



## Navigating economic turmoil: Chilean businesses during COVID-19 lockdowns and vaccine rollouts

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### ABSTRACT

**Objectives:** This study evaluates the effects of COVID-19 lockdowns, differentiated by their stringency, on the sales of Chilean businesses across various size categories and industries throughout 2020 and 2021. It also explores the role of the vaccination campaign and the implementation of the Mobility Pass in mitigating the negative economic effects of stringent containment measures.

**Methods:** The study uses administrative data from the Chilean Internal Revenue Service (SII), examining sales across different business sizes and industries, from March 2020 to December 2021. Through an econometric analysis, we estimate the effects of lockdowns on business sales during two distinct periods: initial reliance on dynamic non-pharmaceutical interventions (NPIs) pre-vaccine, and a subsequent stage characterized by high vaccine uptake and reduced NPI stringency.

**Results:** Lockdowns significantly reduced sales across all business sizes and most industries during the first period, with microenterprises and certain service sectors experiencing the highest decline. The national vaccination campaign and the introduction of the Mobility Pass in the second period appears to have mitigated the negative effects of lockdowns, primarily benefiting micro and small firms.

**Conclusions:** The study highlights the trade-offs between health and economic outcomes during the pandemic, stressing the importance to alleviate mobility restrictions post-vaccine rollout to ease the economic strain on businesses. The findings call for targeted support measures for MSMEs and vulnerable industries affected by NPIs.

### Introduction

In December 2019, the emergence of the novel coronavirus, SARS-CoV-2, led to the outbreak of COVID-19, a severe respiratory illness initially detected in Wuhan. On March 11, 2020, the World Health Organization (WHO) declared a pandemic as the virus rapidly spread across the world. Within a short period of time, governments were compelled to deploy significant efforts to manage and mitigate the impacts of COVID-19 on public health. Non-pharmaceutical interventions (NPIs) limiting social interactions were among the most widely adopted strategies, including nationwide or localized lockdowns, curfews, shutdowns of non-essential businesses, school closures, and travel bans. While numerous studies have addressed the epidemiological outcomes of NPIs [1–6], the economic ramifications, particularly in developing and emerging economies, have received less attention [7,8]. This study aims to fill the research gap by examining the effects of COVID-19

lockdowns on the Chilean business sector.

Chile provides a unique context for exploring the balance between epidemiological and socioeconomic outcomes during the COVID-19 pandemic. The country implemented some of the world's most stringent containment measures, as documented by the Oxford COVID-19 Government Response Tracker (OxCGRT) [9]. The heterogeneity of Chile's business landscape and the reliability of its accurate administrative records enable a comprehensive analysis of how the pandemic has impacted diverse business types and industries. Furthermore, Chile's vaccination strategy included the introduction of a Mobility Pass, a measure that tied mobility rights to vaccination status [10]. This approach not only aimed to bolster vaccination rates but also sought to strike a balance between public health requirements and the need to mitigate the socioeconomic fallout from the crisis.

As the vaccination rollout progressed and its effectiveness became increasingly evident [11,12], Chilean health and economic authorities

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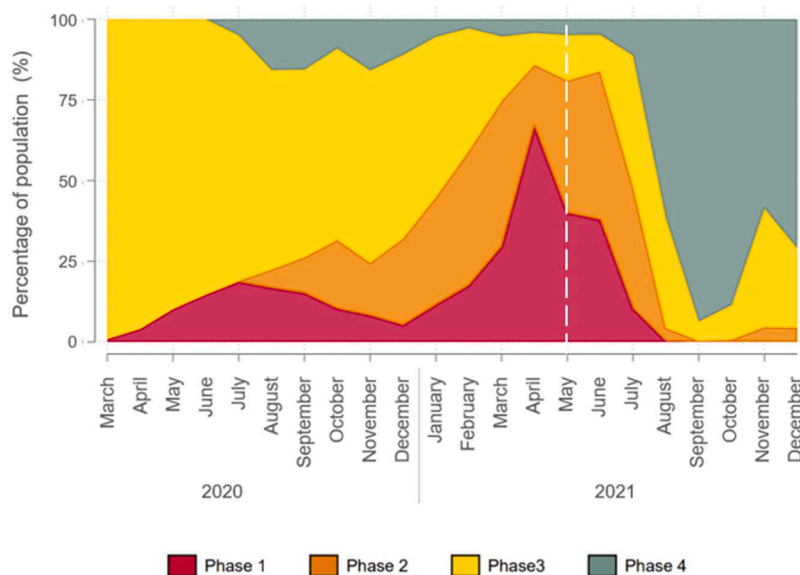


