



HOME (NOT SO) SWEET HOME: REMOTE WORK AND MEDICAL LEAVES IN BRAZIL

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The COVID-19 pandemic caused an unprecedented shift to remote work worldwide. In this paper, we investigate the dual impact of this transition on physical injuries and mental health issues by analyzing more than 1.5 million medical leaves in Brazil from 2018 to 2021. Using a differences-in-differences model, we compared workers from firms who transitioned to remote work (non-essential services) and those who stayed commuting to their workplace (essential services) before and after the pandemic. Our findings reveal a significant decrease in labor accidents, primarily driven by fewer bodily injuries, but a substantial increase in medical leave related to mental health issues. The abrupt transition to remote work, combined with increased domestic responsibilities in a setting of social distancing norms, likely contributed to elevated stress levels and work-life conflicts. Our findings highlight the contrasting health

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JEL Codes: I10, I18, D04

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Abstract

The COVID-19 pandemic caused an unprecedented shift to remote work worldwide. In this paper, we investigate the dual impact of this transition on physical injuries and mental health issues by analyzing more than 1.5 million medical leaves in Brazil from 2018 to 2021. Using a differences-in-differences model, we compared workers from firms who transitioned to remote work (non-essential services) and those who stayed commuting to their workplace (essential services) before and after the pandemic. Our findings reveal a significant decrease in labor accidents, primarily driven by fewer bodily injuries, but a substantial increase in medical leave related to mental health issues. The abrupt transition to remote work, combined with increased domestic responsibilities in a setting of social distancing norms, likely contributed to elevated stress levels and work-life conflicts. Our findings highlight the contrasting health impacts of remote work adoption in the context of an abrupt transition, with persistent mental health consequences that extend well beyond the initial pandemic shock.

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1 Introduction

The COVID-19 pandemic brought unprecedented changes in the way we live and work. One of the most relevant changes was the rapid and widespread adoption of remote work. As stay-at-home orders were implemented globally, millions of employees transitioned from their traditional workplace to working from home. This shift, while necessary to curb the spread of the virus, had profound implications for both physical and mental health. On the one hand, the reduction in commuting and physical presence in potentially hazardous work environments arguably decreased labor accidents. On the other hand, isolation, stress, and blurred boundaries between work and personal life associated with remote work may have contributed to a rise in mental health issues (Russell et al., 2009; Song and Gao, 2020; Gajendran and Harrison, 2007; Kim and Kim, 2025).

This paper explores these contrasting trends by analyzing empirical data on medical leaves in Brazil before and after the pandemic. In particular, we leverage more than 400,000 labor accidents per year registered in Brazil between 2018 and 2021, with detailed information about the medical problem and some demographics of the workers, such as gender, age, and firm sector. Brazilian workers in the formal labor market are entitled to stay on paid medical leave when they suffer an accident or disease caused by their work. By exploring the dual impact of remote work on physical and mental health, this study provides a comprehensive understanding of the implications of the work-from-home model in the context of a global crisis.

To investigate how the adoption of remote work affected medical leave, we compare workers entitled and not entitled to remote work using a differences-in-differences model. Specifically, we explore the Brazilian government’s stay-at-home regulation that defined essential sectors that must remain open during the pandemic while the remaining sectors should stop their in-person operations, forcing an abrupt adoption of working-from-home arrangements for some firms and employees. Due to the granularity of our dataset, we disentangle the heterogeneous effect by types of medical leave, such as the gender and age group of workers.

Our analysis reveals the contrasting effects of the COVID-19 pandemic on medical leave for workers who transitioned to remote work. We find a significant decrease in medical leaves, driven primarily by a reduction in labor accidents related to bodily injuries, with consistent results across the gender and age groups. However, there was a notable increase in medical leave due to mental health issues. We argue that this dual effect is attributed to the abrupt transition to remote work, which reduced physical labor accidents as workers stayed home but elevated stress levels and mental health issues due to the sudden need to adapt homes for work and manage domestic duties without proper protocols and support from employers. Our differences-in-differences estimates show an overall reduction of 10.6% in medical leave for remote workers, alongside a 160% increase in mental health-related leave, each relative to the control group. Despite the low frequency of medical leave caused by mental health illnesses before the pandemic, our findings highlight a substantial increase in these incidents for workers in remote work arrangements.

To ensure the robustness of our findings, we conducted an event study to assess the dynamic effects of the COVID-19 pandemic on medical leave and to test for any pretrends. This exercise confirms that there is no prior trend for medical leave, validating the parallel trend assumption of our differences-in-differences model. Although total medical leave returned to prepandemic levels six months after the outbreak, mental health-related leave remained elevated after the one-year period evaluated in the event study. This sustained increase suggests that remote work may have contributed to higher stress levels due to overwork and blurred boundaries between professional and personal tasks.

To understand the potential mechanisms driving our findings, we conducted a series of exercises on employment trends and heterogeneous effects. Arguably, there are factors specific to the COVID-19 pandemic, such as job losses in sectors most affected by the economic downturn, and others that are intrinsic to changes in the mode of work, such as work-life balance in remote work settings. Furthermore, if workers who remained their jobs are systematically different from those who suffered job losses, change in the composition of

essential and non-essential services may confound our estimates. We address these questions as follows.

First, we leverage data on employment to show that, despite the fact that larger job losses affected workers in non-essential services, there were no meaningful changes in the composition measured by demographic characteristics such as gender, education level, and age group. Hence, even non-essential sectors experienced a sharper decline in formal employment following the pandemic, which partially explains fewer labor accidents related to physical injuries, changes in the composition of sectors are not driving our results. More importantly, these job losses may have reduced physical injuries caused by machinery or hazardous workplaces, but the striking increase in mental health issues indicates that workers in the non-essential sector were negatively affected by stressor factors when working from home.

Second, we explore an alternative specification that uses only public employees in the group entitled to work from home. Since most Brazilian public employees have job stability, job losses may not be the main driver of changes in medical leave. We show that public employees do not have fewer bodily injuries when transitioning to remote work arrangements; however, we also find an increase in mental health problems for these workers. These results suggest that while a reduction in physical injuries is influenced by job losses in the pandemic, the increase in mental health leave is driven by changes in the mode of work, especially the challenges of maintaining work-life balance when working from home.

Lastly, in exploring further mechanisms behind the increase in mental health issues, we find that it was primarily driven by men and workers in high-stress sectors such as banking and financial services. In a setting where male workers stayed home with other family members, they likely had to take on more family responsibilities. This outcome is particularly striking, as women would in theory face a heavier burden, balancing household and childcare responsibilities while working in the same environment. (Sandoval-Reyes et al., 2021; Alon et al., 2020).

Our paper contributes to three strands of literature. First, we document a widespread effect on mental health unrelated to job loss and negative income shocks. Using data on Brazilian workers from the formal labor market covered by a social safety net, who remained employed during the pandemic, we differ from other studies that found negative effects on mental health driven by income shocks (Baranov et al., 2022; Fontes et al., 2024; Bau et al., 2022). Therefore, our approach isolates the effect of remote work from economic distress in the context of the pandemic (Mahmud and Riley, 2021; Witteveen and Velthorst, 2020), providing valuable information on other mechanisms that may also affect mental health, such as increased stress and domestic tasks.

Second, we provide a novel data set that includes detailed information registered by labor medicine doctors about physical and mental health issues that caused medical leave. Specifically for remote work, the findings in the literature are mixed in terms of stress and work-life balance. Although some evidence points out that workers may benefit from remote work through increased job autonomy (Duxbury and Halinski, 2014; Gajendran and Harrison, 2007; Hartig et al., 2007; Sardeshmukh et al., 2012; Fan and Moen, 2023), other studies show higher levels of stress due to overwork and increased work-life conflicts (Song and Gao, 2020; Felstead and Henseke, 2017; Russell et al., 2009; Yucel et al., 2024). Most of the evidence in the aforementioned studies is based on surveys, self-reported data, and small samples. Thus, our article adds to this literature by providing compelling evidence from more than 1.5 million medical leave in Brazil, representing a more accurate and objective measure of physical and mental health problems.

Finally, we also contribute to the growing literature on the expansion of remote work following the COVID-19 pandemic and its consequences for firms and workers (Emanuel and Harrington, 2024; Davis et al., 2024; Bloom et al., 2021, 2024; Hansen et al., 2023; Brucks and Levav, 2022; Jalota and Ho, 2024; Ho et al., 2023). We show that the sharp decline in medical leaves due to bodily injuries is short-lived and concentrated in the first months of the pandemic. This pattern is consistent with the literature documenting short-run positive effects

of working from home (Duxbury and Halinski, 2014; Gajendran and Harrison, 2007; Hartig et al., 2007; Sardeshmukh et al., 2012) and reflects temporary reductions in commuting, workplace exposure, and employment in non-essential services during lockdowns. In contrast, we find that medical leaves related to mental health increase persistently throughout the period we study, even after vaccination campaigns began and in-person activities gradually resumed. This result suggests potential adverse effects of remote work arrangements implemented without adequate organizational adaptation (Song and Gao, 2020; Felstead and Henseke, 2017; Russell et al., 2009; Yucel et al., 2024). By distinguishing between temporary effects associated with the pandemic shock and sustained effects related to changes in the organization of work, our findings contribute directly to ongoing debates on the long-term consequences of remote work in post-pandemic labor markets (Aksoy et al., 2023, 2025; Barrero et al., 2023a,b; Buckman et al., 2025; Zarate et al., 2024).

2 Background

2.1 Labor Market Regulation in Brazil

Brazil employs more than 100 million workers, according to the National Household Survey (PNAD Continua - 2023) of the Brazilian Institute of Geography and Statistics (IBGE). Approximately 38 million are in the formal labor market, 32 million are self-employed, and the remaining 30 million declare working in the informal sector (IBGE, 2024).

Within the formal labor market, employees are covered by the CLT¹, which regulates labor contracts and protects workers’ rights. One crucial aspect of this framework is the medical leave provision, which allows employees to take time off work due to illness, injuries, and labor accidents. Medical leave is granted upon presentation of a medical certificate, typically issued by a licensed healthcare professional, specifying the nature of the illness or

¹”*Consolidação das Leis do Trabalho*” (CLT). Federal Regulation No. 5.452. Implemented on 1 May 1943.

injury and the recommended duration of the leave.

Firms in the formal labor market must ensure that employees receive appropriate medical treatment and continue paying the employee’s salary during the period of medical leave, thus providing financial stability during times of illness or injury. Therefore, the Brazilian labor legislation for the formal labor market aims to safeguard employees’ rights, in sharp contrast to the lack of protections in the informal sector.

2.2 Labor accidents and medical leave in Brazil

According to Brazilian law, an accident at work is defined as any injury or illness that has the workplace as the cause or occurred while commuting to work. Employers or employees must inform the government about the occurrence of a labor accident through a document called “*Comunicados de Acidentes de Trabalho - CAT*”. Filing a CAT is mandatory to request paid medical leave from the Ministry of Social Security (INSS).

In 2018, the INSS evaluated 595 thousand administrative processes related to labor accidents. The total expenditure, including aid and benefits, was approximately R\$ 12 billion (Brazilian Labor Justice (TRT4), 2020). Only about 17% of the injured required minor medical care, allowing employees to continue their normal work. In other cases, about 61% resulted in the employee being away from work for less than 15 days, during which the employer pays the worker’s salary, and in 22% cases, absences lasted more than 15 days².

2.3 The Covid-19 Pandemic and remote work expansion

During the COVID-19 pandemic, the Brazilian government declared a nationwide emergency³. The federal government aimed to mobilize resources and coordinate regulations to combat the spread of the virus across the country. As part of this emergency response, strict measures were implemented to protect public health. These measures were aimed at

²Since 83% of labor accidents result in medical leave, we use the terms “labor accidents” and “medical leaves” interchangeably throughout the remainder of the paper.

