



The call of nature. Three post-pandemic scenarios about remote working in Milan

Marco Biagetti^a, Giuseppe Croce^b, Ilaria Mariotti^{c,*}, Federica Rossi^c, Sergio Scicchitano^{d,e}

^a National Institute for Public Policies Analysis (INAPP); John Cabot University in Rome, Italy

^b Università La Sapienza di Roma, Italy

^c DASTU-Politecnico di Milano; CIMET - Italy's National University Centre for Applied Economic Studies, Italy

^d John Cabot University in Rome, Italy

^e Global Labor Organization (GLO), Germany

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ABSTRACT

In recent years remote working (RW) arrangements have increased in many countries, mainly because of the COVID-19 pandemic, which has also intensified the need for humans to live closer to nature. Within this context, the paper aims to discuss three possible future scenarios for the spread of RW by 2050, and how this could affect residential choices, people's relationship with the natural environment, and thus the renewed role of large cities, small towns, and areas close to nature. A specific focus is placed on the city of Milan in northwest Italy. To give empirical foundations to our scenarios, we analyzed data for the year 2021. The first scenario we consider (the Gentrified City) implies the risk that Milan will become a gentrified city, thus pushing social and economic inequality. However, on the contrary, our data suggest that in Italy a potential pool of workers would leave the city and move to a small town or closer to nature if allowed to work remotely. This trend could lead to the second scenario (the Doughnut City), but data for Milan show that the share of those willing to leave Milan is lower than the national average, which can be explained by the good quality of offered services; thus, the city center is unlikely to empty due to RW. The desirable option would be represented by the third scenario: some remote workers move to intermediary cities (the Intermediary Cities scenario), reducing territorial disparities.

1. Introduction

ILO (2020) defined remote working (RW)¹ as an arrangement where workers wholly or partially perform their tasks and duties from an alternative location to the default workplace (i.e., employer's/client's premises or public space). Although it was already present well before COVID-19, it was only at the time of the outbreak of the COVID-19 pandemic that RW was experimented on a massive scale by firms and workers who were forced to adopt it as a strategy to continue their activities during the spread of the virus. Data say that RW has become part of the "new normal" arising after the pandemic as workers and companies have discovered the

* Corresponding author.

E-mail address: ilaria.mariotti@polimi.it (I. Mariotti).

¹ 'Remote working' is a general umbrella term that includes other flexible ways of working, such as teleworking, smart and agile working, as well as working from home (ILO, 2020).

potential welfare and productivity gains deriving from RW. A new hybrid work arrangement involving a few working days from home is now desired by workers and accepted by employers (Eurofound, 2022b). Indeed, RW allows workers to cut the number of weekly commutes, which means leaving more hours to the family or for leisure (and overtime). Moreover, if firms and workers incur significant fixed costs in RW because of technology, production process changes, and human capital upgrading, there may be a strong disincentive to move back (Brynjolfsson et al., 2020; Bonacini et al., 2021a).

Specifically, densely populated areas, and cities, which have lost human presence during the lock-down phases of the pandemic, have promoted social distancing and RW arrangements to protect public health (Florida et al., 2021). Besides, cities such as Milan were hit by the pandemic, especially during the first wave in March-May 2020, from a public health and economic point of view. Many business meetings were canceled, leisure and cultural activities stopped, and iconic events were postponed (e.g., Milan Design Week, etc.); central neighborhoods have registered a decrease in human presence from -47% to -63%, and the suburban municipalities attracted remote workers (Mariotti et al., 2022a). Similarly, New York and San Francisco have experienced the so-called “doughnut effect”: the leave of workers and inhabitants from the center to peri-urban and peripheral areas (Ramani & Bloom, 2021; Gupta et al., 2022).

Although the pandemic will not make cities lose their role (Glaeser, 2022), the rise of RW has underlined that many people can avoid commuting daily to work, thus being able to go to the office two/three days a week (hybrid working). This ‘new normal’ will be a new work-life balance, favoring suburban areas, intermediary cities, and rural areas, and increasing demand for collaborative spaces, including coworking spaces, and satellite offices to promote ‘near working’, that is working close to home (Mariotti et al., 2023). Moreover, the pandemic has intensified the desire for humans to live closer to nature, especially for those who lived in large cities during the lockdowns. According to data reported by Aksoy et al. (2022) from many countries, employees interviewed between 2021 and 2022 value the possibility of working from home 2–3 days a week as equal to 5% of their earnings, on average (5.4% for the Italian sample). For their part, firms are enabled to reduce office and space costs if fewer employees travel to the workplace every day.

Currently, 73% of people in Europe live in cities, and by 2050, that number is expected to rise to 82%, adding more than 36 million extra urban residents. Cities will face several difficulties, including issues with resource availability and fair economic development. Urban environments’ quality is also in danger, making sustainable development and regeneration necessary to maintain liveable and healthy circumstances for city dwellers. This also represents a financial opportunity for all parties involved in addressing the high demand for new house development, infrastructure refurbishment, and other facilities. As a result, nature-based solutions, which heavily rely on natural areas and characteristics in and around cities, could play a crucial role in sustainable urbanization, which primarily rely on natural areas and features in and around cities to perform essential ecosystem services (European Commission, 2015, 2020; Kotsila et al., 2020; Mahmoud et al., 2022). They offer a variety of strategic opportunities that fall into three categories of interrelated issues and trends.

First, using natural solutions helps urban economic development because it supports the quality and quantity of those resources, such as water for drinking, manufacturing, and sanitation, that are readily available. Urban sustainability challenges may lead to the emergence of new business models that separate economic growth from resource degradation and unequal resource distribution. This would promote the circular economy and reliance on local resources, leading to more efficient use of resources like energy and materials. Restoring neglected urban areas can improve nearby commercial and residential districts by creating new, dynamic spaces that raise land and neighboring property values, attract investors, and improve public well-being. This is because multifunctional designs that include nature can create these new, dynamic spaces. Secondly, sustainable urban planning with nature-based solutions has a positive environmental impact. It offers possibilities for climate change adaptation, boosting urban resilience. Third, the social component of sustainable urbanization is aided by nature-based solutions. For instance, the presence of green space can be related to people’s perceived happiness and general health, while having green space nearby appears to reduce the incidence of costly forms of illness, such as heart disease, obesity, and depression.

Within this context, the paper aims to discuss possible scenarios for the spread of RW in the next 20 and 30 years in Italy, and how this could affect residential choices, people’s relationship with the natural environment, and thus the new role of big cities. A particular focus is made on the city of Milan, the capital city of the Lombardy region in North-western Italy, which is recording the highest RW share among the Italian macroregions.

For entire generations of Italians, and even before it became the catchy claim of Expo 2015, Milan has always been a place to be, the elective destination to strive for, where to train, test one’s skills, and realize one’s personal aspirations (CAMCOM, 2021). Over the years, the city’s international allure, the variety and excellence of its university system, the numerous opportunities offered by the country’s richest and liveliest labor market, and the high quality of its services have helped to forge the iconography of the ‘productive capital of Italy’ in the collective imagination. Milan metropolitan area is the core of a broader industrial metropolitan region, Lombardy, home to about 10 million people in 2021. Lombardy shows a GDP of 384.53 billion € in 2021 (23% of the Italian GDP), thus being the first Italian region with a doubled GDP compared to Lazio, the second region. The Milan metropolitan area is one of the 14 metropolitan areas in Italy, it has 3,236,683 inhabitants, and 305,000 firms (33% of the Lombardy region and 6% of Italy), which constitute 42.9% of the Italian corporations (the Italian average is 24.6%) (CAMCOM, 2021). Milan is often identified as a prosperous region, an international capital of fashion and design, and the Italian city hosting the highest share of multinational companies. The concentration of tertiary activities in the Milan metropolitan area accounts for more than 82% of local wealth formation (CAMCOM, 2021). Compared to Italy, Lombardy and Milan are more specialized in services with a high knowledge content, which are more suited to being performed remotely. Besides, the Lombardy region and the Milan metropolitan area show, on average, a high Institutional Quality Index, which measures the quality of Italian public institutions at the provincial level (Nifo & Vecchione, 2014). Finally, Milan has the highest average value of a house bought and sold in 2021, hovering around 330,000 euro, followed by Florence, and Rome (OMI, 2022). Despite this high cost, from 2011 to date, more than 254,000 young people between the ages of 19 and 34 have decided to

move to the city, 113,000 more than those who have taken the opposite route; in particular, the balance from abroad is positive, from where more than 80,000 young people have arrived, compared to the 20,000 Milanese expatriates. The majority of these people are qualified since about one in three new residents is a university graduate, a figure that rises to almost 50% if only the Italian component is taken into account - which, moreover, is widely in the majority, accounting for two-thirds of the total number of new arrivals (CAMCOM, 2023).

To give empirical foundations to our scenarios, we analyzed data from the Survey on Labour Participation and Unemployment (INAPP-PLUS) for the year 2021, which includes information on socio-demographic characteristics and employment conditions of working-age Italians. Specifically, the 2021 wave has a dedicated section on RW, with questions concerning both periods before and after the pandemic outburst.

By using the INAPP-PLUS dataset, the paper aims to provide an answer to the following research questions:

- Is RW going to stay in Italy for the next 20 to 30 years?
- After the outbreak of the COVID-19 pandemic, is there a potential pool of remote workers who would prefer living in smaller towns or moving closer to nature? What are their characteristics?
- Do Milanese remote workers behave differently from the other respondents, and why?
- Will the city of Milan become a doughnut city, a gentrified city, and/or will promote the relocation towards intermediary cities?

The paper fills the gap in the literature about scenario studies that is relatively scant. Five sections compose the paper. The next section is dedicated to the literature review focusing on the following three strands: i) RW heterogeneity among European countries; ii) RW during and after the COVID-19 pandemic and its impact on the geography of work, residential location choices, and the rise of digital nomads and workations; iii) scenario studies. The third section presents the data and methodology. Section four is dedicated to describing and discussing the results of the PLUS survey on the percentage of RW at a NUTS3 level and the willingness of the Italian workers to leave the city and move to a small town or closer to nature if allowed to do RW. In addition, it presents a scenario analysis of RW trends in Italy in 2050 with a focus on the effects on the city of Milan. Conclusions and policy implications, also concerning nature-based solutions for sustainable urbanization, according to the proposed RW scenario, bring the paper to a close.

2. Literature review

The present literature review focuses on the following three strands: (i) RW heterogeneity among European countries and measures of teleworkability; (ii) RW during and after the COVID-19 pandemic and its impact on the geography of work, residential location choices, and potential benefits of RW on urban mobility and related environmental impacts; (iii) scenario studies.

2.1. RW heterogeneity among European countries and measures of teleworkability

The first strand of the literature focuses on the heterogeneity of RW spread and how to measure teleworkability. The capacity to work remotely became a key aspect of the COVID-19 age, as it allows individuals to keep working while minimizing both the risks to public health and the pandemic's recessive effects (Bonacini et al., 2021a, 2021b; Barbieri et al., 2021; Florida et al., 2021; Barrero et al., 2023).

Digital technologies can potentially convert the organization of work and companies into complex environments. In particular, they can accelerate the diffusion of RW practices and, in line with the skill-bias technical change theory (Card & DiNardo, 2002), technology is likely to display its non-neutrality by showing different effects on different skills. Indeed, the feasibility of working from home depends on the characteristics of jobs in terms of the skills and tasks required. Some recent empirical analyses (see, for instance, Dingel & Neiman, 2020; Gottlieb et al., 2020; Koren & Peto, 2020) have classified and ranked occupations in the US according to their RW capacity, by using data from the United States Bureau of Labor Statistics Occupational Information Network (O*NET).² The lack of an O*NET-type dataset in many countries does not allow the construction of task-based measures of RW feasibility. In this article, we use data from the ICP, which is the Italian version of the O*NET. It is important to notice that Italy is the only country to have a dictionary of occupations similar to the US O*NET, which allowed us to build an indicator of RW feasibility at the occupational level by combining 7 different questions.³

2.2. RW during and after the COVID-19 pandemic and its impact

The second strand of literature concerns the effects of the COVID-19 pandemic – and the resulting increase in RW – on the geography of work, residential location choices, and the potential benefits of remote working on urban mobility and related environmental impacts.

