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Private equity for the development of smart cities: the Italian case

Anna Gervasoni[*], Francesco Bollazzi[**], Margherita Mietto[***]

Abstract
The present study investigates whether Private Equity (PE) funds are supporting Smart cities' development in Italy. Initial evidence is given regarding the presence of a convergence of financial resources towards businesses operating in the economic sectors considered to be strategic to the development of the cities of the future. Details regarding the major features of the phenomenon are provided. To perform the research, a sample of 1,369 PE transactions undertaken by Italian and foreign investors in Italy in the years 2015-2021 was examined. The final output of this paper is a descriptive qualitative and quantitative analysis, whose main contributions are as follows. It emerges that companies operating in the industries that are key to the grounding of smart cities attracted substantial attention in the reference period. Infrastructures, firms providing ecological services and businesses supporting digitalization processes have catalyzed the greatest share of capital. Most operations have been conducted by International PE players and about half the investments have involved companies located either in Lombardy or in Lazio. Moreover, the buyout approach has been the most frequently adopted strategy when launching the examined deals. Finally, a significant growth of the entry multiple EV/EBITDA was recorded in the investigated period, suggesting soaring competition as well as PE players' acknowledgement of the centrality of smart cities to the country's future development.

Keywords: smart city, private equity, SDGs, impact investing, sustainable finance

JEL Codes: G23, H5, I30

1. Introduction

1.1 Smart cities: the solution to contemporary challenges

The global crises that have marked the past two decades have conveyed the message that humanity is extremely vulnerable to exogenous contingencies and often inefficient at remedying internally generated ones. The 2007 financial crisis, the Covid-19 pandemic and the current Ukraine conflict are emblematic examples of events leading the worldwide community to step back from their certainties and to build what was previously missing in the economic, health and political spheres. Going deeper into the analysis of these past and present black swans, two lessons can be learned: the centrality of planning and monitoring in the public as well as in the private sector and the undeniable evidence that everything is interconnected. It has become obvious that it is no longer advisable to use the weak old processes to manage public welfare, but a

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radical transformation is needed to bring strength and resilience to the complex system shaping the daily lives of world citizens. For this reason, the concept of smart city has increasingly appeared on the most important international roundtables, in a new global effort to create the necessary conditions for such a revolution.

1.2 Definition and main characteristics

Several factors underlie the urgent need for policymakers to promote and stimulate the conversion of traditional cities into sustainable urban areas. On the one hand, the world population is growing at an accelerated pace, the United Nations (2017) predicting 9.8 billion inhabitants in 2050. In those countries where this statement does not hold, huge territorial inhomogeneities still make it convenient to move to town to enjoy far better economic and social conditions as well as job opportunities. Cities are expected to host 68% of the world's population by 2050 (namely, 68% of 9.8 billion people), against 55% in 2020 (United Nations Department of Economic and Social Affairs, 2018). Given that 80% of the global GDP is produced in urban areas (The World Bank, 2020), it goes without saying that the proper management of this enormous mass of people is fundamental to avoid the collapse of the global economy. On the other hand, the environment is sending alarm signals delivering a compelling message: resources previously thought to be inexhaustible are limited in quantity and must be accurately managed. In essence, the world community will face a situation characterized by an increasing demand for decreasing resources. In this context, proper planning and monitoring is crucial to preserve the economic integrity and competitiveness of urban communities and, consequently, the quality of life in metropolitan areas. This is exactly what smart cities are intended to achieve.

It is extremely hard to define such a utopistic concept as the one lying behind the idea of a smart city. Moreover, it is not rare to find conflicting and unclear interpretations of the same. For the aim of this paper, the European Commission (n.d.) definition will be considered, according to which:

Smart cities are "*cities using technological solutions to improve the management and efficiency of the urban environment. A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business.*". It "*goes beyond the use of digital technologies for better resource use and less emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat*

buildings. It also means a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population.".

The lines above convey the idea that the smart city is 360-degree sustainability. The city of the future will be a place where the whole set of communitarian issues undermining the development and economic growth of urban centres will be effectively foreseen and efficiently managed, starting from health and pollution problems, and ending with waste management and infrastructural concerns. In this context, technology is the conveyor belt collecting citizens needs and demands and moulding them into real and enjoyable benefits, in a bottom-up governance model of city management.

Starting from 2015, the smart city concept has experienced a rebirth in terms of collective awareness and action, mainly because of a number of initiatives undertaken by the UN intergovernmental organization. Sustainable urban centres can be considered the concrete product of the achievement of the UN Social Development Goals and the application of the UN New Urban Agenda vision. Through the acceptance and adoption of the New Urban Agenda, which is a document intended to provide international guidance in achieving urban sustainable development, governments around the world have formally committed to building areas where citizens' needs are satisfied with respect to all seventeen goals outlined by the UN Global Assembly as being associated with high life quality (Figure 1).

Figure 1: The 17 UN SDGs

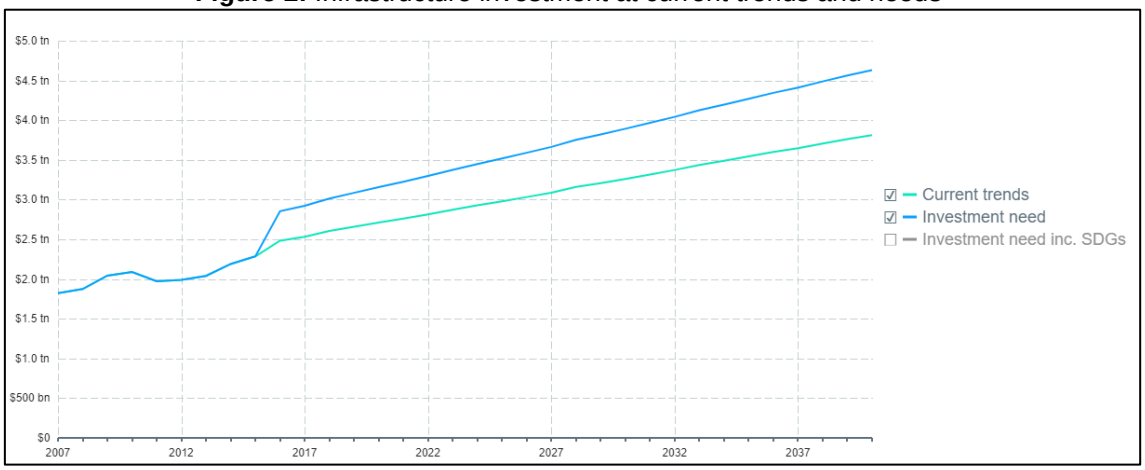
Note. The list of the seventeen Social Development Goals (SDGs) by the United Nations (UN). From: THE 17 GOALS | Sustainable Development. (2022). https://sdgs.un.org/goals

Smart cities are the physical place where inclusivity, safety, resilience, and sustainability intersect and converge thanks to the solid construction of a dense network of interconnected services.

1.3 Funding the city of the future

Despite the benefits brought by the smart city revolution, the transformation process is coming at a huge price. In fact, central and regional governments across the globe are increasingly facing the issue of not being able to provide the capital necessary to meet the public demand for energy, transportation, infrastructure, water, waste management, better education, and quality of life, just to mention a few. Especially when it comes to infrastructures, fundamental assets to the improvement of urban wellbeing, according to the G20 Global Infrastructure Hub, public investments are far lower than the public needs and the gap to be bridged will increase exponentially in the future (Figure 2).

