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Away from the cities? A medium-to-long-term investigation of how the COVID-19 pandemic has changed population spatial patterns in Italy

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Abstract

This article focuses on the medium-to-long-term effects of COVID-19 and associated non-pharmaceutical interventions on population movements across the urban–rural spectrum in Italy. By analysing data from Facebook/Meta, population registers, and the housing market from January 2020 to May 2022, we aim to determine whether trends observed at the beginning of the pandemic have sustained over time. Results indicate an initial shift away from densely populated urban areas, marked by increased Facebook connections, higher rent prices and rising property sales in less densely populated locales. As the pandemic progressed, however, a decline in Facebook connections outside of urban poles indicated a resurgence in urban living. At the same time, intermediate and ultra-peripheral regions continued to attract permanent residents, as evidenced by a lively housing market and population growth in these areas. This suggests a complex pattern, where urban areas remain attractive, but the appeal of suburban and rural living has significantly increased, with both theoretical and practical implications. These findings challenge existing models of urbanisation and call for a re-evaluation of the factors driving residential preferences and mobility. Ultimately, a better understanding of

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these patterns could inform balanced policies that leverage internal migration dynamics, by supporting infrastructure development in suburban and rural areas, while adjusting urban planning to mitigate potential negative impacts like overcrowding and resource strain.

Keywords
COVID-19, Italy, population, rural areas, urban exodus

Introduction

The emergence of COVID-19 triggered an unparalleled global health emergency, placing immense strain on national healthcare infrastructures. Consequently, it compelled authorities at both national and local levels to implement drastic measures to curb the spread of the virus. These measures often took the shape of non-pharmaceutical interventions, prominently enforced through extensive lockdowns in Italy, marking the first instance of these widespread restrictions on this scale. Subsequently, numerous other nations followed suit, implementing analogous measures. These actions effectively halted societies worldwide, affecting every facet of social and economic life.

Early reports on the media speculated about significant changes in internal migration patterns. Reports about a rural revival (BBC, 2020; Bloomberg, 2020; Reuters, 2020) emerged because of an 'exodus' from large cities (Marsh, 2020; Oliveres and Sanchez, 2021; Paybarah et al., 2020). Individual preferences for areas characterised by low population density, isolation and open spaces (Pomeroy and Chainey, 2020), the quest for bigger houses, as well as the increase in remote working opportunities (Mariotti et al., 2022) all favoured the emergence of this trend.

Recent empirical evidence has confirmed an increase in within country migration from urban centres towards less populated areas in Europe (González-Leonardo et al., 2022a, 2022b; González-Leonardo and Rowe, 2022; Rowe et al., 2023; Stawarz et al., 2022; Vogiazides and Kawalerowicz, 2022) and globally (Borsellino et al., 2022; Fielding and Ishikawa, 2021; Perales and Bernard, 2023). In this work, we align to this stream of research and, focusing on Italy, we investigate changes in population movements on the urban–rural continuum during the COVID-19 pandemic. In particular, we analyse whether these trends have been persistent over time and thus we improve on the existing literature in three significant ways.

First, most previous works about Italy have focused on the initial period of the global pandemic, while rarely authors have gone beyond 2021. More specifically, there is a lack of up-to-date evidence on how the global pandemic has affected long-term population dynamics in Italy, although Italy represents a critical setting for this question. Based on the Eurostat classification, about 67% of Italian municipalities are classified as rural areas, 30% as towns and suburbs and only 3% as urban areas (Guglielminetti et al., 2021). In the past decades, non-urban areas are the ones which have experienced the greatest population decrease and population ageing (Reynaud and Miccoli, 2018). Thus, understanding the evolution of urban–rural population trends over time has relevant demographic and social implications.

Second, the handful of papers that have investigated the persistence of population mobility trends brought about by COVID-19 (e.g. Malka, 2023; Rowe et al., 2023; Serrano and Fajardo, 2023) report conflicting findings; therefore, greater clarity is needed. Some authors have indeed found evidence for a long-lasting trend towards the repopulation of rural areas (Malka, 2023), but others have highlighted, in contrast, how changes resulting from the pandemic were only temporary and have pointed towards an urban renaissance following the end of stricter lockdowns (Serrano and Fajardo, 2023). We posit that one reason for such inconsistencies lies in the different data and approaches taken by these works. In contrast, we try to be as comprehensive as possible in the analysis. We thus consider jointly Facebook/Meta presence data, administrative registry data and housing market data to better disentangle different mechanisms behind short- and long-term relocation trajectories.

Finally, we adopt a fine-grained classification measure, the Italian 'Classificazione delle Aree Interne',[1] which positions municipalities across the urban–rural continuum. This allows us to move beyond the typical rural versus urban dichotomy and rather obtain a very detailed picture about which areas, whether suburban areas or, rather, rural locations, might have attracted more individuals during the lockdowns and beyond.

Overall, we argue that identifying and understanding the main changes in mobility during the COVID-19 pandemic is key to identify potential future trends, that is, whether processes of counter-urbanisation or suburbanisation underpin migration movements away from cities, and, if this is the case, from cities to where (Colomb and Gallent, 2022). A critical mass of young professionals and wealthy individuals may impact the local composition of rural areas both positively and negatively. On the positive side, they can counteract the effects of an ageing population, raise local fertility rates and create demand for services. On the negative side, they can raise rental prices, increase competition for scarce public services and, more broadly, fragment the identity of fragile social ecosystems. Consequently, it is important to estimate not only how the trajectories of mobility have changed during the pandemic but also whether they have led to more permanent residential and mobility transformations.

This article is structured as follows. Section 'Background' discusses in more details what has been found in previous works, with a specific focus on the Italian case. Sections 'Data and methods' and 'Results', respectively, present the data and methods and the main results. Section 'Discussion and conclusion' concludes this article with a general discussion of the findings and their policy implications.

Background

In this section we first look at more general patterns of residential mobility around the globe after the outbreak of the pandemic and, then, we zoom in on the Italian case.

COVID-19: an urban exodus?

During the COVID-19 pandemic, the tale of an urban exodus, for which people moved from crowded city centres towards more distant and remote areas, had emerged on news outlets worldwide (Marsh, 2020). Evidence from several countries confirmed significant out-migrations from city centres towards rural and suburban areas during the early phases of the pandemic. Nonetheless, the extent to which such changes persisted is still subject to debate, as is the extent to which individuals have moved towards areas adjacent to large cities, in line with a process of suburbanisation (Lopez-Gay, 2021), or rather towards more distant, peripheral and rural areas, representing a process of rural renaissance.

