RETHINKING ITALIAN INNER AREAS: LESSONS FROM THE POTENTIAL DEMOGRAPHY[1]

Francesca Bitonti, Angelo Mazza

Abstract. The National Strategy for Inner Areas (NSIA) categorizes Italian municipalities based on their distance from "poles", i.e. centres providing essential services. Inner areas (IAs) are municipalities located within a certain distance from the poles. Although the NSIA aims to counteract depopulation and ageing processes affecting IAs, traditional demographic indicators, as the ones officially released by Istat annually, have not been considered to identify them.
For this reason, we aim to provide a demographically nuanced representation of IAs. In particular, we exploit the concepts of potential demography to delineate a demographic profile of the Italian IAs, both in actual and predictive terms. The idea of Potential Years of Life is used to assess the future economic potential of the IAs' population.
The preliminary application shows a complex situation that the NSIA classification failed to capture. A discrepancy between the IAs experiencing the strongest demographic distress and the territories receiving national funding has emerged.

1. Introduction: behind the demographically distressed territories

A large part of the Italian territory is characterized by a spatial organization based on "minor centres", often small in size, which in many cases are not able to guarantee residents accessibility to essential services. These areas have been defined as "inner areas" (IA) by the National Strategy for Inner Areas (NSIA) in 2014. NSIA is a government policy for development and territorial cohesion to counteract marginalisation and demographic decline within IAs throughout the country, which was defined by the "*Accordo di partenariato 2014-2020*" approved by decision of the European Commission on October 29, 2014 (Barca *et al.*, 2014). Since the 1950s, a significant part of the Italian rural and inland territories has undergone a process of marginalization which, first of all, has exhibited an intense phenomenon of de-anthropization, consisting in a) reduction in the population and demographic ageing; b) reduction in employment and in the degree of exploitation of territorial capital (Barca *et al.*, 2014). Secondly, this process has brought about a progressive

[1] Authors' contribution: conceptualization, final draft and editing: FB, AM; supervision, methodology: AM; data wrangling, statistical analysis, original draft, visualization: FB.

quantitative and qualitative reduction of the local offer of public, private, and collective services – that is, the services which "define the quality of citizenship in contemporary European society" (Vendemmia *et al.*, 2021).

NSIA categorizes all Italian municipalities on the basis of their distance from the centres providing services, defined as "poles", the identification of which constitutes the first step of the classification process. Poles are defined as municipalities able to offer the presence of simultaneously:

1. at least one hospital with an emergency department;
2. good offer of secondary schools (i.e., at least two different types of high schools);
3. one railway station (Italian silver level).

The other municipalities are then classified according to the travel time residents must spend to reach the nearest service provider centre:

1. Belt areas, travel time under 20 minutes;
2. Intermediate areas, between 20 and 40 minutes;
3. Remote areas, between 40 and 75 minutes;
4. Ultra-remote areas, with a travel time above 75 minutes.

Inner areas are defined as all the municipalities whose travel time is above 20 minutes, i.e. intermediate, remote, and ultra-remote areas. The distances considered are the road distances measured in terms of time in ideal travel conditions. According to this classification, inner areas cover 60% of the national territory, 52% of all municipalities, and 22% of the Italian population (De Matteis, 2013).

A new classification was published at the beginning of 2022 (Nota tecnica Nuvap, 2022). The methodology used has not changed; however, among the updates, notable is the introduction of more advanced and precise distance calculation techniques (Istat, 2022).

NSIA has, as the ultimate objective, the reversal of the demographic trend, both in terms of number of residents and in terms of composition by age and birth rate (Barca *et al.*, 2014; Barca & Carrosio, 2020). Therefore, the demographic situation has to be central to formulating an economic development plan for IAs. Despite this, no demographic indicator is considered to identify IAs affected by chronic population drain. The model proposed by NSIA has received appreciation in the scientific debate, both for the proposed classificatory work and the definition of "inner area". At the same time, despite the extensive premises accompanying the NSIA processing, it appears to be strongly focused on the provision of the three services indicated. The same classification model proposed, based solely on distances from the municipalities considered "poles", determines the categorization of the whole national territory, neglecting the differences in terms of demographic, economic conditions, and infrastructural accessibility. Moreover, there remain some inconsistencies such as that, while recognizing that inland areas are affected by the

exodus of young people, NSIA still adopts indicators such as health services, which are of little significance in terms of improving the supply of services that create opportunities to prevent this.