Fig. 1. Distribution of population across phases of the step-by-step plan. Note: The dashed line marks the separation between the two periods of analysis. Source: Authors' calculations based on data from the Chilean Ministry of Science, Technology, Knowledge and Innovation.

adjusted the deconfinement plan for managing the pandemic response. These adjustments included easing mobility restrictions, allowing access to social and recreational gatherings, and gradually reopening specific economic activities to Mobility Pass holders (e.g., restaurants, pubs, nightclubs, gyms, theaters, cinemas). These measures enable an evaluation of the effects of COVID-19 containment measures before and after the vaccination campaign and the implementation of the pass. By analyzing the case of Chile, this study offers valuable contributions to the understanding of the delicate trade-off between public health and economic priorities during a pandemic.

### Chilean government's response to COVID-19

Chile, a country of approximately 19.5 million inhabitants in 2020 [13], employed a multifaceted strategy to combat the COVID-19 pandemic, focusing on infection prevention, early detection, isolation, and monitoring of infected individuals and their contacts to curtail viral transmission. Public health measures included centralized management of critical care beds and a mass vaccination campaign using vaccines with diverse manufacturing technologies. This approach effectively slowed viral spread and generated evidence on vaccine effectiveness [14,15].

Since March 2020, as COVID-19 cases spread across the country, the Chilean government implemented localized lockdowns, cordons, and sanitary customs to minimize population mobility and slow infection transmission. Individuals requiring essential services, such as food, medicine, or medical care, needed police permits to venture out. On July 19, 2020, as the first pandemic wave began to recede, the "Step-by-Step: We Take Care" deconfinement plan was announced [16]. This plan sought to balance public health with social and economic activity by adopting dynamic interventions to mitigate viral spread while minimizing societal and economic disruptions.

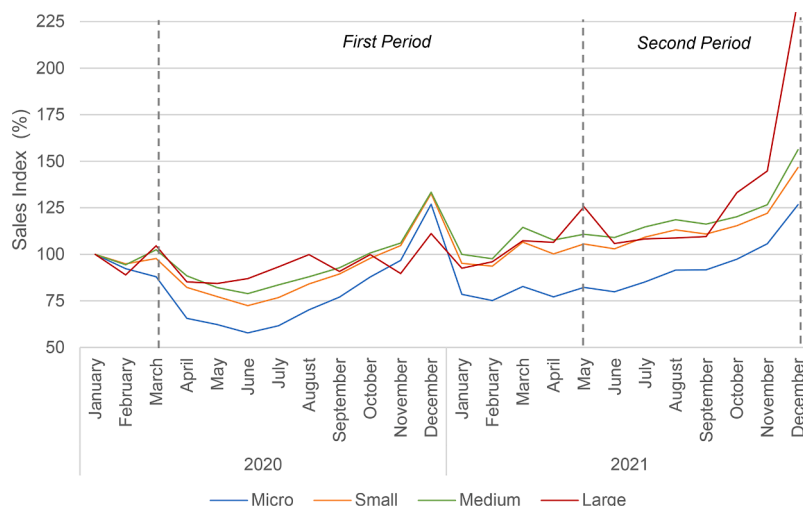
The "Step-by-Step" plan consisted of five phases, each with unique characteristics relating to restrictions and freedoms for individuals and businesses. Phase 1, known as "Quarantine", was the most stringent stage. During this phase, people were required to stay at home, with outings limited to essential activities with a special permit, such as grocery shopping or medical appointments. Most businesses, especially those not considered essential, were closed. During Phase 2 ("Transition"), weekday lockdowns were lifted, but weekend and holiday lockdowns remained in place. More businesses were allowed to reopen,

although some with high risk of transmission like restaurants, pubs, or theaters remained closed. During Phase 3 ("Preparation"), residents had greater freedom to move around, including on weekends and holidays. Most businesses were allowed to operate, but some capacity limits applied, especially for indoor activities. During Phase 4 ("Initial Opening"), further restrictions were lifted, and larger gatherings were allowed. Most businesses could operate at almost full capacity, although hygiene and distancing rules still applied. Phase 5 ("Advanced Opening") represented the least restrictive stage. Only some preventive measures like mask usage and social distancing were still recommended. Moving forward or backward through these phases was contingent upon the evolution of various factors, which included epidemiological indicators, healthcare network capacity, testing capabilities, traceability metrics and vaccination coverage. Remarkably, these decisions were not adopted with immediate economic outcomes as a primary consideration.