Figure 2: Infrastructure investment at current trends and needs



Note. Graph comparing the investment needed to fill the infrastructure gap and the current expenditure at the global level. The sectors considered are: energy, telecommunications, transport and water. From: Global Infrastructure Outlook - A G20 INITIATIVE. (2022). https://outlook.gihub.org/

Estimates suggest that, if the current trend is maintained in the coming years, in the period starting from 2015 to 2040 public administrations will be facing an infrastructure deficit amounting to $15 Tn (Global Infrastructure Outlook - A G20 INITIATIVE, n.d.).

Although with different intensities, the infrastructural gap emergency applies to every regional and national reality. Italy alone is currently failing to fully meet the local communitarian needs in terms of energy, telecommunications, transport, and water

supply[1], with investment $373 Bn under the level needed (Global Infrastructure Outlook - A G20 INITIATIVE, n.d.).

In such a context, it can be stated with a high degree of certainty that public finances will increasingly suffer from an inability to bring substantial contributions to the development of the cities of the future and will prove to be incapable of satisfying the gradually growing need for more sustainable life conditions, unless another actor steps in, namely the private sector.

2. Purpose of the paper

2.1 Private sector involvement, sustainable finance, and impact investing

Although it has been known for a long time, only recently has it been publicly declared that a high number of local municipalities around the world are not able to get the necessary funding from central governments to finance smart cities due to scarcity of resources. This idea has led to the conclusion that private investment is fundamental to bridge the big financing gap that prevents the grounding of the city of the future.

There are two main ways in which private investors can contribute to the building of sustainable cities. On the one hand, they can directly join forces with local administrations in promoting and developing specific projects. A good example of this are PPPs, which typically involve the financing of public large-scale projects through private capital [2]. On the other hand, private resources can be channelled to private companies producing goods and providing services in the public interest. Within the aim of this paper, the second, indirect way will be considered.

Investment by private actors in the capital of companies whose business is intended to positively impact public welfare falls into the realm of sustainable finance, which is defined by the EU Commission as "*finance to support economic growth while reducing pressures on the environment and taking into account social and governance aspects"* (n.d., as cited in Migliorelli, 2021). According to literature, the financial system is thought to be particularly suitable to support social goal achievement because of the five functions it fulfils within the economic environment: produce information ex ante regarding the allocation of resources; monitor investments and exert corporate governance; facilitate risk management and diversification; mobilise and pool savings;

[1] These are considered to be the four main sectors making up the national infrastructural system according to the same G20 Global Infrastructure Hub.
[2] See Gervasoni, A., Lertora, M., & Pascarelli, G. (2022) for further information on the topic.

and ease the exchange of goods and services (Schoenmaker, D., & Schramade, W. 2019).

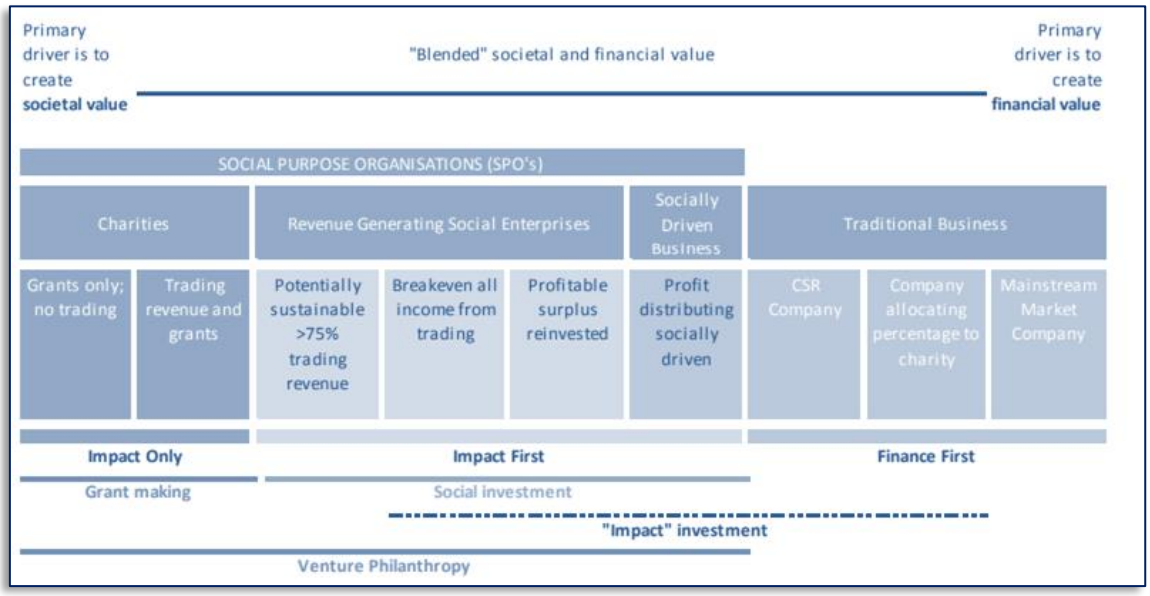
Under the wide umbrella of sustainable financial activities, it is possible to find impact investing, namely, the action of making *"investments with the intention to generate positive, measurable social and environmental impact alongside a financial return"* (Migliorelli, 2021). The strand of literature connected to impact investing is relatively recent, but it is gaining momentum among the academic finance community because of several revolutionary insights it has given regarding the power of properly managed finance. While traditional rational financial models represent investors' return in purely pecuniary terms, economists have progressively realized there is a form of non-monetary return from investment that should be considered by financial operators when making decisions on resource allocation (Elhauge, 2005; Fama & French, 2007; Hart & Zingales, 2017), the so-called social return. In fact, investors have proved that they reach a higher utility level when the investments they make not only generate a positive financial return but also, and most importantly, a positive social impact (Barber et al., 2021). This suggests that the greater attention by financial operators to sustainability issues comes from the top of the investment chain, from those who provide the liquidity to be allocated.

As appealing as it may sound to generate profits while contributing to the well-being of society, no evidence has so far been collected in support of greater financial returns from impact investments compared to conventional ones. Indeed, past academic contributions seem to be contradictory in this direction. While in some specific asset classes empirical studies have supported the hypothesis that investing in businesses with social aims repays in financial terms (Kinnersley, 2013 as cited in Caseau & Grolleau, 2020), there is a strand of literature that goes in the opposite direction, claiming the existence of a negative relationship between financial returns and the impact orientation of the target firm (Barber at al., 2021). On the other hand, a group of academics and professionals affirm the alignment and convergence between returns in impact investing funds with respect to their traditional competitors (Morgan Stanley, 2019; Mudaliar & Bass, 2017); according to the latter, no difference can be found among the profits generated by sustainable rather than traditional funds.

These confounding results may be explained by the intrinsic peculiarity and complexity of the field. In fact, the business strategies of the companies subject to investment may be driven by societal rather than financial values in different proportions, which makes the spectrum of impact investments extremely wide and differentiated (Figure 3), going

from revenue generating societal enterprises, passing through socially driven businesses and ending up with traditional companies (Rangan et al., 2012).

Figure 3: The investment spectrum



Note. The spectrum of impact investments from the target company perspective. From: European Venture Philanthropy Association. (2011). European Venture Philanthropy Association: An Introduction. p.5.