Consequently, remote workers can move their residence away from the office, leaving the city center for more affordable, less congested suburban areas or smaller cities. Anecdotal evidence and statistical data report offices left empty in many centers of metropolitan areas worldwide as more and more people continued to work from home even after the virus retreat. It is not surprising

² For a complete survey, see Kostea et al. (2022).

³ More information on the data is provided in Section 3.

that RW is seen as a major risk for large cities since it impacts their structure (see [Table A1](#) in Appendix C for a review).

Recently [Guaralda \(2020\)](#) have highlighted the following effects on the urban settlements in Australia: (i) “sea-change” (the breakaway from larger towns towards smaller, coastal ones located far away from the most densely populated conglomerates); (ii) “e-change” (the new form of migration of workers allowed to work remotely from small towns); (iii) “flee-change” (namely, the escape from larger towns to dodge the COVID-19 crisis). Regarding the second abovementioned change applicable also to more densely populated areas than Australia, undoubtedly, RW represents an innovation with an inherent spatial dimension, implying the split of work from a specific physical site (e.g., the office, the employer’s premises).⁴ [Althoff et al. \(2022\)](#) explored the impact of RW on the economies of major US cities, showing that areas characterized by a high share of business service workers among their residents, lost population in favor of lower population density areas. [Delventhal et al. \(2022\)](#) focused on the Los Angeles metropolitan area and found that residents moved to peripheral areas, traffic congestion eased, and average real estate prices fell, with a decline in downtown locations and an increase in the outskirts.

[Gurrutxaga \(2021\)](#) analyzed the Spanish case, finding an increase in rural population in 13 out of 17 regions and a rise in the share of rural population over the total population in 14 regions in 2020.

Only a few studies have explored the case of Italy, at least to the best of our knowledge. [Di Matteo et al. \(2022\)](#), [Militello and Mirabile \(2020\)](#), and [Mirabile and Militello \(2022\)](#) investigated the so-called ‘South Working’, i.e., the moving of remote workers to Italian southern and inner areas while working for companies based in northern big cities or abroad.

Some papers specifically focus on Milan ([Mariotti et al., 2022b](#); [Gorriani et al., 2021](#)) and the Lombardy region [Mariotti et al. \(2022a\)](#). [Mariotti et al. \(2022b\)](#) analyzed the change in the attractiveness of the Milan neighborhoods during the pandemic compared to 2019. They found a drop in city users within central neighborhoods, in contrast with an increase in visitors during the day in the peripheral areas. [Mariotti et al. \(2022a\)](#) extended the analysis to the Lombardy region, finding that municipalities closer to Milan with a strong broadband connection, a high concentration of knowledge workers, and foreign immigrants are more suitable for hosting remote workers.

Following [Gokan et al. \(2022\)](#) two major implications derive from RW for cities. First, RW creates a new divide between skilled and unskilled workers as the former are mostly able to work from home while the latter are employed in occupations requiring physical presence ([Sostero et al., 2020](#); [Eurofound, 2022b](#)). As skilled workers have to spend less time at the workplace (e.g., the office), the demand for local consumption services (e.g., bars, restaurants, cleaning, transport services) located in city centers near the offices falls and, as a consequence, the number of workers, mainly unskilled, employed in those activities decreases. As workers made redundant flow into other sectors, wages in such sectors are pushed down and, as a result, wage inequality between skilled and unskilled broadens. Second, reducing the commuting costs for skilled workers makes it convenient for them to move their residence to suburbs or other smaller cities where houses are more affordable. Furthermore, along with RW, COVID-19 has spurred unprecedented online shopping use. The effects of it compound those of RW as both loosen workers’ ties to the urban centers where offices and shops are more concentrated.

If this flight from the city center occurs, the urban structure changes and the city transforms from gentrified to doughnut. In a gentrified city, skilled workers live close to their workplaces located in the center: oppositely, in a doughnut city, they live in the suburbs, leaving the center to the unskilled. The change in the city structure determines a change in the prices and rents of real estate. If remote workers move from the center to the suburbs, the price difference between inner and outer areas is expected to narrow. This is what is occurring in many large cities, for example in London as reported by [Gokan et al. \(2022\)](#), and in some US cities as studied by [Ramani and Bloom \(2021\)](#). [Gupta et al. \(2022\)](#) estimate that remote work may result in a long-run depreciation of bureau values in New York City: according to the authors, their valuation is likely to fall 39% below pre-pandemic levels.

In addition, RW has often been welcomed as an attractive solution because of its ecological implications. By reducing the number of trips to the office of each remote worker, traffic congestion and emissions are expected to decrease with a valuable contribution to improving the urban environment and reducing carbon dioxide emissions. [Roberto et al., \(2023, pp. 13010607\)](#) in their study about Italy, based on a survey of remote workers in public administrations in four different provinces, find that workers who would have commuted at least partially by car have saved on average 6 kg of CO₂ per day thanks to remote working (with an average round-trip commuting distance of approximately 35 km). However, a wider analysis of the long-run and short-run effects of RW reveals that its ‘green’ effects are less certain than it is often supposed, and several policy actions must be put in place to realize these potential benefits ([Eurofound, 2022a](#)).

[Batty \(2020\)](#) reports that modal shifts, in which people avoid public transport in favor of walking, cycling, or driving, are likely to be a fairly immediate consequence of the pandemic, and this is likely to have a major impact on the volume of travel within and between towns in the UK. The author states that the history of the city in the twentieth century is one of letting the city “breathe” through the decentralization of congested activities from housing to industry to services to edge cities, low-density sprawl, and new communities far from the central city. Combined with working from home and severe social distancing, these old ideas look increasingly attractive. During the Second World War in the UK, the strategy that emerged was based on decentralization away from the urban core. The emergence of smart growth through policies associated with transit-oriented development came onto the agenda, and before the pandemic began, the notion of a greener, more compact way of urban living began to take hold as our love affair with the car began to wane.

⁴ Concerns have been raised regarding the relation between the so called “shape of towns” and “technological deepening”. For instance, [Foth and Caldwell \(2021\)](#) stress the key role played by smart city technologies on health monitoring and the implementation of outbreak control measures during the pandemic.

The city transition from a gentrified to a doughnut structure is a possibility made real by RW, but it is countered and limited by opposing factors. These countervailing forces must also be carefully considered to build realistic scenarios for the future. First, and most importantly, RW is only an imperfect substitute for on-site work and face-to-face interactions in most circumstances. Consequently, only a limited shift to RW is feasible, and each firm and organization is required to define a sustainable arrangement combining the two.

Excessive use of RW might result in weaker learning spillovers inside a firm, difficult monitoring and coordination, and, in the end, a decline in productivity. Second, the downward flexibility of prices and rents of offices and houses in city centers might be in some cases enough to restrain their forsaking by remote workers. Moreover, economic models predict that the lower density of people working and interacting face-to-face in the city could undermine urban agglomeration externalities, which would adversely affect productivity (Delventhal et al., 2022).

However, it is reasonable to believe that the collective advantages and opportunities brought by urban density and representing large cities' true economic strength will continue attracting firms and people. As outlined above, RW represents a major risk for big cities. However, as Glaeser (2022) argued, it does not constitute a general threat to all cities and the vitality of the urban economic life per se. The force of attraction of urban agglomerations is generally more robust than the centrifugal force potentially set in motion by RW. Indeed, as underlined by Storper and Venables (2004) only cities can provide a favorable environment for innovation, creativity, and economic growth, thanks to the clustering of talents, face-to-face interactions, and economic diversity.

Nonetheless, RW acts as a catalyst of change, and its impact will likely determine different outcomes across cities. Some cities may cope with the new forms of hybrid work or gain new momentum, while RW could be detrimental and accelerate their decline for a few of them. In the end, divergences across cities in their future economic and social evolutions might widen. As a matter of fact, workers who can access RW are now somewhat less constrained in their residential choices, so they can move to areas and cities less costly or endowed with better amenities. It is worth noting that amenities do not include only exogenous, natural attributes like climate but also endogenous endowments, corresponding to the quality of services, access to public or less congested common goods, and cultural heritage. The environmental quality of a city and its boroughs is certainly one of the most relevant amenities for their inhabitants. The ability of urban centers to retain their residents and to attract new ones will rely - in the future more than in the recent past - not only on affordability but also on the liveability of the city which highly depends on pollution levels, the offer of green areas, city cycling and the possibility of practicing outdoor sports (Eurofound, 2022a).

Ultimately, the diffusion of RW may increase the competition between cities in attracting remote workers. This makes the amenities featuring each city even more relevant and, as a result, the role of local governments to the extent that they are responsible for offering such local amenities (Florida et al., 2021).

Bond-Smith and McCann (2022) analyze the effects of the RW and hybrid work revolution on cities' spatial structures and performance. The authors propose an analytical framework focused on the role of frequency of commuting to explain the RW behavior and the effects on the performance of cities. They find that the optimal frequency of commuting is positively related to the opportunity costs of less-than-continuous face-to-face interaction and inversely associated with travel plus travel-time costs. Moreover, the results also support the "doughnut effect" model: more significant growth in the suburbs and hinterlands around large cities. The authors state that the reduction in the frequency of commuting makes larger cities and their hinterlands more desirable, despite longer commuting distances. In addition, inter-city effects occur giving rise to an inter-urban 'shadow' (Cuberes et al., 2021) effect. Therefore, it can be stated that the results imply enhanced productivity of larger cities over smaller cities.

In this scenario, the struggle of cities to retain and attract remote workers is expected to be somewhat less fierce in Europe than in the US context. Indeed, European cities are better endowed with distinctive amenities like monuments, parks, and cultural life accrued over centuries and highly valued by their inhabitants, particularly the more educated ones (Glaeser, 2022; Drabo et al., 2022). Moreover, European cities tend to also have far better regional and local transit systems that improve territorial connection and integration and contribute to enabling remote working and hybrid working patterns. As a result, European cities could perhaps be less affected by the centrifugal thrusts of RW.

The rise of digital nomads and workations worldwide corroborates the importance of living and working in nature. Examples of coworking and coliving spaces in tourist sites such as the Italian seaside and Alps have attracted remote workers and digital nomads (Mariotti et al., 2024). Digital nomads are a distinct category of expat knowledge workers; in most cases, they seek long-term relationships with the places in which they are located (Orel, 2019; Sánchez-Vergara et al., 2023).

2.3. Scenario studies

As far as we know, only a few studies have developed researched-based scenarios, specifically on policies, proposing the options: "do nothing", "do the minimum", and "do all", to improve the life/work urban environments.

Zenkeler et al. (2022) focused on urban planning implications of home-based work within the City of Gold Coast (Queensland, Australia). By analyzing 172 survey responses, they found that home-based workers would like to live in neighborhoods integrating residential amenities with place-making initiatives to enhance economic performance, networking, and collaboration. The authors then provided some urban planning policy recommendations broken down into three scenarios (i.e., do nothing – do the minimum – do all) to improve the life/work urban environments.

By applying four future-study methods (i.e., bibliometrics, brainstorming, futures wheel, and scenarios), Barbosa et al. (2022) built a likely scenario for work in 2050, considering the main global trends and the recent changes caused by the pandemic. Among the other results, the authors expected that by 2050 some jobs will have at least one remote working day.

Héry et al. (2022) drew four possible scenarios about the medium-term consequences (5 years) of the COVID-19 crisis on work organization, highlighting four key issues: remote working, worker and team autonomy, social and environmental responsibility policies, and the evolution of workers' skills.

