



# Changes in household income during COVID-19: a longitudinal analysis

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## Abstract

This paper investigates how Italian household income has changed across different stages of COVID-19 after considering the effects of support measures taken by the government to lessen the detrimental economic impact of the pandemic. We use longitudinal microdata from six waves of a nationally representative household survey conducted by the Bank of Italy at various points in time during 2020 and most of 2021. Panel data results show an improvement or at least no deterioration in the household's financial situation following the initial negative shock of COVID-19 in early 2020. Additionally, while our estimates suggest that the economic crisis instigated by COVID-19 has not had any differential effect by household area of residence and household size, the level of education of the household head seems to matter. Specifically, households headed by individuals with higher education are less likely to have been financially harmed by the pandemic than those headed by individuals with a lower level of education.

**Keywords** COVID-19 · Household income · Government measures · Stages of the pandemic

**JEL Classification** D31

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The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission.

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## Introduction

COVID-19 has had devastating economic effects. A significant fraction of the population lost their job (temporarily or even permanently) or saw their working hours reduced because of the lockdown measures and the general reduction in economic activity.<sup>1</sup> Governments have deployed unprecedented resources to address this epidemiological emergency. For instance, it has been estimated that between March and December 2020 the Italian government has spent about 14.18 billion euro for this purpose (FocuSicilia 2021).

Given that Italy was the first Western and European country that had to deal with COVID-19, it can be considered as a frontrunner in the response to the pandemic. Its government had in fact to quickly adopt several drastic provisions in an attempt to contain the spread of the virus. Italy moved to a lockdown across the entire national territory on March 10, less than 3 weeks from the first known case of coronavirus. The lockdown was initially set to last 4 weeks, but was prolonged until May 4. While between the beginning of May and the end of the summer there has been a gradual removal of COVID-19 restrictions, with the surge of COVID-19 cases at the start of autumn, this process stopped and the government had to re-introduce some restrictive provisions. While certain regulations were adopted nationwide, targeted interventions were implemented from the first week of November according to the risks faced by the different regions. Stringent measures were essentially confirmed in January and February 2021, but in mid-March 2021 extra restrictions were put in place to cope with the rapid spread of COVID-19. Containment provisions have been again gradually eased after Easter following a decrease in the number of infections.

This paper looks at how household income in Italy has changed across different phases of the pandemic after considering the effects of the support provisions taken by the government to lessen the negative economic consequences of COVID-19. We use data from six waves of a household survey conducted at various points in time during the lockdown and post-lockdown periods. The first wave, which was carried out between the end of April and the beginning of May 2020, allows us to examine the impact of COVID-19 in the early stage when the restrictions were tighter, and the Italian government took only the first set of measures against the pandemic. The other waves, which were collected between summer 2020 and summer 2021, capture later stages of the pandemic when some of the lockdown restrictions were first gradually relaxed and then re-introduced and relaxed again, while also additional initiatives were implemented to mitigate the effect of COVID-19.

This study has two main objectives. The first is to analyse whether, following the initial shock in early 2020, the household's financial situation has, on average, improved or at least has not worsened. The second goal is to investigate whether despite government support measures, certain types of households are more likely to have experienced an income drop during COVID-19.

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<sup>1</sup> At the end of March 2020, following the closure of non-essential activities, about 7.8 million Italian workers became temporarily unemployed (Sanfelici 2021). Additionally, it has been estimated that in Italy the number of hours worked decreased by approximately 13% in 2020 (OECD 2021).

The data on which this paper is based offer some advantages relative to many existing studies on the effect of COVID-19 on household income. We use real data, whereas many works (e.g., Almeida et al. 2021; Gallo and Raitano 2020; Palomino et al. 2020) employ simulated data to forecast potential future scenarios on the basis of different assumptions about the spread of the virus and the measures taken to address it. Additionally, while a large number of studies (e.g., Tran et al. 2020; Smallwood et al. 2021) rely on cross-sectional data that provide a snapshot of the financial impact of the pandemic, this paper is based on longitudinal data. The longitudinal dimension of the data means that respondents are surveyed repeatedly, allowing us to examine how the response of the same households does vary over time. Also, unlike other papers (e.g., Bourquin et al. 2020; Adams-Prassl et al. 2020), we employ a sample that is nationally representative—meaning that it matches the characteristics of the national population. Finally, while many papers analyse how household income was affected by the pandemic in its early stages (e.g., Figari and Fiorio 2020; Carta and De Philippis 2021), our data allow us to examine both the short- and the long-term effects of COVID-19.

The remainder of this study is organised as follows. We first briefly summarise the results of previous studies looking at the consequences of COVID-19 on household income in Italy. This is followed by a short description of the different phases of the virus in Italy and the measures taken by the Italian government to mitigate its economic effects. Next, we outline the data and the model used in this study, which is followed by a presentation of the empirical results. Finally, some conclusions are given.

### **Previous studies on the effect of COVID-19 on household income in Italy**

The coronavirus crisis has had a negative impact on Italian household income. Employing panel data from the COME-HERE survey, Clark et al. (2021) find that in Italy mean equivalised disposable household income in PPP fell by about 10% between January and May 2020. Using EUROMOD (the EU-wide micro-simulation model), Figari and Fiorio (2020) suggest that in Italy during the first month of the pandemic poverty rate increased by more than 8 percentage points. Estimates produced by the Italian confederation of traders in commerce and tourism (Confesercenti), which are based on data from several sources [i.e., the Italian National Statistical Institute (ISTAT), Svimez (Association for the Industrial Development in Southern Italy) and the SWG Observatory], indicate that each household lost an average of 1257 euro in 2020 due to COVID-19 (Confesercenti 2020).

Additionally, the emerging consensus from existing research is that COVID-19 has not affected households equally. It negatively affected especially the most vulnerable households. Carta and De Philippis (2021) conclude that in Italy the proportion of household members, who at the end of 2019 were employed in lockdown sectors, is higher in households at the bottom 20% of the equivalised labour income distribution. A similar finding has been obtained by Gallo and Raitano (2020). Using household-specific information from six EU countries, including Italy, Christelis et al. (2020) show that the pandemic has caused higher financial concerns

among lower-income households and households that are liquidity-constrained (i.e., they report that they are not able to meet an unexpected payment equal to 1 month of their household income).

