Alone and Lonely. The economic cost of solitude for regions in Europe

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Abstract: Solitude is a rising phenomenon in the western world. The number of people affected by solitude has been rising for some time and the Covid-19 pandemic has brought this trend to the fore. Yet, we know next to nothing about the aggregate subnational economic consequences of the rise in solitude. In this paper we analyse the consequences of solitude on regional economic performance across Europe, distinguishing between two of its key dimensions: alone living, proxied by the regional share of the population in one-person households; and loneliness, proxied by the aggregate share of social interactions. We find that solitude has important implications for economic development, but that these go in different directions. While alone living is a substantial driver of economic growth across European regions, high shares of lonely people undermine it. The connection of loneliness with economic growth is, however, dependent on the frequency of in-person meetings, with large shares of the population meeting others on a weekly basis yielding the best economic returns.

Keywords: solitude, alone living, loneliness, growth, GDP per capita, regions

JEL: J12, P48, R23

1. Introduction

The Covid 19 pandemic has brought to the fore the salience of solitude in modern societies (Smith and Lim, 2020). But the advance of different forms of solitude is certainly not a new phenomenon. It has been growing, albeit somewhat under the radar, for quite some time.

Solitude is not univocal: being alone without other people can happen in very different forms. Solitude often takes place "when a person's social relationships are perceived by the person to be less in quantity, and especially in quality, than desired" (Encyclopaedia Britannica, 2021). In this case, solitude can be equated to 'loneliness' and is often considered a distressing experience, which leads to irritability and depression and to increases in premature deaths (Cacioppo and Cacioppo, 2018). Loneliness is becoming a rising problem in industrialised countries (Snell, 2017) where "around a third of people are affected by this condition, with one person in 12 affected severely" (Cacioppo and Cacioppo, 2018: 426). Western societies seem to be experiencing an 'epidemic of loneliness' (Kar-Purkayastha, 2010).

Solitude may also refer to people living alone, without the company of family and friends. This situation can be defined as 'living alone' or 'alone living.' Alone living normally lacks the negative connotations associated with loneliness. Increasingly individuals choose to live alone, not because they are forced to but out of choice (Wilkinson, 2014). And even though living alone has at times been connected to economic hardship, people increasingly choose to live alone as a consequence of factors like the greater participation of women in the labour force, increased life expectancy, and urbanisation (Klinenberg, 2012). The number of people living alone has been rising for some time (Sandström and Karlsson, 2019). In Europe the trend towards living alone has been more pronounced

among women than men and far more common in large cities than in small towns and rural areas.

Although loneliness and alone living are two different manifestations of solitude, living alone does not necessarily mean that individuals are lonely. Lonely individuals often feel isolated, but that is not the case for those living alone, who frequently compensate for the lack of in-person interaction in the household with a wide network of interpersonal face-to-face and digital relationships outside it (Klinenberg, 2012).

Both dimensions of solitude are also bound to have different economic implications. Overall, more people living alone, and more lonely people, may imply less interactions, less knowledge diffusion and, consequently, less economic growth. The economic implications of the surge in alone living and loneliness may also differ. Lonely people generally suffer more from depression, are more likely to report health problems and, thus, participate less in the labour force. Loneliness can therefore trigger a decline in economic activity and income growth (Fulton and Jupp, 2015; Mihalopoulos et al., 2021). Alone living may not have the same negative economic implications. Following the psychological literature (e.g. Long, Seburn, Averill, and More, 2003), the economic impact of alone living —which may be associated to positive phenomena, such an increase in self-understanding, inner peace, self-renewal, problem solving and creativity— is likely to have a more positive influence on economic activity than loneliness, or the deprivation of interpersonal contacts. Although many people living alone suffer from economic hardship, especially in old age (e.g., Portacolone, 2013), the fact that the explosion in single-person households is related to the rise of young professionals and, especially, young professional women (Ogden and Hall, 2000) suggests that alone living may be connected to more, not less economic dynamism. As

argued by Klinenberg (2012), alone living implies as series of costs, such as rents. This means that a growing percentage of adults living alone are economically active and dynamic.

There is no shortage of research on loneliness and alone living, mainly from a sociological and psychological viewpoint (e.g., Coplan and Bowker, 2013; Gerstein and Tesser, 1987; Littman-Ovadia, 2019; Long and Averill, 2003). Yet, their economic implications have so far attracted limited attention. More research is still required in order to fill what remains an important gap in our knowledge (Mihalopoulos et al., 2021).

In this paper we aim to fill this gap by analysing the economic implications of the rises in these two dimensions of solitude in Europe. We analyse the extent to which loneliness and alone living affect economic growth across regions of Europe and what is the geographical dimension to these processes.

In order to do that, we build an original balanced panel database measuring different dimensions of loneliness and living alone for 139 European regions at NUTS2 level between 2011 and 2017. The results highlight that different forms of solitude have important implications for economic growth. First, the pervasiveness of lonely individuals in a society seems to be mostly detrimental for economic growth. European regions with a lower sociability over time grow less than those where local citizens are more likely to engage in interaction with others on a more regular basis. But this connection is greatly dependent on the frequency of interactions. Regions with the highest share of lonely individuals do not grow less. Nor do places where, on average, daily meetings prevail growth more. In contrast, greater shares of the population living alone in a region is mostly connected to greater economic growth. Thus, the economic impact of rising solitude in Europe is not unidirectional. The benefits of more people living alone

from an aggregate economic perspective are clear, but the potential effects of loneliness on economic growth, while generally negative, are highly dependent on the differences and interactions among different groups of the population.

The rest of the paper is organised as follows: Section 2 explains the theories, both psychological and sociological, behind the different notions of the concept of solitude and explores the potential impact the rise in loneliness and alone living may have on economic activity and, therefore, on economic growth; Section 3 describes the data and the variables used in the empirical analysis, for which the main findings are reported in Section 4. Finally, Section 5 concludes and ventures into some preliminary policy implications.

2. Solitude, loneliness and alone living

2.1 Solitude, loneliness and aloneness in society

Many European Romance languages do not really distinguish between different forms of solitude. The idea of being *solo* in Spanish or Italian, *seul* in French, *só* in Portuguese covers the two fundamental elements of the concept of solitude: that of being physically separated from others, or 'alone', and that of being emotionally detached or disconnected from others, or 'lonely.' Hence, being lonely and living alone describe very different states of mind and can represent different attitudes towards life, leading to diverse economic outcomes. According to the psychological and sociological literature (Littman-Ovadia, 2019; Long et al., 2003), being or living alone can take a positive connotation, as it allows more quality time to be spent on personal activities and well-being. Being

lonely, in contrast, points to an emotional detachment from others and society, which can affect health and well-being (Bosma et al., 2015; Tani et al., 2020).

