

Mapping Urban Social Investment: A Composite Indicators Approach for the Municipalities of Milan

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Abstract

This paper investigates the territorial patterns of social investment within the province of Milan by developing a composite indicator grounded in the *stock-flow-buffer* framework. Drawing on municipal-level data from the A Misura di Comune database, the analysis evaluates 133 municipalities over the period 2018–2020 through the Adjusted Mazziotta–Pareto Index. The results reveal a persistent north–south divide, with higher social investment performance concentrated in the wealthier northern and western municipalities and lower scores prevailing in the southern periphery. While the *stock* and *buffer* dimensions remain relatively stable over time, the *flow* dimension shows greater volatility, reflecting the uneven capacity of local labour markets to sustain inclusive employment. The city of Milan exhibits a distinctive profile, combining high education and welfare capacity with fragmented labour dynamics. Overall, the findings highlight the structural nature of spatial inequalities in social investment and underscore the importance of multilevel governance and fiscal coordination in reinforcing the capacity of lagging municipalities. The study contributes to the territorialisation of the social investment paradigm by linking welfare performance to local institutional and socio-economic conditions.

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Keyword: Social Investment; Composite Indicator; Subnational Analysis; Territorial Policy

Introduction

Over the past two decades, the concept of *social investment* has become a cornerstone of welfare state transformation in Europe, reshaping the balance between protection and promotion within social policies (Morel et al., 2012; Hemerijck, 2017). Rooted in the idea that social policies should not only compensate for risks but also enhance individuals' capabilities and future earning potential, the social investment approach integrates education, employment,

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and social protection into a coherent policy framework aimed at fostering inclusive growth (Bonoli, 2013; Ferrera, 2022). While the debate has been largely framed at the national level, recent studies have emphasized the importance of *territorialising* social investment, as local and regional governments play an increasingly central role in shaping welfare outcomes (Kazepov & Barberis, 2013; Andreotti et al., 2012; Gallo-Rivera et al., 2025).

The metropolitan scale represents a particularly relevant setting for analysing social investment policies. Cities are not only arenas where welfare needs concentrate, but also laboratories of innovation in service delivery, education, and active labour market policies (van Gent et al., 2021; Musterd & Ostendorf, 2023). Urban contexts exhibit deep spatial inequalities in human capital accumulation, labour market participation, and access to social services, reflecting the unequal geography of social investment capacities. In this regard, measuring *how municipalities invest in human and social capital* is crucial to understanding local welfare regimes and their contribution to social cohesion (Greco et al., 2019; Myftiu & Scalise, 2025).

Despite the growing policy relevance of local welfare, robust and comparable metrics of *social investment performance* at the municipal level remain scarce. Existing approaches often rely on single indicators or qualitative assessments, overlooking the multidimensional nature of the phenomenon (Mazziotta & Pareto, 2016; Greco et al., 2019). To fill this gap, this paper proposes a composite indicators approach to assess municipal-level social investment performance within the province of Milan, grounded in the *stock–flow–buffer* framework (Hemerijck, 2017). This paradigm conceptualises social investment policies as enhancing human capital stocks (*stock*), facilitating life-course transitions and employment (*flow*), and providing inclusive safety nets (*buffer*).

By integrating data from A Misura di Comune, a comprehensive multi-source statistical framework developed by Istat and the ARCH.I.M.E.DE project, this study evaluates 133 municipalities in the province of Milan over the period 2018–2020. The methodological approach builds on the Adjusted Mazziotta–Pareto Index (AMPI), a non-compensatory technique widely adopted in Italian territorial statistics (Mazziotta & Pareto, 2016; Gallo-Rivera et al., 2025). The resulting indices allow for the comparison of social investment orientation across municipalities and over time, revealing the spatial structure and persistence of social inequalities within the metropolitan area.

This paper contributes to the literature in three main ways. First, it operationalises the *social investment paradigm* at the municipal level, advancing the territorialisation of welfare research. Second, it applies a robust composite indicators methodology, ensuring comparability and sensitivity to multidimensional imbalances. Third, it provides new empirical evidence on how different municipalities in the province of Milan perform in terms of stock, flow, and buffer policies, offering insights for local policy design and regional development strategies.

The remainder of the paper is structured as follows. The next section outlines the theoretical foundations of the social investment paradigm and its territorial implications. This is followed by a description of the data sources and the methodology. The subsequent section presents the main empirical results, while the final parts of the paper discuss the findings, draw policy implications, and offer concluding remarks on future research directions.

Theoretical framework and literature review

The social investment paradigm represents a major reconfiguration of welfare state logic, shifting from a compensatory model of social protection to a more proactive one centred on human capital formation and activation (Morel et al., 2012; Hemerijck, 2017). It reconceptualises welfare as a productive factor, emphasising the complementarities between education, labour market participation, and social inclusion policies. Rather than merely addressing short-term needs, social investment aims to strengthen individuals' *capacities to participate, learn, and adapt* throughout their life course (Bonoli, 2013; Ferrera, 2022).

This approach builds on three interrelated dimensions – stock, flow, and buffer (Hemerijck, 2017).

- *Stock policies* refer to the accumulation of human capital and skills through education and training, from early childhood to adult learning.
- *Flow policies* focus on facilitating smooth transitions across the life course and within labour markets, promoting gender equality and work–life balance.
- *Buffer policies* ensure adequate income protection and inclusion mechanisms for individuals facing temporary or structural risks, such as unemployment, disability, or care needs.

Together, these dimensions form an integrated welfare architecture that combines efficiency and equity (Hemerijck & Vandenbroucke, 2012; Taylor-Gooby, 2021).

However, while the social investment approach has been central to the European policy debate, its implementation and outcomes are territorially uneven. National welfare systems interact with subnational governance, fiscal capacities, and institutional path dependencies that condition the local expression of social investment (Kazepov & Barberis, 2013; Andreotti et al., 2012; Ferrera, 2022). Metropolitan areas, in particular, face the dual challenge of being both engines of economic innovation and sites of deep social fragmentation (Musterd & Ostendorf, 2023; van Gent et al., 2021). Urban governance structures, local budgets, and municipal service provision play a decisive role in shaping the *territorial capacity* for social investment (Myftiu & Scalise, 2025).

Despite this increasing attention to subnational dimensions, empirical attempts to measure social investment performance at the local scale remain limited. Most studies focus on national indicators or specific policy domains, making it difficult to compare how municipalities balance the three functional dimensions of stock, flow, and buffer (Morel et al., 2012; Bonoli, 2013; Hemerijck, 2017). Recent contributions have highlighted the potential of composite indicators to operationalise complex welfare concepts, enabling cross-territorial comparisons and supporting evidence-based policy (Greco et al., 2019; Mazziotta & Pareto, 2016). Composite indices allow researchers to integrate heterogeneous dimensions – such as educational attainment, labour market structures, and social spending – into a single synthetic measure, while preserving information about multidimensional imbalances (Gallo-Rivera et al., 2025).

