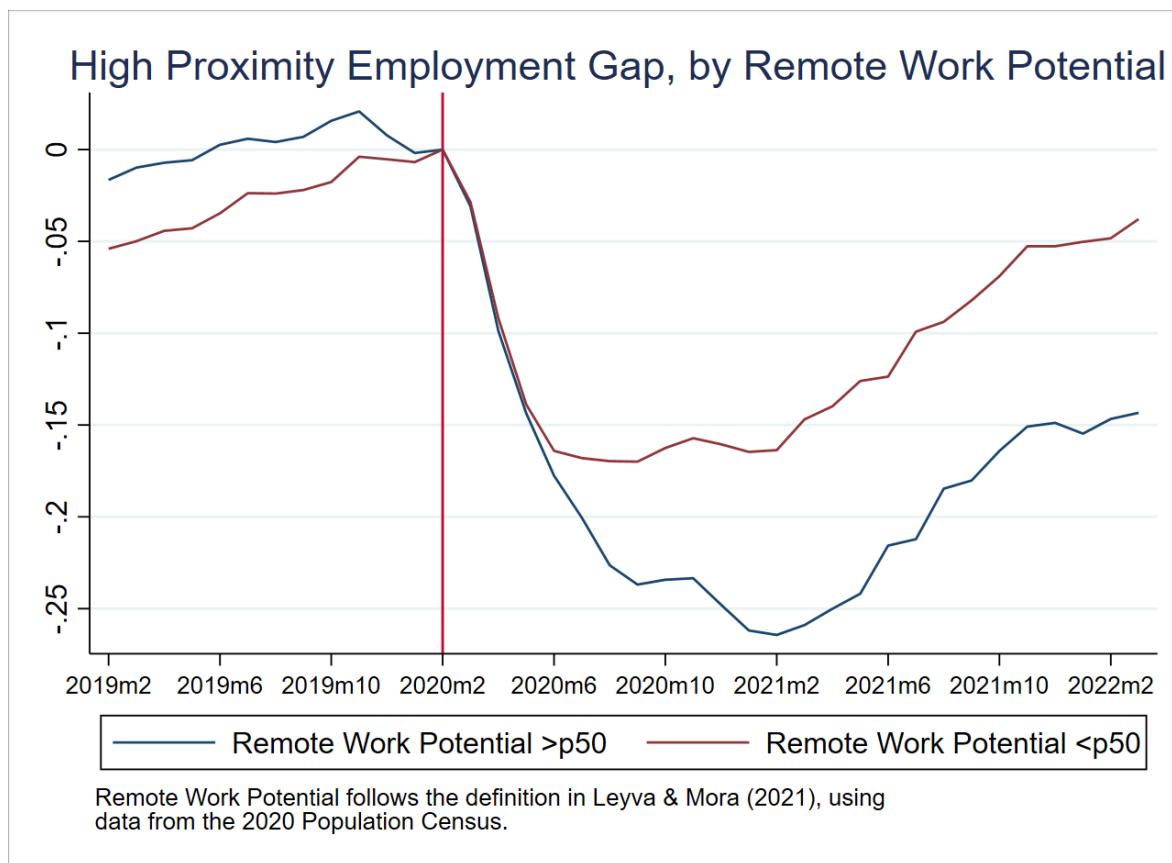


Figure 2: High proximity formal exmployment, by remote work potential

Figure 2 illustrates that high proximity employment is still weaker in municipalities where a greater proportion of local jobs could be performed remotely at the beginning of the pandemic than in municipalities with a lower feasibility of implementing remote work. A municipality is classified in the high remote work group if its level of remote work potential in February 2020 was above the national median (weighted by total employment). This suggests that remote work may be influencing the weak recovery in high proximity sectors.<sup>1</sup> At the national level we calculate potential remote work at 25.6%, while Leyva and Mora (2021) estimate it at 10.6% using their disaggregated occupation data. Our estimates differ because in order to construct a municipality level measure of remote work, we use Census data that is less disaggregated at the occupation level.<sup>2</sup>

### 3 Model and Estimation

We now aim to estimate the effect of remote work potential, as defined above, on high proximity employment. A natural way would be to compare high proximity employment before and after the pandemic across municipalities with more and less remote work potential in a difference-in-difference

<sup>1</sup>The Census reports two-digit occupations, which does not allow us to directly apply Leyva and Mora's (2021) classification. They classify the occupations in the SINCO catalog as either feasible to be performed remotely or not, using four digit occupations. Therefore, we consider a two-digit occupation to be remotely realizable if at least one of its four-digit occupations is remotely realizable according to the aforementioned study.