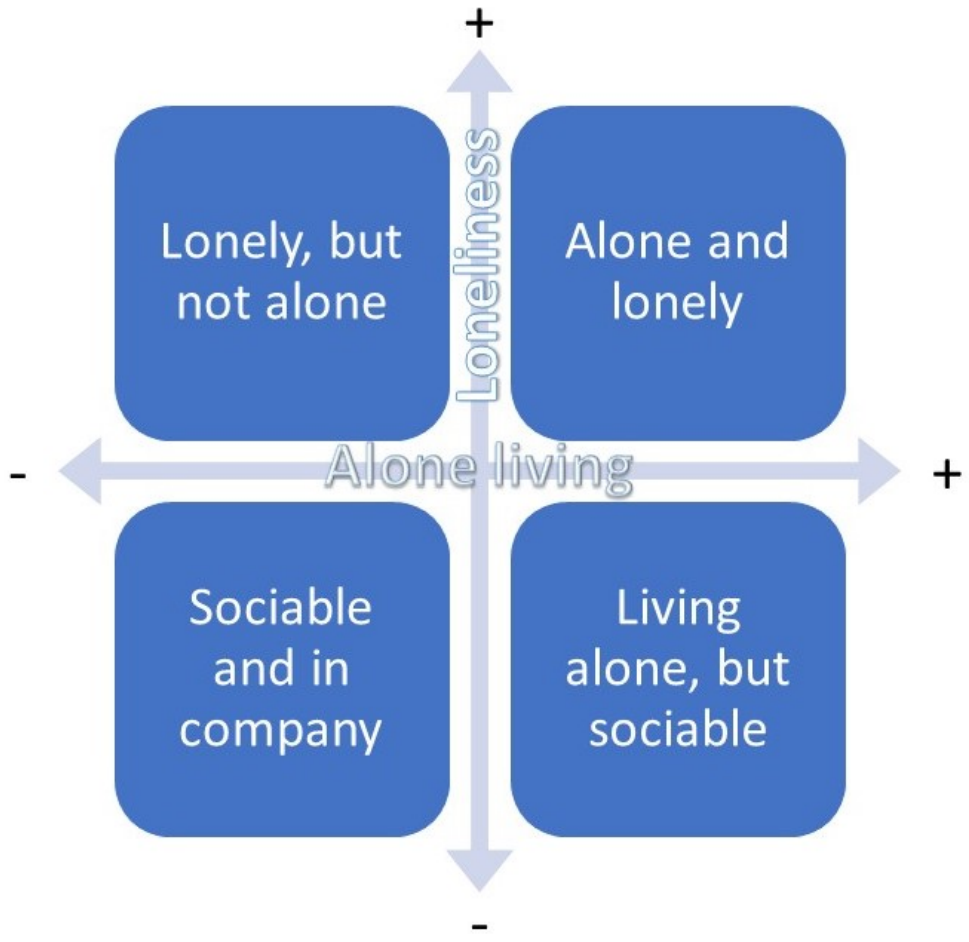
Both alone living and loneliness can coincide during the life cycle of an individual, but can also be experienced at different stages of life. Alone living has traditionally been associated with old age, but in recent times it has been increasingly connected to adulthood (Vespa, 2017). It depends on personal characteristics, like marital/family status, occupation, and other social circumstances. The question is whether living alone is good or bad for the individual. Most analyses tend to point towards the idea that alone living is positive from a personal point of view. It has been highlighted that living alone, especially as a young adult, leads to the activation of psychic functions that facilitate individual cognitive development. This in turns, affects the future quality of relationships and the strength of interpersonal bonds (Detrixhe, Samstag, Penn, & Wong, 2014; Fromm, 1994).

Loneliness also tends to happen more frequently among the elderly. It has been connected to disease, depression and early mortality (e.g., Tani, Cheng, Piracha, & Wang, 2020). However, loneliness can also appear in earlier stages of life, affecting adults and adolescents, leading to severing contacts with family and friends and to emotional distress (Mund, Lüdtke, & Neyer, 2020; Nikitin & Freund, 2018). Women are also more prone to experience loneliness (Drescher & Schultheiss, 2016; Mund, Freuding, Möbius, Horn, & Neyer, 2020), as their expectations, especially on partner and family relationships, are higher than those of men. In sum, loneliness is a subjective and psychological condition, that not necessarily manifests itself when a person is physically alone (Larson, 1990; Wright & Silard, 2020).

Nevertheless, loneliness can also have some positive connotations. This is especially the case when it is related to the state of being alone (Detrixhe et al., 2014; Goossens et al., 2009) and the capacity of being alone to better understand relationships with other people (Wachtel, 2008). This is often referred to as 'aloneness.' Once a person is aware about his or her inner sphere, she or he will definitely be able to have a better quality of social contacts and experiences. Hence, a person can still be lonely —that is moderately alienated from others— but still satisfied with their own life (Leontiev, 2019: 558). Therefore, as for living alone, certain forms of loneliness can also adopt a positive undertone for the individual, leading to a satisfactory engagement with the rest of society.

Although being lonely and alone living are often associated, they do not necessarily happen simultaneously. There are four potential forms of solitude related to the intersection of alone living with loneliness. This is reflected in the alone and lonely matrix presented in Figure 1. First, and depending on the intensity of both dimensions of solitude, individuals can be lonely, and living alone may be party to this loneliness. Having said that, according to Klinenberg (2012), most adults in the US living alone are far from lonely. They compensate for living alone through often rich networks of friends and work relations, with whom they engage frequently either in-person or online. These are sociable people living alone. Loneliness can also be felt by people that share their lives with family and friends. These people, despite being surrounded by others, feel emotionally detached and, as a consequence, lonely. They are lonely, but not alone. Finally, people may not experience any form of these two dimensions of solitude. In this case, they are sociable and in company.

Figure 1. The alone and lonely matrix



2.2 The economic impact of loneliness and alone living

How does the prevalence of these two different forms of solitude —loneliness and alone living— shape economic activity and, thus, the potential for development? As we have seen whether people live alone or feel lonely is likely to have implications for their capacity and willingness to undertake work. This, in turn, will affect their impact on the economy. Hence, the presence and/or prevalence of large numbers of people living alone or feeling lonely in a particular territory can have important implications for its development and prospects.

In places where the share of people feeling lonely is low, there will be more interpersonal exchanges and more interaction. More frequent social relations and face-to-face contacts

are, according to the economic geography literature, fundamental factors for the exchange of ideas and the development of new knowledge (Maskell and Malmberg, 1999; Gertler, 2003; Storper and Venables, 2004). Moreover, more trust and inter-personal relationships lead to forms of bonding and bridging, generating essential social capital for economic growth (Putnam, 2000; Rodríguez-Pose & Storper, 2006). By contrast, lack of interactions and low social capital can trigger an increase sense of loneliness, which does not only affect individual mental health and well-being (Simons et al., 2020), but can also deflate the collective capacity of a society to grow. On the whole, loneliness can have a high cost for society, as it is at the root of both physic and psychic pathologies, which represent a burden on the health care system (Pretty et al., 2016). Being lonely also weakens the potential of individuals to work and to participate actively in the economy. This results in a loss of talent and a smaller workforce, fundamentally affecting those groups with a greater tendency to feeling lonely, including those on low incomes or women (Bosma, Jansen, Schefman, Hajema, & Feron, 2015; Mielck, Kiess, Knesebeck, Stirbu, & Kunst, 2009). Hence, a strong prevalence of loneliness —or, conversely, low levels of sociability— will be detrimental for economic growth. This leads to our first hypothesis:

H_1: Lower levels of sociability in a region will result in lower economic activity and growth.

Although greater levels of interaction and sociability are generally drivers of economic activity and growth, an excess of sociability can also detract from engaging in economic activities and dent the capacity and time of individuals and workers to become economically active. Hence, the relationship between the degree of sociability in a society and economic outcomes is likely to be non-linear, with very high and very low sociability

bound to weaken the overall economic activity in a territory. From this we derive our second hypothesis:

H_2: Too much or too little sociability is likely to have negative implications for economic growth.