Here, we intended to provide a more articulated reading of the phenomenon in question, arriving at a classification of the territory capable of going beyond the availability of the three services of general interest (schools, hospitals, stations) considered by the NSIA as essential to ensure territorial cohesion and the development of disadvantaged areas. This work aims to provide a demographic profile of the Sicilian municipalities to stress the importance of the population structure and dynamics in identifying the areas suffering from young and active forces drain.

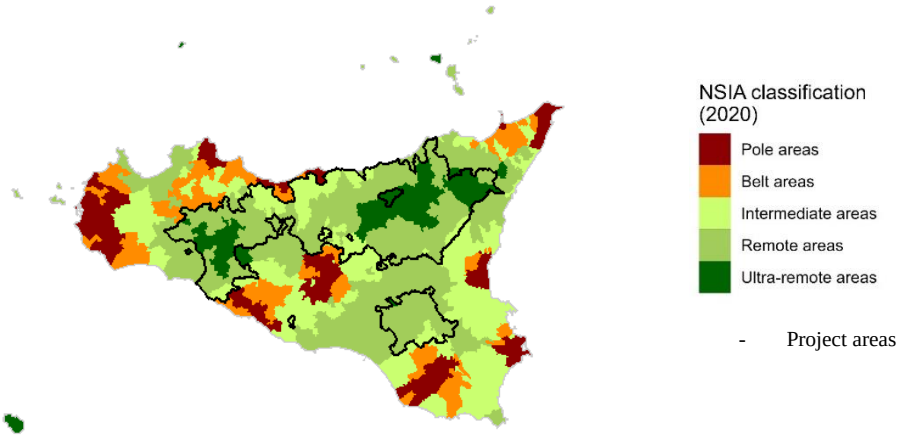
The remainder of the work is structured as follows: section 2 presents the geographical context of the application and elaborates on the demographic profile of the Sicilian municipalities; section 3 reports the discussions and conclusions of the work.

2. The demographic profile of the Sicilian municipalities

The southern Italian island of Sicily will be a case application of a new classification method based on the concept of potential demography that will be introduced in the next section. According to the 2020 NSIA classification (Dipartimento per le politiche di coesione - Mappa Aree Interne 2020 (governo.it)), the Sicilian IAs include 310 of the 390 municipalities of the region (areas coloured in shades of green in Figure 1).

Among them, 34 municipalities have been classified as ultra-remote areas and are mainly located in the northeastern and western inland areas (without considering the minor isles). Between 2014 and 2022, NSIA selected eight project areas (PAs) among the Sicilian IAs: Calatino, Madonie, Nebrodi, Terre Sicanie, Valle del Simeto – Etna, Troina, Bronte and Corleone (Regione Sicilia, 2022). The PAs are groups of municipalities intended as pilot areas where targeted actions to counter territorial marginalization are to be implemented. For each PA, a framework program agreement (ApQ) is established, outlining all the interventions to be carried out, the allocated financial resources, the scheduling of activities, and the expected results associated with each intervention (Tantillo and Lucatelli, 2018).

Figure 1 – *NSIA classification of Sicilian municipalities updated in 2020. Source: authors' elaboration on NSIA data.*



IAs account for 75.64% of the whole area of the region while hosting almost half (47.84%) of the total residing population in 2020 (Table 1). Similar figures highlight the importance of IAs both geographically and demographically.