<sup>2</sup>It is also worth noting that Monroy-Gomez-Franco (2020) estimates this national figure at 20%-23%.

strategy. However, as shown in Figure 2, employment in high proximity services didn't follow the same trends across municipalities with high and low remote work potential - even before the pandemic, in the end of 2019, high proximity services seemed to perform worse in locations with high remote work.<sup>3</sup> To the extent that remote work is associated to differential trends in municipal employment, the difference-in-difference strategy would yield biased estimates (due to time being correlated with differences between the treated and control group).

We then use a triple-differences strategy to quantify the effect of remote work potential on the employment gap in high-proximity sectors during the pandemic. Our data consist of a monthly employment panel of high and low-proximity sectors at the municipal level. As mentioned above, it would be natural to compare gaps in high-proximity employment in places with greater and lesser remote work (first difference). However, municipal employment trends may be different where there is more remote work potential, even in the absence of the pandemic. These trends may be adjusted for by using low proximity sectors as a control group, because these occupations capture the differential behavior of employment in municipalities with high and low remote work potential (second difference). Finally, the effect of the pandemic is obtained by comparing this double difference (high-proximity employment in locations with greater and lesser remote work potential versus low-proximity employment in locations with greater and lesser remote work potential) before and after the onset of the pandemic (resulting in the triple difference). The model is as follows:

$$\begin{aligned} Employment\_Gap_{gjt} = & \mu_j + \alpha_1 HiProx_g + \alpha_2 Pandemic_t \\ & + \delta_1 RW_j \times HiProx_g + \delta_2 RW_j \times Pandemic_t + \delta_3 HiProx_g \times Pandemic_t \\ & + \beta RW_j \times HiProx_g \times Pandemic_t \\ & + \Theta X_{jt} + \epsilon_{gjt} \end{aligned}$$

In the above,  $Employment\_Gap_{gjt}$  is the gap in employment in municipality  $j$ , in month  $t$ , in group  $g$  (high or low proximity sectors) relative to February 2020;  $RW_j$  is the percentage of remote work potential from municipality  $j$  in February 2020 as defined in the previous section;  $HiProx_g$  is an indicator variable equal to one for the group of high proximity employment sectors;  $Pandemic_t$  is an indicator variable equal to one for the months of the pandemic;  $\mu_j$  is the fixed effect of the municipality  $j$ , and  $X_{jt}$  is a vector of controls.<sup>4</sup> The above regression is weighted by the number of formal workers in municipality  $j$ , in group  $g$ , in February 2020. Table 1 shows the main estimates.

A 1 percentage point (pp) increase in remote work potential implies a drop of 0.42 percentage points in employment in high-proximity formal work sectors during the pandemic. The results also indicate that high-proximity employment tended to be higher, prepandemic, in municipalities where remote work potential was higher. It is possible to calculate the effects of remote work on high proximity formal employment of in each month of the study period, using an event study estimation. The estimating equation in this case is the following, where the notation corresponds to the one used in

<sup>3</sup>A possible explanation is that food delivery and on-demand entertainment, which substitute demand away from high proximity employment, and became widespread during the pandemic, were already on the rise in our treated municipalities.

<sup>4</sup>The vector includes the following variables to control for other factors associated with the course and recovery of the pandemic: interactions of month indicator variables with school-age population (6 to 24 years), interactions of month indicator variables with the percentage of total employment in the secondary sector (measured in February 2020), interactions of month indicator variables with municipality indicator variables and the number of COVID-19 cases and deaths in the municipality in the previous month.

VARIABLES	(1) Coefficient
$RW_j \times HiProx_g \times Pandemic_t$	-0.42*** (0.054)
$HiProx_g \times Pandemic_t$	0.00 (0.021)
$RW_j \times Pandemic_t$	0.16* (0.082)
$HiProx_g$	-0.07** (0.031)
Observations	152,760
Municipalities	2,010
Months	38
Groups	2
R-squared	0.291
Standard errors in parentheses, clustered at the municipal level. *** p<0.01, ** p<0.05, * p<0.1	

Table 1: Triple Difference Estimates

the main equation and  $\lambda$  are fixed effects of time.

