Intergenerational Residence Patterns and COVID-19 Fatalities in the EU and the US

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ABSTRACT

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We study how patterns of intergenerational residence possibly influence fatalities from Covid-19. We use aggregate data on Covid-19 deaths, the share of young adults living with their parents, and a number of other statistics, for the 27 countries in the European Union, the UK, and all US states. Controlling for population size, we find that more people died from Covid in countries or states with higher rates of intergenerational co-residence. This positive correlation persists even when controlling for date of first death, presence of lockdown, Covid tests pc, hospital beds per capita, proportion of elderly, GDP pc, government's political orientation, percentage urban, and rental prices. The positive association between co-residence and fatalities is led by the US. Our estimates pass the Oster test for selection on unobservables.

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1. Introduction

Covid is a relatively deadly epidemic (Yang et al., 2020) that is particularly likely to kill older people (Abdulamir and Hafidh, 2020). It is also very contagious (Wu et al., 2020). One strategy that individuals and policy-makers have used to protect the more vulnerable elderly from the virus is to minimize contacts between older adults and younger people (Koh, 2020). Intergenerational co-residence makes it harder to avoid such intergenerational contacts. This paper's main goal is to test whether intergenerational co-residence is positively associated with Covid fatalities. Tests are performed using data from the 28 countries in the European Union (EU) prior to Brexit as well as the fifty states of the USA, which adds up to 78 areas (countries or US states).[1]

By studying 78 geographic areas that are part of only two federations (the EU and the USA) we add to previous cross-country or cross-region studies of the association between intergenerational co-residence and Covid fatalities in multiple ways. First, we expand on Bayer and Kuhn's (2020) study based on data from 24 countries from four continents; our sample is a more homogeneous set of 78 EU countries or US states. [2] Second, our period of observation is longer than most other studies, including Bayer and Kuhn (2020): we collected number of deaths from February 15 (first death in France) to June 16 2020, sixty three days after the first Covid death was reported in Wyoming. Third, as pointed out by Belloc et al (2020), Bayer and Kunz pull together countries at different stages of their epidemic curve. In contrast, we analyze cumulative fatalities attributed to Covid measured at fixed intervals after an area's onset of the epidemic: 20, 30, 40, 50 and 60 days after the area's first death. We investigate not only whether intergenerational co-residence contributes to deaths from Covid-19 but also whether such contribution (if positive) varies with the timing of the epidemic's onset.

Many cross-country studies of fatalities from Covid such as Bayer and Kuhn (2020) and Sorci et al (2020) have used variation in CFR (case fatality rate) as their measure of mortality. This requires data on both Covid cases and fatalities. Our fourth contribution is that we use cumulative fatalities as our variable of interest and thus avoid the need to collect data on confirmed cases, a variable with considerable measurement

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[1] We limited our study to Europe and the USA to minimize the number of unobservables possibly influencing the results. We are not aware of another Covid study based on pooled data from European countries and US states.

[2] The countries they selected had at least 200 diagnosed cases by March 15, 2020, and include Australia, Austria, Belgium, Canada, Switzerland, Denmark, Spain, France, Germany, Italy, Japan, the Netherlands, Norway, Singapore, South Korea, Sweden, the United Kingdom, and the United States.

problems given its dependence on highly varying testing rates. In our sample testing rates per capita ranged from zero in Italy, France, California or Florida (when tests are measured six days after the epidemic's onset) to 69 percent in Luxembourg (when measured 46 days after Covid's onset; see Table 2).

Fifth, and most importantly, we make a methodological contribution to the literature on fatalities and intergenerational co-residence by controlling for test rates per capita measured 14 days prior to the dates at which fatalities are measured, for number of days separating the first death in France from the onset date in a state or country, number of hospital beds, and for a number of other economic, demographic and political factors likely to be associated with Covid fatalities.

We find that intergenerational co-residence, defined as the share of 18-34 years old living with their parents, is associated with more cumulative deaths after 20, 30, 40, 50 and 60 days. For example, an extra one percentage point in such co-residence is associated with 3.7% more cumulative deaths from Covid 30 days after the area's onset of the epidemic. The size of this association does not change significantly with number of days since the epidemic's onset in the area. When distinguishing between US states and EU countries, we find that the association between co-residence and cumulative deaths is larger for US states than for EU countries.

Even though it was not our primary goal, our study also offers a more sophisticated comparison of fatalities due to Covid in the US and the EU than a simple comparison between European countries and the USA as one country. It may be incorrect to pool all the states of the US from a statistical point of view.[3]

The next section discusses the models and data used in this study. Results are presented in Section 3 and Section 4 concludes.

2. Empirical Set-Up
2a. The model. Our main variables of interest are cumulative Covid-caused deaths and intergenerational co-residence rates. We estimate the conditional correlation of Covid deaths and intergenerational co-residence rates using log-linear regressions, with log of number of deaths being the left-hand side variable. We use a logarithmic transformation. Logarithms allow us to interpret coefficients in percentage terms which

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[3] This may be considered as another application of Simpson's paradox, as pointed out in this twitter thread by Miles Beckett https://twitter.com/mbeckett/status/1278750652160634880.

favors comparability across areas (countries and states) that are highly heterogeneous.[4] This leads to the following estimating equation:

$$\log (Deaths)_r = \beta_0 + \beta_1 Coresid_r + \beta_2 X_r + \beta_3 Z_r + \varepsilon_r, \qquad (1)$$

where Deaths are the number of cumulative Covid-caused deaths 20, 30, 40, 50, or 60 days after the first death in area r, and Co-resid is the proportion of 18 to 34 years old individuals living with their parents in that area. *X* is a vector of variables related to Covid and *Z* is a vector of demographic and other controls.

