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Unveiling the Complexity in Developing Smart Cities: A Comparative Study Across Countries

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Abstract

Creating Smart Cities (SC) is crucial for addressing today's global economic, social, and environmental issues. Nevertheless, a significant gap exists in comprehending the nation's contextual routes to accomplish this, particularly in developing nations. This research analyzes Smart Cities models. A fuzzy-set qualitative comparative analysis (fsQCA) was employed, and it revealed routes to create Smart Cities and their complex dynamics in developed and developing countries. The empirical findings of this research provided the basis of a proposed model that highlights five distinct pathways in developed nations and three in those still developing. Five contextual typologies for Smart City creation have been established in developed countries: 1) Global development and tech integration, 2) Economic growth and human capital investment, 3) Social development and governance enhancement, 4) Sustainable mobility and environmental management, and 5) Comprehensive SC vision for developed countries. In contrast, the SC contextual typologies for developing nations comprise 1) Comprehensive urban development and social inclusion, 2) Human capital development with a global view, and 3) Human capital development with tech integration. These research insights serve as essential orientations for policymakers and theorists striving to create Smart Cities.

JEL classification numbers: 021, O380.
Keywords: Smart cities, QCA, Typologies, Pathways, Smart city model, Developing countries.

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1. Introduction

City growth has led nations and their decision-makers to urgently seek solutions to address economic, social, and environmental issues. According to the ONU (2019) in its World Urbanization Prospect report, the regions with the highest percentage of people living in cities are North America (82%), Latin America and the Caribbean (81%), and Europe (74%), while the regions of Asia and Africa have levels close to 50%. However, it is estimated that by 2050, there will be an increase of 2,2 billion people living in cities in Africa and Asia, while more developed regions will stabilize (ONU, 2022). In response to these pressing scenarios of rapid urbanization, the concept of Smart Cities (SC) has emerged as a timely and viable alternative for city management and addressing issues of pollution, health, mobility, and education (Sharifi, 2020; Yigitcanlar et al., 2019; Zaheer and Dhunny, 2019).

Despite some advances in the study and measurement of SC, Deepti and Tooran (2020) identified a growing trend in defining SC from the perspective of first-world cities. Therefore, there is a recognized need for studies on SC in developing countries (Alderete, 2022) as well as a lack of empirical studies on cities in developing countries that are in the process of becoming SC (Staletić et al., 2020; Zhao et al., 2021). Similarly, the absence of reference frameworks hinders the implementation of SC models (Micozzi & Yigitcanlar, 2022), especially models that cater to similar contexts, since, as Antwi-Afari, Owusu-Manu, Simons, et al. (2021) suggest, what is considered smart in a developed country may not be viewed as such in a developing country due to unique circumstances. Hence, adopting paths and models incongruent with economic, social, political, cultural, urban, and geographical circumstances results in a loss of resources (Dameri et al., 2019; Mao et al., 2023; Neirotti et al., 2014).

Therefore, this study aims to analyze the pathways for generating SC in developed and developing countries by examining sufficient and necessary conditions. To achieve this, a fuzzy-set qualitative comparative analysis (fsQCA) was conducted on 60 cities in developed countries and 53 cities in developing countries. These cities were selected based on their scores in the IESE Cities in Motion Index (ICIM) (Berrone and Ricart, 2022). Through this study, we seek to contribute to bridging the gap in the need for empirical research in cities of developing countries, providing a framework of reference for decision-makers concerning the conditions in which they should invest more significant effort to transform their cities into SC (Caragliu and Del Bo, 2019).

At the same time, the analysis of the pathways to generate SC in developed countries serves not only for application in similar contexts but also for future research concerning the implemented public policies that have contributed to strengthening these conditions. It also addresses the transfer of knowledge and lessons learned, as referred to by Antwi-Afari et al. (2021), among cities with high levels of SC.

2. Literature review

2.1 Smart Cities

The term SC has predominantly been understood as an approach focused on the incorporation of technologies (Yigitcanlar, 2016) and data analysis for the city management of services such as governance, education (Al Nuaimi et al., 2015), electricity and water supplies (Chuan Tao et al., 2015), mobility and transportation (Osman, 2019), public health (Lee et al., 2016), as well as the creation of innovation ecosystems between the public and private sectors (Linde et al., 2021). On the other hand, authors like Costa et al. (2017) highlight the importance of SC in areas such as empowerment, citizen participation (Bouskela et al., 2016), human capital development (Caragliu et al., 2011), and environmental care and sustainability (Trindade et al., 2017).