$$\begin{aligned}
Employment\_Gap_{gjt} = & \mu_j + \lambda_t + \alpha_1 HiProx_g \\
& + \delta_1 RW_j \times HiProx_g + \sum_t \delta_{2t} RW_j \times Pandemic_t + \delta_{3t} HiProx_g \\
& + \beta_{gt} \mathbf{RW}_j \times \mathbf{HiProx}_g \\
& + \Theta X_{jt} + \epsilon_{gjt}
\end{aligned}$$

The results of the event study estimation are shown in Figure 3 and are interpreted as the effect, at month  $t$ , of a 1 pp increase in the percentage of potential remote work on the gap in formal high proximity employment. The estimated coefficients for the months prior to the pandemic are small and not significant, indicating that the estimate is not affected by secular trends in unobserved variables. During the pandemic, a higher proportion of potential remote work is associated with a larger gap in high proximity employment with respect to low-proximity employment, with effects from -0.6 pp to -0.4 pp for every 1 pp of feasible remote work. The effects were more negative month-on-month through February 2021. By March 2021, the effects are slightly lower, although remote work potential is still associated with larger gaps in high-proximity employment in February 2022.

### 3.1 Wages

Having found negative effects of occupations that can be performed remotely on high proximity employment, it is natural to ask whether this is due to changes in labor demand or supply (or both). The two hypotheses can be told apart by studying wages: if labor decreased due to lower demand for high-proximity services, then we should observe lower compensation in these sectors after the pandemic. A negative effect of remote work on wages would suggest that remote work reflected on lower sales in high proximity sectors, causing the observed drop in employment. While this is