³Decree No. 188, issued on 4 February 2020, by the Ministry of Health

flattening the infection curve, alleviating strain on healthcare systems, and protecting vulnerable populations. In parallel, the government introduced economic support measures, including payroll subsidies and programs to reduce working hours or temporarily suspend labor contracts, in an effort to alleviate the costs for firms and preserve employment during the crisis.⁴

The adoption of remote work became a crucial strategy to ensure business continuity while safeguarding the health and safety of employees. Essential services, such as healthcare, public safety, and food supply chains, were authorized to continue their operations with the necessary precautions. However, other sectors considered non-essential transitioned abruptly to remote work arrangements to minimize physical interactions and reduce the risk of virus transmission⁵.

All non-essential sectors became subject to mandatory remote work requirements simultaneously in March 2020.⁶ The formal regulatory basis for these restrictions was the state of public calamity declared by Legislative Decree No. 6/2020, which expired on December 31, 2020. Beginning in January 2021, enforcement of social distancing measures was devolved to state and municipal governments—a competence formally upheld by the Federal Supreme Court (STF, ADI 6341)—with states maintaining emergency frameworks through 2021 given the ongoing epidemiological pressure prior to the full vaccine rollout. Many firms in non-essential sectors also chose to continue remote work arrangements voluntarily beyond the period of formal restriction⁷. In this context, the gradual decentralization of enforcement

⁴The Brazilian Constitution does not allow firms to reduce wages or working hours under normal circumstances. However, during the pandemic, specific legislation was enacted to temporarily authorize these measures, and in such cases, the government compensated workers for lost income, thus helping firms reduce costs without imposing a severe income shock on employees. Source: Brazilian Legislative House

⁵The list of essential services, initially defined in March 2020, underwent only minor changes throughout the pandemic. Table A.4 details all sectors included in the list along with their respective inclusion dates. We address potential concerns related to the staggered adoption of the status of essential services in the robustness section

⁶The essential services framework was established by Decree No. 10.282 of March 20, 2020, and subsequently refined by Decrees No. 10.292, 10.329, and 10.344, which progressively reclassified a small number of activities—including gyms and personal care services—as essential, thereby removing them from the mandatory remote work requirement.

⁷Media reported strong reluctance from both firms and employees to abandon remote work arrangements, even after the vaccination rollout. (PEGN, 2021, CNN, 2021).

over 2021 implies that effective compliance became progressively less uniform.

The pandemic exacerbated mental health issues in both Brazil and throughout the world. Stress and anxiety caused by the pandemic have led to a notable increase in mental health-related problems. According to a study by the IBGE, there was a significant increase in reports of mental health problems during the pandemic, with a substantial number of Brazilians seeking mental health services (BBC News Brasil, 2021). The World Health Organization (WHO) also reported a dramatic increase in the prevalence of anxiety and depression worldwide, estimating a 25% increase in the first year of the pandemic (World Health Organization, 2022).

3 Methods

3.1 Theoretical Framework

To guide the interpretation of our empirical results, we outline a simple framework linking remote work with medical leave due to physical and mental health conditions. We model medical leave as the result of commuting conditions, sectoral risks, home-office feasibility, and idiosyncratic factors.

$$\text{MedicalLeaves}_{ij} = f(C_i, R_j, H_{ij}, u_{ij}),$$

where C_i captures the length of commute and the exposure to traffic-related risks faced by the worker i in sector j ; R_j denotes sector-specific hazards or stressors; H_{ij} measures the feasibility and quality of remote work; and u_{ij} represents individual shocks. We focus on two outcomes. For *physical injuries*, both commuting risks and sectoral hazards are expected to increase medical leave, whereas remote work reduces exposure to these risks. Therefore,

$$\frac{\partial \text{MedicalLeaves}_{ij}^{\text{Physical}}}{\partial H_{ij}} < 0.$$

For *mental health-related* leaves, the mechanisms are more nuanced. Sector-level stressors can increase the incidence of mental health problems, but the effect of remote work can vary. Greater autonomy and flexibility can reduce stress (Duxbury and Halinski, 2014; Gajendran and Harrison, 2007; Hartig et al., 2007; Sardeshmukh et al., 2012), while inadequate infrastructure or care responsibilities at home can offset these benefits (Song and Gao, 2020; Felstead and Henseke, 2017; Russell et al., 2009; Yucel et al., 2024). Hence,

$$\frac{\partial \text{MedicalLeaves}_{ij}^{\text{Mental}}}{\partial H_{ij}} \geq 0.$$

The COVID-19 pandemic represents a shock in this context. Instead of a gradual and voluntary transition, the adoption of remote work was sudden and widespread, often without adequate technological or managerial support (Bloom et al., 2021, 2024). School closures and increased household responsibilities further constrained workers, amplifying work-life conflict and psychological stress (Yucel et al., 2024; Russell et al., 2009). Although this limits the generalizability of our estimates to non-pandemic contexts, the findings still provide useful insights into the mechanisms through which remote work, when poorly supported, can worsen mental health outcomes.⁸

3.2 Data

We use monthly data from "*Comunicados de Acidentes de Trabalho*" (CAT-INSS) between 2018 and 2021. This data set is regulated by Law No. 6.367/1976, which established the reporting of workplace accidents to the Brazilian National Institute of Social Security (INSS). According to Brazilian labor legislation, employers must report all labor incidents and ensure that workers receive adequate benefits and medical assistance in cases of injury or incapacity resulting from work-related incidents. The CAT-INSS dataset provides comprehensive

⁸In the section 4.4, we present a set of exercises aimed at disentangling pandemic-related effects—such as job losses—from the impact of switching to remote work, and we test alternative definitions of treated and control groups to identify which mechanisms are most likely to drive changes in mental and physical health-related medical leave.

information on reported workplace accidents and consequently medical leaves in all municipalities in the country. Furthermore, it also includes detailed information on the date and location of the accident, the nature of the injuries, the firm sector, and the occupations of the workers. For this paper, we used data from July 2018 to December 2021⁹. Regarding the identification of which sectors adopted remote work arrangement after the COVID-19 pandemic, we rely on the federal regulation of essential services¹⁰.

We group all labor accidents registered per municipality by month and firm sector¹¹. We rely on a specific code called the "Classificação Nacional de Atividade Econômica" (CNAE) that characterizes the main economic activity of Brazilian firms. We use the CNAE code to match the essential services defined by the federal regulation and create a panel where we identify labor accidents in (i) firms allowed to maintain in person operations after the COVID-19 outbreak, *essential services*, and (ii) firms forced to move to remote work, *non-essential services*. For our baseline approach, we grouped labor accidents by essential and non-essential services at the municipality level. This decision simplifies the analysis of a high-dimensional panel, given that Brazil has 673 different CNAE codes¹². Lastly, we collect data on formal employment by sector from the Brazilian Ministry of Labor to explore employment trends in essential and nonessential sectors before and after the pandemic.

⁹Brazil has 5,570 municipalities, and in these period 4,898 reported at least one labor accident in the CAT-INSS.

¹⁰Table A.4 lists all sectors classified as essential services. Most of these occupations require on-site work—such as transportation, food retail, and healthcare—with very limited scope for remote tasks. Although some administrative or IT-related roles within essential sectors could be performed from home, there is no evidence of widespread remote-work adoption in most of the sectors classified as essential services in Brazil (Agência Brasil, 2021). Finally, as noted in Section 2.3, despite the start of vaccination in January 2021 and the gradual easing of distancing measures, many firms in non-essential sectors continued to operate remotely throughout the year.

¹¹We organize the panel at the municipality-industry level because the outcomes depend heavily on local labor-market conditions—such as health-service capacity and commuting patterns—that vary substantially between municipalities, even within the same industry. This level of disaggregation allows us to control for these fixed local characteristics and avoid aggregation bias (Goodfriend, 1992).

¹²Using this approach, we identified 4,898 municipalities reporting labor accidents in non-essential services and 2,797 municipalities with at least one incident in essential services; As a result, our panel consists of 7,695 units over a 42-month period

Table 1: Medical Leaves in Brazil - Monthly Average from 2018 to 2022

		1	2	3	4	5	6
		Essential Services			Non Essential Services		
Monthly Average		Before Pandemic	After Pandemic	t-test	Before Pandemic	After Pandemic	t-test
Gender	Total	7,916.14	7,713.73	-202.40	27,821.95	25,036.52	-2,785.43
	Female	4,524.00	4,625.82	101.82	7,371.57	6,351.13	-1,020.44
	Male	3,389.28	3,055.69	-333.59	20,441.85	18,614.00	-1,827.85
Age	15-25 y.old	1,246.42	1,196.56	-49.86	4,792.19	4,470.13	-322.06
	25-35 y.old	2,297.33	2,203.87	-93.46	8,085.09	7,064.26	-1,020.83
	35-45 y.old	2,067.95	2,089.08	21.13	6,656.04	6,049.60	-606.43
	45-55 y.old	1,110.33	1,092.47	-17.85	3,934.57	3,558.91	-375.65
	55 y.older	439.90	366.34	-73.55*	1,711.33	1,470.95	-240.37
Cause	Mental Health	238.90	96.78	-142.12***	154.90	115.69	-39.20**
	Body Injuries	5,010.28	3,978.43	-1,031.85**	22,234.23	18,929.08	-3,305.15*
	Musculoskeletal Illness	512.66	386.30	-126.36***	1,829.66	1,496.60	-333.05**
	Mortality and Morbidity	692.00	744.30	52.30	1,497.52	1,530.47	32.95
	Body Pain	88.00	64.13	-23.87***	305.33	242.87	-62.46**
	Flu and respiratory viruses	1,205.52	1,169.21	-36.30	992.61	914.91	-77.70
Employment	Number of Jobs (milions)	6,820	7,089	0,268	37,214	38,044	0,830

Note: This table presents the monthly average of medical leave in Brazil from 2018 to 2022. Columns 1 and 2 show these statistics before and after the pandemic (March 2020) for sectors declared as essential services by the Brazilian Government, while columns 4 and 5 show the same statistics for the remaining sectors (non-essential services). Columns 3 and 6 present the results of a t-test on the difference of means before and after the pandemic for essential and non-essential services, respectively.

*p<0.1, **p<0.05, ***p<0.01

3.3 Empirical Framework

Our identification strategy employs a difference-in-differences approach to test the impact of remote work arrangements on labor accidents. With the federal regulation suspending in-person operations for nonessential services following the COVID-19 outbreak, employees in these sectors transitioned to remote work settings. Consequently, this group abruptly stopped commuting to physical workplaces and began to perform their duties from home. In contrast, workers in essential services maintained their commute routines and continued to be exposed to workplace environments.

Following the theoretical framework presented in Section 3.1, we expect a reduction in labor accidents for workers in non-essential sectors that adopted remote work, particularly in physically demanding industries such as manufacturing and machinery, since their tasks cannot be performed remotely. There is also likely to be a decrease in accidents during commutes, as remote work eliminates the need for workers to travel to their workplaces. Furthermore, remote work mitigates the exposure to diseases transmitted by interpersonal contact,

potentially reducing the incidence of infectious diseases such as influenza and COVID-19. However, prolonged time spent in shared living spaces, coupled with various restrictions caused by social distancing rules, can lead to conflicts over household responsibilities and childcare, potentially increasing stress levels and contributing to mental health issues such as burnout, which can also be classified as labor accidents.