Alone living, by contrast, is devoid of the negative implications linked to loneliness and other forms of solitude. Although traditionally many people did not live alone by choice, in recent decades more and more individuals, often very active in the labour force, are choosing to live alone (Band-Winterstein & Manchik-Rimon, 2014). The archetypal profile of the elderly citizen living alone is increasingly being replaced by that of an adult professional, often women, with high levels of education and stable employment that chooses to live alone. This is a trend which in Europe started in the 1970s, with the so-called 'second demographic transition' (Van De Kaa, 1987). It took hold earlier in Nordic countries, before spreading, first, to Central and, later, Southern Europe (De Jong & Van Tilburg, 1999). These alone-living highly educated professionals make an important contribution to the economy (Band-Winterstein & Manchik-Rimon, 2014). In the US, for example, 41 percent of individuals aged between 25 and 34 living alone in 2015 had at least a bachelor's degree, while two thirds had a permanent full-time job (Vespa, 2017:15). The share of those living in the developed world has kept on rising in the last decades. Factors such as the massive entry of women into the labour force, high levels of urbanisation, and greater longevity have facilitated this revolution (Klinenberg, 2012). The growing importance of careers, especially for women; a greater preference for broad social networks, often to the detriment of more traditional couple relationships; and the communications revolution, have contributed to make alone living more viable and, often, not a lonely experience. Many of those living alone have a more vibrant social life

than those living in larger households (Klinenberg, 2012). In many ways, we are witnessing a growing trend towards one-person households within a modern urban life-style where the neighbourhood and social relationships are at times easier to establish than within the framework of more traditional, larger households (Bagheri, Armanmehr, Moradi, & Moshki, 2015; Howley et al., 2015).

Furthermore, alone living is expensive —or, at least more expensive on average than living with others. Consequently, many of those living alone require considerable economic resources to finance the costs of properties and rents (Vespa, 2017:11).

Finally, alone living can provide the peace and quiet that facilitates concentration and thinking and leads to greater productivity, away from the distractions and chatter associated with large households (Klinenberg, 2012). But alone living does not only have positive implications. Long periods alone within four walls can also cause health, social, and physical problems (Sanders, Bowie, & Bowie, 2004). The rates of self-harm and suicide are higher among those living alone (Shaw et al., 2021).

On balance, the benefits of living alone outweigh the potential drawbacks, meaning that our third hypothesis is:

H_3: High shares of the population living alone in a region are likely to be connected to higher levels of economic growth.

3. Empirical analysis

3.1 Data and variables

In order to assess the extent to which these two different forms of solitude are connected to regional economic performance in Europe, we rely on a new dataset, including data on alone living and loneliness, plus a number of controls that are bound to affect economic growth, stemming from EUROSTAT, the Statistic on Income and Living Conditions (SILC) Survey, the European Social Survey (ESS), the European Community Household Panel (ECHP) Survey, and the Quality of Government Institute (Dahlberg, Holmberg, Rothstein, Pachon, & Axelsson, 2020). The data cover a total of 139 regions in 13 European countries[1] for the period between 2011 and 2017.

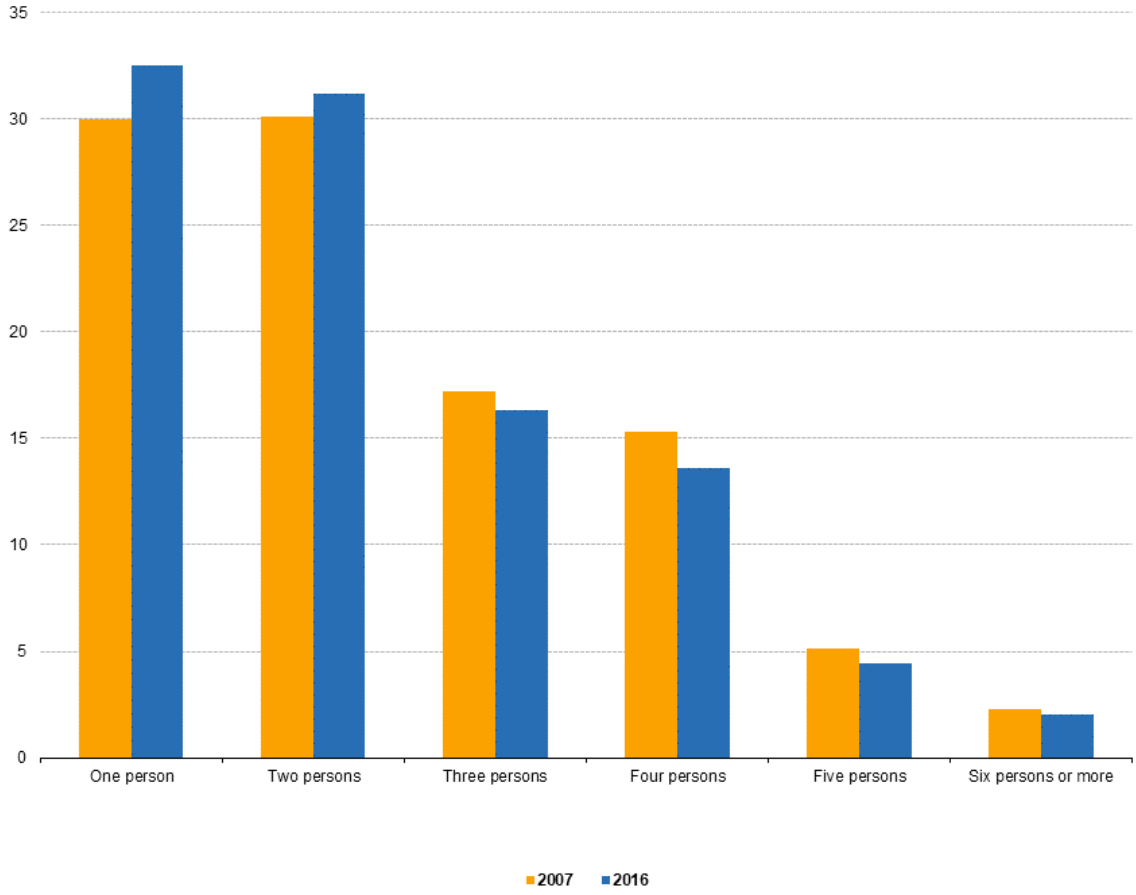
The dependent variable is the annual growth rate of GDP per capita (*GDP_PC*) extracted from EUROSTAT. This is a commonly used variable for national economic performance.

As supported by previous literature (Bagheri et al., 2015; Shaw et al., 2021), we use the regional share of single person households as our proxy for alone living. We derive this measure from Eurostat's SILC survey. This survey collects information on age, year of birth, country of birth, living conditions and poverty for European citizens at country level. For what concerns living conditions, the survey provides information on the composition of private households. We use the percentage of people living alone on the overall population. Unfortunately, data at regional level are reported as census data in 2011, thus our proxy for living alone is time-invariant.

[1] Belgium, Czechia, Denmark, Finland, France, Germany, Hungary, Netherlands, Poland, Portugal, Spain, Sweden, and the United Kingdom.

