



Who defaults during COVID-19? evidence from local lockdown restrictions

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ABSTRACT

We examine whether geographically heterogeneous COVID-19 lockdown restrictions affected household credit risk using a proprietary dataset of over 42,000 personal loans from an Italian financial institution. Exploiting local variation in the intensity of local lockdown restrictions, we find that stricter local restrictions significantly increased the likelihood of borrower default. The effect is heterogeneous across borrower characteristics, being stronger even among high-credit-score borrowers and attenuated for homeowners. Our results are robust to alternative specifications, including geographic exclusions of metropolitan areas. Taken together, our findings show that localized public health interventions had meaningful and uneven financial consequences, with implications for targeted credit risk and social protection policies.

1. Introduction

In Italy, as in many countries, the COVID-19 pandemic of 2020–2021 triggered unprecedented public health interventions, including localized lockdowns and mobility restrictions that varied significantly across regions. While a growing literature examines the socio-economic consequences of these measures, including their effects on mental health (Bertoni et al., 2021), mobility (Alexander and Karger, 2023), and employment (Coibion et al., 2025), little is known about their micro-level effects on household financial vulnerability and credit risk.

In this paper, we question whether the intensity of local lockdown restrictions affected individual default risk in the personal loan market. To do so, we employ a unique proprietary dataset from an Italian bank that contains detailed microdata on non-purpose personal loans and match Italian borrowers' residential locations with province and regional-level indicators of COVID-19 restriction severity (Conteduca and Borin, 2022). This spatial variation allows us to identify the effect of local lockdown intensity on individual credit outcomes.

We document that borrowers residing in areas under stricter lockdown measures were significantly more likely to default. A one-standard-deviation increase in province-level stringency is associated with a roughly 24–31 % increase in the odds of default, holding borrower characteristics and time effects constant. Control variables display expected signs, as predicted by prior research: higher income, better credit scores, and indicators of socioeconomic stability significantly reduce default risk. Overall, our findings suggest that localized

public health restrictions had durable financial consequences for household creditworthiness, even in segments of the credit market not directly tied to specific consumption purposes.

Our study contributes to the emerging literature on household finance and crisis shocks by providing micro-level evidence on the role of geographically heterogeneous policy interventions. While recent work shows that COVID-19 impacted demand for personal credit, such as buy-now-pay-later (Chen et al., 2024), stock market participation (Guo et al., 2025), and consumer spending (Kubota et al., 2021; Alexander and Karger, 2023; Oblander and McCarthy, 2023), we are the first to show how variation in local lockdown restrictions impacts the likelihood of borrower defaults.

In doing so, we also contribute to the literature on heterogeneous economic responses to COVID-19 (Hanspal et al., 2021; Kubota et al., 2021; Shakhnov and Paczos, 2022; Alexander and Karger, 2023; Bonaccolto et al., 2023; Yannelis and Amato, 2023; Chetty et al., 2024). Prior work examines a wide range of macro- and micro-level responses. For example, Shakhnov and Paczos (2022) study sovereign defaults following pandemic-induced fiscal shocks. Alexander and Karger (2023) show that stay-at-home orders reduced mobility and consumer spending. Yannelis and Amato (2023) review the literature on household consumption, credit, and investment behaviour during the COVID-19 pandemic. They call for new research to help policymakers respond more effectively to such shocks through targeted interventions. Finally, Hanspal et al. (2021) document how the pandemic-era stock market crash shaped household expectations about retirement, debt,

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and investment. Unlike these studies, we leverage within-country variation in lockdown stringency to estimate the micro-level effect of localized containment policies on individual default risk in the personal loan market. By identifying which borrowers are most likely to default during COVID-19, our findings yield novel insights for policymakers and regulators on the effective design of targeted credit-risk management and social-protection policies during systemic disruptions.