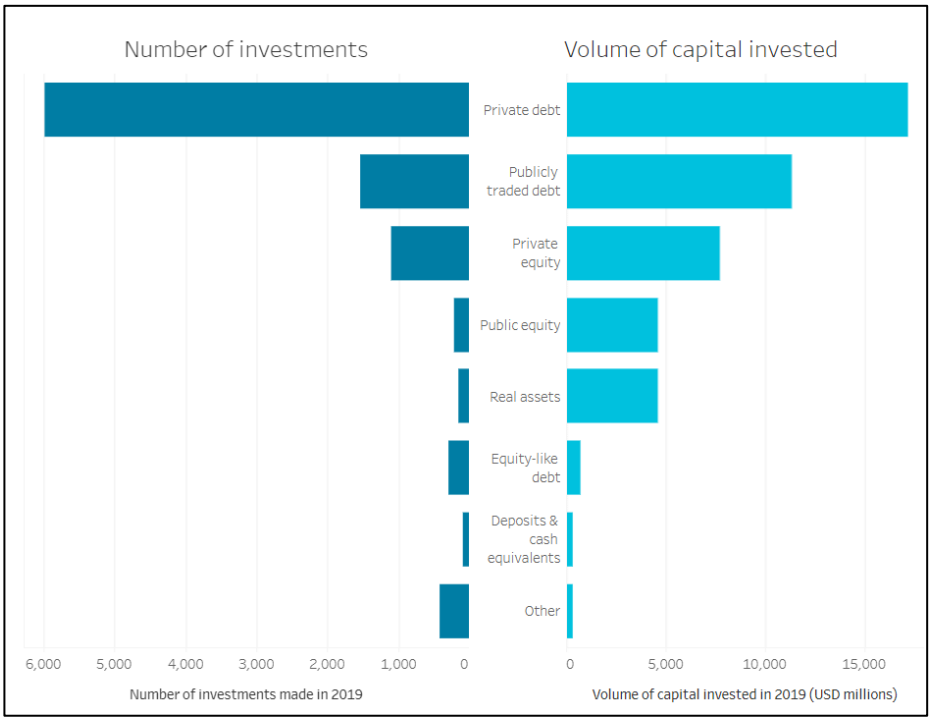
Such a high degree of diversity needs to be taken into consideration when conducting empirical analysis to avoid leading to erroneous inferences and generalizations. Moreover, leaving aside the different shades that impact investing may take, it must be highlighted that companies targeted by impact investors lie at the intersection of traditional businesses and not-for-profit models. They pursue a double mission which is enacted through innovative and original business models (Viviani & Maurel, 2019). In such a context of social and business logics, traditional financial and non-financial rules may be inefficient in measuring the actual performance of these types of investments.

Notwithstanding the above-mentioned contradictory evidence, it must be stated that an interesting eye-opener emerging from the analyses conducted lies in the fact that, while monetary returns per se cannot be claimed with certainty to outperform the industry average, the risk-adjusted returns seem to hint at a different intuition. In fact, in accounting for risk, social investing appears to deliver a substantial reduction in downside deviation during turbulent times in those funds that opted to undertake this kind of activity (Gibson & Krueger, 2017; Morgan Stanley, 2019). In essence,

investments oriented towards companies acting in the collective interest may deliver better financial performance not because of higher returns but thanks to reduced risk.

As already mentioned, a high number of financial intermediaries operating across a wide range of asset classes have entered the impact investment market. It is true, nevertheless, that only a few typologies are working as catalysts of the process bringing private investors liquidity towards products and services aimed at getting to the root of problems that prevent the achievement of high life quality standards. Private Equity belongs to and is an active player within this small circle[3] (Figure 4).

Figure 4: Impact investment activity in 2019



Note. Number and volume of impact investments for the PE asset class in 2019. From: GIIN. (2020). 2020 Annual Impact Investor Survey. Global Impact Investing Network.

2.2 Private Equity and social investing

Private Equity is risk capital contributed by private investors into non-listed companies in need of financial resources (Gervasoni & Sattin, 2020). This type of investment is

[3] Indeed, according to the GIIN (Global Impact Investing Network) 2020 Annual Impact Investor Survey, Private Equity is placed third in the ranking of the asset classes attracting the highest amount of capital to be allocated in social investments, with an invested amount equal to $7,733M in 2019 (https://thegiin.org/research/publication/impinv-survey-2020#charts).

undertaken by specialized intermediaries operating in the alternative finance segment of financial markets, the so-called Private Equity funds.

According to the European definition[4], the objective of Private Equity (PE) operators is typically to channel liquidity and financial resources from institutional investors towards businesses in the growth, maturity or decline phases of their lifecycle. The main aim of this category of funds is to buy stakes in private companies, keep them in the medium to long term and record a satisfactory capital gain when selling these shares. In this sense, as in any investment activity, the final objective of PE funds is to earn financial returns. Notwithstanding the fact that over time financial operators in this sector have abandoned the purely arbitrary-based logics in favour of a more active managerial and strategic role in target firms, in the end pecuniary remuneration is what drives capital allocation and divestment in PE.

While the focus of PE investors has typically been on matching investors demands with target firms' needs, it is common knowledge that Private Equity activity significantly affects several economic actors beyond clients and invested companies. In fact, given the quantity and diversity of the stakeholders that companies have to interact with, and keeping in mind that, even more in some specific industries, firms exert great externalities on the whole community through the provision of goods and services, it can be safely concluded that, through its active role in target firms' businesses, Private Equity activity strongly affects society as a whole. In this sense, there is strong evidence suggesting that PE brings significant benefits to invested companies as well as to the wider public.

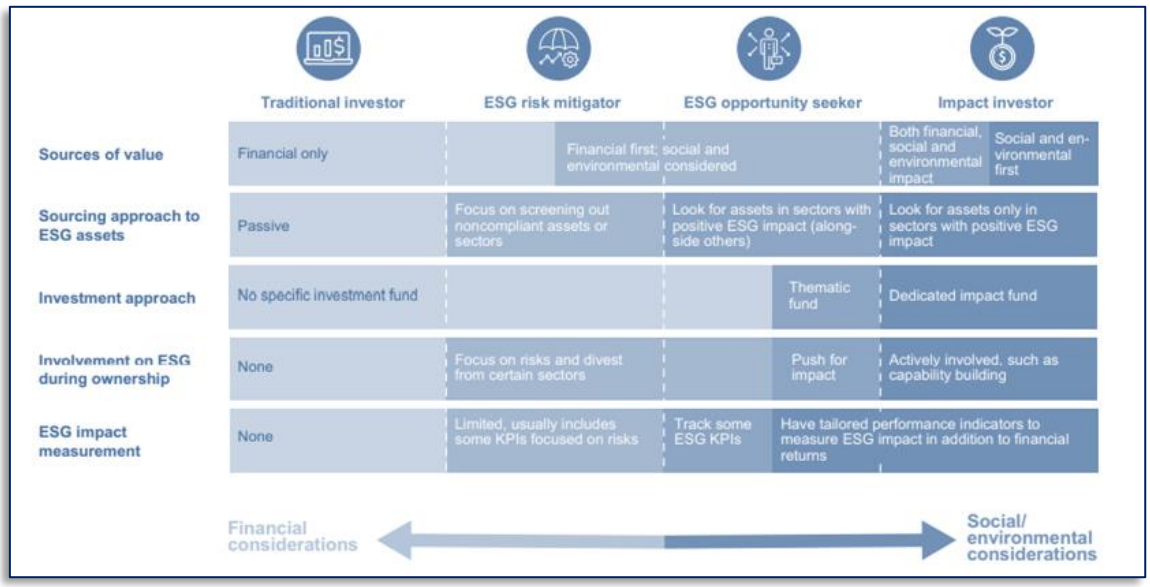
According to previous research (Bloom et al., 2015; Kaplan & Strömberg, 2008), both the financial and the managerial resources offered by Private Equity funds are highly valuable to target firms' performance (Gupta et al., 2021). Moreover, these investors are reported to exert positive externalities beyond the boundaries of the focal company. For instance, it has been empirically proven that industries where private equity funds typically invest record a faster growth in terms of productivity and employment (Bernstein et al., 2014; InvestEurope, 2022). Additionally, job reallocation is claimed to benefit from PE activity, but this relationship is contingent upon a few macroeconomic and credit conditions (Haltiwanger et al., 2019).