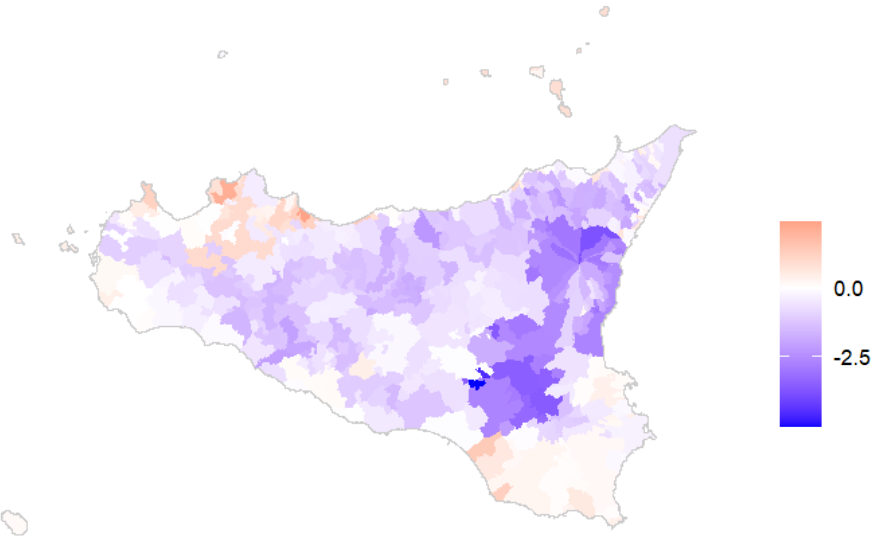
Table 1 – *Territorial area and population counts in Sicilian NSIA areas. Percentage values in brackets. Source: authors' elaboration on NSIA data.*

NSIA classification	Geographic area (km2 – 2019)	Total population (2020)
Pole areas	2882.30 (11.16)	1758272 (36.38)
Belt areas	3409.22 (13.20)	763426 (15.79)
Intermediate areas	6584.51 (25.50)	1151185 (23.82)
Remote areas	10749.76 (41.61)	1059083 (21.91)
Ultra-remote areas	2206.71 (8.53)	101739 (2.11)
Sicily	25832.54 (100.00)	4833705 (100.00)

In Sicily during the last decades, economic globalization and the expansion of urban areas have aggravated the contrast between the coastal metropolitan cities which offer public and private services (Palermo, Catania, and Messina) and the depopulation of the inland areas, historically characterized by the presence of agricultural activities (Scrofani and Novembre, 2015), as illustrated in Figure 2.

These areas are often inaccessible, sometimes unknown to foreigners, and suffer from economic and cultural marginalities. The census data from the last three decades highlighted that the local population has shown a progressive tendency to concentrate along the Northern and Eastern coasts, especially in the vicinity of the large metropolitan centres (Bitonti *et al.*, 2023). This trend has accentuated the differences between urbanized and inland areas, which are even more isolated, scarcely populated and almost completely lacking in basic services.

Figure 2 – *Population mean growth rate during the period 2002-2022 in Sicily. Source: authors' elaboration on Istat data.*



According to our elaborations based on Istat data, just 20.5% of the Sicilian municipalities registered a positive population mean growth rate in 2002-2022 (i.e. 80 municipalities out of 390). Moreover, areas recording an average growth in population between 2002-2022 have, on average, a higher share of young and adult people in 2022 compared to the areas registering population loss (Table 2). This means that the municipalities affected by depopulation have been losing the active part of the population. In other terms, less and less working-age individuals are left to support the increasing share of the elderly. As noted by Barca *et al.*, 2014, heterogeneous dynamics emerged, with areas losing and gaining population over time not always coinciding with IAs and poles. In our opinion, such "demographic distress" should be explicitly considered in the definition of IAs.

Table 2 – *Population structure of Sicilian municipalities in 2022 based on the population mean growth rate for 2002-2022. Source: authors' elaborations on Istat data*..

Population mean growth rate (2002-2022)	Young people [0-19]	Adult people [20-65)	Older people [65+)
Positive	18.9%	59.8%	21.2%
Negative	16.6%	57.7%	25.6%

Another relevant dimension to consider is, in our thoughts, the temporal dynamics of the demographic change involving the different municipalities. Areas experiencing systematic demographic drain over time should be separated from areas affected by a contingent population loss. Figure 3 shows the mean growth rates between 2002 and 2022 of different dependency indices (subfigs.3.a-c-e) and their absolute values recorded in 2022 (subfigs.3.b-d-f).
Values reported in the right-hand side maps refer to 2022 and highlight a higher demographic burden for people in the working-age class in IAs and especially in PAs (contoured by black solid lines). The lower proportions of young people (Y) and the higher proportions of older people (E) over the working-age individuals (A) emerging in IAs (and PAs in particular) may seem proof of the efficacy of the current NSIA classification. Yet, looking at the left-hand side maps, the situation becomes more complex, and the temporal dynamics of dependency ratios configure a multifaceted situation where the increasing burden of elderly over working people and the youngsters drain appear heterogeneous. Indeed, the areas characterized by an average increase in the demographic burden do not always correspond to the PAs selected among the IAs identified according to the current methodology.