2. Data and methodology

We employ a rich proprietary loan-level dataset from an Italian financial institution containing personal non-secured loans of up to 75,000 euros over the Covid-19 period from 9th March 2020 (the first lockdown day in Italy) to 31st March 2022 (the date of Decree Law No. 24, which declared the end of the Covid-19 emergency period). Over this period, Italy implemented nationwide lockdown measures that varied in intensity across the country. Our dataset contains detailed information on borrower risk profiles, including credit scores and non-performing loan status, as well as sociodemographic characteristics. To this, we merge borrower data with local indicators of COVID-19 restriction intensity at the regional and provincial levels, provided by [Conteduca and Borin \(2022\)](#). This spatial variation allows us to identify the effect of local lockdown intensity on individual credit outcomes. These indicators capture the severity of mobility restrictions and economic shutdown measures. The final sample consists of 42,524 loans over the sample period. [Table 1](#) presents descriptive statistics for all variables, and [Appendix A](#) variable definitions.

We estimate logit models with month-year fixed effects and standard errors clustered at regional or provincial levels, depending on the spatial scope of the COVID-19 restriction measures implemented. Our identification relies on cross-sectional spatial variation in restriction intensity across local areas, conditional on individual, loan-level, and local COVID-19 and economic characteristics. The model is:

$$Default_i = \beta_1 SI_i + \beta_2 Credit_score_i + \sum_{k=1}^8 X_{ik} + \tau_{m-y} + \varepsilon_i \quad (1)$$

Where the dependent variable *Default* is a binary indicator equal to 1 for defaulted personal loans and 0 otherwise. The main explanatory variable is the Stringency Index (SI) developed by [Conteduca and Borin \(2022\)](#), which captures the intensity of containment and restriction measures implemented at the local level during the COVID-19 pandemic. The restrictions considered include measures affecting in-person schooling, production activities, retail shops and personal services, bars and restaurants, public events, private gatherings, and public information campaigns. A particularly important component concerns mobility restrictions, which encompass limitations on public transportation, mandatory quarantine and isolation rules, restrictions on domestic travel and internal movement (including inter-regional and inter-municipal bans), as well as controls on international travel. In our specifications, the index is measured at either the province (*Province_SI*) or the regional (*Region_SI*) level, and is log-transformed and standardized. The model also includes the borrower's *Credit_score*, log-transformed and standardized, and a set of borrower- and loan-level control variables, which includes: i) *Amount*, i.e., the amount borrowed; ii) *Gender*; iii) *Age*; iv) *Age2*; v) *Monthly_income*; vi) *Italian*; vii) *Married*, viii) *Homeowner*. Furthermore, motivated by related literature (e.g., [Borri et al., 2021](#)), we also include controls for local COVID-19 conditions and for local economic conditions. Regarding the former, we use daily COVID-19 data provided by the Italian Civil Protection Department (Presidency of the Council of Ministers) through its official open-data repository.¹ Based on these data, we construct three variables: i) Δ *Covid-19 cases*, defined as the daily change in the total number of

confirmed cases at the provincial level; ii) *Hospitalisation*, measured as the ratio of regional hospitalisations to total confirmed cases; and iii) Δ *Covid-19 deaths*, defined as the daily change in the number of deaths at the regional level attributable to the pandemic. To account for local economic conditions, we use publicly available data from ISTAT to compute *Unemployment*, defined as the quarterly change in the regional unemployment rate for the population aged 15–74 ([Herkenhoff, 2019](#)), which corresponds to the standard age range used in European statistical reporting (e.g., Eurostat).

3. Results

3.1. Baseline results

[Table 2](#) presents the baseline results. Regressions 1 and 2 focus on lockdown restrictions at the region level, while 3 and 4 are based on the province level. Across all regressions, we observe that local lockdown intensity is strongly and positively associated with borrower default risk, even after controlling for rich borrower controls, income categories, and month-year fixed effects. This implies that borrowers were more likely to default under more stringent local COVID-19 lockdown restrictions. In terms of economic significance, a one-standard-deviation increase in province-level stringency is associated with roughly a 24–31 % increase in the odds of default, holding borrower characteristics and time effects constant (Models 2 and 4, [Table 2](#)).