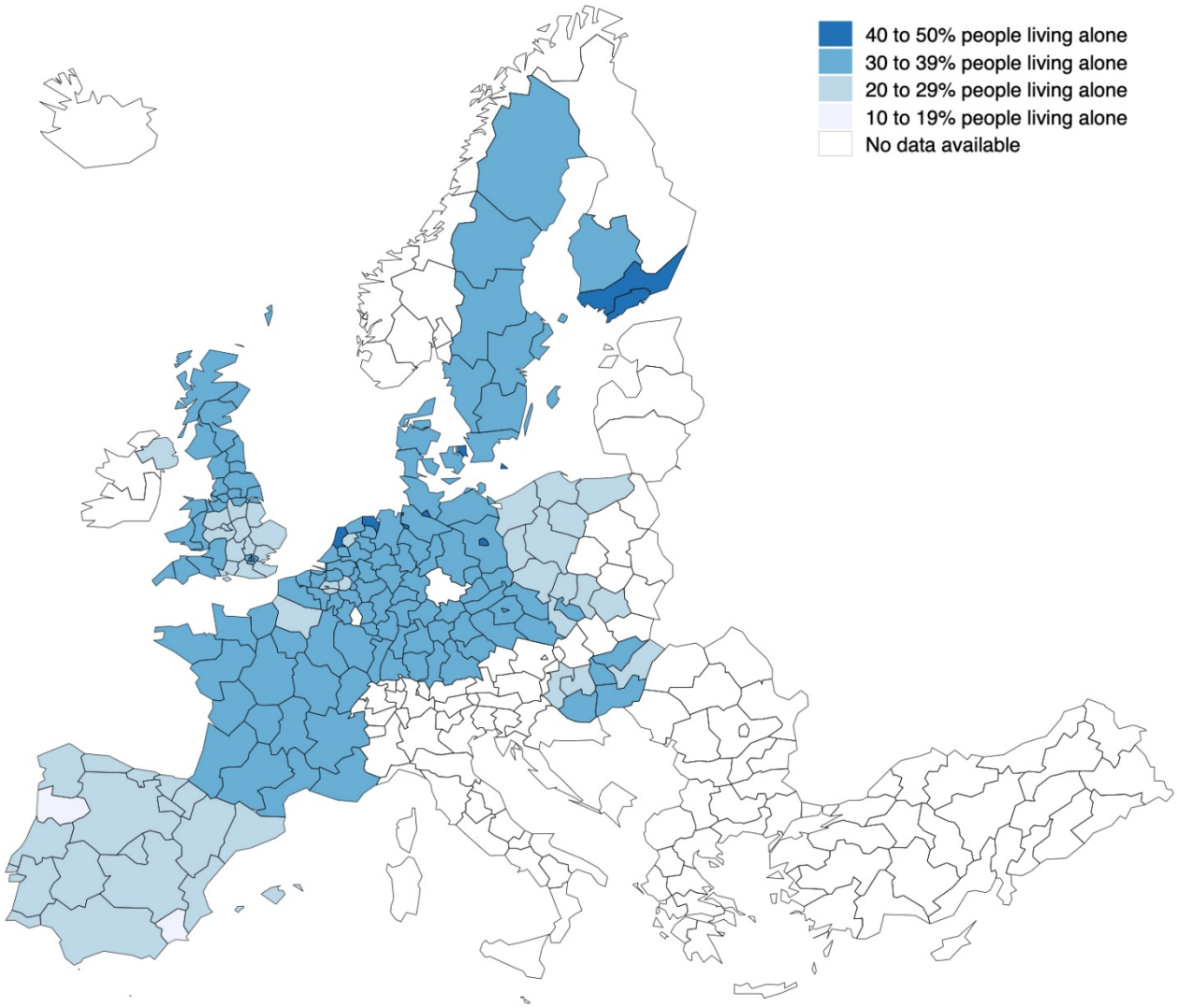
Single person households have increased significantly in Europe since the mid-2000s. The share of households with one or two persons was 3.6 percentage points higher in 2016 than in 2007 (EUROSTAT, 2017). The share of households with four members or more, by contrast, declined by 1.7 points. In 2016 already single person households represented the largest group in the EU. 32.5 % of households consisted of just one person (31.2 % of two persons), and only 14% of four persons (in 2007 the percentage was more than 15%) (Figure 2).

Figure 2. Households by number of occupants, EU-28, 2007 and 2016 (% share of all households)



(Source: Eurostat, 2017).

Figure 3. Percentage of people living alone in 2011 (% share of all households).



Source: Authors' elaboration.

Figure 3 shows the distribution of people living alone across the 139 regions in our sample. Alone living displays a clear national pattern. In 2011 it was far higher in the Nordic countries and in Central Europe than in the Iberian Peninsula and in Eastern Europe —with Czechia being the main exception to this trend. The contrast between levels of alone living above 30% in countries like Belgium, Finland, France, Germany, the Netherlands, or Sweden and far lower levels in Poland, Portugal, or Spain was stark (Figure 2). Alone living also displayed a clear urban pattern. The highest percentage of

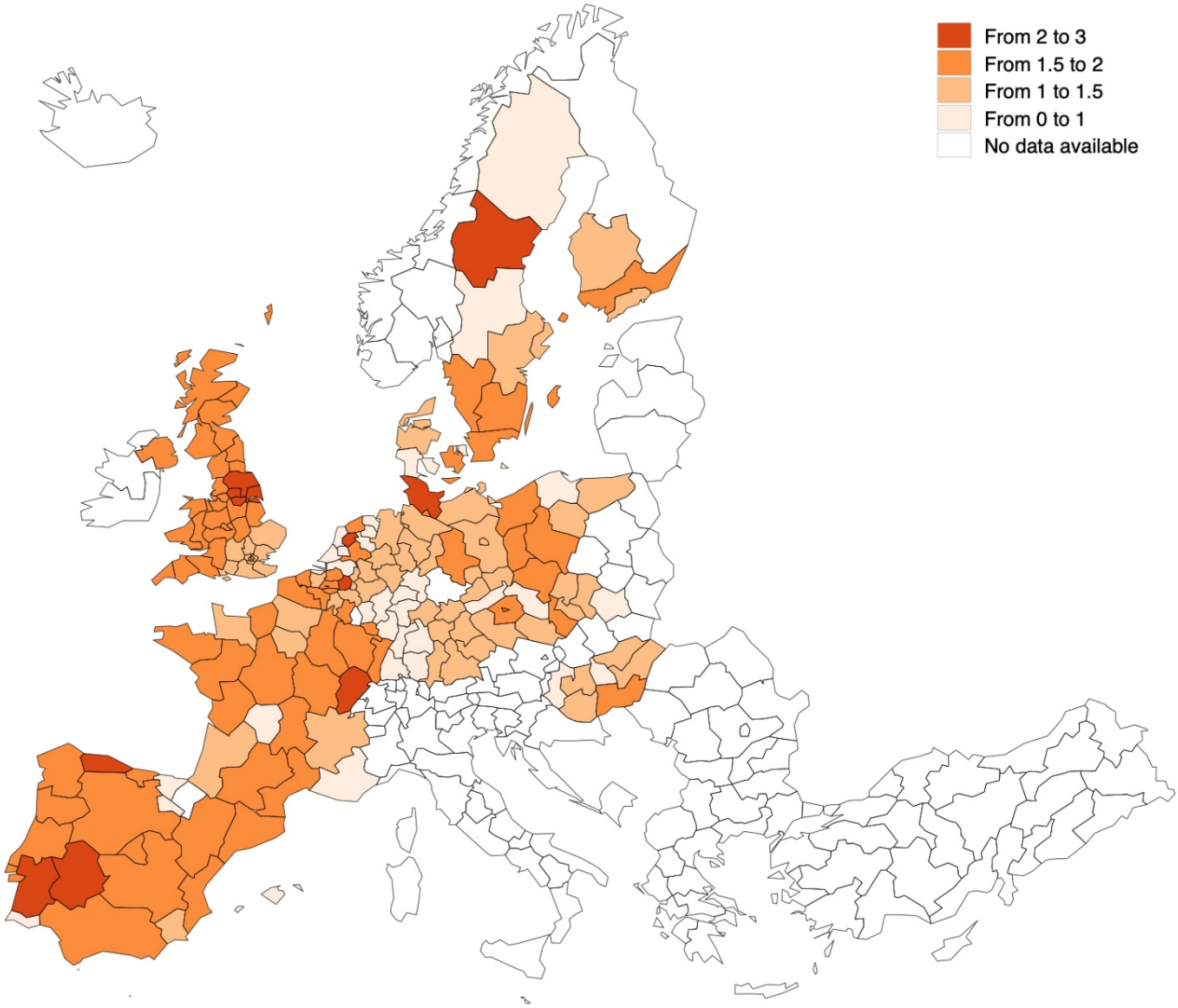
people living alone in Europe was found in city regions, such as Berlin (49.43%), Brussels (49.22%), or Etelä-Suomi (Helsinki) (42.68%). Cities like Amsterdam, Bremen, Copenhagen, Hamburg, or London were not far behind. The lowest shares of single person households were found in the North of Portugal (17.2%) and in Murcia, in Spain (18.45%), far below from the mean of our sample, which is 32%.