Table 3 provides a comprehensive comparison of the mean rates and growth rates (2002–2022) for selected dependency ratios across three categories of municipalities: those not defined as IAs, IAs not included among PAs and PAs. In of mean dependency ratios, the PAs exhibit the highest values for all the indices considering the elderly proportions over the other parts of the population, indicating a greater demographic burden. Conversely, the Y/P and Y/A indices, which measure the proportion of youth relative to total and active populations, are marginally lower in PAs compared to other groups, signaling a reduced share of younger residents.

When examining mean growth rates of dependency ratios, a more nuanced picture emerges. While the E/P, E/A, and E/Y indices have increased across all groups, the rate of growth is significantly slower in PAs compared to the other municipalities. This slower growth in dependency ratios for PAs suggests a relative stabilization of the elderly burden, potentially reflecting the effects of NSIA interventions.

Figure 3 – *Dependency ratios (as mean growth rates between 2002-2022 in subfigs.4.a-c-e and as annual values in 2022 in subfigs.4.b-d-f) in Sicily. Note: Y = population aged [0,19]; A = population aged [20,65); E = population aged [65+); Dependency ratio: D_A = E/A + Y/A. PAs are contoured by solid black or white lines. Source: authors' elaboration on Istat and NSIA data.*

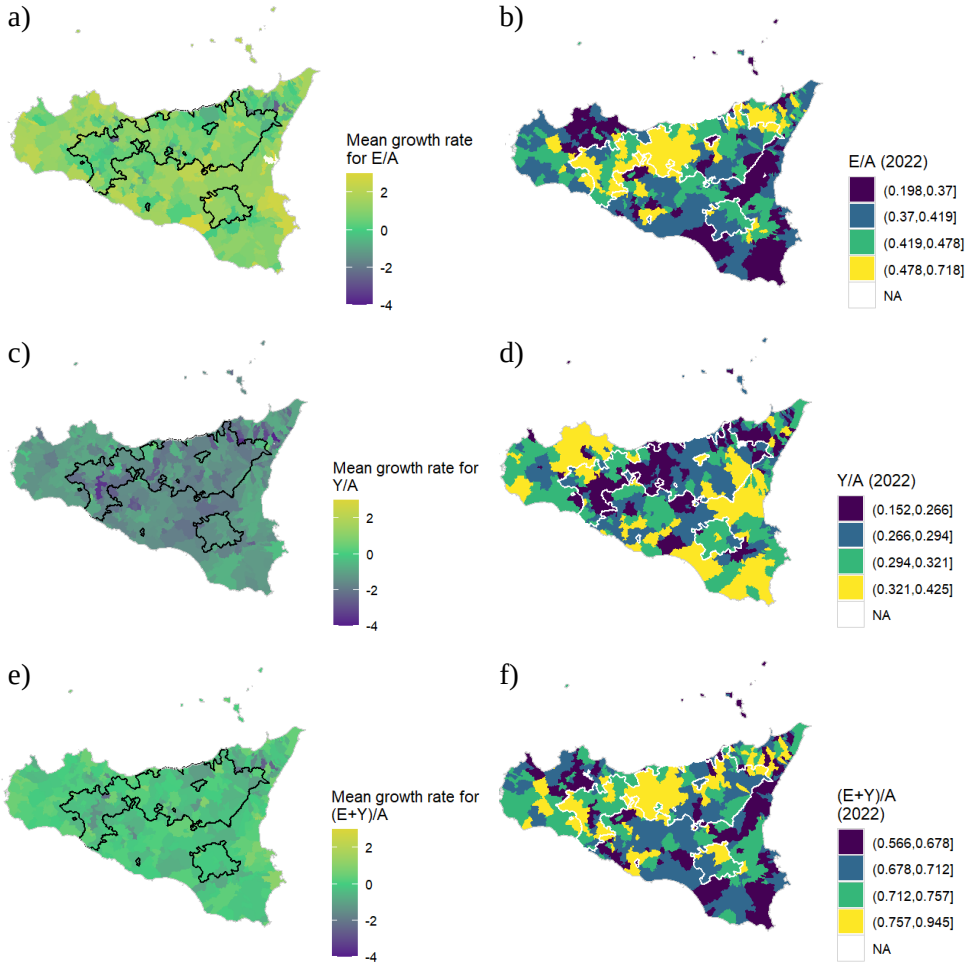


Table 3 – *Comparison between the mean rates and the mean growth rates (2002-2022) of selected dependency ratios between municipalities not defined as IAs, IAs not included among the PAs and PAs. Note: P = total population; Y = population aged [0,19]; A = population aged [20,65); E = population aged [65+). Source: authors' elaboration on Istat and NSIA data.*

	Index	Not IAs	Inner areas (no PAs)	Project areas
Mean rates (2002-2022)	E/P	0.200	0.226	0.250
	E/A	0.334	0.394	0.443
	E/Y	1.032	1.255	1.438
	Y/P	0.199	0.192	0.183
	Y/A	0.331	0.330	0.322
Mean growth rates (2002-2022)	E/P	1.731	1.015	0.841
	E/A	1.908	0.913	0.752
	E/Y	2.895	2.293	2.163
	Y/P	-1.202	-1.365	-1.408
	Y/A	-1.020	-1.468	-1.495

Conversely, the municipalities not classified as IAs exhibit the lowest average dependency ratios for elderly but show the highest mean growth rates for these ratios. This indicates that, although “Not IAs” have a lower initial burden from the elderly population, the pace of aging in these municipalities is accelerating more rapidly than in other regions. On the other end, the mean growth rates for Y/P and Y/A show consistent negative growth across all