Regarding borrower characteristics, *Credit_score* is a positive predictor of default, which implies that borrowers with better credit scores are less likely to default. Conversely, men are more likely to default, as are those who borrow larger amounts. We also identify an interesting nonlinear (inverted-U) relationship between borrower age and the probability of loan default, consistent with life cycle borrowing and asset-accumulation dynamics ([Agarwal et al., 2009](#)).² The variables capturing socioeconomic stability, including marital status, homeownership, and Italian citizenship, are associated with significantly lower default risk. These factors likely reflect greater income stability and access to informal insurance, reducing households' exposure to liquidity shocks. Finally, hospitalisation stress is positively associated with borrowers' default.

3.2. Additional analyses

[Table 3](#) presents moderation analyses examining the moderating effects of homeownership, age, and borrower gender on the relationship between local lockdown restrictions and the probability of default. We focus on the more granular province-level stringency index, but in unreported tests, available upon request, we also consider the regional-level stringency index and obtain results that are very similar. Our main results hold across all models. In terms of moderators, we find meaningful heterogeneity for creditworthiness and homeownership: the adverse effect of stringency is stronger for borrowers with higher credit scores (*Province_SI* \times *Credit_score* OR = 1.023) and weaker for homeowners (*Province_SI* \times *Homeowner* OR = 0.890). These results suggest that stricter COVID-19 restrictions eroded the repayment capacity of traditionally low-risk borrowers, indicating that mobility and business restrictions weakened the protective role of high credit scores. This largely reflects pre-pandemic income stability rather than resilience to systemic disruptions. Conversely, homeownership mitigates this effect, likely due to reduced exposure to rental payments and the availability of targeted mortgage forbearance and regulatory protections introduced

² In an unreported analysis, available upon request, we replace the age variables with *Retired*, a dummy variable equal to 1 if the individual exceeds the statutory average retirement age and 0 otherwise. We find a highly significant coefficient of less than 1, which indicates that retirees are less likely to default during the COVID-19 lockdowns.

¹ The database is available at: <https://dati-covid.italia.it/>

Table 1
Descriptive statistics.

	Continuous and binary variables					
	N. obs	Mean	Median	Min	Max	St. Deviation
Default	42.524	0.045	0.000	0.000	1.000	0.207
Province_SI	42.524	0.000	-0.192	-15.552	1.881	1.000
Region_SI	42.524	0.000	0.283	-2.748	0.726	1.000
Credit_score	42.524	0.000	0.005	-24.160	1.024	1.000
Amount	42.524	0.000	0.041	-2.635	3.729	1.000
Male	42.524	0.552	1.000	0.000	1.000	0.497
Age	42.524	0.000	-0.066	-1.790	2.424	1.000
Italian	42.524	0.941	1.000	0.000	1.000	0.236
Married	42.512	0.449	0.000	0.000	1.000	0.497
Homeowner	42.524	0.743	1.000	0.000	1.000	0.437
Δ Covid-19 cases	42.426	0.000	0.042	-29.429	17.040	1.000
Hospitalisation	42.036	0.000	-0.321	-0.424	8.877	1.000
Δ Covid-19 deaths	41.821	0.000	0.035	-13.778	13.971	1.000
Unemployment	42.524	0.000	-0.107	-4.903	6.068	1.000

	N. obs	Categorical variable			
		<€1.25K	€1.25K - €2K	€2K - €3K	>€3K
Monthly_income	42.524	41.26 %	46.19 %	8.53 %	4.02 %

Table 2
Baseline results.

	(1)	(2)	(3)	(4)
	Dep. Variable: Default			
Province_SI			1.235** (0.082)	1.236*** (0.082)
Region_SI	1.213** (0.077)	1.313*** (0.059)		
Credit_score	0.918*** (0.007)	0.913*** (0.006)	0.918*** (0.009)	0.912*** (0.009)
Amount		1.454*** (0.071)		1.403*** (0.059)
Male		1.725*** (0.075)		1.726*** (0.078)
Age		4.196*** (0.295)		3.831*** (0.217)
Age ²		0.192*** (0.332)		0.207*** (0.242)
Monthly_income [1.25 K, 2 K]		0.512*** (0.104)		0.512*** (0.077)
Monthly_income [2 K, 3 K]		0.405*** (0.255)		0.409*** (0.177)
Monthly_income [>3 K]		0.263*** (0.163)		0.276*** (0.194)
Italian		0.657** (0.195)		0.679** (0.154)
Married		0.885 (0.096)		0.875* (0.081)
Homeowner		0.710 (0.235)		0.750** (0.141)
Δ Covid-19 cases		0.998 (0.034)		0.992 (0.042)
Hospitalisation		1.310*** (0.076)		1.244*** (0.075)
Δ Covid-19 deaths		1.012 (0.026)		1.014 (0.032)
Unemployment		0.966 (0.067)		0.980 (0.052)
Month-Year FE	Yes	Yes	Yes	Yes
Clustered SE	Region	Region	Province	Province
N. obs	42,524	41,809	42,524	41,809
Pseudo R ²	0.043	0.088	0.040	0.082