[4] The European definition of Private Equity does not include Venture Capital in the PE type of investments while in North America and UK Venture Capital is considered as a segment of PE (Gervasoni & Sattin, 2020).

Despite the financial focus these funds typically have when selecting and managing their portfolio investments, the change in their clients' demands have got PEIs to increasingly shift resources and attention towards the creation of social value.

According to a report by Bain & Company (Yang et al., 2019), Private Equity funds are starting to act and incorporate ESG factors into their investment strategies along a continuum at the extreme of which it is possible to find impact investors (Figure 5).

Figure 5: ESG investment models



Note. The spectrum of investment models through which investors can pursue ESG goals. From: Yang, K., Akhtar, U., Dessard, J., & Seemann, A. (2019). Private Equity Investors Embrace Impact Investing. Bain & Company. Retrieved from https://www.bain.com/insights/private-equity-investors-embrace-impact-investing/

The increased attention this asset class is nurturing towards environmental, social and governance imperatives has been analysed by academics (Crifo & Forget, 2012; Indahl et al., 2019; Milenković et al., 2015). However, a specific solid and well-structured strand of literature related to impact investing in Private Equity seems to be missing, both in the international and the Italian context. The main goal of the present paper is, hence, to make the first steps in shedding light on possible paths through which it may be viable to close this gap.

2.3 Private equity, Impact Investing and Smart cities

As already mentioned, research on Private Equity impact investing is extremely scant and, professional reports aside, an enormous academic gap can be detected on this

topic. While it has been frequently stated that a greater number of PE operators are moving towards social sustainability, it seems that no previous research has been conducted to scientifically prove and study this trend. The main goal of the present study is, thus, to provide initial evidence on a recent trend in Private Equity investments, suggesting increased incidence of impact investing in the Italian market, with a focus on the economic sectors forming the basis of the sustainable social development lying behind the concept of smart city.

As far as logical reasoning is concerned, the view adopted in past research will be accepted by assuming that impact investments in Private Equity are transactions involving the acquisition of a majority or minority stake in companies providing goods and services aimed at satisfying one or more of the 17 needs embedded in the UN SDGs. Moreover, given that previous investigations and analyses have pointed out a strong relationship of equivalence between the UN Social Development Goals and the needs that Smart cities were born to meet (Blasi et al., 2022; Grossi & Trunova, 2021; Schwarz-Herion, 2022; Visvizi & Perez, 2021), for the aim of this paper it will be taken for granted that financing the satisfaction of one or more of the UN 17 SDGs and, hence, making impact investments is analogous to allocating resources towards firms operating in the economic sectors that support the building of Smart cities, and vice versa.

Once the connections above are accepted, it is possible to state the main research question pursued by this analysis:

"Is Private Equity giving signs of contributing to the grounding of Smart cities?"

And more precisely,

"What are the economic sectors toward which Private Equity funds are channelling financial resources? Do they belong to the fundamental industries driving Smart cities?"

If the answer to the previous question is positive, then:

"What are the characteristics of these impact investments?"

3. Analysis and findings

To answer the research questions outlined above, a descriptive study is undertaken having as unit of analysis Italian Private Equity deals taking place in the last seven years. More concretely, transactions are analysed both from a quantitative and qualitative point of view to gain insights regarding recent trends in the Private Equity phenomenon in Italy

and on the existence of initial evidence suggesting increased attention towards Smart cities strategic sectors.

3.1 Sample construction and selection

The present analysis is conducted on a sample of 1,369 transactions detected in the years 2015-2021 by the proprietary database run by the Private Equity Monitor®[5]. The final sample, which can be safely stated to be close to the universe of reference, was obtained according to the following methodology. The first layer of data was built through manual search of all the Private Equity transactions taking place in the reference period in whatever industry, both involving Italian target firms acquired by Italian or foreign funds and foreign target companies invested in by Italian operators. The information thus collected was supplemented with financial data retrieved from trustworthy databases, such as Aida and Orbis, as well as privately known figures transmitted by personal contacts. To properly answer the research question, a subsample was subsequently built by filtering the transactions having as object companies operating in industries central to the development of Smart cities according to the criteria illustrated below.

3.2 Smart city and related industries subsample

With the aim of identifying the economic sectors interested by the present research, several official international and national documents on the Smart city and sustainable development topics have been analysed. In this context, the study of the text of the PNRR (Piano Nazionale di Ripresa e Resilienza) national plan has given the strongest guidance in pinpointing five reference areas:

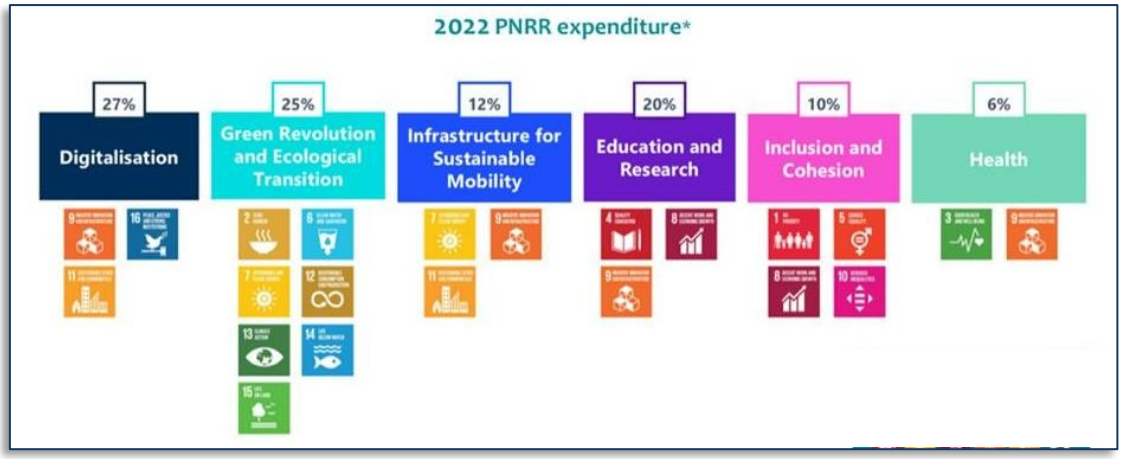
1. Infrastructure related to mobility, logistics, energy and environment, telecommunications;
2. Digitalization of products, services, and processes;
3. Ecological transition;
4. Healthcare, education, and personal services; and

[5] The Private Equity Monitor - PEM is an Observatory active since 2000 at LIUC Business School, thanks to the contribution of Deloitte, EOS Investment Management, Fondo Italiano di Investimento SGR, McDermott Will&Emery, UniCredit and Value Italy SGR. For twenty years the Observatory has been developing a permanent monitoring activity on venture capital investments made in our country, in order to offer operators, analysts, scholars and institutional referents, useful information for the performance of related activities and has established itself as a primary source of information in the sector. (https://www.liucbs.it/ricerca-applicata-e-advisory/centro-sulla-finanza-per-lo-sviluppo-e-linnovazione/osservatori-e-club/private-equity-monitor-pem/)

5. Financial services[6].

In this paper all the invested companies operating in one or more of the five sectors outlined above are deemed to contribute to the grounding of Smart cities. According to our assumption, businesses fuelling the blooming of sustainable cities automatically meet one of the 17 Sustainable Development Goals through the provision of their goods and services. More precisely, each reference area can be matched with specific SDGs as shown in Figure 6.