In this regard, the Adjusted Mazziotta–Pareto Index (AMPI) offers a robust and non-compensatory framework for aggregating indicators when dimensions are interdependent and substitution across them is undesirable. It introduces a penalty term that captures the variability across indicators, thereby penalising units with unbalanced profiles (Mazziotta & Pareto, 2016). This property makes it particularly suitable for measuring phenomena like social investment, where balanced development across education, labour market, and social protection domains is crucial.

Building upon this theoretical foundation, this study conceptualises *urban social investment* as a multidimensional and territorially embedded phenomenon, measurable through municipal-level indicators reflecting the stock–flow–buffer architecture. In doing so, it bridges the macro-level conceptual debates on welfare transformation with the micro-level realities of local governance and service delivery. The empirical analysis of municipalities within the province of Milan provides an ideal testing ground, given the area’s socio-economic diversity, its role as a major metropolitan region in Italy, and the availability of granular statistical data (ISTAT, 2023).

Data and indicators selection

Individual indicators were retrieved from *A Misura di Comune*, a multi-source² framework that integrates both experimental and established data sources. This system aims to provide data that depict the structural characteristics of municipalities in demographic, social, environmental, and economic terms, along with measures of community well-being. A key component of this system is the experimental databases created through the ARCH.I.M.E.DE project, which focuses on building and updating territorial data within Istat's Integrated Microdata System. Additionally, significant contributions come from utilizing Open Data provided by other Italian National Statistical System (Sistan) entities, such as the Ministry of the Interior, the Ministry of Economy and Finance, the Ministry of Economic Development, and the Institute for Environmental Protection and Research (ISPRA).

In total, 21 indicators were analysed, similarly divided between the stock, flow and buffer dimensions.

To represent cities’ stock policies, we selected 5 individual indicators related to:

- (1) Incidence of tertiary qualification Males
- (2) Incidence of tertiary qualification Females
- (3) Incidence of secondary school attainment Males
- (4) Incidence of attainment of secondary education Females
- (5) *Children taken care of by municipal childcare services by municipality*

² <https://www.istat.it/wp-content/uploads/2022/12/Scheda-progetto-2024.pdf>

Flow policies are represented by the 8 individual indicators:

- (1) *Incidence of employees Full-time Male*
- (2) Incidence of employees Full-time Females
- (3) Incidence of employees Part-time Male
- (4) Incidence of employees Part-time Females
- (5) Incidence of permanent employees Males
- (6) Incidence of permanent employees Females
- (7) Incidence of employees Fixed-term Males
- (8) Incidence of employees on fixed-term contracts Females

Finally, buffer are represented by the 8 individual indicators:

- (1) *Expenditure on interventions and social services of municipalities by type of user: Family and minors*
- (2) Expenditure on interventions and social services of municipalities for: Disabled people
- (3) Expenditure on social interventions and services of municipalities for: Dependencies
- (4) Expenditure on social interventions and services of municipalities for: Elderly people (65 years and over)
- (5) Expenditure on interventions and social services of municipalities for Immigrants, Roma, Sinti and Travellers
- (6) Expenditure on interventions and social services of municipalities for: Poverty, hardship for adults and homelessness
- (7) Expenditure on social interventions and services of municipalities pe: Multi-user
- (8) Expenditure on social interventions and services per inhabitant per municipality

Most of these individual indicators have positive polarity, except for those related to non-stable employment. Due to data availability constraints, we only consider data from 2018 to 2020. The dataset includes 133 municipalities in the province of Milan.

Tables 1, 2 and 3 report some summary statistics for the individual indicators in 2018, 2019 and 2020, respectively. As Table 1 shows, missing values are not present in the datasets. Comparing the median and mean values reveals that the indicators for childcare services, and per inhabitant expenditure on social interventions and services are strongly right skewed. While the other indicators are quite symmetric. Additionally, the coefficients of variation indicate a high degree of heterogeneity among municipalities for many indicators, such as *Expenditure on interventions and social services of municipalities for Immigrants, Rom, Sinti and Travellers* and *Expenditure on interventions and social services of municipalities for Dependences*. Similar comments also apply to the 2019 and 2020 data, as reported in Table 2 and 3.

Table 1 Summary statistics of individual indicators, 2018 – Dataset: A Misura di Comune