By designating workers in nonessential sectors as the treated group, our identification strategy relies on whether labor accidents in treated and control groups would have followed similar trajectories post-March 2020 in the absence of COVID-19 and the widespread adoption of remote work. Although this assumption is untestable, we argue that it is likely to hold given the unexpected nature of the pandemic for firms and its arguably exogenous origins. Before March 2020, there were no relevant obstacles for firms to adopt remote work practices. However, pandemic-related restrictions accelerated the adoption of remote work, particularly for nonessential sectors that must adapt their operations to comply with federal regulation. Furthermore, the absence of differential pretrends offers indirect evidence supporting the validity of our findings¹³. Under these assumptions, we use the following model to assess the effect of the COVID-19 pandemic on medical leave.

$$y_{mgt} = \phi_m + \phi_{st} + \beta_1 * \text{COVID}_t + \beta_2 * \text{COVID}_t \times \text{Non-essential} + X_{mt} + \mu_{mgt} \quad (1)$$

The dependent variable y_{mgt} represents the number of labor accidents in a municipality m , for each group g - essential and non-essential services, in the month t . Regarding the covariates, COVID_t is a dummy variable equal to one after the announcement of social distancing rules and the regulation of essential sectors by the Brazilian government in March 2020 and Non-essential is a dummy equal to one for the group of firms classified as non-essential services and hence mandated to adopt remote work arrangements ; ϕ_m and ϕ_{st} are municipalities

¹³We acknowledge that jobs in teleworkable (non-essential) sectors may differ systematically from those in non-teleworkable (essential) ones. Although these differences could confound our estimates, we mitigate this concern by controlling for sector, region, and time-fixed effects to account for time-invariant characteristics

and state-specific time fixed effect, while the former captures any time-invariant characteristics of the municipalities, the latter absorbs all time-varying changes that occur at the state level, such as changes in the government spending in healthcare and infrastructure, which usually benefit multiple municipalities; and X_{mt} is a vector of covariates, specifically we use the municipality’s GDP per capita to account for differences in economic development across municipalities. Our main coefficient of interest is β_2 , which shows the effect of COVID-19 on labor accidents for workers in non-essential services after controlling for location- and time-fixed effects. Finally, we also test an alternative specification of Equation 1 using the sector size in each municipality as weights in the differences-in-differences design¹⁴.

4 Results

4.1 Dynamic Effects and Parallel Trends

We present the results of our empirical analysis through an event study, which simultaneously establishes the validity of our identification strategy and reveals the full temporal dynamics of the treatment effects. Following Sun and Abraham (2021), we include indicator variables for each month before and after the COVID-19 outbreak (2020m3), and use the weighted specification as our baseline to account for the relative importance of each sector within municipalities. This approach gives more weight to estimates from municipalities where non-essential services represent a larger share of local employment, providing a more policy-relevant average effect and improving precision in the presence of heterogeneous sector sizes.

Figure 1 presents the event-study estimates for three outcomes: total medical leave, bodily injuries, and mental health-related leave. Two findings stand out. First, all coefficients in the pre-pandemic period are small and statistically indistinguishable from zero, supporting the parallel trends assumption underlying our difference-in-differences design. Second, the

¹⁴This strategy helps to address both within-municipality differences—such as the relative size of essential versus non-essential services—and across-municipality differences, by giving more weight to larger municipalities in the estimation.

post-pandemic trajectories reveal a striking divergence between physical and mental health outcomes — the central result of this paper.

For bodily injuries and total medical leave, the treatment effect is large, negative, and concentrated in the first six months following the pandemic onset. We interpret this pattern as reflecting the abrupt elimination of workplace and commuting hazards for non-essential workers. Workers in manufacturing and other industries involving machinery or heavy loads were no longer present at their workplaces, substantially reducing their exposure to the risks that typically generate labor accidents. After this initial period, bodily injury leave gradually converges back toward pre-pandemic levels, consistent with a temporary shock to working conditions rather than a permanent structural change.

The trajectory for mental health-related leave is markedly different. Starting from no discernible pre-trend, the effect turns positive after the pandemic onset and remains elevated throughout the entire post-pandemic period we study. We argue that the abrupt transition to remote work elevated stress levels in a context where workers had little time to adapt their homes and firms had not established protocols and adequate support for executing job tasks from home. Additionally, a potential explanation for the increase in mental health issues is that employees transitioned to remote work while also having to take on domestic duties, such as housekeeping and childcare in a setting where schools were closed. Lastly, this trajectory may reflect the cumulative impact of prolonged uncertainty about pandemic and vaccine deployment, increased stress from extended periods at home, and possibly greater awareness or willingness among workers to seek help¹⁵ (Sandoval-Reyes et al., 2021; Song and Gao, 2020; Russell et al., 2009).

¹⁵In Section 4.4 we present a series of exercises to disentangle COVID-specific factors from those related to changes in the mode of work. More specifically, we extend our analysis to account for employment trends, shifts in the composition of sectors, and heterogeneous effects by gender and age group.

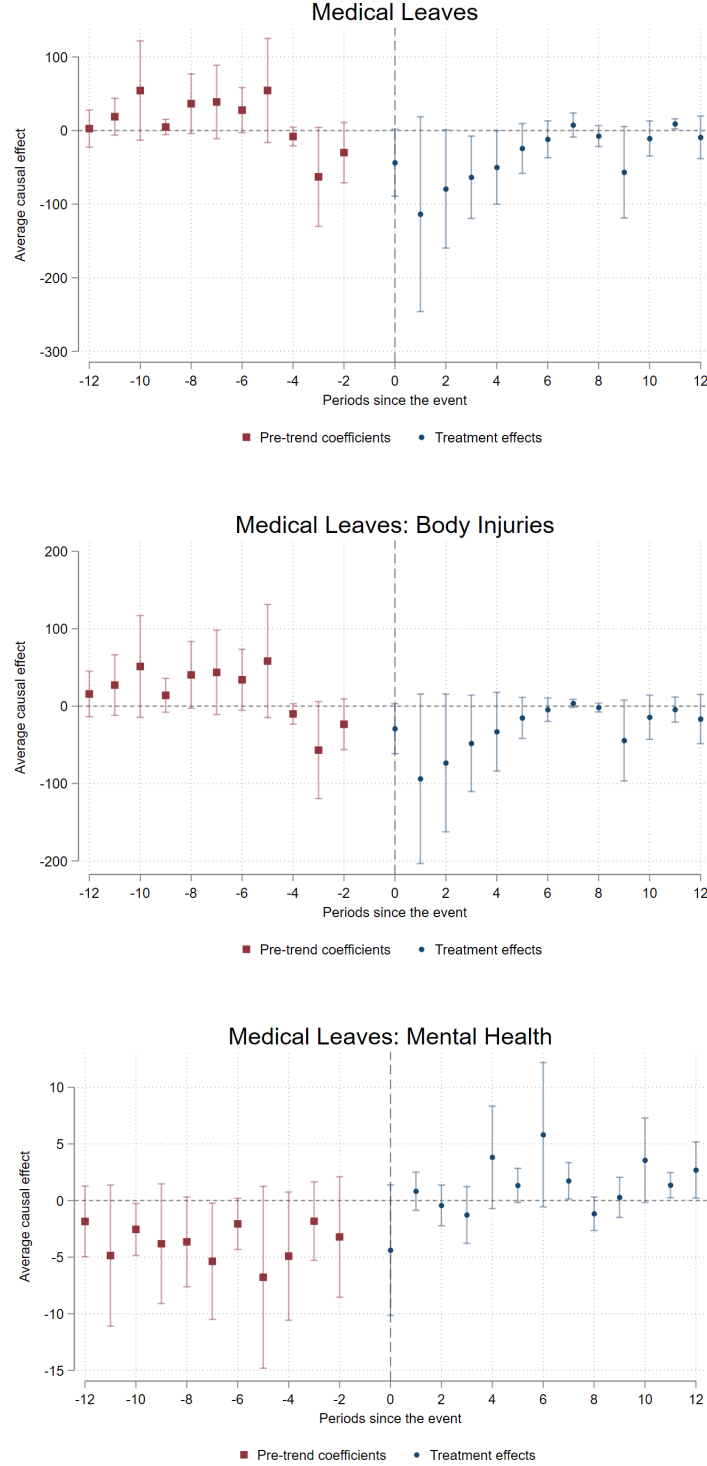


Figure 1: Dynamic Effects of COVID-19 on Medical Leaves

Note: This figure shows the event-study for the effect of the COVID-19 pandemic on medical leaves using the specification proposed by Sun and Abraham (2021). The outcome variables are total medical leaves, and medical leaves related to bodily injuries and mental health issues respectively. The bars represent 95 percent confidence intervals. Standard errors are clustered at the municipality level.

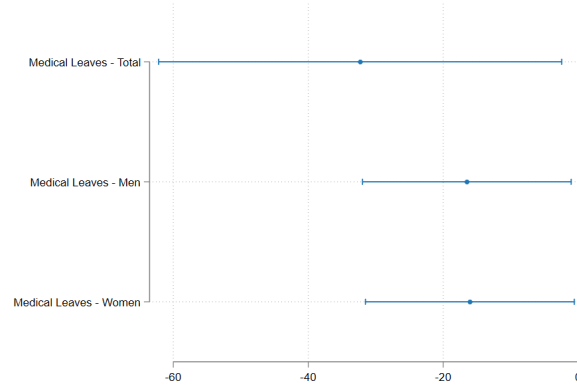
4.2 Main Estimates

Figure 2 complements the event-study evidence by presenting the average treatment effect disaggregated across gender (Panel A), cause of medical leave (Panel B), and age group (Panel C), using the same weighted difference-in-differences estimator. The reduction in total medical leave and bodily injuries is broadly consistent across gender and age groups. The increase in mental health-related leave, however, is concentrated among workers aged 25 to 45 years. Full estimates for both the unweighted and weighted specifications are reported in Appendix Table A.1.

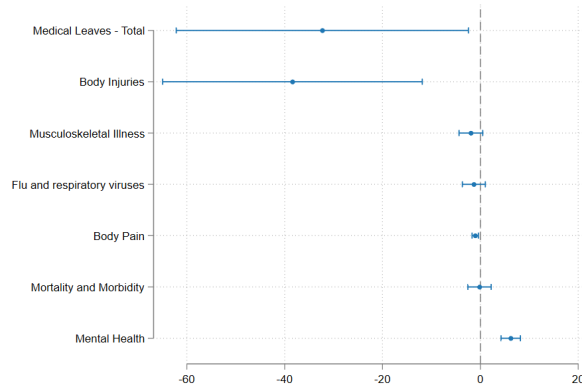
The reduction in total medical leave corresponds to approximately 10.6% relative to the unweighted control group mean (Table A.1, column 5). Medical leave related to mental health — though rare in the pre-pandemic period — increased by approximately 160% in the same specification. Although heightened uncertainty during the pandemic may have contributed to higher stress levels, we argue that the abrupt shift to remote work likely amplified the mental health effect. Our difference-in-differences design supports this interpretation by comparing workers similarly exposed to pandemic conditions, thereby isolating the additional impact of the remote work transition.

Considering the weighted specification, the implied percentage effects are considerably smaller: total medical leave fell by approximately 0.02% and mental health-related leave increased by roughly 0.5% relative to the weighted mean (Table A.1, column 10). The smaller magnitude is a consequence of Brazil’s extreme spatial concentration of formal employment. The weighted mean is dominated by a handful of large urban municipalities where baseline medical leave is higher than in the typical municipality, so even large absolute effects translate into modest percentage changes relative to that denominator.

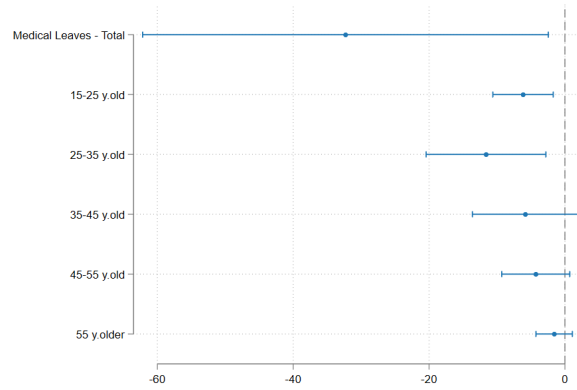
This pattern also reflects differences in sector composition across municipality size. Non-essential sectors in large urban centers encompass a broad mix of activities. Smaller municipalities tend to have more specialized non-essential sectors such as retail and food services. The two estimators therefore identify distinct parameters: the unweighted ATT captures the



(a) Gender



(b) Cause



(c) Age

Figure 2: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil

Note: This figure shows the differences-in-differences estimator and 95% confidence intervals for the effect of the pandemic on medical leaves for workers in non-essential services using the sector sizes as weights, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$. Panel A presents the overall results and breaks them down by gender, Panel B shows the effect by cause of medical leave, and Panel C by age group.

average treatment effect for the average municipality, while the weighted ATT approximates the effect for the average Brazilian worker. For national-level policy evaluation—such as projecting aggregate costs to Brazil’s social security system (INSS) or designing mental health support programs for the formal workforce—the weighted estimator is the more appropriate benchmark, as it reflects the experience of the worker who is most likely to be directly affected by remote work mandates. For sub-national and municipal policy, the unweighted estimator better captures the experience of the typical municipality and provides a more conservative basis for local resource allocation. Crucially, both specifications agree on the direction and qualitative interpretation of all effects: the remote work transition reduced physically hazardous workplace exposure while substantially increasing mental health leave.