According to Blasi et al. (2022); Lai & Cole (2023) and Ruhlandt (2018) the concept of SC is a fuzzy one that has been explained through the integration of various dimensions. However, two main approaches have been identified (Kummitha & Crutzen, 2017), the first focusing on the implementation of technologies, and the second on the benefits that these technologies bring to people. In this regard, Kim & Feng (2024) and Yigitcanlar et al. (2018) emphasize that such classification should be cautiously approached, as attempting to understand SC solely from a technological perspective leads to a one-dimensional view. SC solely from a technological perspective leads to a one-dimensional view.

2.2 Smart city models

Various studies have devised methodologies for measuring SC, basing their theoretical framework on Giffinger´s (2007) SC model. Giffinger suggests six dimensions for the examination of medium-sized European cities: 1) Smart economy, 2) Smart people, 3) Smart governance, 4) Smart mobility, 5) Smart environment, and 6) Smart living. Additionally, the International Telecommunication Union (ITU-T SG20, 2017) expanded this SC model by incorporating the perspective of integrating the Internet of Things (IoT) and technologies in city management. Furthermore, Smiciklas (2017) contributed to this expansion by proposing the term 'smart and sustainable cities', highlighting the necessity for cities not only to focus on implementing innovative technologies but also to integrate sustainable practices to ensure fair and environmentally respectful development.

2.3 Conditions in Smart Cities

Tang et al. (2019) state that there is a wide range of terminology to categorize and study SC; some authors refer to dimensions, factors, themes, and conditions. In this research, and according to the QCA methodology, the term condition will be used to determine those elements that generate an SC. Rodríguez Bolívar et al. (2023) state that the complexity of the cities and their characteristics and conditions, makes cities' complexity and particular characteristics and conditions make them context-dependent. Consequently, Caragliu & Del Bo (2019) and Duygan et al. (2022) argue that there is less attention to the configurational conditions to develop a SC according to the context. Therefore, each of the nine conditions is subsequently defined in this research concerning the dimensions analyzed in the IESE Cities in Motion Index (Berrone & Ricart, 2022). These are economy, human capital, international projection, mobility and transport, environmental, technology, urban planning, governance, and social cohesion.

2.3.1 Economy

The economy (Eco) from the SC perspective has been associated with enabling innovation and entrepreneurship (Giffinger, 2007), the development of industries and employment in information and communication technologies (Albino et al., 2015), productivity, collaborative economy (Berrone & Ricart, 2022), and responsible resource use in productive industries. It also involves the management capabilities of various actors to address economic challenges (Carayannis et al., 2022). Additionally, Bellini et al. (2022) noted the impetus towards developing digital commerce, artificial intelligence, autonomous models, and using transactional technologies to fortify local and global trade.

2.3.2 Human Capital

Human capital (HC), as elucidated by Kumar et al. (2022) and Kummitha & Crutzen (2017), can only be comprehended through the lens of smart citizens, focusing on the development of capabilities, education, language competencies, and multicultural experience. Becker et al. (2023) assert that the development approach SC or Cities 5.0 incorporates technologies that provide access to a plethora of services, such as cultural events that allow the development of people. Sharif & Pokharel (2022) and Verdejo et al. (2022) highlight the significance of infrastructure development, such as schools, research and innovation centers, and smart labs, which enhance individuals' capacities and create new products.

2.3.3 International Projection

The international projection (Intl) is analyzed by Berrone & Ricart (2022) through assessing the city's international importance and recognition. They measure various factors, including the number of international flights, their passenger traffic, the number of international congresses held in the city, and hotel occupancy rates, among others. It is noteworthy that the indicators examined within this condition are also considered by authors such as Giffinger (2007) and Smiciklas (2017) within the Economic (Eco) dimension.

