Family Ties and the Pandemic: Some Evidence from Sars-CoV-2

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Abstract

This paper provides an empirical analysis of the relationship between the strength of family ties and the spread of Sars-CoV-2. The dataset is constructed for a cross-section of 63 countries combining different data sources, to cover seven dimensions: the spread of the virus, family ties, trust and religion, policies implemented to stop the outbreak, status of the economy, geography, demography. We observe a robust positive relationship between family ties and the contagion rate across the world; in particular, the attitude of parents towards the wellbeing for their children is the main force that drives the positive correlation with the contagion. Instead, the respect toward parents (the variable love-parents) seems to be a component of the family ties which negatively correlates with the diffusion of Sars-CoV-2, leading to the final quadratic relationship between the overall family ties strength and the spread of the virus. Moreover, as expected, we find a significant negative correlation between religion and trust and the number of infected people. As conclusive evidence, we observe that the death rate, as well as the recovery rate, are not affected by the strength of family ties and other social capital variables. What matters, in this case, are structural variables like GPD, number of hospital beds per capita, life expectance, median age and geographical location.

Keywords: Family Ties, Social Capital, Sars-CoV-2, Pandemic
JEL classification: A13, I12, I18

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1 Introduction

The spread of Sars-CoV-2 around the globe has seriously affected the lives of most people. After an initial outbreak in China, the virus has incredibly spread worldwide and mostly affected all European countries and then the USA, India, and South America. Some papers have tried to understand the path of the virus transmission and the main determinants of the disease diffusion. There are many possible variables: apart from the epidemiological nature of the virus, the efficiency of the health system, the intensity of lockdown and isolation policies enforced by many countries, masks wearing, the number of hospital beds and intensive care units to end with the role of preventive medicine and territorial health structure. In general, not appropriate attention has been paid to the role of other structural variables, such as the social, family and demographic structure of different nations and geographical area.

We believe that to get a good explanation of the different virus transmission across the globe we need to adequately consider, foremost, epidemiological factors, health variables and containment policies enforced by governments; but also to address the demography of the different populations and the social structure of various countries; in particular, the role of family ties in each area and relationships among generations existing in each country.

In this paper, after a brief recall of the literature on virus transmission, in the third paragraph, we address the issue of the role of family ties in explaining many social phenomena, in particular the spread of the coronavirus. We discuss the reasons why the family structure (and relationships within families) may be a key factor if one wants to understand differences in the Covid-19 cases and the number of deaths across countries. In the fourth paragraph, we describe our original dataset based on data taken from World Values Survey (WVS), John Hopkins' Covid data archive and GlobalEconomy.com. In the fifth one, we present our econometric estimates which show that family ties are a key variable, able to explain a large part of the different distribution of Covid-19 cases and deaths across the world. This outcome can be very useful to several governments in defining and implementing what may be an effective policy to address the virus transmission.

A good policy to address the Sars-CoV-2 should be based not only on medical factors or containment policies, but also on regulating social and family behaviours of different population – for example, by enforcing social distancing within the families, or keeping kids away from grandparents or limiting their relation, or simply asking relatives to take adequate precaution when they meet, as wearing masks and gloves, keeping distance, etc. – and giving the proper attention to school as a channel for the virus transmission. Family and social dimensions may be in the end successful in containing the virus diffusion as health prevention and medical treatment. In the same way, we find clear evidence that the role of religion – to consider himself as a religious person, or religious beliefs, apart from the judgement on the church – and the degree of trust significantly reduce the spread of the virus. It seems reasonable to assume that religious people and people who show a high level of trust tend to comply more with rules and follow the stringency policies enforced by governments to contain the contagion.

2 What do we know on virus transmission and containment policies

The literature on virus transmission with some exceptions is very recent. There are some few papers which address the determinants, the health economics and the effects of the pandemic that have affected the globe between 1918 and 1920. Barro (2020), Barro -Ursùa-Weng (2020) and Aasve et al. (2020) show that the pandemic of the Nineteenth century had very different geographical patterns and that social distancing measures were very effective in preventing the spread of the virus. In the same time, the degree of trust – the trust that people have with respect to other people and governments – and social capital have clearly emerged as one of the key variables for the success of the containment policies enforced by public authorities and limiting the virus diffusion.

The number of infected people and deaths in the 1918-1920 pandemic was very high and terrible. Between the Autumn of 1918 and the spring of 1919, the influenza pandemic was able to cause a death toll of almost 50 millions of people – there is a degree of uncertainty on this magnitude, also given the limited way of tracing and accounting deaths linked to the pandemic at that time – while the number of estimated cases was at least four times the number of people who died. The key aspect which contributed to the virus spread was the end of the First World War that originated an incredible movement of people across Europe – soldiers were going back home from the battlefield. At that time, however, the virus circulated relatively slowly and essentially was brought by soldiers, who were looking to get back to their home – travelling and commuting were very limited at that time. This in part explains why there were three major waves in the 1918-1919 pandemic (some authors also considered a fourth minor wave at the beginning of 1920). Of course, the health technology and the knowledge at the virus diffusion at that time were quite limited, as the way of communicating and exchanging key information among countries.

In the 2020 pandemic, the virus transmission has been much quicker, since travel opportunities, the role of airplane flights, movements of people linked to touristic activities, shipping of goods worldwide, and many other means of moving around the globe are now incredibly more significant. One interesting question is whether, given the different health and social conditions of the other pandemics in history, we have to expect major waves following this winter 2020 and in the early spring of 2021[1]. At this moment, we are not sure of the trend of contagion in the next few months and if we have to live with the virus for some period of time; if our epidemiology technologies and infections controlling capabilities are strong enough to prevent new diffusion; if people will have to keep going in adopting social distancing and mask wearing; or if and when finally the vaccine will be discovered and its distribution to most of the human being living on the earth accomplished.

The history of pandemics shows that most of the virus tend to remain for a certain period – two or more waves, which is linked to the specific virus epidemiology and to the speed of

[1] When this work was closed (beginning of November) is clear that a major second wave, bigger than the first one, is currently under way.

public authorities' response and the responsible behaviour of population. The current main challenge is whether with our epidemiological techniques, we will be able to moderate and flatten the next probable curves in virus transmission. However, these months after the onset of the pandemic have already taught us some key factors in addressing this pandemic which is useful to briefly assess. One of the key factors is how the virus tends to spread across time: a recent analysis[2] clearly shows that the epidemiological curve not necessarily follows the path of an exponential curve, but rather tends to rise rapidly, peak and then to flatten. The initial phase, in the very first two-four weeks, is exponential[3] but then, given the government response and the change in the behaviour of the population, the curve tends to smooth and slowly decrease. In these last two months (September and October) we have experienced a clear upsurge of the pandemic, which seems evidently related to a certain relaxation of the social isolation measures which took place during the summer holiday. This is crucial for the understanding of pandemic mechanics and its evolution and the definition of accurate public policies to address the pandemic diffusion.

One first important aspect is the different reaction across the various countries in adopting lockdown measures, such as self-isolation, wearing masks and tools of protection. Given that we do not have yet a good medical solution to Sars-CoV-2, the current policy to address the virus has to be based on social distancing and enforcing good practices in human behaviour[4]. There is clear evidence that in regions and states where the lockdown measures were stronger and more intense, the death rate and the number of infected people were considerably lower. Based on a sample of 11 European countries among which Italy, Spain, UK, France and Germany, Flaxman et. al. (2020) found that the adoption of major non-pharmaceutical measures like national lockdowns, closure of schools, ban of public events and social gathering, have had a big effect in reducing transmission, diminishing the Reproduction Index below 1 for all the observed countries.

However, this is generally true only when people largely trust others and the government – when the quality of institutions is high and people follow the norms and show a high level of social capital – and therefore the severity of measures is followed by people and leads to a significant geographical restriction on the movement of individuals[5]. Along the same line, Scala et al (2020) show the importance of the right timing of restriction policies and mobility limitations: "while an early lockdown shifts the contagion in time, beyond a critical value of lockdown strength, the pandemic tends to restart after lifting the restrictions". Hsiang et al. (2020) show that even if closing schools and restriction of the movement of the population tend to produce high and very significant economic effects (on GDP and employment), the anti-contagion measures have been quite successful in slowing down the exponential growth of the virus in the initial phase, therefore saving in economic terms and human lives a

[2] Baldwin (2020).