4.3 Robustness

Alternative specification. Given that the number of labor accidents is count data with nonnegative integer values, Poisson and Negative Binomial models are often suggested as appropriate methods to test the sensitivity of our estimates to the causal effect of the COVID-19 pandemic on medical leaves. To address the relatively low incidence of labor accidents in some municipalities and sectors in Brazil, we run both models as a robustness test. The results of this exercise are presented in Table A.3. Our main conclusion stands in both specifications; mental health issues increased while there was a drop in total medical leave for workers that transitioned to remote work, confirming the robustness of our findings.

Changes in the designation of Essential Services. In our main specification, we define nonessential services as the treated group because of the abrupt shift toward remote work during the pandemic. To address concerns regarding changes in the classification of essential services over time, which implies that some sectors migrated from the treated to the control group, we implement a robustness test using a staggered DiD framework. To make use of the method proposed by Callaway and Sant’Anna (2021), we invert the treatment definition in this specification: we consider essential services as treated and examine the

effect of their staggered inclusion in the essential list. As a result, the signs of the estimated coefficients are inverted relative to the main analysis. Figure A.4 shows the results of this exercise for the overall effect and for mental health medical leave. Our main conclusion still holds with more cases of medical leave for employees working in person compared with fewer cases of mental health issues.

Demographic Composition Controls. A further concern is that the COVID-19 shock may have altered the demographic composition of non-essential sectors, so that changes in medical leave partly reflect compositional rather than behavioral responses. To address this, we re-estimate Equation (1) augmenting the baseline specification with time-varying controls for the shares of male workers and workers in each age group within sector-municipality cells. Appendix Table A.2 reports these estimates alongside the baseline. The point estimates are virtually identical across all outcomes and specifications, confirming that demographic recomposition does not account for the main findings.

4.4 Mechanisms

Job Loss vs. Changes in the Mode of Work. A key concern for interpreting our results is whether the effects we document on medical leaves are driven by (i) COVID-specific shocks—most notably job displacement—or (ii) broader mechanisms related to the reorganization of work, such as the expansion of remote work and reductions in commuting and work-related mobility. Distinguishing between these channels is essential, particularly for understanding the implications of remote work for worker well-being.

To address this issue, we examine the heterogeneity in the effects of treatment between groups differentially exposed to job loss during the pandemic. We focus on public-sector workers who experienced little to no job separation and remained employed throughout the period, even in non-essential occupations. This group provides a direct test of whether the observed effects are mechanically driven by labor force reductions or instead reflect changes in how work was performed.

Specifically, we estimate a difference-in-differences specification in which the treatment group consists solely of public-sector employees, comparing outcomes before and after the onset of COVID-19. Since these workers did not face substantial job loss, finding effects similar to the baseline would support the interpretation that changes in the mode of work—rather than displacement—drive the results.

Table A.5 presents the estimated effects. Two patterns emerge. First, the coefficient of mental-health-related leave for government employees is positive and statistically significant (p-value of 5.9%), despite minimal job loss. This supports the interpretation that mental health impacts originate from broader changes in workplace organization—such as blurred work-life boundaries, increased isolation, or stress associated with remote work—rather than from COVID-specific displacement. Second, we find no effect on leaves related to bodily-injury. Interpreted alongside the decline in bodily injuries in the full sample, this suggests that reduced commuting and lower physical exposure at work have limited effects on physical accidents; instead, job losses appear to be the primary driver of the decrease in bodily-injury medical leaves.

These findings reinforce that the reduction in bodily-injury leave is driven largely by job displacement, which disproportionately affected non-essential services, while the increase in mental-health leave may reflect changes in the experience of work itself—particularly the shift to remote work and disruptions in work-life balance.

Gender-specific effects. To investigate whether the pandemic affected men and women differently, we explore gender heterogeneity in the impacts on employment, body injuries, and mental-health-related medical leave. Table 2 summarizes these results. Job losses are remarkably similar between genders, with average reductions of 0.039% for men and 0.046% for women relative to baseline levels. These findings indicate that the contraction in non-essential sectors hit both groups to a comparable degree, and we do not observe gender-specific trends in employment losses.

Panels B and C show sharp gender differences in medical-leave outcomes, conditional

Table 2: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil - Gender and Age Group

Panel A: Employment	Gender		Age Group				
	(1) Male	(2) Female	(3) 15-25 y.old	(4) 25-35 y.old	(5) 35-45 y.old	(6) 45-55 y.old	(7) 55 y.older
COVID $\times$ Non-essential	-8.699,92*** (684.98)	-7.745,59*** (375.38)	-4.691,10*** (452.93)	-4.938,34*** (254.71)	-3.403,22*** (176.46)	-2.568,38*** (125.76)	-838,23*** (60.15)
<i>s.e.</i>							
<i>control mean</i>	22.588.601	16.901.961	5.016.660	11.188.543	11.314.752	7.658.962	4.308.460
<i>avg. effect</i>	-0,039%	-0,046%	-0,094%	-0,044%	-0,030%	-0,034%	-0,019%
Panel B: Body Injuries							
COVID $\times$ Non-essential	-16,501** (7.886)	-16,052** (7.896)	-6,125*** (2.097)	-10,654*** (4.079)	-7,857** (3.476)	-4,597** (2.146)	-2,614** (1.194)
<i>s.e.</i>							
<i>control mean</i>	126,120	39,970	29,644	48,231	39,025	23,133	10,296
<i>avg. effect</i>	-13,08%	-40,16%	-20,66%	-22,09%	-20,13%	-19,87%	-25,39%
Panel C: Mental Health							
COVID $\times$ Non-essential	5,575*** (0.819)	0,640* (0.343)	0,075 (0.049)	0,729*** (0.235)	3,048*** (0.484)	1,707*** (0.373)	0,828*** (0.146)
<i>s.e.</i>							
<i>control mean</i>	0,574	0,583	0,046	0,326	0,371	0,227	0,068
<i>avg. effect</i>	970,53%	109,84%	161,89%	223,43%	820,81%	750,89%	1213,46%

Note: This table shows the estimator of differences in differences for the effect of the pandemic on employment and medical leave by gender and age-group of workers in non-essential services, captured by the coefficient of interaction COVID $\times$ Non-essential. Columns 1 to 2 report estimates by gender while columns 3 to 7 show the results by age group. Panel A presents the results for employment, while panel B and C shows the effect by bodily injuries and mental health medical leaves respectively. Robust standard errors are shown in parentheses.

*p<0.1, **p<0.05, ***p<0.01

on remaining employed. Panel B documents a much larger proportional decline in bodily-injury leave among women (−40%) than men (−13%). This gap likely reflects pre-pandemic differences in occupational risk exposure: women in non-essential services were more concentrated in in-person roles—retail, hospitality, administrative support—where the removal of commuting and workplace presence reduced accident risk most sharply. Across age groups, the reduction in bodily-injury leave is broadly uniform (approximately 20–25% for all cohorts), suggesting it reflects the general elimination of physical workplace hazards rather than an age-specific phenomenon.

Panel C reveals a strikingly different pattern for mental health leave. Men experienced a nearly nine-fold proportional increase (+970%) than women (+110%). While the magnitudes partly reflect very low pre-pandemic baseline rates for mental health leave across all groups, the size of the gender gap points to differences in how men and women adjusted to the sudden shift to home-based work. Alon et al. (2020) document that the pandemic placed heavier

domestic burdens on women through childcare and household responsibilities; however, our results suggest that men—who on average had less prior experience integrating domestic tasks with their work routine—may have faced greater psychological adjustment costs when suddenly confined to the home environment.

The age pattern in Panel C reinforces this reading. Mental health effects are concentrated among workers aged 35–45 (+821%) and 45–55 (+751%), with an even larger proportional increase among workers 55 and older (+1,213%). Workers in the 35–55 range typically face simultaneous pressures from intensive career demands and active family responsibilities, making the collapse of spatial and temporal boundaries between work and home particularly disruptive. By contrast, workers aged 15–25 show no statistically significant mental health effect, consistent with their lower family obligations and—as documented in Panel A—higher exposure to job displacement, which may have removed them from the sample of workers experiencing the prolonged stress of home-based work. Panel (b) of Figure 4 illustrates the temporal dynamics of these gender differences through event-study estimates: the increase in mental health leave for men builds gradually from the pandemic onset and remains elevated throughout the sample period, while the effect for women remains small and precisely estimated near zero throughout. Appendix Figure A.5 plots all group-specific estimates alongside 95% confidence intervals, providing a direct visual assessment of the statistical significance of these heterogeneous effects.

Panel (b) of Figure 4 also reveals a pattern in the pre-treatment period that warrants acknowledgment. For men, the pre-treatment coefficients are slightly below zero in the periods furthest from the treatment date and trend upward toward zero as the pandemic approaches—a mild upward drift in the relative mental health leave of non-essential versus essential sector men prior to 2020. While this pattern does not appear systematic, it represents a potential violation of the parallel trends assumption. To the extent that this pre-existing upward trend would have continued in the absence of the pandemic, our estimates would *overestimate* the average treatment effect for men: the true counterfactual

for men would lie above zero rather than at zero, reducing the net estimated effect. That said, the post-treatment increase in mental health leave for men is of a magnitude that far exceeds any plausible extrapolation of the pre-existing trend, and our conclusion that the mental health burden of the remote work transition fell disproportionately on men remains substantively robust.

High-stress activities. We show that the abrupt transition to remote work affected mental health by increasing stress in a social distancing context where multiple family members stayed home. Furthermore, with schools closed, men and women were arguably required to participate more intensively in childcare and housekeeping. Lastly, the increase in mental health leave is not directly related to a negative income shock, as our data only include employees who stayed at work during the pandemic.

To shed more light on the drivers of increased mental health issues, we focus on financial sector firms (investment and commercial banking, brokerages, insurance companies, etc.), which previously exhibited higher levels of stress and anxiety¹⁶. The COVID-19 outbreak exacerbated stress and anxiety, and professionals already experiencing high levels of overwork and job pressure were likely the most affected by social distancing norms and legal restrictions on mobility.

We restrict our sample to the non-essential sectors and further split it between financial firms and other companies. We employ the same differences-in-differences regression described in Equation 1, considering financial sector firms as the *treated group*. Figure 3 and Table A.6 present the results and detailed estimates of this analysis¹⁷. Our findings indicate a significant increase in medical leave for workers in the financial sector, especially among men aged 25 to 35 years. Unlike the general trend where we observed a decrease in total medical leave, particularly physical injuries, the financial sector experienced a significant increase in medical leave in various health issues, not just mental health.

¹⁶Surveys and descriptive studies in Brazil have documented these trends (Investe, 2023).

¹⁷We also perform an event study as a robustness check. The estimates presented in Figure A.3 are less precise as we have substantially reduced the sample size.

This exercise highlights a distinct and more severe impact of the transition to remote work on employees in high-stress industries. Therefore, our findings suggest that these workers faced additional stressors in the pandemic, exacerbating existing job pressures in a remote work context. The rise in medical leave among men aged 25 to 35 years underscores the particular vulnerability of younger male employees in these sectors, who might be balancing high job demands with additional family responsibilities at home.