Note(s): Logistic regressions with Default as the dependent variable. In Models (1)–(2), the region-level stringency index (Region_SI) is included, while Models (3)–(4) consider the province-level stringency index (Province_SI). All Models include month–year fixed effects. Reported coefficients are standardized odds ratios. Standard errors (in parentheses) refer to the underlying standardized log-odds coefficients and are clustered at the region or province level as indicated. Significance levels: *, **, *** denote statistical significance at the 10 %, 5 %, and 1 % levels, respectively. Source: authors' elaboration.

Table 3
Moderation analyses.

	(1)	(2)	(3)	(4)
	Dep. Variable: Default			
Province_SI	1.240*** (0.082)	1.332*** (0.097)	1.204** (0.083)	1.187** (0.075)
Credit_score	0.914*** (0.009)	0.912*** (0.009)	0.912*** (0.009)	0.912*** (0.009)
Amount	1.402*** (0.059)	1.401*** (0.059)	1.405*** (0.059)	1.404*** (0.059)
Male	1.728*** (0.078)	1.727*** (0.078)	1.728*** (0.078)	1.749*** (0.075)
Age	3.841*** (0.216)	3.821*** (0.217)	3.952*** (0.205)	3.835*** (0.217)
Age ²	0.206*** (0.242)	0.207*** (0.242)	0.202*** (0.233)	0.206*** (0.243)
Monthly_income [1.25 K, 2 K]	0.511*** (0.076)	0.512*** (0.076)	0.511*** (0.077)	0.512*** (0.077)
Monthly_income [2 K, 3 K]	0.409*** (0.176)	0.408*** (0.177)	0.409*** (0.177)	0.409*** (0.177)
Monthly_income [>3 K]	0.277*** (0.194)	0.277*** (0.193)	0.276*** (0.196)	0.276*** (0.195)
Italian	0.680** (0.154)	0.677** (0.153)	0.682** (0.154)	0.680** (0.154)
Married	0.873* (0.080)	0.874* (0.080)	0.876* (0.080)	0.874* (0.080)
Homeowner	0.750** (0.141)	0.734** (0.139)	0.750** (0.141)	0.750*** (0.141)
Province_SI * Credit_score	1.023** (0.009)			
Province_SI * Homeowner		0.890** (0.051)		
Province_SI * Age			1.029 (0.157)	
Province_SI * Age ²			1.046 (0.160)	
Province_SI * Male				1.065 (0.058)
Δ Covid-19 cases	0.993 (0.043)	0.992 (0.041)	0.992 (0.042)	0.992 (0.042)
Hospitalisation	1.243*** (0.075)	1.243*** (0.075)	1.245*** (0.076)	1.245*** (0.076)
Δ Covid-19 deaths	1.014 (0.032)	1.014 (0.032)	1.012 (0.032)	1.013 (0.032)
Unemployment	0.979 (0.053)	0.980 (0.052)	0.981 (0.052)	0.980 (0.052)
Month-Year FE	Yes	Yes	Yes	Yes
Clustered SE	Province	Province	Province	Province
N. obs	41,809	41,809	41,809	41,809
Pseudo R ²	0.082	0.083	0.083	0.082

Note(s): Logistic regressions with Default as the dependent variable. The main independent variable is the province-level stringency index (Province_SI). Model (1) includes the interaction between Province_SI and Credit_score; Model (2) includes the interaction between Province_SI and Homeowner; Model (3) includes interactions between Province_SI and Age as well as Age²; Model (4) includes the interaction between Province_SI and Male. All Models include month-year fixed effects. Reported coefficients are standardized odds ratios. Standard errors (in parentheses) refer to the underlying standardized log-odds coefficients are clustered at the province level as indicated. Significance levels: *, **, *** denote statistical significance at the 10 %, 5 %, and 1 % levels, respectively. Source: authors' elaboration.

during the COVID-19 pandemic.