| Pillar | Indicators | N | Mean | St. Dev. | Min | 1° Q. | Median | 3° Q. | Max | C.V. | Polarity |
|--------|---|-----|--------|----------|-------|-------|--------|--------|--------|------|----------|
| Stock | Incidence of tertiary qualification Males | 133 | 20,45 | 5,86 | 11,17 | 16,96 | 19,15 | 22,23 | 45,46 | 0,29 | + |
| | Incidence of tertiary qualification Females | 133 | 28,80 | 5,90 | 19,70 | 25,22 | 27,54 | 30,41 | 49,29 | 0,20 | + |
| | Incidence of secondary school attainment Males | 133 | 70,11 | 4,59 | 60,36 | 67,42 | 69,32 | 72,06 | 85,71 | 0,07 | + |
| | Incidence of attainment of secondary education Females | 133 | 79,54 | 3,84 | 66,65 | 77,36 | 79,20 | 81,56 | 90,54 | 0,05 | + |
| | Children taken care of by municipal childcare services by municipality | 133 | 17,28 | 12,12 | 0,00 | 8,59 | 16,71 | 23,43 | 51,26 | 0,70 | + |
| Flow | Incidence of employees Full-time Male | 133 | 71,29 | 6,72 | 49,39 | 68,05 | 71,61 | 75,69 | 93,79 | 0,09 | + |
| | Incidence of employees Full-time Females | 133 | 28,71 | 6,72 | 6,21 | 24,31 | 28,40 | 31,95 | 50,61 | 0,23 | + |
| | Incidence of employees Part-time Male | 133 | 31,29 | 8,48 | 13,02 | 25,77 | 30,43 | 35,37 | 66,54 | 0,27 | - |
| | Incidence of employees Part-time Females | 133 | 68,71 | 8,48 | 33,46 | 64,63 | 69,57 | 74,23 | 86,98 | 0,12 | - |
| | Incidence of permanent employees Males | 133 | 62,44 | 7,47 | 35,31 | 58,24 | 62,41 | 67,70 | 82,41 | 0,12 | + |
| | Incidence of permanent employees Females | 133 | 37,56 | 7,47 | 17,59 | 32,30 | 37,59 | 41,76 | 64,69 | 0,20 | + |
| | Incidence of employees Fixed-term Males | 133 | 62,92 | 10,27 | 17,90 | 57,76 | 63,10 | 69,63 | 86,16 | 0,16 | - |
| | Incidence of employees on fixed-term contracts Females | 133 | 37,08 | 10,27 | 13,84 | 30,37 | 36,90 | 42,25 | 82,11 | 0,28 | - |
| Buffer | Expenditure on interventions and social services of municipalities by type of user: Family and minors | 133 | 43,97 | 14,02 | 7,50 | 36,37 | 44,11 | 52,31 | 80,09 | 0,32 | + |
| | Expenditure on interventions and social services of municipalities for: Disabled people | 133 | 32,42 | 11,81 | 6,83 | 23,55 | 32,30 | 39,57 | 66,81 | 0,36 | + |
| | Expenditure on social interventions and services of municipalities for: Dependencies | 133 | 0,16 | 0,42 | 0,00 | 0,00 | 0,00 | 0,16 | 4,09 | 2,68 | + |
| | Expenditure on social interventions and services of municipalities for: Elderly people (65 years and over) | 133 | 9,36 | 4,34 | 0,73 | 6,16 | 9,00 | 12,53 | 27,21 | 0,46 | + |
| | Expenditure on interventions and social services of municipalities for Immigrants, Roma, Sinti and Travellers | 133 | 1,50 | 1,66 | 0,00 | 0,29 | 0,69 | 2,37 | 7,86 | 1,11 | + |
| | Expenditure on interventions and social services of municipalities for: Poverty, hardship for adults and homelessness | 133 | 3,80 | 2,16 | 0,00 | 2,27 | 3,49 | 4,99 | 10,80 | 0,57 | + |
| | Expenditure on social interventions and services of municipalities per: Multi-user | 133 | 8,79 | 7,14 | 0,27 | 4,44 | 7,16 | 10,79 | 50,52 | 0,81 | + |
| | Expenditure on social interventions and services per inhabitant per municipality | 133 | 125,57 | 43,35 | 20,55 | 94,01 | 129,58 | 151,50 | 241,15 | 0,35 | + |

Table 2 Summary statistics of individual indicators, 2019 – Dataset: A Misura di Comune

| Pillar | Indicators | N | Mean | St. Dev. | Min | 1° Q. | Median | 3° Q. | Max | C.V. | Polarity |
|--------|---|-----|--------|----------|-------|--------|--------|--------|--------|------|----------|
| Stock | Incidence of tertiary qualification Males | 133 | 20,73 | 6,06 | 10,38 | 17,24 | 19,09 | 22,18 | 44,92 | 0,29 | + |
| | Incidence of tertiary qualification Females | 133 | 30,05 | 5,97 | 17,84 | 26,43 | 28,60 | 31,92 | 49,54 | 0,20 | + |
| | Incidence of secondary school attainment Males | 133 | 71,66 | 4,77 | 62,28 | 68,64 | 70,88 | 74,18 | 86,14 | 0,07 | + |
| | Incidence of attainment of secondary education Females | 133 | 80,46 | 3,61 | 68,79 | 78,11 | 80,25 | 82,54 | 89,90 | 0,04 | + |
| | Children taken care of by municipal childcare services by municipality | 133 | 19,99 | 16,79 | 0,00 | 9,19 | 18,66 | 26,51 | 135,71 | 0,84 | + |
| Flow | Incidence of employees Full-time Male | 133 | 71,80 | 6,92 | 46,57 | 69,26 | 72,24 | 76,11 | 97,46 | 0,10 | + |
| | Incidence of employees Full-time Females | 133 | 28,20 | 6,92 | 2,54 | 23,89 | 27,76 | 30,74 | 53,43 | 0,25 | + |
| | Incidence of employees Part-time Male | 133 | 30,98 | 7,62 | 14,45 | 26,08 | 31,13 | 34,61 | 69,10 | 0,25 | - |
| | Incidence of employees Part-time Females | 133 | 69,02 | 7,62 | 30,90 | 65,39 | 68,87 | 73,93 | 85,55 | 0,11 | - |
| | Incidence of permanent employees Males | 133 | 62,74 | 7,58 | 31,83 | 58,08 | 63,17 | 67,81 | 88,35 | 0,12 | + |
| | Incidence of permanent employees Females | 133 | 37,26 | 7,58 | 11,65 | 32,19 | 36,83 | 41,92 | 68,17 | 0,20 | + |
| | Incidence of employees Fixed-term Males | 133 | 62,20 | 9,17 | 32,73 | 57,09 | 63,21 | 68,25 | 82,99 | 0,15 | - |
| | Incidence of employees on fixed-term contracts Females | 133 | 37,81 | 9,17 | 17,01 | 31,75 | 36,79 | 42,91 | 67,27 | 0,24 | - |
| Buffer | Expenditure on interventions and social services of municipalities by type of user: Family and minors | 133 | 43,01 | 13,32 | 11,57 | 35,78 | 42,12 | 51,28 | 78,16 | 0,31 | + |
| | Expenditure on interventions and social services of municipalities for: Disabled people | 133 | 32,22 | 11,09 | 9,31 | 23,77 | 33,01 | 38,77 | 69,57 | 0,34 | + |
| | Expenditure on social interventions and services of municipalities for: Dependencies | 133 | 0,19 | 0,41 | 0,00 | 0,00 | 0,00 | 0,24 | 3,37 | 2,21 | + |
| | Expenditure on social interventions and services of municipalities for: Elderly people (65 years and over) | 133 | 9,27 | 4,56 | 0,00 | 6,13 | 8,71 | 11,85 | 29,36 | 0,49 | + |
| | Expenditure on interventions and social services of municipalities for Immigrants, Roma, Sinti and Travellers | 133 | 1,64 | 1,77 | 0,00 | 0,31 | 0,79 | 2,66 | 8,65 | 1,08 | + |
| | Expenditure on interventions and social services of municipalities for: Poverty, hardship for adults and homelessness | 133 | 4,27 | 2,39 | 0,00 | 2,67 | 4,09 | 5,65 | 14,86 | 0,56 | + |
| | Expenditure on social interventions and services of municipalities per: Multi-user | 133 | 9,41 | 7,83 | 0,08 | 4,62 | 7,25 | 12,24 | 47,31 | 0,83 | + |
| | Expenditure on social interventions and services per inhabitant per municipality | 133 | 131,69 | 45,15 | 9,98 | 102,63 | 135,63 | 161,70 | 232,42 | 0,34 | + |