[3] We checked the data for many countries, even with a different starting point in time – Italy was, after China, the first Western country to experience the start of the pandemic at the end of February, followed then by Germany, Spain and France. After a period of incredible growth, which lasted more than a month, the number of infected people clearly dropped in a couple of months.

[4] See on this Van Bavel et al (2020), Baldwin-Weder di Mauro (2020) and Batscher et al (2000).

[5] See on this the data and the analysis made by Flaxman et al. (2020).

considerable amount of money. Aksoy et al. (2020) focus on the role of public attention in the reaction of governments. Countries with high institutional quality, in which public attention to Covid-19 (measured as the share of daily Google searches in a country related to Covid-19) increased fast after the first case, rapidly introduced non-pharmaceutical measures. Countries with high institutional quality but low public attention waited more time before introducing any anti-contagion measures. These slow responses appear to have increased consequent death tolls.

The recent data on virus diffusion clearly show that in Brazil, US, India, Iran and Israel, for some different reasons, the slowness to adopt stricter measures against the infection – social distancing, use of masks, etc. – have caused a considerable increase of the virus diffusion. During this summer, the relaxation of many containment measures and the increase in travelling and movement of people, connected to summer vacations in some European and Western countries, are provoking clear signs of a new upsurge.

Going to the data on Covid diffusion, some studies show that social distancing is one of the main crucial variables in determining the different scores on Covid cases and the number of deaths. Greenstone-Nigam (2020) prove that physical isolation was very effective when adopted for containing the virus' spread. In countries where social distancing has been adopted, and especially in the early stage of the Covid diffusion, the reduction in the number of infections and deaths have been very strong and well-defined. According to Old and Scott (2020), as mortality rates of COVID-19 increase strongly with age, social distancing, especially for older and at-risk groups, becomes an important variable. In this regard, comparing the age and longevity structure of the United States in 1920, with the current one, the value of social distancing today is more than three times higher than the corresponding value of 1920.

Some papers have addressed the complex issue of whether the weather condition, mainly the temperature (Celsius degree) and percentage of humidity that characterized some specific geographic area, may have affected the number of cases and in general the transmission of the virus. While some evidence show that there is a clear correlation with the degree of humidity, the level of air pollution and the average temperature, the epidemiology studies showed that especially after the Covid diffusion in very warm countries in May-July 2020 – such as India, South Africa and other African and Central America countries – this relation tends to be not so robust, if not fully weak.

As regards the degree of humidity, Ward et al. (2020) found a negative correlation with the number of Covid-19 cases in Australia: a 1% decrease in relative humidity increases the number of cases of 7-8%. Similar findings have been found for China (Hubei Province) by Qi et al. (2020). The fact that the two studies have been carried out in different hemispheres and in different seasons (Autumn in Australia, Winter/Spring in China) suggests the universality of a negative correlation between the degree of humidity and the magnitude of the pandemic.

Coker et al. (2020) addressed the role of air pollution in the Corona outbreak. A polluted environment may threaten the respiratory system, increasing the severity of Sars virus

consequences for patients. They highlight a positive link between ambient PM2.5 concentration on excess mortality rate in Northern Italian Regions, the area of the country most badly affected by the pandemic.

The degree of people's mobility and the intensity of travelling and commuting are another obvious variable that may explain the different data of Covid cases and the spread of the virus. Bonaccorsi et al (2020) and Scala et al. (2020) show that the intense restriction in mobility (measured by the telephone traffic), as a consequence of lockdown measures taken after the virus outbreak, was quite effective in containing the virus diffusion and flatten the curve.

Another interesting variable that shows a clear correlation with virus transmission is the degree of economic development of various nations. Countries with a higher Gdp (per capita) have scored better, meaning an obvious ability to detect better the infection, a superior reaction and effectiveness in promoting containment policies. This is also due of course to the fact that wealthier countries also tend to have better and more effective health systems. The same picture also emerges from other data that are strictly connected with the countries' level of Gdp, such as the degree of trade openness and exchange of good and services. We should also expect that the effectiveness and efficiency of the various national health services, e.g., the number of hospitals, the number of bed and the size of intensive units, are the other crucial variables that may explain a low virus diffusion and a limited number of deaths.

Countries have also shown a different ability in tracing and introducing some forms of early warning that partially also explains the different results of various countries. For example, China has shown a robust ability to react to the virus diffusion, enforcing very strict lockdown measures. The same also seems true for Korea, Singapore and some other Asian countries. Of course, it is self-evident that authoritarian regimes and countries with weaker democratic institutions may be facilitated in enforcing social isolation measures and quickly to implement a fully lockdown policy, as compared to democratic regimes[6].

Social, psychological and behavioural attitude and response by people is another crucial factor that explains the performance of health systems and the number of people infected across countries. Van Babel et al (2020) highlights that the perception of threat plays a crucial role. Like other animals, human beings can perceive emotions and the feeling of danger that can be very effective in the virus containment, since it motivates people to adopt good practices and change unhealthy behaviour. However, as the last months of this summer are showing, people very often "exhibit an 'optimistic bias': the belief that bad things are less likely to befall oneself than others" – the importance of handwashing or wearing a mask have been partially abandoned and in many holidays spots in Europe, the touristic season has brought negligent behaviours. This bias can be very dangerous since it "can lead people to

[6] See Frey-Chen- Presidente (2020). The number of swabs and the ability to perform early tracing mechanism are other important variables in the Covid spread.

underestimate their likelihood of contracting" the virus and therefore to disregard health warnings, health general rules and guidelines suggested by the government. Of course, as we will see in a moment, this bias is much frequent when social capital is low, rules of law are less shared and followed, people do not respect social norms, the degree of trust is low – people have a low trust on other people and the government.

The intensity of social distancing has been quite different in various countries; the same is true for people's compliance to governments' decisions. Measures of social distancing have been gradually adopted during the initial phase – in the months of March and April – by most countries, even if there have been some surprising exceptions – Brazil, the same US, and in particular, Sweden and the UK – however, in the last country, the decision to leave everything opened before the end of March has been fully reversed.

The degree of compliance to more or less broad lockdown measures taken by various governments seems very interestingly to be essentially related to the degree of trust and social capital existing in various countries – and probably to other moral and civic variables which determine the social capital of a nation, such as religious belief[7]. Trusting the government and other people is a key variable in shaping people behavior and there are individuals who behave better when they know other people will do the same. For example, Aasve at al. (2020) show that the pandemic had permanent effects on individuals' social trust. Borgonovi and Andrieu (2020) show that in the Us, the enforcement of social distancing and policies of containment (namely, the reduction in people's mobility) have been much larger in counties with high levels of social capital. In the same vein, Frey-Chen-Presidente (2020) show that – contrary to the initial feelings – the response of collectivist and democratic governments has been superior and more effective than authoritarian governments.

In a very interesting paper, Bartsher et al. (2020) explore the role of social capital in some European countries: in the initial phase of the pandemic, is more probable that areas with higher social capital tend to be the areas with more virus diffusion – since this area are also more socially active. After the initial phase, however, countries with high social capital show a clear reduction in the number of infections and positive cases – and this is true before the moment when the government decided to enforce a more or less full lockdown policy. Their estimates show that a one-standard deviation increase in social capital tends to produce between 12% and 32% fewer Covid cases per capita, from mid-March to mid-May. The area with higher social capital shows lower excess mortality and a stronger decline in mobility. The data also show that the main mechanism through which social capital may affect the number of infections is individual mobility. However, social capital reveals to be crucial not only in the pre-lockdown period but also when the drastic measure of social distancing and isolation are taken. Along the same line, Durante-Guiso-Gulino (2020) and Sapienza and Zingales (2020) show that the indicators of social capital and trust are clearly correlated with the number of people infected and the size of the contagion: areas with higher social capital have shown a

[7] For an excellent analysis of the relevance of religious beliefs, see McCleary and Barro (2019). On social capital and trust, see Bartscher et al (2020), Ciminelli-Mandico (2020), Durante-Guiso-Gulino (2020), Borgonovi-Andrieu (2020), Barrios-Benmelech-Hochberg-Sapienza-Zingales (2020), Greenstone-Nigam (2020).

sharper drop in mobility and infected people; and that, after partial reopening in some countries, social distancing measures remained more prevalent in areas with higher social capital.

Finally, some papers showed that the nature of the political regime and the political colour of different areas had affected the Sars-CoV-2 diffusion. Interestingly, in the same vein, Painter-Qu (2020) show that in the Us, political colour and political preference may have affected social distancing enforcement and containment policies: people living in Republican counties are 'less likely to completely stay at home after a state order has been implemented relative to those in Democratic counties'.