In Spain, González-Leonardo et al. (2022a, 2022b) and González-Leonardo and Rowe (2022) looked at register data that allow to analyse changes of residence among 8130 Spanish municipalities in 2020 (González-Leonardo et al., 2022a) and across 2020 and 2021 (González-Leonardo et al., 2022b; González-Leonardo and Rowe, 2022). Results show that migration into urban centres significantly decreased in 2020, while rural areas registered significant net migration gains. Such effects appear to persist, although waning, over time. In fact, 2021 still recorded high levels of inward to rural areas and out-migration from cities, but outflows from the former and inflows to the latter converged to pre-pandemic levels, resulting in net-migrations figures close to those observed prior to COVID-19 (González-Leonardo et al., 2022b; González-Leonardo and Rowe, 2022). Serrano and Fajardo (2023) also considered Spanish population registers, providing an even more detailed analysis on population dynamics. They observed a decrease in urban population between 2020 and 2021, but a renewed increase during the period from 2021 to March 2022. Patterns for rural areas differ depending on their accessibility level. More accessible rural areas experienced an overall increase in population, although more marked in the first phase of the pandemic. Differently, the increase in population of more remote areas was relevant only in the first period of the pandemic while these same areas experienced a decline, although to a

lower extent than before 2020, at later stages. In the United Kingdom, the Office for National Statistics (ONS, 2020) found a clear pattern of population density decrease in London and in the rest of the country and an increase in coastal towns (either small or large) during July and August 2020. While this was quite foreseeable, it is interesting that, differently from previous years, the trend continued also in September, suggesting that residential choices might have changed. Findings from Germany point to an upsurge in net population losses in large cities, jointly with continuous inflows in rural and hinterlands areas (Stawarz et al., 2022). Vogiazides and Kawalerowicz (2022) showed how Sweden's capital was among the most affected areas by the global pandemic, with people moving out of Stockholm towards suburbs and small municipalities outside the main urban core. A similar pattern has emerged elsewhere in Europe and across the world such as in Japan (Fielding and Ishikawa, 2021) and Australia (Borsellino et al., 2022). Nonetheless, using household-level longitudinal data in combination with aggregate-level migration statistics, Perales and Bernard (2023) found that in the Australian context, the pandemic precluded movement from regional areas towards urban cores, but did not result in a statistically significant increase in moves from capital cities to regional areas across 2020 and 2021.

Some authors opted to utilise dynamic and real-time data sources rather than relying on more established registry data. For instance, Denis et al. (2020) used data from Facebook/Meta users to evaluate how non-pharmaceutical measures impacted overall mobility in India. Their analysis revealed that urban areas experienced a significant population decline, whereas rural areas saw an increase in inhabitants. Rowe et al. (2023) also exploited the same data source, studying population movement across the rural–urban continuum from March 2020 to August 2021 in the United Kingdom. They discovered a higher-than-average mobility from high-density population areas to low-density areas, indicating a trend of movement away from large cities, especially during the two strict lockdown periods. However, this migration pattern did not persist over time, as evidenced by a reduction in movement to low-density areas and an increase in mobility towards high-density agglomerations following the easing of strict lockdown measures. Still in the United Kingdom, Wang et al. (2022) leveraged Twitter data and identified a comparable trend of individuals relocating from large cities to nearby rural areas, both before and during the peak of the pandemic. However, in contrast to Rowe et al. (2023), Wang et al. (2022) noted that, while fewer people left major urban areas in 2021 as compared to 2020, most individuals who had left in 2020 had not yet returned to big cities by the end of 2021. Gibbs et al. (2021) also harnessed Facebook/Meta data to estimate that, between March 2020 and March 2021, low-density areas in the United Kingdom experienced lower population declines than urban areas. However, the duration of these effects remains uncertain.

Finally, papers exploiting housing market data confirm that, during the pandemic, cities became less attractive, as compared to non-urban areas. Research in the United States has pointed towards a donut effect (Ramani and Bloom, 2021) caused by COVID-19, reflecting the hollowing out of city centres and growth of suburban outer rings. González-Leonardo et al. (2023) analysed housing transactions in four territorial typologies (i.e. core cities, suburbs, towns and rural areas) in Spain between 2017 and 2022. While the total number of housing transactions declined during the national lockdown (spring 2020), it bounced back again later, particularly in rural areas, marking a persistent rise in internal migration movements to these areas since the outbreak of COVID-19 up to 2022. In France, Breuillé et al. (2022) exploited data from the online real estate agency MeilleursAgents between January 2020 and September 2021 and found that, starting from the spring of 2020, there has been an increase in interest in moving away from urban areas and relocate to more rural municipalities, especially after the third and fourth lockdown (fall/winter 2020–2021). Finally, a comparative analysis taking into account 11 case studies across the world, including, among others, the Ile-de-France region (Paris, France), the Greater London region (UK), the New York City region (USA), the metropolitan areas of Naples (Italy) and Toronto (Canada) found evidence for a decrease in prices in urban areas, coupled with an increase demand in properties in the countryside

and generalised higher prices in rural and suburban areas (Tamine, 2022).

The Italian case

Italy has been the first European country affected by COVID-19, and, as such, it has attracted lot of attention when it comes to understanding the consequences of the pandemic and the implementation of non-pharmaceutical restrictions such as lockdowns.[2]

Some authors have focused on the spatial mobility implications of such policies in Italy. Most of these works have built upon almost real-time large-scale data sets to estimate origin–destination movements between Italian provinces (Pepe et al., 2020), individual mobility patterns (Caselli et al., 2020), and variation in mobility related to economic variables such as the area's demographic characteristics (Galeazzi et al., 2021) as well as fiscal capacity and income inequality (Bonaccorsi et al., 2020). Beria and Lunkar (2021) performed an in-depth analysis of mobility during the COVID-19 first outbreak and lockdown in 2020 using the data provided by Facebook/Meta Data for Good programme. Among other questions, they investigated where people spent the lockdown and, coherently with what witnessed in other countries, they found evidence for a decline of population in big cities. Beria and Lunkar (2021) argued that, overall, people mostly concentrated in suburban and peripheral areas, rather than marginal and rural locations. The authors explained this finding with the stop of commuting patterns and return to individuals' place of origin, which is often inside the same region. Lanza et al. (2022) used phone data to zoom into the specific case of the Apennine area of the province of Piacenza, a representative case of Italy's marginal areas, assessing human presence before (2019) and during (March and September 2020) the lockdown. Among their findings, residents seem to have re-oriented their living preferences following the pandemic outbreak and the most remote municipalities, with limited Internet and transport connections, seemed to have lost attractiveness in favour of better connected municipalities.

Some authors have considered more in depth how socio-economic dynamics have influenced mobility patterns. For example, Gauvin et al. (2021) analysed the determinants of spatial variations in mobility during the first wave of COVID-19, considering both provinces and city neighbourhoods. They found evidence for a persistent desertification of historic city centres and stressed the role of the local structure of the labour market and other demographic factors, such as population's age and sex composition, to explain mobility variations at the provincial level. Along the same lines, Bonaccorsi et al. (2021) using Facebook/Meta data found that higher- and lower-income areas displayed different trajectories of recovery, with poorer areas displaying, up to October 2020, lower mobility than pre-lockdown level, reinforcing pre-existing dynamics of economic segregation.