Table 3 Summary statistics of individual indicators, 2020 – Dataset: A Misura di Comune

| Pillar | Indicators | N | Mean | St. Dev. | Min | 1° Q. | Median | 3° Q. | Max | C.V. | Polarity |
|--------|---|-----|--------|----------|-------|--------|--------|--------|--------|------|----------|
| Stock | Incidence of tertiary qualification Males | 133 | 21,58 | 6,22 | 12,11 | 17,57 | 19,96 | 23,19 | 44,72 | 0,29 | + |
| | Incidence of tertiary qualification Females | 133 | 31,30 | 6,32 | 19,27 | 27,35 | 29,87 | 33,55 | 50,33 | 0,20 | + |
| | Incidence of secondary school attainment Males | 133 | 72,55 | 4,61 | 62,52 | 69,66 | 71,89 | 75,08 | 86,23 | 0,06 | + |
| | Incidence of attainment of secondary education Females | 133 | 81,26 | 3,55 | 68,26 | 79,13 | 81,41 | 83,02 | 91,04 | 0,04 | + |
| | Children taken care of by municipal childcare services by municipality | 133 | 17,83 | 13,61 | 0,00 | 9,97 | 16,12 | 24,42 | 103,70 | 0,76 | + |
| Flow | Incidence of employees Full-time Male | 133 | 71,20 | 6,33 | 48,64 | 67,93 | 71,49 | 75,41 | 85,49 | 0,09 | + |
| | Incidence of employees Full-time Females | 133 | 28,80 | 6,33 | 14,51 | 24,59 | 28,51 | 32,07 | 51,36 | 0,22 | + |
| | Incidence of employees Part-time Male | 133 | 30,55 | 7,93 | 12,63 | 25,45 | 29,85 | 35,22 | 71,09 | 0,26 | - |
| | Incidence of employees Part-time Females | 133 | 69,45 | 7,93 | 28,91 | 64,78 | 70,15 | 74,55 | 87,37 | 0,11 | - |
| | Incidence of permanent employees Males | 133 | 62,28 | 7,45 | 32,95 | 57,50 | 62,82 | 66,92 | 79,46 | 0,12 | + |
| | Incidence of permanent employees Females | 133 | 37,72 | 7,45 | 20,54 | 33,08 | 37,19 | 42,50 | 67,05 | 0,20 | + |
| | Incidence of employees Fixed-term Males | 133 | 62,89 | 10,10 | 34,62 | 56,52 | 63,35 | 69,14 | 85,45 | 0,16 | - |
| | Incidence of employees on fixed-term contracts Females | 133 | 37,11 | 10,10 | 14,55 | 30,86 | 36,65 | 43,48 | 65,38 | 0,27 | - |
| Buffer | Expenditure on interventions and social services of municipalities by type of user: Family and minors | 133 | 41,59 | 12,83 | 13,16 | 33,90 | 40,79 | 49,94 | 77,30 | 0,31 | + |
| | Expenditure on interventions and social services of municipalities for: Disabled people | 133 | 28,75 | 11,04 | 8,40 | 21,02 | 29,00 | 35,60 | 69,18 | 0,38 | + |
| | Expenditure on social interventions and services of municipalities for: Dependencies | 133 | 0,09 | 0,21 | 0,00 | 0,00 | 0,00 | 0,08 | 1,71 | 2,29 | + |
| | Expenditure on social interventions and services of municipalities for: Elderly people (65 years and over) | 133 | 8,61 | 4,13 | 0,97 | 5,66 | 8,44 | 11,05 | 23,66 | 0,48 | + |
| | Expenditure on interventions and social services of municipalities for Immigrants, Roma, Sinti and Travellers | 133 | 1,56 | 1,94 | 0,00 | 0,18 | 0,59 | 2,65 | 9,75 | 1,25 | + |
| | Expenditure on interventions and social services of municipalities for: Poverty, hardship for adults and homelessness | 133 | 10,58 | 6,96 | 0,41 | 5,55 | 9,55 | 13,95 | 40,45 | 0,66 | + |
| | Expenditure on social interventions and services of municipalities per: Multi-user | 133 | 8,83 | 7,33 | 0,00 | 4,31 | 7,02 | 10,84 | 47,63 | 0,83 | + |
| | Expenditure on social interventions and services per inhabitant per municipality | 133 | 134,97 | 43,35 | 30,02 | 101,14 | 140,87 | 155,87 | 238,52 | 0,32 | + |

Methodology: The method of penalties by coefficient of variation – The Adjusted Mazziotta-Pareto Index

Building on municipal indicators, we aim to propose an index of the Social Investment (SI) domains using Adjusted Mazziotta-Pareto Index, widely used for policy decision making in Italy ([Mazziotta and Pareto, 2016](#)). Due to data availability issues, we consider three time period for our analysis, 2018, 2019 and 2020.

The Adjusted Mazziotta-Pareto Index (AMPI) is a non-compensatory approach that extends the Mazziotta-Pareto Index. It standardizes the individual indicators at the reference time, ensuring that the indicators are independent of variability³ and allowing only relative comparisons over time. In contrast, the AMPI enables absolute comparisons over time by re-scaling individual indicators within the range (70; 130), based on two reference points: a minimum and a maximum value. These values represent the possible range of each indicator across all time periods and units ([Mazziotta and Pareto, 2016](#)).

Given the matrix $X = \{x_{ij}^t\}$ with n rows (units) and m columns (indicators), we calculate the matrix \mathbf{R} of normalized scores r_{ij}^t as follow:

$$r_{ij}^t = \begin{cases} 60 * \frac{(x_{ij}^t - Min_{x_j})}{Max_{x_j} - Min_{x_j}} + 70, & \text{if the polarity of the indicator's is positive;} \\ 60 * \frac{(Max_{x_j} - x_{ij}^t)}{Max_{x_j} - Min_{x_j}} + 70, & \text{if the polarity of the indicator's is negative;} \end{cases} \quad (1)$$

where x_{ij}^t is the value of the indicator j for the unit i at the time t and Min_{x_j} and Max_{x_j} are the “goalposts” for the indicator j . Denoting with Inf_{x_j} and Sup_{x_j} the overall minimum and maximum of the indicator j across all units and all years and with Ref_{x_j} the reference value for the indicator j , the “goalposts” are defined as:

$$\begin{cases} Min_{x_j} = Ref_{x_j} - \Delta \\ Max_{x_j} = Ref_{x_j} + \Delta \end{cases} \quad (2)$$

Where:

$$\Delta = \frac{(Sup_{x_j} - Inf_{x_j})}{2} \quad (3)$$

³ The normalized indicators have a mean of 100 and a standard deviation of 10.