Vector *X* includes a dummy equal to one if the government imposed a lockdown and days from first death to lockdown: imposition of a lockdown and the speed at which a lockdown was imposed have been associated with lower death rates from Covid (e.g. Friedson et al 2020, Huber and Langen 2020). We also control for number of tests per capita 14 days prior to the day deaths were measured and for number of days that elapsed between onset of the epidemic in France and in each country/state. We enter days since onset in France as a quadratic function (i.e. we also include the square of days since onset in France).

Vector *Z* includes demographic variables, starting with total population in the country/state. Population's effect may be mechanical: more people implies a potential for more deaths. In addition, it is possible that population affects number of deaths because it affects population density. In turn, such density may facilitate the spread of infections such as Covid. It is not just the total population that matters, but also the share of individuals over age 65 who are more likely to die from Covid (Abdulamir and Hafidh, 2020). We thus add proportion of individuals over 65 as a control. Furthermore, our regressions control for proportion urban: density in large cities may be particularly conducive to Covid infections and fatalities (Florida 2020).[5]

Furthermore, vector *Z* includes a control for whether the area is a US state. We control for hospital beds per capita. Here again, we include a square term. We also control for whether an area has a government leaning to the left (in the case of European countries) or a governor affiliated with the Democratic party (in the case of US states). Political variables have helped explain cross-country variation in Covid deaths in previous studies.

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[4] https://stats.stackexchange.com/questions/298/in-linear-regression-when-is-it-appropriate-to-use-the-log-of-an-independent-va.

[5] However, intergenerational rural families could also facilitate the spread of Covid. Covid-19 Stalks Large Families in Rural America https://www.wsj.com/articles/Covid-19-households-spread-coronavirus-families-navajo-california-second-wave-11591553896?shareToken=st88d807a0fa83404080f6766404ad8496&reflink=article_email_share

For example, a study of 103 countries by Sorci et al (2020) found that democracies suffer from a higher mortality burden than autocratic regimes. Our controls include a dummy for US and an interaction between leftist government.

Two economic variables are included in Z as well. First, GDP (Gross Domestic Product or its equivalent in the case of US states) per capita,[6] for it may influence the spread of Covid (e.g. through exposure to foreigners) and how fatal it is via a number of channels, including quality of health care and degree of lockdown. Rent, a major determinant of the price of housing, is included in the controls, in part due to its influence on individual and policy-makers options to separate those who are sick from those have not yet caught the virus.

We subject our estimates to the Oster (2019) test for selection on unobservables Oster (2019) develops a methodology to evaluate the possible degree of omitted variable bias under the assumption that the selection on the observed controls is proportional to the selection on the unobserved controls. We use it to compute the value of the relative degree of selection that would be necessary to explain our coefficient for the share of young individuals living with their parents.

2b. The data. The European data we use are limited to 28 countries belonging to the European Union (EU).[7] For the US we include the 50 states. Table 1 contains links to our data sources, the year they were measured, and the dates they were downloaded. Data on daily Covid-caused deaths were extracted from the European Centre for Disease Prevention and Control in the case of European countries and from the New York Times github page in the case of US states. We then computed cumulative number of deaths at 10-day intervals starting from the onset of a country/state's Covid epidemic. A limitation of this study follows from the lack of comparability of data on fatalities across different countries and states.[8]

Regarding the Covid-related controls, information on lockdown measures was collected by Olivier Lej for both the EU and the US. The number of tests in EU countries

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[6] GDP is expressed in dollar terms for both US states and EU countries.

[7] A list of all the countries can be found in the appendix. Brexit occurred during our research and we kept the UK in our sample.

[8] For more on that topic, see https://analysis.Covid19healthsystem.org/index.php/2020/06/04/how-comparable-is-Covid-19-mortality-across-countries/. According to Coleman et al (2020) statistics on Covid-caused deaths reported by country/state may not be accurate indications of the actual number of deaths due to the Covid virus. Unfortunately, we did not have data on excess mortality for each area in our data set. An example of a study based on excess mortality after Covid limited to a particular country is Laliotis and Minos (2020).

comes from the University of Oxford while information on tests in US states is from the COVID Tracking Project *(The Atlantic)*. This data also allowed us to calculate DAYSPOSTF, the number of days that elapsed between the first death in France and the first death in a particular area which we define as the onset of the epidemic in an area (country or state).

Demographic information (i.e. the share of 18-34 years old living with their parents, total population and the share of individuals over age 65) comes from Eurostat for EU countries and from the American Community Survey for US states. In both cases the information is for 2018. The share of population living in urban areas was extracted from the United Nations (UN) Population Division for EU countries (World Urbanization Prospects) and from the Iowa Community Indicators Program of Iowa State University for US states. The UN data define 'urban' according to the criteria used by each country. The US data is based on the 2010 Census and defines urban as "densely settled territory with specific population thresholds and urban clusters (each with their own population size and density thresholds)."

Data on hospital beds were obtained from the OECD for the EU and from the Global Health Data Exchange webpage for the US. In both cases, the information is for 2017. We gathered information on the government in power in the EU countries based on the last elections as reported in Wikipedia. Most countries who are members of the EU have governments based on what parties won a majority of seats in the last election. We considered as left-wing those parties belonging to the Greens-European Free Alliance, European United Left-Nordic Green Left, and Progressive Alliance of Socialists and Democrats groups.[9] For US states, we refer to the party of the state's governor and we classified Democrats as left-wing. Rental prices come from Statista and Zillow for EU countries and US states, respectively, and were collected for 2020. We collected 2018 data on per capita GDP from the World Bank (for EU countries) and from the U.S. Bureau of Economic Analysis (for US states). All data can be found in the Appendix.