To contextualize the dynamics between public health measures and economic activity, we present two figures. Fig. 1 shows the distribution of population across phases of the Step-by-Step Plan, between March 2020 and December 2021.<sup>1</sup> Fig. 2 depicts the trajectory of business sales for different size groups throughout 2020 and 2021. We can observe a pronounced decline in sales for all size groups in the early months of the pandemic, with microenterprises hit particularly hard. While some recovery can be seen from mid-2020 onwards, it was notably more challenging for microenterprises to rebound to pre-pandemic performance levels. Interestingly, all types of firms experienced a dramatic surge in sales towards the end of 2021.

On February 2, 2021, Chile initiated a massive COVID-19 vaccination campaign, prioritizing older adults, frontline healthcare workers, and individuals with underlying health conditions [14]. The campaign featured a two-dose schedule, primarily using Sinovac's inactivated CoronaVac vaccine and Pfizer's mRNA vaccine in a lesser degree. Vaccine uptake was notably high, and primary regimens demonstrated

<sup>1</sup> Given the absence of a formally defined plan until July 2020, we made an analytical assumption that all municipalities not under full lockdown (Phase 1) during the early months of 2020 were effectively operating under conditions similar to Phase 3, which provides a reasonable approximation of the level of restrictions they faced. Besides this, it is worth noting that despite significant progress in vaccination and decreasing infection rates, no municipality in Chile reached Phase 5 of the "Step-by-Step" plan in 2020 or 2021.



**Fig. 2.** Evolution of indexed business sales by size. Note: Sales figures are indexed, normalized to 100 for each category as of January 2020. The dashed lines mark the limits of the two periods of analysis. Source: Authors’ calculations based on data from the Chilean SII.

considerable effectiveness, with CoronaVac achieving 65.9% effectiveness against COVID-19 infection, 87.5% against hospitalization, 90.3% against ICU admission, and 86.3% against death [15].

In May 2021, the Ministry of Health introduced the Mobility Pass, allowing fully vaccinated individuals to circulate during lockdowns and enabling a progressive reopening of select economic activities such as restaurants, cinemas, theaters, gyms, and sports venues [16]. Subsequently, Chile became the first South American country to administer booster doses, offering homologous and heterologous vaccine boosters for those vaccinated with CoronaVac. Maintaining a valid Mobility Pass became contingent upon receiving a booster shot, initially for adults over 55 and then gradually extended to the entire adult population.

The pass became an integral part of the “Step-by-Step” plan and a novel strategy to balance public health with economic activity. While several countries implemented ‘vaccine passports’ or ‘green passes’, such as the Digital Green Certificate in the European Union, Chile’s Mobility Pass had specific attributes that distinguish it. Unlike other systems that facilitated international travel [17], Chile’s Mobility Pass was primarily designed to grant increased internal mobility within the country during lockdowns to fully vaccinated individuals. This approach directly linked the benefits of vaccination to domestic freedom of movement, integrating public health objectives with strategies to mitigate the socioeconomic impact of lockdowns.

**Methods**

We use a dataset containing anonymized administrative records from the Chilean Internal Revenue Service (Servicio de Impuestos Internos, SII), encompassing the entire formal economy.<sup>2</sup> This allows us to estimate the effects of lockdowns on monthly business sales at the municipal level. Our analysis is divided into two periods: the ‘first period’ (March 2020 – April 2021), when there was no vaccine availability and reliance was on dynamic NPIs; and the ‘second period’ (May 2021 – December 2021), reflecting high vaccine uptake and less stringent NPIs. We also employ municipal-level information on the “Step-by-Step Plan”, as well as other secondary data sources as control variables.

The dataset, comprising a total of 7,524 observations (342

municipalities for 22 months), provides a comprehensive account of registered businesses reporting sales in Chile. For each municipality-month pair, the dataset also allows disaggregation by firm size and industry, two key dimensions of heterogeneity in the business sector. To account for differences in purchasing power across time periods, we classify firms based on their yearly sales in units of account indexed to past inflation (known as the Unidad de Fomento, UF). We classify firms by industry according to the Chilean adaptation of the International Standard Industrial Classification of All Economic Activities (ISIC Rev.4) at one digit, resulting in 18 distinct industries for our analysis. In adherence to the legal standards set by the Chilean Internal Revenue Service (SII), data observations at the municipal level that include fewer than eleven businesses per category had to be excluded. This measure safeguards against the inadvertent disclosure of private information by ensuring that no specific business can be singled out from the limited number of data points.