Values will fall approximately in the range (70; 130) while 100 represents the reference value (the province of Milan average in a given year). Denoting with $M_{r_i^t}$ e $S_{r_i^t}$, respectively, the mean and standard deviation of the normalized values of r_i^t , the generalized form of AMPI is given by

$$AMPI_i^{t+/-} = M_{r_i^t} \pm (S_{r_i^t} * cv_{r_i^t}) \quad (4)$$

Where:

$$cv_{r_i^t} = \frac{S_{r_i^t}}{M_{r_i^t}} \quad (5)$$

is the coefficient of variation of r_i^t .

The sign of the indicator depends on the nature of the phenomenon being measured. If the composite index is “positive,” meaning that increasing values correspond to positive changes in the phenomenon (e.g., well-being, socio-economic development), the $AMPI^-$ is used. Conversely, if the composite index is “negative,” meaning that increasing values correspond to negative changes in the phenomenon (e.g., poverty, inequality), the $AMPI^+$ is used ([Mazziotta and Pareto, 2016](#)).

The composite indicator is calculated as the arithmetic average, to which a penalty is applied to penalize statistical units with an unbalanced distribution of values across each dimension and over time. The indicator's results are explained by two components: the first captures the average effect (additive component), while the second accounts for the penalty effect due to imbalance. The penalty coefficient considers the horizontal variability of each indicator j per unit i , applying a penalty to units with greater value imbalances than others.

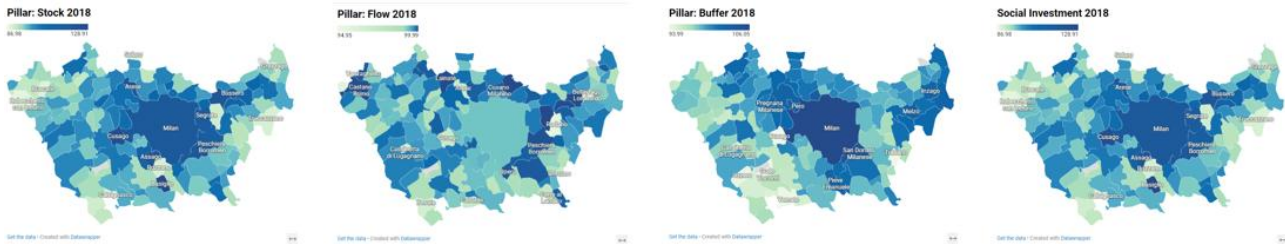
Results

Scores and Rankings Comparison

The results of the composite indices reveal significant territorial heterogeneity in the social investment performance of municipalities within the province of Milan. Figures 1–3 illustrate the geographical distribution of the *stock*, *flow*, and *buffer* dimensions, as well as the overall *Social Investment (SI) Index* for 2018, 2019, and 2020. Darker shades correspond to higher social investment performance, while lighter tones indicate lower scores. Across the three years, the maps consistently reveal a pronounced north–south divide within the province of Milan, with stronger social investment capacity concentrated in the northern and western municipalities and weaker performance prevailing in the southern periphery. This spatial configuration aligns with the broader socio-economic geography of the Milan metropolitan area, marked by disparities in income, employment stability, and access to education and welfare services.

Figure 1 depicts the baseline situation in 2018. High-performing municipalities in the *stock* pillar include Basiglio, Cusago, and Assago, followed by Arese and Cernusco sul Naviglio, all located in the affluent belt surrounding Milan (Table 4). These municipalities display strong educational attainment levels and extensive childcare service coverage. In contrast, peripheral municipalities such as Bubbiano, Calvignasco, and Baranzate show markedly lower stock values, signalling limited human capital accumulation.

Figure 1 Maps that represent the social investment paradigm of municipalities in the province of Milan, 2018



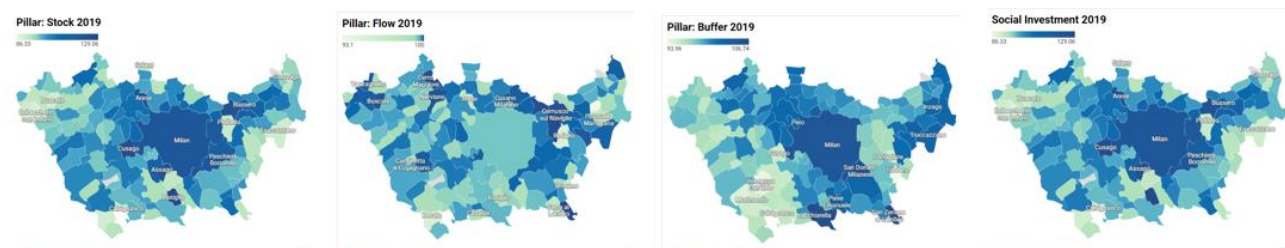
In the *flow* dimension, the spatial pattern appears more heterogeneous. The top positions (Table 5) are held by Pioltello, Cinisello Balsamo, and Lainate, municipalities characterised by balanced employment structures and relatively stable full-time and permanent job shares. Conversely, smaller and more peripheral areas show weaker flow scores, reflecting higher labour market instability and part-time employment.

The *buffer* pillar presents a distinctly metropolitan pattern, with Milan emerging as the leading municipality (Table 6), followed by San Donato Milanese and Novate Milanese. These results underline Milan’s role as the metropolitan welfare provider, concentrating the majority of social expenditure and specialised services.

Overall, the composite Social Investment Index (SI) ranks Basiglio first, Cusago second, and Assago third, confirming the strong link between local wealth, education, and welfare capacity (Table 7).

Figure 2 shows the results for 2019, when the general spatial pattern remains stable but some local shifts emerge. In the *stock* pillar, Cusago overtakes Basiglio, consolidating its leading position, while Milan improves slightly, moving from seventh to sixth place (Table 4). The persistence of top-performing municipalities highlights the structural nature of educational and service advantages in the northern belt.

Figure 2 Maps that represent the social investment paradigm of municipalities in the province of Milan, 2019

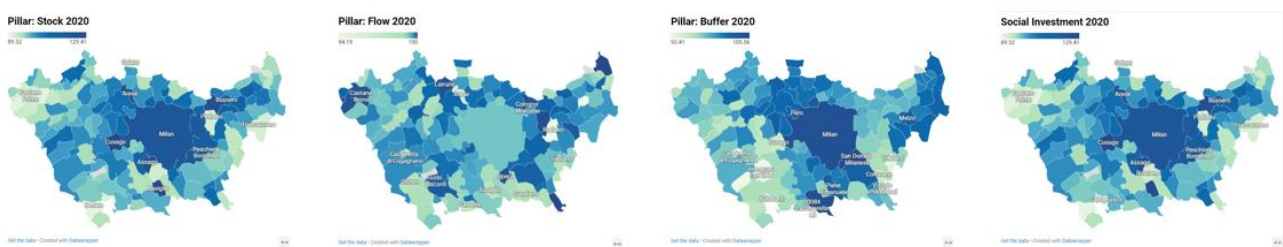


The *flow* pillar, however, exhibits the highest variability. Municipalities such as Pioltello and Cassina de' Pecchi maintain good performance, while Cinisello Balsamo, formerly second, drops outside the top ten, revealing the sensitivity of labour market indicators to short-term economic cycles (Table 5).