Table 2 reports descriptive statistics for our sample of 28 European nations/states and 50 US states. For simplicity, in the rest of this paper they are all called 'areas'. It can be seen from Table 2A that for the average 'area' cumulative deaths went up from 219

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[9] The latest elections were held in Ireland on February 8, 2020, and Slovakia on February 29, 2020. The elections were either pre-Covid or at the very beginning of Covid, so in all cases we classified the government's leaning in light of the latest election results responsible for the formation of a national government.

after 20 days to 2754 at 60 days after the first death in that area. Table 2B breaks these statistics down by continent. Mean cumulative deaths at 60 days after onset amounted to 1710 per US state and to 4617 per EU country.

The average fatality rate per capita at every interval is also found in Tables 2A and 2B. It went up gradually, starting at 33 deaths pc after 20 days and reaching 255 deaths after 60 days (Table 2A). 20 days after the onset of an area's epidemic cumulative fatalities per capita were remarkably identical in both continents, but the standard deviation is much higher in the EU (94) than in the US (44). This implies more of a range in per capita deaths in Europe than in the US. But as the epidemic proceeded at its unique pace in each country or state fatal average fatalities per capita in US states grew faster and with more of range across the US. 60 days after onset, average fatalities for US states had reached 279, well beyond the average for EU countries (213) and the range across US states exceeded that across EU countries, with a standard deviation of 382 in the US and 343 in the EU. According to Baker (2020) death rates varied more in the US than in Europe. It can be seen from Table 2B that this only holds if one waits for each area's epidemic to develop over more than 20 days.

From Table 2A it can be seen that tests per capita grew considerably over time: from an average of 0.004 per capita 6 days after onset to an average of 0.038 46 days after onset in a particular area. At every point in time EU countries had more tests than US states. For example, at 46 days EU countries on average had 0.047 versus 0.033 for the US (see Table 2B). It can also be seen that 30% of all areas did not have a lockdown, implying that a lockdown was imposed in 70% of the areas. This was considerably more frequent in the EU than in the US: 61% of EU countries did not have a lockdown, but this was only the case with 12% of US states. On average it took an area 6.5 days from onset to lockdown. The first COVID-related death in the EU or US was reported in France on February 15. "Days post France" reports the number of days from February 15 to the first death in a particular area. That day points to the onset of the epidemic in that country or state. On average, an area experienced its first Covid-caused death 32 days after France. On average EU countries had an earlier onset: after 29 days compared to 33 days later for US states. Days between onset in France and other areas lie in a range between zero and 58.

Our principal explanatory variable of interest is co-residence. On average, among the 78 areas in our sample 37.5% of 18-34 year-olds live with their parents. For European countries this proportion is 49% and for US states it is 31%. Slightly less than 10 million

individuals live in the average area. On average, 17.5% of individuals are older than 65 and almost 74% of an area's population lives in cities. There are significantly fewer hospital beds per capita in the US than in the EU, but the standard deviation is more than twice as large in the EU than in the US. 49% of US governors are democrats and we define 25% of EU governments as left-wing. An area's average GDP per capita is 51,738 (with an average of 58722 for US states and 39268 for EU countries.

Figure 1 plots per capita number of deaths 30 days after onset and share of 18-34 year olds living with parents for all 78 areas (EU countries and US states). In Panel A all 78 areas are included; Panel B is for US states only; and Panel C for EU countries. The simple correlation between these two variables is barely positive when all areas are included and it is flat for the EU. In contrast, there is a clearly positive slope in Panel B: fatalities per capita and co-residence of young adult children and their parents are positively associated in the United States. States driving this association include New Jersey, Connecticut and Rhode Island, where both fatalities per capita and co-residence rates are relatively high. In the EU some countries with high co-residence have high fatalities per capita, as in the case of Spain and Italy, but others with even higher co-residence rates, such as Croatia and Slovakia, have very low fatalities.

We now proceed to the regression analysis allowing us to examine the partial association between fatalities and co-residence, after controlling for many other relevant factors.

3. Results

Main findings. Table 3 contains the results of the main estimations of equation 1 for the combined sample of 28 EU countries and 50 US states. Cumulative deaths are measured either after 20, 30, 40, 50 or 60 days. Given that the function we estimate is a logarithmic transformation, it follows from the first coefficient in Column 1 that one extra percentage point in the share of young individuals living with their parents is associated with 3.2% more cumulative deaths from Covid 20 days after an area's first death. Columns 2 to 5 indicate that one extra percentage point in the share of individuals age 18-34 living with their parents is associated with 3.7% more deaths after 30 days, 3.6% more deaths after 40 days and 50 days, and 3.5% after 60 days. All associations between deaths and co-residence are highly significant statistically.

Next, we assess whether the association between mortality and co-residence is more applicable to the US or to Europe. Table 4 reports two coefficients for each of the

cumulative fatalities regressions: co-residence and the interaction between co-residence and US. The coefficient of co-residence now refers to EU countries only. It is positive but not statistically significant. The coefficients of the interactions between co-residence and US are positive and statistically significant starting with fatalities 30 days after onset, implying that co-residence has a stronger association with cumulative deaths in the US than in Europe. The total association between co-residence and fatalities in the US is calculated by adding up the two coefficients of co-residence and co-residence*US. Consider deaths at 60 days after onset (col. 5 in Table 4). We add up 0.0137 and 0.0881 = 0.1018, implying that a one extra percentage point in the share of co-residence in the US (let us say from the mean of 33% co-residing in the state to 34%) is associated with an increase in deaths60 of 10.18 percent. This sum is significantly different from zero. All results remain invariant if we use population over 65 instead of overall population.