Although COVID-19 has led to a drop in average household income, the magnitude of such decrease would have been much greater if the Italian government had not adopted several initiatives to mitigate the economic effects of the crisis. This proposition is supported by the results of several studies. OECD (2020) macro-data show that while during the second quarter of 2020 household disposable income decreased in Italy, such a decline is considerably smaller than the corresponding one in nominal GDP observed during the same period. Using the micro-simulation model TAXBEN-DF, Monteduro et al. (2022) show that the emergency measures taken by the Italian government between March and December 2020 were instrumental in cushioning against the impact of the pandemic on poverty. Similarly, Di Bartolomeo et al. (2021) employ the QUEST dynamic general economic equilibrium model to simulate the effect of the extraordinary fiscal policies adopted by Italy in an attempt to alleviate the economic consequences of the pandemic. They find that without these policies in 2020 GDP would have fallen more than it actually did (13.4% vs 8.9%).

### The phases of COVID-19 in Italy and the emergency economic measures

Between March 2020 and June 2021 Italy went through different phases of the COVID-19 pandemic. The lockdown phase started on March 10 with the enactment of a decree called “I stay at home”. Such decree limited movement of people unless for proven necessity (health, work, or food supply). All sporting and cultural events were also suspended. On March 20, a decree labelled “Italy’s block” blocked non-essential activities and imposed a ban on moving to different municipalities. The first set of economic measures in response to COVID-19 is included in the “Cure Italy” Decree that was issued on March 17. Following this decree, the benefit of the exceptional fund to supplement earnings (Cassa d’Integrazione in deroga) was extended to cover all employees (including those employed in companies with less than 5 employees) across the entire national territory and all productive sectors. This meant that employers, who had to suspend or reduce their work activity due to the COVID-19 pandemic, could use this fund to support their workers’ income.<sup>2</sup> The “Cure Italy” Decree also banned collective and individual dismissals. Additionally, in April the government enacted the so-called “Liquidity” Decree that introduced a series of extraordinary provisions to support firms in facing the COVID-19 emergency.

The gradual easing of the lockdown began on May 4 with the re-opening of manufacturing and construction industries. On May 19, the “Relaunch” Decree was published in the Official Gazette. This was the third major government intervention in an attempt to revitalize the economy following the outbreak of the coronavirus. Such decree introduced an extraordinary income support measure, the Emergency

<sup>2</sup> The replacement rate is 80% of the missed wage with, however, binding ceilings that highly reduce the replacement rate for middle- and high-paid workers.

Income (Reddito di Emergenza). It was designed to help those households who were not beneficiaries of any income support programs, despite having been negatively affected by the COVID-19 outbreak (Natili and Raitano 2020).

The third phase, which started on June 11, saw a further easing of lockdown measures. For instance, betting shops, bingos, cinemas, and theatres could re-open, though with restrictions. Nightclubs were briefly allowed to re-open for about a month in the summer. During this phase, the government enacted what is known as the “August” Decree comprising, among other measures, new furlough arrangements, and the extension of the ban on dismissals.

Following an increase in COVID-19 infections, several decrees between October 13 and December 3 brought back a number of restrictions. Regional lockdown measures were also implemented at the beginning of November. Italy was divided into three zones: red for high risk, orange for medium risk, and yellow for low risk. While red zones were under a complete lockdown, in the other zones most shops remained open and people were allowed to move freely but could not leave their home town or city. In an attempt to mitigate the economic effects caused by the re-introduction of restrictions, a decree called “Refreshments” (Ristori) was issued at the end of October. This was shortly followed by three other decrees (“Refreshments-bis”, “Refreshments-ter”, and “Refreshments-quater”) that expanded government’s support for workers, households, and businesses (e.g., suspension of tax payments, measures supporting sports workers). Furthermore, on December 18 the government adopted the so-called “Christmas” Decree that restricted non-essential gatherings to contain the spread of coronavirus during the festive season. Stringent measures were essentially confirmed in January and February 2021, though a new category (white zone) was added to the aforementioned classification based on the regional assessment of the risk. White zones were the safest and had fewer restrictions than others.

More severe restrictions were taken at the beginning of March as a result of an upsurge of COVID-19 cases. The majority of regions were classified as high-risk red zones on March 15. During the Easter weekend (April 3–5) the whole of Italy became a red zone. Additional provisions were again implemented to lessen the economic impact of COVID-19. For example, the “Support” Decree, which entered into force on March 23, further extended the ban on dismissals until June 30, 2021. About 2 months later, the so-called “Support-bis” Decree was enacted, introducing several provisions including a new set of cash incentives and resources to guarantee access to credit and liquidity. However, the situation improved at the end of April when most Italian regions moved to low-risk yellow zones. On June 21, the whole country (except for the small region of Valle d’Aosta) became white zone. A week later the obligation to wear masks outdoors was lifted in this zone.

Table 1 summarises the different phases of COVID-19 in Italy and reports the main economic measures that were adopted by the Italian government in each phase in response to the pandemic. It also shows the correspondence between the timing of these measures and the period covered by each wave of the survey used in this study.

**Table 1** Phases of COVID-19 and emergency measures in Italy

Phase	Timeline	COVID-19 cushioning measures	Period of survey wave
Lockdown	9 March–3 May 2020	“Cure Italy” Decree (17 March 2020) “Liquidity” Decree (9 April 2020)	1
Softer lockdown	4 May–10 June 2020	“Relaunch” Decree (19 May 2020)	–
Further easing of containment measures	11 June–7 October 2020	“August” Decree (15 August 2020)	2 and 3
Re-introduction of some restrictive measures	8 October 2020–5 March 2021	“Refreshments” Decree (29 October 2020) “Refreshments-bis” Decree (9 November 2020) “Refreshments-ter” Decree (24 November 2020) “Refreshments-quater” Decree (30 November 2020)	3, 4 and 5
Adoption of more restrictive measures	6 March–25 April 2021	“Support” Decree (23 March 2021)	5
Progressive relaxation of restrictions	26 April–3 September 2021	“Support-bis” Decree (26 May 2021)	6

## Data and methodology

Data used in this study come from six waves of a Special Survey of Italian Households (SSIH) carried out by the Bank of Italy across the different phases of the COVID-19 pandemic. The purpose of this survey was to gather information about the impact of the virus on the economic situation and expectations of households. For each household the respondent is always the head of the family. SSIH weights make the survey representative of the Italian households (Depaolo 2021). The first wave was conducted between the end of April and the beginning of May 2020, the second between the end of August and the beginning of September 2020, the third at the end of November 2020, the fourth between the end of February and the beginning of March 2021, the fifth at the end of April 2021, and the sixth between the end of August and the beginning of September 2021.