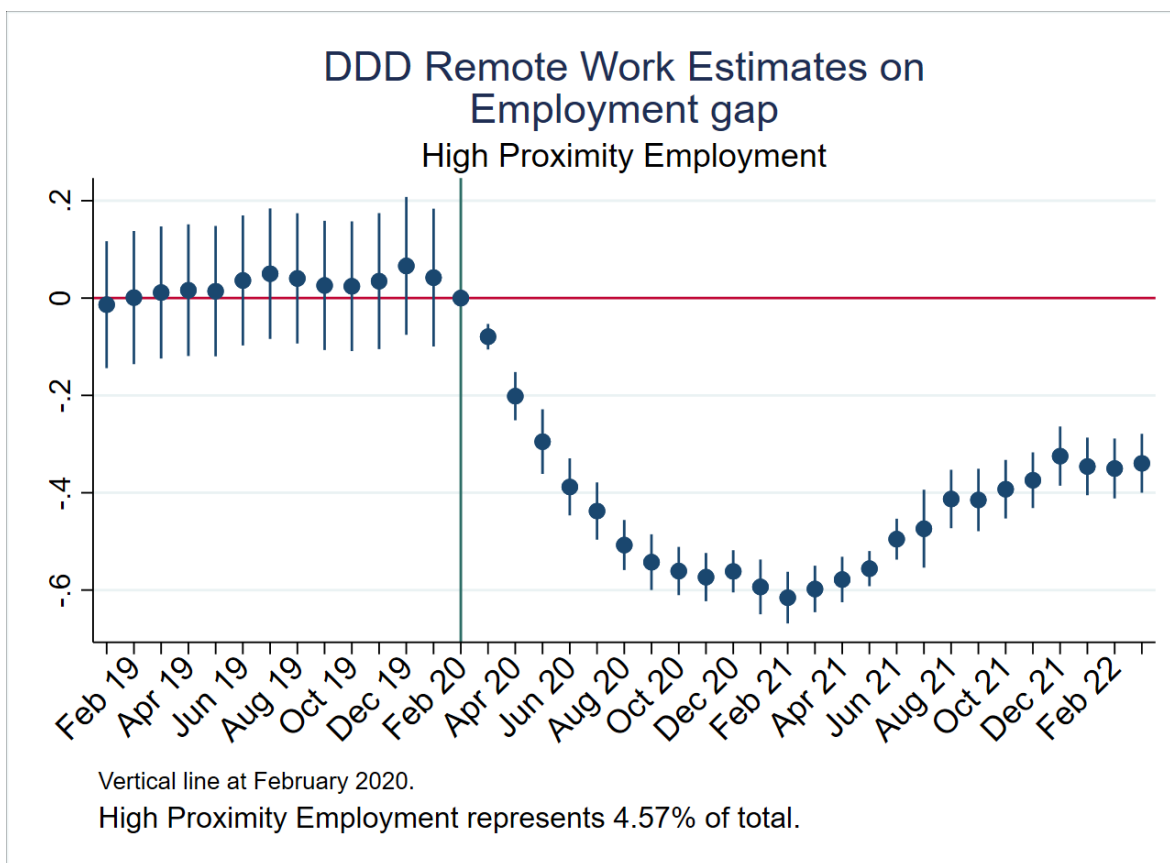


Figure 3: Event study triple difference estimates for high proximity employment

consistent with existing anecdotal and empirical evidence (such as Chetty et al., 2020), in Table 4 we find zero effects of remote work on wages under the triple difference strategy. We posit two explanations that are still consistent with a lower demand for high-proximity employment. First, it is possible that high-proximity sectors received a negative demand shock that got translated only to employment and not wages due to binding minimum wages in these sectors. We find some evidence of this in Figure 5, which shows wage distributions by high- and low- proximity sectors, and confirms that a large mass of wages paid pre-pandemic in high-proximity sectors were close to the lower bound of the distribution.<sup>5</sup>

Second, it is also possible that demand for high proximity employment decreased simultaneously with labor supply, resulting in offsetting positive and negative wage effects and the observed negative employment effects. The channel by which remote work potential could have lowered labor supply matches the narrative of workers valuing remote jobs more highly than other occupations post-pandemic.<sup>6</sup> Figure 4 shows some evidence of offsetting demand and supply forces on wages, as reflected by small negative effects in 2020 and small positive effects in 2021. The effects are, again, very small: a 10pp point increase in the share of remote occupations in a municipality would increase the wage gap (with respect to 2020) in just .02pp.

<sup>5</sup>The large mass at the observed lower bound is, incidentally, close to the legal lower bound of wages: approximately equal to 120 MXN daily or 6 dls.

<sup>6</sup>clearly, the high proximity employment we study as our main outcome are, by their nature, unlikely to be performed remotely, and so, possibly less attractive when remote work is possible

	Wage gap		
$HiProx_g \times RW_j \times Pandemic_t$	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
$HiProx_g \times RW_j$	0.001* (0.000)	0.001 (0.000)	0.001 (0.000)
$RW_j \times Pandemic_t$	0.000 (0.000)	0.000 (0.000)	-0.001 (0.001)
$HiProx_g \times Pandemic_t$	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
$HiProx_g$	-0.000** (0.000)	-0.000* (0.000)	-0.000* (0.000)
$RW_j$	-0.000** (0.000)		
$Pandemic_t$	0.000*** (0.000)	0.000*** (0.000)	0.001*** (0.000)
Observations	779220187	779220187	759240747
MunFE	No	Yes	Yes
Controls	No	No	Yes

Note: This table shows results of triple -difference regressions of the wage gap on potential remote work at the municipal level. The regression is at the month-municipality-group (high proximity employment or not) level.

Table 2: Triple difference estimates, wages

We take the results as suggestive evidence that a weak labor demand in high proximity sectors was a predominant force at the start of the pandemic, with some effects of lower supply after the start of 2021. This evidence of lower labor supply is important for policy, as it suggests that the restaurant and entertainment firms that survived the pandemic may still face a stiff job market, and may therefore be pressured to raise prices, especially amid the environment of high inflation that prevails post-pandemic.

### 3.2 Prices

As suggested above, a closely related question is whether prices in sectors that involve high physical proximity changed differently due to the influence of remote work. Given our results above, *a priori* it is possible that prices went down, due to the negative demand shock, or that larger hiring costs led to higher prices instead. If the pandemic caused closures, then we might also expect higher costs due to lower competition in high-proximity sectors.

Figure 6 shows the price gaps, with respect to February 2020, in the restaurant and cinema industries (net of core inflation), by remote work potential at the city level.<sup>7</sup> The Figure shows that, while

<sup>7</sup>We use the sample of cities for which INEGI reports separate price indexes.