To examine the economic effects of lockdowns, we merge our monthly municipal-level data on business sales with geographical information on the implementation of the “Step-by-Step” plan [18]. We exploit changes in lockdown measures across space and time, as municipalities experienced full or partial lockdowns regularly throughout our estimation periods. Thus, our analysis capitalizes on the implementation lags and the varying intensity of localized lockdowns across Chilean territory, enabling us to disentangle the effects of different phases of the “Step-by-Step” plan on business performance.

To control for potential covariates affecting local economic activity, we cross-check our data with secondary data sources, including municipal information on income, population, and mobility. While larger populations typically denote a higher demand for goods and services, household income reflects the purchasing power within a municipality. Population estimates are derived from Census data, and household income is determined using the National Socio-Economic Characterization Survey (CASEN). The inclusion of mobility indicators as controls is also important, as the different phases of the Step-by-Step Plan do not have a one-to-one correspondence with actual population movement.<sup>3</sup> Throughout the pandemic, individuals voluntarily altered

<sup>2</sup> Disclosure: The information contained herein was collected for tax purposes, originating from self-declarations submitted by taxpayers to the Chilean Internal Revenue Service (SII). Hence, the veracity of these data is not the responsibility of the institution.

<sup>3</sup> By controlling for mobility, the coefficients  $\beta_1$  and  $\beta_2$  capture the effects of lockdowns on business sales that are not channeled through changes in mobility. Consequently, the estimates can be regarded as a lower bound for the total effect of lockdowns on business sales, acknowledging the possibility of additional effects mediated by changes in mobility.

their mobility patterns due to varying levels of concerns about the virus or changes in work arrangements (e.g., remote work) [19]. Furthermore, compliance with lockdown measures varied across municipalities due to differences in enforcement or local economic conditions [20]. Mobility indicators for each location are based on observed traveling patterns and derived from the relative variation between the first two weeks of March 2020 and subsequent months. Mobility indicators by municipality were made publicly available through the GitHub platform administered by the Chilean Ministry of Science, Technology, Knowledge, and Innovation [18].

The equations we use to estimate the effects of lockdowns are:

$$\ln(Sales_{it}^{size}) = \beta_0 + \beta_1 * Phase_{1it} + \beta_2 * Phase_{2it} + \theta * C_{it} + \eta_t + \varepsilon_{it} \tag{1}$$

$$\ln(Sales_{it}^{industry}) = \beta_0 + \beta_1 * Phase_{1it} + \beta_2 * Phase_{2it} + \theta * C_{it} + \eta_t + \varepsilon_{it} \tag{2}$$

Here,  $\ln(Sales_{it}^{size})$  represents the natural logarithm of the aggregated monthly sales of firms of a specific size category (micro, small, medium, or large) located in municipality  $i$  during month  $t$ . Similarly,  $\ln(Sales_{it}^{ind})$  represents the natural logarithm of the aggregated monthly sales of firms belonging to one of the 18 distinct industries, located in municipality  $i$  during month  $t$ . By taking the logarithm of the sales, we can interpret the coefficients in the model as the percentage change in sales associated with a one-unit change in the independent variables. On the right side of the equation,  $Phase_{1it}$  and  $Phase_{2it}$  are continuous variables that capture the percentage of time that municipality  $i$  spent in Phase 1 and Phase 2 during month  $t$ , respectively. Therefore, the coefficients  $\beta_1$  and  $\beta_2$  can be interpreted as conditional associations that measure the average difference in business sales between different phases of the Step-by-Step plan, after controlling for other covariates.  $C_{it}$  is a vector of municipal controls, which includes household income, population, and mobility indicators, aiming to account for possible confounding factors. The parameter  $\theta$  represents a vector of coefficients corresponding to these municipal controls. Lastly,  $\eta_t$  denotes the monthly fixed effects, which control for any unobserved time-varying factors that might influence the outcome variable, such as seasonality, macroeconomic trends, or other exogenous shocks unrelated to containment measures. Lastly,  $\varepsilon_{it}$  is the error term, capturing unexplained variation.