We exploit the longitudinal aspect of the data and select only those households who have participated in all the six waves (i.e., 606). A well-known issue of research conducted using longitudinal data is the loss of sample members between the first wave of data collection and subsequent follow-ups. Furthermore, longitudinal surveys carried out during COVID-19 may be especially vulnerable to attrition (McKenzie 2021). In line with such expectation, our survey data were subject to significant attrition during the five follow-ups: 18.4% from wave 1 to wave 2 (198 households out of 1079<sup>3</sup> in wave 1 did not participate in wave 2), 7.8% from wave 2 to wave 3 (69 households out of 881 in wave 2 did not participate in wave 3), 9.6% from wave 3 to wave 4 (78 households out of 812 in wave 3 did not participate in wave 4), 5.2% from wave 4 to wave 5 (38 households out of 734 in wave 4 did not participate in wave 5), and 12.9% from wave 5 to wave 6 (90 households out of 696 in wave 5 did not participate in wave 6). Overall, the attrition rate is 43.8%.<sup>4</sup> This loss of participants may result in a potential threat of bias when it is not random and is related to the outcomes of interest (Mihelic and Crimmins 1997).

The survey asks household heads the following question on the economic impact of the pandemic:

“As a consequence of the coronavirus (COVID-19) outbreak, after considering the support measures taken by the government, how has your household income changed in the last two months?”

- (a) Has decreased less than 25%
- (b) Has decreased between 25 and 50%
- (c) Has decreased more than 50%
- (d) Has remained the same
- (e) Has increased

<sup>3</sup> Only those households interviewed using remote communication tools in wave 1 were followed in the next waves. One should also note that the way interviews are conducted may have an effect on respondents' answers (Neri and Zanichelli 2020).

<sup>4</sup> In Germany, to evaluate the impact of COVID-19 school closures, two parental surveys were conducted in spring 2020 and early 2021 (Werner and Woessmann 2021). Only 47% of the respondents to the first wave participated in the second wave.

The above answers have been used to construct a dichotomous indicator that takes the value of 1 if household income has decreased [i.e., (a), (b) and (c)], and 0 if it has remained the same or has even increased [i.e., (d) and (e)].

The survey systematically collects information on gender, age and education level of the household head, household's geographical area of residence, and household size.

The following model is estimated:

$$Y_{it} = \beta'_0 X_{it} + \gamma_0 D_{2t} + \gamma_1 D_{3t} + \gamma_2 D_{4t} + \gamma_3 D_{5t} + \gamma_4 D_{6t} + \varepsilon_{it}, \quad (1)$$

where  $Y_{it}$  denotes the above-mentioned binary indicator for the change in household income for household  $i$  ( $i=1$  to 606) in wave  $t$  ( $t=1-6$ );  $X_{it}$  is a vector of control variables (i.e., gender, age and education of the household head, household size, and area of residence);  $D_{2t}$  is a dummy variable that takes the value of 1 if data refer to the second wave, and 0 otherwise;  $D_{3t}$  is a dummy variable that takes the value of 1 if data refer to the third wave, and 0 otherwise;  $D_{4t}$  is a dummy variable that takes the value of 1 if data refer to the fourth wave, and 0 otherwise;  $D_{5t}$  is a dummy variable that takes the value of 1 if data refer to the fifth wave, and 0 otherwise;  $D_{6t}$  is a dummy variable that takes the value of 1 if data refer to the sixth wave, and 0 otherwise; and  $\varepsilon_{it}$  is an error term. The main parameters of interest are  $\gamma_0$ ,  $\gamma_1$ ,  $\gamma_2$ ,  $\gamma_3$ , and  $\gamma_4$  that capture the dynamics of the change in household income during the six waves of the survey, with the first wave being the baseline comparison.

One may add household fixed effects,  $\alpha_i$ , to the right side of Eq. (1). Hence, we have

$$Y_{it} = \beta'_1 X_{it} + \gamma_5 D_{2t} + \gamma_6 D_{3t} + \gamma_7 D_{4t} + \gamma_8 D_{5t} + \gamma_9 D_{6t} + \alpha_i + v_{it}. \quad (2)$$

Household fixed effects pick up the influence of time-invariant household characteristics on the dependent variable of the model. These may include observable household characteristics (e.g., gender of household head), but they may also comprise unobservable or difficult-to-observe traits. For instance, pessimistic household heads might tend to systematically exaggerate the impact of COVID-19 on the economy and on their personal financial situation.

Equations (1) and (2) are estimated using Ordinary Least Squares (OLS). As noted by Cohen-Zada et al. (2017), a fixed-effects Linear Probability Model (LPM) has several advantages. First, it uses all observations, whereas a fixed-effects logit model uses only those observations for which the outcome variable varies within each match. Hence, omitting these observations may lead to biased estimates. Second, while the logit fixed-effects model delivers consistent estimates only under the stronger assumption of exogeneity, the LPM requires exogeneity to hold only within a fixed effect. Third, LPM results can be easily interpreted. Fourth, any non-linear estimation relies on the functional form, whereas in the linear model the fixed effects account for variation in the data in a completely general way. These considerations explain why the fixed-effects LPM is commonly used in a large number of studies despite the possibility that the predicted value may lie outside the unit range due to