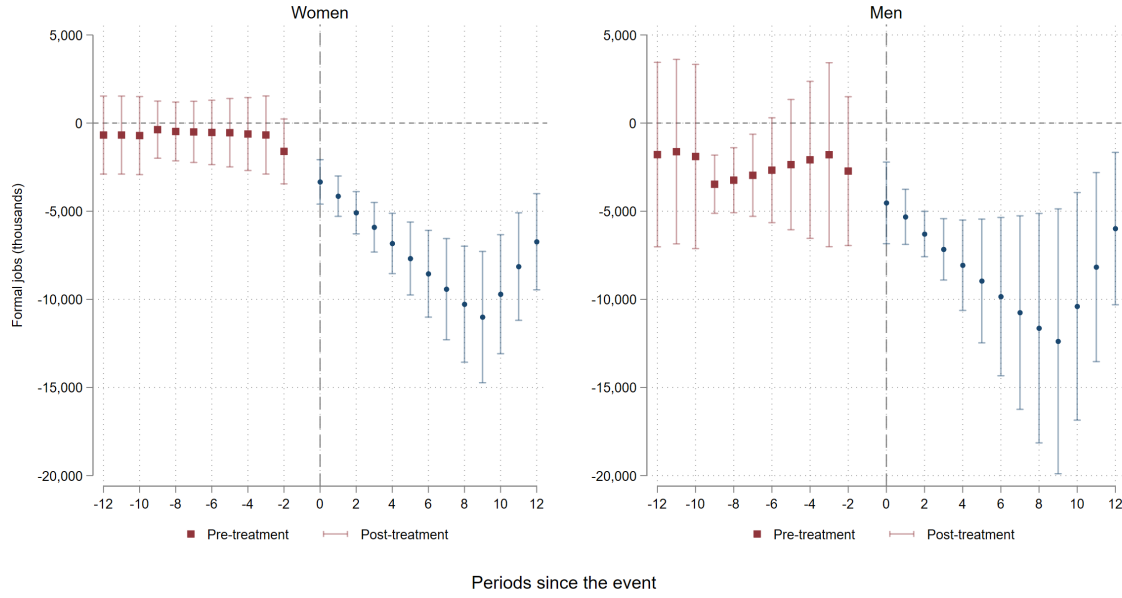
Lastly, these findings indicate that industry-specific factors play a crucial role in determining the health impacts of working from home. Although remote work can reduce physical risks in industries with significant manual labor, it can exacerbate mental health problems in highly stressful, cognitively demanding sectors.

Employment Trends. A potential concern in our analysis is whether essential and non-essential services were equally impacted by job dismissals following the pandemic. If nonessential sectors experienced higher employment losses, this could partially explain the observed decline in medical leave due to labor accidents. Moreover, if individuals that remained employed differ systematically from those who lost their jobs, compositional changes may confound our results. To investigate these potential confounding factors, we use administrative employment data from the Ministry of Labor to assess changes in formal jobs across essential and non-essential sectors.¹⁸

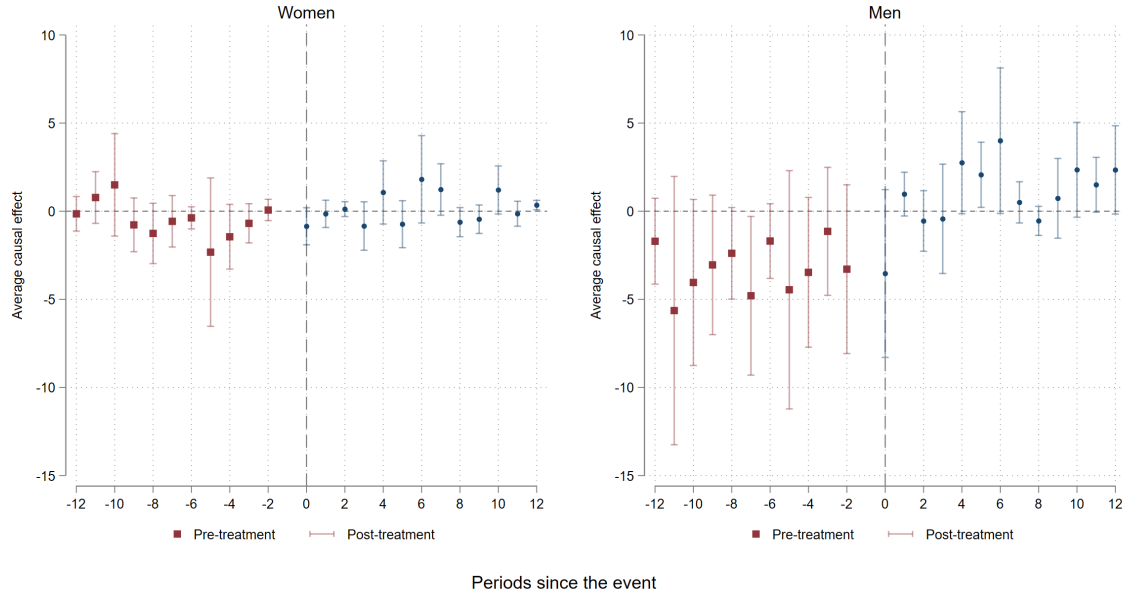
Table 3 reports summary statistics on gender and education for essential and non-essential services, as well as the sectoral composition within essential services—those that arguably faced lower pressure for job losses at the onset of the pandemic in 2020. The bottom panel shows that the shares of women and highly educated workers¹⁹ across sectors remained stable between 2018 and 2022, with most changes below one percentage point. To further examine

¹⁸The *Relação Anual de Informações Sociais (RAIS)*, released by the Ministry of Labor, provides information on gender, age, education, and the total number of formal jobs by sector at the end of each calendar year. Because our analysis relies on monthly data, we construct sectoral employment trends at the municipal level by linearly interpolating between yearly observations. This approach approximates monthly employment dynamics while maintaining consistency with the official annual statistics.

¹⁹We classify individuals with a bachelor’s degree or higher as highly educated, following the RAIS information on educational attainment.



(a) Employment Effects



(b) Mental Health Effects

Figure 3: Gender-Specific Dynamic Effects of the COVID-19 Pandemic

Note: This figure shows event-study estimates of the effect of the COVID-19 pandemic on formal employment (Panel a) and mental health-related medical leave (Panel b), presented separately for women (left) and men (right) using the specification proposed by Sun and Abraham (2021). The outcome in Panel (a) is the 12-month moving average of formal jobs in non-essential services; the outcome in Panel (b) is the count of mental health-related medical leaves. Both panels share a common vertical axis within each panel to facilitate direct gender comparison. The bars represent 95% confidence intervals, with standard errors clustered at the municipality level.

whether changes in sector composition could explain our main results, we estimate Equation 1 using sector-level employment, disaggregated by gender and age group, as the outcome variables.

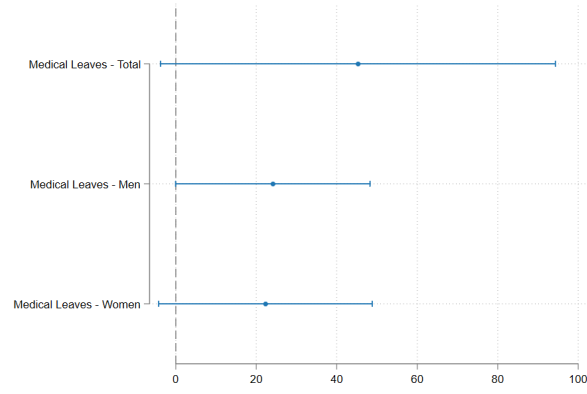
Table 3: Descriptive Statistics by job sector from 2018 to 2022

CNAE Sector	2018		2019		2020		2021		2022	
	Formal Jobs	(%)	Formal Jobs	(%)	Formal Jobs	(%)	Formal Jobs	(%)	Formal Jobs	(%)
A - Agriculture	1,497,914	3.8%	1,473,795	3.8%	1,466,390	3.8%	1,531,816	3.8%	1,751,423	3.8%
C - Manufacturing	6,660,916	16.9%	6,693,319	16.9%	6,776,937	16.9%	7,171,788	16.9%	7,642,799	16.9%
F - Construction	1,977,182	5.0%	1,987,390	5.0%	2,111,806	5.0%	2,313,533	5.0%	2,667,550	5.0%
G - Retail	6,824,985	17.3%	6,803,431	17.3%	6,694,891	17.3%	7,065,461	17.3%	7,584,184	17.3%
H - Storage	1,785,563	4.5%	1,821,032	4.5%	1,787,314	4.5%	1,863,294	4.5%	2,023,951	4.5%
I - Hotels and Restaurants	1,920,330	4.9%	1,936,808	4.9%	1,593,151	4.9%	1,702,332	4.9%	2,032,858	4.9%
N - Administrative	3,639,570	9.2%	3,704,160	9.2%	3,834,290	9.2%	4,002,467	9.2%	4,549,976	9.2%
O - Public Services	8,149,898	20.7%	8,079,605	20.7%	7,660,804	20.7%	8,184,268	20.7%	7,807,715	20.7%
P - Education	2,105,299	5.3%	2,076,397	5.3%	1,962,750	5.3%	1,976,724	5.3%	2,628,355	5.3%
Q - Social Services	1,084,973	2.8%	1,096,039	2.8%	1,140,515	2.8%	1,250,267	2.8%	1,482,305	2.8%
Others	3,748,232	9.5%	3,818,586	9.5%	3,757,001	9.5%	4,115,065	9.5%	4,518,567	9.5%
Non Essential Services	39,394,862		39,490,562		38,785,849		41,177,015		44,689,683	
<i>Women (%)</i>	<i>42.8%</i>		<i>42.8%</i>		<i>42.3%</i>		<i>42.8%</i>		<i>42.9%</i>	
<i>High-Educated (%)</i>	<i>27.2%</i>		<i>27.2%</i>		<i>27.4%</i>		<i>27.4%</i>		<i>26.5%</i>	
<i>jobs change YoY</i>			<i>0.24%</i>		<i>-1.78%</i>		<i>6.17%</i>		<i>8.53%</i>	
Essential Services	7,236,253		7,225,930		7,450,327		7,551,856		8,101,181	
<i>Women (%)</i>	<i>50.8%</i>		<i>51.5%</i>		<i>50.3%</i>		<i>51.9%</i>		<i>51.3%</i>	
<i>High-Educated (%)</i>	<i>25.6%</i>		<i>25.9%</i>		<i>26.2%</i>		<i>26.6%</i>		<i>26.5%</i>	
<i>jobs change YoY</i>			<i>-0.14%</i>		<i>3.11%</i>		<i>1.36%</i>		<i>7.27%</i>	

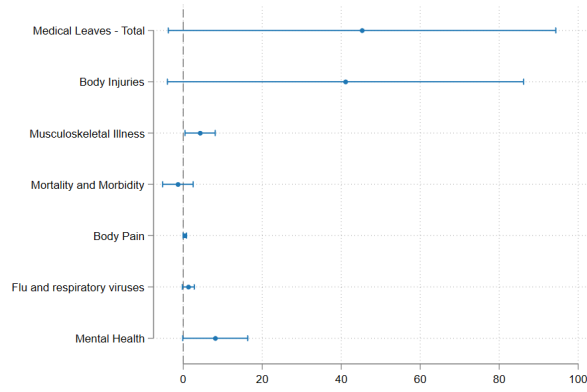
Note: This table shows some statistics on sectors and demographic characteristics of workers in non-essential and essential services in Brazil. Source: Ministry of Labor - "*Relação Anual de Informações Sociais (RAIS)*"

Panel (a) of Figure 4 presents event-study estimates for formal employment separately for women (left) and men (right). Both groups show significant and comparable decreases in formal jobs in non-essential services following the pandemic outbreak, with flat pre-trends for both genders confirming the parallel trends assumption. This indicates that non-essential sectors faced larger employment losses than essential sectors across both genders, consistent with the interpretation that part of the decline in physical medical leaves is explained by pandemic-driven dismissals. These analyses use distinct samples—men and women in essential versus non-essential sectors, and similarly for each age group—allowing us to assess whether groups experienced systematically different employment trajectories.