In sum, we implement a panel data regression model with time-fixed effects and both time-variant and time-invariant control variables. This empirical approach leverages the longitudinal nature of the data, tracking changes in both treatment and outcome variables over time while controlling for observed and unobserved heterogeneity. By doing so, we can disentangle the effects of lockdowns on business sales from other potential confounders. We set the least restrictive stages of the Step-by-Step Plan, Phase 3 and above, as the baseline (or reference category) in our analysis, providing us a clear and intuitive comparative framework to present and interpret the estimated effects of total and partial lockdowns on business sales.

**Results**

*First period*

In Table 1 we report the effects of these lockdowns by firm size for the first period (March 2020 – April 2021), which was characterized by the frequent implementation of NPIs such as full or partial lockdowns. Each column corresponds to a different size category, illustrating the percentage change in sales.

The results highlight the significant effects of lockdowns on businesses across various size categories, with microenterprises experiencing the most severe negative effects. For each 1% increase in time

spent in Phase 1, microenterprises experienced a decrease in sales of 0.201%. Thus, if a microenterprise were in full lockdown for an entire month (i.e., 100% of the time), sales would decrease by roughly 20.1% compared to a month spent in one of the least restrictive stages (Phase 3 or above). When restrictions were eased to Phase 2, the decrease in sales for each 1% increase in time was 0.125%. In comparison, small businesses experienced a 0.145% decrease in sales for each 1% increase in time spent in Phase 1, and a decrease of 0.084% for each 1% increase in time spent in Phase 2. Medium-sized enterprises saw a decrease of 0.118% in sales for each 1% increase in time spent in Phase 1, but no significant change in sales was detected during Phase 2. For large firms, no statistically significant effects were found for changes in time spent in either full or partial lockdowns. These findings underscore the particular vulnerability of micro and small enterprises to strict containment measures.

Table 2 shows the effects of lockdowns on various industries during the first period. Evidently, not all sectors were equally vulnerable or resilient to COVID-19 containment measures. Our estimates reveal that several industries, such as Education, Real Estate, Healthcare, Culture and Leisure, Hospitality, and Agriculture, experienced considerable declines in sales during the first period. In contrast, other industries were deemed "essential" by authorities and exempted from certain restrictions (e.g., Mining, Transportation, Utilities) or could continue operating remotely (e.g., Finance). Overall, the lockdowns of the first period had strong and negative effects on most industries.

*Second period*

In February 2021, Chile initiated its vaccination campaign, and by May 2021, the government introduced the Mobility Pass. This pass allowed vaccinated individuals to move freely during lockdowns, incentivizing vaccination and enabling pass holders to engage in social activities or visit establishments such as restaurants, pubs, and event venues, which were gradually allowed to reopen. Table 3 presents the effects of lockdowns on businesses during this second period, with each column representing a different firm size category and displaying the percentage change in sales.

According to Table 3, lockdowns during the second period only had negative and significant effects on medium-sized enterprises. Specifically, for each 1% increase in time spent in Phase 1, sales for medium-sized enterprises decreased by 0.173%, and by 0.116% for each 1% increase in time spent in Phase 2. There were no statistically significant effects on micro, small, or large businesses during this period.

This differential effect on medium-sized enterprises may be due to limited access to financial aid as the government directed public support mostly towards micro and small businesses [21]. Medium-sized businesses may also have faced greater supply chain disruptions due to their

**Table 1**  
Effects of lockdowns by business size during the first period (March 2020 – April 2021).

	(1) Micro	(2) Small	(3) Medium	(4) Large
Phase 1 (Full Lockdown)	-0.201*** (0.019)	-0.145*** (0.024)	-0.118*** (0.032)	0.028 (0.090)
Phase 2 (Partial Lockdown)	-0.125*** (0.021)	-0.084*** (0.026)	-0.051 (0.036)	0.003 (0.102)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.93	0.90	0.82	0.51
Observations	4288	4249	3132	1714
Mean	10.68	11.88	12.12	14.30

**Notes:** \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Robust standard errors in parenthesis.

The control variables used in the analysis include household income, population, and mobility indicators at the municipality level. Time-fixed effects are included to account for common shocks across municipalities that vary by month.