**Table 2** Test of attrition at baseline (wave 1)

	All	Non-attrition households	Attrition households	Difference ( <i>p</i> value)
Households reporting to have experienced a fall in income in the last 2 months	0.558	0.575	0.540	0.035 (0.37)
Male household head	0.492	0.603	0.379	0.224 (0.00)
Households of 5 or more members	0.065	0.044	0.086	-0.042 (0.01)
Household head with higher education	0.151	0.190	0.110	0.080 (0.00)
<i>Household's head age</i>				
18–34 years	0.186	0.167	0.205	-0.038 (0.34)
35–49 years	0.266	0.324	0.207	0.117 (0.00)
50–64 years	0.268	0.308	0.226	0.082 (0.01)
65 or more years	0.280	0.201	0.362	-0.161 (0.00)
<i>Household area of residence</i>				
South	0.360	0.309	0.413	-0.104 (0.01)
Centre	0.194	0.222	0.165	0.057 (0.07)
North	0.446	0.469	0.422	0.047 (0.23)
Observations	1079	606	473	

Survey weights are used

issues with non-linear fixed effects.<sup>5</sup> Robust standard errors are consistently applied to account for the built-in heteroskedasticity in LPM. Nevertheless, although we prefer using the fixed-effects LPM for our main results, we also employ an ordered logit fixed-effects model (where answers to the above question have been ordered to create an appropriate dependent variable) to test the robustness of the findings.

Following the approach of Stoeffler et al. (2020), a formal test of differences between attritor and non-attritor households is shown in Table 2. The results suggest that these two groups have different characteristics. Compared to households who did not take part in all follow-ups, those who responded to all waves of the survey are less likely to live in the South, less likely to have 5 or more members, more likely to have a head of household with higher education, more likely to have a male head of household, and less likely to have a head of household aged 65 or over. However, interestingly, there is no statistically significant difference between attritors and non-attritors with respect to having experienced an income reduction during the early stages of the pandemic.

Two methods are commonly employed to account for attrition bias: a sample selection model, such as that proposed by Heckman (1979), or the use of inverse probability weights (IPW) (Wooldridge 2002). We choose the latter as the former relies on the identification of a suitable “instrument”, that is, a factor that influences

<sup>5</sup> According to Von Hippel (2015), linear probability models should be preferred to the logistic ones when the probabilities that one is modelling are not extreme (i.e., they vary between 0.2 and 0.8 or a little beyond). In such a case, results are practically indistinguishable, but logistic estimates are harder to interpret.

attrition, but does not have any effect on our outcome variable. While it has been suggested that factors related to interviewers or the interviewing process may be appropriate instruments (Zabel 1998), this information is not collected in our survey. The intuition behind the IPW method is to give more weight to households whose characteristics make them more likely to drop out of the sample and less weight to households with characteristics associated with a higher probability to remain in the panel.

## Results

Column 1 of Table 3 reports LPM estimates from a specification without household fixed effects (i.e., Eq. 1). Survey weights are applied and robust standard errors are clustered at household level. Regression estimates show that after an initial drop in the early stage of the pandemic, household income recovered subsequently. More specifically, in wave 1, households were about 27, 21, 25, 24, and 28 percentage points more likely to have experienced a decline in their income when compared to waves 2, 3, 4, 5, and 6, respectively.

In line with the results of the studies discussed earlier, the social insurance benefits progressively put in place by the Italian government are likely to have played a pivotal role in partially compensating the income losses suffered by households as a result of the economic crisis induced by COVID-19. However, other forces may be at play. Some adjustment occurred in the labour market following the initial shock. Galasso (2020) reports that in Italy 6 weeks into the lockdown, the number of people who were able to work from home increased considerably while some individuals returned to their usual workplace. It is also possible that the partial and gradual removal of COVID-19 restrictions during summer 2020 helped a number of households financially recover from the effect of the pandemic. This has, for instance, occurred in the UK where some retail and hospitality workers started to return to work in July 2020 and saw their incomes return to approximately the same levels they had before COVID-19 (Buzzeo et al. 2020).

Given the non-random nature of sample attrition, we need to adjust our estimates using the IPW method. However, before presenting these new results, following the approach of Chamberin and Ricker-Gilbert (2016), one should first check that coefficient estimates do not change in any meaningful way once survey weights are excluded. This is confirmed looking at the findings reported in Column 2 of Table 3. The IPW technique consists of three steps (Yamano and Jayne 2005). The first step involves estimating probit models to measure the influence of observable characteristics on the probability that a household in wave  $t$  will not drop out of the sample in wave  $t+1$ . In the second stage, the relevant probabilities ( $Pr_{it}$ ) are computed. The third step involves calculating the inverses of these probabilities ( $1/Pr_{it}$ ) and using them as weights to correct for attrition bias.<sup>6</sup> Column 3 of Table 3 presents the results adjusted for attrition bias. As one can see, our findings do change very little

<sup>6</sup> For observations in wave 6, the inverse probability weight is the product of the inverse probability weights of wave 1 to wave 5 (Yamano and Jayne 2005).

**Table 3** Impact of the pandemic on households' probability of experiencing a fall in income: LMP—main results

	Not corrected for attrition		Corrected for attrition		Not corrected for attrition		Corrected for attrition	
	With survey weights	Without survey weights	With inverse probability weights	With survey weights	Without survey weights	With survey weights	Without survey weights	With inverse probability weights
	(1)	(2)	(3)	(4)	(5)	(6)	(6)	(6)
Constant	0.523*** (0.048)	0.490*** (0.040)	0.459*** (0.020)	0.221*** (0.023)	0.182*** (0.017)	0.163*** (0.016)		
<i>Time period (reference category: wave 1)</i>								
Wave 2	-0.269*** (0.025)	-0.241*** (0.020)	-0.214*** (0.020)	-0.260*** (0.027)	-0.239*** (0.022)	-0.221*** (0.022)		
Wave 3	-0.210*** (0.027)	-0.168*** (0.022)	-0.162*** (0.022)	-0.201*** (0.028)	-0.167*** (0.024)	-0.159*** (0.024)		
Wave 4	-0.246*** (0.029)	-0.216*** (0.022)	-0.198*** (0.022)	-0.239*** (0.032)	-0.216*** (0.024)	-0.202*** (0.024)		
Wave 5	-0.238*** (0.029)	-0.214*** (0.022)	-0.215*** (0.022)	-0.232*** (0.030)	-0.214*** (0.025)	-0.209*** (0.025)		
Wave 6	-0.283*** (0.028)	-0.254*** (0.022)	-0.247*** (0.022)	-0.272*** (0.030)	-0.254*** (0.024)	-0.232*** (0.024)		
Male household head	-0.058* (0.035)	-0.073** (0.032)	-0.066** (0.032)					
Households of 5 or more members	0.052 (0.059)	0.057 (0.056)	0.058 (0.054)					
Household head with higher education	-0.136*** (0.036)	-0.122*** (0.032)	-0.112*** (0.031)					
<i>Household's head age (reference category: 65 or more years)</i>								
18–34 years	0.193*** (0.065)	0.174*** (0.058)	0.183*** (0.060)	-0.026 (0.264)	0.221 (0.257)	0.228 (0.257)		
35–49 years	0.154*** (0.037)	0.138*** (0.033)	0.135*** (0.033)	-0.056 (0.211)	0.139 (0.190)	0.157 (0.191)		