Next, in Table 4, we examine how the effect of lockdown intensity on borrower default varies by borrower income. To do so, we estimate regressions for four subsamples defined by monthly income categories: below €1.25 K, between €1.25 K and €2 K, between €2 K and €3 K, and above €3 K. We find that for the lowest-income group (< €1.25 K), the provincial stringency index is significantly associated with higher default odds (OR = 1.284), whereas estimates for higher-income brackets are smaller and insignificant. Therefore, the effect of local lockdown intensity on default is concentrated among low-income borrowers. In other words, stricter local conditions disproportionately affect borrowers with limited financial buffers. Other covariates behave as expected across income groups, with credit scores remaining strongly protective and loan amounts exhibiting larger marginal effects at higher income levels. Overall, the results highlight substantial heterogeneity in vulnerability to stringency across income distribution.

3.3. Robustness tests

In Table 5, we present several robustness checks. In column (1), we employ an alternative measure of restriction intensity based on a dummy variable equal to one if the provincial stringency index is above the sample mean and zero otherwise. In column (2) we exclude loans from Italian metropolitan areas (Turin, Genoa, Milan, Bologna, Venice, Florence, Rome, Bari, Naples, Reggio Calabria, Cagliari, Catania, Messina, Palermo) since the effect of Covid-19 was likely to be more severe in these highly dense population areas, which could impact credit outcomes and thus the inferences we make. Finally, in column (3), we reestimate our baseline model using province-month clustered standard errors rather than province-clustered standard errors. Finally, in unreported tests, available upon request, we reestimate all the paper's results using: i) regional-level COVID-19 lockdown-intensity measures, and ii) standard errors clustered at the individual-level. Our results are robust

Table 4
Analysis by monthly income categories.

	(1)	(2)	(3)	(4)
Dep. Variable: Default				
Province_SI	1.284*** (0.084)	1.185 (0.152)	0.905 (0.303)	1.740 (0.446)
Credit_score	0.918*** (0.012)	0.907*** (0.014)	0.905** (0.042)	0.925 (0.048)
Amount	1.216*** (0.051)	1.491*** (0.069)	2.244*** (0.124)	2.392*** (0.164)
Male	1.820*** (0.095)	1.780*** (0.106)	0.975 (0.277)	2.216 (0.560)
Age	9.637*** (0.331)	2.050*** (0.239)	0.115*** (0.516)	0.190 (1.226)
Age ²	0.089*** (0.379)	0.373*** (0.253)	6.492*** (0.484)	2.488 (1.274)
Italian	0.724 (0.208)	0.655** (0.169)	0.851 (0.343)	0.328** (0.560)
Married	0.852 (0.142)	0.863 (0.094)	1.333 (0.227)	0.759 (0.338)
Homeowner	0.751 (0.175)	0.772* (0.152)	0.608* (0.256)	0.701 (0.440)
Δ Covid-19 cases	0.984 (0.021)	0.896* (0.059)	1.530*** (0.095)	1.154 (0.158)
Hospitalisation	1.280*** (0.084)	1.122 (0.093)	1.746*** (0.187)	1.749 (0.583)
Δ Covid-19 deaths	1.023 (0.040)	1.024 (0.030)	0.890 (0.137)	1.159 (0.120)
Unemployment	0.984 (0.048)	0.949 (0.100)	1.128 (0.157)	1.231 (0.267)
Month-Year FE	Yes	Yes	Yes	Yes
Clustered SE	Province	Province	Province	Province
N. obs	17,269	19,297	3556	1547
Pseudo R ²	0.066	0.095	0.187	0.248

Note(s): Logistic regressions with Default as the dependent variable. The main independent variable is the province-level stringency index (Province_SI). The Table reports estimates from four separate Models, each estimated on a different subsample defined by Monthly_income categories: monthly income below €1.25 K, monthly income between €1.25 K and €2 K, monthly income between €2 K and €3 K, and monthly income above €3 K. All models include month-year fixed effects. Reported coefficients are standardized odds ratios. Standard errors (in parentheses) refer to the underlying standardized log-odds coefficients and are clustered at the province level as indicated. Significance levels: *, **, *** denote statistical significance at the 10 %, 5 %, and 1 % levels, respectively. Source: authors' elaboration.