3 The importance of family ties for trust, public morale and the transmission of social values

To explain the differences among countries in Covid-19 cases, we think that a crucial role has been played by family ties and social capital – which we know is strongly correlated to the family structure. Our key hint is the following: in the context where family ties are important, people tend to live more together; where grandparents, sons and nephews live all together, this may affect the different diffusion rates experienced by many countries.

In the last decade, some papers have tried to address the importance of family ties. The family ties and family structure matter a lot in explaining the level of trust, the growth rate of an economy, the social capital and many people's economic and political behaviour.

The first author who clearly described the importance of family ties was Edward Banfield in 1958[8]. The author depicts the family as "*amoral familism*", a situation in which there is "inability of the villagers to act together for their common good or, indeed, for any end transcending the immediate, material interest of the nuclear family. This inability to concert activity beyond the immediate family arises from an ethos – that of 'amoral familism (…) (according to which people) maximize the material, short-run advantage of the nuclear family; and assume that all others will do likewise" (p. 9).

Therefore, "in a society of amoral familism, no one will further the interest of the group or community except as it is to his private advantage to do so" (p. 83). In this society, it is tough to build and maintain public organizations, given the selfish attitude of individuals who rely exclusively on the family. This aspect is not new, unique, or so surprising, since in many other countries and among other people, "where legal authority is weak and the law is resented and resisted, the safety and welfare of the individual are mainly assured by the family"[9]. This characteristic of family ties is the key core of many countries in Southern Europe and Asia and has attracted some studies and research projects over the last 50 years.

[8] Banfield (1958).
[9] Barzini (1968).

Bisin and Topa (2002), Bisin and Verdier (1998, 2000, 2010) have highlighted the role of cultural transmission, in particular the transmission of social status and cultural traits: children are influenced by their family ('vertical transmission'), and then with the population at large and the environment in which they live with (e.g. teachers, schools, etc. ('oblique transmission').

Therefore, one may assume that moral values and social capital (e.g., social civicness and trust in institutions) may be essentially transmitted (although not exclusively) by families to their heirs, and that, these values tend to remain stable across a certain period of time. The persistence of moral values, the degree of civicness and social capital in most of the developed countries, and in particular in some Italian regions, as first proved by Putnam (1996) to extend across least six centuries, confirm the stability of moral value within the members of various families, and in some specific social and economic contexts. Family matters and matters a lot. Recently Sgroi et al. (2020) show that cultural traits in Italy are very persistent and tend to mimic those of their maternal grandmother. Family shapes the moral values of individual members; in particular, the values and the cultural traits of the youngest, in the end, affecting overall public ethics and tax morale. Therefore, the transmission of cultural values within the same family along different periods of time would also inevitably imply some, more or less pronounced, the stability of public morale, social capital, and trustworthiness.

Apart from the vertical transmission, there is also some, more or less intense, form of oblique transmission, where the social context (e.g., school, neighbourliness, etc.) helps to share moral values. In general, we observe substantial homogeneity among the various communities, and people's choice to reside in areas where other individuals live that share the same values. We also observe a strong persistence of cultural traits, attitudes, values, and lifestyles among various communities, with some pronounced resilience of cultural traits and heterogeneous values. For example, Orthodox Jewish communities in the United States, but also elsewhere in the world, are a clear example of cultural persistence. Outside the USA, we have the well-known case of Corsicans, Catalans, Irish Catholics, and Italians, especially in Northern Europe.

Guiso-Sapienza and Zingales (2006, 2007, 2010) and Butler et al. (2009) show that in Italy social capital tends to persist over the long-term (more than five centuries) and explains its stability since the experience of free-city-state in the Middle Age. Tabellini (2008, 2010), by using an approach based on instrumental variables, links cross-country variation in measures of trust to the quality of political institutions in the nineteenth century and attributes the persistence of institutions to indicators of individual values and beliefs, such as trust and respect for others. Of course, the finding of some significant statistical correlations does not imply causal relationships; endogeneity needs to be addressed.

Francis Fukuyama (1995) argues that "though it may seem a stretch to compare Italy with the Confucian culture of Hong-Kong and Taiwan, the nature of social capital is similar in certain respects. In parts of Italy and in the Chinese cases, family bonds tend to be stronger than other kinds of social bonds not based on kinship, while the strength and number of intermediate associations between state and individual have been relatively low, reflecting a pervasive distrust of people outside the family. The consequences for the industrial structure are similar:

private sector firms tend to be relatively small and family-controlled, while large-scale enterprises need the support of the state to be viable."

The key finding is, therefore, that amoral familism tends to produce a special and stable social equilibrium, in which people exclusively trust and care about their immediate family: "expect everybody else to behave in that way, and therefore (rationally) do not trust non-family members and do not expect to be trusted outside the family" (Alesina-Giuliano, 2010, 2011) and Alesina et al. (2018). The 'power of the family' on individuals tends to affect their degree of political participation; therefore, resulting in low civic engagement and low generalized trust, confidence in public life, and the quality of political institutions. This kind of familism is predicted to hinder the development of high-quality political institutions, the pursuit of the common good, and participation in public affairs. In the same time, social capital strongly affects economic performances and that trust, and civic norms are stronger in countries with higher and more equal incomes, and better-educated and ethnically homogeneous population.

The importance of the family and the key role of family ties have been already emphasized as a key factor to explain many economic, political and social dimensions, such as the quality of democracy, the political participation, the economic growth, and the quality and the intensity of social capital – and we may add the compliance to containment policies in the case of a pandemic outbreak. We are not willing to say that family ties are always bad… "Strong or weak family ties are neither "bad" nor "good" but they lead to different organizations of the family"[10] and have different economic, moral, and social implications. Of course, a strong correlation does not necessarily imply causality: "do political institutions flourish only where the family is weak or is it the other way around? Does the family become self-sufficient only where the political institutions are not strong enough?"[11].

By summarizing, there is sound evidence that:

a) when the role of the family is strong, civic duty tends to be low, so is the social capital, tax morale and tax compliance. When family ties are weak, on the other hand, trust in the public sector tends to result in higher public morale and greater civic duty, and also tax evasion tends to be lower[12].
b) In Southern European countries, the role of the family is very important; however, this is also true in many other developed and less developed countries;
c) studies have demonstrated that countries where family matters tend to show less social capital, less participation, weaker political involvement, and a lower degree of trust;
d) Societies that rely heavily on families tend to have a lesser degree of trustworthiness and confidence in public institutions;
e) Family ties are often associated with negative economic performance, reduced rate of investment and growth.

[10] Alesina-Giuliano (2011).
[11] Barzini (1978).
[12] See on this Schneider (2012), Alm (2012, 2014), Marè-Motroni-Porcelli (2020).

In this paper we investigate whether family ties and the power of the family affect the size of the virus' spread, the number of deaths and other variables related to the recent pandemic. To the best of our knowledge, this is the first study that attempts to address this issue.

4 Our Dataset

We build our dataset by merging different types of data at the country level. Information on COVID-19 outbreak, our dependent variables, have been collected from the Center for Systems Science and Engineering (CSSE) of the Johns Hopkins University. Data include, for 187 countries, the number of confirmed cases, the number of deaths and the number of recovered from the January 22 up to September 12, the day we closed the estimation (data are updated on a daily basis).

Information on the composition of the population, on the status of the economy, the policy response to the pandemic and other general structural characteristics of each country (including also information on the health care system), have been collected from "GlobalEconomy.com" and from "ourworldindata.org", two web repositories that combine official statistics and research data sources on almost all world countries of the world. In particular, regarding the status of the economy, we consider the following variables: GDP per capita, Trade openness, Globalization index, Gini income inequality index, the Human development index, Health spending per capita, the number of hospital beds per capita and Infant death. Regarding the structure of the population, we have included: Population size, Percent urban and rural population, Population ages above 65, Population ages 0-14, median age and life expectancy. The health care conditions have been measured considering the diabetes prevalence rate and the cardiovascular death rate. We took the following general variables to measure another relevant general characteristic of each country: Rule of law index, Corruption Perceptions Index, Fragile state index, Civil liberties index, Social globalization index, Student-teacher ratio primary school, Carbon dioxide emissions, Degree of transport and telecommunication infrastructure. In order to measure the policy response to the pandemic we collected the Government Response Stringency Index published daily on ourworldindata.org, this is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). Finally, we also considered the following geographical characteristics: latitude and hemisphere.