The research by Guglielminetti et al. (2021) is also relevant for this work. The authors used housing transactions and online housing search data to estimate the impact of the COVID-19 pandemic on housing demand in Italy. By adopting a density and distribution-based measure, they distinguished between cities, towns and suburbs, and rural areas. They found an increase in housing demand both in suburbs and rural areas, as compared to cities, in correspondence of the lockdown. Nonetheless, they highlighted how such demand was highly driven by the characteristics of the dwelling, that is, larger size, presence of a terrace or garden. Guglielminetti et al. (2021) also stressed how, even in 2020, demand was still strong in cities, downplaying the idea of a definitive loss of attractiveness of large cities in favour of rural places.

Overall, the literature does not point towards a clear prediction about the long-term effects of the COVID-19 pandemic on population movements across the urban–rural continuum. Consistently with other evidence, we can hypothesise a decrease in the population of big cities at the beginning of the pandemic. However, we do not make any a priori prediction about whether this trend is persistent over time, in such a way that we continue to observe an increase in the population of more rural areas or, rather, a come back to pre-pandemic trends and levels.

Data and methods

In this section, we first present the different data sets we use in the analysis. We then focus on the main measures and on the methods employed.

Data and outcomes

This article exploits a four different data sources at the municipal level. Although we anticipate a uniformity of findings across the various data sets we use, it is important to note that each of them offers distinct advantages and insights. Specifically, we exploit data about active Facebook users and average renting prices to proxy temporary relocations, while we use an index of overall housing market dynamism and the administrative residency register to proxy more permanent relocations. Facebook data are likely to provide the most immediate and real-time information about individuals' presence and activities. Data on rental prices allow us to gauge immediate affordability, reflecting short and medium-term shifts influenced by dynamic market conditions. Conversely, data pertaining to housing transactions and demographic information about the place of residence capture more permanent adjustments, offering valuable insights into long-term trends and tendencies within the population's housing choices. This multifaceted approach allows us to gain a comprehensive understanding of mobility patterns while considering both short-term fluctuations and long-term trends. This is important to explore nuances in mobility tendencies beyond the early phases of the COVID-19 pandemic.

We now introduce each of the four indicators in more details.

First, we follow previous analyses (Beria and Lunkar, 2021; Bonaccorsi et al., 2020; Galeazzi et al., 2021) and use Facebook Disaster Maps data, available via the Facebook/Meta Data for Good initiative (Maas et al., 2019). These data contain spatial and temporal information about presences, based on the behaviour of Facebook users with active Global Positioning System (GPS) and active location history. Meta (former Facebook) has released in the last few years aggregated data on the overall number of active users per different spatial units per day, worldwide.

These data fill a gap in understanding spatial and temporal behaviours of population. However, the sample includes only active users, whose composition inevitably might change over time due to uncontrollable factors such as generational habits, temporary trends and the prevalence of social networking. Nonetheless, these data can serve as an instantaneous indicator of population mobility and an indirect measure of people's presence during the period in question, aspects usually not captured in official statistics.

Data on Facebook presences are detected passively and is fully anonymised. In the case of Italy, data are available geo-tagged for the whole country (Italy Coronavirus Disease Prevention Map package), and for comparability purposes, we aggregate the data using administrative boundaries at the municipality level. Facebook data cover the period between March 2020 and May 2022. For each day, there are three measurements, that is, active users, at a time frequency of 8 hours related to a spatial matrix of equidistant points over the Italian surface. To obtain a data set of Facebook's users at the municipality scale, first, we calculate, for each point, the average of the three 8-hourly observations to get the daily average. Second, we match the points with the official code of the municipality they belong to. Finally, we sum up the daily averages per points to get the daily average per municipality. For municipalities which do not have at least 10 Facebook presences, we assign to them a threshold value equal to seven to avoid big jumps from zero. Prior to choosing this value, as a robustness check, we tried different thresholds to make sure this decision did not significantly impact the results. Finally, we create a Facebook population measure, which provides the number of active Facebook users in a specific municipality. We use this measure as a proxy of temporary presences.

Second, we use data on average renting prices and housing transactions derived from the Italian observatory of the housing market (OMI – Osservatorio del Mercato Immobiliare) a branch of 'Agenzia delle Entrate', the Italian Tax and Revenue Service. OMI provides updated real estate data on different topics providing the opportunity to comprehensively study recent dynamics in the housing market at the national scale. The real estate values identify, for every delimited homogeneous territorial area (OMI zone) of each municipality, a minimum/maximum range of price per square metre, by property type and state of preservation. As many municipalities have a limited number of transactions per year, the available data may be influenced by the low representativeness of the sample. Nevertheless, the analyses provide an overall up-to-date and dynamic picture of the changes in the real estate market at the

national scale. The OMI database provides information on different types of building units. For the aim of this work, we select only those types classified as residential buildings. OMI data are available every 6 months. For comparability with the other data sources, we (1) aggregate[3] all values at the municipal level and (2) we consider data for the second semester (S2) of each year of interest, that is, S2/2019, S2/2020 and S2/2021. We create an indicator of the average renting price by taking into consideration the residential renting values of the different OMI zones per semester. This measure is also used as a proxy of temporary presences.

From the OMI database, we also retrieve information on housing market dynamism, which serves as a proxy for more permanent presences. Instead of a crude measure of housing transactions, we choose the more balanced index of dynamism of the housing market (in Italian, Intensità Mercato Immobiliare or IMI). This index represents the ratio between the number of housing transactions happening in a certain area at a certain time and the available housing stock. As for the renting price, we measure it as the average at the end of S2 of each year (2019, 2020, 2021). IMI is particularly interesting as it captures any transaction in the housing market, including, for example, second homes rental and acquisitions, and it is therefore a good indicator of the attractiveness of places.

Finally, we utilise various information obtained from the national statistical agency ISTAT (2023), which annually releases individual-level data across a range of domains. We focus on changes in the number of residents. This information is gathered through administrative processes at the individual scale within different municipalities and then aggregated at the municipality level. ISTAT provides access to data sets on the number of residents on a yearly basis, collected as of January 1st each year. We analyse these data over a 3-year period (2020–2022) and use it as a proxy for more permanent presences and relocation decisions.

Main independent variable: the 'Aree Interne' classification

To operationalise where an area sits along the urban–rural continuum, we exploit a methodology developed by ISTAT (2021) and defined as 'Aree Interne' classification. Italian municipalities are categorised based on the number of services available and from the relative distance from each service in six categories. Urban and inter-municipal[4] poles of attraction are those able to offer services connected to education (a full range of secondary education), healthcare (at least one emergency care hospital) and mobility (at least a medium-small railway station). The remaining municipalities are classified as outlying areas, intermediate areas, peripheral areas and ultra-peripheral areas, based on an accessibility indicator calculated in terms of the number of minutes taken to get to the nearest urban pole (ISTAT, 2022). Overall, urban poles and inter-municipal poles of attraction account for about 3.1% of all Italian municipalities. Outlying municipalities are about 48.4%. Finally, the last three categories account for 48.5% of the total municipalities. In the map (Figure 1), retrieved from the Italian Government Department for Territorial Cohesion,[5] we present the distribution of the different categories on the Italian territory.