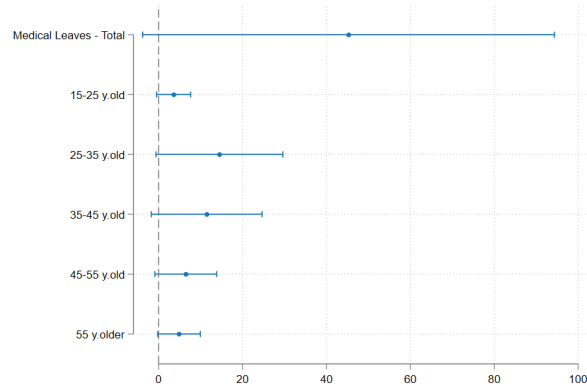
We report the effects of treatment on employment for the gender and age group in Table 2 (Panel A). Across all categories, we find sizable and statistically significant declines, indicating that neither gender nor age groups experienced trends meaningfully different from the broader employment contraction in non-essential sectors. Absolute reductions are larger



(a) Gender



(b) Cause



(c) Age

Figure 4: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil (Financial Sector)

Note: This figure shows the differences-in-differences estimator and 95% confidence intervals for the effect of the pandemic on medical leaves for workers in non-essential services using the sectors sizes as weights, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$. Panel A presents the overall results and breaks them down by gender, Panel B shows the effect by cause of medical leave, and Panel C by age group.

for younger workers and for men; however, compared to their baseline employment levels, the average effect for women is slightly larger. These patterns are broadly consistent with the evidence on demographic heterogeneity in COVID-19 employment losses: Alon et al. (2020) show that women and younger workers were disproportionately exposed to job displacement during the pandemic, particularly in service-intensive industries, and our finding of slightly larger proportional losses for women (-0.046% versus -0.039% for men) and the concentration of employment declines among the youngest cohort (15–25 year-olds at -0.094%) aligns with this evidence, suggesting our setting is not atypical in terms of which groups bore the brunt of pandemic-induced job displacement.

We show in this robustness test that although job losses disproportionately affected workers in non-essential services, there were no meaningful compositional changes or differential trends across gender or age groups.²⁰ However, despite these dismissals, we document a substantial increase in mental health–related medical leave among those who remained employed in non-essential sectors.

5 Discussion

The Divergent Dynamics of Bodily Injuries and Mental Health Outcomes. We interpret the contrasting patterns for bodily injuries and mental health–related leave as the result of job losses and differential reporting incentives. In the early months of the pandemic, non-essential sectors experienced substantial dismissals. Under this uncertainty, workers may have faced greater barriers to reporting minor workplace accidents—particularly fearing that filing an incident shortly after the shift to remote work could jeopardize their employment. This mechanism is plausible given that about 78% of occupational accidents in Brazil are

²⁰As an alternative approach, Appendix Table A.7 reports DiD estimates using the *share* of workers in each demographic group as the dependent variable. Both men’s and women’s shares declined by similar magnitudes (-0.46 and -0.42 percentage points, respectively), confirming the absence of differential gender compositional changes. For age groups, younger workers’ shares (25–35 and 35–45) fell while older workers’ shares (45–54 and 55 and older) rose, consistent with the pattern of differential exposure to job displacement documented in Panel A.

classified as low severity (Brazilian Labor Justice (TRT4), 2020). As firms adapted and job security stabilized, incentives to underreport diminished, and bodily injury leaves naturally converged back to pre-pandemic levels.

In contrast, the trajectory for mental health-related leaves is markedly different. Conditions such as burnout, anxiety, and severe stress are less discretionary to conceal, making intentional underreporting unlikely. The sustained increase over nearly the entire first year of the pandemic indicates that the effect extends beyond the initial transition to remote work and reflects the cumulative strain associated with working from home under restrictive conditions. Although we lack information on household composition, the pattern does not appear to be driven solely by delayed school reopening²¹. As shown in Table 2, mental health leaves increase for both men and women and across all age groups except for workers aged 15 to 25. This suggests that, beyond the early tension created by the abrupt shift to remote work, persistent loss of work-life balance plays a central role in explaining why mental health effects continued even after initial COVID-specific events, such as school closures, gradually eased.

Moral Hazard and Incentives for Filing Labor Accident Claims in Brazil. In the context of medical leave claims related to labor accidents in Brazil, moral hazard—the risk that workers might fake or exaggerate injuries to access benefits—appears to be limited due to the structure of the country’s social security system and the associated costs for workers.

First, access to medical leave benefits through INSS (National Social Security Institute) requires a medical inspection (*"perícia"*) and subsequent approval. This inspection acts as a gatekeeping mechanism, reducing the chances that false claims will be successful. Workers face the risk of being denied benefits if the medical examiner does not validate the injury or its severity, which discourages frivolous claims. Second, the financial benefits themselves may not always outweigh the costs associated with filing a claim. The benefit amount is

²¹Many schools in Brazil resumed mandatory in-person classes only in the second semester of 2021 (Secretaria da Educação do Estado de São Paulo, 2021)

calculated on the basis of the average salary of the last 12 months or the entire contribution period. The worker receives 91% of this average salary, provided that it is not below the current minimum wage. In cases where the worker’s wage exceeds the benefit limit, which in 2024 is set at R\$ 7,786.02 (about US\$ 1,300.00), there is no clear financial incentive to claim medical leave, as doing so could result in a decrease in income during the leave period. In addition, the process of claiming medical leave can be time-consuming and bureaucratic, imposing further costs in time and uncertainty.

In the context of remote work, these factors suggest that workers are unlikely to file claims purely for the convenience of recovering at home. If minor injuries occur, the costs and risks associated with seeking medical leave may outweigh any potential benefits, making moral hazard less likely to influence the decision to file a claim. In summary, the combination of mandatory medical inspections, possible wage reductions, and bureaucratic hurdles serves to limit incentives for moral hazard in Brazil’s labor accident claims system, reinforcing the credibility of the reported data.

Policy Implications. The persistent increase in mental health–related medical leave—concentrated among men and mid-career workers—appears to originate not from remote work per se, but from the abrupt and organizationally unsupported nature of the transition. Workers were required to adapt their homes, routines, and family dynamics overnight, without established protocols or employer support. This suggests that the mental health costs of working from home are not inherent to the model itself, but arise when the shift is sudden and insufficiently managed. Policies that allow adequate adjustment time, provide mental health resources, and establish clear work–life boundaries are therefore likely to be most effective in mitigating these costs.

6 Conclusion

The COVID-19 pandemic reshaped the way we work, with a large adoption of remote work. Our findings reveal a significant decrease in labor accidents, primarily due to fewer bodily injuries, as workers were no longer exposed to the physical hazards of their usual work environments. However, this positive outcome contrasts with a substantial increase in medical leave related to mental health problems, particularly among men and high-stress environments. Our paper sheds light on the complexity of remote work. Although it can reduce physical health risks, it also introduces significant mental health challenges.

Our study highlights the need for comprehensive remote work policies that address both physical and mental health. Policymakers and employers must prioritize mental health support, provide access to mental health services, and promote work-life balance. A balanced approach that considers both physical and mental health is crucial to fostering a healthy and productive workforce in the post-pandemic era.

Note: During the preparation of this work the author used ChatGPT 4.0 in order to check the grammar and improve readability. After using this tool/service, the author reviewed and edited the content as needed and take full responsibility for the content of the publication.

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8 Appendix

8.1 Figures and Tables

Table A.1: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil (Full Estimates)

Dependent Variable	Main Specification					Weighted Specification					(11) Obs.
	(1) ATT	(2) ATT	(3) ATT	(4) ATT	(5) Control	(6) ATT	(7) ATT	(8) ATT	(9) ATT	(10) Weighted	
	3 months	3-6 months	6-9 months	Mean	3 months	3-6 months	6-9 months	Mean			
Panel A: Gender											
Total	-0.532*** (0.056)	-1.269*** (0.168)	-0.920*** (0.129)	-0.021 (0.062)	4.997	-32.305** (15.237)	-77.730 (49.452)	-47.683*** (18.224)	-5.523 (11.427)	207,830	323,190
Women	-0.255*** (0.031)	-0.284*** (0.084)	-0.611*** (0.090)	-0.184*** (0.042)	1.324	-16.052** (7.896)	-22.637 (23.199)	-26.085** (10.331)	-9.719 (9.252)	55,065	323,190
Men	-0.279*** (0.030)	-0.982*** (0.092)	-0.309*** (0.050)	0.161*** (0.033)	3.671	-16.501** (7.886)	-54.858** (27.096)	-21.548** (8.957)	4.052 (5.242)	152,701	323,190
Panel B: Cause											
Mental Health	0.045*** (0.005)	0.007 (0.006)	0.018*** (0.006)	0.028*** (0.006)	0.028	6.214*** (1.011)	-0.309 (1.601)	2.348* (1.301)	3.185** (1.396)	1,157	323,190
Body Injuries	-0.332*** (0.044)	-0.887*** (0.133)	-0.125*** (0.035)	0.194*** (0.027)	3.993	-38.410*** (13.539)	-65.988 (43.106)	-34.641* (18.928)	-3.873 (8.928)	166,090	323,190
Musculoskeletal Illness	-0.025*** (0.006)	-0.086*** (0.015)	-0.017* (0.010)	0.012 (0.011)	0.328	-1.937 (1.236)	-6.699 (4.303)	-2.837 (2.250)	1.757 (2.041)	13,668	323,190
Mortality and Morbidity	-0.013** (0.006)	-0.041*** (0.013)	-0.026*** (0.009)	0.008 (0.010)	0.268	-0.171 (1.215)	-3.483 (3.096)	-4.727*** (1.631)	-3.702** (1.884)	11,187	323,190
Body Pain	-0.005** (0.002)	-0.016*** (0.004)	-0.003 (0.004)	0.005* (0.003)	0.054	-1.048*** (0.331)	-1.270 (0.932)	-1.136* (0.608)	-0.033 (0.339)	2,281	323,190
Flu and Respiratory	-0.002 (0.006)	-0.005 (0.011)	-0.008 (0.011)	0.016 (0.011)	0.178	-1.331 (1.198)	0.026 (1.574)	0.478 (1.003)	1.005 (1.555)	7,415	323,190
Panel C: Age											
15-25 y.old	-0.053*** (0.010)	-0.247*** (0.028)	-0.163*** (0.020)	0.061*** (0.015)	0.861	-6.166*** (2.267)	-12.450 (7.779)	-9.113** (3.837)	0.629 (2.469)	35,798	323,190
25-35 y.old	-0.187*** (0.017)	-0.376*** (0.050)	-0.261*** (0.038)	-0.048** (0.023)	1.452	-11.616*** (4.499)	-23.047 (14.234)	-14.032*** (5.225)	-5.250 (4.021)	60,395	323,190
35-45 y.old	-0.140*** (0.016)	-0.291*** (0.042)	-0.236*** (0.041)	-0.023 (0.020)	1.195	-5.832 (3.974)	-18.411 (11.562)	-8.747** (3.857)	-0.582 (2.968)	49,721	323,190
45-55 y.old	-0.075*** (0.010)	-0.163*** (0.026)	-0.121*** (0.024)	0.010 (0.014)	0.707	-4.292* (2.555)	-10.737 (7.353)	-7.791** (3.104)	2.547 (2.748)	29,391	323,190
55 y.older	-0.025*** (0.006)	-0.075*** (0.014)	-0.055*** (0.012)	-0.027*** (0.009)	0.307	-1.581 (1.367)	-6.336 (4.120)	-2.887 (2.121)	-2.532 (1.914)	12,784	323,190

Note: This table shows the estimator of differences in differences for the effect of the pandemic on medical leave for workers in non-essential services, captured by the coefficient of interaction

COVID $\times$ Non-essential. Columns 1 to 4 report the unweighted estimates while columns 6 to 9 show the results using the sectors sizes as weights. Panel A presents the overall results and breaks them down by gender, panel B shows the effect by cause of medical leave, and Panel C by age group. Robust standard errors are shown in parentheses.