Measuring loneliness is a more complex affair. Previous studies have tended to rely on the UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980) to measure the various degrees of loneliness. However, this scale is not appropriate in our case, because we deal with loneliness at an aggregate territorial level and not at the individual micro-level. For this reason, we resort to an alternative measurement. We use the frequency of meeting others outside the household, taking into account different time horizons: a week, a month, more than a month (Bosma et al., 2015; DeLeire & Kalil, 2010). We derive this information from the European Social Survey (ESS). This survey, directed by the University of London within the European Research Infrastructure Consortium Forum, collects information at the individual level on personal and social well-being, social capital and social trust, social exclusion, education and occupation, among other themes. It is conducted every two years and targets individuals older than 15. For the purpose of the analysis, we select the question; "*How often do you meet socially with friends, relatives or work colleagues?*" 7 possible responses are contemplated: (i) never; (ii) less than once a month; (iii) once a month; (iv) several times a month; (v) once a week; (vi) several times a week; (vii) every day. From these answers we derive two different measures for social interactions. The first one is a *sociability index*, which expresses a standardized measure for the total number of in-person meetings, independently from their frequency. This measure is aggregated at the regional level and computed as follows:

$$soc\_index_{rt} = \frac{meet_{rt} - mean(meet_{rt})}{sd(meet_{rt})}$$

Where *meet* is the total number of meetings per region *r* and year *t*, *mean(meet)* is the average number of meetings per region and year, and *sd(meet)* is the standard deviation of the total frequency of meetings per region and year.

Figure 4. Distribution of the sociability index by NUTS2 region in 2017.



Source: Authors' elaboration.

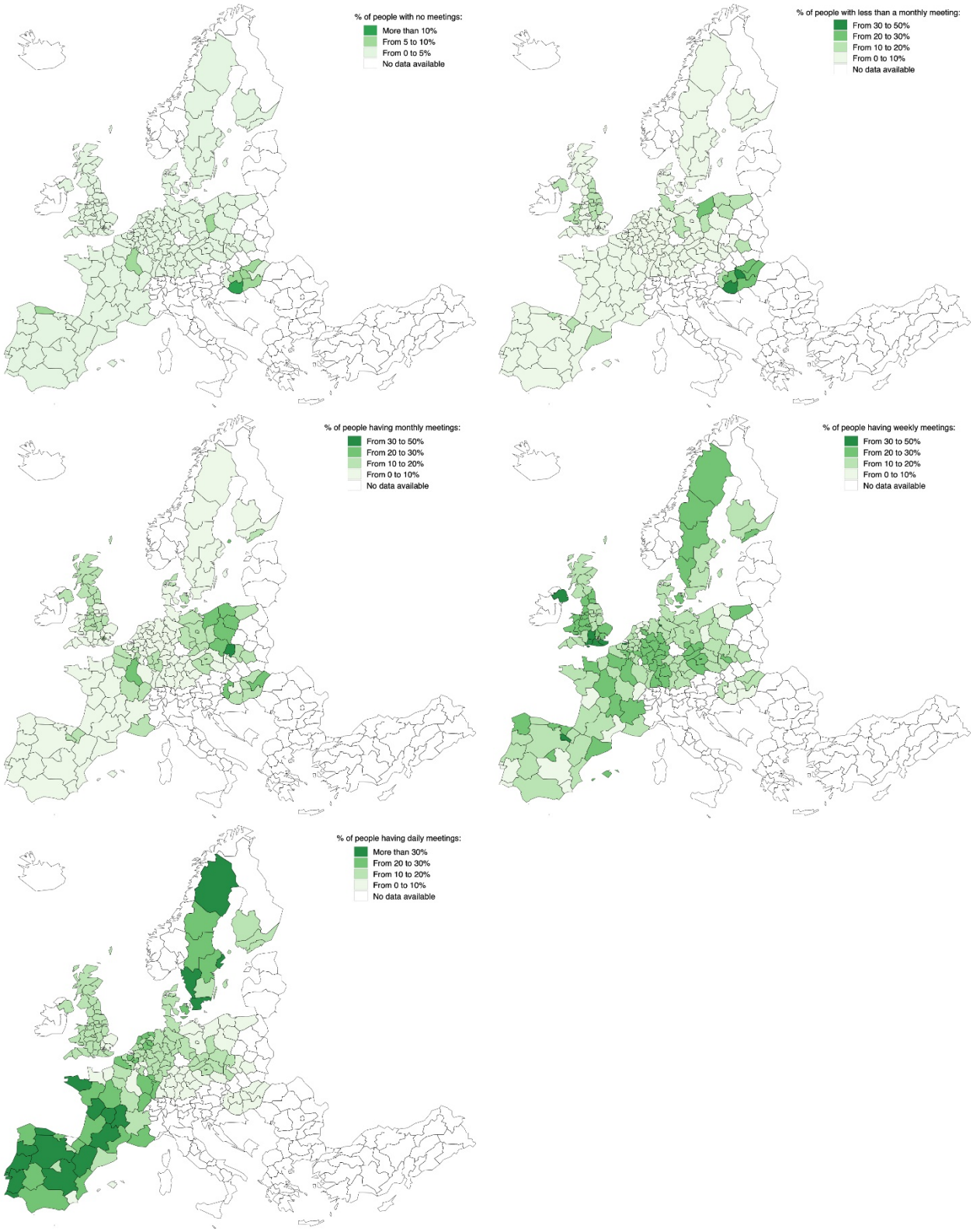
Figure 4 reports the geographical distribution of the sociability index. It is worth noting that, as is the case in the USA (Klinenberg, 2012), alone living in Europe does not equate

to being lonely. Many of the regions with a high concentration of people living alone, such as Brussels, most UK regions, Franche-Comté in France or Schleswig-Holstein in Germany, have a high sociability index as well.

The second set of measures deals with each single level of personal interactions, grouped in the following five categories: *never meet*, if the frequency of meeting with friends, relatives or work colleagues was less than once a month (answer: *never* or *less than once per month*); *monthly*, calculated as the sum of answers of meeting *once a month* or *several times a month*; *weekly*, if meetings took place once, or more than once, a week; and *daily*, if the answer was everyday meetings. The value of each category was then divided by the total number of survey's respondents in each single region and year to obtain a weighted measure over the population per region.