2.3.4 Mobility and Transport

Mobility and transport (M&T) represent a paradigm shift, rethinking mobility from a human-centric perspective rather than solely focusing on facilitating automobile use (Mukhtar-Landgren & Paulsson, 2021). This involves not only the integration of non-polluting modes of transport but also smart mechanisms for traffic management and incorporating integrated transportation methods (Kumar et al., 2022). Dowling (2018) highlights that M&T also involves the integration of on-demand technologies and non-motorized vehicles and, equally important, the redesign of public spaces and the transport system to include individuals with motor, visual, or auditory disabilities. It also includes smart parking, loading stations, shared hybrid cars and bicycles, smart traffic lights, and smart logistics (Bıyık et al., 2021).

2.3.5 Environmental

The environmental (Env) condition encompasses various elements in the vision of sustainable urban development, including reducing pollution levels and developing and utilizing renewable energies, as highlighted by Micozzi & Yigitcanlar (2022). It also involves the preservation of biodiversity and the management of protected natural areas (Sharif & Pokharel, 2022). Similarly, the Env focus within the SC framework extends to controlling water and air pollution levels. This is achieved by integrating technologies and sensors that provide real-time information for efficient resource management and decision-making, as Ullo and Sinha (2020) discussed. Furthermore, the Env condition promotes the creation of green areas with multifaceted purposes. These areas provide recreational spaces for residents and contribute to the population's physical and mental well-being. Additionally, they serve as carbon sinks and foster biodiversity in the urban landscape, as highlighted by Caragliu et al. (2011).

2.3.6 Technology

The development of technology (Tech) in SC encompasses various applications. According to Syed et al. (2021), IoT systems have been integrated into the management of services in cities, including transportation, control of energy supply, video surveillance, and security, innovation in healthcare and telemedicine (Silva et al., 2018), industrial processes to enhance and automate production, the implementation of Tech to measure conditions in agricultural production and reduce risks from diseases. Lastly, there is also the incorporation of technologies and sensors in households. These IoT applications through sensors and devices have enabled decision-makers (Reyes-Menendez et al., 2020) to manage extensive data volumes via big data analysis (Osman, 2019). In this regard, Chuan Tao et al. (2015) highlight that a SC integrates information technologies and technological infrastructure to improve its citizen's quality of life. Jiang et al. (2023) point out that “typical SC technologies include smart urban labs, open government portals, citizens’ dashboards, and social media, digital twins” (p.34).

2.3.7 Urban Planning

Urban planning (UP) encompasses the management of land use, the creation of smart buildings and homes managed with technology (Mundada & Mukkamala, 2020), infrastructure development for energy and water service provisions, enhancements in transportation systems, and innovation in healthcare and education (Deepti & Tooran., 2020). UP in SC adopts an approach towards the social inclusion of diverse urban residents in public services (Trindade et al., 2017).

2.3.8 Governance

According to Tan & Taeihagh (2020), SC's governance approach (Gov) emphasizes the value of public participation and involvement of critical stakeholders in the decision-making process, integrating technologies for a more transparent and accountable system. Mandić and Kennell (2021) and Palos-Sanchez et al. (2019) note that various governance models have defined it through intelligent norms and policies. Meanwhile, Nam and Pardo (2011) highlight that a smart governance approach should encompass the government's leadership capability to efficiently manage its services and provide citizens with access to information.

2.3.9 Social Cohesion

Social cohesion (Sc), as per Berrone & Ricart (2022), involves the well-being of individuals through the provision of health, education, and justice services. Authors such as Giffinger (2007) and Yigitcanlar (2016) refer to essential factors such as social inclusion and gender equality. According to Zaheer & Dhunny (2019), technological management in cities enhances citizens' quality of life by offering improvements in transportation, healthcare, democratization of knowledge and technologies, and better security systems.