Figure 6: The Italian National Recovery and Resilience Plan and SDGs



Note. NRRP expenditure breakdown into measures for the country's sustainable development. PEM® elaboration from source Cerved.

According to this reasoning, Private Equity deals targeting companies active in one or more of these industries can be considered to be impact investments, namely investments creating social as well as financial value. It might be claimed that there are a residual number of socially sustainable firms operating in economic sectors other than these five. However, in this study it will be assumed that the reference areas taken into consideration to build the "Smart city" subsample are the five most representative categories and include the main bulk of investments with high sustainability impact. In other words, the analysed industries are the ones which really contribute to the implementation of Smart cities. In essence, it is taken as implicit that there is an equivalence between the words "Smart city" and "sustainability", and that these two

[6]These five reference areas have been extrapolated from the text of the National Recovery and Resilience Plan (PNRR). According to the latter, six sectors are considered as essential to Italy's future development (Figure 6), which can be synthetized into the five listed in the text. These same economic areas overlap with the strategic sectors commonly and scientifically considered as crucial to Smart Cities' development. For the aims of this paper, PNRR's six strategic areas have been re-organized into the above presented ones to make the research results clearer and easier to share and explain.

concepts fully distinguish investments made towards targets operating in the five listed industries from those active in other sectors.

Once the operations respecting the Smart city criteria are accounted for, the subsample amounts to 253 transactions. The analyses made in this work are centred on the comparison between the general sample and the "Smart city subsample" to get a preliminary idea of the magnitude of the sustainability phenomenon in Italy as well as the differences in attributes between the latter and investments in traditional industries.

3.3 Data analysis and discussion of results

The final aim of this paper is to show which industries are catalysing the attention of Italian PE funds, and whether it is possible to discern a movement of financial resources towards the five macro sectors delineated in the previous paragraph and, possibly, what particularities characterize these investments.

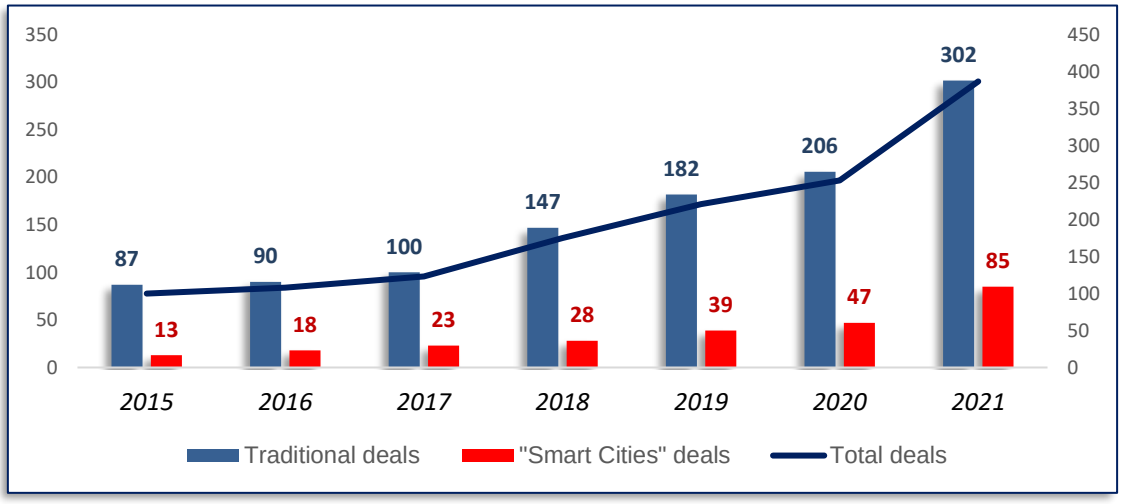
Given the authors' intentions, a preliminary step consists in understanding the importance the Smart city subsample built as reported above has held within the whole set of PE transactions carried out in the Italian market in the 2015–2021 time span.

Table 1: Investments in Smart cities' economic sectors vs. traditional businesses

Year	"Smart cities" deals	Traditional deals	Total deals
2015	13	95	*108*
2016	18	82	*100*
2017	23	100	*123*
2018	28	147	*175*
2019	39	182	*221*
2020	47	208	*255*
2021	85	302	*387*

As can be seen from Table 1, deals involving companies operating in at least one of the five strategic sectors supporting the establishment of Smart cities have exponentially increased in absolute terms throughout the reference period. However, it is possible to notice an upward trend in the transactions concerning more traditional segments of the Italian economy too. In fact, Italian Private Equity activity at the aggregate level has experienced a boost in the period analysed and this is even clearer when graphically displayed on a comparative bar chart (Chart 1).

Chart 1: Private Equity transactions by industry



At this point, the question that needs to be answered is whether the growth rate experienced by Italian Smart city deals in the period 2015 – 2021 is not only explained by the general positive surge (Table 2) but also by an intensified attraction exerted by socially sustainable topics on funds' clients and managers.

Table 2: Private Equity deals' trend over time and CAGR

Year	2015	2016	2017	2018	2019	2020	2021
Total deals	100	108	123	175	221	253	387
% Growth	-	8%	14%	42%	26%	14%	53%

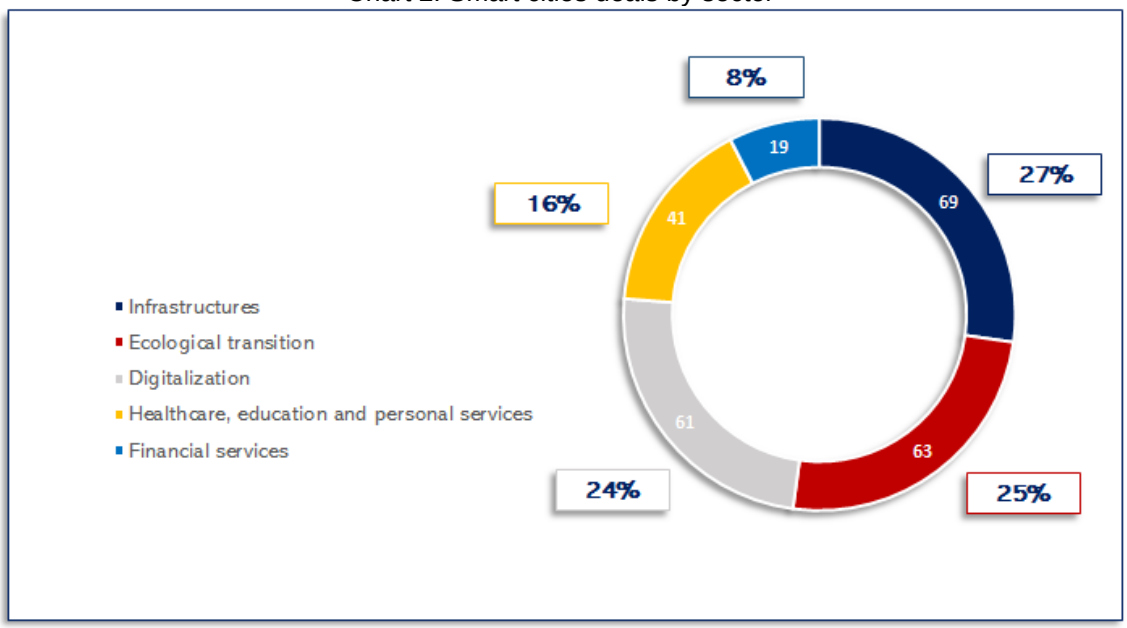
An effective approach in addressing this fundamental concern is to run a comparative analysis on the two subgroups generated by the application of the smart cities criteria to the general sample. More precisely, the relative weight of smart cities transactions compared to those in traditional industries can be considered as a proxy of the relative importance each subsample has held in the reference period. Looking at the percentages exhibited in Table 3, it is possible to conclude that, despite the ascending movement followed by the aggregate figures, investments with social impact have gradually assumed a greater role in PE resource allocation. This phenomenon is matched by a simultaneous decrease in the interest towards more traditional industries.