In the *buffer* dimension, San Donato Milanese advances to the top position, while Milan moves to fourth, still maintaining high expenditure capacity for families, the elderly, and vulnerable populations (Table 6). The composite SI index again confirms Basiglio, Cusago, and Assago among the top-ranked municipalities, with Milan consolidating its role in the upper tier (Table 7).

Figure 3 presents the 2020 results, marked by the onset of the COVID-19 pandemic and its immediate territorial impacts. Despite the exogenous shock, the relative hierarchy of municipalities remains remarkably stable, suggesting strong path dependence in social investment performance.

Figure 3 Maps that represent the social investment paradigm of municipalities in the province of Milan, 2020



In the *stock* pillar, Cusago reaches the first position, surpassing Basiglio, while Cernusco sul Naviglio climbs to third place (Table 4). These municipalities continue to display high educational levels and strong family policy infrastructures.

The *flow* pillar again proves the most volatile. Municipalities such as Opera and Lainate improve their positions (Table 5), while others experience declines, consistent with temporary employment disruptions and the expansion of flexible contracts during the pandemic.

In the *buffer* pillar, San Donato Milanese confirms its leadership, with Milan remaining within the top three and continuing to provide the largest share of metropolitan welfare services. At the bottom of the ranking, municipalities such as Bubbiano, Calvignasco, and Ozzero continue to report minimal expenditure on social services, indicating enduring fiscal and administrative constraints (Table 10).

The composite SI Index for 2020 places Cusago first, followed by Basiglio and Cernusco sul Naviglio (Table 7). The municipality of Milan remains seventh overall, consolidating its steady orientation toward social investment.

Table 4 Stock - first ten bests, municipalities in Province of Milan, Italy

| Municipalities | Stock Index estimated | | | Rank Stock Index estimated | | |
|-----------------------|-----------------------|---------|---------|----------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Basiglio | 128.91 | 129.063 | 127.712 | 1 | 1 | 2 |
| Cusago | 125.448 | 127.38 | 129.408 | 2 | 2 | 1 |
| Assago | 121.848 | 124.499 | 125.245 | 3 | 3 | 4 |
| Arese | 121.622 | 122.806 | 124.238 | 4 | 5 | 5 |
| Cernusco sul Naviglio | 121.206 | 123.917 | 125.528 | 5 | 4 | 3 |
| San Donato Milanese | 119.762 | 120.954 | 120.617 | 6 | 7 | 7 |
| Milano | 118.764 | 120.992 | 121.808 | 7 | 6 | 6 |
| Segrate | 117.41 | 119.398 | 119.398 | 8 | 8 | 8 |
| Bussero | 116.301 | 116.313 | 117.535 | 9 | 10 | 10 |
| Peschiera Borromeo | 115.856 | 116.53 | 117.549 | 10 | 9 | 9 |

Table 5 Flow - first ten bests, municipalities in Province of Milan, Italy

| Municipalities | Flow Index estimated | | | Rank Flow Index estimated | | |
|--------------------|----------------------|--------|--------|---------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Pioltello | 99,985 | 99,984 | 99,968 | 1 | 2 | 3 |
| Cinisello Balsamo | 99,984 | 99,927 | 99,812 | 2 | 11 | 30 |
| Lainate | 99,98 | 99,868 | 99,949 | 3 | 26 | 6 |
| Gorgonzola | 99,976 | 99,899 | 99,776 | 4 | 19 | 34 |
| Cassina de' Pecchi | 99,968 | 99,926 | 99,869 | 5 | 12 | 17 |
| Castano Primo | 99,967 | 99,923 | 99,949 | 6 | 14 | 6 |
| Peschiera Borromeo | 99,956 | 99,893 | 99,87 | 7 | 22 | 16 |
| Opera | 99,941 | 99,903 | 99,952 | 8 | 18 | 5 |
| Vanzaghello | 99,936 | 99,928 | 98,735 | 9 | 10 | 116 |
| Cusano Milanino | 99,932 | 99,942 | 99,841 | 10 | 9 | 23 |

Table 6 Buffer - first ten bests, municipalities in Province of Milan, Italy

| Municipalities | Buffer Index estimated | | | Rank Buffer Index estimated | | |
|---------------------|------------------------|---------|---------|-----------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Milano | 106,051 | 105,064 | 104,799 | 1 | 4 | 3 |
| San Donato Milanese | 104,538 | 105,813 | 105,561 | 2 | 3 | 1 |
| Novate Milanese | 103,5 | 103,695 | 103,626 | 3 | 5 | 5 |
| Pero | 103,393 | 102,966 | 103,244 | 4 | 9 | 9 |
| Melzo | 102,906 | 103,288 | 103,373 | 5 | 6 | 7 |
| Rho | 102,847 | 102,584 | 102,559 | 6 | 17 | 15 |
| Pieve Emanuele | 102,764 | 103,134 | 103,357 | 7 | 8 | 8 |
| Inzago | 102,728 | 102,945 | 102,262 | 8 | 10 | 21 |
| Cassano d'Adda | 102,64 | 102,923 | 102,903 | 9 | 12 | 11 |
| Pregnana Milanese | 102,494 | 102,376 | 102,205 | 10 | 18 | 23 |

Table 7 SI - first ten bests, municipalities in Province of Milan, Italy

| Municipalities | SI Index estimated | | | SI Index estimated | | |
|-----------------------|--------------------|---------|---------|--------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Basiglio | 128,91 | 129,063 | 127,712 | 1 | 1 | 2 |
| Cusago | 125,448 | 127,38 | 129,408 | 2 | 2 | 1 |
| Assago | 121,848 | 124,499 | 125,245 | 3 | 3 | 4 |
| Arese | 121,622 | 122,806 | 124,238 | 4 | 5 | 5 |
| Cernusco sul Naviglio | 121,206 | 123,917 | 125,528 | 5 | 4 | 3 |
| San Donato Milanese | 119,762 | 120,954 | 120,617 | 6 | 7 | 7 |
| Milano | 118,764 | 120,992 | 121,808 | 7 | 6 | 6 |
| Segrate | 117,41 | 119,398 | 119,398 | 8 | 8 | 8 |
| Bussero | 116,301 | 116,313 | 117,535 | 9 | 10 | 10 |
| Peschiera Borromeo | 115,856 | 116,53 | 117,549 | 10 | 9 | 9 |

Cross-year comparison and interpretation

The comparison across the three years reveals limited mobility within municipal rankings, underscoring the persistence of structural inequalities in social investment capacity. High-performing municipalities consistently combine *strong educational attainment, stable employment structures, and robust fiscal resources*. Conversely, low-performing areas remain locked in disadvantage due to weaker economic bases and smaller administrative capacities.