3. Materials and Methods

Qualitative Comparative Analysis (QCA) is a comparative method oriented toward cases, developed by Ragin (1987) and grounded in set-theoretic analysis and Boolean logic. Its primary objective is to overcome the deficiencies found in both qualitative and quantitative approaches, particularly concerning sample size and the depth of case analysis (Medina et al., 2017; Schneider & Wagemann, 2012). In contrast to probabilistic methods, QCA, according to Ragin (2008), utilizes the terms "causal conditions" (independent variables) and "outcome" (dependent variable), expressing its configurational logic. The holistic nature of QCA allows for the analysis of cases as complex units composed of conditions(Fiss, 2011). In contrast to statistical methods, which seek to determine the net effects of independent variables (Oana et al., 2021; Schneider & Wagemann, 2012; Vis, 2012), QCA studies the context in which a particular outcome occurs through the analysis of the sufficiency and necessity of these conditions (Mello & Tanja, 2021). One of the main contributions of this method is the analysis of causal complexity through three principles: 1) conjunctural causality (the combination of conditions gives rise to an outcome), 2) equifinality (there are different pathways to the same outcome), and 3) causal asymmetry (the outcome and non-outcome may require different explanations) (Benoît Rihoux, 2009). On the other hand, Mello & Tanja (2021) point out that through QCA, it is possible to identify patterns within cases, create typologies, test theories, and develop new theories.

Three main techniques are employed in set-theoretic analysis through QCA: crisp-set (csQCA), fuzzy-set (fsQCA), and multivalue (mvQCA) (Schneider & Wagemann, 2012). CsQCA uses dichotomous values of 0 and 1 to denote non-membership and full membership in the set. Recognizing the limitations of this technique in studying social phenomena, Ragin (2000) refined the methodology by introducing fsQCA, which establishes the degree of membership by assigning values within the range of 0 and 1 (Oana et al., 2021). This allows for assessing quantitative differences among qualitatively identical phenomena (C. Ragin & Strand, 2008; Schneider & Wagemann, 2012). On the other hand, mvQCA establishes categorical differences within the conditions.

3.1 Research Approach

This research has followed the fsQCA technique using the four stages proposed by Oana et al. (2021) and Schneider & Wagemann (2012): 1) configuration model design, hypothesis formulation, case selection, and calibration, 2) truth table construction, 3) consistency analysis and logical minimization, and 4) presentation of the solution.

3.2 Research Question

This study seeks to answer the question: What conditions or configurations of conditions are sufficient and necessary for the generation of SC in the context of both developed and developing countries?

3.3 Hypothesis and explanatory conditions

Through reviewing the dimensions of SC models, the analysis of conditions proposed by the ICIM index (Berrone & Ricart, 2022) integrates the measurement of conditions analyzed by other indices. Furthermore, according to Lai & Cole (2023), this index is the most suitable for measuring SC. Within the framework of the QCA theory, the singular model approach is recognized as selecting a theory or model to analyze the conditions or configuration of conditions that generate a result. This study examines nine conditions through the following hypothesis.

H1: The presence of Eco, HC, Intl, M&T, Env, Tech, UP, Gov, and Sc is sufficient and necessary (set-theoretic relation) to give rise to a SC (outcome) in the context of cities in both developed and developing countries.

3.4 Case and Data Collection

The empirical data collection was based on the results measuring the nine dimensions of the IESE Cities in Motion 2022 (ICIM) (Berrone & Ricart, 2022) developed by the Business School of the University of Navarra. This index employs a quantitative methodology by measuring 114 indicators to gauge the degree of intelligence across 183 cities belonging to 92 countries. Two samples were taken from the total cities analyzed in the ICIM to conduct a comparative analysis between cities from developed countries (60 cities) and cities from developing countries (53 cities).

For the sample selection, performance criteria from the ICIM index were employed, focusing on cities with high, medium, and low performance. The second criterion involved the classification of cities in developed and developing countries according to the (UNPD, 2023). Acknowledging the ambiguity in the classifications of developed and developing countries, this criterion was refined by also considering the Gross National Income (GNI) per capita, Atlas Method (The World Bank, 2022), to encompass countries classified as upper middle income, lower middle income, and low income within the developing country classification.

Furthermore, aiming to prevent issues of limited diversity (Ragin, 2000), that is, having few empirical cases to explain configuration relationships, the criterion advocated by Mello & Tanja (2021), a minimum of four cases per condition was considered. The selected cities and criteria are presented in Appendix 1 (Table A.1 1).

3.5 Data Analysis

The data analysis was conducted separately for cities in developed countries and those in developing countries using the fsQCA® software in its 4.1 version. However, the results are presented jointly in tables for comparative analysis, following the design proposed by Garcia-Rio et al. (2023). This methodology allowed a comparison of the outcomes obtained for both categories of cities, highlighting the differences and similarities between the necessary conditions for developing SC in developed and developing contexts.