Whatever the scenario considered, improving the relationship between human residents and nature within cities must be seen as a necessary goal in the near future. To this end, the literature shows that the creation of urban parks, green areas, and pedestrian and cycle paths is a realistic and effective way to generate benefits for residents (e.g. Boscacci et al., 2017; Bottero, 2022; Mariotti & Riganti, 2021) since, in the new post-pandemic context, represent valuable amenities in the urban environment. However, as a side effect of these positive externalities, generating collective benefits, the real estate prices in the vicinity are likely to rise and, as a result, this could spur gentrification (the so-called "green gentrification", as in Bottero, 2022) with negative effects on previous and less advantaged residents.

Moreover, the 'more-than-human' approach to planning and urban design is emerging. This approach questions the human-centered design of cities and considers "nonhuman agencies, recognize [s] humanity's entanglements with ecosystems and the planet, work[s] towards multispecies justice, and design[s] for cohabitation" (Fieuw, 2022, p. 2). In this regard, Sheikh (2022) discussed two Australian foresight (e.g., future-oriented research that seeks to render future possibilities apparent and comprehensible) and visioning tools from a 'more-than-human' perspective, to inform city planning aligned with nature.

As described in the previous paragraph, the new digital technologies allow to be dispersed across the territory but interconnected at the same time. The studies by Steven Liaros (Liaros, 2019, 2021; Liaros & De Silva, 2022) discussed a systems-based approach to the design and development of smart rural villages (i.e., a network of circular economy villages, managing natural environments in the development plan) in Australia. It is argued that the leave of people from cities to rural locations opens possibilities to reshape cities themselves, and the greater connection to nature should be reflected in new development forms.

At least to our knowledge, no evidence is provided about future RW scenarios: the present paper aims to fill the gap in the literature. Thus, in the following paragraph, we describe the data and methodology used to achieve this aim.

3. Data and methodology

Our analysis adopts an innovative dataset recently constructed by merging two Italian surveys developed and provided by the Italian National Institute for the Analysis of Public Policies (INAPP). The first is the Participation, Labour, and Unemployment Survey (PLUS), which provides reliable statistics on labor market phenomena that are rarely or only marginally covered by Eurostat's much better-known Labor Force Survey (LFS). The INAPP-PLUS survey also contains information on a wide range of standard individual characteristics as well as many occupation and enterprise characteristics for about 45,000 individuals in each wave. We use the (last) ninth wave of the survey, which was collected in 2021 and released in the second half of 2022.⁵

The second survey that makes up our innovative dataset is the 2013 wave of the Italian Sample Survey on Professions (ICP), launched in 2004 and currently conducted by INAPP. The ICP integrates the traditional approach by focusing on the nature and content of work. It aims to describe all existing occupations with a high degree of analytical detail, both in terms of requirements and characteristics that a worker is supposed to be endowed with and in terms of the activities and working conditions that each occupation entails. The choice was made to involve workers rather than experts, to give priority to the point of view of those who carry out the occupations analyzed on a daily basis and who have a direct and concrete assessment of the extent to which specific characteristics, essential to the job performance, are used. The survey provides information on about 16,000 workers and describes all the 5-digit occupations (e.g., 811 occupational codes) present in the Italian labor market, from those working in private companies to those present in public institutions and structures or those operating autonomously.

The conceptual frame of reference for the study and the taxonomies of variables used in the ICP survey are based on the American model of the Occupational Information Network (O*Net), as the latter constitutes the most complete in terms of the job description and the most capable of responding comprehensively to the questions from potential stakeholders. Following the US O*NET conceptual model, the ICP questions explore each occupation as a multidimensional concept that can be described in terms of these four thematic areas: a) worker demands (e.g. skills, knowledge, educational levels), b) worker characteristics (e.g. traits, work style), c) job demands (i.e. general work activities and work environment), d) experience demands (i.e. training and experience). It is noteworthy that Italy is one of the few European countries to have a dictionary of occupations similar to the US O*NET. Taking advantage of this feature, the ICP seems to be more reliable in capturing the production structure, technology, and industrial relations that crucially characterize the Italian economy. This is because The ICP is based on the Italian rather than on the US dictionary of occupations. Based on Italian ICP data, our analysis avoids potential biases that may arise when matching information on occupational structures (e.g., those contained in the US O*Net repertoire) and labor markets of different countries. It should be noted that the existing literature on automation (Goos et al., 2014) and recent contributions on RW in Italy (Boeri et al., 2020) instead use US O*Net data, thus creating a sophisticated 'bridge' between US and European (and Italian in particular) occupations, possibly reflecting US-specific technology and work practices.

We use data from the ICP to build the "RW capacity". It is a long-term indicator, under the hypothesis that RW may become a long-term lasting solution. Indeed, the COVID-19 pandemic has forced many companies to intensive use of RW and to think about a 'new normal' way of working as a future challenge (Barrero et al., 2020, Barbieri et al., 2021, Bloom et al., 2021, Bonacini et al., 2021a,

⁵ Further information on the INAPP-PLUS dataset is in the Appendix.

Dingel & Neiman, 2020, Caselli et al., 2022, Kosteas et al., 2022). Thus, in line with Bonacini et al. (2021a), we built a composite index (ranging from 0 to 100) that proxies for the feasibility of a RW arrangement.⁶

4. Empirical analysis

The empirical analysis consists of two phases: i) the description and the discussion of the results of the PLUS survey about the percentage of RW at a provincial (NUTS3) level, and on the willingness of the Italian workers to leave their city and move to a small town or closer to nature if allowed to do RW; ii) scenario analysis about RW trends in Italy in 2050 with a focus on the effects on the city of Milan.

4.1. RW diffusion and willingness to move to a smaller town or closer to nature

In the year 2021, the median time size of RW exceeds ten days per month (e.g., half of the monthly working days), particularly in the areas surrounding Milan but not in the municipality where it lowers to 13 days (see Table 1). The mean is always higher than the median suggesting a positive (right-) skewness confirmed by this statistic. Kurtosis is much less than that of the normal (i.e., 3); this means that the standard deviation is higher than what should be expected from a normal distribution. It is not surprising as the number of days in RW is often decided by individual contracts, thus concentrating mass around a particular number of days.

The positive skewness, the low kurtosis, and the high standard deviation of these four distributions suggest the presence of multiple modes around the number of RW days per month. This is confirmed by Figure A2 in the Appendix. The graph shows the presence of three modal points: one for a low, one for a medium-high, and the latter for a high number of days of RW in the last month. The municipality of Milan exhibits values that are lower compared to those for Italy, Lombardy, and the province of Milan. The four distributions present very high variance. To sum up, the dispersion among workers is high and RW is particularly used by commuters from other towns in the province or the region, less so by people already residing in the municipality.

Fig. 1 illustrates the percentage of people working from home at least once a week in 2019 and 2020. Before the pandemic spread, the Italian mean was 4.77%, with some differences across provinces: Bologna in Emilia Romagna (8.18%) was the first ranked, while Prato in Tuscany (1.37%) has resulted to be the last one. Milan province was above the national average (7.08%). In 2020 the rise of RW across all the Italian provinces is striking, especially for Milan, whose percentage jumped to 26%, thus gaining the first position in this ranking. Other global surveys show similar results. Cevat (2022) underline that globally individuals are working remotely between 1 and 2 (1.46 on average and 1.45 in Italy) full paid days each week. Employees desire about 2 RW days; employers plan with 1 RW day. Respondents value hybrid work 2–3 days a week as much as 5% of a pay raise (5.5% in Italy), while 15% of total employees (12% in Italy) would quit or start looking for a RW job if their employer announced that all employees must return to the worksite 5 + days a week.

Moreover, Fig. 2 shows the relationship between the population/population density and the potential and actual RW indexes across the Italian provinces. As expected, the Figure shows a positive correlation between population/population density and the spread of RW, which means that RW is a phenomenon that affects especially larger cities (Croce & Scicchitano, 2022). Milan province stands out for its highest potential and actual RW values in 2020, even compared to other densely populated territories. For this reason, we focus our attention on Milan. Although not representative of the entire national reality, the city of Milan is the place where you can observe more easily the possible evolutions and scenarios that may arise after COVID-19 through the spread of the RW.

Given these figures, we will focus our analysis on Lombardy, and specifically on the Milan province and the municipality.

To answer our second research question (i.e., After the spread of the COVID-19 pandemic, is there a potential pool of remote workers who would move closer to nature? What are their characteristics?), two questions in the PLUS survey are particularly relevant:

- Would you move to a small town were you allowed to start teleworking? Yes/No
- Would you move closer to nature were you allowed to start teleworking? Yes/No

Since we are only interested in the behavior of remote workers, who can move given the characteristics of their occupations, we restrict the analysis to workers with higher than the median teleworkability (see Section 3 for a definition). The following figures, therefore, refer to this subsample of respondents.

Fig. 3 shows that 37.4% of Italian workers would move to a small town if allowed to start RW. This percentage falls slightly in Lombardy (34.9%), it is virtually constant in the Milan province (37.3%), while it decreases more in Milan municipality (30.9%).

Fig. 4 exhibits an even higher desire to move closer to nature: 44% of Italian workers would do that if allowed to start RW. As above, the percentage decreases to 42.1% for Lombardy, 37.8% for Milan province, and 36.5% for the municipality.

Looking at some socio-demographic characteristics of the sample, Fig. 5 disentangles the answers by gender: in Italy, women show a higher propensity to move closer to nature, where they are allowed to start RW. The difference by gender is even the largest among Lombardy residents, with 49.9% of females willing to move compared to 33.7% of males and is still positive but less large between females (39.2%) and males (34.2%) in the municipality of Milan. This difference suggests that, regardless of their area of residence,

⁶ The index is calculated by taking the average of the following seven questions: (1) importance of performing general physical activities (which enters reversely); (2) importance of working with computers; (3) importance of manoeuvring vehicles, mechanical vehicles or equipment (reversely); (4) requirement of face-to-face interactions (reversely); (5) dealing with external customers or with the public (reversely); (6) physical proximity (reversely); (7) time spent standing (reversely).

Table 1

During the last month, how many days have you worked from home?.

	Median	Mean	Std. Dev.	Skewness	Kurtosis
Italy	12	13.78	9.50	0.42	1.95
Lombardy	14	14.51	9.42	0.29	1.88
Province of Milan	14	15.14	9.71	0.30	1.80
Municipality of Milan	13	14.94	9.39	0.29	1.86

Source: Authors' calculations on PLUS data for 2021.

women have a greater inclination towards closeness to nature while placing less value on proximity to the workplace. However, women living in the city of Milan are somewhat less inclined, perhaps because they appreciate the services and amenities available there (Fig. 7, and Figures A3, A4, A5, and A6 in the Appendix).

Instead, looking at the family composition (Fig. 6), workers with children are less willing to move than those without offspring, especially in Milan municipality (32.5% versus 40.5%). Adults with children are less inclined to move as they rely on care services and family networks available in the city, as found in the literature about remote working propensity in Italy (Di Matteo et al., 2021; Alfano et al., 2023).

Although the Milan municipality is one of the most expensive Italian cities, and, like many metropolises, it is characterized by traffic, pollution, and a hectic pace, the previous analysis shows that the percentage of Milanese workers who would like to leave the city is slightly below the corresponding national average.

Among the possible reasons explaining this attachment to the city, the amenities offered are certainly one of the main ones. Indeed, looking at the data, the Milanese award scores higher than the national or regional average when questioned on the quality of the services they provide (i.e., public transport, mobility, basic health, public offices, and education). For example, about 20% of Milanese assess a high quality of public transport, versus only 8.27% of the Italians (Fig. 7). Similar evidence emerges for the other services (see Figures A3, A4, A5, and A6 in the Appendix).

From Fig. 8 (panels a and b), it is worth noting that the willingness to move closer to nature is higher for people with higher-than-the-median teleworkability in Italy and Lombardy, but lower in the province and municipality of Milan. Particularly striking is the different behavior in the town: the gradient of the yellow line in the figure is very steep.