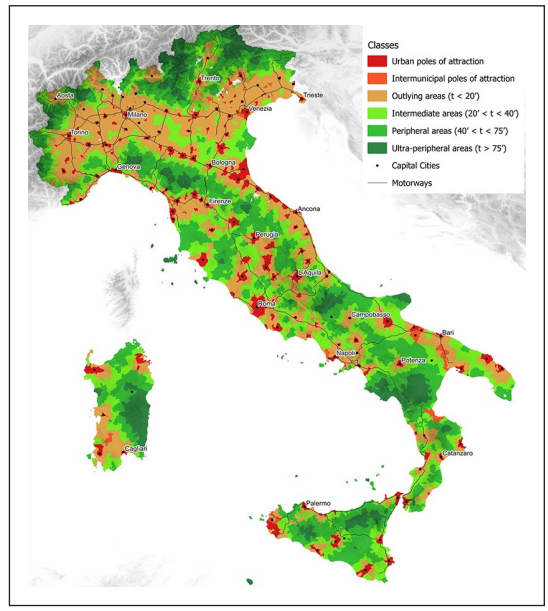

Figure 1. Map of Italy's 'Classificazione delle Aree Interne'.
Source. Italian Government Department for Territorial Cohesion.
Notes: t = average time in minutes to reach the centroid of the nearest pole.

Table 1. Mean values of relevant indicators by Italian classification (2020–2022).

'Aree Interne' Classification	Facebook presences	Renting price	IMI	Residents
Urban poles of attraction	6822	4.811	0.020	112,951
Inter-municipal poles of attraction	1790	4.549	0.020	26,929
Outlying areas	489	3.328	0.017	6220
Intermediate areas	267	2.788	0.012	4210
Peripheral areas	158	2.674	0.010	3085
Ultra-peripheral areas	74	3.248	0.008	1908
All	522	3.109	0.0142	7532

Data sources: Facebook/Meta, IMI and ISTAT.
Notes: Based on author's calculation.

In Table 1, we present mean values statistics for each outcome, pooled across all years, based on the official Italian classification of 'Aree Interne'. What emerges from the table is that urban poles tend to attract the greatest number of presences (and demand, when it comes to housing-related indicator), as all mean values are larger for this category. The further from urban poles, the lower are the indicator scores, with the only exception of renting prices in ultra-peripheral areas. This might be explained by the fact that many highly seasonal mountain and sea towns belong to this category.

Control variables

In the empirical analysis, we additionally control for a set of confounders, while trying to keep the model as parsimonious as possible. Specifically, we control for region (20 Italian regions) and tourism categorisation (operationalised in six categories that range from non-touristic to extremely touristic, retrieved from ISTAT in 2022). We also control for population change between 2011 and 2019 (continuous value, retrieved from ISTAT), and a series of demographic characteristics retrieved from ISTAT retrieved in the latest available year depending on their availability: population density (2020), the proportion of foreign residents (2020), overall level of unemployment (2019), an index of deprivation of the area (2014) and access to Internet (2018)[6] (continuous, proportion of total household not served by wireline network, this is retrieved from the Authority for Communications Guarantees [AGCOM], which is the regulator and competition authority for the communication industries in Italy). Only for the rental market, we also control for the prevailing residential building type (classified according to the official rules as: standard housing; economic housing; small and large villas; residential mix; no prevalent type,[7] retrieved from OMI).

Methods

Since we are interested in the evolution in the four indicators of interest, we calculate the rate of difference for each outcome based on the following

$$\Delta Y = \frac{(Y_{i,t} - Y_{i,b})}{Y_{i,b}}$$

where the variation in the indicator value (ΔY) is equal to the ratio of the difference between the indicator value for each municipality i at time t and the indicator value for each municipality i at baseline time b, and the original value at the baseline b. We additionally censor the rate of change at the 0 and 99th percentile to exclude outliers.

Baseline values differ, depending on the specific indicator. For Facebook data, we select as baseline the 3rd of March 2020. We select this day because of data availability reasons and because, as a Tuesday (weekday) prior to the start of any lockdown measures including school closures, we expect it to be representative of a 'typical day' in terms of where people are.[8] We then compare this value with one measured in the full lockdown period (Tuesday 31th of March 2020) and then, respectively, 1 and 2 years later (Tuesday 30th of March 2021 and Tuesday 29th of March 2022). For both the rent value and the IMI

value, the baseline corresponds to the mean value, for each municipality, calculated during the second half (S2) of 2019 (pre-pandemic). We compare it with the same average value, obtained for the second half of, respectively, 2020 and 2021. Finally, for the residential outcome, the baseline is the 1st of January 2020. We then estimate the change between the 1st of January 2021 and 1st of January 2022.

The empirical strategy consists of a regression analysis of the above-explained difference rate on the main independent variable, the rural–urban spectrum classification, controlling for the set of area characteristics previously mentioned. Hence, the final models' equation is

$$\Delta Y_i = \beta_0 + \beta_1 * AI_i + X\beta + \varepsilon_i$$

with ΔY_i representing the variation in the indicator of interest, which is regressed on the 'Aree Interne' (AI_i), where $X\beta$ represents the vector of covariates mentioned before.

Results

We now present the main results of the analysis, from the most temporary and flexible measures of presences to the most permanent ones. To enhance clarity, see Figure A1 in the Supplementary Material, which provides a map depicting the Italian regions along with the country's main cities.

Temporary presences

In Figure 2(a)–(c), we observe the evolution in the number of Facebook/Meta presences in the three time points, as compared to the 3rd of March 2020. In 2020, by the end of March, notable decreases in Facebook users (depicted by whiter shades) were observed in major urban poles such as Milano and Roma, while surrounding areas experienced increases (indicated by more intense red hues). The 2021 map reveals more Facebook users along coastal regions like Liguria and Sardegna, as well as in the Western Alps. In 2022, a general reduction in Facebook users is evident, particularly in areas with a higher concentration of urban and inter-municipal poles.

In Table 2, we assess whether these differences are statistically significant.[9] During the first lockdown, there is a significantly greater number of Facebook users outside of urban poles up to peripheral zones, coherent with the narrative of the urban exodus towards more rural areas. Comparing the baseline with the number of Facebook users in 2021, 1 year after the initial start of the pandemic, we observe that a large number of users is still located in outlying (although, not peripheral) areas but the overall trend is less pronounced and of reduced magnitude. Finally, examining 2022 in comparison to the pre-COVID reference period (beginning of March 2020), we note a significant decrease in extremely rural areas, while there is no statistical difference between poles and the closer areas (up to intermediate). These results suggest that while there was indeed an urban exodus during the first lockdown, this pattern did not persist.