Information on trust, attitude toward religion and composition of the family, especially to monitor the rate of older people living in the family, have been collected from the latest available World Value Survey (WWS) editions at the time of closing the estimations. In particular, we have extracted the following variables collapsed at country level in terms of averages: Trust people (people can be trusted? 1=agree, 2=disagree), Trust church ("how much confidence do you have in church" (1=a great deal, 4=none at all), Religious person ("are you a religious person", 1=religious person, 3=convinced atheist), Cohabitation with parents ("do you live with your parents", 1 = yes).

In conclusion, the strength of family ties, that represents our primary variable of interest, have been computed using the same data, and following the same procedure, proposed in Marè-Motroni-Porcelli (2020). The strength of the family ties can be measured considering three WVS variables. First of all, the variable that denotes directly the importance of the family (importance of family), which collects opinions about the importance of the family from 1, indicating high importance to 4 indicating less importance. The two other variables, instead, capture the strength of the family ties indirectly and from different angles: the relevance of love and respect for one's parents (love parents), and the duties and responsibilities of parents towards children (help child). In particular, the variable "love parents" measures how the respondent agrees with one of two statements: a) "Regardless of what the qualities and faults of one's parents are, one must always love and respect them;" or b) "One does not have the duty to respect and love parents who have not earned it". The variable "help child" captures to what extent the respondent agrees with one of the two statements: a) "It is the parents' duty to do their best for their children even at the expense of their wellbeing;" or b) "Parents have a life of their own and should not be asked to sacrifice their wellbeing for the sake of their children." The first option for both questions takes the value of 1, while the second alternative takes the value of 2. As suggested in Marè, Motroni, Porcelli (2020) in the empirical analysis, the strength of family ties is considered computing the principal component of the variable's importance of "family", "love parents" and "help child".

Table 1 and Table 2 that follow display, respectively, the detailed description and the descriptive statistics considering the regression sample of 63 countries. The variables reported in the tables have been divided into seven groups that correspond to the dimensions of our analysis: Covid-19 variables (dependent variables), Family ties, Trust and religion, Policy Economy, Geography, Demography. Finally, the variables reported are a restricted set of those collected, since we focus the attention only the variables used in the final specification of the empirical model in order to maximize the number of countries included in the analysis.[13]

[13]The regression sample includes the following 63 countries, for which we could collect the main block of variables without missing values: Albania, Azerbaijan, Argentina, Austria, Bangladesh, Armenia, Belgium, Brazil, Bulgaria, Belarus, Canada, Chile, China, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Guatemala, Hungary, Iceland, India, Indonesia, Ireland, Italy, Japan, Jordan, Korea, South, Latvia, Lithuania, Luxembourg, Malta, Mexico, Moldova, Morocco, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Zimbabwe, Spain, Sweden, Switzerland, Turkey, Ukraine, Egypt, United Kingdom, Tanzania, USA.

Table 1. Description, source, and availability of variables

Variables	Description	Source
Covid-19 variables (dependent variables)		
Covid cases per 10000 inhab.	Number of registered cases per capita since January 22 up to September 12 per 10000 inhabitants (daily average)	COVID-19 Data Repository Johns Hopkins University
Covid deaths per 10000 inhab.	Number of deaths registered since January 22 up to September 14 per 10000 inhabitants (daily average)	
Covid death ratio %	% of deaths over registered cases since January 22 up to September 14 (daily average)	
Covid recovery ratio %	% of recovered over registered cases since January 22 up to September 14 (daily average)	
Family ties		
Principal component	Principal component among "family," "loveparents", and "helpchild"	World Values Survey and European Values Study
Importance of family	"how important is family in your life" (1=very important, 4=not at all important)	
Love parents	"love and respect parents" (1=agree, 2=disagree)	
Help child	"parents should sacrifice own wellbeing for their children" (1=agree, 2=disagree)	
Trust and religion		
Religious person	"how important is religion in your life" (1=very important, 4=not at all important)	World Values Survey and European Values Study
Trust church	"are you a religious person" (1=religious person, 3=convinced atheist)	
Trust people	"how much confidence do you have in church" (1=a great deal, 4=none at all)	
Rule of law	"people can be trusted" (1=agree, 2=disagree)	

Variables	Description	Source
Policy		
COVID measures stringency index	Composite indicator measuring the policy response of the governments to the spread of the COVID-19 outbreak over nine dimensions (school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls	Our World in Data
Economy		
GDP	GDP per capita Purchasing Power Parity (average 2008-2018)	Our World in Data and The Global Economy repository
Human development index	Composite index that measures key dimensions of human development: life expectancy, literacy, educational enrolment and per capita GDP (year 2015)	
Health expenditure % GDP	Health spending (% of GDP) (average 2008-2018)	
No. of beds per 1000 inhab.	Hospital beds include inpatient beds available in public, private, general, and specialized hospitals and rehabilitation centers. In most cases beds for both acute and chronic care are included (year 2018).	
Geography		
Latitude	Distance from the equator	COVID-19 Data Repository
North hemisphere	Dummy = 1 if the country is in the north hemisphere	
Demography		
Age (median)	year 2015	Our World in Data and The Global Economy repository
Life expectancy in years	Life expectancy in years (average 2008-2018)	
Diabetes prevalence	Percentage of people ages 20-79 who have type 1 or type 2 diabetes (year 2017)	
Cardiovasc death rate	Number of deaths of cardiovascular disease per 100,000 individuals (year 2017)	

Table 2. Descriptive statistics (regression sample)*

Variables	Obs.	Mean	Std. Dev.	Min	Max
Covid-19 variables (dependent variables)					
Covid cases per 10000 inhab.	63	19.8683	19.5229	0.0640	85.3092
Covid deaths per 10000 inhab.	63	0.8906	1.2172	0.0026	5.4686
Covid death ratio %	63	4.2134	3.5307	0.0607	14.2558
Covid recovery ratio %	63	63.4387	20.7174	0.0000	88.6117
Family ties					
Principal component	63	0.3542	0.9955	-2.1650	1.9461
Importance of family	63	1.2954	0.1718	1.0549	1.8619
Love parents	63	1.1337	0.0879	1.0158	1.4212
Help child	63	1.2206	0.1688	1.0270	1.7321
Trust and religion					
Religious person	62	1.3502	0.2471	1.0297	1.9614
Trust church	62	2.1904	0.5278	1.1151	3.3897
Trust people	63	1.6971	0.1719	1.2396	1.9358
Rule of law	63	0.5659	0.9958	-1.5645	1.9964
Policy					
COVID measures stringency index	63	51.88	19.84	0.00	92.67
Economy					
GDP	63	27385	18760	2268	93007
Human development index	61	0.822	0.104	0.535	0.953
Health expenditure % GDP	62	6.111	4.160	0.862	16.928
No. of beds per 1000 inhab.	61	4.232	2.794	0.530	13.050
Geography					
Latitude	63	38.4167	16.0184	0.7893	64.9631
North hemisphere	63	0.8571	0.3527	0.0000	1.0000
Demography					
Age (median)	61	37.69	7.48	17.70	48.20
Life expectancy in years	63	76.15	5.79	54.95	83.28
Diabetes prevalence	61	7.1	2.9	1.8	17.7
Cardiovasc death rate	61	231.3	130.0	79.4	559.8

(*) The number of observations is restricted to countries with no missing values in all variables.

5 The empirical model and the econometric results

Figure 1 and 2 reports a preliminary view of the main variables of our analysis. In particular, figure 1 shows the intensity of the Covid-19 outbreak across the 63 countries included in our analysis. In the cartograms, we report the number of cases and deaths per capita together with the death and recovery ratios, all in terms of daily average over the 235 days covered in the dataset. Figure 2 report, for the same number of countries, the intensity of the family ties measured with our three variables: help-child, the importance of the family, love-parents and the principal component constructed over the three variables.