4.2. Scenario analysis

The COVID-19 pandemic, which has created a mass social experiment in RW, has pushed its adoption everywhere. For example, in the US the adoption of RW (current amount of RW, % of fully paid working days) was under 10% and equal to approximately 5% from 1965 to 2019 (Fig. XXX). During the pandemic such a percentage has shown a pic of about 60%, actually (January 2023) it has been stabilized at 27%. The most recent evidence shows that 20% of full workdays will be supplied remotely after the pandemic ends, compared with just 5% before (Barrero et al., 2021). Fig. 9.

The situation was similar in Italy.⁷ Recent estimates show that, among the EU-28 countries, Italy had one of the lowest proportions of workers with the possibility of RW before the pandemic in 2019 (Eurofound, 2022b and Figure A1 in Appendix). Using data from the Italian Labor Force Survey for 2008–13, Pighini and Staffolani (2019) show that only 1% of workers are "teleworkers". As a result of the crisis, RW became much more popular and could become an ordinary way of working after the pandemic. In June 2020, the Budget Committee of the Italian Parliament approved an amendment that forces public administrations to plan RW for at least 50% "of the activities that can be carried out in this way" by the end of this year and 60% thereafter. On June 17, the Minister of Public Administration claimed that 90% of public sector employees were involved in RW during the first wave of the epidemic. In addition, the same Minister has identified activities that can be carried out remotely, intending to promote the stable use of RW in about 50% of them (Bonacini et al., 2021a).

Many COVID-related shifts are considered to be cyclical rather than structural. Consistent with the current literature, we believe the COVID-induced shift to RW will have long-lasting effects (Bonacini et al., 2021a, 2021b; Kosteas et al., 2022; Barrero et al., 2023). Once firms (and workers) have incurred the relevant fixed costs of adopting RW technologies, changing production processes, and acquiring the necessary human capital, it is unlikely that they will want to return to fully face-to-face work arrangements (Brynjolfsson et al., 2020). Many companies, especially those dealing with IT (Information Technology), including Facebook, have already decided they will allow many employees to work from home permanently.⁸ Besides, several public

⁷ In the Italian regulation, the telework requires the indication of times and location outside the office. Instead, the Law n. 81/2017 (the so-called Jobs Act of self-employment), concerning "Measures for the protection of self-employed non-entrepreneurial work and measures aimed at promoting flexible articulation in the times and places of subordinate work", which officially introduced the smart working (or Lavoro agile) in the Italian regulation, defines the smart work as an activity that, although performed in a subordinate regime, is characterized by the absence of constraints on where and when the same is carried out. Therefore, the smart work of RW substantially differs from the telework, but the recent regulation has been currently used in very few cases. More specifically, it refers to Chapter II "Agile work" (articles 18–23).

⁸ More in particular, Mr. Zuckerberg stated: "It's clear that Covid has changed a lot about our lives, and that certainly includes the way that most of us work. Coming out of this period, I expect that remote work is going to be a growing trend as well." (See: <https://www.nytimes.com/2020/05/21/technology/facebook-remote-work-coronavirus.html>).

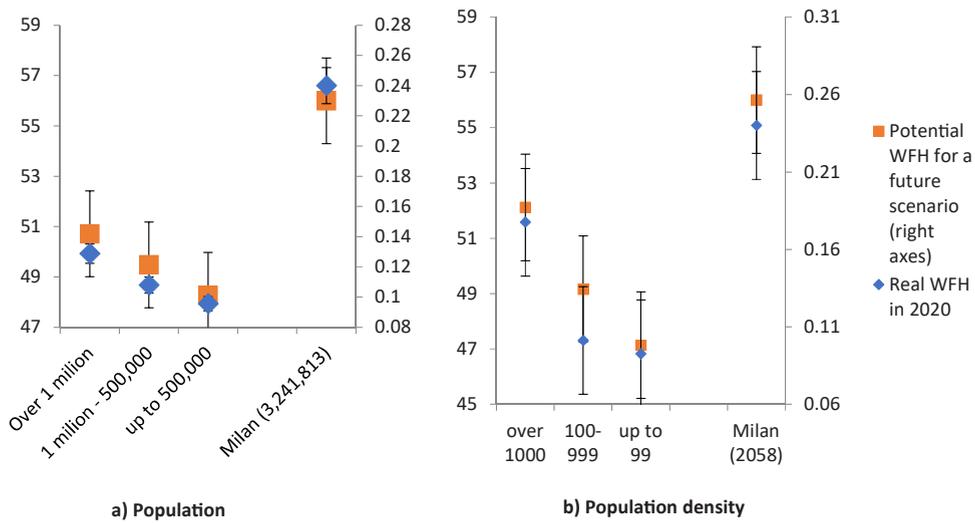


Fig. 2. Population/population density and potential and actual RW in 2020 across Italian Provinces (NUTS 3) compared to Milan province. Source: Authors' calculations on ISTAT and INAPP-ICP data.

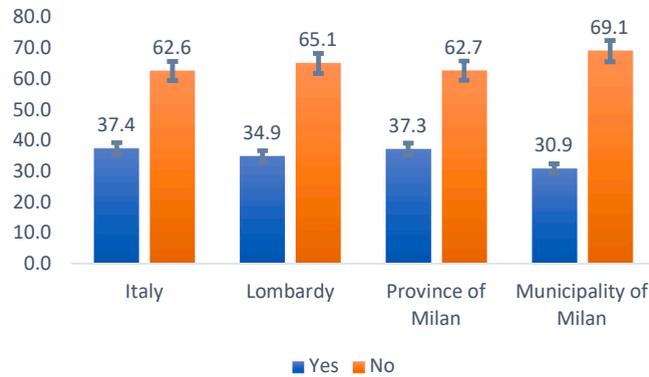


Fig. 3. Would you move to a small town were you allowed to start RW? (Percentage values). Source: Authors' calculations on PLUS data for 2021.

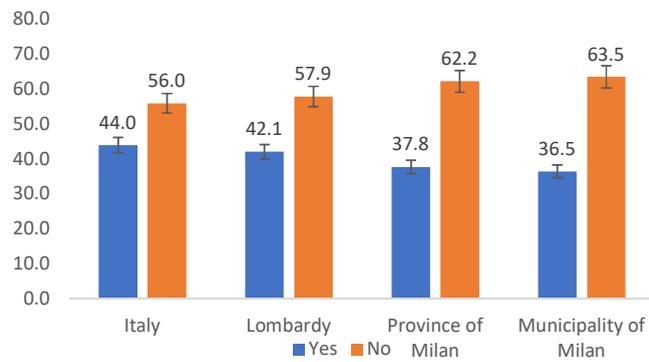


Fig. 4. Would you move closer to nature were you allowed to start RW? (Percentage values). Source: Authors' calculations on PLUS data for 2021.

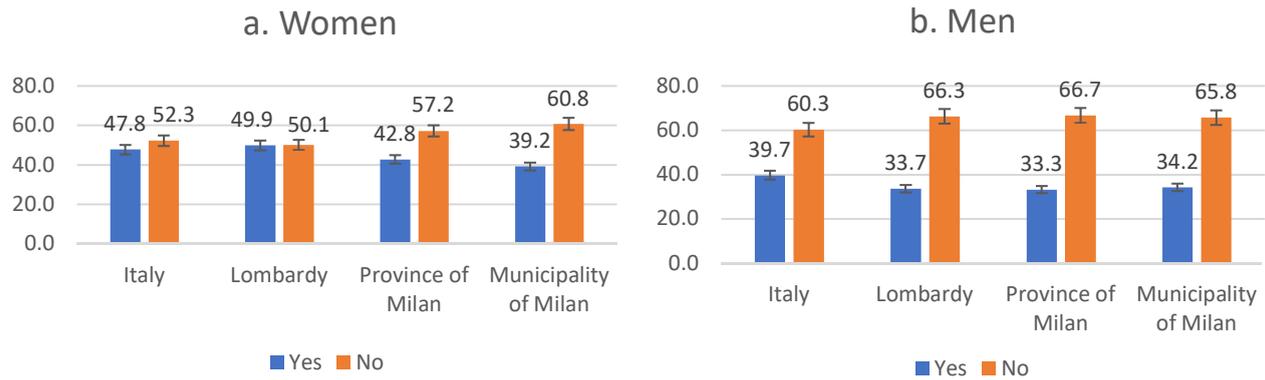


Fig. 5. Would you move closer to nature were you allowed to start RW? Disentanglement by gender (Percentage values)

Source: Authors' calculations on PLUS data for 2021.

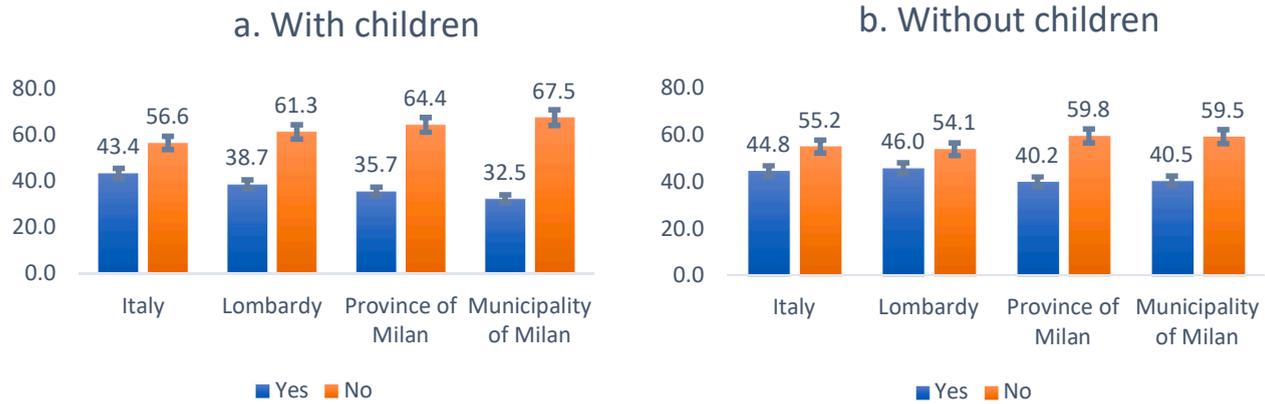


Fig. 6. Would you move closer to nature were you allowed to start RW? Disentangling by family composition (Percentage values)
 Source: Authors' calculations on PLUS data for 2021.

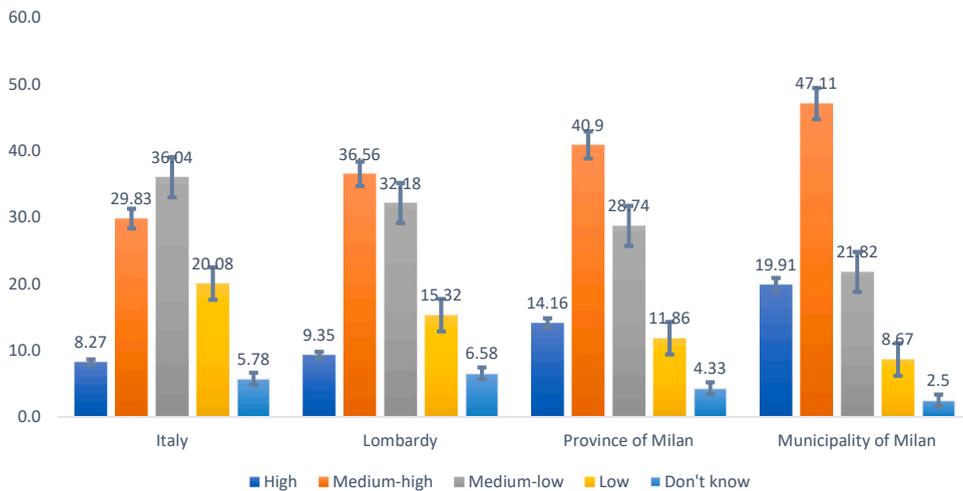


Fig. 7. How would you assess the quality of public transport? (percentage values)

Source: Author's calculations on PLUS data for 2021.

administrations have adopted the so-called “near working” policy to allow their employees to work remotely in third places like coworking spaces close to their homes.⁹

This structural change may lead to a new way of producing and managing flexible work practices within firms, with a considerable reorganization of work, especially in re-engineering production processes based on new digital technologies and the possibilities offered by RW. The role of public policies in the process towards a possible “new normal” in the labor market is essential, by supporting complementarities between technology and human capital and offering up-skilling and reskilling processes not only for workers but also for managers and entrepreneurs.