Our estimates pass the Oster (2019) test for selection on unobservables. In particular, we obtain a measure of the extent of selection on unobservables relative to selection on observables (delta) equal to 1.55. This value implies that selection on unobservables would have to be 1.55 times larger than selection on observables to explain the observed correlation between intergenerational co-residence and Covid-related deaths. This threshold exceeds the rule-of thumb cutoff of 1 in observational studies.

Discussion of the main findings: Our cross-country and cross-state analysis confirms a finding first reported by Bayer and Kuhn (2020) based on data for 24, mostly European, countries: more people die from Covid where intergenerational co-residence is more common. Our finding is based on regressions controlling for multiple factors that may influence fatalities (their only control variable is an East Asia dummy) and on a larger sample of 78 areas, of which 50 are US states. While we find that the association between Covid deaths and intergenerational co-residence across European countries is positive, we find that it is weak and not significant statistically, which is consistent with analyses by Belloc et al (2020) and Arpino et al (2020) at either the cross-country level, the European regional level or based on an analysis of Italian regions.

A surprising result is that the positive association between intergenerational co-residence and Covid fatalities is larger in the US than in Europe. This was already apparent from simple correlations presented graphically in Figures 1B and 1C. After controlling for many factors likely to influence fatalities from Covid our regression results indicate that across US states cumulative deaths vary positively with share of individuals

age 18-34 living with their parents, while this not the case across EU countries. For example, in the US a one extra percentage point in the share of co-residence is associated with an increase in deaths60 of 10.18 percent.

As for the meaning of this positive association between fatalities and intergenerational co-residence, there are a number of possible interpretations. We are reluctant to jump to conclusions about causality based on this limited evidence. It could be that when adult children live with their parents this exposes more vulnerable populations to a dangerous virus, but it is certainly premature to conclude that some deaths could be avoided if older adults and their adult children live in separate households rather than sharing the same residence. Next, we list a number of alternative interpretations of the positive deaths/co-residence association.

First, the association could indicate an income effect not captured by the inclusion of area-level Gross Product and average rent in the regressions. Other income, wealth, or cost-of-living components associated with intergenerational co-residence could simultaneously affect fatalities and co-residence. Lovett et al (2020) noted the association between multigenerational co-residence and high fatality rates in poverty-stricken parts of the US such as Indian reservations. That many of the US states with above-average co-residence also have above-average state income (as in the case of New Jersey and Connecticut) suggests that poverty is not a major factor here, but the possible association between co-residence and poverty is worthy of further investigation based on more detailed individual or regional data.

Second, intergenerational co-residence may reflect a more widespread presence of active religious communities encouraging physical contacts conducive to the spread of Covid-19. A carefully designed study of 312 areas in Germany with varying proportions of Catholics found that Covid fatalities were higher in areas with higher proportions of Catholics (Laliotis and Minos 2020). The authors hypothesize that Catholics may have stronger social and family networks, which e.g. may be associated with higher rates of intergenerational co-residence. For example, intergenerational co-residence is more common in predominantly Catholic countries such as Italy and Spain. However, as pointed out by Arpino et al. (2020), some of the lowest case levels of Covid were recorded in Portugal and Slovenia, two other countries where the Catholic Church is the

largest Christian denomination. Whether our findings result from differences in religious affiliation is also worthy of further investigation based on more detailed data.[10]

Third, given the high percentage of the US population that either immigrated or are children of immigrants one may also want to investigate whether our US findings are related to cross-state variation in the presence of immigrants from certain countries, either in the respondents' generation or their ancestors', and frequency of intergenerational co-residence in the countries of emigration.

Fourth, intergenerational co-residence is just one measurable components of the broader concept of intergenerational relationships, as proposed by Arpino et al (2020). Other components of such intergenerational relationships include geographic proximity, contact frequency and provision of grandchild care. Future research may want to estimate how geographic variations in Covid fatalities also vary with these other dimensions of intergenerational relationships.

Fifth, intergenerational co-residence may indicate psychological dispositions such as perceived sociability, as suggested by Oksanen et al. (2020). They showed that Covid mortality was significantly positively associated with such sociability. It could be that countries with cultures that encourage sociability also have higher rates of intergenerational co-residence. This interpretation is reinforced by Albertini et al.'s (2020) simulation experiments suggesting that high intergenerational connectedness alone is not sufficient to rapidly contaminate a large fraction of the elderly, and thus cause high fatalities. Only when they introduce social connectedness among the elderly do they find that a virus infects large fractions of the elderly.

Other findings: The regression results reported in Table 3 confirm that extent of testing helps explain variation in deaths from Covid, in line with previous research e.g. by Sung and Kaplan (2020) and Terrieau et al (2020). We find that a 1 percentage point increase in tests per capita 6 days after the epidemic's onset is associated with a 40% reduction in fatalities after 20 days. Associations between tests per capita and fatalities decline as time goes on, but remain substantial and highly statistically significant. At 60 days past onset it is down to a 7.35% reduction in fatalities. Associations between our measures of lockdown and fatalities are mostly statistically insignificant. That at 20 days after onset a country or state that did not set a lockdown has fewer fatalities may be a

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[10] In the USA official data don't specify respondents' religion, so it may be a problem for researchers to analyze this question adequately.

spurious result: fewer fatalities may lead the government to be less inclined to impose costly lockdowns. However, this negative coefficient disappears once the country reaches 30 days after lockdown. As for hospital beds, coefficients of the quadratic function of hospital beds are weakly significant in most columns in Table 3. For example, in column 4 we report that more hospital beds are associated with more deaths, but the square term is negative. As a country or state has more hospital beds fatalities are higher. This holds up to 4.5 beds per capita. Beyond that number more beds are associated with lower cumulative fatalities.