Figure 1 – Covid-19 outbreak data for the 63 countries included in the analysis

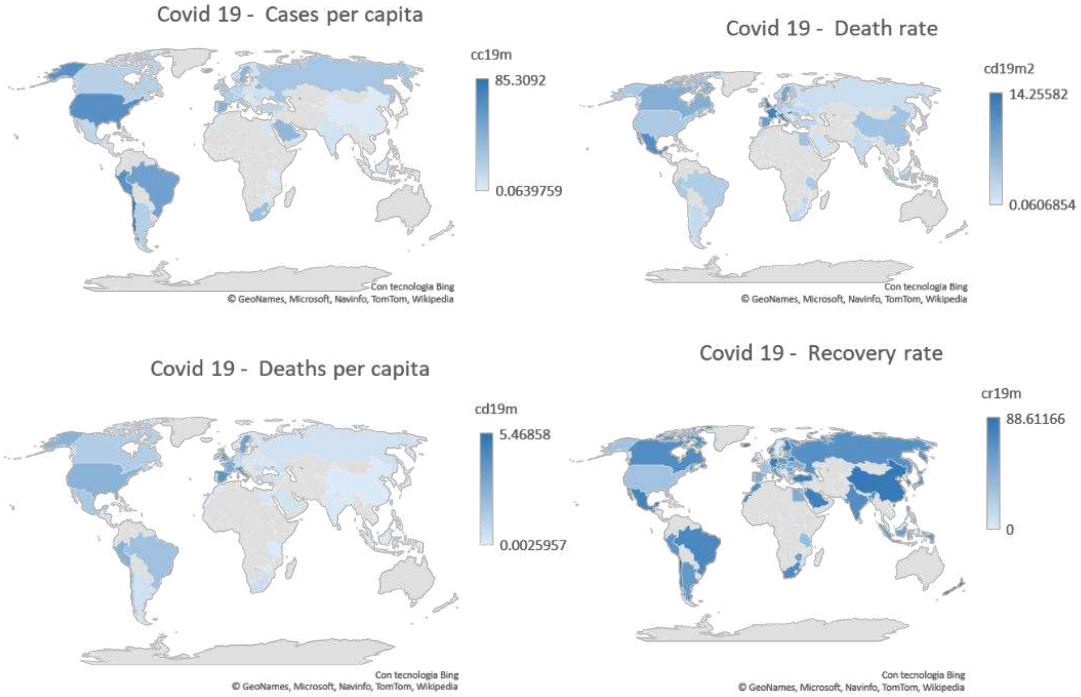
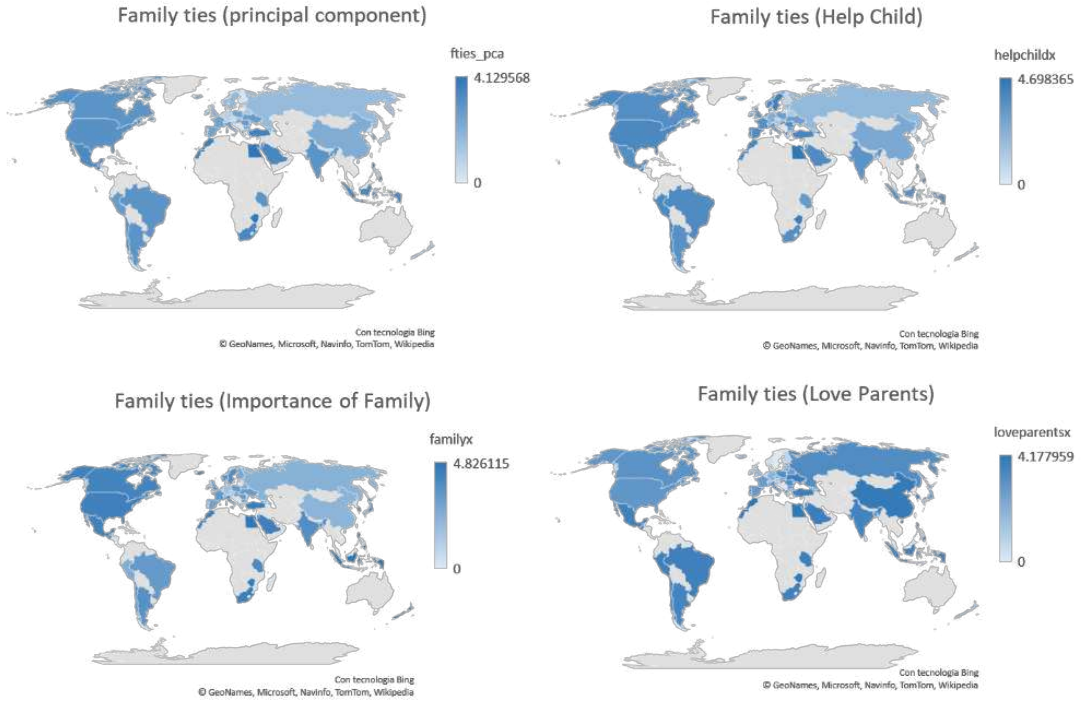


Figure 2 – Family Ties data for the 63 countries included in the analysis



Notes: original variables have been standardized and reversed to show a positive polarity

The analysis of the raw data shows a clear nonlinear relationship between the strength of family ties and the impact of the COVID-19 outbreak. In particular, Figures 3, 4 and 5 show a set of scatterplots where, on the horizontal axis, we measure the intensity of the family ties in terms of the principal component and in terms of the original three variables, instead, on the vertical axis we report our dependent variables: the number of COVID-19 cases per 10000 inhabitants, the death rate and the recovery rate.

Clearly, in Figure 3 we observe a quadratic relationship between the strength of the family ties and the number of Covid-19 cases per 10,000 inhabitants. This preliminary evidence shows that the intensity of the family ties may play an essential role in the transmission of the virus, suggesting that where the importance of the family is substantial, the probability of contagious becomes higher. However, when we decompose the overall effect measured through the principal component into the three original variables, we obtain further interesting evidence. It seems that the attitude of parents towards the wellbeing for their children (the variable help-child), together with the variable that captures the importance of the family, are the elements of the family ties that correlate positively with the contagion. Instead, the respect toward parents (the variable love-parents) seems to be a component of the family ties which negatively correlates with the diffusion of Covid-19, leading to the final quadratic relationship between the overall family ties strength and the spread of the virus.