Thus, the literature review and the empirical analysis of the case of Italy allowed us to frame the following three scenarios about RW trends in Italy in 2050. These scenarios refer to the first scheme proposed by [Sostero et al. \(2020\)](#) and are enriched by specific considerations referring to the case of Italy and the city of Milan: 1) gentrified city; 2) doughnut city; 3) Intermediary cities. The fourth scenario “city paradox” proposed by [Sostero et al. \(2020\)](#) concerning a very high share of RW is excluded because not feasible in the case of Milan.

4.2.1. Scenario 1: $RW < 10\%$ (“Gentrified city”)

In Scenario 1, firms tend to limit RW possibilities, the workers’ residential choices and the city’s structure are not affected and are partially similar to the pre-pandemic consolidation pattern, and somewhat to the situation in 2023, the time of writing the paper. With a low share of remote workers, the number of people allowed to choose to live distant from the center is very limited and, as a result, the rent difference between the center and suburbs and small towns around the city does not change apart from the effects of other possible exogenous factors.

Workers prefer to live near their workplaces; however, as rents largely differ between the city center and the suburbs, workers’ residential choices cannot be uniform: higher-income families continue to reside in the center, while the remaining ones are located more or less distant and commute. Young workers with unstable employment and low income are more likely to live in the suburbs. This is consistent with [Fig. 8](#) above, which points out that young workers residing in Milan have a much higher propensity to move closer to nature in remote work.

As a result, the city’s structure in scenario 1 tends to be gentrified ([Gokan et al., 2023](#)). The actual distribution of the families between the center and the suburbs will depend on the evolutions of labor productivity, earnings, and rents: to the extent that average productivity and earnings grow more than rents, the share of workers living in the center increases while, on the contrary, whether housing prices rise more, a more significant number of families are forced to relocate in the suburbs.

In this scenario, given the non-increasable presence of urban parks and green areas and the high demand for prestigious apartments within the city center, the divide between humans and nature would strengthen. If this type of green amenities was present in the suburbs or near municipalities, the public transportation system would play a crucial role in bridging the human-nature divide. Desirable interventions aimed at increasing the supply of urban parks, green areas, and pedestrian and cycle paths in the city center may, as a side-effect, widen the center-periphery rent differential and strengthen the gentrification process ([Boscacci et al., 2017](#); [Mariotti & Riganti, 2021](#); [Bottero, 2022](#)).

⁹ In Italy, the municipality of Bologna and the Emilia Romagna Region have adopted such a policy (SmartBo: https://www.cittametropolitana.bo.it/portale/Comunicazione/Comunicati_stampa/SmartBo_nasce_la_rete_bolognese_per_lo_sviluppo_sostenibile; PIAO-Piano Integrato delle attività di organizzazione 2023–2025/Integrated Plan of Organisational Activities 2023–2025).

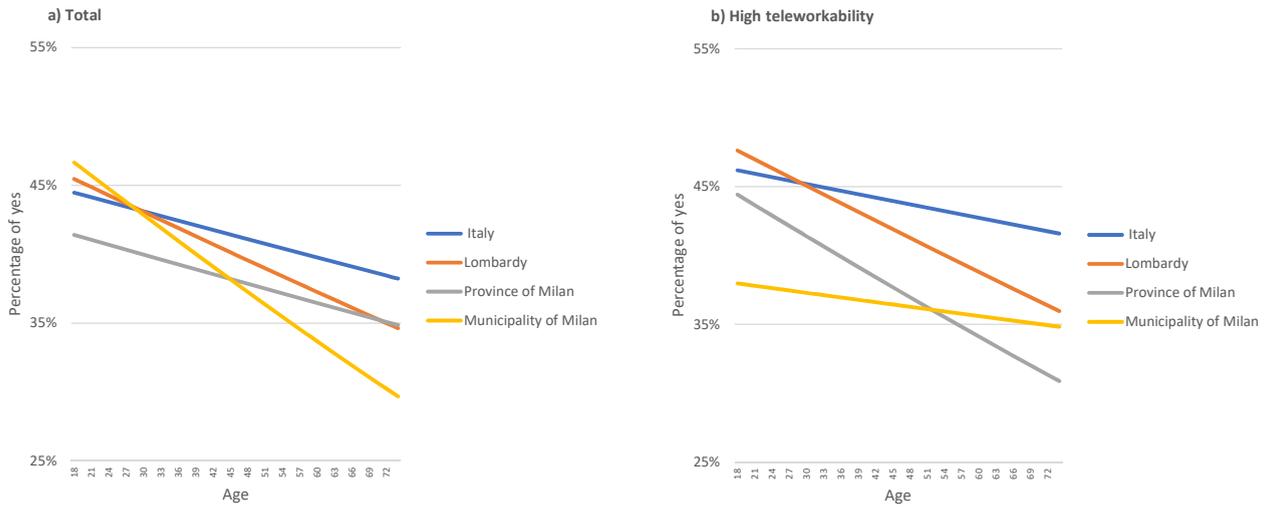


Fig. 8. Relationship between age and the percentage of people willing to move closer to nature if allowed to start RW: total and people who are employed in higher-than-the-median teleworkable jobs. Source: Authors' calculations on PLUS data for 2021.

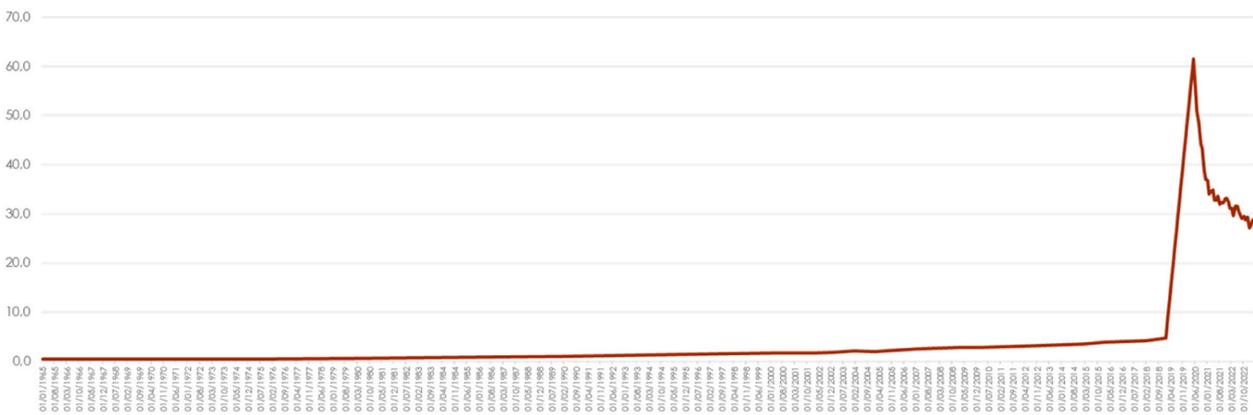


Fig. 9. The amount of RW in the US: % of fully paid working days.
 Source: authors' elaboration on [Barrero et al. \(2021\)](#).

Scenario 1 resembles the situation of Milan in the first half of 2023. The average real estate price in Milan is 5710 euros per square meter, and even in some peripheral neighborhoods, thanks to urban regeneration processes and the growth of services, prices are now around 3700 per square meter (CAMCOM, 2023). Similarly, the average rent of a three-room apartment in the city (even in the less prized neighborhoods) is about 1200 euros a month (CAMCOM, 2021). The pandemic has certainly impoverished households, thus, the issue of housing affordability may represent one of the critical factors for the dynamics and social composition of the city in the years to come. In 2022, the municipality received almost 17,000 requests for help in the form of applications for contributions under the 'Rent Support' notice (bando "Sostegno affitto").

Therefore, the current real estate context may be an obstacle to the settlement of families in search of larger sizes: as proof of this, the number of singles in the city has grown by 15% in the same period, so much so that today 55% of Milanese families are single-person households (in 2001, single-person households accounted for 47%). Besides, according to CAMCOM (2021), in the last twenty years, Milan has lost 14% of its population aged between 25 and 44 years old, despite a 4% increase in the total number of residents: if in 2001, young adults represented one-third of the population, in 2023 they correspond to about one in four Milanese.

Although the real estate prices are high, the migration balance for qualified young people between the ages of 19 and 34 has always remained in surplus, even in the two-year pandemic period, a sign that Milan has never lost its appeal to this particular target group. Specifically, Milan has been able to attract more talent from abroad than it has exported. In this respect, Milan constitutes a perfect counterpoint in Italy, a country affected by the brain drain of highly educated people (Cattaneo et al., 2019) with a lower probability of firm creation, with a worrying dearth of start-up enterprises (Anelli et al., 2023).

One of the main prerequisites for this turnaround is undoubtedly attributable to the increasingly marked international openness of the university system: over the past ten years, Milanese universities have seen the number of foreign enrolments double, now amounting to 10% of university students (a much higher share than the Italian average, which stands at 3%, and in line with that of countries such as France and Germany). But the repercussions of this hyper-skilled mobility have also reverberated on the production system, helping to consolidate the city's profile as an ideal destination for those who choose to innovate. According to data from the Startup Heatmap Europe Report, Milan in 2022 was ranked 12th among the most popular start-up hubs in Europe, up five places from its 2021 ranking. In particular, thanks to an average 36% increase in early-stage investments over the past three years, Milan stands out as one of the few contexts in Europe where it has become easier for start-ups to increase their seed rounds.

In addition, the share of graduates in the total number of transfers has also changed. Whereas until a decade ago, the share of graduates deciding to move out of town could be considered almost residual (13.9%), today its relative weight is close to 25%. It is beyond the scope of this paper to investigate the many reasons behind this change - ranging from the internal dynamics of the labor market to socio-economic conditions to cultural and subjective elements - but it is sufficient to point out here that the issue of the attractiveness of young talent cannot, and must not, be treated in isolation from the homologous issue of talent retention. However, some signs deserve not to be underestimated between the folds of this exciting fresco. The first aspect evokes the phenomenon of the so-called 'brain drain'. Italy has been widely documented to be one of the most relevant countries affected by the brain drain phenomenon at high levels of education (Cattaneo et al., 2019).

As stated above, this scenario is characterized by low levels of RW. The opposite situation is described in the next section: Scenario 2, the "Doughnut city".

4.2.2. Scenario 2: $RW > 50\%$ ("Doughnut city")

With % or more of the labor force composed of remote workers able to relocate far from the center, the city's structure likely undergoes a severe impact: it turns from gentrified (scenario 1) to a doughnut structure. Even in the case of less-than-optimal transport services and mobility, many families take the opportunity to change residence, thus moving outside the city, to benefit from the houses' lower prices (Mariotti et al., 2022a). Fig. 3 shows that a large share of workers living in Milan (around 30%) are willing to leave the city and move to a small town in the case of RW, and even more (around 36%) would move closer to nature. These figures imply the existence of a sizeable potential relocation with high-skilled workers moving from the large city to its outskirts.

In Scenario 2, the city center is less congested, and many houses and offices remain empty, causing rents to fall substantially. Therefore, workplaces and houses in the central business district become more attractive because of the reduced real estate prices, but many jobs are lost in activities like bars, restaurants, fitness centers, cleaning, and security, which provided services to commuters and residents who crowded the city center before the pandemic.

Given the lower demand for housing, a greater supply of urban parks and green spaces within the city center is facilitated where possible. Moreover, large new urban projects, such as those concerning the regeneration of the Milanese railway yards¹⁰ could compensate for the flight and rebuild the relationships between humans and nature within the city by paying attention to green spaces.

On the other hand, new jobs in these services are opened in the suburban areas and small towns where families relocate. The increased number of residents in these areas boosts demand for houses, rents, and services, likely improving their social vitality.