The municipality of Milan presents a distinctive profile: it performs strongly in *stock* and *buffer* dimensions but lags in *flow*, reflecting the dual nature of its labour market dynamic yet fragmented. These findings reinforce the idea that metropolitan welfare systems are both engines of innovation and loci of inequality (Kazepov & Barberis, 2013; Myftiu & Scalise, 2025).

Overall, the results reveal a spatially clustered geography of social investment, where municipal performance correlates closely with income, population density, and administrative capability. The stability of rankings across time suggests that building local social investment capacity requires long-term, multi-scalar policy strategies integrating education, employment, and welfare domains.

Municipalities with the lowest social investment performance

The analysis of the lowest-ranked municipalities (Tables 8–11) provides additional insights into the structural and spatial dimensions of social investment weaknesses within the province of Milan. In the stock dimension, a distinct cluster of low-performing municipalities emerges in the southwestern periphery, with Baranzate, Calvignasco, and Bubbiano consistently occupying the last positions from 2018 to 2020 (Table 8). These municipalities tend to have smaller populations, lower shares of tertiary-educated residents, and limited access to childcare and early education services, suggesting chronic underinvestment in human capital.

Table 8 Stock - last ten bests, municipalities in Province of Milan, Italy

| Municipalities | Stock Index estimated | | | Rank Stock Index estimated | | |
|------------------------|-----------------------|--------|--------|----------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Rozzano | 89.651 | 92.531 | 93.302 | 124 | 120 | 123 |
| Truccazzano | 89.525 | 90.907 | 92.688 | 125 | 124 | 126 |
| Solaro | 88.86 | 91.648 | 91.976 | 126 | 122 | 127 |
| Buscate | 88.785 | 91.015 | 90.795 | 127 | 123 | 130 |
| Robecchetto con Induno | 88.708 | 89.218 | 93.721 | 128 | 129 | 121 |
| Grezzago | 88.562 | 90.128 | 93.469 | 129 | 127 | 122 |
| Bubbiano | 88.512 | 90.044 | 91.749 | 130 | 128 | 128 |
| Turbigo | 88.044 | 90.835 | 91.027 | 131 | 125 | 129 |
| Calvignasco | 86.983 | 86.334 | 89.319 | 132 | 130 | 132 |
| Baranzate | 83.067 | 85.718 | 86.034 | 133 | 131 | 133 |

The flow dimension reveals more erratic trends. Municipalities such as Bellinzago Lombardo, Rodano, and Arese record sharp declines over time, while others, Cerro al Lambro and Dresano, remain persistently low (Table 9). The volatility of the flow index underscores the vulnerability of local labour markets to cyclical fluctuations and limited capacity for stable employment generation.

Table 9 Flow - last ten bests, municipalities in Province of Milan, Italy

| Municipalities | Flow Index estimated | | | Rank Flow Index estimated | | |
|---------------------|----------------------|--------|--------|---------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Cerro al Lambro | 97,598 | 97,342 | 98,601 | 116 | 114 | 117 |
| Dresano | 97,495 | 96,321 | 98,319 | 117 | 117 | 119 |
| Casarile | 97,468 | 98,072 | 97,664 | 118 | 111 | 126 |
| Cusago | 97,21 | 99,258 | 99,423 | 119 | 91 | 78 |
| Arese | 97,088 | 96,503 | 96,295 | 120 | 116 | 127 |
| Besate | 96,603 | 95,147 | 98,868 | 121 | 118 | 111 |
| Cassinetta di | | | | | | |
| Lugagnano | 96,143 | 97,947 | 97,99 | 122 | 113 | 124 |
| Nosate | 95,666 | 98,854 | 99,854 | 123 | 107 | 20 |
| Rodano | 95,479 | 94,854 | 94,185 | 124 | 119 | 129 |
| Bellinzago Lombardo | 94,945 | 93,099 | 94,196 | 125 | 120 | 128 |

In the buffer dimension, the lowest-ranked municipalities, Bubbiano, Calvignasco, Ozzero, and Gudo Visconti (Table 10), are again concentrated in the southern and western periphery, where fiscal and administrative capacity is weakest. These areas report low social expenditure and limited service provision, highlighting overlapping vulnerabilities across domains.

Table 10 Buffer - last ten bests, municipalities in Province of Milan, Italy

| Municipalities | Buffer Index estimated | | | Rank Buffer Index stimati | | |
|----------------|------------------------|--------|--------|---------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Casarile | 95,339 | 97,283 | 98,066 | 121 | 106 | 98 |
| Cassinetta di | | | | | | |
| Lugagnano | 95,289 | 96,266 | 93,647 | 122 | 117 | 128 |
| Morimondo | 95,24 | 95,57 | 97,26 | 123 | 123 | 111 |
| Calvignasco | 95,134 | 94,43 | 95,132 | 124 | 126 | 125 |
| Bubbiano | 95,083 | 95,231 | 94,678 | 125 | 124 | 126 |
| Ozzero | 94,388 | 94,852 | 93,557 | 126 | 125 | 129 |
| Vernate | 94,201 | 96,106 | 97,531 | 127 | 119 | 104 |
| Tribiano | 94,159 | 93,961 | 94,171 | 128 | 129 | 127 |
| Gudo Visconti | 93,995 | 94,341 | 93,436 | 129 | 127 | 130 |
| Cusago | 93,994 | 95,631 | 95,658 | 130 | 122 | 123 |

Finally, the overall SI Index (Table 11) confirms Calvignasco, Bubbiano, and Rozzano as the municipalities with the weakest composite performance, a pattern that remains largely unchanged across the three years. Their persistent low scores reflect *multidimensional disadvantage*, where human capital deficits coexist with fragile labour markets and minimal welfare infrastructure.