Figure 3 – Covid-19 cases vs family ties variables

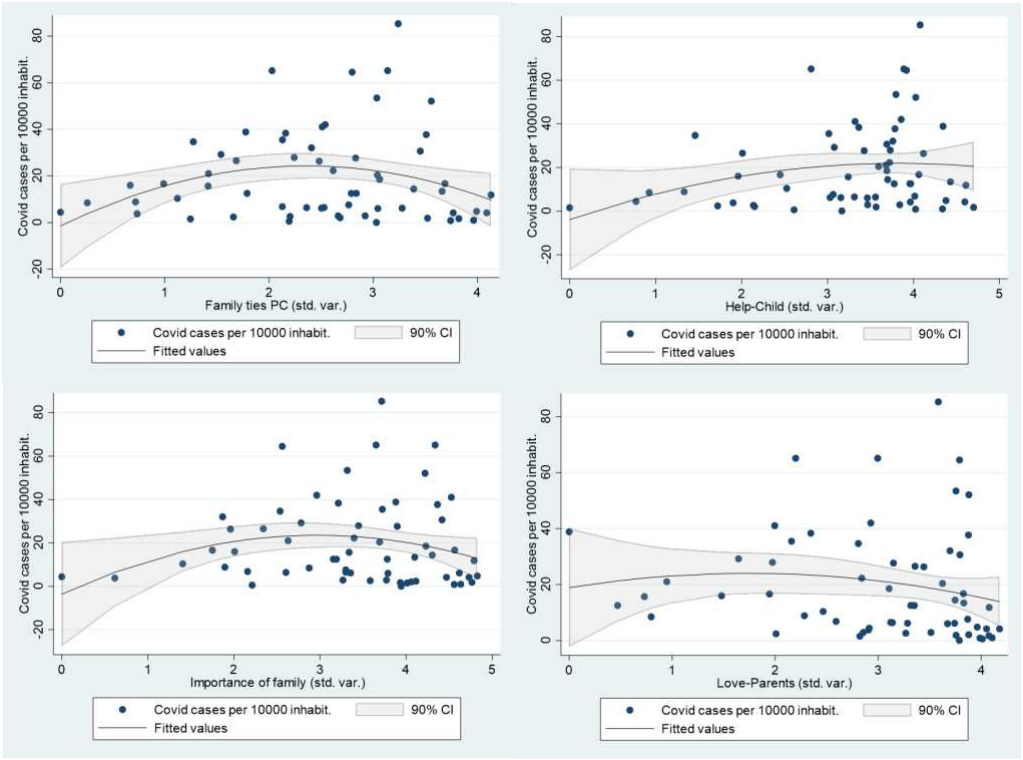


Figure 4 – Covid-19 death rate vs family ties variables

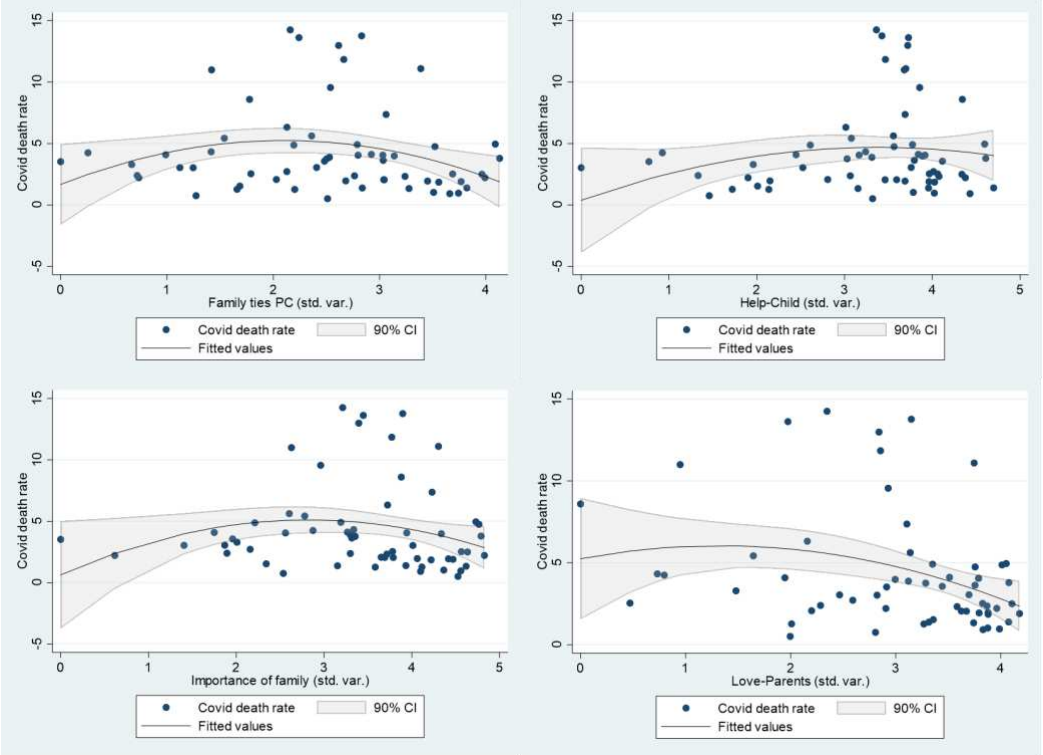
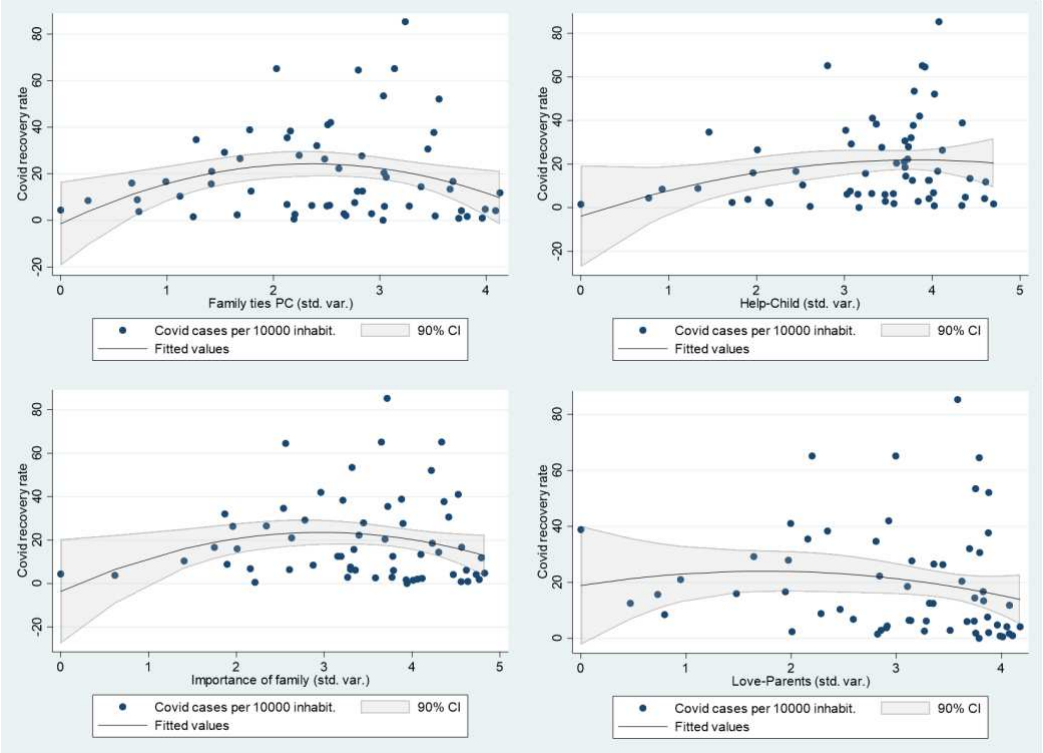


Figure5 – Covid-19 recovery rate vs family ties variables



Figures 4, instead, visualizes the relationship between family ties variables and the death rate providing a very similar pattern to the one concerning the number of cases. Finally figure 5 reports the relationship between family ties variables and the recovery rate, in this case, the pattern of the relationship is inverted as expected.

To obtain a more robust analysis of the relationship existing between the strength of the family ties and the intensity of the virus diffusion, we specify the following linear model:

$$Y_i = \beta_0 + \beta_1 F_i + \beta_2 F_i^2 + \beta_3' \boldsymbol{T}_i + \beta_4 P_i + \beta_5' \boldsymbol{E}_i + \beta_6' \boldsymbol{G}_i + \beta_7' \boldsymbol{D}_i + \varepsilon_i \qquad (1)$$

where

- Y_i measures the intensity of the COVID-19 outbreak in terms of number of cases, number of deaths, death rate and recovery rate, these variables have been considered in terms of daily averages over the 235 days period covered in the dataset;
- F_i measures the strength of the family ties in terms of the principal component of the three original variables *(family, help child and love parents as reported)* and enter into the model with a quadratic structure;
- $\boldsymbol{T}_i$ is a matrix of social capital variables, including trust, religious beliefs and rule of law.
- P_i is the Government Stringency Index measuring the policy response of the governments over nine dimensions *(school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls)*
- $\boldsymbol{E}_i$ is a matrix of economic variables, including GPD, Human development index, Health expenditure, no. of hospital beds per capita;
- $\boldsymbol{G}_i$ is a matrix of geographic characteristics, including latitude and hemisphere;
- $\boldsymbol{D}_i$ is a matrix of demographic characteristics, including median age, life expectancy and health status.
- ε_i is the stochastic component of the model.

The coefficients have been estimated through the OLS estimator using robust standard errors to correct for heteroscedasticity, in the regression analysis, all variables have been standardized (with mean 0 and standard deviation 1) in order to make the results of the point estimates comparable across the betas and to identify, at the same time, what are the variables that exert the most substantial impact.

Our estimate is based on a cross-section approach. One may ask whether a panel structure may produce better results. Some authors use a day-by-day approach data on virus cases and deaths, from the beginning of March to the end of May (see for example Bartscher et al. (2020) that use regressions with the daily log cumulative Covid-19 cases on a measure of social capital and some daily fixed effects). We are not fully persuaded of the usefulness of such approach, since putting together daily data with variables with small variability across time may increase the number of observations but not to add much significance to the coefficients' econometric estimates. However, as a robustness check – see table A1 in the appendix – we have specified the same model as a daily panel without averaging the dependent variables. In this case, the

coefficients have been estimated using a Feasible GLS estimator, leading to a set of results statistically identical to the one obtained with the cross-sectional approach.

The results of the point estimates of the relationship between family ties and covid-19 cases, based on our cross-sectional approach, are reported in Table 3, where each column corresponds to a different specification of the model. In column 1) we consider the full model, in columns form 2) to 9) we consider separately the other groups of variables included in the final specification.