*p<0.1, **p<0.05, ***p<0.01

Table A.2: Robustness: The Effect of COVID-19 Pandemic on Medical Leaves, Controlling for Demographic Composition

Dependent Variable	Main Specification			Weighted Specification		
	(1) ATT	(2) ATT + Controls	(3) Control Mean	(4) ATT	(5) ATT + Controls	(6) Weighted Mean
Panel A: Gender						
Total	−0.532*** (0.056)	−0.525*** (0.057)	4.997	−32.305** (15.237)	−31.844** (15.141)	207,830
Women	−0.255*** (0.031)	−0.254*** (0.031)	1.324	−16.052** (7.896)	−15.764** (7.838)	55,065
Men	−0.279*** (0.030)	−0.273*** (0.031)	3.671	−16.501** (7.886)	−16.396** (7.843)	152,701
Panel B: Cause						
Mental Health	0.045*** (0.005)	0.045*** (0.005)	0.028	6.214*** (1.011)	6.108*** (0.990)	1,157
Body Injuries	−0.332*** (0.044)	−0.334*** (0.044)	3.993	−38.410*** (13.539)	−39.182*** (13.466)	166,090
Musculoskeletal Illness	−0.025*** (0.006)	−0.025*** (0.006)	0.328	−1.937 (1.236)	−1.912 (1.218)	13,668
Mortality and Morbidity	−0.013** (0.006)	−0.012* (0.006)	0.268	−0.171 (1.215)	0.450 (1.256)	11,187
Body Pain	−0.005** (0.002)	−0.005*** (0.002)	0.054	−1.048*** (0.331)	−1.096*** (0.326)	2,281
Flu and Respiratory	−0.002 (0.006)	−0.001 (0.006)	0.178	−1.331 (1.198)	−1.301 (1.181)	7,415
Panel C: Age						
15-25 y.old	−0.053*** (0.010)	−0.049*** (0.010)	0.861	−6.166*** (2.267)	−6.175*** (2.265)	35,798
25-35 y.old	−0.187*** (0.017)	−0.185*** (0.018)	1.452	−11.616*** (4.499)	−11.684*** (4.481)	60,395
35-45 y.old	−0.140*** (0.016)	−0.138*** (0.016)	1.195	−5.832 (3.974)	−5.666 (3.963)	49,721
45-55 y.old	−0.075*** (0.010)	−0.075*** (0.010)	0.707	−4.292* (2.555)	−4.108 (2.533)	29,391
55 y.older	−0.025*** (0.006)	−0.025*** (0.006)	0.307	−1.581 (1.367)	−1.464 (1.347)	12,784

Note: This table replicates the main estimates of Appendix Table A.1 (columns 1, 5, 6, and 10) and adds specifications that augment the baseline with time-varying controls for the demographic composition of the sector-municipality cell: the shares of male workers and workers in each age group (15–25, 25–35, 35–45, 45–54, and 55+) in formal employment. All specifications include municipality-sector and time fixed effects. All regressions use 323,190 observations. Robust standard errors are shown in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil - Poisson and Negative Binomial Estimates

Dependent Variable	ATT Poisson	ATT Neg. Binomial	Obs.
	Panel A: Gender		
Total	-0.080*** (0.010)	-0.077*** (0.008)	316,050
Women	-0.171*** (0.013)	-0.129*** (0.011)	228,690
Men	0.010 (0.010)	-0.021** (0.009)	302,022
Panel B: Cause			
Mental Health	0.612*** (0.062)	0.664*** (0.067)	50,820
Body Injuries	0.070*** (0.007)	0.065*** (0.008)	298,200
Body Pain	0.088* (0.045)	0.119*** (0.046)	7,134
Flu and Respiratory Viruses	-0.051*** (0.015)	-0.029 (0.018)	130,872
Panel C: Age			
15-25 y.old	-0.029** (0.012)	-0.021* (0.012)	224,994
25-35 y.old	-0.093*** (0.012)	-0.093*** (0.011)	252,546
35-45 y.old	-0.106*** (0.013)	-0.105*** (0.012)	246,498
45-55 y.old	-0.084*** (0.015)	-0.108*** (0.014)	216,090
55 y.older	0.032 (0.021)	-0.004 (0.021)	174,468

Note: This table shows the Poisson and Negative Binomial estimates for the effect of the pandemic on medical leaves for workers in non-essential services, captured by the coefficient of interaction COVID $\times$ Non-essential. Panel A presents the overall results and breaks them down by gender, panel B shows the effect by cause of medical leave, and Panel C by age group. Robust standard errors are shown in parentheses.

*p<0.1, **p<0.05, ***p<0.01

Table A.4: List of sectors included in the list of essential services during the COVID-19 pandemic

Description	Phase
Manufacturing of pharmaceutical chemicals	Mar/20
Maintenance of various equipment	Mar/20
Maintenance of telecommunications equipment	Mar/20
Electric power generation and distribution	Mar/20
Hypermarkets and Groceries Stores	Mar/20
Bakeries and dairy shops	Mar/20
Public transportation	Mar/20
Air cargo transportation	Mar/20
Storage	Mar/20
Airport operations	Mar/20
Postal services	Mar/20
Courier services (non-postal)	Mar/20
Radio	Mar/20
Broadcast television	Mar/20
Telecommunication	Mar/20
IT services	Mar/20
General public administration	Mar/20
Civil defense	Mar/20
Environmental inspection and control	Mar/20
Healthcare	Mar/20
Social assistance	Mar/20
Technical engineering/architecture services	Apr/20
Testing and technical analysis	Apr/20
Equipment rental	Apr/20
Electronic security monitoring	Apr/20
Urban pest control	Apr/20
Call centers	Apr/20
Billing and registration information	Apr/20
Packaging and labeling	Apr/20
Street retail trade	May/20
Food retail in vehicles	May/20
Hairdressers, manicurists, and pedicurists	May/20
Funeral services	May/20
Gyms (physical fitness)	May/20
Religious organizations	May/20
Vehicle parking	May/20

Note: This table reports the list of sectors considered essential services during the pandemic and the respective approval date for this status. Despite some variation, most of the sectors were included in the list of essential services in March 2020.

Table A.5: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil - Public Employees as Treated Group

Panel A: Gender	ATT	R-squared
Total	34.131 (22.267)	0.953
Women	17.503 (12.405)	0.950
Men	17.674* (10.670)	0.947
Panel B: Cause		
Mental Health	6.305* (3.339)	0.791
Body Injuries	31.252 (21.375)	0.933
Body Pain	0.456* (0.260)	0.784
Flu and Respiratory Viruses	-0.063 (0.786)	0.965
Panel C: Age		
15-25 y.old	3.750* (2.095)	0.939
25-35 y.old	11.573 (7.190)	0.944
35-45 y.old	8.536 (5.646)	0.954
45-55 y.old	4.533 (3.065)	0.941
55 y.older	2.900 (2.424)	0.885

Note: This table shows the estimates for the effect of the pandemic on medical leaves considering Public Employees as the treated group and workers in essential services as the control group. Panel A presents the overall results and breaks them down by gender, panel B shows the effect by cause of medical leave, and Panel C by age group. Robust standard errors are shown in parentheses.

*p<0.1, **p<0.05, ***p<0.01

Table A.6: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil (Financial Sector)

	ATT Baseline	Control Group Mean	ATT Weighted	Obs.
Panel A: Gender				
Total	1.222*** (0.447)	1.421	45.272* (25.021)	34,503
Women	0.229 (0.274)	0.812	22.281* (13.532)	34,503
Men	1.016*** (0.237)	0.608	24.119* (12.319)	34,503
Panel B: Cause				
Mental Health	0.254*** (0.042)	0.033	8.102* (4.196)	34,503
Body Injuries	1.742*** (0.305)	0.899	41.074* (22.987)	34,503
Musculoskeletal Illness	0.242*** (0.072)	0.092	4.256** (1.949)	34,503
Mortality and Morbidity	-0.067 (0.053)	0.124	-1.363 (1.970)	34,503
Body Pain	0.040 (0.034)	0.016	0.388* (0.217)	34,503
Flu and Respiratory Viruses	0.170*** (0.057)	0.217	1.286* (0.777)	34,503
Panel C: Age				
15-25 y.old	0.108 (0.119)	0.224	3.586* (2.072)	34,503
25-35 y.old	0.532*** (0.204)	0.412	14.498* (7.708)	34,503
35-45 y.old	0.230 (0.156)	0.371	11.481* (6.727)	34,503
45-55 y.old	0.105 (0.076)	0.199	6.492* (3.759)	34,503
55 y.older	0.062 (0.044)	0.079	4.864* (2.590)	34,503

Note: This table shows the estimator of differences in differences for the effect of the pandemic on medical leave for workers in non-essential services, captured by the coefficient of interaction COVID $\times$ Non-essential. Column 1 reports the unweighted estimates while Column 3 shows the results using the sector sizes as weights. Panel A presents the overall results and breaks them down by gender, panel B shows the effect by cause of medical leave, and Panel C by age group. Robust standard errors are shown in parentheses.

*p<0.1, **p<0.05, ***p<0.01

Table A.7: The Effect of COVID-19 Pandemic on the Demographic Composition of Non-Essential Sectors

Dependent Variable	ATT
	Panel A: Gender
Men	−0.0046*** (0.0004)
Women	−0.0042*** (0.0004)
	Panel B: Age Group
15–25 y.old	0.0008 (0.0005)
25–35 y.old	−0.0035*** (0.0006)
35–45 y.old	−0.0017*** (0.0005)
45–54 y.old	0.0033*** (0.0004)
55 y.older	0.0012*** (0.0003)

Note: This table reports DiD estimates of the effect of the COVID-19 pandemic on the share of workers in each demographic group in non-essential services, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$. The dependent variable is the share of workers belonging to each gender or age group within formal employment in non-essential sectors. Robust standard errors are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Administered doses

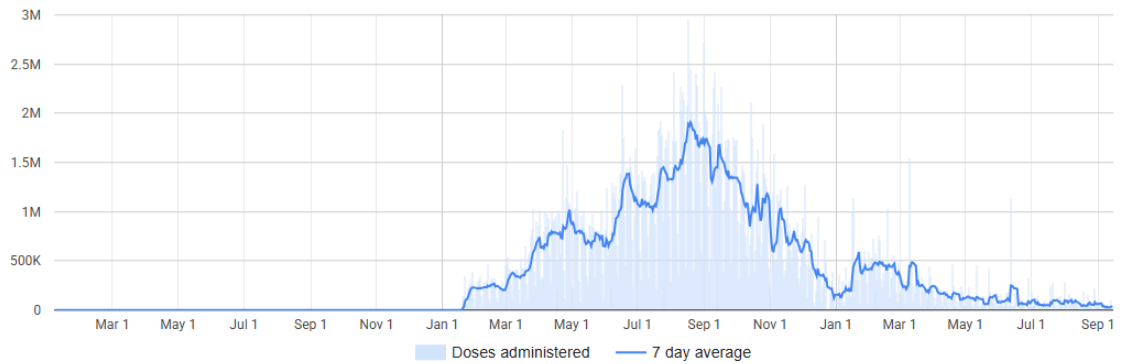
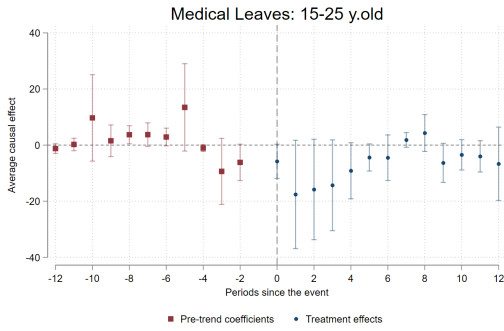
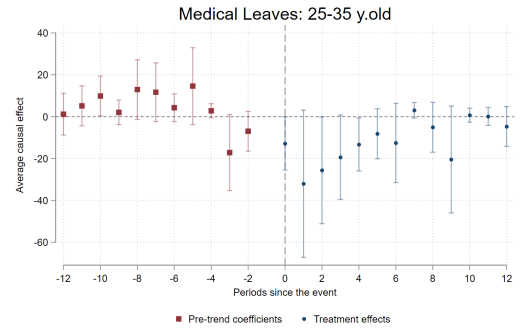


Figure A.1: COVID-19 Vaccination in Brazil.