Figure 5 reports the number of interpersonal contacts according to these categories in 2017, while the same maps for year 2011 are reported in Figure A1 in the Appendix. In 2017, the population who had daily social meetings with friends, relatives or co-workers formed the largest group. Those reporting less than monthly meetings represented a very small share of the population. However, differences across regions and countries were stark. The Portuguese and the Spanish, but also the French and Swedes were far more likely to have daily meetings than Czechs, Hungarians, Poles or even British and Germans (Figure 5). In France the contrast between the more sociable southern French and the lonelier northerners was also strong. In most countries there is also an evidence of greater sociability in more sparsely populated, frequently rural, regions, and lower levels of daily interaction in cities. But there are exceptions, as daily meetings in London or in Stockholm, were higher than in the rest of the country.

Figure 5. Percentage of the population interacting with friends, relatives and co-workers on a daily, weekly, monthly and less than monthly basis (2017).



Source: Authors' elaboration.

The percentage of people with no meetings was below 5% of the population in the majority of European regions, with the main exception of Hungary, where it exceeded 5% across the country and even went over 10% in some regions.

Having the social index and the five types of personal interactions allows us to provide a possible explanation of how people living alone but with a different number of contacts may affect regional economic growth.

To control for other possible factors that may influence the outcome of the analysis, we introduce a set of control variables. These are indicators that, according to the literature on economic growth, shape the economic performance of European regions. They include: *population density*, computed as the population per squared kilometre; the percentage of people older than 65 in 2011, *elderly population*, to understand if living alone is also driven by the share of elderly people in the society (Band-Winterstein & Manchik-Rimon, 2014); the level of education, *education*, proxied by share of the adult population with higher education (ISCED 5 to 8 level); *GDP*, as a proxy for regional agglomeration (Combes et al., 2011); and *GDP per capita* in levels to control for the level of development of a region.

As far as institutions can shape the economic performance of regions in Europe (Rodríguez-Pose and Ketterer, 2020), we introduce in the model *government quality* as an additional control (Charron, Lapuente, & Annoni, 2019). Government quality is a composite indicator that takes into consideration not only the perception of the quality of public services, but also the level of corruption, and the nonarbitrary forms of government, i.e., impartiality.

The variables description and summary statistics are reported in Tables A1 and A2 in Appendix.

3.2 Empirical strategy

Due to the nature of some of our variables, like living alone and the share of elderly, which are available only for 2011, we adopt an Hausman Taylor (HT) econometric approach. Panel analysis with fixed effect models are not suitable in the presence of time-invariant regressors, and random effects are not robust when unobserved region-specific effects are correlated with other independent variables (Hausman, 1978; Cameron and Trivedi, 2010; Rodríguez-Pose and Ketterer, 2012). Thus, the HT approach solves the problem by fitting a random-effects model including some of the variables not correlated with other regressors as instruments of the endogenous (time-variant) factors (Baltagi et al., 2003). This renders HT basically a mix of fixed and random effects estimations, by using the within transformation of the time-variant variables, while simultaneously calculating the coefficients for the time-invariant variables. The equation behind the model is as follows:

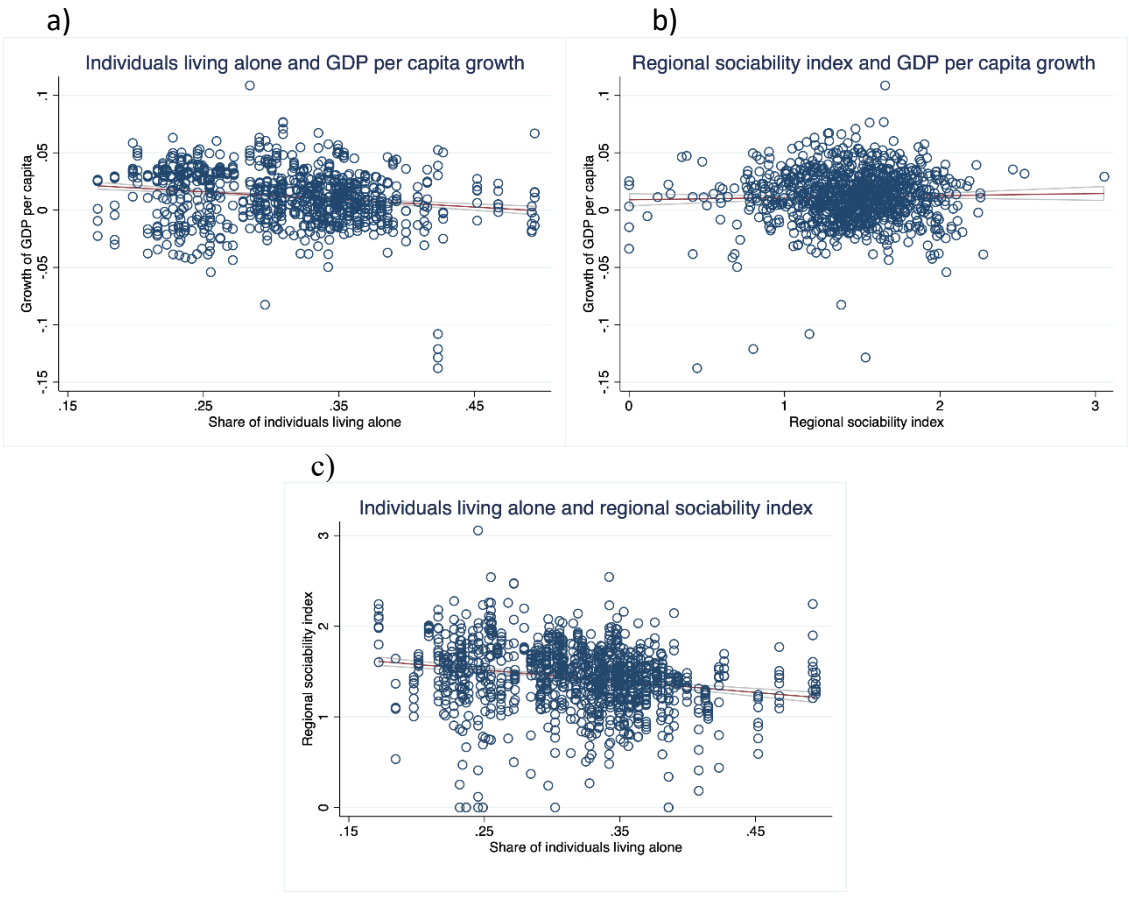
$$Y_{it} = \alpha_0 + \beta_1' X_{1it} + \beta_2' X_{2it} + \delta_1' Z_{1i} + \delta_2' Z_{2i} + \mu_i + \varepsilon_{it}$$

Where *i* stands for the number of regions *i* = 1, 2, ..., 139, time is the time period *t*= 2011, 2012, ..., 2017. $X_{1it}$is a vector composed by the time-variant regressors which are uncorrelated with μ_i, while X_{2it} are those variables correlated with μ_i. The same logic is applied with Z_{1i} and Z_{2i} for the time-invariant regressors. Thus, the HT model uses the information already included in the model to instrument X_{2it} and Z_{2i}, and prevents possible biases caused by random-effects estimator (Baltagi et al, 2016; McPherson and Trumbull, 2008). Finally, we include in the model year dummies and regional (NUTS2) dummies to control for further omitted variables bias. We cluster standard errors at regional NUTS2 level.