Table 5
Robustness tests.

	(1)	(2)	(3)
Dep. Variable: Default			
High_province_SI	Change explanatory variable 1.243* (0.117)	Excluding metropolitan areas	Include province-month SE
Province_SI		1.257** (0.101)	1.236* (0.127)
Control variables	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes
Clustered SE	Province	Province	Province-month
N. obs	41,809	32,454	41,809
Pseudo R ²	0.082	0.078	0.082

Note(s): Logistic regressions with Default as the dependent variable. Columns (1)-(3) correspond to robustness checks: (1) replaces Province_SI with High_province_SI, a binary variable equal to one if the provincial stringency index is above the sample mean; (2) excludes loans from Italian metropolitan areas (Turin, Genoa, Milan, Bologna, Venice, Florence, Rome, Bari, Naples, Reggio Calabria, Cagliari, Catania, Messina, Palermo); (3) uses province-level clustered standard errors. Reported coefficients are standardized odds ratios. Standard errors (in parentheses) refer to the underlying standardized log-odds coefficients and are clustered at the province or province-month level as indicated. All models include month-year fixed effects. Significance levels: *, **, *** denote statistical significance at the 10 %, 5 %, and 1 % levels, respectively. Source: authors' elaboration.

across all cases, thereby confirming that the relationship between local stringency and default is not driven by functional form assumptions and geographic composition.

4. Conclusion

Using a proprietary loan dataset from an Italian financial institution, we provide micro-level evidence that localized COVID-19 restrictions

had persistent effects on household credit risk. Individuals living in areas subject to stricter lockdowns exhibit higher default risk, even in the market for non-purpose personal loans. From a policy perspective, our findings highlight the need for targeted interventions that account for local conditions during periods of shock (Yannelis and Amato, 2023). Specifically, they highlight the importance of considering the financial-stability implications of geographically differentiated public health policies and suggest that local economic disruptions can have

long-lasting effects on household financial vulnerability.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Table A1.

Table A1
Definition of variables.

Variable	Definition
Dependent variables	
Default	Binary variable equal to 1 for defaulted personal loans, 0 otherwise
Explanatory variables	
Region_SI	Region-level stringency index developed by Conteduca and Borin (2022) , log-transformed and standardized.
Province_SI	Province-level stringency index developed by Conteduca and Borin (2022) , log-transformed and standardized.
High_province_SI (*)	Binary variable equal to 1 if the provincial stringency index is above the sample mean, 0 otherwise.
Control variables	
Credit_score	Borrower's credit score, log-transformed and standardized.
Amount	Amount borrowed, log-transformed and standardized.
Male	Binary variable equal to 1 when the Borrower is a male and 0 otherwise.
Age	Borrower's age, standardized.
Age ²	Square of borrower's age, standardized.
Monthly_income	Categorical variable with 5 levels: <€1.25 K (base level), €1.25 K - €2 K, €2 K - €3 K, >€3K
Italian	Binary variable equal to 1 if Italian, 0 otherwise.
Married	Binary variable equal to 1 if married, 0 otherwise.
Homeowner	Binary variable equal to 1 if homeowner, 0 otherwise.
Δ Covid-19 cases	Daily change in total confirmed cases (province level), standardized.
Hospitalisation	Ratio of regional hospitalisations to total cases, standardized.
Δ Covid-19 deaths	Daily change in COVID-19 deaths (regional level), standardized.
Unemployment	Quarterly change in regional unemployment rate (ages 15–74), standardized.

Note(s): (*) Variable only included in robustness analysis.

Data availability

The data that has been used is confidential.

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