Table 3 (continued)

	Not corrected for attrition		Corrected for attrition		Not corrected for attrition		Corrected for attrition	
	With survey weights	Without survey weights	With inverse probability weights	With survey weights	Without survey weights	With survey weights	Without survey weights	With inverse probability weights
	(1)	(2)	(3)	(4)	(5)	(6)	(6)	(6)
50–64 years	0.167*** (0.038)	0.168*** (0.032)	0.165*** (0.032)	-0.141 (0.136)	-0.003 (0.118)	-0.008 (0.110)		
<i>Household area of residence (reference category: North)</i>								
South	-0.051 (0.034)	-0.035 (0.030)	-0.026 (0.029)					
Centre	-0.032 (0.043)	0.004 (0.037)	0.013 (0.037)					
Household fixed effects	No	No	No	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.098	0.076	0.071	0.565	0.555	0.553		
No observations	3636	3636	3636	3636	3636	3636		

Household head's gender and household size are not included in Columns 4, 5, and 6 as they are time-invariant. Similarly, household area of residence and household head's education are also not included in Columns 4, 5, and 6 as they show extremely little variation across waves for each household

Robust standard errors clustered at household level are in parentheses

\*\*\*, \*\*, and \* denote statistical significance at 1%, 5%, and 10%, respectively

once attrition bias is accounted for. In general, consistent with the theory (Wooldridge 2002), standard errors tend to be smaller after correcting for attrition bias.

As regard household characteristics, estimates from the first half of Table 3 seem to suggest that households headed by women are more likely to have been financially harmed by the pandemic. This result is in line with the findings of several studies (see, for instance, Blundell et al. 2020). Additionally, households with a higher educated head are found to be less likely to have seen their income decline. This may be due the fact that educated workers have been more likely to be able to carry out their work from home. Our estimates indicate also that households headed by individuals aged 65 or over have been less affected by the economic crisis instigated by COVID-19. Pensions have generally not been reduced during the pandemic (Eurofound 2022) and they are the main income source for many older individuals. On the other hand, there is no evidence suggesting that the economic crisis induced by COVID-19 has had any differential effect by household area of residence and household size.

Next, household fixed effects are added to the model (i.e., Eq. 2). However, only the wave dummies and household head's age are included among the explanatory variables of the fixed-effects model as the other household characteristics turn out to be either time-invariant (i.e., household head's gender and household size) or they show extremely little variation over time for each household (i.e., household head's education and household's geographical area of residence<sup>7</sup>). Given that fixed-effects estimates use only within-household differences, basically ignoring any information between households, fixed-effects estimates for this latter set of variables are likely to be imprecise and have large standard errors. Estimates from the fixed-effects regressions are shown in Columns 4, 5, and 6 of Table 3.<sup>8</sup> Two considerations support the appropriateness of the fixed-effects model. First, the R-squared is considerably higher in the regressions shown in the second half of Table 3. Second, results (available from the author upon request) indicate that household dummies are jointly statistically significant ( $p$  value < 0.001). Findings from the fixed-effects estimations consistently confirm that household's probability of experiencing a fall in income is higher in wave 1 compared to the other waves.<sup>9</sup> On the other hand, the effect associated with household head's age disappears when household fixed effects are included. Households headed by individuals aged 65 or over are no longer found the ones who have been less adversely affected by the pandemic. While, as argued earlier, many older individuals have continued to receive the same amount of social security benefits throughout the pandemic, in Italy some of them typically rely also

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<sup>7</sup> Only 2 households report to have changed their area of residence across the 6 waves (both moving from the Centre to the South). Similarly, the number of household heads with higher education increases from 111 to 114 from wave 1 to wave 2, and this figure does not change in the successive waves.

<sup>8</sup> Estimates on the wave dummies from a specification that includes also independent variables displaying very little variation over time for each household are similar to those presented in Columns 4, 5, and 6 of Table 3 (these estimates are available from the author upon request).

<sup>9</sup> We also replicate the estimates reported in Table 3 using logit and probit models (correcting and not correcting for attrition bias). The trend on how the household income situation has changed across the different waves of the survey is consistent with our earlier results (estimates are available from the author upon request).

on their children's financial support, which might have experienced a drastic reduction in light of the COVID-19-related economic crisis (Senior Italia 2020). Additionally, self-employment is particularly frequent among working pensioners (Eurofound 2012) and there is evidence showing that the pandemic disproportionately affected self-employed people (Monteduro et al. 2020).

The model displayed in Column 5 of Table 3 is then estimated separately for the different categories of each household characteristic, and the strength of the coefficients on the wave dummies is compared using the equality of coefficients test. The results, which are shown in Table 4, suggest that the probability of suffering an income reduction in later stages of the pandemic is consistently lower among households headed by individuals with higher education relative to those headed by individuals with a lower level of education. Additionally, the equality of coefficients test shows that one can safely reject the null hypothesis that coefficients on the wave dummies are equal across these two types of households. On the other hand, in contrast to the results reported in the first half of Table 3, households headed by women are found to be systematically less likely to have been financially harmed by the pandemic compared to households headed by men.<sup>10</sup> However, the equality of coefficients test indicates that the difference in the coefficients on wave dummies for these two kinds of households is not statistically significant at the conventional levels. Similarly, differences in the probability of experiencing an income loss in later stages of COVID-19 are not found to be statistically different from zero across household size and area of residence.