Companies will adopt a multilocation model, with owned offices, shared offices, collaborative spaces, and coworking spaces closer to their employees. Specifically, coworking spaces become a highly demanded service in the suburbs to host remote workers and provide them with equipment, suitable rooms (Mariotti et al., 2023), and the opportunity for face-to-face interactions with colleagues and other workers (Biagetti et al., 2023). Also, fiscal revenues to local authorities increase, allowing to finance more and better public services.

¹⁰ https://www.fssistemiurbani.it/content/dam/fs-sistemi-urbani/scali-milano/ADP_SCALI_MI_ALL-K_PAR-SI.pdf

In this scenario, workers go to the workplace for a given number of days per week or month (hybrid working), causing an increase in commuting distance but a reduction of time per person. The final effect on congestion also depends on the intensity (how many days per week) and commuting distance. In any case, the mobility of people from suburban areas to the center becomes an even more crucial issue, thus demanding public transport expansion.

The sustainability and extension of the massive recourse to RW assumed in this scenario depends on the remote workers' preferences and productivity evolution. If workers get used to working remotely, they will no longer be willing to give it up. This may force employers to change the work organization to accommodate this demand by the workers. On the other hand, should the firms experience a substantial decrease in labor productivity due to the massive use of remote work, employers will oppose a further extension of this type of work and seek to limit its use.

An extensive recourse to RW and the decrease of workers in the city center may also weaken the agglomeration economies that, according to economic analysis, generate economic benefits for people and firms located in the city. Consequently, average productivity could be adversely affected, and the productivity advantage of urban jobs would decrease.

During the pandemic, Milan has experienced the loss of city users, as described by [Mariotti et al. \(2022b\)](#) and inhabitants, against the trend between 2011 and 2019 trend, characterized by a constant expansion of its urban population. In 2020 and 2021 Milan experienced a demographic contraction of 2.3% and 1.8%, respectively, for more than 56,000 fewer residents ([CAMCOM, 2023](#)).

Besides, the number of those who have preferred to move 'out of town' has increased, meaning both the hinterland (which in 2021 absorbed 33% of those who left Milan, against an average of 29% in the previous decade) and the other Lombardy provinces, whose overall receptivity has risen by one and a half percentage points, account for 20% of the total. On balance, therefore, one out of two Milanese who relocated outside Milan has not moved too far away from the capital, a sign that both the nodal function and the gravitational force of the metropolis are not in question ([CAMCOM, 2023](#)).

In addition to the meager birth rate, which could be considered a sadly acquired fact, this population contraction is due to: (i) remote working and studying; (ii) the change in consumption patterns; (iii) the economic recession, and the dynamics of the cost of living. All these elements will probably continue to have in the immediate future significant repercussions on people's long-term decisions.

However, even before the pandemic, cancellations had been steadily increasing for five years, reaching a peak in 2021, when 46,000 people left the city, 30% more than the average for the five-year pre-COVID-19 period – from 2015 to 2019 - ([CAMCOM, 2021](#)). More specifically, compared to the recent past, the number of aspiring Milanese, both from the rest of the peninsula and from abroad, has contracted considerably. At the same time, the number of those who have decided to leave the capital for other Italian municipalities has exploded. A loss of the city's attractiveness can explain this: Milan may instead have been affected by the weakening of certain conditions of liveability, starting with the decrease in families' purchasing power. Even before the pandemic, the cost of living in Milan had already risen by more than 6% compared to 2011; the scarcity of some raw materials created by the spread of the virus and further aggravated by the Russian-Ukrainian conflict, together with the energy crisis, have led to a further increase in the prices of many goods in the last two years, bringing inflation in the city to + 13% in ten years. On the other hand, the average citizen's income has grown by only 7.1% in the same interval, making it effectively impossible to cope with both the effects of the high cost of living and the simultaneous rise in property values, which rose by more than 30% in both sales and rents in the period 2011–2021.

In addition, the pandemic has also profoundly transformed the forms of living, making larger spaces necessary to reconcile different activities; it is not difficult to imagine how the new requirements have turned out to be economically unsustainable for many. It is no coincidence that the most significant share of direct moves to the province (around 28% of the total) concerns young adults aged between 25 and 34 years old, increasingly looking outside the city for more affordable housing solutions. But Milan is also in danger of becoming progressively less attractive for families, as the number of couples with children in the city has fallen by 2.8% over the last ten years.

The two scenarios described above represent the two possible extremes in the RW diffusion. The following scenario sets in between them.

4.2.3. Scenario 3: RW about 25% ("Intermediary cities")

In scenario 3 "Intermediary cities", workers with highly teleworkable activities move to intermediary cities ([Rodriguez-Pose & Griffiths, 2021](#)), especially if they are closer to nature. [OECD \(2022\)](#) defines intermediary cities as small and medium-sized cities, which play an essential role in the rapid transformation of human settlements by supporting the massive flows of population, goods, and services between rural and metropolitan areas. Firms restructure and downsize headquarters and open satellite offices to be more relative to the workers. Besides, the demand for coworking spaces in intermediary cities grows ([Biagetti et al., 2023](#); [Sostero et al., 2020](#)). Regarding mobility, an increased use of private transport is expected in intermediary cities. As in scenario 2, fiscal revenues to intermediary cities' local authorities increase, allowing them to finance more and better public services.

With an intermediary share of remote workers, the evolution of the city's structure depends on how many choose to leave the city center. If only a few of them actually move, this scenario tends to converge to scenario 1 (gentrified city). Conversely, if most of the remote workers move towards the suburbs or smaller towns, the city's structure is affected and tends to the situation depicted in scenario 2 (doughnut city).

The first determinant of the residential choices of remote workers is the comparison of house rents between the center, suburbs, and intermediary cities. In case of a significant rent differential, many remote workers and their families flee the center. Internet connection quality is also a prerequisite for an area to become a destination for an influx of remote workers as new inhabitants ([Mariotti et al., 2022a](#)). However, other variables in this intermediary scenario may also prove decisive in moving the city towards scenario 1 or 2. First, the residential choices depend on how many days per week the remote workers must be at work in presence. In a "pure" remote work pattern, the workers have broad freedom in their residential choices, while in the most likely case of hybrid remote work, with a mix of work from home and in-presence days, workers' choices also depend on the time and costs of commuting to the center. In this regard,

Table 1 above reports a significant variance in the number of days spent working from home. In this heterogeneity of situations, those who can work more days from home find it more convenient to relocate to the suburbs or intermediary cities.

Second, a large relocation from the center of Milan only occurs if transport services and mobility allow easy and affordable commuting. Third, in this scenario, amenities are particularly relevant. Suppose families appreciate the cultural and social life, education, health services, and other amenities the city center offers; in this case, only a few leave the center of Milan, and this scenario converges to scenario 1.

Also, the evolution of housing prices and rents depends on the number of remote workers who decide to live far from the center of Milan. In case only a few of them take the opportunity to move, prices will not be affected. In the opposite case, where most remote workers relocate, the prices in the center and periphery of the city are likely to be affected: those in the center decrease somewhat. In contrast, those in the suburbs where workers relocate increase.

Scenario 3 affects the city of Milan by reducing congestion, real estate prices, and generally the cost of living.

The leave of people from Milan opens possibilities to reshape the city itself, and the greater connection to nature should be reflected in new development forms in intermediary cities (Liaros, 2019, 2021; Liaros & De Silva, 2022). This scenario will rebalance the equilibrium between Milan, intermediary cities, and rural areas. Specifically, RW can be conceived as a factor of potential socio-economic transformation for intermediary cities and rural areas, thus reshaping their relations with metropolitan cities. Several recent policy initiatives launched by the EC and other international institutions addressed the issues of RW and territorial rebalancing and development, especially in rural areas.

This scenario could constitute a new frontier in the relationship between humans and nature, through revitalising towns and villages rich in green spaces, but in danger of depopulation. Recent near-working policies, such as the initiative of the Emilia Romagna region (Piano integrato delle attività di organizzazione 2023–2025) go in this direction, by promoting sustainable development, through the creation of coworking spaces scattered across the territory. Thanks to these spaces, remote workers could work near their homes and be more in contact with nature. Moreover, this scenario would create a better balance between the city centers and their suburbs.

Intermediary cities (e.g., Piacenza, Pavia) could represent the destination of the 31% of Milanese workers, who would move to a smaller town if allowed to start RW (see Fig. 3). However, not all intermediary cities would benefit from RW, since commuting to Milan should be feasible: transport connections play therefore a key role. For example, the high-speed railway station placed in Reggio Emilia (travel time to Milan: 44 min), makes this town a possible destination for remote workers.

Affluent towns and smaller cities benefit from an exodus of highly paid knowledge workers from Milan and the Milan metropolitan area. While this constitutes the beginnings of a slow, painful rebalancing away from Milan, few of the Italian most deprived areas benefit substantially (Farmer & Zanetti, 2021). Besides, many firms in the knowledge economy have gotten rid of their offices and many jobs have gone permanently remote.

Recent studies have found the attractive potential of intermediary cities for RW and the subsequent new demand for collaborative and flexible spaces since those agglomerations connect urban to rural areas in terms of supply of services and opportunities (Biagetti et al., 2023; Mariotti et al., 2022a). In line with the vision outlined by the Sustainable Development Goals (SDGs), the European Rural Vision established some research directions that are inextricably linked to the capacity of remote working arrangements to boost the attractiveness of rural territories and to address the local challenges related to the socio-economic transformations that have hit rural areas in recent years.

5. Discussion and conclusions

The recent spread of RW, unlike other effects on the labor market related to COVID-19, is likely to produce structural effects in the labor market and these arrangements can be considered as a permanent “new normal” in the labor market. To be more precise, hybrid is the future of work. Hybrid working arrangements balance the benefits of being in the office with the benefits of working from home (Barrero et al., 2021). As of 2023, 29% of full-time American employees (20–64 years of age) have a hybrid arrangement (Barrero et al., 2023). Given that employment patterns are unlikely to return completely to old paradigms of work paradigms, it is important to recognize the health issues associated with fully remote work and the inability of many workers to perform their jobs remotely. In addition, remote work can limit creativity and innovation, which typically benefit from interaction and physical proximity between people. Choudhury et al. (2022) provide causal evidence on the effects of the extent of hybrid work on outcomes relevant for employees and report that intermediate WFH is positively associated with both higher self-reported work-life balance and lower self-reported isolation from colleagues. They also show that hybrid work results in higher performance ratings on measures such as quality of work and creativity for managers. Non-managers reported no performance penalty for being in hybrid work. Therefore, hybrid work arrangements are likely to become the dominant model for jobs that lend themselves to these arrangements.¹¹ The paper aims to fill the gap in the literature by examining three potential scenarios for the spread of RW in the next 20 to 30 years in Milan and how this could affect people’s residential and working preferences and their relationship with nature. The province of Milan stands out for its highest

¹¹ This trend can be seen in opinion surveys. Fewer than one in five US executives surveyed in a PwC Pulse survey planned to return to full-time, face-to-face work in the fall of 2021, and only 4% of respondents planned to remain exclusively remote. The overwhelming majority of respondents (more than three out of four) embraced the concept of hybrid work or a blended model where some employees work in-person while others work remotely. From an employee perspective, more than half of workers in the same survey expressed a preference for working remotely at least 2 days/week, with only 19% of all respondents having a strong preference for working exclusively from home. home (<https://www.pwc.com/us/en/library/pulse-survey/future-of-work.html>).

potential and actual RW values in 2020, even compared to other densely populated areas. The results of this paper represent a helpful tool to support the definition of new RW strategies that could help policymakers reduce a part of the systematic mobility demand, and rethink the structure of large cities, intermediary cities, smaller cities, rural areas, and the effects of RW on their ecosystem.

The empirical analysis underlines that in Italy, a possible pool of workers would relocate to a small town (37.4%) or closer to nature (44%) if allowed to work remotely. The results for Milan are in line with the national average or lower, which can be explained by the good quality of the offered services, discouraging residential changes.