Temporary presences, rental market

We next focus on the pattern of rental prices and their evolution over the years. Figure 3(a) and (b) illustrates these changes over time, indicating areas where prices have increased (blue), remained stable (yellow) or decreased (red). Overall, there appears to be little change between the baseline period (S2/2019) and the first year of the pandemic (Figure 3(a)), except for a decrease in certain areas that do not exhibit a clear pattern. By the end of 2021, compared to 2020 (Figure 3(b)), we observe a resurgence in numerous zones in Calabria, the northern part of Lazio, Toscana and various areas in the more economically productive regions of the country, such as Lombardia, Emilia Romagna and Veneto.

In Table 3, we first statistically assess the change between the baseline (average value of S2/2019) and the first period after the pandemic started (average value of S2/2020).[10] We observe that, in comparison to urban poles, intermediate areas experience the greatest growth. We then examine the relative change between 2020 and 2021, but no significant pattern emerges, except for a significant reduction in growth of ultra-peripheral areas compared to urban poles.

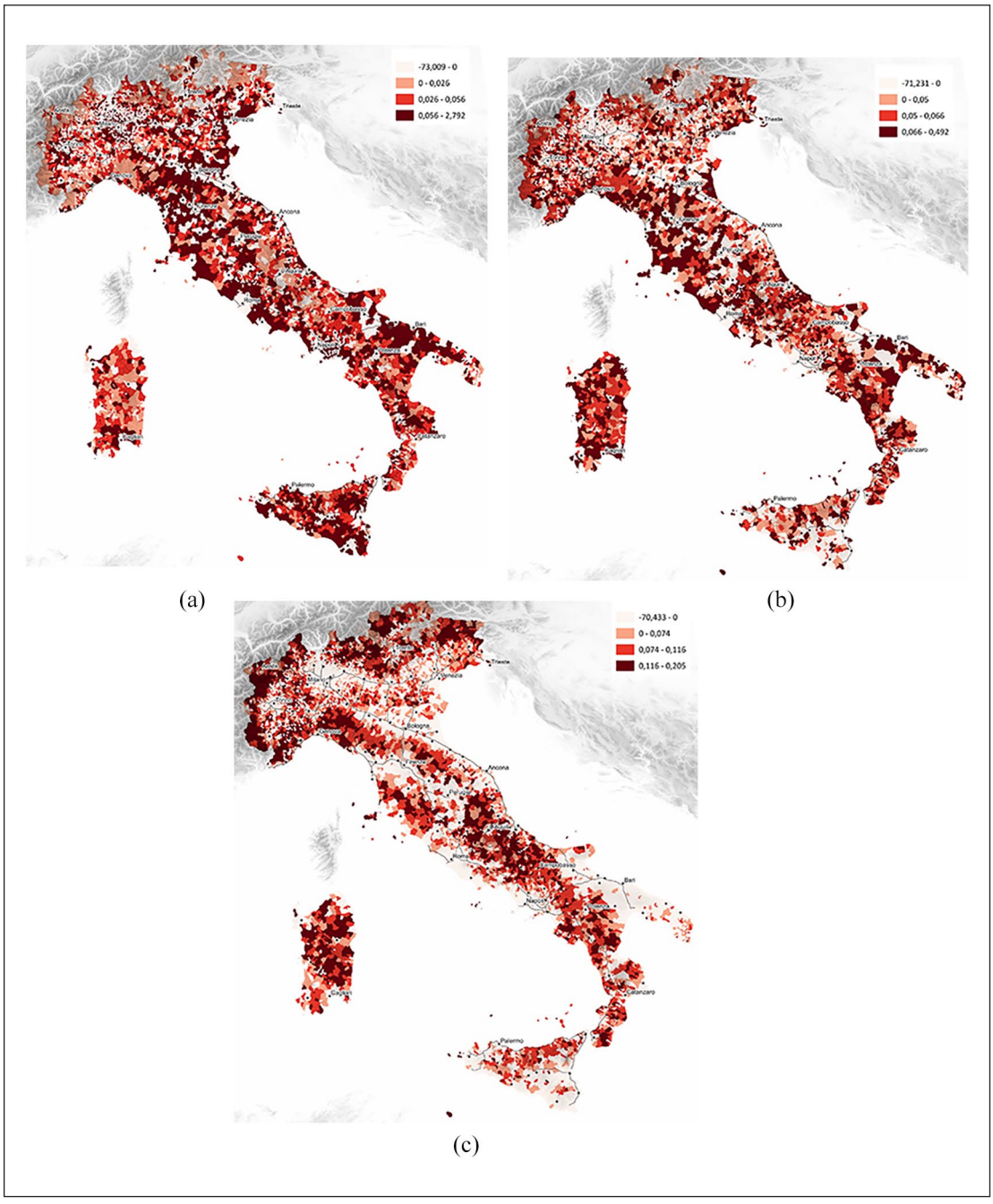

Figure 2. Variation in Facebook presences on (a) 31 March 2020, (b) 30 March 2021 and (c) 29 March 2022.
Notes: Authors calculation on Facebook/Meta data. Baseline is 3 March 2020.

Table 2. Change in Facebook presences across time, baseline 3 March 2020.

Variables	31 March 2020	30 March 2021	29 March 2022
Reference category: urban poles of attraction			
Inter-municipal poles of attraction	0.030*** (0.008)	0.008 (0.005)	–0.004 (0.005)
Outlying areas	0.040*** (0.005)	0.016*** (0.004)	0.004 (0.003)
Intermediate areas	0.041*** (0.006)	0.012* (0.005)	–0.005 (0.004)
Peripheral areas	0.035*** (0.007)	0.001 (0.007)	–0.022*** (0.006)
Ultra-peripheral areas	0.007 (0.013)	–0.049*** (0.014)	–0.082*** (0.013)
Constant	0.138 (0.099)	0.214* (0.094)	–0.085 (0.096)
Observations	6485	6485	6485
R^2	0.181	0.144	0.103

Notes: Robust standard errors are in parentheses.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