3.3 Correlation between growth and the different dimensions of solitude

When considering the correlations between alone living and loneliness, on the one hand, and economic growth on the other, we find that there seems to be virtually no relationship between these two dimensions of solitude and recent levels of regional economic performance in Europe. As can be seen in Figure 6, the fitted regression line between growth and alone living (6a) and the sociability index (6b) is almost flat. In principle, these different forms of solitude seem not to matter for the economic trajectory of regions.

Figure 6. Correlation between growth and a different dimensions of solitude and between alone living and the sociability index.



There is also virtually no correlation between the share of individuals living alone in a region and the regional sociability index (Figure 6c). The slope of the regression line is

marginally negative —there tend to be more people meeting others in regions where the proportion of people living alone is lower— but the relationship is not significant.

4. Results

Table 1 reports the results of the baseline model where the sociability index (our indicator of loneliness) and the share of single person households (our indicator of alone living) are considered for the 139 regions included in the analysis.

In column 1 and 2 we introduce the sociability index and the share of individuals living alone separately respectively, while in column 3 we include them together.

Table 1. Degree of sociability and share of individuals living alone and economic growth

Dept variable: Growth of GDP per capita	(1)	(2)	(3)
Regional sociability index	0.006**		0.006**
	[0.003]		[0.003]
Share of individuals living alone		3.934***	3.743***
		[1.126]	[1.096]
Population density (ln)	-0.403***	-0.419***	-0.403***
	[0.085]	[0.089]	[0.085]
GDP (ln)	0.189***	0.185***	0.189***
	[0.045]	[0.048]	[0.045]
Government quality	0.002	0.002	0.002
	[0.004]	[0.004]	[0.004]
Education	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]
GDP per capita	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]
Elderly population	-7.163***	-7.852***	-7.408***
	[2.236]	[2.352]	[2.248]
Country dummies	YES	YES	YES
Time dummies	YES	YES	YES
Observations	973	973	973
Number of ID	139	139	139
Wald Chi-2	562.4	575.1	602.9
Prob > Chi2	0	0	0

Note: Clustered standard errors at regional NUTS2 level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

The results go in line with hypotheses H_1 and H_3. First, regions with on average a more sociable population have, in accordance with H_1, grown more during the period of analysis than those where the share of lonely individuals is higher. More interaction within a society seems to be a driver of economic activity and growth. Similarly, and in agreement with H_3, the share of individuals living alone is connected with a higher regional economic performance. In both cases the coefficients are positive and highly significant at the 1% level for alone living, and 5% for the sociability index. These results suggest that having a higher share of young adults living alone but remaining sociable in European regions —a situation similar to that described by Klinenberg (2012) for the case of the US— is conducive to greater economic growth. Individuals who live alone but are not lonely enhance the economic wealth of the regions they live in.

Some of the control variables have also contributed to significantly shape the economic performance of European regions in recent years. Ageing societies, for example, represent an important barrier for regional growth (Mund, Lüdtke, et al., 2020). Economic agglomeration is connected to greater per capita economic growth, aligned with the predictions of the new economic geography. Agglomeration also trumps density in terms of generating growth (Table 1).

But do variations in the prevalence of loneliness across the population make a difference for economic growth? This is what we tackle in H_2, where we posit that there might be a 'sweet spot' for economic growth between having a large share of the population isolated and rarely meeting others and, conversely, spending large chunks of their time providing often needless chatter, while smoking a cigarette or sipping coffee in bars or cafés. To do that, we unpack the sociability index into five categories, with the aim of understanding

better if changes in the prevalence of the frequency of social interactions among the regional population are linked to changes in GDP per capita.

Table 2. Frequency of social meetings and economic growth

Dept variable: Growth of GDP per capita	(1)	(2)	(3)	(4)	(5)
Share of regional population by frequency of social meetings					
Never	0.125*				
	[0.067]				
Less than once per month		0.037			
		[0.028]			
Monthly			-0.029		
			[0.025]		
Weekly				0.040*	
				[0.020]	
Daily					-0.035**
					[0.27]
Share of individuals living alone	3.893***	3.939***	3.951***	3.940***	3.855***
	[1.126]	[1.128]	[1.124]	[1.127]	[1.133]
Population density (ln)	-0.416***	-0.420***	-0.421***	-0.420***	-0.411***
	[0.088]	[0.088]	[0.088]	[0.088]	[0.088]
GDP (ln)	0.189***	0.187***	0.182***	0.186***	0.184***
	[0.047]	[0.048]	[0.048]	[0.047]	[0.048]
Government quality	0.002	0.002	0.002	0.002	0.003
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Education	0.001	0.001	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
GDP per capita	0.001	0.001	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Elderly population	-7.725***	-7.852***	-7.894***	-7.876***	-7.681***
	[2.353]	[2.343]	[2.345]	[2.360]	[2.357]
Country dummies	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES
Observations	973	973	973	973	973
Number of ID	139	139	139	139	139
Wald Chi-2	598.7	540.8	525.3	577.1	568.6
Prob > Chi2	0	0	0	0	0

Note: Clustered standard errors at regional NUTS2 level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

The *a priori* expectations are, to a considerable extent, confirmed by the results presented in Table 2. Each column reports the coefficients for five categories of prevalence of different frequencies of interpersonal contacts, starting from the share of regional individuals that report no in-person meetings at all (*Never*) in column 1 to regions with high shares of people who interact socially with others on a daily basis (*Daily*) in column 5.

The sociability 'sweet spot' seems to be connected to having a large share of individuals who meet with friends, relatives and co-workers on a weekly basis. Shares of population meeting others on a monthly or less than monthly basis have less of a sway over economic growth. By contrast, in those places like most of Portugal, many parts of Spain or southern France or Sweden, where daily meetings are the norm, the levels of growth are lower, once other factors are controlled for. When a larger share of the population has what can be considered far too frequent meetings, the economic benefits of greater interaction may disappear, while simultaneously the negative effects are boosted. The only result that goes against expectations is that of the positive and significant coefficient for the shares of population claiming never to meet others. Having a non-negligible share of people that can be considered as anti-social —often so-called *nerds* or *geeks* that prefer, if at all, to meet others online rather than in person— may not only not be detrimental for growth, but can contribute to promote economic activity at an aggregate level. This result points to the economic implications of 'aloneness,' that is the presence of people that choose, but are not forced, to be alone (Leontiev, 2019). That is, people that decide to be not sociable but remain satisfied with their lives. Thus, the presence of relatively high shares of population with very limited or no in-person social interaction —many of whom live alone— may not be detrimental for growth. High shares of people being alone and lonely can be a driver of economic growth in European regions. By contrast, relatively high shares of people that are too social and/or have an intense social life can be detrimental for economic growth in some European regions.

The living alone variable is always positive and highly significant, regardless of the shares of people that report different frequencies of social interactions, confirming once again that high percentages of single-person households are far from harmful for the economic

growth of European regions. They, in fact, contribute to generate greater regional economic dynamism. The coefficients of the control variables conform to those reported in Table 1.

5. Conclusions

In this paper we have examined how different forms of solitude —loneliness and alone living— have affected the economic performance of European regions. The aim has been to bring attention to a topic that is becoming more and more visible and address an important gap in our knowledge, as the research considering the economic implications of the wave of alone living and of the 'epidemic of loneliness' (Kar-Purkayastha, 2010) is virtually inexistent.