The three scenarios of Milan in 2050 can be defined as co-evolutionary scenarios between nature and humans in cities, affecting the human-nature relationship. The results, indeed, underline the need to make urban areas more walkable, more fun, more liveable, and also make them greener. The city must be not just a place of wealth generation, culture, and activity, but a unique ecosystem that offers us protection against climate threats and a vital, visceral connection with wildlife.¹² Moving nature-based solutions higher up the urban design and planning agenda is a significant opportunity to prepare cities for the future, providing an innovative ecosystem approach that can contribute to a city's resilience, economic growth, and human well-being (European Commission, 2020; Mahmoud et al., 2022; OECD, 2023).

The regeneration of neglected urban spaces can, for instance, improve business and residential areas, as multifunctional design with nature can create new dynamic spaces, such as socio-cultural hybrid spaces and collaborative spaces (Mariotti et al., 2023; Biagetti et al., 2023), that increase land and neighboring property values, thus attracting investors, while improving citizens' well-being. Besides, sustainable urban planning with nature-based solutions has a positive environmental impact since it can also reduce pressure on peripheral natural areas; for example, wastewater can be treated closer to residential sources and provide satisfactory near-home recreation opportunities that diminish the need to travel for contact with nature (European Commission, 2020).

In addition, nature-based solutions contribute to the social dimension of sustainable urbanization: green space availability can be related to people's perceived happiness and general health while having green space nearby appears to reduce the incidence of costly forms of illness, such as heart disease, obesity and depression (Kotsila et al., 2020; Mahmoud et al., 2022).

The scenario analysis we performed for Milan depicts three main scenarios. The first, the "gentrified city" scenario, predicts a RW share lower than 10% which is partly similar to the pre-pandemic consolidation pattern and somewhat to the situation in 2023, the time of writing the paper. This scenario shows a significant difference between housing prices in the center and the suburbs/small towns, low housing affordability¹³ in the center, and higher-income workers and families who prefer to reside in the center.

The "Donought effect" scenario – with RW higher than 50% – is characterized by reduced housing price differentials between the center, the suburbs, and small towns. Medium and high-income, well-educated remote workers are likely to relocate to the suburbs or small towns, which are somewhat revitalized because consumer services relocate from the center to the suburbs/small towns. Nevertheless, the high percentage of RW is a necessary but not sufficient condition to have the doughnut effect: the choices of relocation of workers also depend on the comparison between center and suburbs/small towns regarding amenities (in particular, natural amenities), efficiency and costs of mobility, and other services.

In Scenario 3 "Intermediary cities" – with RW about 25% – highly teleworkable workers relocate to intermediary cities, mainly if they are closer to nature. Scenario 3 is desirable because of spatial redistribution effects. RW might be considered a factor of potential socio-economic development for rural and intermediary communities, changing their relationships with major cities. This Scenario is perhaps the most realistic and probably desirable because it avoids the *status quo* of Scenario 1 with high house prices in the center, and imbalances from gentrification, and avoids Scenario 2, which involves impoverishment and desertification of the city center with negative consequences on personal relationships, productivity, economic activities etc. This Scenario well fits into the recent European policies fostering the potential of intermediary cities and tackling the challenges these cities face.¹⁴

A recent study by Aksoy et al. (2023) corroborates Scenario 3 since it shows that in April-May 2023, full-time employees worked from home 0.9 days per week, on average, looking across 34 countries.¹⁵ RW levels are higher in English-speaking countries. While full-time employees worked an average of 1.4 full paid days per week from home across Australia, Canada, New Zealand, the UK, and the US, RW levels average only 0.7 days per week in the seven Asian countries covered by the G-SWA, 0.8 in the European countries, and 0.9 for four Latin American countries and South Africa. Therefore, a large European city like Milan will not be emptied by RW (e.g., doughnut city) because of the growth of hybrid working. The risk is that Milan will keep on being a gentrified city, thus massively pushing social and economic inequality.

If Scenario 3 has to be desired, policy recommendations concerning nature-based solutions for sustainable urbanization should be put forward (Kotsila et al., 2020; Mahmoud et al., 2022).¹⁶ There is a need for action on several factors; mobility improvement is

¹² https://www.nytimes.com/2023/05/09/opinion/urban-gardens-rewilding-cities-biodiversity.html?unlocked_article_code=LC40-EZl2LvAUFHllbVZw6B6M_NhT3uoC0pX2lZy58R68ah3hcAymho0NTc2j9EH7SFs7oabT3cbxs-VJJJzHj91pgNl8EpQEC8XJaETaX3J7szKVCpaw2eytap1UIRdW1WIdPD9s9v

¹³ For a review see the Osservatorio Casa Abbordabile (Observatory Affordable Housing): www.oca.milano.it.

¹⁴ The OECD Programme Unlocking the potential of intermediary cities supports countries, regions and cities to take advantage of opportunities presented to intermediary cities, and tackle the challenges these cities face (<https://www.oecd.org/cfe/cities/intermediary-cities.htm>).

¹⁵ This finding and other results in this report are based on data from Wave 3 of the Global Survey of Working Arrangements (G-SWA).

¹⁶ The urban agenda the European Union has relaunched for the 2021–2027 programming period concerns the European Green Deal strategy (EGD), the post-pandemic funds delivered by the NextGenerationEU and the Recovery and Resilience Facility instruments, and the New European Bauhaus initiative (NEB). These strategies have been created to support the transformation of the built environment and urban spaces from a local and community co-designed perspective.

advocated since hybrid working calls for hybrid mobility. If RW reduces average energy and emission savings (Roberto et al., 2023, pp. 13010607) because of lower commuting, and the city's demand reduction is undesirable, its supply could be changed by expanding it through increased integration with its hinterland and intermediary cities. For instance, the following actions should be promoted: (i) the extension of Milan metro lines beyond the narrow municipal boundaries and the reinforcement of suburban railway lines; (ii) the creation of an effective circular public transport system in the city; (iii) the reinforcement of car interchange car parks at the city gates; (iv) the integration of taxi ranks; (v) the elimination of traffic bottlenecks that slow it down and unnecessarily increase pollution; (vi) the geographical extension of car sharing and bike sharing; (vii) the creation of an integrated bike-train-bike transport system with good interchange stations (Fratesi, 2023). Consequently, improved sustainable mobility will reduce the gradient of real estate prices to benefit all categories affected by high rents without necessarily sacrificing environmental sustainability. Within this context, systemic interventions should be promoted to prevent municipalities of the same urban area from competing with each other. A strong governance of the Milan metropolitan city is therefore advocated (Fedeli et al., 2020).

Besides, the "near working" strategy might be adopted by the private and public sectors. Specifically, some Italian public administrations (e.g., Municipality of Milan, Municipality of Bologna, and Emilia Romagna Region) allow their employees to work closer to home in coworking spaces, in intermediate cities, peripheral and rural areas (Krasilnikova, 2024). In addition, some firms in Italy give vouchers to their employees to work in coworking spaces near their homes. These new working patterns have been used by national and regional transport strategies to solve issues with mobility and promote the growth of low-traffic areas and cities (Krasilnikova, 2024). However, a divergence between suburbs and intermediary cities may arise in Scenario 3, with those better connected to the center and well equipped with local services and natural amenities attracting more residents, more consumer services, and increasing the real estate values. Besides, there may be a "shadow effect" on the neighboring cities if this Scenario increases the reduction of commuting: because of less commuting, the hinterland of the poorer cities may begin to overlap with the hinterland of the richer cities (such as Milan), which may result in a different hierarchy of cities in terms of prosperity (Mariotti, 2021; Bond-Smith & McCann, 2022). As a result, capital will concentrate in larger cities since, there, investments will be safer and more lucrative; in contrast, riskier locations will be those with weaker economies.

According to Bond-Smith and McCann (2022), the effects of RW and hybrid working on the productivity of cities and the overall economy will depend on the balance between the introduction of new information and communications technologies, changes in work practices including working-from-home, and the implications for agglomeration processes; therefore the effects on large cities, intermediary cities and peripheral areas might be heterogeneous. However, no clear conclusions exist about how these changes will play out.

Research results point out that RW, in the form of hybrid working, will most likely become a permanent feature of the future of work and that urban, denser areas are more exposed to this change around the world and in Europe (Barrero et al., 2023). However, no particular experience can be generalized, even the one in Milan that we have investigated here, as actual evolutions and prevailing scenarios will differ between cities and regions according to their structural characteristics. Institutional and cultural factors will also play a role. The RW can be a catalyst for evolution, but the results of evolution depend on pre-existing local structures. Available data on the bigger cities in the US show that the "doughnut city" scenario is prevailing. On the other hand, a more differentiated pattern may emerge in continental Europe.

In our understanding, scenario 3 ("Intermediary cities") is the most desirable and even realistic for Milan as it allows to reap the benefits of RW and, at the same time, to realize a new, more balanced relationship between the city center, peripheries, and intermediary cities. Within this scenario, a sustainable and more satisfying interaction between people and nature must be pursued. On the contrary, scenario 1 ("gentrified city") would imply an exacerbation of the current imbalances and inequalities between the center and the surrounding areas, while scenario 2 ("doughnut city") would imply the emptying of the city center and a substantial loss of its agglomeration benefits.

CRedit authorship contribution statement

Mariotti Ilaria: Conceptualization, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Biagetti Marco:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Croce Giuseppe:** Conceptualization, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Rossi Federica:** Conceptualization, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Scicchitano Sergio:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

Data Availability

The authors do not have permission to share data.

Appendix A

INAPP-PLUS survey

A dynamic computer-assisted telephone interviewing (CATI) approach was used to distribute the questionnaire to a sample of residents aged between 18 and 74, according to a stratified random sample of the Italian population. In the last wave, a new section on remote working was added to the questionnaire to investigate the diffusion of such a 'new normal' way of working among Italian workers. One of the key elements of this dataset is the absence of proxy interviews: only respondents are reported in the survey to reduce measurement errors and partial non-response. However, the INAPP-PLUS survey provides individual weights to account for non-response and attrition problems that usually affect sample surveys. Similar to other empirical studies based on the same dataset (see, among others, Clementi and Giammatteo, 2014; Filippetti et al., 2019; Meliciani and Radicchia, 2011, 2016, Bonacini et al., 2021a, Esposito and Scicchitano 2022, Caselli et al., 2022), all descriptive statistics and estimates reported in this analysis are weighted using these individual weights. Finally, it is important to note that PLUS is the only survey on the labor market in Italy in the period after the COVID-19 epidemic, as the Italian Institute of Statistics' Labor Force Survey (LFS) has been recently put on hold.

Appendix B

RW feasibility around the world

A well-recognized indicator of RW feasibility is the Dingel and Neiman (2020) DN index, which intends to classify occupations according to whether employees can work remotely. They use data from the United States Bureau of Labor Statistics Occupational Information Network (O*NET) and bring together information from 15 different questions across O*NET's Work Context and Generalized Work Activities Questionnaires. Merging this index with occupational employment numbers from the US Bureau of Labor Statistics, the authors determine that about 37% of US workers can do their jobs entirely remote. They point out a wide variance of RW feasibility across broad occupation types, ranging from 0 for categories such as food preparation and serving-related occupations to 100% for computer and mathematical occupations. Such an index has also been applied to measure RW feasibility in other countries. For instance, using the same index Beland et al. (2020) conclude that 37.5% of Canadian jobs can be done remotely. It was also shown that the feasibility of working remotely in local labor market areas may influence the effects of lockdown measures. Caselli et al. (2022) demonstrate that small areas with a higher share of professions that can be done from home exhibit a smaller increase in mobility after reopening.