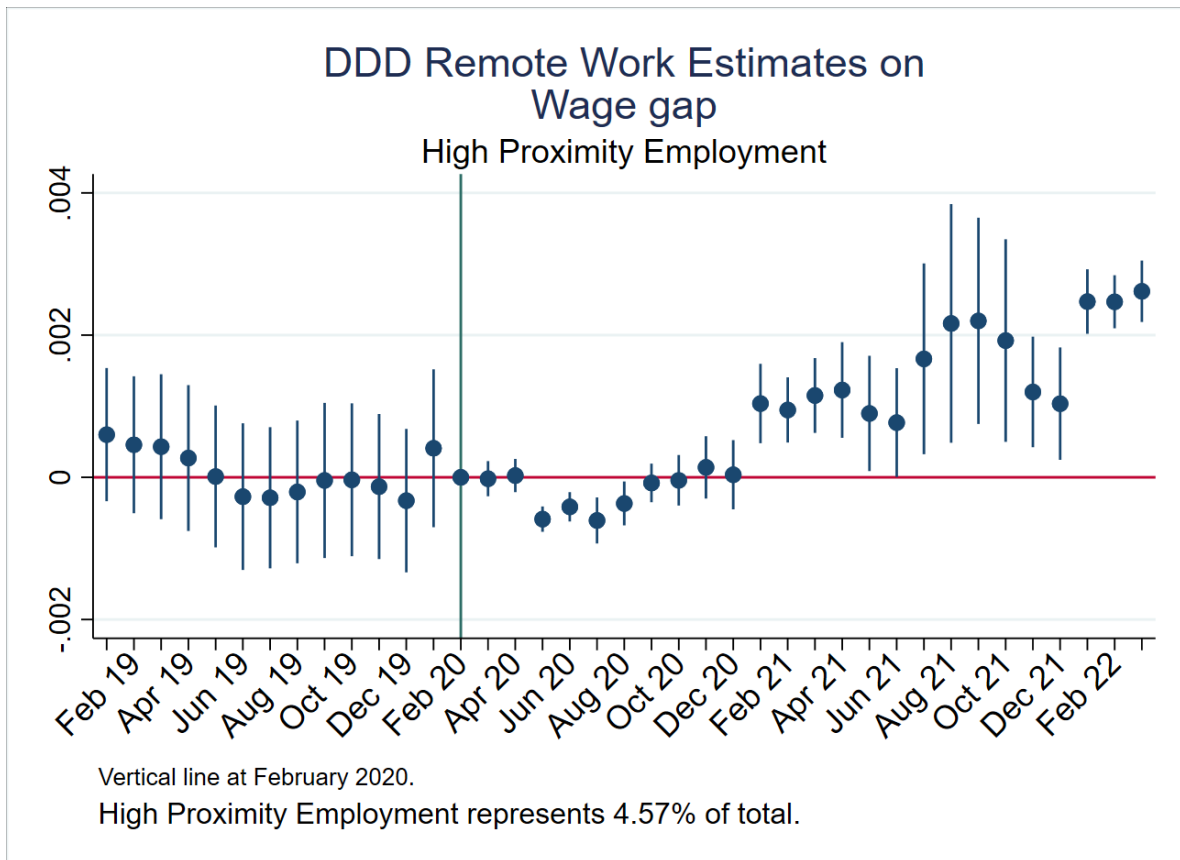


Figure 4: Events study triple difference estimates for high proximity wages



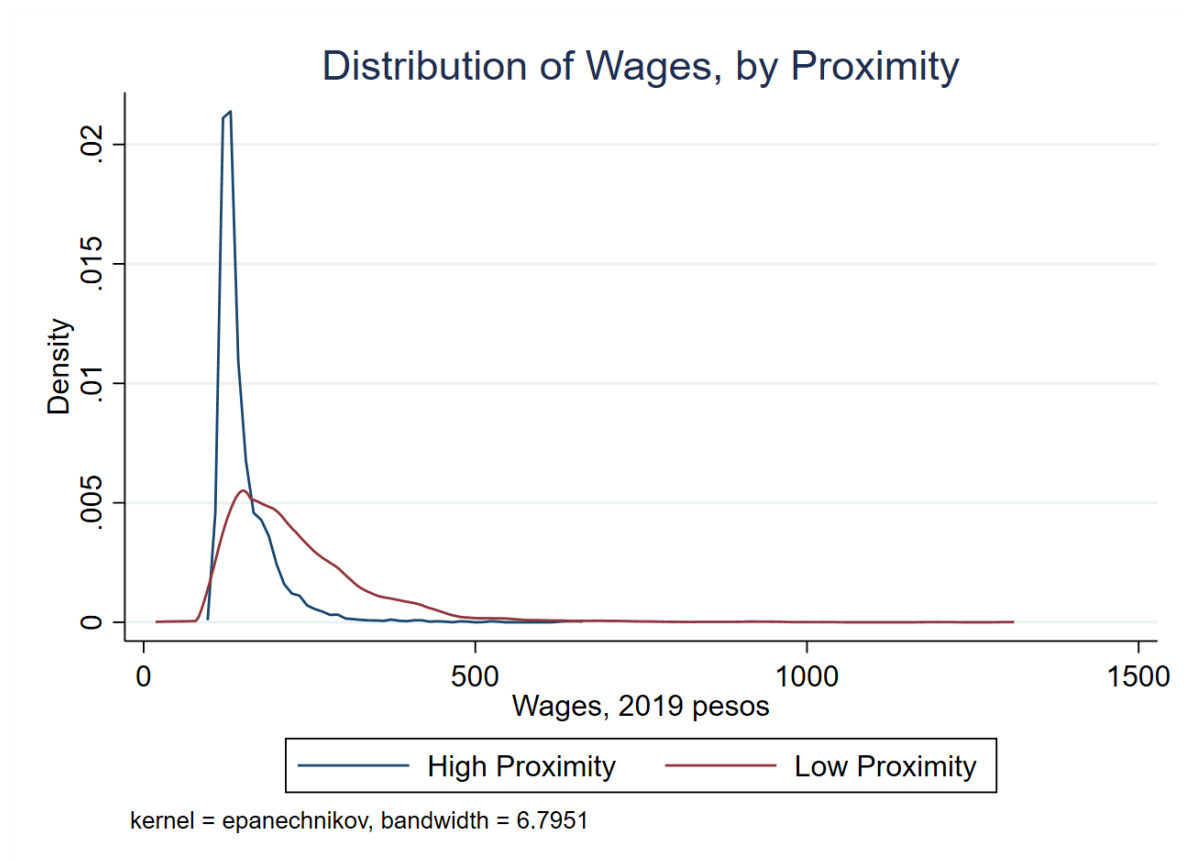


Figure 5: Wage distribution for high and low proximity sectors, February 2020

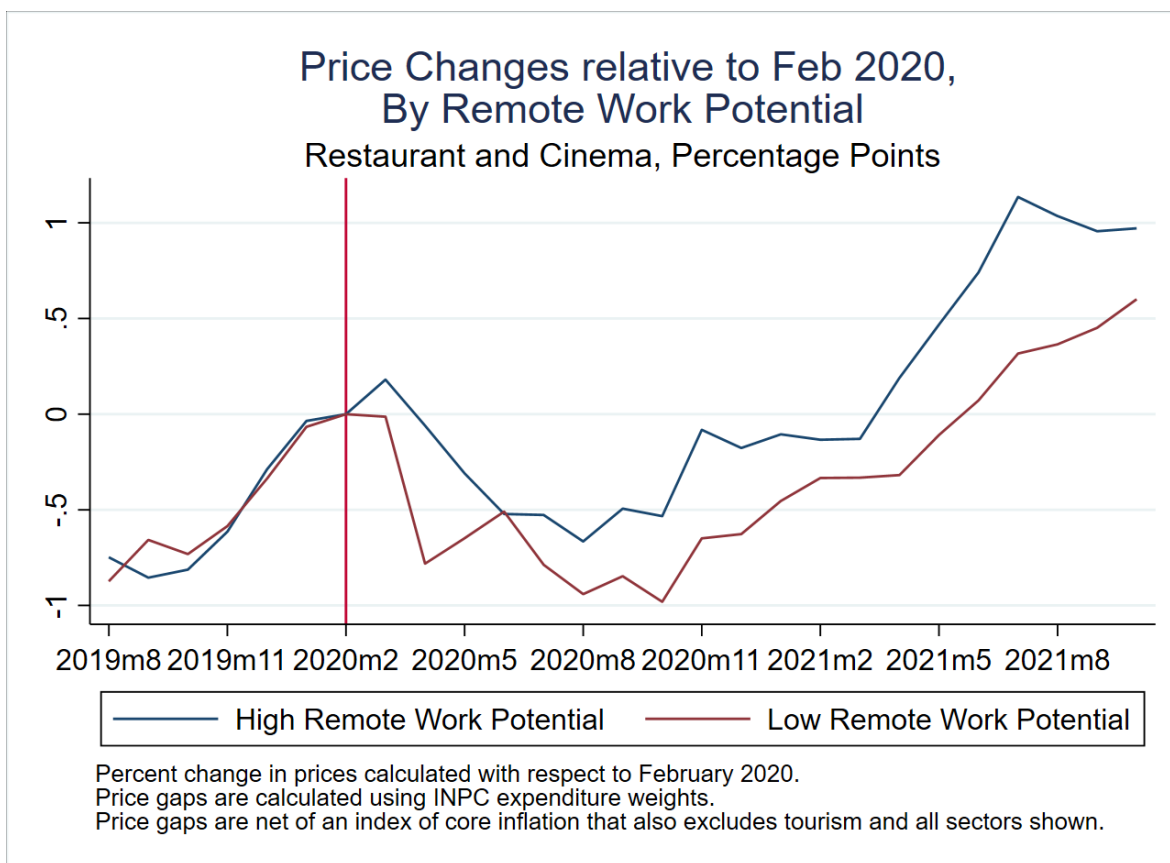


Figure 6: Local Price of Restaurants and Entertainment, by Remote Work Potential

prices in locations with high and low potential remote work followed similar trends before the pandemic, after February 2020 the prices of restaurants and cinemas increased more in locations where remote work was more likely. Given the small sample, we are precluded from running a full-fledged Difference in Differences specification- indeed, despite the clear descriptive pattern our Diff-in-Diff regressions seem underpowered and do not find a statistically significant