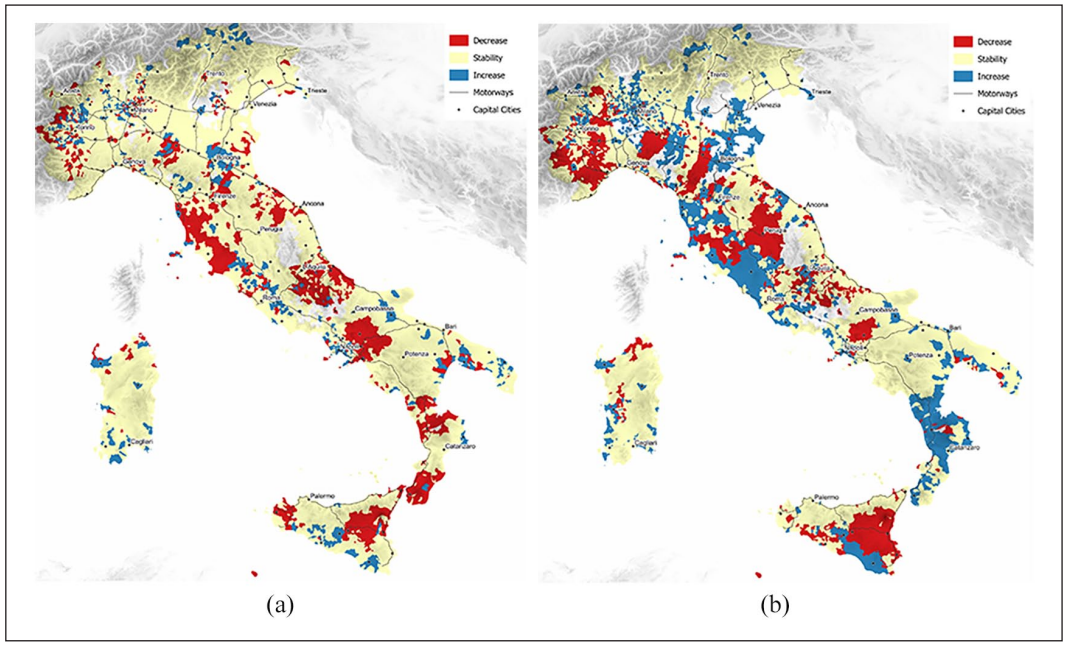

Figure 3. Change in average rent prices between (a) 2019 and 2020 and (b) 2020 and 2021.
Notes: Authors calculation on OMI data.

Permanent presences, housing market

Figure 4(a) and (b) illustrates the evolution of the IMI value across the same period. During S2/2019, the areas characterised by the greatest dynamism include the 'Pianura Padana', the large plain where Milan sits and certain areas around Rome. In S2/2020, we observe a similar pattern to that of 2019, but with more pronounced trends. By S2/2021, IMI values also increase along the Tirrenic coast (Lazio, Toscana, Liguria), on the periphery of the main islands (Sicilia, Sardegna), in the southeastern region of Puglia and in western parts of the country (Alps in Piemonte). While some parts of the country's IMI index are influenced by the tourist second home market, an interesting trend

Table 3. Change in renting values across time.

Variables	ΔRent	
	2020–2019	2021–2020
Reference category: urban poles of attraction		
Inter-municipal poles of attraction	0.012 (0.011)	–0.034 (0.026)
Outlying areas	0.003 (0.003)	–0.014 (0.023)
Intermediate areas	0.008* (0.004)	–0.014 (0.023)
Peripheral areas	–0.000 (0.003)	–0.023 (0.023)
Ultra-peripheral areas	0.004 (0.003)	–0.059* (0.023)
Constant	–0.101*** (0.023)	0.467*** (0.140)
Observations	7285	7134
R^2	0.057	0.162

Notes: Robust standard errors are in parentheses.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

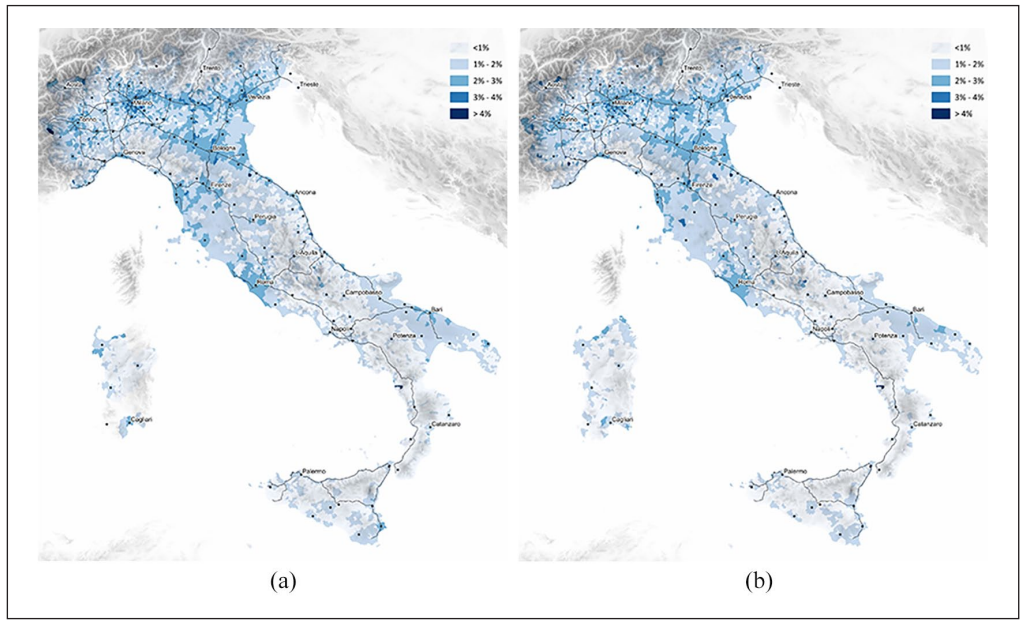

Figure 4. Change in IMI value between (a) 2019 and 2020 and (b) 2020 and 2021.
Notes: Authors calculation on OMI data.

emerges along major economic corridors in Northern Italy (Milano – Bologna, Milano – Bergamo – Brescia, Veneto towns). In these cases, the indicator trend may be linked to new forms of living in non-central cities.

We test in the next table (Table 4) whether there are statistically significant changes over time.[11]

Unlike the other indicators, we observe that across all specifications, non-central areas exhibit significantly greater dynamism compared to urban poles and inter-municipal poles of attraction. When considering the total number of transactions weighted by the available housing stock, a pattern emerges that strongly favours non-urban areas, especially in the time frame between 2020 and end of 2021, extending beyond the initial period of the pandemic.

Table 4. Change in IMI value across time.