However, the lack of an O*NET-type dataset in many countries has pushed researchers to evaluate alternative methodologies to build a RW feasibility index. Focusing on Europe, Palomino et al. (2020) build the capacity of working under a lockdown for individuals in European countries, based on a 'Lockdown Working Ability Index' that determines individuals' RW feasibility and whether their occupation is essential or else it is "shutable" when a lockdown takes place. Following this procedure, the authors point out great heterogeneity across European countries (northern countries evidence a higher score than southern ones) but also across genders, types of contracts (permanent/temporary; full-time/part-time), and educational levels. Similarly, Adams-Prassl et al. (2020) find significant variability both across and within occupations and industries in terms of the share of tasks that can be done remotely. Globally, Garrote Sanchez et al. (2021) conclude that about 20% of jobs can be performed from home, but this ratio falls to only 1 in 26 jobs for low-income economies.

Sostero et al. (2020) showed that employees working from home regularly or, at least, sometimes in 2019 were more than 25% of the workforce in most Northern European countries, while countries like Greece, Cyprus, and Italy have a percentage below 10%. After the COVID-19 pandemic spread, this trend drastically changed and the share of remote workers was over 30% in many European countries, and equal to 40% in Italy. Some firm-specific factors (such as firm size, sector specialization, and workers' occupation and skills) affect the differences in the propensity to work remotely.

One of the most recent reports by Eurofound (2022c) updated this framework, looking at the diffusion of RW in 2021. They found that the RW increase continued into 2021, consistently with the extension of physical distancing measures; this was particularly relevant for countries like Bulgaria, Romania, Latvia, Lithuania, and the Netherlands. Instead, in Italy, there was only a modest increase in 2021 (see figure A1 in the Appendix).

Appendix C. Tables and figures

Table A1

Literature review: the RW impacts on the cities' structure.

Case study: country	Authors (year)
United States	Florida et al. (2021); Glaeser (2022); Aksoy et al. (2022); Gupta et al. (2022); Ramani and Bloom (2021); Althoff et al. (2022); Delventhal et al. (2022); Barrero et al. (2023).
Italy	Gorini et al. (2021); Mariotti et al. (2021a); Mariotti et al. (2022a); Di Matteo et al. (2022); Roberto et al., (2023, pp. 13010607).
United Kingdom	Batty (2020); Gokan et al. (2022).
Spain	Gurrutxaga (2021)
Canada	Brail and Kleinman (2022)
Australia	Guaralda (2020)

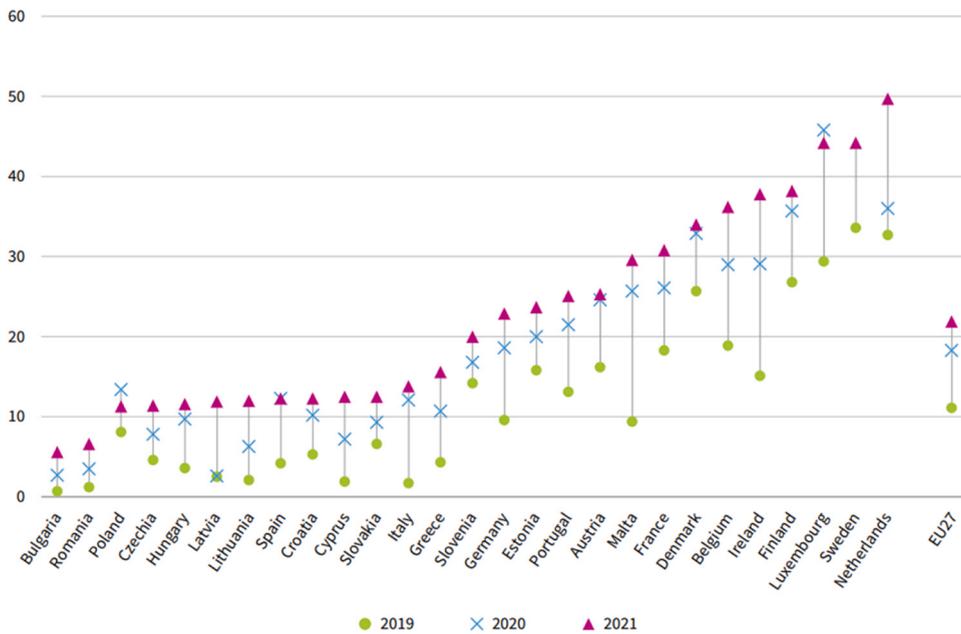


Fig. A1. Share of employees working from home by country, 2019–2021, EU27 (%). Source: Eurofund (2022b) pp.13.

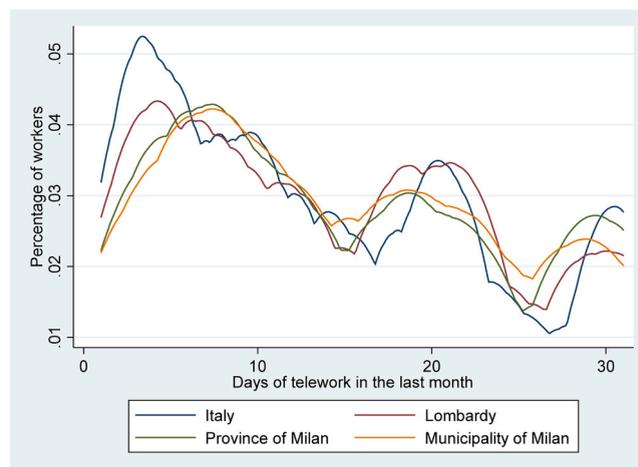


Fig. A2. Densities of days of telework in the last month. Source: Authors' calculation on PLUS data.

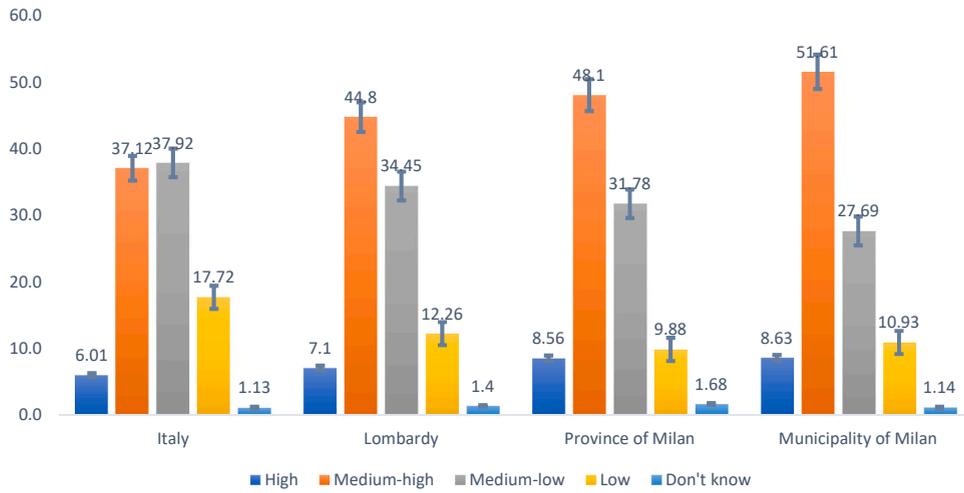


Fig. A3. How would you assess the quality of mobility? (percentage values). Source: Author's calculations on PLUS data.

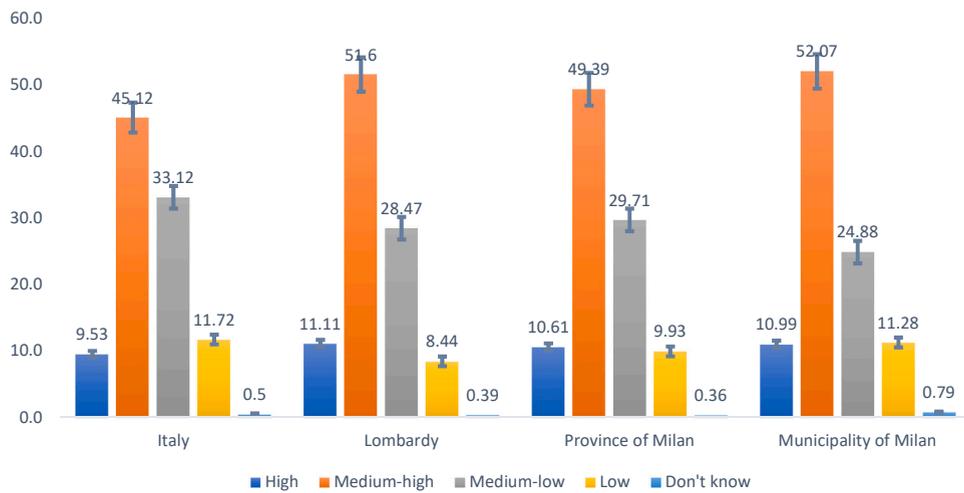


Fig. A4. How would you assess basic health care? (percentage values). Source: Authors' calculation on PLUS data.

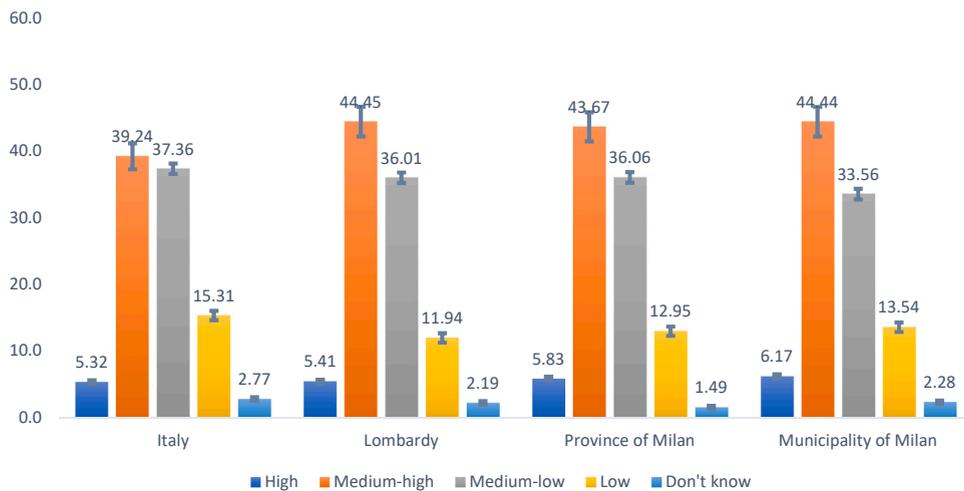


Fig. A5. How would you assess the quality of public offices? (percentage values). Source: Authors' calculation on PLUS data.

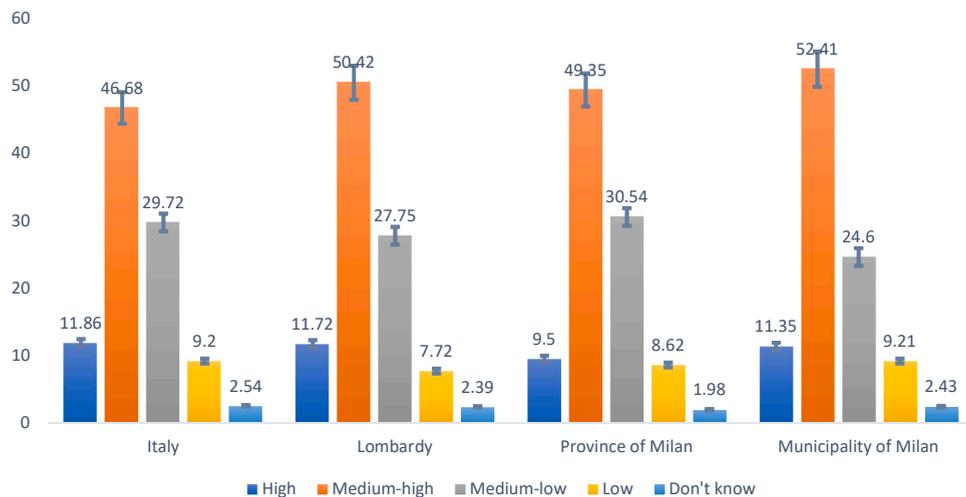


Fig. A6. How would you assess the quality of education? (percentage values). Source: Authors' calculation on PLUS data.

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