We also include a quadratic function of days it took for the epidemic to reach a country or state after the epidemic's onset in France on February 15 (the variable is called DaysPostF in Table 3) and find that the more time elapsed between a state or country's epidemic and the onset in France, the more fatalities at every point we measure deaths. However, the square term is negative. When we solve the quadratic function we find that for instance deaths at 40 days from the area's onset reach a maximum if that area started its covid epidemic 28 days after France. If a state or country's epidemic started more than 28 days after February 15 cumulative fatalities drop, possibly indicating that the state had a chance to learn from the experience of other states that faced the epidemic earlier. For example, they could adopt techniques and strategies pioneered by the states or countries that had to address the pandemic at an earlier stage, as suggested by Landoni et al (2020).

Furthermore, we find that early fatalities were higher in countries with a left-wing government. Left-wing governments in Europe suffered 1.19% more fatalities after 20 days. This result is probably driven by Italy and Spain, two of the most affected countries. This does not hold for the US.

Deaths are higher in more urban states or countries 30 days or longer after the local start of the epidemic. For example, At 30 days after the first death a one extra percentage point in percent urban is associated with 2.6% more cumulative deaths from Covid. Not surprisingly, the larger its population the more deaths are recorded in a country or state. As for Gross Domestic Product (or its equivalent for US states), it is associated positively with cumulative deaths at every measuring point (perhaps because people travel more and have more visitors).

4. Conclusion

We find that intergenerational co-residence is associated with a higher number of deaths from Covid using a sample of 28 European countries and 50 US states. This finding is applicable to cross-state comparisons in the US more than to cross-country comparisons in the EU.

If the association is causal it implies that reductions in such co-residential arrangements may protect an area's inhabitants from dying of Covid-19. However, we are not able to establish such causality.

Further research is needed that will include better statistics on deaths from Covid, longer period for the measurement of cumulative deaths, and more countries. It would also be useful to further explore our findings at a more detailed level, such as the US counties, European provinces, or other sub-national levels.

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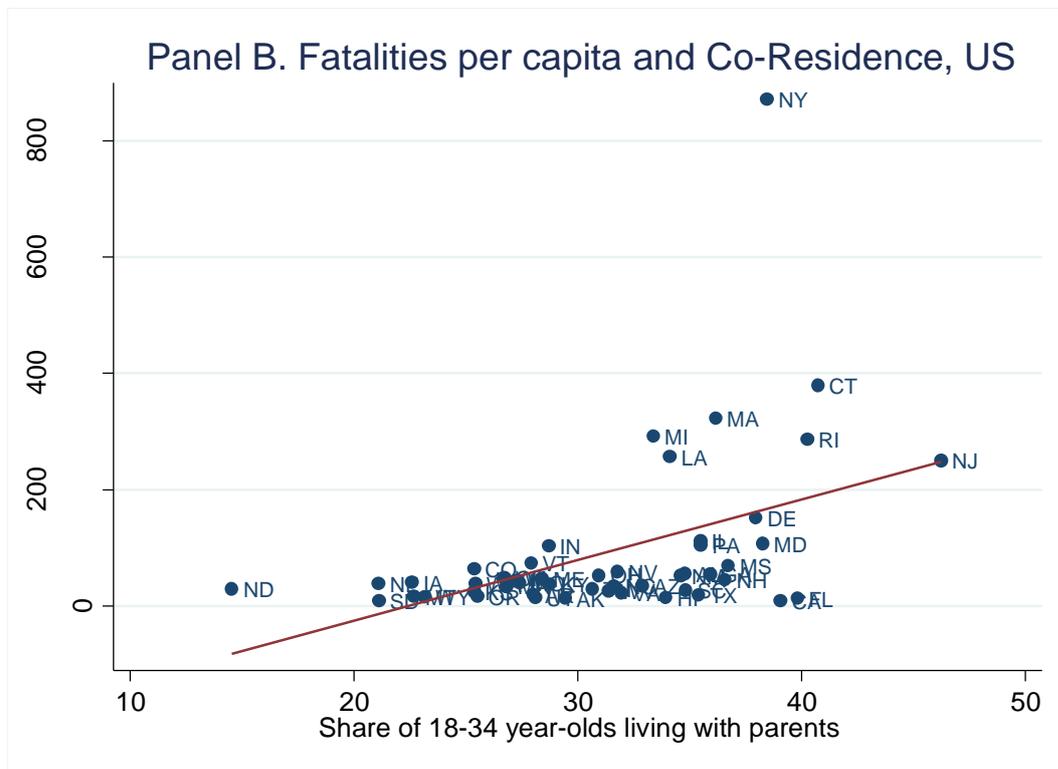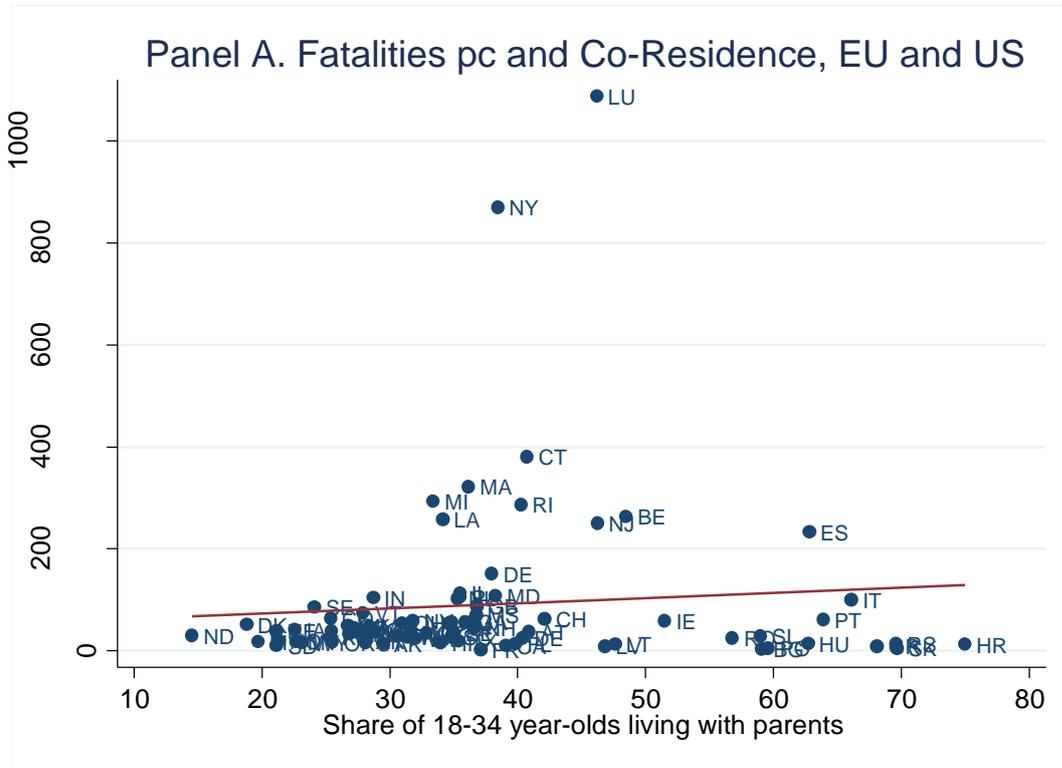
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Tables and Figures