As a robustness check, we estimate an ordered logit fixed-effects model.<sup>11</sup> The dependent variable ranges from 1 (income has decreased more than 50% in the last 2 months) to 5 (income has increased in the last 2 months). Estimates on the main parameters of interest, which are shown in Table 5, are consistent with our previous results. In the later phases of the pandemic (between summer 2020 and summer 2021), households are found to be less likely to have experienced a decline in their income relative to the early stage of the outbreak. On the other hand, households are more likely to have seen their income increase or remain the same in waves 2, 3, 4, 5, and 6 as compared to wave 1. However, in line with expectations, the probability of income remaining unchanged is found to be much greater than that of income increasing. This would seem to suggest that many households, who have been financially affected at the start of the coronavirus pandemic, did not experience a further reduction in their income in the later stages of COVID-19.

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<sup>10</sup> One possible explanation for this result is that household fixed effects account for household head gender differences in financial worries. Women may overstate the negative effect of the pandemic on household income because they tend to be more financially preoccupied than men. Higher age expectancy, more breaks from work for maternity and child raising, and less confidence with financial tasks may explain this situation (INNOVU 2019).

<sup>11</sup> In line with the specification of the model used in the second half of Table 3, wave dummies and household head's age are the only explanatory variables included in the regressions.

**Table 4** Heterogeneous effects of the pandemic on households' probability of experiencing a fall in income-test of equality of coefficients

	Gender of household head		Education of household head		Household size			Household's geographical area of residence		
	Male	Female	Higher education	Less than higher education	Five or more members	Less than five members	South	Centre	North	
Wave 2	-0.24*** (0.02)	-0.23*** (0.04)	-0.16*** (0.04)	-0.26*** (0.02)	-0.29*** (0.12)	-0.24*** (0.02)	-0.28*** (0.04)	-0.18*** (0.04)	-0.24*** (0.03)	
Wave 3	-0.19*** (0.03)	-0.11*** (0.04)	-0.12*** (0.05)	-0.18*** (0.02)	-0.26*** (0.12)	-0.16*** (0.02)	-0.24*** (0.04)	-0.10*** (0.05)	-0.15*** (0.03)	
Wave 4	-0.23*** (0.03)	-0.18*** (0.04)	-0.16*** (0.05)	-0.23*** (0.02)	-0.35*** (0.11)	-0.21*** (0.02)	-0.26*** (0.04)	-0.16*** (0.04)	-0.22*** (0.03)	
Wave 5	-0.22*** (0.03)	-0.20*** (0.05)	-0.17*** (0.05)	-0.22*** (0.03)	-0.23*** (0.12)	-0.21*** (0.02)	-0.26*** (0.04)	-0.13*** (0.05)	-0.22*** (0.03)	
Wave 6	-0.27*** (0.03)	-0.20*** (0.04)	-0.13*** (0.05)	-0.28*** (0.02)	-0.32*** (0.10)	-0.25*** (0.02)	-0.26*** (0.04)	-0.18*** (0.05)	-0.28*** (0.03)	
Diff [p value]		-0.24 [0.24]		-0.43 [0.06]		-0.38 [0.44]			0.16 [0.67]	

The coefficients reported above are from LPM fixed-effects regressions where household's probability of experiencing a fall in income was modelled as function of the wave dummies and household head's age. Robust standard errors clustered at household level are in parentheses  
 \*\*\*, \*\*, and \* denote statistical significance at 1%, 5%, and 10%, respectively

**Table 5** Impact of the pandemic on household income: ordered logit (fixed effects)-marginal effects

	Not corrected for attrition (survey weights)				Corrected for attrition (inverse probability weights)				
	Has decreased more than 50%	Has decreased between 25 and 50%	Has remained the same	Has increased	Has decreased more than 50%	Has decreased between 25 and 50%	Has decreased less than 25%	Has remained the same	Has increased
Wave 2	-0.082*** (0.008)	-0.091*** (0.009)	0.197*** (0.016)	0.031*** (0.005)	-0.061*** (0.006)	-0.075*** (0.007)	-0.061*** (0.005)	0.162*** (0.012)	0.034*** (0.004)
Wave 3	-0.065*** (0.008)	-0.072*** (0.008)	0.155*** (0.016)	0.025*** (0.004)	-0.048*** (0.006)	-0.059*** (0.007)	-0.049*** (0.005)	0.130*** (0.013)	0.027*** (0.004)
Wave 4	-0.076*** (0.009)	-0.084*** (0.009)	0.183*** (0.017)	0.029*** (0.005)	-0.059*** (0.006)	-0.073*** (0.007)	-0.060*** (0.005)	0.159*** (0.013)	0.033*** (0.004)
Wave 5	-0.074*** (0.008)	-0.083*** (0.009)	0.179*** (0.016)	0.028*** (0.004)	-0.060*** (0.006)	-0.074*** (0.007)	-0.061*** (0.006)	0.161*** (0.013)	0.034*** (0.004)
Wave 6	-0.086*** (0.008)	-0.096*** (0.010)	0.208*** (0.017)	0.033*** (0.004)	-0.068*** (0.006)	-0.084*** (0.007)	-0.069*** (0.006)	0.183*** (0.013)	0.039*** (0.005)
No. obs	3636				3636				

Regressions include also household head's age among the explanatory factors  
 Robust standard errors clustered at household level are in parentheses  
 \*\*\*, \*\*, and \* denote statistical significance at 1%, 5%, and 10%, respectively



## Conclusions

This paper has analysed changes in Italian household income across different stages of the pandemic. We employ longitudinal household-level data from six waves of a nationally representative survey carried out by the Bank of Italy at various points in time during 2020 and most of 2021.

Households are found to be significantly more likely have experienced a drop in income in the early stage of the pandemic as compared to its subsequent stages. This result, which is robust to both attrition bias and household fixed effects, may be attributed to the relaxation of some containment measures in the post-lockdown phases relative to the lockdown period, as well as to the adoption of government support provisions that have mitigated the negative economic effects caused by COVID-19. Unfortunately, the data do not allow us to determine the relative importance of each of these two factors.