**Table 2**  
Effects of lockdowns by industry during the first period (March 2020 – April 2021).

	(1) A Agriculture	(2) B Mining	(3) C Manufacturing	(4) D Energy	(5) E Utilities	(6) F Construction	(7) G Commerce	(8) H Transportation	(9) I Hospitality
Phase 1 (Full Lockdown)	-0.266*** (0.093)	-0.082 (0.239)	0.112 (0.080)	-0.377 (0.408)	-0.206** (0.101)	-0.084* (0.050)	-0.143*** (0.048)	0.032 (0.058)	-0.271*** (0.055)
Phase 2 (Partial Lockdown)	-0.215** (0.090)	-0.034 (0.278)	0.121 (0.083)	-0.361 (0.417)	-0.162 (0.111)	-0.061 (0.052)	-0.068 (0.046)	-0.001 (0.061)	-0.176*** (0.056)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.26	0.32	0.67	0.35	0.55	0.80	0.84	0.74	0.74
Obs.	3980	807	4005	392	1946	3716	4288	4122	4110
Mean	11.08	10.95	10.90	10.56	8.96	10.50	12.01	10.47	8.84

	(10) J Communications	(11) K Finance	(12) L Real estate	(13) M Prof. services	(14) N Adm. services	(15) P Education	(16) Q Healthcare	(17) R Culture & leisure	(18) S Other services
Phase 1 (Full Lockdown)	-0.175* (0.101)	-0.145 (0.189)	-0.364*** (0.091)	-0.168** (0.067)	-0.040 (0.064)	-0.432*** (0.104)	-0.288*** (0.080)	-0.271** (0.107)	-0.189*** (0.049)
Phase 2 (Partial Lockdown)	0.093 (0.114)	0.003 (0.184)	-0.127 (0.099)	-0.027 (0.072)	-0.050 (0.066)	-0.189* (0.114)	-0.075 (0.090)	-0.228** (0.110)	-0.070 (0.053)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.67	0.41	0.59	0.75	0.74	0.62	0.72	0.52	0.78
Obs.	1728	1217	2223	2240	3112	1128	1642	1033	2900
Mean	9.34	10.02	9.94	9.91	10.06	10.15	10.19	8.34	8.32

**Notes:** \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Robust standard errors in parenthesis. The control variables used in the analysis include household income, population, and mobility indicators. Time-fixed effects are included to account for common shocks across municipalities that vary by month. Each column stands for a different industry: (A) Agriculture, Livestock, Forestry & Fishing; (B) Mining & Quarrying; (C) Manufacturing Industries; (D) Supply of Electricity, Gas, Steam & Air Conditioning; (E) Water Supply, Sewage Disposal, Waste Management & Decontamination; (F) Construction; (G) Wholesale & Retail Trade; (H) Transportation & Storage; (I) Hotel Accommodation & Food Service Activities; (J) Information & Communications; (K) Financial & Insurance Activities; (L) Real Estate Activities; (M) Professional, Scientific & Technical Activities; (N) Administrative & Support Service Activities; (P) Education; (Q) Human Health Care & Social Welfare Activities; (R) Artistic, Entertainment & Recreational Activities; (S) Other Service Activities. Summarized industry names are included to enhance readability.

**Table 3**  
Effects of lockdowns by business size during the second period (May 2021 – December 2021).

	(1) Micro	(2) Small	(3) Medium	(4) Large
Phase 1 (Full Lockdown)	-0.051 (0.038)	-0.077 (0.047)	-0.173** (0.072)	-0.264 (0.311)
Phase 2 (Partial Lockdown)	0.006 (0.036)	-0.046 (0.045)	-0.116* (0.068)	-0.360 (0.282)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.94	0.92	0.86	0.53
Observations	2448	2431	1884	1030
Mean	10.72	11.98	12.20	14.42

**Notes:** \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Robust standard errors in parenthesis. The control variables used in the analysis include household income, population, and mobility indicators. Time-fixed effects are included to account for common shocks across municipalities that vary by month.

relatively higher levels of integration into foreign markets. Additionally, the withdrawal of pension funds and the Emergency Family Income (EFI) increased labor supply shortages during the pandemic [22]. This might have particularly affected enterprises of medium size, which have greater demand for work than small businesses and pay lower salaries than large companies. Lastly, medium-scale companies may be less adaptable than micro and small firms in terms of shifting their business models or pivoting to online sales.