Figure 1: Fatalities per capita 30 days after onset and Share of 18-34 year olds living with parents

Panel A. Fatalities pc and Co-Residence, EU and US

Panel B. Fatalities per capita and Co-Residence, US

Panel C. Fatalities per capita and Co-Residence, EU
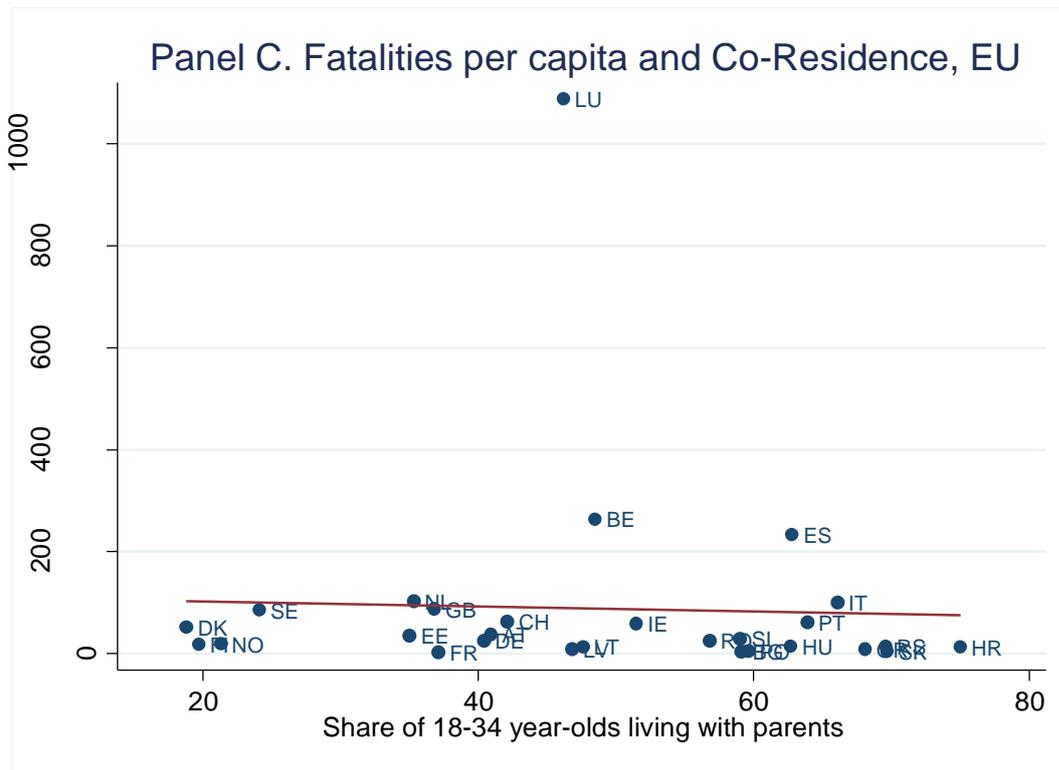
Notes: Fatalities 30 days after the first death in a given country; pc: per capita. For data sources see Table 1; for acronyms for country or US state see below.