4. Results

4.1 Calibration of conditions

Calibration refers to assigning membership and non-membership values to the set (Oana et al., 2021).The calibration process involves both theoretical and empirical data review. In this research, the direct calibration method was chosen, primarily used when quantitative values are available for measuring the conditions. The anchor values of 0.95 (full membership), 0.5 (cross-over point), and 0.05 (full non-membership), displayed in the same order in Table 1 for each of the conditions, were established by calculating the percentiles of the processed data, as suggested by Pappas & Woodside (2021).

Table 1: Conditions Calibration

Conditions	Developed Country	Developing Country
Eco	(75,50,35)	(36,25,10)
HC	(80,53,40)	(46,25,10)
Intl	(85,35,20)	(40,10,0)
M&T	(90,60,45)	(61,40,20)
Env	(60,55,30)	(50,35,5)
Tech	(80,70,60)	(56,40,15)
UP	(100,60,40)	(65,40,25)
Gov	(95,70,55)	(56,40,5)
Soc	(95,88,70)	(75,60,30)
SC	(74,59,56)	(47,33,23)

4.2 True Table Construction

The second step in the QCA methodology involved constructing the truth table. This process entailed obtaining all logically possible configurations due to the 2^k formula, where K represents the number of conditions (Ragin, 2000). This study has nine conditions, and two indicate the states of membership and non-membership. Hence, 512 configurations were obtained for each sample. To reduce the truth table, adjustment criteria of 1 and 0.8 consistency were applied (Rihoux & Ragin, 2009). Moreover, the Proportional Reduction of Inconsistency (PRI) criterion was analyzed, indicating how much a condition contributes to the outcome. High values in PRI and PRODUCT demonstrate sufficiency in the results (Medina et al., 2017). Additionally, Oana et al. (2021) suggest PRI values greater than 0.5 to explain the sufficiency of condition configurations. Table 2 illustrates the reduced truth table, comprising columns representing the respective conditions and the outcome, where a value of 1 indicates the presence of the condition and 0 denotes its absence.

The truth table analysis enables the question regarding which configurations of conditions are sufficient to generate SC in the context of developed and developing countries, revealing multiple pathways (equifinality). A condition is deemed sufficient whenever its presence implies the presence of the condition (Medina et al., 2017), even if the condition does not appear in multiple pathways (causal asymmetry).

Table 2: Reduced True Table

Developed country													
Eco	**HC**	**Intl**	**M&T**	**Env**	**Tech**	**UP**	**Gov**	**Sc**	**number**	**SC**	**raw consist.**	**PRI consist.**	**SYM consist**
1	1	1	1	1	1	1	1	1	1	1	0.975	0.922	0.922
1	1	1	1	0	1	1	1	0	1	1	0.931	0.826	0.826
1	1	1	0	0	1	1	1	0	1	1	0.919	0.682	0.682
0	1	1	1	1	0	1	1	0	1	1	0.911	0.643	0.643
0	1	1	0	0	0	0	1	1	1	1	0.886	0.360	0.390
1	1	1	0	0	1	1	0	0	1	1	0.860	0.414	0.414
1	0	1	0	0	1	1	0	0	1	1	0.811	0.198	0.198
Developing country													
Eco	**HC**	**Intl**	**M&T**	**Env**	**Tech**	**UP**	**Gov**	**Sc**	**number**	**SC**	**raw consist.**	**PRI consist.**	**SYM consist**
0	1	0	1	1	1	1	1	1	1	1	0.999	0.990	0.990
0	1	1	1	1	1	1	1	1	1	1	0.998	0.991	0.991
0	1	1	0	0	1	0	1	1	1	1	0.971	0.804	0.902
0	1	1	0	0	0	0	0	0	1	1	0.802	0	0

Note: A value of 1 indicates the presence of the condition, and 0 denotes its absence.
Source: own study.

4.3 Consistency analysis and logical minimization

Although sufficient condition configurations displaying the outcome of SC have been identified in Table 2 the third step in QCA analysis enables the removal of redundancies through consistency analysis and logical minimization. Standard analysis via the logical minimization process allows for three types of solutions: complex, parsimonious, and intermediate. Rihoux and Ragin (2009) and Schneider & Wagemann (2012) recommend using the intermediate solution as it enables the analysis of counterfactuals. This solution does not exclude configurations for which there is no empirical evidence within the analyzed cases, but includes conditions with theoretical support in their analysis.