Table 3: Weight of the Smart city subsample on the overall sample analysed

Year	"Smart cities" deals (%)	Traditional deals (%)
2015	13%	87%
2016	17%	83%
2017	19%	81%
2018	16%	84%
2019	18%	82%
2020	19%	81%
2021	22%	78%

Once the existence of a Smart city attitude among Private Equity operators is accepted, a major interrogation regards the economic areas driving the transformation. By dissecting available data, it is possible to discern the strategic sectors capturing the greatest share of capital channelled into the entrepreneurial system by PE players. As can be noticed from Chart 2, 27% of the analysed deals involve companies operating in the infrastructure sector. Given what has been previously stated regarding the widening of the infrastructural gap, this result is not surprising, and it appears to corroborate the fact that also in Italy financial operators are taking concrete action to help satisfy the needs for sustainable housing and building.

Chart 2: Smart cities deals by sector

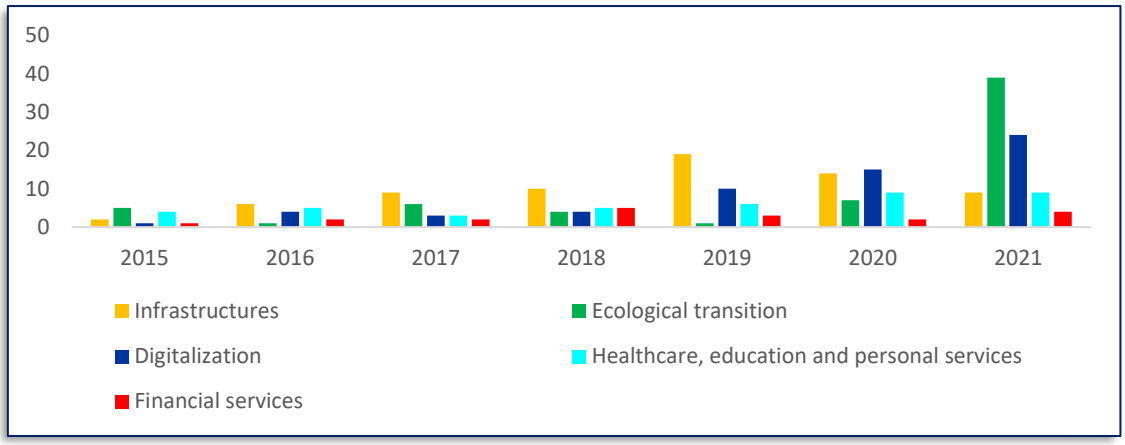


Interestingly, infrastructure is not the only sector that has attracted the attention of PE activity, but it seems that firms supporting the process of ecological transition and digital transformation appear very frequently among the data, respectively in 25% and 24% of the deals investigated in the period 2015-2021. Finally, healthcare, education and personal services show the lowest presence recording respectively 16% and 8% of the transactions in the Smart city subsample. Although the general picture already provides meaningful information, a deeper understanding of the phenomenon can be gained by monitoring the evolution of the deals recorded for the five sectors in each year (Table 4).

Table 4: Smart city deals per sector over time

	Deals by strategic sector per year							
Strategic sector	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	**Total**
Infrastructure	2	6	9	10	19	14	9	**69**
Ecological transition	5	1	6	4	1	7	39	**63**
Digitalization	1	4	3	4	10	15	24	**61**
Healthcare, education, and personal services	4	5	3	5	6	9	9	**41**
Financial services	1	2	2	5	3	2	4	**19**

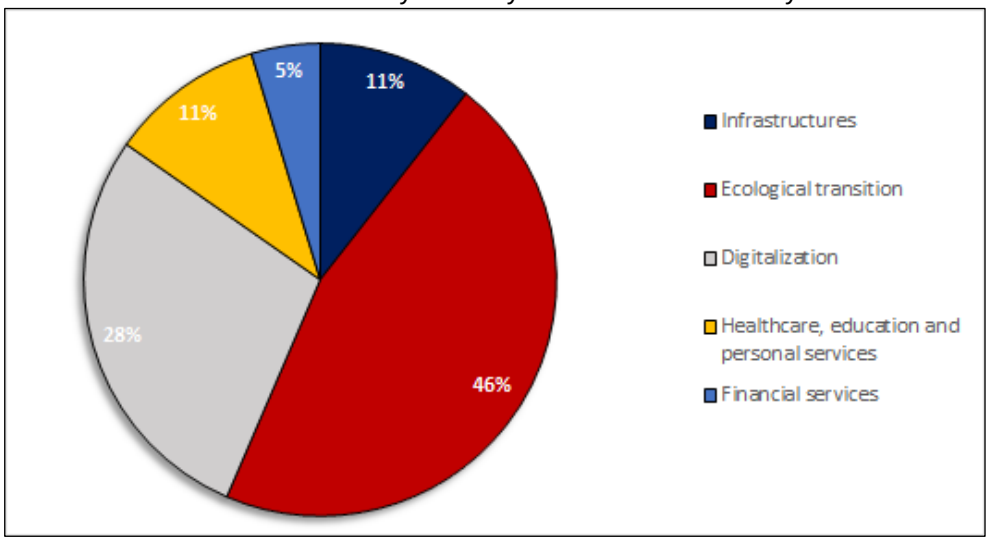
Chart 3: Smart Cities deals over time – comparison across strategic sectors



Although the comparative bar charts shown in Chart 3 highlight an increasing trend involving almost all the sectors analysed, the impressive growth of investments in companies supporting the ecological transition process can be clearly seen. It seems that environmental preservation and proper natural resource management have been the topics receiving the greatest surge in interest among PE players in the last three years. This phenomenon explains why at the end of the reference period (year 2021) the

relative importance held by each segment is different from the total (that recorded considering the aggregate figures in all the seven years). More concretely, target companies operating in the environmental and green fields are now the ones appealing to PE funds the most (46% of the deals), followed by digitalization services (28%), while infrastructure-related transactions only cover 11% of the analysed subsample (Chart 4).

Chart 4: Smart city deals by sector in % - 2021 only



In the past decade, Italian companies have turned out to be increasingly valuable and attractive to the eyes of foreign financial players. In fact, according to the Private Equity Monitor almost one deal in two is undertaken by big international funds investing in the priceless know-how patiently built up and passed down from generation to generation in Italian SMEs. In this context, it is extremely interesting to get an initial understanding of the origin of the capital channelled towards the economic areas considered here. More specifically, it is interesting to find out whether and to which degree the PE transactions constituting the subsample in hand have been launched by non-domestic rather than Italian funds. To address this issue, within the group of target companies active in one or more of the five strategic economic fields, the number of operations run by foreign players is compared to the count of deals undertaken by domestic funds.