groups, with the decline being slightly more pronounced in PAs, reflecting ongoing challenges in maintaining or increasing the proportion of younger residents even in areas receiving funding. The slightly higher retention of youth in Not IAs further highlights the advantage of more accessible, urbanized regions in terms of demographic vitality and potential for future socio-economic growth. Table 3 reveals a clear overarching trend affecting all Sicilian municipalities, irrespective of their classification. Across the three categories, a common pattern emerges: the aging population is a prominent feature, with a significant demographic burden placed on the working-age population, particularly in more peripheral areas.

Overall, the depopulation processes occurring in Sicilian IAs have been causing two demographic trends: the first is the aggravation of the demographic burden of the elderly over working age individuals; the second is the shrinking of the young age classes, those which can contribute the most to the future socioeconomic vitality of IAs. The ongoing demographic dynamics induce future social, economic and cultural changes, which are worthy of attention. A crucial aspect that should be

addressed pertains to examining the labour force potential, which each area will need to confront the emerging challenges in the forthcoming decades (Blangiardo, 2013).

According to the potential demography paradigm, a population's future can be considered an economic asset, and a population possessing more "future years" can be considered wealthier (Blangiardo and Rimoldi, 2012). The assessment of a population's future is determined by calculating its "potential years of life" (PYL), a measure first introduced by Hersch (1944). PYL is the sum of the life expectancies of all its members. During a year, PYL increases through births and net migrations, while it decreases by the simple "consumption" of the remaining years of life (due to time flow) and by deaths (Blangiardo, 2012). Hersch's fundamental idea was straightforward. For an individual of a specific age x, their PYL is represented by the life expectancy, e_x (Panush and Peritz, 1996). If the age distribution of a population is given by P_x, then:

$$PYL = \frac{1}{2}\sum_{x=0}^{100+} P_x(e_x + e_{x+1}) \quad (1)$$

The PYL can be broken down in several meaningful ways. Thus, following the indication of Panush & Peritz (1996), the PYL spent in the working life ages is:

$$PYL_W = \frac{1}{2}\sum_{x=20}^{64}[P_x\,(e_{x:\overline{65-x}} + e_{x+1:\overline{65-x-1}})] + e_{20:\overline{65-20}} \cdot l_{20}\sum_{x=0}^{19} P_x L_x^{-1} \quad (2)$$