Name		Name		Name		Name	
Alabama	AL	Hawaii	HI	Missouri	MO	Serbia	RS
Alaska	AK	Hungary	HU	Montana	MT	Slovakia	SK
Arizona	AZ	Idaho	ID	Nebraska	NE	Slovenia	SI
Arkansas	AR	Illinois	IL	Netherlands	NL	S. Carolina	SC
Austria	AT	Indiana	IN	Nevada	NV	S. Dakota	SD
Belgium	BE	Iowa	IA	New Hampshire	NH	Spain	ES
Bulgaria	BG	Ireland	IE	New Jersey	NJ	Sweden	SE
California	CA	Italy	IT	New Mexico	NM	Switzerland	CH
Colorado	CO	Kansas	KS	New York	NY	Tennessee	TN
Connecticut	CT	Kentucky	KY	North Carolina	NC	Texas	TX
Croatia	HR	Latvia	LV	North Dakota	ND	United Kingdom	GB
Delaware	DE	Lithuania	LT	Norway	NO	Utah	UT
Denmark	DK	Louisiana	LA	Ohio	OH	Vermont	VT
Estonia	EE	Luxembourg	LU	Oklahoma	OK	Virginia	VA
Finland	FI	Maine	ME	Oregon	OR	Washington	WA
Florida	FL	Maryland	MD	Pennsylvania	PA	West Virginia	WV
France	FR	Massachusetts	MA	Poland	PO	Wisconsin	WI
Georgia	GA	Michigan	MI	Portugal	PT	Wyoming	WY
Germany	DE	Minnesota	MN	Rhode Island	RI		
Greece	GR	Mississippi	MS	Romania	RO		

Table 1: Data definitions and sources

Variable	EU countries	US states	Year Measured	Downloaded on
Covid deaths	https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases	https://github.com/nytimes/covid-19-data/blob/master/us-states.csv	2020	April 26, 2020
Intergenerational co-residence	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_lvps08&	https://data.census.gov/cedsci/table?q=Young%20Adults,%2018-34%20Years%20Old,%20Living%20At%20Home%20by%20state&g=0100000US.04000.001&hidePreview=true&tid=ACSDT1Y2018.B09021&vintage=2018&layer=VT_2018_040_00_PY_D1&cid=B09021_008E	2018	April 23, 2020
COVID-RELATED VARIABLES				
Number of tests*	https://ourworldindata.org/grapher/full-list-total-tests-for-covid-19	https://covidtracking.com/api	2020	June 19, 2020
Days from 1st death to lockdown	https://github.com/OlivierLej/Coronavirus_CounterMeasures	https://github.com/OlivierLej/Coronavirus_CounterMeasures	2020	April 25, 2020
Days post France**	Same source as above	Same source as above	2020	Same as above

DEMOGRAPHICS				
Total population, and % over 65	https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do	https://data.census.gov/cedsci/table?q=S0102&tid=ACSST1Y2018.S0102	2018	May 11, 2020
% Urban population	https://population.un.org/wup/DataQuery/	https://www.icip.iastate.edu/tables/population/urban-pct-states	2010	May 16, 2020
OTHER VARIABLES				
Hospital beds (per 1000 inhabitants)***	https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2019_4dd50c09-en	http://ghdx.healthdata.org/record/united-states-hospital-beds-1000-population-state	2017	June 25, 2020
Government political orientation	https://en.wikipedia.org/wiki/List_of_ruling_political_parties_by_country; https://europarl.europa.eu/election-results-2019/en/breakdown-national-parties-political-group/2019-2024/	https://en.wikipedia.org/wiki/List_of_United_States_governors	2020	May 27, 2020
Rental Prices	https://www.ubs.com/microsites/prices-earnings/en/	https://www.zillow.com/research/data/	2020	May 8, 2020
Gross Domestic Product in dollars (per capita)	https://data.worldbank.org/indicator/NY.GDP.PCAP.CD	https://www.bea.gov/ https://www2.census.gov/programs-surveys/popest/tables/2010-2016/state/totals/nst-est2016-01.xlsx	2018	April 29, 2020

*   The number of tests was measured 14 days prior to the number of fatalities.

** Number of days from February 15, when the first Covid death in our sample was reported in France, to the first death in a particular country.

***Data for Bulgaria, Croatia, Romania and Serbia is from https://ourworldindata.org/.

Table 2a: Descriptive statistics for Complete Sample (EU + US)

	mean	Sd	min	max
US	0.641	0.483	0	1
Deaths 20	219.385	540.602	1	3716
Deaths 30	815.436	2111.819	6	12998
Deaths 40	1524.872	3746.013	7	20212
Deaths 50	2210.885	5105.801	8	24576
Deaths 60	2753.590	6190.687	8	29427
Deaths 20 pc	32.753	65.476	0.104	503.467
Deaths 60 pc	255.205	367.796	5.137	1838.716
Co-residence	37.504	13.762	14.543	75
Tests pc 6	0.004	0.013	3.08e-07	0.118
Tests pc 16	0.011	0.032	0.00004	0.287
Tests pc 26	0.019	0.051	0.0004	0.459
Tests pc 36	0.028	0.061	0.001	0.549
Tests pc 46	0.038	0.077	0.004	0.693
Days to lockdown	6.5	8.327	-16	31
No lockdown	0.295	0.459	0	1
Days post France	31.718	8.990	0	58
Population	9.859	16.094	0.062	83.019
% over 65	0.175	0.024	0.111	0.228
% urban	72.777	13.800	38.7	97.7
Hospital beds pc	3.440	1.595	1.7	8
Leftist gov.	0.397	0.493	0	1
GDP pc	51738.37	20422.01	7246.192	116597.3
Rental prices	1562	630.5	521.4	2990

Notes: Data sources: see Table 1. Deaths20, Deaths30 etc refer to cumulative deaths 20, 30, etc days after the first death in the country/state. Co-residence using the share of 18-34 year-olds living with their parents. "Days post France" is the number of days between first death in France and first death in country/state. Days to lockdown reflects the number of days from the first COVID-related death to lockdown. It is missing for those countries/states without lockdown. Population is expressed in millions of citizens.