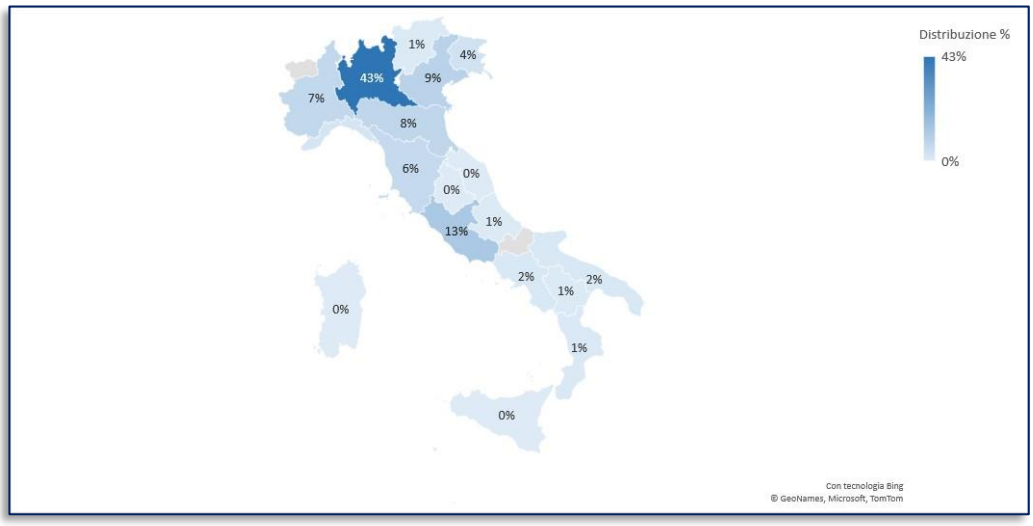
Table 5: Smart city deals by origin over time – number and percentage

	Deals by origin (#)		Deals by origin (%)	
	Domestic	**International**	**Domestic %**	**International %**
2015	4	9	31%	69%
2016	6	12	33%	67%
2017	7	16	30%	70%
2018	11	17	39%	61%
2019	14	25	36%	64%
2020	20	27	43%	57%
2021	36	49	42%	58%

From Table 5 it is possible to discern a clear-cut trend confirming the assumption that the big international PE players are leading the Italian Smart city revolution, being the source of most of the financial resources allocated to the five sectors fundamental to the development of sustainable cities. More precisely, around 70% of the transactions included annually in the Smart city subsample were launched by non-domestic operators while only 30% were conducted by national ones. However, it must be noted that domestic players' involvement in Smart city deals increased throughout the reference period, reaching a proportion equal to 42% of the overall operations in 2021 from as low as 29% of deals in 2015.

The Italian territory suffers from huge inhomogeneities when it comes to entrepreneurial and financial activity intensity. According to the PEM®, Lombardy, Emilia Romagna and Veneto are the three most relevant regions at the national level when it comes to attracting PE funds. Therefore, a further step in this analysis is exploring whether this same pattern is followed when dealing with impact investments or whether evidence reveals surprising insights. From the map shown in Figure 7, it can be noticed that the normal order is somehow upset.

Figure 7: Smart Cities deals by region



While Lombardy continues to play the role of catalyst pole, with 43% deals involving firms operating in that region, the second place is no longer held by Emilia Romagna (which is in fourth place immediately preceded by Veneto), but Lazio becomes the second most important geographic area attracting 13% of the international and domestic PE investments aimed at socially and sustainably impacting the community. Further details on the number of deals by region are reported in Table 6.

Table 6: Smart city deals by region (number)

Deals by Geographic Area, 2015-2021	
Deals (#) by region	**Region**
108	Lombardy
32	Lazio
23	Veneto
20	Emilia-Romagna
18	Piedmont
16	Tuscany
9	Friuli-Venezia Giulia
6	Liguria
4	Campania; Puglia
3	Calabria
2	Abruzzo; Basilicata; Trentino-Alto-Adige
1	Marche; Sardinia; Sicily; Umbria

The great majority of PE transactions taking place in the Italian market traditionally fall into the buyout category[7]. In such a deal type, PE funds enter private companies by acquiring a control stake from previous owners, usually represented by entrepreneurs, and founding families. Buyouts are, hence, typically characterized by a substantial involvement of investment professionals, who are actively engaged in the target company's life in a sort of partnership with the invested firm's management team. It would be intriguing to verify whether this phenomenon also applies to the deals taking place in Smart cities strategic sectors or if the prevalence of another transaction type emerges from analysed data.

Table 7: Smart city deals by investment strategy over time (number and percentage)

	Deals by typology (#)			Deals by typology (%)		
	Buy Out	**Expansion**	**Turnaround**	**Buy Out**	**Expansion**	**Turnaround**
2015	9	3	1	68%	25%	7%
2016	14	4	0	75%	25%	0%
2017	14	8	1	64%	34%	2%
2018	17	9	2	62%	32%	6%
2019	27	11	1	71%	28%	1%
2020	38	7	2	81%	14%	5%
2021	72	11	2	85%	13%	2%

Table 7 displays for each year of the reference period the percentage of operations by transaction typology. It shows that the great majority of deals fall into the buyout category. Moreover, the relative importance of this category increased throughout the period, rising from 68% of Smart city deals to as much as 85% of transactions in 2021. In conclusion, there does not seem to be a difference between the aggregate sample and the Smart city subsample when it comes to the investment approach adopted by domestic and international PE funds.

Having conducted the previously presented analyses, it may be enriching to complement the study by giving an indication of the magnitude of the Smart city phenomenon. More precisely, the sales figures of the companies operating in one or more of the five sectors

[7] See recent PEM® reports (https://www.liucbs.it/ricerca-applicata-e-advisory/centro-sulla-finanza-per-lo-sviluppo-e-linnovazione/osservatori-e-club/private-equity-monitor-pem/#risultati-di-ricerca).

stimulating the building of sustainable cities is considered as a good proxy for the size of the observations constituting the subsample.

Chart 5: Average revenues of Smart city subsample of deals over time (€; M)

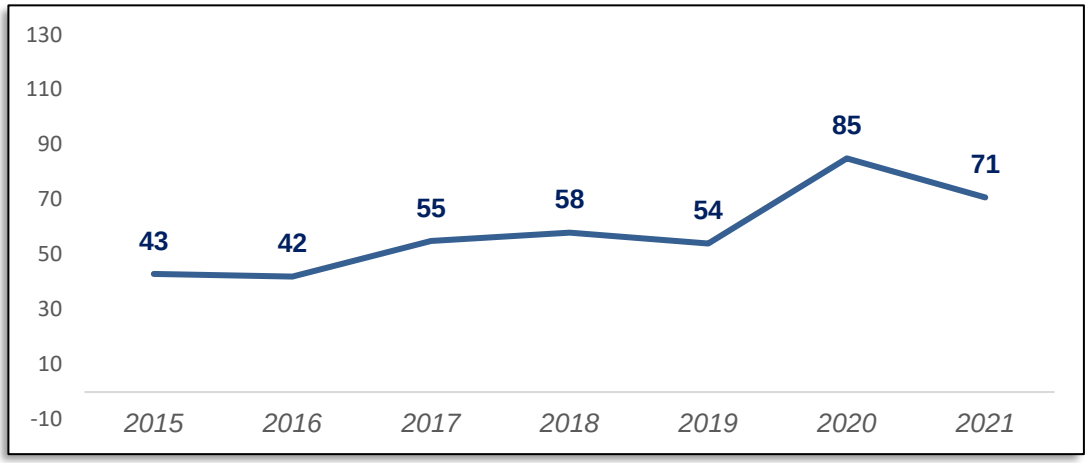


Chart 5 represents the upward trend that average revenues in the Smart city subsample recorded in the years 2015-2021. More precisely, they registered a CAGR of 9%, starting with average sales amounting to €43M in 2015 and ending with a mean of €71M of revenues in 2021. Comparing these figures with the average sales of the transactions undertaken in the remaining economic sectors (Table 8), no significant difference leaps to the eye among the companies operating in socially sustainable segments and those active in more traditional industries.