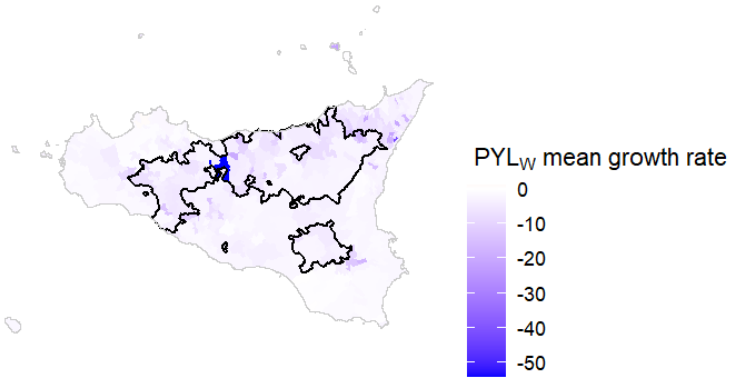
where $e_{x:\overline{65-x}}$ is the expected number of years lived before age 65 by a person now aged *x*. The PYL can be seen as the years of life that the present population will likely experience. The mean growth rate for PYL_W at the municipality level in 2002-2022 is illustrated in Figure 4. Quite all the Sicilian municipalities have experienced a decrease in PYL_w on average during the time period considered. Among them, the areas registering the largest loss are mainly located in the northeastern mountainous regions of Mt. Etna and Nebrodi, and in some inland regions in North-West and South-East. Not all of them are included among the PAs.

This preliminary, and still partial, picture of the demographic distress of Sicilian IAs is intended as a means of discussion and contributes to the debate on NSIA classification with the final scope of effectively allocating resources to the more deprived and marginalized areas of Italy.

3. Discussion and conclusions

The demographic profile of Sicilian municipalities has been highlighted as a crucial aspect that needs to be considered in the identification of areas suffering from population drain. We have demonstrated the complex nature of demographic distress in different areas by analyzing the dynamics of population growth and age distribution over time, and the PYL in working ages. Considering such dynamics can

Figure 4 – *Mean growth rate for PYL_W at the municipality level during 2002-2022. Note: the population age classes considered for the PYL_W computation are [0,19] and [20,65]. Source: authors' elaboration on Istat and NSIA data.*



lead to more targeted and effective intervention plans. The results have been represented cartographically, making it easy to visualize the areas facing greater difficulties and those that are not as peripheral. This visual representation can aid policymakers and stakeholders in identifying priority areas for investment and development initiatives.

The demographic impact of the NSIA project on Italian municipalities during the period 2002–2022 is best understood by considering the initiative's objectives, timeline, and contextual dynamics. While the NSIA was formally implemented from 2014/2015 onward, the historical trends of depopulation and demographic aging in IAs date back several decades, reflecting broader structural issues (Barca et al., 2014). Therefore, the project's direct influence on reversing these trends within the analyzed period is expected to be modest, particularly in the initial years (2002–2014). Evidence from integrated place-based policies suggests that, while measurable impacts on population size or age composition often remain limited in the short term, these initiatives can mitigate the outmigration of young adults and partially rejuvenate local communities when sustained over time (De Rossi, 2021). Consequently, the demographic dynamics observed in NSIA-targeted areas from 2015 to 2022 are likely influenced by a combination of project interventions and prevailing external pressures, including urbanization and global migration patterns (Scrofani and Novembre, 2015). Further longitudinal analyses are necessary to distinguish the initiative's specific contributions from these broader trends.Overall, this study contributes to the ongoing debate on how to support and revitalize inner areas in Italy effectively, and it emphasizes the importance of taking into account various factors beyond the provision of essential services. By adopting a more

comprehensive approach, we can develop better-informed policies that address different municipalities' unique needs and challenges, ultimately fostering sustainable development and minimizing wasteful efforts. As a final note, it is essential to recognize that regional contexts may vary significantly, and the proposed reclassification should be adapted and validated accordingly for other regions in Italy and beyond. Continued research and refinement of such classification models will be essential to ensure that development policies are well-tailored and effective in supporting the growth and well-being of all communities across the country.