Variables	*ΔIMI*	
	2020–2019	2021–2020
Reference category: urban poles of attraction		
Inter-municipal poles of attraction	–0.029 (0.021)	0.083* (0.036)
Outlying areas	0.037* (0.015)	0.108*** (0.019)
Intermediate areas	0.074*** (0.020)	0.170*** (0.026)
Peripheral areas	0.086*** (0.024)	0.136*** (0.032)
Ultra-peripheral areas	0.070 (0.044)	0.211*** (0.060)
Constant	–0.156 (0.483)	0.751 (0.557)
Observations	7337	7265
R^2	0.031	0.014

Notes: Robust standard errors are in parentheses.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

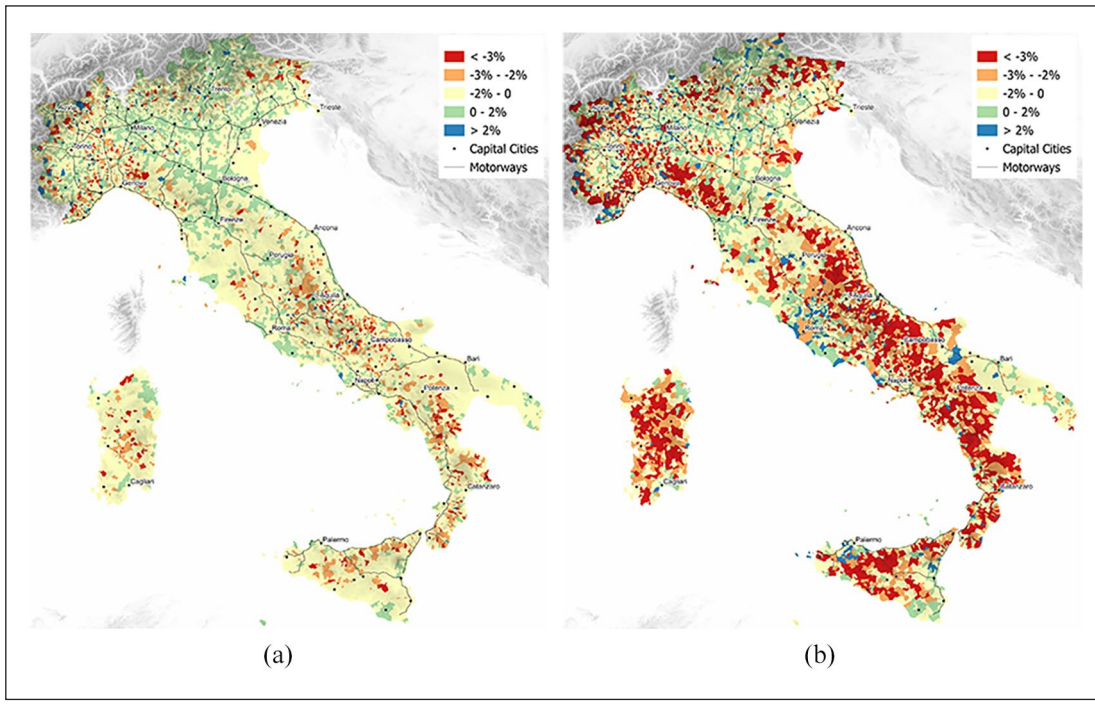

Figure 5. Variation in resident population between (a) 2019 and 2020 and (b) 2020 and 2021.
Notes: Authors calculation on ISTAT data.

Permanent presences, number of residents

Finally, we analyse the variation in the number of total residents (Figure 5 and Table 5). Figure 5 depicts the change in the number of residents from the end of 2019 until the end of 2021. The overall trend aligns with the long-standing trend of depopulation characterising rural areas in Italy over several decades. However, we note that some areas

Table 5. Change in resident population number across time.

Variables	ΔResidents	
	2020–2019	2021–2020
Reference category: urban poles of attraction		
Inter-municipal poles of attraction	–0.000 (0.001)	0.001 (0.003)
Outlying areas	–0.000 (0.000)	0.006*** (0.001)
Intermediate areas	–0.001* (0.001)	0.002^{+} (0.001)
Peripheral areas	–0.003*** (0.001)	–0.000 (0.001)
Ultra-peripheral areas	–0.005*** (0.001)	–0.003^{+} (0.002)
Constant	0.004 (0.012)	–0.036* (0.018)
Observations	7821	7821
R^2	0.177	0.205

Notes: Robust standard errors are in parentheses.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

experience gains in residents, notably in the Alps, the Pianura Padana, along the Tirrenic coast, in Piemonte and in Puglia (consistent with the IMI maps presented earlier). Another phenomenon observed is the increase in population around the main urban poles, likely due to a concentration of inhabitants in municipalities that serve as commuter hubs for accessing major centres for work or study reasons.

When examining whether these changes are statistically significant (Table 5),[12] we observe that in the first year after the start of COVID-19, there is only a minor negative effect in relatively more rural areas (intermediate, peripheral and ultra-peripheral areas), which experience slower growth than urban poles, likely consistent with the pre-COVID trend. A similar pattern emerges between 2020 and 2021. However, results from the period 2021–2020 indicate that outlying areas have grown faster in terms of number of residents than urban poles. It is important to note that, within the Italian context, the change of residency is not automatic and requests the active engagement of the applicant. Given that, not everyone changes their residency, but in the recent years, there have been growing incentives to rapidly update residency status after moving, as there may be benefits related to local taxation, utilities rates, access to healthcare and education and so on. Provided this, given the likelihood of under reporting, these results can be viewed as conservative estimates.

Discussion and conclusion

As discussed by Delage and Rousseau (2022), during the summer of 2020, the phrase "There's nothing left to sell," uttered by real estate agents in isolated localities, seemed to be clear evidence of an urban exodus. While the idea of rural revival was already circulating in an anti-metropolitan discourse (Halbert et al., 2021), Covid-19 amplified it with narratives extolling the peaceful countryside on platforms such as the BBC, Reuters, and Bloomberg. This romantic vision sparked critical reactions, such as the hashtag #guillotine2020 denouncing the privileges of celebrities in lockdown, but it did not stop the narrative of urban exodus from persisting.

This romanticised vision has further expanded in Italy where it seemed that anyone had, first, the chance to relocate to second homes out of urban contexts and, second, had the willingness and opportunity to make this relocation permanent (Pavesi, 2022). In this work, we have tried to answer the question: was this rhetoric grounded?

The results of this article highlight that the pandemic might have started new residential dynamics which are persisting beyond the early stages of the pandemic. These patterns are, however, extremely complex, making difficult to grasp them using only one indicator. For this reason, we have used four different indicators to unpack the different mechanisms beyond changes in residential dynamics. We have

looked, first, at active Facebook users and average rent prices as indicators of temporary moves, and, second, at housing market transactions and changes in official residency as more permanent measures of (potential) relocation.

This work uncovers a significant trend in residential patterns during the pandemic. Initially, individuals began to appreciate the advantages of living away from densely populated urban areas. This shift was evident through an increase in Facebook connections made outside of traditional urban hubs, suggesting a rise in social interactions in less crowded locales. Moreover, there was a notable uptick in both rental rates and property sales in these areas, indicating a growing interest in residing in less congested regions. However, as the pandemic progressed and, most likely, more employers required employees to return to in-person work, urban areas regained their appeal. This resurgence in urban preference was reflected by a decline in Facebook connections and rents in 2022 outside of the urban poles. Nevertheless, despite this renewed attraction to urban living, intermediate and ultra-peripheral areas continued to hold considerable appeal for permanent residences. This was evidenced by a lively housing market in municipalities outside of urban centres and an increase in the resident population in these outlying areas.