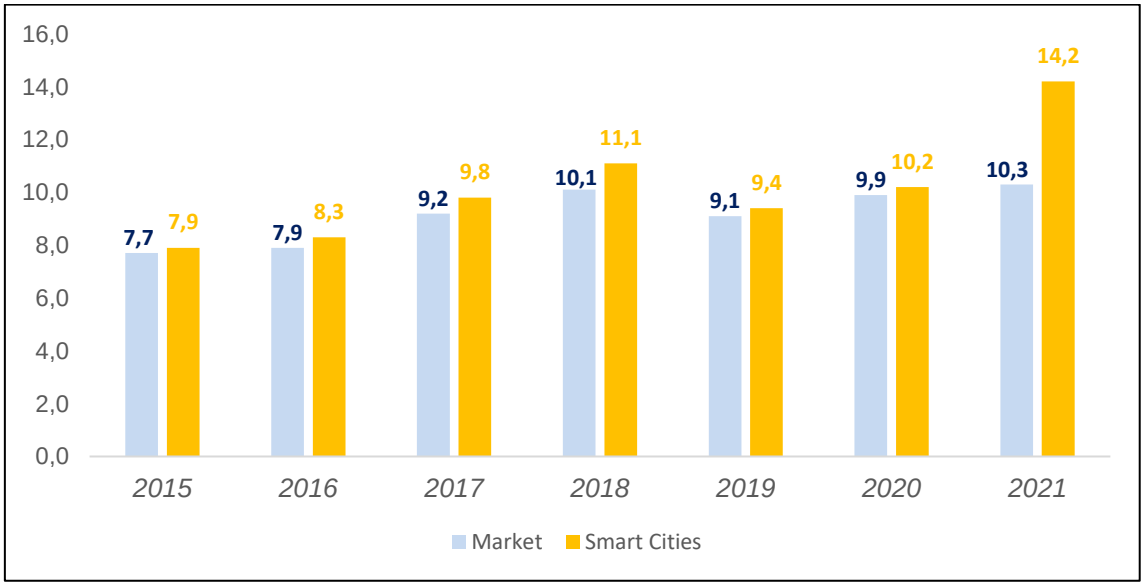
Table 8: Average sales of the Smart city subsample deals over time (€; M)

	Average sales (€; M)	
	Traditional	**Smart city**
2015	40	43
2016	39	42
2017	52	55
2018	62	58
2019	51	54
2020	81	85
2021	68	71
Total	393	408

Overall, it can be said that, despite the fact that PE investments in Smart cities sectors are no longer limited to small and medium-sized firms but are increasingly extending the reach to companies of every size, this upward trend in the revenues of invested companies is not characteristic of the Smart city subsample but is extremely homogenous among target firms in any analysed industry, whether it is innovative or traditional.

In the last few years, the increasing competition due to the presence of a high number of active operators has led to an upward trend of the entry multiple EV/EBITDA in the Italian market. As can be noticed from Chart 6, this same general pattern involves deals related to both traditional and socially sustainable companies. However, it must be said that the greatest growth has occurred in the Smart city subsample (from an average multiple of 7,7x to 14,2x), suggesting that, the market having recognized the centrality of these areas to the country's recovery, financial operators have recently been willing to make an incremental financial effort to secure the management and control of these strategic activities.

Chart 6: Comparison of the average EV/EBITDA multiple between the market and the Smart city subsample



4. Conclusions and further recommendations

The financing of Smart cities is a much debated yet poorly explored topic when it comes to scientific and academic studies. Above all, the contribution that private capital can make to the grounding of more sustainable cities through the spread of impact investments constitutes a relevant gap to be filled in international as well as Italian research. The main aim of this paper is to find possible paths through which future investigations may close this gap in past literature. By conducting a descriptive qualitative and quantitative analysis, some interesting insights emerge.

In the period of reference, it seems that the attention of international and domestic Private Equity operators active in the Italian market has progressively shifted towards companies whose goods and services positively benefit society. More precisely, it appears that firms operating in the infrastructure sector and in those industries promoting ecological and digital transitions have received the greatest share of capital among the five sectors strategic to the development of Smart cities. Moreover, it must be kept in mind that over time the last two categories have recorded an astonishing growth, ending up being the industries with the highest incidence among the deals undertaken in the Smart cities subsectors in 2021. Analyzed data suggest that most operations involving one or more of the five Smart cities sectors was undertaken by International PE players and that an average of one in two impact investments involved a company located either in Lombardy or in Lazio. In addition to this, the exploration undertaken designates the buyout approach as the most frequently adopted one when launching a Private Equity transaction, both in traditional and in sustainable economic sectors. Moreover, the information collected does not hint at substantial differences in size (considering revenue figures) between operations in traditional firms and businesses with social impact. Finally, the significant growth of the entry multiple EV/EBITDA in the time frame 2015 - 2021 suggests a high degree of competition in the Italian PE industry, especially when it comes to investments in socially sustainable companies, of which operators are probably progressively acknowledging the strategic centrality in the country's recovery path and Italian development of smarter centres. The increase recorded by PE investments in these industries is a confirmation of their centrality to the country's future development, given that PEIs usually direct their efforts towards high-potential economic sectors.

The findings presented here are intended to guide future academic works towards an in-depth understanding of the dynamics according to which private capital is channeled into

the economic actors that are supposed to fuel the realization of Smart cities, both in Italy and worldwide. To achieve such an objective, several questions need to be addressed.

In light of the results of the present paper, there may be some relevant issues that are worth exploring in future research. More concretely, it may be of interest to investigate through quantitative analyses the factors, whether macroeconomic, fund or company related, influencing PEI's likelihood of investing in a company operating in the sectors underpinning the development of smart cities rather than in firms active in more traditional businesses. Evidence in this direction would allow academics as well as practitioners to attract and channel financial funds towards the economic sectors supporting Italy's development.

Secondly, it would be eye-opening to collect and analyse empirical data on the performance investments in socially sustainable companies record over time and to confront these with financial and non-financial returns on investments in more traditional firms. However, to properly undertake such research, it would be appropriate to first develop financial and non-monetary metrics capable of taking into consideration the particularities of impact investments and to overcome the current barriers to the proper and complete evaluation of the performance of this special asset class. In this sense, it may be useful to conduct qualitative exploration through surveys and case studies.

Finally, it would add a high degree of concreteness and give more reliability to results to study the differences in behavior displayed by impact investments undertaken in different areas. In fact, it is evident that, as the Smart city concept is extremely wide and encompasses an extensive range of sectors and industries, investments in healthcare-related activities exhibit very different characteristics with respect to investments in firms operating in the energy industry. Taking into account such a distinction would sharpen analyses and give more targeted insights to the academic as well as the professional community.

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