Table 3. OLS point estimates of the impact of family ties on COVID-19 cases per capita

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
	Y = Covid cases per capita								
Familiy ties PC	**0.454**	**0.756**							
	[0.046]**	**[0.001]*****							
Familiy ties PC square	**-0.0997**	**-0.157**							
	[0.204]	**[0.003]*****							
Religious person	**-0.62**		0.142						
	[0.041]**		[0.529]						
Trust church	**0.585**		-0.0830						
	[0.010]***		[0.719]						
Trust people	**-0.406**		-0.0692						
	[0.003]***		[0.613]						
Rule of law index	**-0.500**		0.219						
	[0.083]*		[0.174]						
COVID measures stringency index	-0.109			-0.0457					
	[0.513]			[0.654]					
GDP per capita Purchasing Power Parity	**0.485**				**0.364**				
	[0.000]***				**[0.027]****				
Human development index	0.267				-0.0953				
	[0.300]				[0.456]				
Health spending % GDP	**0.244**					**0.168**			
	[0.085]*					**[0.009]*****			
No. of beds per 1000 inhab.	**-0.174**					-0.119			
	[0.084]*					[0.146]			
Latitude	0.0366						0.0558		
	[0.770]						[0.604]		
North hemisphere	-0.734						-0.443		
	[0.223]						[0.279]		
Median age in years	-0.163							0.0332	
	[0.371]							[0.658]	
Life expectancy in years	0.346								0.0755
	[0.357]								[0.532]
Constant	0.066	-0.623	0.00385	0.129	-0.0289	0.0148	0.466	0.119	0.0761
	[0.887]	[0.001]***	[0.973]	[0.153]	[0.814]	[0.879]	[0.215]	[0.193]	[0.501]
Observations	61	63	62	63	61	61	63	61	61
R-squared	0.475	0.069	0.065	0.004	0.133	0.112	0.041	0.002	0.111

*Notes: all variables are standardized, p-values in brackets , robust standard errors, * p<0.10, ** p<0.05, *** p<0.01"*

As shown in column 1) and 2) of Table 3, family ties exert a strong quadratic impact on the number of COIVD-19 cases as also reported in visual terms in Figure 3. Moreover, also other variables present a strong correlation with the number of COVID-19 cases leading to an R2 index of 47%.

As reported in table 3, we have very interesting evidence stemming from social capital variables: trust in other people and religiosity are negatively correlated with the number of cases, instead trust in the church shows a positive correlation. The role of religion in shaping and affecting trust and public morale has attracted many scholars and researches in the last

year (see among others Torgler 2006). The conclusions are in general not clear and unambiguous and the effect of religion on trust and the sense of civicness is not well-defined. We have some evidence that people who declare themselves as a very religious people then tend to obey to the rules of law and belief in common value, showing a high degree of trust and social capital; otherwise, there are other estimates where the belief in church and God tend to negatively affect the trust and public morale. In our case, following the recent work of McCleary and Barro (2019), we may presume that the degree of religiosity may have encouraged more compliant behaviour with social distancing and measures of physical limitation – wearing masks, keeping distance with other people and so on. We think that "religious beliefs motivate people to be productive, through inculcated values such as diligence, integrity and thrift. […] Religious beliefs – not per se participation in organized religion and personal prayer – are important guiding mechanisms fer economic behavior"[14].

On the other side, it is not clear how to explain why "trust in the church" has positively affected the number of cases – one simple hypothesis is that these people have resulted in increased attendance of churches and religious functions – and for that reason a bigger chances to be infected. As shown by McCleary and Barro (2019), is the moral values component of religious beliefs which in the end matters: religiosity implies dedication to work, thrift, honesty, and thrustworthiness and therefore, a higher chance to respect order and the rules of law – the rules set by governments during the pandemic.

The fight of the pandemic has been conducted, especially in the surge phase, through the adoption of the lockdowns and/or measures to limit the movements of people to the maximum extent possible. Both measures imply an extreme restriction of personal freedom, and for being successful, they need people to obey the rule of law strictly. It is reasonable to assume that a high attitude towards the respect of the rule of law and a high level of trust on the government and on other people have a positive impact in curbing the outbreak of the Coronavirus pandemic. In general, the assumption is confirmed with the various dependent variables, however, the magnitude of the effect is not very meaningful. Interestingly, the variable rule of law exhibits an opposite (negative) sign than family ties (positive sign, linear model), indirectly confirming the role of the family ties in the spreading of the virus.

Moreover, table 3, shows that GDP and health expenditure exhibit a robust positive correlation which was quite surprising at first sight. *Prima facie*, one should expect lower virus transmission in countries with higher GDP and higher health expenditure, which should imply a better and more efficient health system. One initial possible explanation is that this result is an effect of the efficiency of data collection. More developed countries were able to detect more cases than poorer ones. The number of swabs is positively correlated with the level of a country's health system. It is plausible therefore to assume that the more advanced countries have been able to discover, detect and therefore register, a greater number of cases. As a result, the number of deaths to be linked to the virus also becomes greater. The non-significance of the coefficient of health expenditure variable in regressions with the mortality

[14] See on this the analisys of the role of religion on moral values, trust and economic behavior made by McCleary and Barro (2019) (pag. 5).

and recovery rate can be seen as a confirmation of this hypothesis. The more advanced countries were able to detect more cases, but, also due to the lack of knowledge on COVID-19, they have not shown a greater ability to treat it. Another possible plausible explanation could be that most of the infections have originated in nursing homes and hospitals, which are more widespread in more developed countries which have historically greater investments in healthcare, a larger public health expenditure, and a more developed and efficient health system.

In table 4 we report the results of the same model specified with the three variables used to measure the strength of family ties in substitution of the principal component. The econometric analysis shows that the attitude of parents towards the wellbeing for their children (the variable help-child) is the family ties component that mainly generates a positive impact on the spread of covid-109. Therefore, we confirm the graphical analysis provided in figure 3.

Table 4. OLS point estimates of the impact of family ties on COVID-19 cases per capita, segmentation of different family ties variables

	(1)	*(2)*
	Y = Covid cases per capita	
Help Child	**0.224**	**0.209**
	[0.085]*	**[0.007]*****
Importance of family	-0.103	-0.0377
	[0.360]	[0.629]
Love Parents	0.0209	-0.124
	[0.896]	[0.098]*
Religious person	**-0.628**	
	[0.039]**	
Trust church	**0.555**	
	[0.027]**	
Trust people	**-0.326**	
	[0.017]**	
Rule of law index	**-0.472**	
	[0.091]*	
COVID measures stringency index	-0.12	
	[0.481]	
GDP per capita Purchasing Power Parity	**0.538**	
	[0.000]***	
Human development index	0.133	
	[0.625]	
Health spending % GDP	0.206	
	[0.215]	
No. of beds per 1000 inhab.	-0.0254	
	[0.858]	
Latitude	0.0688	
	[0.589]	
North hemisphere	-0.884	
	[0.101]	
Median age in years	-0.203	
	[0.268]	
Life expectancy in years	0.446	
	[0.257]	
Constant	0.0512	-0.0558
	[0.947]	[0.836]
Observations	61	63
R-squared	0.496	0.079

*Notes: all variables are standardized, p-values in brackets , robust standard errors, * p<0.10, ** p<0.05, *** p<0.01"*

In table 5, following the same structure of table 3, we report the results of the relationship between our variables and covid-19 death rate. Different evidence emerges now, the death rate is not correlated with family ties and social capital variables; what seems to matter now are structural and demographic variables. We observe a negative relationship with the number of hospital beds and life expectancy. Instead, a positive relationship emerges with the dummy "north hemisphere" and the median age and a negative relationship with the distance from the equator.

The empirical estimates highlight the crucial role of the age structure of various societies in the outbreak of Covid-19. It is reasonable to expect that where the share of those over 65 is higher, the Covid-19 cases and deaths increase. Finally, life expectancy exhibits a negative correlation with death rate meaning that in countries where people live longer the chance to recover is higher.