Given the pioneering and exploratory nature of this research, there are inevitable shortcomings. Data shortages are the main limiting factor. Existing data on alone living and, especially, on loneliness at subnational level is testing. With existing data, the feasibility of distinguishing different degrees of solitude by gender, age, economic, social or health status is extremely limited. Nor is it possible to identify shares of population living alone or lonely as a result of choice or being driven into solitude without them wanting it. The data limitations at subnational levels of surveys like the ESS and EU-SILC also play a part. We are forced to aggregate data on the basis of surveys with limited numbers of individuals per region, something that may have implications on how representative they are and on the results. This type of analysis may also not be exempt from selection bias. However, we are examining a trend that is becoming so prevalent that cannot be simply waved away on the basis that the data are insufficient or imperfect.

The analysis, developed using a panel covering the period between 2011 and 2017, shows that the rise of solitude, while potentially having pernicious health, mental health and social consequences, both at the individual level and society as a whole, does not pose the same threat from an economic perspective. Greater shares of people living alone may, indeed, be a substantial driver of economic growth across European regions. Our results show that the proliferation of single-person households is positively connected to growth in all the specifications tested. The increasing wave of people choosing to live alone — rather than being forced to by external circumstances— can propel economic growth, provided they remain active in the labour force and willing to network and interact with others.

The 'loneliness epidemic,' in contrast, can have damaging economic consequences. A society with a greater percentage of people feeling lonely maybe one where health and mental health problems abound and where depression and desperation are rife. Loneliness undermines the capacity of the workforce as a whole and generates additional health, psychological and social burdens that have important economic implications. More lonely people may imply less interactions that, according to many social science theories, represent the foundation for knowledge generation and diffusion. The result will be less economic growth. The connection between loneliness and economic growth, however, depends on factors such as the frequency of meetings by the population. Too much interaction, such as the prevalence of daily meetings, can undermine the benefits of in-person exchanges. Societies where a large share of individuals meet on a less than weekly basis are also less likely to grow. The 'sweet spot' seems to be related to large shares of the population meeting with friends, relatives and co-workers on a weekly basis. However, and in contrast to expectations, having a relatively high share of highly lonely

people —those that declare never to meet others in person— is not only not detrimental for growth, but is connected with a better regional economic performance. This is probably linked to the potential benefits of aloneness, or the presence of individuals choosing to live alone from society, but still satisfied with their lives (Leontiev, 2019).

So, alone living and loneliness affect economic activity and performance. But what can be done in order to make sure that the potential benefits of solitude are maximised while its downsides kept at bay? As highlighted earlier, the exploratory nature of this study, aimed to bring attention to a topic —that of the economic consequences of the rise in solitude at an aggregate, regional level— that has been unfolding under our noses but has attracted virtually no attention and the limitations in terms of data, make moving from the scientific to the policy realm highly adventurous. Moreover, it is not always clear that governments and administrations should intervene in areas that belong in the sphere of the individual, fundamentally when any form of solitude can at times be the result of personal choices. Having said that, the economic consequences of rising solitude are, as we have shown, important and governments should start thinking about them not just at the individual, but also at the aggregate level. In terms of alone living, given its potential economic benefits, it might be the case that the possibility of encouraging choice may be put on the table. In many regions of Europe young professionals can live alone if they choose. In other parts of Europe, high levels of youth and young adult unemployment, the prevalence of temporary and/or precarious employment, and rigid labour markets and education systems often prevent many young adults from living on their own. The phenomenon of the *mammoni* or *vitelloni*, young adults living with their parents well into their thirties, is not exclusive to Italy. It prevails across many regions in other southern European countries. This, as our study confirms, can have detrimental effects for

economic dynamism, both at an individual and aggregate level. In these cases, considering facilitating choice for alone living is something that should be on the agenda of different governments.

Greater intervention might be required to combat loneliness. This could be more effective when addressing its roots in order to prevent or minimise its negative collective health, well-being, social and economic consequences. This, however, needs to be done while respecting those that, for whatever reason, prefer to be alone.

On the whole, we have brought attention to a phenomenon that is becoming pervasive and can have significant economic consequences at a regional level across Europe and that should be higher up the political agenda. The rise in different forms of solitude across the whole of Europe and its economic consequences deserve far greater attention than it has been afforded until now.

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APPENDIX

Table A1. Variables' description and summary statistics.

VARIABLES	Source	Description	Mean	St. Dev.	Min.	Max.
Growth of GDP per capita	EUROSTAT	Annual growth rates GDP per capita	0.0116	0.0224	-0.138	0.109
Share of individuals living alone	EUROSTAT/ SILC survey	Single person per household (living alone) in 2011	0.316	0.0621	0.172	0.494
Regional sociability index	ESS survey	Standardize measure for the total number of meetings	1.429	0.396	0	3.057
Never	ESS survey	Percentage of people with no interactions	0.016	0.024	0	0.238
Less than once per month	ESS survey	Percentage of people having seldom interpersonal contacts (less than a month)	0.068	0.066	0	0.473
Monthly	ESS survey	Percentage of people with monthly interpersonal contacts	0.089	0.052	0	0.397
Weekly	ESS survey	Percentage of people with weekly interpersonal contacts	0.174	0.055	0.007	0.642
Daily	ESS survey	Percentage of people with daily interpersonal contacts	0.163	0.102	0	0.746
Elderly population	EUROSTAT/SILC survey	Percentage of people older than 65 y.o. over the total population in 2011	0.174	0.0290	0.0981	0.248
Population density (ln)	EUROSTAT	Population density	5.244	1.396	1.203	10.45
GDP (ln)	EUROSTAT	Regional GDP	10.56	1.094	6.957	13.30
GDP per capita	EUROSTAT	Regional GDP per capita	36.49	43.24	5.366	351.0
Education	EUROSTAT	Tertiary education – ISCED 5-8	25.19	6.984	7.800	51.40
Government quality	QOG	Quality of Government	0.423	0.760	-1.907	2.714

Table A2. Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) PC_GDP_growth	1.000													
(2) i_soc_index	0.033	1.000												
(3) Living alone	-0.185*	-0.182*	1.000											
(4) never_meet	0.205*	0.273*	-0.194*	1.000										
(5) less_monthly	0.290*	0.166*	-0.226*	0.656*	1.000									
(6) monthly_meet	0.264*	0.084*	-0.199*	0.327*	0.566*	1.000								
(7) weekly	0.009	-0.081*	0.038	-0.181*	-0.178*	0.036	1.000							
(8) daily	-0.233*	0.125*	-0.162*	-0.272*	-0.488*	-0.586*	-0.310*	1.000						
(9) ln_DEN	-0.018	0.025	0.223*	-0.068*	-0.018	-0.005	0.162*	-0.247*	1.000					
(10) ln_GDP	-0.082*	0.155*	0.234*	-0.218*	-0.263*	-0.175*	0.144*	-0.002	0.613*	1.000				
(11) qua	-0.273*	-0.143*	0.494*	-0.512*	-0.619*	-0.456*	0.123*	0.207*	0.098*	0.286*	1.000			
(12) ISCED	-0.162*	0.017	0.282*	-0.273*	-0.305*	-0.257*	0.233*	0.033	0.367*	0.458*	0.406*	1.000		
(13) i_pcgdp	-0.061*	0.058*	0.234*	-0.114*	-0.135*	-0.073*	0.198*	-0.091*	0.610*	0.641*	0.351*	0.369*	1.000	
(14) elderly	-0.138*	-0.004	0.276*	-0.154*	-0.232*	-0.311*	-0.080*	0.292*	-0.252*	0.085*	0.296*	-0.026	0.034	1.000

* shows significance at the .1 level

Figure A1. Percentage of meetings in 2011