Table 11 SI - last ten bests, municipalities in Province of Milan, Italy

| Municipalities | SI index estimated | | | Rank SI Index estimated | | |
|------------------------|--------------------|--------|--------|-------------------------|------|------|
| | 2018 | 2019 | 2020 | 2018 | 2019 | 2020 |
| Besate | 90,247 | 90,557 | 90,608 | 123 | 126 | 131 |
| Rozzano | 89,651 | 92,531 | 93,302 | 124 | 120 | 123 |
| Truccazzano | 89,525 | 90,907 | 92,688 | 125 | 124 | 126 |
| Solaro | 88,86 | 91,648 | 91,976 | 126 | 122 | 127 |
| Buscate | 88,785 | 91,015 | 90,795 | 127 | 123 | 130 |
| Robecchetto con Induno | 88,708 | 89,218 | 93,721 | 128 | 129 | 121 |
| Grezzago | 88,562 | 90,128 | 93,469 | 129 | 127 | 122 |
| Bubbiano | 88,512 | 90,044 | 91,749 | 130 | 128 | 128 |
| Turbigo | 88,044 | 90,835 | 91,027 | 131 | 125 | 129 |
| Calvignasco | 86,983 | 86,334 | 89,319 | 132 | 130 | 132 |

Taken together, these results expose a polarised provincial landscape: affluent municipalities such as Basiglio, Cusago, and Assago reinforce their advantages, while smaller and economically weaker ones remain trapped in structural constraints. This widening intra-provincial divide underscores the need for targeted policy interventions and fiscal equalisation mechanisms aimed at strengthening the social investment capacity of lagging municipalities and promoting a more cohesive metropolitan welfare system.

Discussion and Policy Implications

The findings from the composite indicators reveal a persistent and spatially polarised geography of social investment within the province of Milan. Municipalities endowed with high human capital, diversified labour markets, and strong fiscal autonomy consistently achieve higher scores across all three pillars of the *stock-flow-buffer* framework. In contrast, smaller peripheral municipalities, particularly those located in the southern and southwestern areas, display structural weaknesses that constrain their capacity to sustain long-term social investment strategies.

This territorial divide reflects the broader pattern of “metropolitan dualism”, where the benefits of economic dynamism and welfare innovation tend to be concentrated in the urban core and its immediate surroundings, while outer areas face cumulative disadvantages. The case of Milan exemplifies this pattern: the municipality performs strongly in the *stock* and *buffer* dimensions, confirming its role as a driver of educational and welfare infrastructures, yet it lags in *flow*, signalling persistent labour market fragmentation and rising employment precariousness. This duality mirrors trends observed in other European metropolitan contexts, where inclusive growth objectives are challenged by spatially uneven capacities for social investment (Andreotti et al., 2012; Musterd & Ostendorf, 2023).

From a theoretical standpoint, the results reinforce the territorial interpretation of the social investment paradigm (Hemerijck, 2017; Ferrera, 2022). The ability of local governments to invest in people's capabilities and to sustain inclusive labour markets depends not only on their welfare orientation but also on the *institutional thickness* and *fiscal resilience* of the territories in which they operate. Municipalities with diversified economic structures and higher fiscal revenues, often those located in the northern and western quadrants, demonstrate greater alignment with the *social investment logic*, while those with weaker administrative and financial resources struggle to convert social spending into productive investment.

From a policy perspective, these findings highlight the need for multi-level coordination to strengthen local social investment capacity. Regional and metropolitan authorities could play a key role in reducing the observed disparities through targeted programmes and fiscal equalisation mechanisms. Specifically: (i) *Enhancing human capital formation*; investments in early childhood education and vocational training should be prioritised in lagging municipalities, particularly those persistently low in the stock pillar. Strengthening educational infrastructures would contribute to long-term social mobility and local resilience. (ii) *Promoting labour market inclusiveness*; given the volatility of the flow dimension, policies should focus on stabilising employment conditions through local partnerships between municipalities, firms, and training institutions. Active labour market measures that address gender and generational inequalities are essential to support sustainable employment trajectories. (iii) *Reinforcing social protection systems*; the persistent gaps in buffer performance point to the need for integrated welfare services, especially in peripheral areas. Shared service provision at the inter-municipal level (e.g., social assistance consortia) can help overcome capacity constraints and ensure a minimum level of welfare access across the province. (iv) *Encouraging metropolitan governance and fiscal solidarity*; as the economic and welfare hub, the city of Milan could act as a coordinating centre for redistributive mechanisms and policy experimentation. Metropolitan cooperation, through joint planning, shared investments, and data integration, would help translate the social investment approach into an operational governance framework.

Finally, these results also raise important questions for future research. The persistence of spatial disparities suggests that social investment policies alone may be insufficient to counteract entrenched territorial inequalities without complementary economic development and infrastructure strategies. Integrating composite indicators such as the *Adjusted Mazziotta-Pareto Index* within regional monitoring systems could support continuous evaluation and guide adaptive policy design.

In conclusion, the Milan case demonstrates that while the social investment paradigm provides a coherent framework for inclusive welfare development, its effectiveness ultimately depends on territorial governance capacity, the ability of local institutions to mobilise resources, coordinate actors, and sustain investment in human and social capital over time. Strengthening this territorial dimension of social investment is crucial to achieving both social cohesion and economic competitiveness in metropolitan regions.

Conclusions

This paper has examined the spatial distribution of social investment capacity across the municipalities of the province of Milan through a multidimensional composite indicators framework grounded in the *stock-flow-buffer* paradigm. By integrating education, labour market, and welfare dimensions into a single analytical construct, the study provides new evidence on how local institutional, fiscal, and socio-economic characteristics shape the implementation of social investment strategies. The results reveal a territorially polarised pattern, with high-performing municipalities clustered in the northern and western parts of the province and structurally weaker ones concentrated in the southern periphery.

The persistence of these disparities over time points to the importance of territorial factors in conditioning the effectiveness of social investment policies. Municipalities that combine strong human capital endowments, diversified employment structures, and robust fiscal capacities are better positioned to sustain proactive welfare strategies. By contrast, those with fragile economic bases and limited administrative resources face enduring challenges in translating social expenditure into long-term investment in people's capabilities. The stability of rankings across the three years analysis suggests that institutional inertia and resource constraints reinforce the existing divide, producing a self-reinforcing geography of opportunity and exclusion within the metropolitan area.

Beyond its empirical contribution, the study underscores the necessity of integrating the social investment perspective within a broader framework of territorial governance. Enhancing local capacities requires not only increased financial resources but also improved coordination across levels of government and sectors. The Milan case demonstrates that the territorial dimension of welfare cannot be overlooked: the success of social investment policies depends on the ability of local actors to generate complementarities between education, employment, and social protection. Strengthening this multilevel and spatially sensitive approach is crucial for promoting inclusive growth and ensuring that the benefits of welfare innovation extend beyond the urban core to the entire metropolitan region.

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