Table 2B Separate Descriptive statistics for US States and EU countries

	US States		EU Countries	
	Mean	Std Dev	Mean	Std Dev
Deaths 20	179.5	531.0709	290.607	559.827
Deaths 30	583.74	1854.711	1229.179	2489.744
Deaths 40	1011.34	2923.496	2441.893	4811.194
Deaths 50	1401.8	3623.297	3655.679	6866.084
Deaths 60	1710.18	4120.074	4616.821	8536.584
Deaths 20 pc	32.868	43.806	32.547	93.508
Deaths 60 pc	279.094	382.189	212.546	343.146
Co-residence	31.217	6.190	48.732	16.330
Tests pc 6	0.003	0.004	0.007	0.022
Tests pc 16	0.008	0.006	0.017	0.053
Tests pc 26	0.014	0.009	0.027	0.085
Tests pc 36	0.023	0.015	0.036	0.101
Tests pc 46	0.033	0.020	0.047	0.127
Days to lockdown	7.68	8.479	4.393	7.752
No lockdown	0.12	0.328	0.607	0.497
Days post France	33.48	7.517	28.571	10.581
Population	4.908	5.535	18.701	23.592
% over 65	0.165	0.019	0.194	0.021
% urban	73.59	14.565	71.325	12.438
Hospital beds pc	2.63	0.719	4.888	1.710
Leftist gov.	0.48	0.505	0.25	0.441
GDP pc	58721.74	11067.72	39268.07	26748.95
Rental prices	1642.54	577.254	1389.739	691.472

Table 3: Log of Cumulative Covid-19 deaths and intergenerational co-residence rates

VARIABLES	(1) deaths20	(2) Deaths30	(3) Deaths40	(4) Deaths50	(5) Deaths60
Coresidence	0.0322***	0.0368***	0.0364***	0.0355***	0.0350***
	(0.0127)	(0.0126)	(0.0126)	(0.0132)	(0.0134)
COVID-RELATED					
Tests pc	-40.52***	-17.81***	-11.21***	-9.372***	-7.350***
	(9.269)	(3.587)	(2.197)	(1.914)	(1.618)
Days to lockdown	-0.0236	-0.0181	0.00468	0.00166	0.00180
	(0.0317)	(0.0282)	(0.0297)	(0.0295)	(0.0276)
No lockdown	-0.841*	-0.748*	-0.653	-0.580	-0.491
	(0.432)	(0.420)	(0.448)	(0.455)	(0.464)
Days Post France	0.291***	0.267***	0.223***	0.183***	0.162***
	(0.0726)	(0.0602)	(0.0606)	(0.0610)	(0.0592)
Days Post France, squared	-0.00442***	-0.00462***	-0.00405***	-0.00354***	-0.00337***
	(0.000881)	(0.000760)	(0.000769)	(0.000802)	(0.000817)
DEMOGRAPHIC					
Population	0.0520***	0.0582***	0.0617***	0.0618***	0.0610***
	(0.0105)	(0.00996)	(0.0105)	(0.0105)	(0.0105)
% over 65	1.727	3.766	4.516	3.825	2.907
	(7.555)	(8.178)	(8.676)	(8.920)	(9.033)
% Urban	0.0167	0.0256**	0.0286***	0.0302***	0.0322**
	(0.0109)	(0.0105)	(0.0108)	(0.0108)	(0.0110)
OTHER					
US	-0.287	-0.0181	0.0862	0.297	0.608
	(0.692)	(0.597)	(0.625)	(0.609)	(0.558)
Hospital beds	0.801	1.106*	1.151*	1.151*	1.196*
	(0.663)	(0.603)	(0.627)	(0.628)	(0.608)
Hospital beds, squared	-0.101	-0.126*	-0.127*	-0.123*	-0.123*
	(0.0699)	(0.0655)	(0.0676)	(0.0678)	(0.0659)
Leftist gov.	1.186**	1.031*	0.949	0.899	0.969
	(0.531)	(0.565)	(0.570)	(0.592)	(0.599)
Leftist*US	-0.993*	-0.729	-0.607	-0.637	-0.747
	(0.593)	(0.611)	(0.628)	(0.656)	(0.660)
GDP pc	2.33e-05**	2.72e-05**	2.77e-05**	2.59e-05**	2.36e-05**
	(1.09e-05)	(1.05e-05)	(1.06e-05)	(1.09e-05)	(1.11e-05)
Rental Prices	5.43e-05	0.000107	0.000200	0.000318	0.000364
	(0.000262)	(0.000258)	(0.000261)	(0.000267)	(0.000268)
Constant	-5.453	-5.949*	-5.504	-4.661	-4.255
	(3.548)	(3.404)	(3.398)	(3.416)	(3.413)
Observations	78	78	78	78	78
R-squared	0.598	0.700	0.717	0.726	0.734

Notes: For definitions see Table 2A. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Log of Cumulative Covid-19 deaths and intergenerational co-residence rates, separating EU countries and US states

VARIABLES	(1) deaths20	(2) Deaths30	(3) Deaths40	(4) Deaths50	(5) Deaths60
Coresidence	0.0212	0.0211	0.0177	0.0146	0.0127
	(0.0142)	(0.0139)	(0.0136)	(0.0141)	(0.0142)
Coresidence*US	0.0450	0.0643**	0.0771**	0.0867**	0.0881**
	(0.0309)	(0.0305)	(0.0320)	(0.0330)	(0.0332)
Observations	78	78	78	78	78
R-squared	0.585	0.689	0.712	0.728	0.737

Notes: All other controls reported in Table 3 are included. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$