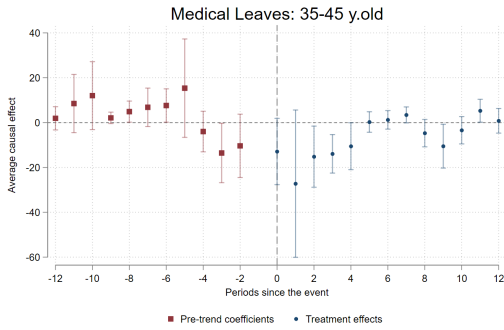
Note: The COVID-19 vaccination campaign in Brazil officially began in January 2021 and reached its peak in September 2021. Source: COVID-19 Open Data.



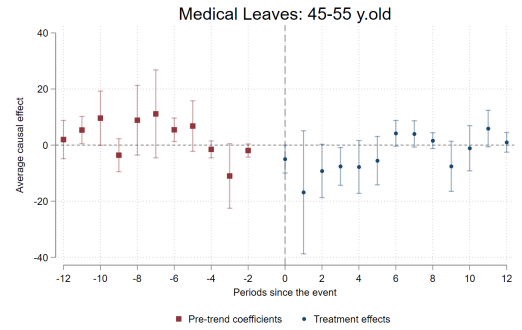
(a) 15 to 25 years old



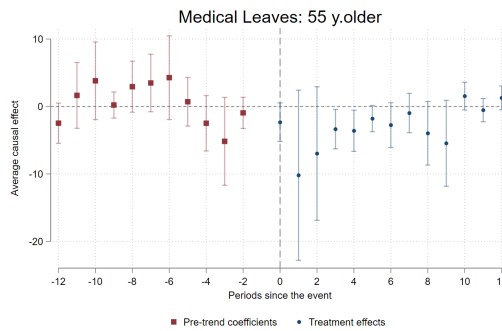
(b) 25 to 35 years old



(c) 35 to 45 years old



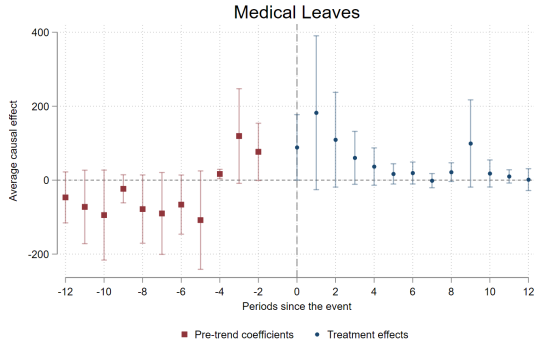
(d) 45 to 55 years old



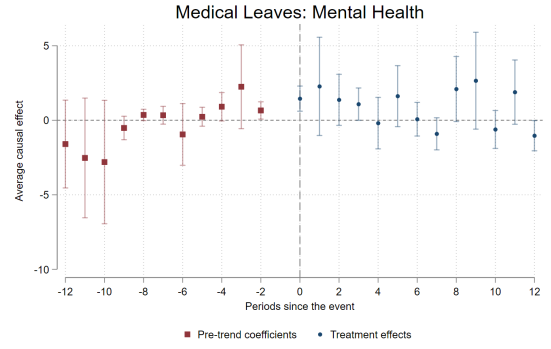
(e) 55 years or older

Figure A.2: Robustness - Event-study by Age Group

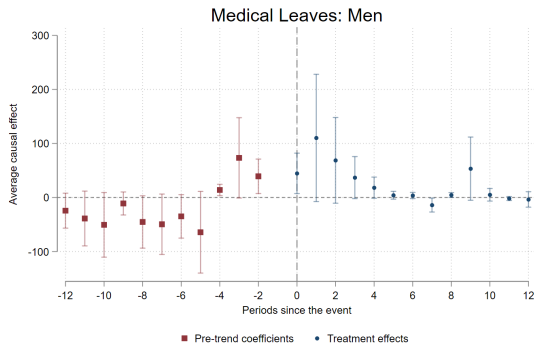
Note: This figure shows the differences-in-differences estimator and 95% confidence intervals for the effect of the pandemic on medical leaves by age group using sectors sizes as weights, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$.



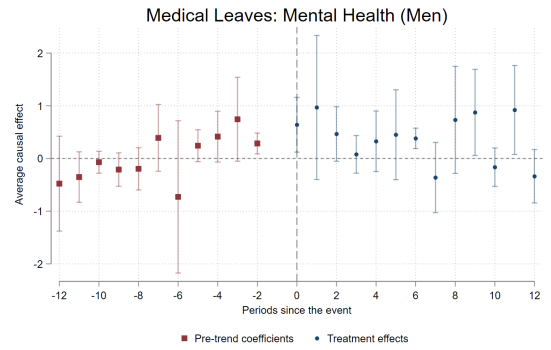
(a)



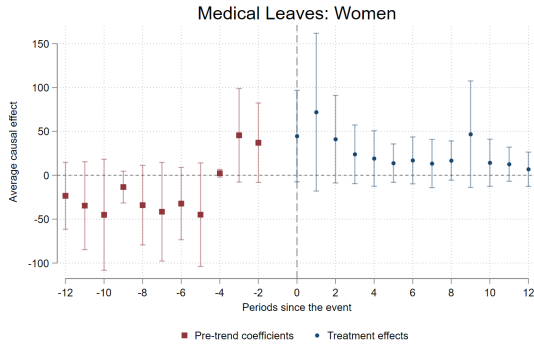
(b)



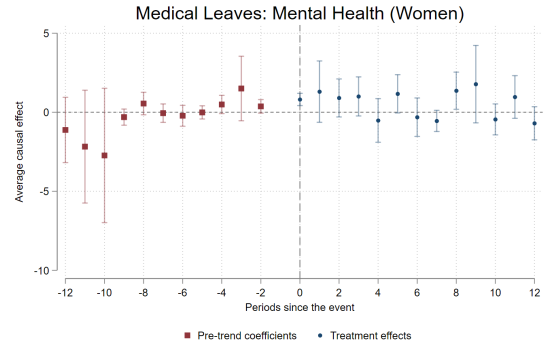
(c)



(d)



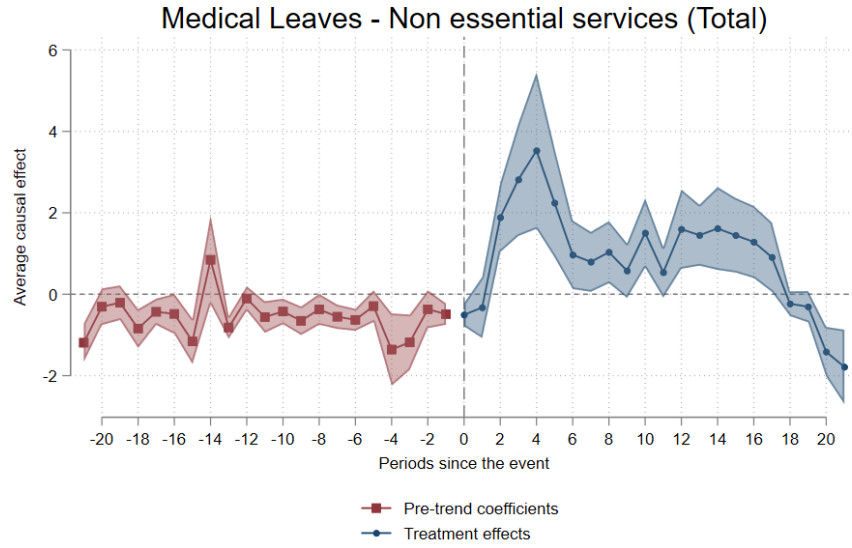
(e)



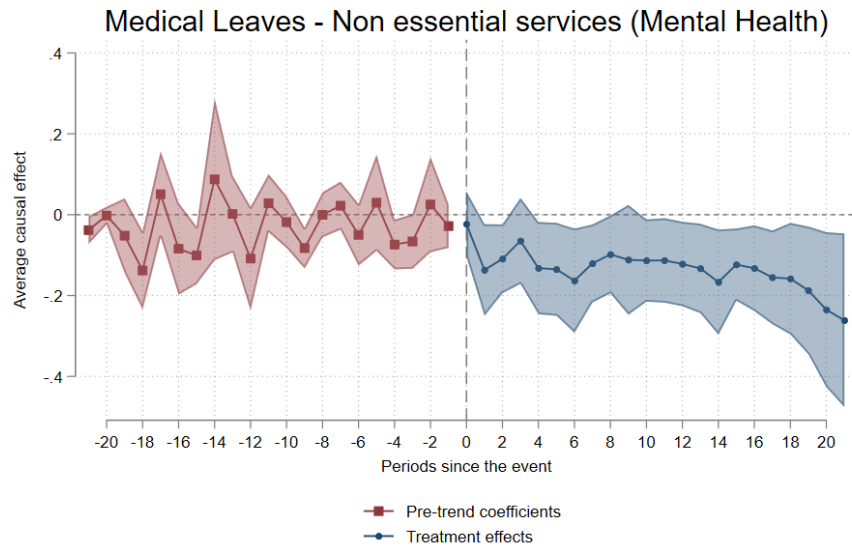
(f)

Figure A.3: Robustness - Event-study (Financial Sector)

Note: This figure shows the differences-in-differences estimator and 95% confidence intervals for the effect of the pandemic on medical leaves for workers in non-essential services using the sector sizes as weights, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$. The outcome variable in the left column are total medical leaves, while the right columns shows mental health medical leaves, both split by gender. The bars represent 95 percent confidence intervals. Standard errors are clustered at the municipality level.



(a) Total Medical Leaves



(b) Mental Health

Figure A.4: The Effect of COVID-19 Pandemic on Medical Leaves in Brazil (Staggered DiD)

Note: This figure shows the differences-in-differences estimator and 95% confidence intervals for the effect of the pandemic on medical leaves for workers in non-essential services, captured by the coefficient of the interaction $\text{COVID} \times \text{Non-essential}$. Panel A presents the overall results and Panel B shows the effect on mental health medical leaves using the method proposed by Callaway and Sant'Anna (2021).

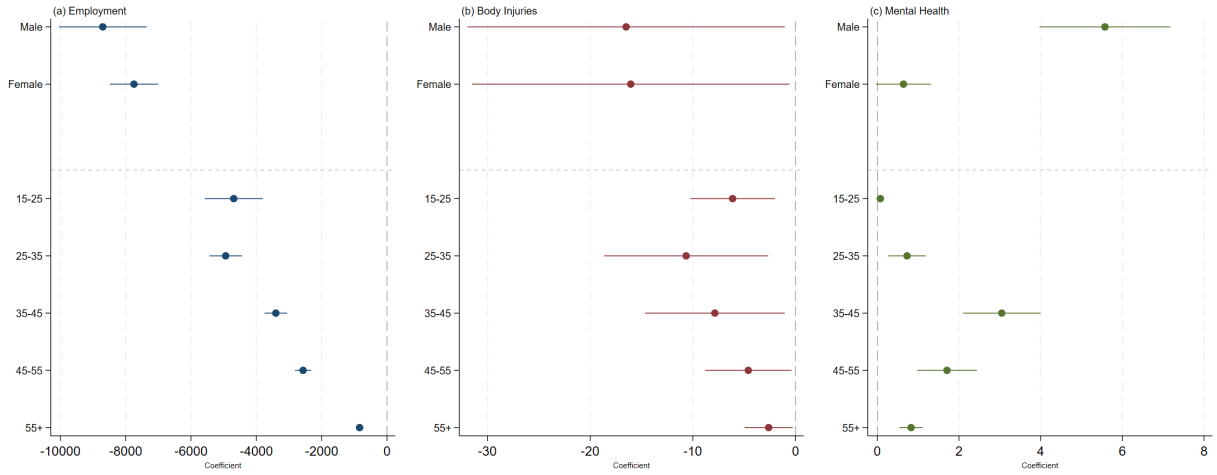


Figure A.5: Heterogeneous Effects of the COVID-19 Pandemic by Gender and Age Group. Each panel plots the DiD estimates from Table 2 with 95% confidence intervals ($\hat{\beta} \pm 1.96 \times \hat{se}$). The dashed horizontal line separates gender comparisons (top) from age-group comparisons (bottom); the dashed vertical line marks zero. Non-overlapping confidence intervals indicate statistically significant differences at conventional levels.