effect. In any case, we interpret this result as evidence of a lower market level supply of these services, coming either from lower competition or higher marginal costs for these firms in locations with more remote work.

## 4 Counterfactual and regional implications

Our previous results show that remote work appears to be associated with larger employment gaps in high-proximity sectors during the pandemic. However, these two types of employment tend to co-locate: in our setting, in all regions of Mexico the correlation between the remote work potential and share of high proximity employment is positive. This suggests that the mechanism we study may be important at more aggregate levels, in particular in determining regional patterns of high proximity employment after the pandemic. To illustrate this, in this section we study how the observed distribution of potentially remote work matters for regional employment in high proximity sectors. We use Banco de México's definition of regions.<sup>8</sup> The strongest correlation between both kinds of em-

<sup>8</sup>These are: i) North: Baja California, Chihuahua, Coahuila, Nuevo León, Sonora y Tamaulipas; ii) Center North: Aguascalientes, Baja California Sur, Colima, Durango, Jalisco, Michoacán, Nayarit, San Luis Potosí, Sinaloa y Zacatecas; iii) Center: Ciudad de México, Estado de México, Guanajuato, Hidalgo, Morelos, Puebla, Querétaro y Tlaxcala; and iv) South: Campeche,

ployment is observed in the central region, where the correlation coefficient between both variables at the municipality level is 0.76, followed by the northern region with 0.65; 0.49 in the north-central, and 0.17 in the southern region.<sup>9</sup>