Table 4 further explores the effects of lockdown measures on different industries during the second period. The estimates indicate that, despite the vaccination campaign, the Mobility Pass, and the gradual reopening of riskier activities, several industries experienced large revenue declines with lockdowns, such as Mining, Hospitality, Finance, Education, and Healthcare. These downturns could be attributed to various factors, including persistent restrictions on certain economic sectors, fluctuating commodity prices, disruptions in global

supply chains, pension fund withdrawals, and reduced international travel [23,24]. For instance, the reduction in ‘Education’ could be attributed to the prolonged closure of educational institutions (from daycares to universities) [25], while the decrease in ‘Healthcare’ could be explained by the suspension of elective surgeries in the eleven most populated regions of the country [26].

We must approach the results for the second period with a degree of caution. The second estimation window covers a shorter time span, and the Step-by-Step Plan experienced some important changes since the beginning of October 2021. These changes may introduce bias into the analysis, particularly for industries with activity concentrated in fewer municipalities. Moreover, the comparison group differs between the two periods. Given that the business environment generally improved in the second period, then even maintaining a similar level of business performance as in the first period would appear as a relative decline.

## Discussion

In this study, we examine the effects of COVID-19 containment measures on business sales in Chile, offering a granular analysis that distinguishes our work from prior research conducted in the country [27–29]. Chile’s response to the pandemic can be divided into two periods. The first period, from March 2020 to April 2021, featured dynamic non-pharmaceutical interventions (NPIs), such as lockdowns, mobility restrictions, and closures of non-essential and riskier sectors. As in the rest of the world, these measures disproportionately affected MSMEs, while large firms, which tend to have better digital infrastructure and greater resources at their disposal, experienced little to no significant impact [30,31].

Chile implemented the Step-by-Step plan to balance epidemiological and socioeconomic concerns, facilitating the gradual reopening of riskier economic activities. The country initiated its vaccination campaign in February 2021, achieving high coverage with 83% of the population receiving a full vaccination regimen by April 30, 2021 [32].

**Table 4**  
Effects of lockdowns by industry during the second period (May 2021 – December 2021).

	(1) A Agriculture	(2) B Mining	(3) C Manufacturing	(4) D Energy	(5) E Utilities	(6) F Construction	(7) G Commerce	(8) H Transportation	(9) I Hospitality
Phase 1 (Full lockdown)	0.193 (0.173)	-1.438*** (0.505)	-0.144 (0.169)	-1446 (1705)	-0.215 (0.202)	-0.116 (0.114)	0.090 (0.077)	-0.203* (0.118)	-0.502*** (0.113)
Phase 2 (Partial lockdown)	0.191 (0.169)	-1.258** (0.515)	-0.127 (0.165)	0.370 (1625)	0.228 (0.201)	0.033 (0.117)	-0.015 (0.073)	-0.223* (0.119)	-0.186 (0.115)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.28	0.34	0.68	0.33	0.58	0.82	0.85	0.74	0.74
Obs.	2272	464	2303	234	1130	2140	2448	2355	2371
Mean	11.06	11.12	11.07	10.72	9.09	10.63	12.21	10.61	9.43
	(10) J Communications	(11) K Finance	(12) L Real estate	(13) M Prof. services	(14) N Adm. services	(15) P Education	(16) Q Healthcare	(17) R Culture & leisure	(18) S Other services
Phase 1 (Full Lockdown)	-0.274 (0.247)	-0.949** (0.475)	-0.291 (0.239)	-0.297 (0.218)	-0.458*** (0.147)	-1.258*** (0.334)	-0.706*** (0.231)	-1.125** (0.446)	-0.212** (0.107)
Phase 2 (Partial Lockdown)	-0.286 (0.223)	-0.307 (0.427)	0.111 (0.239)	-0.073 (0.220)	-0.375*** (0.134)	-0.716** (0.323)	-0.085 (0.205)	-0.739* (0.388)	-0.333*** (0.105)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.67	0.42	0.59	0.77	0.75	0.64	0.72	0.56	0.81
Obs.	1008	719	1294	1331	1812	658	963	744	1727
Mean	9.55	10.16	10.13	10.02	10.17	10.42	10.50	8.81	8.47

**Notes:** \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Robust standard errors in parenthesis. The control variables used in the analysis include household income, population, and mobility indicators. Time-fixed effects are included to account for common shocks across municipalities that vary by month. Each column stands for a different industry: (A) Agriculture, Livestock, Forestry & Fishing; (B) Mining & Quarrying; (C) Manufacturing Industries; (D) Supply of Electricity, Gas, Steam & Air Conditioning; (E) Water Supply, Sewage Disposal, Waste Management & Decontamination; (F) Construction; (G) Wholesale & Retail Trade; (H) Transportation & Storage; (I) Hotel Accommodation & Food Service Activities; (J) Information & Communications; (K) Financial & Insurance Activities; (L) Real Estate Activities; (M) Professional, Scientific & Technical Activities; (N) Administrative & Support Service Activities; (P) Education; (Q) Human Health Care & Social Welfare Activities; (R) Artistic, Entertainment & Recreational Activities; (S) Other Service Activities. Summarized industry names are included to enhance readability.