Our results consistently show that households headed by individuals with higher education were less likely to see a negative impact of the pandemic on their financial situation than those headed by individuals with a lower level of education. On the other hand, the probability of suffering an income fall during COVID-19 is not found to statistically differ by household size and geographical area of residence. Such finding suggests that certain categories of vulnerable households (i.e., those residing in the South and large households) have not lagged behind in the economic recovery from COVID-19. This result would seem to speak in favour of the effectiveness of the extraordinary measures in targeting households who have been financially harmed by COVID-19. Carta and De Philippis (2021) show that, despite the pandemic, the Gini index has remained pretty much unchanged in Italy thanks to the well-functioning of the social insurance system. Similarly, Baldini and Visentin (2021) argue that the policies implemented by the Italian government in response to the virus have significantly attenuated the impact of COVID-19 on inequality.

More specifically, the Emergency Income (Reddito di Emergenza) is expected to have played an important role in preventing more vulnerable households from being financially severely hit by the pandemic. Maitino et al. (2020) predict that the number of households who will benefit from this extraordinary measure is just over 550 thousand and that its estimated budgetary cost is between 600 and 900 million euro. Almost half of the potential beneficiaries live in the South. Brunori et al. (2020), using MicroReg (a tax-benefit micro-simulation model), argue that the Emergency Income will support especially households whose head is unemployed and that do not receive unemployment insurance benefits, as well as households where the head is in the working age population but not in the labour force.

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**Data availability** The full dataset used in this study is freely available online at: <https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/indag-straord-famiglie-italiane/index.html?com.dotmarketing.htmlpage.language=1>

## Declarations

**Conflict of interest** The author declares he has no financial interests.

**Ethical approval** No ethical approval was required to conduct this study.

**Consent for publication** All individuals whose data were collected in the survey used in this study provided consent for publication of these data.

## References

- Adams-Prassl A, Boneva T, Golin M, Rauh C (2020) Inequality in the impact of the coronavirus shock: evidence from real time surveys. *J Public Econ* 189:104245. <https://doi.org/10.1016/j.jpubeco.2020.104245>
- Almeida V, Barrios S, Christl M, De Poli S, Tumino A, van der Wielen W (2021) The impact of COVID-19 on households' income in the EU. *J Econ Inequal* 19:413–431. <https://doi.org/10.1007/s10888-021-09485-8>
- Baldini M, Visentin M (2021) La redistribuzione del reddito in tempo di pandemia. *Lavoce* 29 July 2021. <https://www.lavoce.info/archives/88891/la-redistribuzione-del-reddito-in-tempo-di-pandemia/>. Accessed 30 June 2022
- Benzeval M, Burton J, Crossley T, Fisher P, Jäckle A, Low H, Read B (2020) The idiosyncratic impact of an aggregate shock: the distributional consequences of COVID-19. Understanding society working paper series no. 2020-09
- Blundell R, Costa Dias M, Joyce R, Xu X (2020) COVID-19 and inequalities. *Fisc Stud* 41:291–319. <https://doi.org/10.1111/1475-5890.12232>
- Bourquin P, Delestre I, Joyce R, Rasul I, Waters T (2020) The effects of coronavirus on household finances and financial distress. Institute of Fiscal Studies Briefing Note BN298
- Brunori P, Maitino ML, Ravagli L, Sciclone N (2020) Reddito di emergenza, un altro intervento “categoriale”. *Lavoce* 14/06/2020. <https://www.lavoce.info/archives/67847/reddito-di-emergenza-un-altro-intervento-categoriale/>. Accessed 3 Sept 2022
- Buzzeo J, Alexander K, White-Smith G, Newton B (2020) The impact of COVID-19 on low-income households. Institute for Employment Studies Report 555. [https://www.employment-studies.co.uk/system/files/resources/files/The\\_impact\\_%20of\\_COVID-19\\_on\\_low-income\\_households.pdf](https://www.employment-studies.co.uk/system/files/resources/files/The_impact_%20of_COVID-19_on_low-income_households.pdf). Accessed 10 Jul 2021
- Carta F, De Philippis M (2021) The impact of the COVID-19 shock on labour income inequality: evidence from Italy. Bank of Italy occasional papers no. 606
- Chamberin J, Ricker-Gilbert J (2016) Participation in rural land rental markets in Sub-Saharan Africa: who benefit and by how much? Evidence from Malawi and Zambia. *Am J Agr Econ* 98:1507–1528. <https://doi.org/10.1093/ajae/aaw021>
- Christelis D, Georgarakos D, Jappelli T, Kenny G (2020) The COVID-19 crisis and consumption: survey evidence from six EU countries. ECB working paper no 2507
- Clark AE, D'Ambrosio C, Lepinteur A (2021) The fall in income inequality during COVID-19 in four European countries. *J Econ Inequal* 19:489–507. <https://doi.org/10.1007/s10888-021-09499-2>
- Cohen-Zada D, Krumer A, Shapir OM (2017) Take a chance on ABBA. IZA discussion paper series no. 10878
- Confesercenti (2020) Confesercenti, effetto COVID su reddito italiani, -1257 euro l'anno a famiglia. <https://www.confesercenti.it/blog/fase-due-confesercenti-effetto-covid-su-reddito-italiani-1257-euro-lanno-a-famiglia/>. Accessed 10 Aug 2021
- Depalo D (2021) The effects of remote working. Evidence from COVID-19. <https://iceanet.org/wp-content/uploads/2021/11/Depalo.pdf>. Accessed 28 Feb 2022