Acknowledgements

This study has been partially supported by the PRIN-PNRR research project "Foreign population and territory: integration processes, demographic imbalances, challenges and oppor-tunities for the social and economic sustainability of the different local contexts (For.Pop.Ter)" [P2022WNLM7], funded by European Union—Next Generation EU, compo-nent M4C2, Investment 1.1. It has also been partially supported by the Italian Ministerial grant PRIN 2022 "Depopulation Risk: Experiences, Mobility and Subjective Well-being (DREAMS)" [2022RNKSEL] CUP E53D23010380006. It has also been partially supported by the PNRR - Missione 4 "Istruzione e Ricerca" - Componente 2 "Dalla ricerca all'impresa" - Investimento 1.3 - Partenariato Esteso "GRINS – Growing Resilient, INclusive and Sus-tainable", cod. PE0000018, CUP E63C22002120006, Spoke 8 - "Social sustainabili-ty", finanziato dall'Unione Europea – NextGenerationEU. Finally, it was also partially funded by the European Union - *NextGenerationEU*, in the framework of the *GRINS -Growing Resilient, INclusive and Sustainable* project (GRINS PE00000018 – CUP E63C22002120006). The views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union, nor can the European Union be held responsible for them.

References

BARCA F., CASAVOLA P., LUCATELLI S. 2014. Strategia Nazionale Per le Aree Interne. Definizioni, Obiettivi e Strumenti di Governance. Materiali UVAL 2014.

BARCA, F., CARROSIO, G. 2020. Un modello di policy place-based: la Strategia Nazionale per le Aree Interne. In OSTI. G. AND JACHIA E. (Eds.) *Un disegno di rinascita delle aree interne*, Il Mulino, Bologna.

BITONTI F., MAZZA A., MUCCIARDI M., SCROFANI L. 2023. Urban transformations and the spatial distribution of foreign immigrants in Messina. In E. BRENTARI E., CHIODI M., WIT E. (Eds). *Models for Data Analysis: SIS 2018*, Palermo, Italy, June 20–22. Cham: Springer International Publishing, pp. 53-67.

BLANGIARDO G.C. 2013. Italians of today and tomorrow: awareness of next scenarios and search of new equilibrium. *Rivista Italiana di Economia, Demografia e Statistica*, Vol.17, No.2.

BLANGIARDO G.C. 2012. Discovering the "Demographic GDP". *Rivista Internazionale di Scienze Sociali*, Vol.1, pp.45-58.

BLANGIARDO G.C., RIMOLDI S.M.L. 2012. The potential demography: a tool for evaluating differences among countries in the European Union. *Genus*, Vol.68, No.3, pp.63-81.

DE MATTEIS G. 2013. Montagne e aree interne nelle politiche di coesione territoriale italiane ed europee. *Territorio*, Vol.66, pp.7-15.

HERSCH L. 1944. De la démographie actuelle à la démographie potentielle, *Publications de la Faculté des Sciences Économiques et Sociales, 8.* Université de Genève.

ISTAT. 2022. La geografia delle aree interne nel 2020: vasti territori tra potenzialità e debolezze. https://www.istat.it/it/files//2022/07/FOCUS-AREE-INTERNE-2021.pdf. Last Access: 21.11.2023.

NOTA TECNICA NUVAP. 2022. Aggiornamento 2020 della mappa delle aree interne. 20220214-mappa-ai-2020-nota-tecnica-nuvap_rev.pdf.

PANUSH N., PERITZ E. 1996. Potential demography: a second look. *European Journal of Population / Revue Européenne de Démographie*, Vol.12, No.1, pp.27-39.

R CORE TEAM. 2023. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

REGIONE SICILIA. 2022. Strategie Territoriali Regione Siciliana 2021-2027.

SCROFANI L., NOVEMBRE C. 2015. The inland areas of Sicily. From rural development to territorial reorganization. Semestrale di Studi e Ricerche di Geografia Roma - XXVII, 1, gennaio-giugno.

TANTILLO F., LUCATELLI S. 2018. La Strategia nazionale per le aree interne. *Riabitare l'Italia. Le Aree Interne Tra ab-Bandoni e Riconquiste*. In DE ROSSI A. (Ed). Rome: Donzelli Editore, pp. 403–416.

VENDEMMIA B., PUCCI P., BERIA P. 2021. An institutional periphery in discussion. Rethinking the inner areas in Italy. *Applied Geography*, Vol.135, No.102537.

Francesca BITONTI, University of Catania, francesca.bitonti@unict.it
Angelo MAZZA, University of Catania, a.mazza@unict.it