When making permanent relocation decisions, individuals showed a preference for suburban areas over extremely rural locations. This indicates a trend towards suburbanisation rather than a true rural revival. Studies by Lopez-Gay (2021), Qin et al. (2022), De Vidovich and Scolari (2022) and Stawarz et al. (2022) corroborate this observation, suggesting that people are more drawn to living in suburban settings that offer a balance between urban amenities and rural tranquillity. Long-term data on residential patterns further support this trend, showing that outlying areas have experienced the most relevant growth. The number of residences in these regions has significantly increased, highlighting a lasting shift in living preferences. This suggests that the pandemic has not so much created new trends as it has amplified existing ones, particularly those related to suburbanisation.

Historically, suburbanisation has been driven by factors such as rising housing costs in metropolitan areas and a lack of adequate services in city centres (Morelli et al., 2014; Pagliarin and De Decker, 2021). The pandemic appears to have reinforced these existing patterns. As housing costs continue to rise and urban services remain stretched, people are increasingly looking towards suburban areas as viable long-term living solutions.

With the shift to remote work for many professionals (Mariotti et al., 2022), people found themselves with more flexibility in choosing their living locations. This led to increased interest in areas with more affordable housing, larger spaces and better access to nature. In addition, some individuals and families chose to move away from crowded cities to reduce their exposure to the virus and have more space for social distancing. The pandemic also highlighted the importance of access to outdoor spaces, parks and recreational areas, prompting some individuals to prioritise these amenities when considering a move. Finally, the economic impact of the pandemic may have affected people's financial situations, leading them to seek more affordable living arrangements outside of expensive urban areas. Nonetheless, the empirical analysis does not, overall, find any evidence of the urban exodus, understood as a massive migration from the cities to the countryside, and especially to the more rural and bucolic remote areas, coherently with works in other countries (González-Leonardo et al., 2022b; González-Leonardo and Rowe, 2022; Rowe et al., 2023). Beside the above-mentioned aspects, the attractive nature of the urban poles remains alive.

At the same time, housing market transactions are very clear in showcasing a pattern for declining preferences for urban poles. It might be that, because of the pandemic, individuals have become more interested in buying outside of the urban poles, in order to have the chance to 'escape' the city, if and when necessary, although, perhaps, not fully relocating to these zones. This is indeed coherent with findings from a survey carried out in 16 countries by the real estate agency Engel & Völkers, in which Italy comes second, just after Spain, in terms of buying intensions, as for 70% of their Italian clients buying a second home is an absolute priority, and within the shortest amount of time as possible (Pescarmona, 2022). Further research should thus

deep dive into this topic, understanding if and how an unexpected crisis such as the one brought about by COVID-19 has led individuals, and more specifically those who can afford it, to consider buying elsewhere than urban poles as an 'exit strategy'. More broadly, future research should try to better understand whether the apparently new patterns we have found emerging from the pandemic remain stable afterwards and how they compare with more long-term dynamics.

This is the first work that tries to comprehensively assess the medium-to-long-term impact of the global pandemic on population dynamics and residential trajectories in Italy. Nonetheless, we acknowledge some relevant limitations, mainly because it is difficult to have a set of reliable measures about where individuals are, especially over time. It is important to note that the pre-pandemic reference period we use in this article is temporally restricted, spanning from the second semester of 2019 to the beginning of March 2020. To obtain an even more nuanced understanding of the extent to which whether the trends we identify are genuinely novel compared to the pre-pandemic era, further analysis should aim to compare the post-pandemic period with a more extensive pre-pandemic timeframe. Moreover, most data might not be truly representative of individual presences in the area, especially in Italy, where the number of second homes is quite high (Gentili and Hoekstra, 2019) and, therefore, administrative data are frequently misleading. For example, it might be that because of the lockdown, individuals moved towards second houses in more peripheral and rural areas, although still be officially resident in the city where they work in. On the contrary, Facebook data have limitations too, especially in terms of selectivity and representativeness of the sample (for a full discussion, see Beria and Lunkar, 2021). Nonetheless, geo-located user-generated data still represent a relevant proxy for the number of people present in a specific location at a specific time point also because conventional data cannot provide this kind of information. This simple consideration opens new research perspectives in the field of urban and regional studies that call upon non-institutional sources characterised by a certain level of uncertainty, to describe complex phenomena dealing with the variability of population within space and time. Finally, housing market data, as previously mentioned, may be biased by the fact that municipalities which do not report any rental transaction may be assigned the value of the biggest municipality within the same province, leading to possible provincial biases. To overcome such challenges and assess whether the findings of this work are robust, we have specifically used multiple indicators provided by different data sources which are supposedly complementary in nature and do not suffer from the same problems. A general reflection on the real capacity of data to analyse complex problems such as those under consideration is therefore necessary to provide indications on the spatial effects of population changes at a national level.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. According to the National Strategy for so-called 'Aree Interne' (literal translation in English is 'Inner areas'), which is the main institutional strategy adopted by Italian government to intervene in marginal areas, these areas can be defined as 'those areas significantly distant from the centres of supply of essential services (education, health and mobility), rich in environmental and cultural resources with highly diversified natural aspects'. For further information, see: https://www.agenziacoesione.gov.it/lacoesione/le-politiche-di-coesione-in-italia-2014-2020/

strategie-delle-politiche-di-coesione/strategia-nazionale-per-le-aree-interne/.

2. For details about the different stages of the pandemic, and relative non-pharmaceutical interventions implemented, in Italy, see Conteduca and Borin (2022).
3. While aggregating the data and within the analysis, we take into account the prevalent housing type (i.e. whether economic housing or villas) in each municipal location.
4. Inter-municipal hubs have been identified by aggregating adjacent/bordering municipalities which, taken together, form a Service Offer Centre. For more details, see https://politichecoesione.governo.it/media/2831/20220214-mappa-ai-2020-nota-tecnica-nuvap_rev.pdf.
5. https://politichecoesione.governo.it/it/strategie-tematiche-e-territoriali/strategie-territoriali/strategia-nazionale-aree-interne-snai/le-aree-interne-2021-2027/lavori-preparatori-snai-2021-2027/mappa-aree-interne-2020/.
6. These data are provided at the municipality level at the end of 2018 and are freely downloadable on the AGCOM website https://maps.agcom.it/arcgis/home/item.html?id=d184505cf0474697b01a61bb115c4ed1.
7. For more details, see https://www1.agenziaentrate.gov.it/servizi/Consultazione/glossario_omi.pdf.
8. Facebook data also provide an official baseline value, which corresponds to the average values in the 90 days before the crisis started, that is, when the data collection was initiated (20 March 2023). However, this value is likely to be biased because of the Christmas holiday period, which is likely to inflate the number individuals in certain municipalities (i.e. mountain areas). Nonetheless, as a robustness check, we conduct the same analyses using this official baseline and results are consistent.
9. Table A1 in the Supplementary Material file showcases full results including control variables.
10. Table A2 in the Supplementary Material file presents full results including control variables.
11. Table A3 in the Supplementary Material file showcases full results including control variables.
12. Table A4 in the Supplementary Material file presents full results including control variables.

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