Table 5. OLS point estimates of the impact of family ties on COVID-19 death rate

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
	Y = Covid death rate								
Famility ties PC	0.519	1.029							
	[0.282]	[0.017]**							
Famility ties PC square	-0.0851	-0.250							
	[0.457]	[0.010]**							
Religious person	-0.0397		0.599						
	[0.922]		[0.017]**						
Trust church	-0.51		-0.864						
	[0.226]		[0.003]***						
Trust people	-0.01		0.0965						
	[0.952]		[0.489]						
Rule of law index	-0.285		0.0462						
	[0.433]		[0.743]						
COVID measures stringency index	0.041			0.101					
	[0.749]			[0.270]					
GDP per capita Purchasing Power Parity	-0.216				-0.00538				
	[0.211]				[0.980]				
Human development index	**0.698**				**0.322**				
	[0.085]*				**[0.089]***				
Health spending % GDP	0.147					**0.329**			
	[0.396]					**[0.003]*****			
No. of beds per 1000 inhab.	**-0.535**					-0.116			
	[0.002]***					[0.231]			
Latitude	**-0.658**						-0.180		
	[0.000]***						[0.340]		
North hemisphere	**1.309**						**0.649**		
	[0.002]***						**[0.043]****		
Median age in years	0.407							**0.293**	
	[0.314]							**[0.012]****	
Life expectancy in years	**-0.772**								**0.268**
	[0.018]**								**[0.038]****
Constant	-0.326	-0.419	0.351	0.338	0.367	0.161	-0.0780	0.365	0.213
	[0.661]	[0.241]	[0.019]**	[0.014]**	[0.024]**	[0.147]	[0.322]	[0.008]***	[0.057]*
Observations	61	63	62	63	61	61	63	61	61
R-squared	0.532	0.083	0.197	0.009	0.089	0.158	0.043	0.076	0.173

*Notes: all variables are standardized, p-values in brackets , robust standard errors, * p<0.10, ** p<0.05, *** p<0.01"*

To conclude the set of empirical analysis, table 6 reports the results of the relationship estimated between our variables and covid-19 recovery rate. In line with the evidence emerged with the death rate analysis, social capital variables, and family ties exert a feeble impact on the recovery rate. Again, structural variables play the most important role here. We

observe a strong positive impact generated by the number of hospital beds and life expectancy. Finally, geographical variables, probably associated with climate conditions, exert a strong effect on the recovery rate. Countries located in the northern hemisphere and closer to the equator show a lower recovery rate.

Table 6. OLS point estimates of the impact of family ties on COVID-19 recovery rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Y = Covid recovery rate								
Familiy ties PC	**-0.988**	**-0.873**							
	[0.069]*	**[0.040]****							
Familiy ties PC square	**0.229**	**0.182**							
	[0.072]*	**[0.066]***							
Religious person	-0.493		-0.565						
	[0.349]		[0.089]*						
Trust church	0.654		0.613						
	[0.109]		[0.059]*						
Trust people	-0.0339		-0.108						
	[0.870]		[0.609]						
Rule of law index	-0.148		0.0496						
	[0.591]		[0.769]						
COVID measures stringency index	0.0584			-0.0172					
	[0.692]			[0.859]					
GDP per capita Purchasing Power Parity	**0.351**				-0.0204				
	[0.029]**				[0.932]				
Human development index	-0.701				-0.00688				
	[0.133]				[0.976]				
Health spending % GDP	-0.247					-0.172			
	[0.226]					[0.217]			
No. of beds per 1000 inhab.	**0.372**					0.139			
	[0.029]**					[0.194]			
Latitude	**0.772**						0.295		
	[0.002]***						[0.117]		
North hemisphere	**-1.397**						-0.507		
	[0.005]***						[0.164]		
Median age in years	-0.0847							-0.0440	
	[0.796]							[0.714]	
Life expectancy in years	**1.025**								0.0424
	[0.014]**								[0.831]
Constant	0.867	0.877	-0.0605	0.0109	0.0118	0.110	0.216	0.00348	-0.0206
	[0.305]	[0.030]**	[0.666]	[0.937]	[0.939]	[0.299]	[0.352]	[0.980]	[0.884]
Observations	61	63	62	63	61	61	63	61	61
R-squared	0.42	0.040	0.052	0.000	0.001	0.052	0.059	0.002	0.038

*Notes: all variables are standardized, p-values in brackets , robust standard errors, * p<0.10, ** p<0.05, *** p<0.01"*

6 Concluding remarks

Our data show that family ties, among other factors, are a key variable in explaining the different diffusion of the Sars-CoV-2 pandemic in various countries. Countries where family ties matter, show a higher number of infections and deaths. These results are also confirmed when religion, trust (that affect public morale and the degree of people's civicness) and social capital are considered.

We get some surprising results with the role of national health systems: countries with larger health expenditures show more cases, and this may be due to the increased capacity of detection (the number of swabs) and monitoring of more developed countries, which are characterized by higher expenditure on health. However, as expected, health care systems with higher capacity in terms of the number of hospital beds per capita can reduce the number of deaths sensibly increasing, at the same time, the recovery rate.

Our results suggest a nonlinear impact of family ties on the spread of the virus. As family ties grow, there is an initial positive impact on the spread of contagion and mortality, with a subsequent reduction in the number of cases. This result and Figures 3-5 suggest that family

ties and especially those that go from parents to their children tend to reduce the compliance to the compulsory measure of social distancing. Still, when such relationship between the members of the family becomes very strong, the need to safeguard the health of relatives, especially their parents, emphasizes the importance to keep the correct distance within the family.

There are some clear possible policy implications of our exercise. Given the different age structure of the population, and the different way of living within the families in various countries – with more frequent contact between parents, grandparents and children – we have evidence that countries where family ties are strong and more important, tend to show also a larger virus diffusion. Therefore, one key factor in preventing the virus circulation may be to find an acceptable and sociable way to limit contacts between the youngest and oldest. Social isolation, policies of limited lockdown, or even measures that prevent close contacts between the different members of families – especially the ones that go from parents to their children – seems to be a good tool for the restraint of the virus – at least in the initial phase of the pandemic diffusion, or when the number of infected people risks of getting out of control. Given the larger probability, the younger population has of being infected – most of the time even with very mild symptoms and no serious consequences – actions that temporarily isolate family members and protect people with different age structure may be quite effective in controlling the spread of the pandemic.

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Appendix

Table A1 - Impact of family ties on COVID-19 cases per capita, Death rate and Recovery rate. Daily panel, random effect model, estimated through F-GFLS.

	Cases		*Death Rate*		*Recovery Rate*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Family ties PC	**0.242**	**0.494**	0.180	**0.492**	-0.234	-0.234
	[0.035]**	**[0.000]*****	[0.461]	**[0.072]***	[0.225]	[0.234]
Family ties PC square	-0.0550	**-0.102**	0.00506	-0.105	0.0500	0.0254
	[0.192]	**[0.002]*****	[0.934]	[0.115]	[0.300]	[0.590]
Religious person	**-0.331**		-0.100		-0.268	
	[0.034]**		[0.630]		[0.243]	
Trust church	**0.365**		**-0.363**		0.254	
	[0.004]***		**[0.077]***		[0.103]	
Trust people	**-0.240**		0.00333		-0.0176	
	[0.001]***		[0.965]		[0.865]	
Rule of law index	-0.240		-0.254		-0.0295	
	[0.138]		[0.170]		[0.818]	
COVID measures stringency index	0.00609		-0.00271		-0.00639	
	[0.343]		[0.277]		[0.401]	
GDP per capita Purchasing Power Parity	**0.320**		-0.106		0.116	
	[0.000]***		[0.292]		[0.123]	
Human development index	0.124		0.415		-0.287	
	[0.387]		[0.019]**		[0.155]	
Health spending % GDP	**0.141**		**0.138**		-0.123	
	[0.075]*		**[0.097]***		[0.137]	
No. of beds per 1000 inhab.	-0.0530		**-0.355**		0.105	
	[0.457]		**[0.000]*****		[0.135]	
Latitude	0.0572		**-0.523**		**0.321**	
	[0.443]		**[0.000]*****		**[0.002]*****	
North hemisphere	-0.501		**0.930**		**-0.463**	
	[0.116]		**[0.000]*****		**[0.013]****	
Median age in years	-0.0973		0.235		-0.0519	
	[0.385]		[0.268]		[0.721]	
Life expectancy in years	0.255		**-0.510**		**0.482**	
	[0.209]		**[0.007]*****		**[0.009]*****	
Constant	0.803	-0.883	-0.373	-0.996	0.857	-1.327
	[0.014]**	[0.000]***	[0.350]	[0.000]***	[0.013]**	[0.001]***
Day fixed effect	yes	yes	yes	yes	yes	yes
Country Random effect	yes	yes	yes	yes	yes	yes
Observations	14152	14152	14152	14152	14152	14152
R-squared	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*Notes: all variables are standardized, p-values in brackets , robust standard errors clustered at country level, * p<0.10, ** p<0.05, *** p<0.01"*