- Di Bartolomeo G, D'Imperio P, Felici F (2021) The fiscal response to the Italian COVID-19 crisis: a counterfactual analysis. Working paper no. 1. Italian Ministry of Economic and Finance. Department of the Treasury
- Di Pietro G (2021) Changes in Italy's education-related digital divide. *Econ Aff* 41:252–270. <https://doi.org/10.1111/ecaf.12471>
- Eurofound (2012) Income from work after retirement in the EU. Publications Office of the European Union, Luxembourg
- Eurofound (2022) COVID-19 and older people: impact on their lives, support and care. Publications Office of the European Union, Luxembourg
- Figari F, Fiorio C (2020) Welfare resilience in the first month of COVID-19 pandemic in Italy. CeMPA working paper series no. 3/20
- FocuSicilia (2021) Le risorser per l'emergenza COVID, quanto e dove ha speso lo Stato, 25 January. <https://focusicilia.it/le-risorse-per-lemergenza-covid-quanto-e-dove-ha-speso-lo-stato/>. Accessed 25 Sept 2021
- Galasso V (2020) COVID: not a great equalizer. *Cesifo Econ Stud* 66:376–393. <https://doi.org/10.1093/cesifo/ifaa019>
- Gallo G, Raitano M (2020) SOS incomes: simulated effects of COVID-19 and emergency benefits on individual and household income distribution in Italy. Working paper no. 566, ECINEQ, Society for the Study of Economic Inequality. <http://www.ecineq.org/milano/WP/ECINEQ2020-566.pdf> Accessed 10 Sept 2021
- Heckman J (1979) Sample selection bias as a specification error. *Econometrica* 47:153–161. <https://doi.org/10.2307/1912352>
- INNOVU (2019) Is there a gender bias in financial wellness? <https://www.innovu.com/post/is-there-a-gender-bias-in-financial-wellness>. Accessed 2 Sept 2022
- Maitino ML, Ravagli L, Sciclone N (2020) Il reddito di emergenza e la missione di non lasciare nessuno indietro. <https://welforum.it/il-reddito-di-emergenza-e-la-missione-di-non-lasciare-nessuno-indietro/>. Accessed 3 Sept 2022
- McKenzie D (2021) If your follow-up survey has attrition, what should you do for your descriptive analysis? World Bank Blogs. <https://blogs.worldbank.org/impacetevaluations/if-your-follow-survey-has-attrition-what-should-you-do-your-descriptive-analysis>. Accessed 25 Jun 2022
- Mihelic AH, Crimmins EM (1997) Loss to follow-up in a sample of Americans 70 years of age and older: the LSOA 1984–1990. *J Gerontol Soc Sci* 52:S37–S48. <https://doi.org/10.1093/geronb/52b.1.s37>
- Monteduro MT, De Rosa D, Subrizi C (2020) Lavoratori in lockdown: cambia la distribuzione dei redditi. *Lavoce* 02/12/20. <https://www.lavoce.info/archives/71071/lavoratori-in-lockdown-come-cambia-la-distribuzione-dei-redditi/>. Accessed 5 July 2020
- Monteduro MT, De Rosa D, Subrizi C (2022) Did the policy responses to COVID-19 protect Italian households' income? Evidence from survey and administrative data. Paper presented at a seminar organised by the Joint Research Centre of the European Commission, 9 June 2022
- Natili M, Raitano M (2020) Coping with the pandemic: the new emergency income in Italy. ESPN flash report 2020/67, European Social Policy Network (ESPN). European Commission, Brussels
- Neri A, Zanichelli F (2020) Principali risultati dell'Indagine Straordinaria sulle Famiglie italiane nel 2020, Banca d'Italia, Note COVID-19 26 June. <https://www.bancaditalia.it/publicazioni/note-covid-19/2020/Evi-preliminari-ind-straord-famiglie.pdf>. Accessed 18 Sept 2021
- OECD (2020) Statistical Insights: How did the first wave of the COVID-19 pandemic affect the household sector and public finances? <https://www.oecd.org/fr/sdd/cn/statistical-insights-how-did-the-first-wave-of-the-COVID-19-pandemic-affect-the-household-sector-and-public-finances.htm>. Accessed 22 Sept 2021
- OECD (2021) OECD Economic Surveys: Italy 2021. [https://www.oecd-ilibrary.org/economics/oecd-economic-surveys-italy-2021\\_c91343f7-en](https://www.oecd-ilibrary.org/economics/oecd-economic-surveys-italy-2021_c91343f7-en). Accessed 20 Jan 2022
- Palomino JC, Rodríguez JG, Sebastian R (2020) Wage inequality and poverty effects of lockdown and social distancing in Europe. *Eur Econ Rev* 129:103564. <https://doi.org/10.1016/j.eurocorev.2020.103564>
- Sanfelici M (2021) The Italian response to the COVID-19 crisis: lessons learned and future direction in social development. *Int J Commun Soc Dev* 2:191–210. <https://doi.org/10.1177/2516602620936037>
- Senior Italia (2020) COVID, Senior Italia FederAnziani: Anziani, abbandonati dallo Stato, sostituiscono welfare, un terzo delle loro pensioni a figli e nipoti. [https://www.quotidianosanita.it/studi-e-analisi/articolo.php?articolo\\_id=89470](https://www.quotidianosanita.it/studi-e-analisi/articolo.php?articolo_id=89470). Accessed 4 July 2022

- Smallwood N, Pascoe A, Karimi L, Bismark M, Wills K (2021) Occupational disruptions during COVID-19 pandemic and their association with healthcare workers' mental health. *Int J Environ Res Public Health*. <https://doi.org/10.3390/ijerph18179263>
- Stoeffler Q, Mills B, Premand P (2020) Poor households' productive investments of cash transfers: quasi-experimental evidence from Niger. *J Afr Econ* 29:63–89. <https://doi.org/10.1093/jae/ejz017>
- Tran BX, Nguyen HT, Le HT et al (2020) Impact of COVID-19 on economic well-being and quality of life of the Vietnamese during the National social distancing. *Front Psychol* 11:565153. <https://doi.org/10.3389/fpsyg.2020.565153>
- von Hippel P (2015) Linear vs. logistic probability models: which is better, and when? *Statistical horizons*. <https://statisticalhorizons.com/linear-vs-logistic#:~:text=The%20linear%20model%20assumes%20that,linear%20model%20is%20its%20interpretability.&text=The%20logistic%20model%20is%20less%20interpretable>. Accessed 20 Sept 2021
- Werner K, Woessmann L (2021) The legacy of COVID-19 in education. CESifo working paper no. 9358
- Wooldridge JW (2002) *Econometric analysis of cross section and panel data*. MIT Press, Cambridge, MA
- Yamano T, Jayne TS (2005) Working-age adult mortality and primary school attendance in rural Kenya. *Econ Dev Cult Change* 53:619–654. <https://doi.org/10.1086/426463>
- Zabel JE (1998) An analysis of attrition in the panel study of income dynamics and survey of income and program participation with an application to a model of labour market behaviour. *J Hum Resour* 33:479–506. <https://doi.org/10.2307/146438>

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