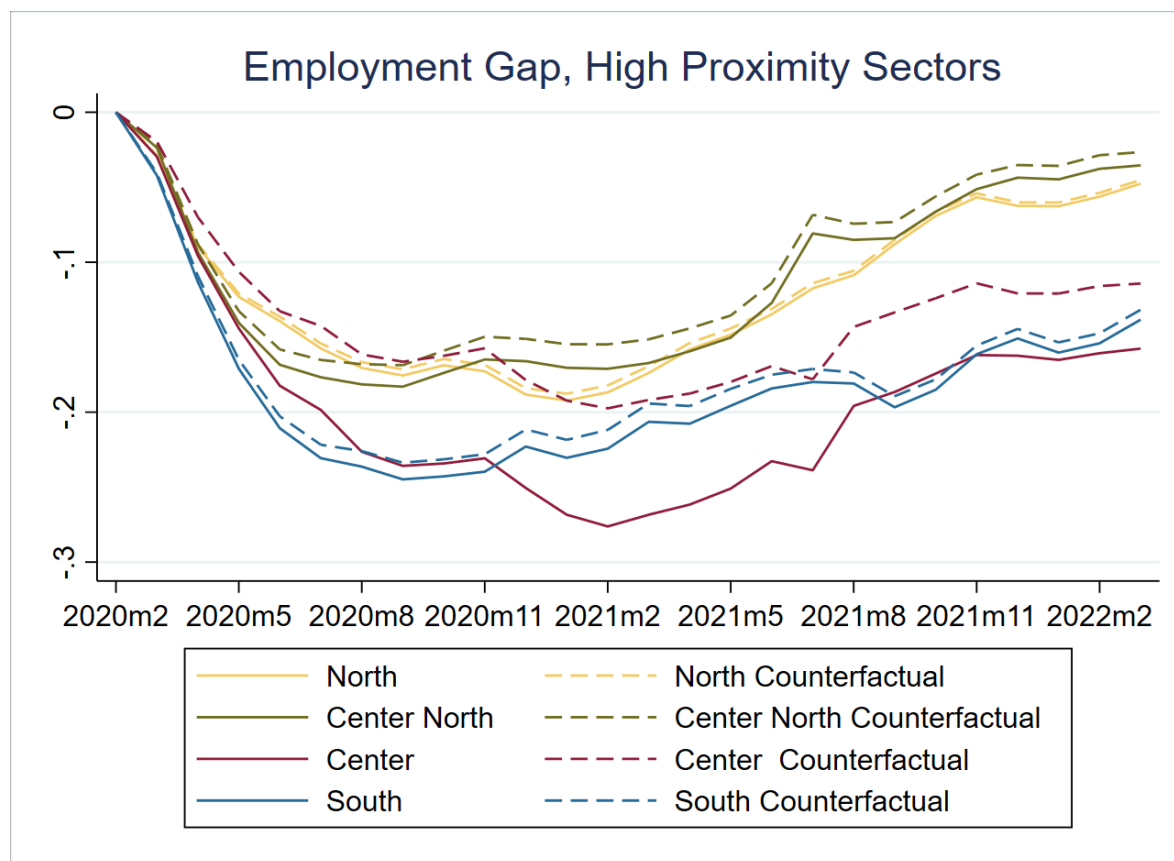


Figure 7: Observed and Counterfactual employment

To illustrate the importance of this interaction, we compute a measure of the co-location of remote work and high-proximity sectors by region in February 2020. This measure is the share of high-proximity employment of each region that is found in municipalities where remote work potential was greater than the national median at the time of the 2020 Census.<sup>10</sup> The central region shows a substantially higher proportion than the others, with 83.9% of its high-proximity employment located where remote work potential was high.<sup>11</sup> The second largest value is observed in the north central region with 58.7%, followed by the northern region with 41.3% and southern region with 38.7%. The central region also has the highest level of remote work potential, with 30.3% under our definition. Remote work potential in the northern region is 22.7%; 23.2% at the north-central, and 20.6% in the south.

This pattern and our previous results suggest that employment in high-proximity sectors would de-

Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz y Yucatán

<sup>9</sup>The co-location of both kinds of employment can also be summarized by calculating the proportion of remote work at the municipal level to which employees in sectors of high proximity are exposed on average. Under this metric, remote work exposure in high proximity sectors in Center is 38.4%, compared to 28.3% in the Center North, 26.4% in the North, and 27.7% in the South.

<sup>10</sup>The national median of remote work potential is calculated by weighting the total formal employment at the municipal level.

<sup>11</sup>The linear correlation weighted between the percentage of remote work potential and high proximity employment at the municipal level by region serves as an alternative measure of this co-localization of both variables and confirms that it is stronger in the central region.

cline more sharply in the central region after February 2020, and would show a slower recovery compared to the rest of the country. Indeed, Figure 7 shows that the central region suffered the largest, and most enduring gap in high proximity employment. The southern region presents the second largest gap, possibly due to high proximity sectors also reflecting low demand due to low tourism. To quantify the role of remote work in the relatively weak recovery of high proximity sectors in the central region throughout the pandemic period, we carried out the following counterfactual. We construct a hypothetical geographical distribution of potential remote work such that each municipality in the country has the same potential remote work, equal to the national share. Thus, the spatial distribution of remote work potential is independent of high-proximity employment and therefore the co-location of both variables does not affect the employment trajectory in high-proximity sectors. By equalizing remote work potential between regions, this counterfactual also incorporates the role of regional differences in remote work potential on the trajectory of formal employment in sectors of high proximity. The dashed line in Figure 7 shows the counterfactual trajectory of high proximity employment in the central region, using the estimates in the previous section and the assumptions described above. This trajectory is more similar to that observed in the other regions, indicating that regional differences in remote work potential, and the co-location of remote work potential and high proximity sectors, contribute to explain the modest relative recovery of these sectors in the central region. Figure 7 displays the counterfactual trajectories of high proximity employment resulting from an equivalent exercise for non-center regions as well. In all cases, counterfactual employment is higher, although the counterfactual trajectories are more similar to the observed time series in these regions than in the center.

## 5 Conclusion

In this paper we find, through a triple difference design, that a larger share of employment in occupations that can be performed remotely implied a decrease in high proximity employment during the COVID-19 pandemic in Mexico. Since high proximity employment and remote work occupations tend to co-locate, our results suggest a challenge for locations that showed a larger share of employment in occupations that can be performed remotely at the beginning of the pandemic. As an illustration of the strength of this channel, we show that if potential remote work and high proximity employment did not co-locate, the most sector-intensive region in Mexico would have displayed a substantially stronger recovery in high proximity employment.

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