Although vaccines proved effective in mitigating severe illness and mortality [14], the government maintained certain societal restrictions to optimize their efficacy, especially as more contagious variants emerged (e.g., omicron subvariant BA.4 and BA.5).

The introduction of the Mobility Pass in May 2021 marked the beginning of the second period. This pass incentivized vaccination while allowing for greater societal movement and engagement in riskier activities. During this period, the economic consequences of the pandemic on MSMEs were largely mitigated, primarily affecting medium-sized enterprises and specific economic sectors. The Chilean government provided targeted support to micro and small enterprises through stimulus packages and digitalization initiatives [21,33]. Indeed, Chile emerged as an OECD leader in MSME digitalization, with 62% of small and medium enterprises adopting digital technologies during the pandemic [34]—a statistic closely tied to the stringency of NPIs.

**Conclusion**

Our analysis reveals the significant and unequal ramifications of COVID-19 containment measures on the Chilean business sector. Micro, small, and medium-sized enterprises (MSMEs), along with specific service industries (e.g. Hospitality, Education, Culture and Leisure) have borne the brunt of lockdowns. The successful rollout of the vaccination campaign, coupled with the introduction of the Mobility Pass, appears to have contributed to alleviate the strain of lockdowns on businesses and mitigate the negative economic effects of the pandemic.

It is important to acknowledge several limitations in our study. First, endogeneity is a major concern in this type of research. Along these lines, factors we have not directly controlled for include the severity of the pandemic itself and the influence of the government’s targeted support to micro and small enterprises through stimulus packages. Although we included fixed effects expected to capture time-varying nationwide factors such as these support policies, a more granular

incorporation of these measures could refine the study’s findings. Second, the data used in our research may not capture the full extent of the effects of lockdowns on certain segments of the economy, particularly the informal sector [35] and small municipalities. Third, the results are specific to the Chilean context, affecting the generalizability of our findings to other countries with different economic structures, policy environments, or public health responses to the pandemic.

As governments continue to navigate the ongoing challenges of the COVID-19 pandemic, our study highlights the importance of carefully calibrated policy responses that strike the right balance between safeguarding public health and mitigating economic hardship, especially for MSMEs and vulnerable industries that bear the greatest burden. In this vein, our findings underscore the need for targeted support measures for MSMEs and the hardest-hit industries. Without strategic interventions, these sectors may struggle to recover even after the pandemic subsides. Our findings also demonstrate the need for adaptability in policy design and implementation in response to changing pandemic circumstances. In the case of Chile, our results suggest that the benefits of the vaccination campaigns and the Mobility Pass extended beyond immediate health outcomes.

Building upon this, policy decisions must be based on accurate and timely data. Continued efforts to gather and analyze data on the pandemic’s socioeconomic impacts are critical for shaping effective policy responses. A data-driven approach to decision-making can help ensure that policies are tailored to the evolving landscape of a crisis, enabling more informed decisions, enhancing resilience, and fostering recovery. Looking forward, the lessons learned from this pandemic should be incorporated into planning for future public health emergencies, to better manage both health and economic risks.

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### Ethical approval

The project was reviewed and approved by Universidad Católica's ethical committee (project number 220,321,012)

### Patient consent statements

Not required as there were no patients involved in this study.

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### CRediT authorship contribution statement

**Julio A. Pertuze:** Conceptualization, Methodology, Writing – review & editing, Funding acquisition, Supervision. **José Pablo Montégu:** Conceptualization, Methodology, Formal analysis, Software, Writing – original draft, Writing – review & editing. **Cecilia González:** Conceptualization, Methodology, Writing – review & editing. **Rafael Araos:** Conceptualization, Methodology, Writing – review & editing. **Paula Daza:** Conceptualization, Methodology, Writing – review & editing.

### Declaration of Competing Interest

None declared.

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