The result of the intermediate solution in Table 3 identifies five condition configurations resulting in the generation of SC in the context of cities in developed countries and three configurations for the context of cities in developing countries. The analysis combined fit, consistency, and coverage measures to assess the findings. The study of raw coverage explains the proportion of cases described by each configuration (Ragin, 2006). For cities in developed countries, it is observed that configuration two is explained in terms of percentages by 26.5%, while configuration five is explained by 23.6% of cases. Concerning cities in developing countries, configurations with the highest percentage of explanation are configurations one and three, at 27.9% and 21.1%, respectively.

Table 3: Intermediate Solution

	Developed Country					Developing Country		
Condition /Configuration	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
Eco	●	●	⊗	⊗	●	⊗	⊗	⊗
HC		●	●	●	●	●	●	●
Intl	●	●	●	●	●		●	●
M&T	⊗		⊗	●	●	●	⊗	⊗
Env	⊗	⊗	⊗	●	●	●	⊗	⊗
Tech	●	●	⊗	⊗	●	●	⊗	●
UP	●	●	●	●	●	●	⊗	⊗
Gov	⊗	●	●	●	●	●	⊗	●
Sc	⊗	⊗	●	⊗	●	●	⊗	●
Raw coverage	0.200	0.265	0.171	0.197	0.236	0.279	0.172	0.211
Unique coverage	0.021	0.077	0.038	0.060	0.069	0.126	0.033	0.040
Consistency	0.811	0.934	0.886	0.911	0.975	0.999	0.802	0.971
Overall sol. Coverage	0.503					0.370		
Overall sol. Consistency	0.884					0.890		

Note: Black circles (●) indicate presence, while dashed circles (⊗) indicate absence. In the blanks, the causal element may be present or absent. Configurations are grouped by their main elements.
Source: own study.

On the one hand, Medina et al. (2017) state that the analysis of unique coverage explains what proportion of cases the desired outcome has, which is exclusively presented by this configuration. Concerning the consistency analysis, it calculates the degree to which a specific configuration constitutes a subset of an outcome (Ragin, 2006). All pathways for SC generation show gross consistency values higher than 0.8, along with the overall consistency result for both outcomes. This leads to the conclusion that the model's consistency is significant. Hence, it is demonstrated that 88.4% of the cases analyzed in the sample of cities from developing countries are included in at least one of the five pathways. Meanwhile, the analysis of cities from developed countries showed that at least 89% of the cases were included in one of the three pathways.

4.4 Typologies and Implications

Table 4 displays the number of pathways (configuration of conditions) leading to the outcome in SC within the context of developed and developing countries. It also indicates the cities with the highest alignment with each pathway.

Table 4: Cases Explaining Configurations

Configuration	Cities (Developed countries)
1	San Francisco, Houston
2	Los Angeles
3	Melbourne
4	Vienna
5	London
Configuration	**Cities (Developing countries)**
1	Buenos Aires, Minsk
2	Manila
3	Jakarta

Source: own study.

To better understand the pathways that cities and decision-makers should undertake in transitioning to SC, Figure 1 presents five typologies for the case of developed countries. Typologies are presented below. Based on this research analysis of five causal pathways in the intermediate solution of cities in developed countries, the following typologies have been classified:

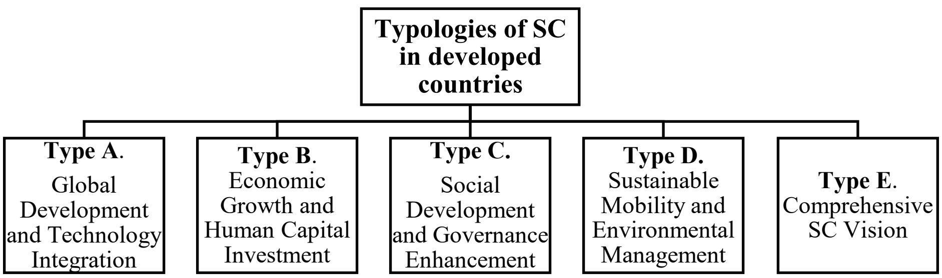

Figure 1: Typologies of SC in developing countries

Type A. Global Development and Technology Integration (i.e., involving the configuration of conditions related to economy, international projection, technology, and urban planning); Type B. Economic Growth and Human Capital Investment (i.e., with the configuration of conditions related to economy, human capital, international projection, urban planning, and governance); Type C. Social Development and Governance Enhancement (i.e., involving the configuration of conditions related to human capital, international projection, urban planning, governance, and social inclusion); Type D. Sustainable Mobility and Environmental Management (i.e., with the configuration of conditions related to human capital, international projection, mobility and transport, environment, urban planning, and governance). Type E. Comprehensive Vision of SC (i.e., comprising economy, human capital, international projection, mobility and transportation, environment, technology, urban development, governance, and social cohesion).

In Figure 2, the following typologies have been classified for cities in developing countries based on the three causal pathways present in the intermediate solution.

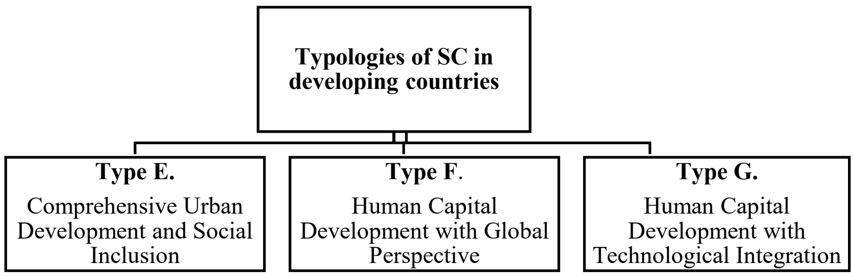

Figure 2: Typologies of SC in developing countries

Type E. Comprehensive Urban Development and Social Inclusion (i.e., encompassing conditions related to human capital, mobility and transport, environment, technology, urban planning, governance, and social inclusion); Type F. Human Capital Development with Global Perspective (i.e., with the configuration of conditions related to human capital, and international projection); and Type G. Human Capital Development with Technological Integration (i.e., involving conditions related to human capital, international projection, technology, urban development, governance, and social cohesion).

Finally, the analysis of the necessity for each condition was conducted. The criterion of 0.8 consistency, as proposed by C. Ragin (2000) and Schneider & Wagemann (2012), was utilized to establish when a condition is necessary. However, Oana et al. (2021) suggest that the consistency criterion in the analysis of necessity should be greater than or equal to 0.90. In Table 5, it was found that the conditions in Intl and UP are almost necessary for cities in developed countries. In the case of cities in developing countries, it was determined that HC, Tech, and Sc are almost necessary conditions for generating a SC. A condition is considered necessary when it is always present whenever the outcome occurs (Mello & Tanja, 2021).

Table 5: Analysis Of Necessary Conditions

Outcome: SC	Developed Countries			Developing Countries	
Conditions tested	Consistency	Coverage		Consistency	Coverage
Eco	0.661	0.648		0.715	0.760
HC	0.770	0.711		0.851	0.849
Intl	0.809	0.790		0.667	0.796
MT	0.782	0.646		0.790	0.826
Env	0.668	0.573		0.743	0.808
Tech	0.657	0.677		0.832	0.858
UP	0.835	0.658		0.689	0.795
Gov	0.763	0.772		0.799	0.763
Sc	0.661	0.558		0.810	0.724

Source: own study.

5. Conclusions

Previous research in SC has predominantly focused on studies of cities in developed countries and advancing methodologies for SC measurement. However, it has been identified that there is a need for research in cities of developing countries (Alderete, 2022; Deepti & Tooran, 2020), analyzing the conditions and pathways that have led these cities to become SC (Mora et al., 2019; Rodríguez Bolívar et al., 2023; Ruhlandt, 2018). Therefore, to bridge this gap, this research was conducted using fsQCA, a holistic approach combining quantitative and qualitative techniques to analyze the diverse combinations of conditions that create a Smart City.

Five contextual pathways or typologies were identified for cities in developed countries: 1) Global development and technology integration, 2) Economic growth and human capital investment, 3) Social development and governance enhancement, 4) Sustainable mobility and environmental management, 5) Comprehensive vision of SC, and three for creating SC in developing countries: 1) Comprehensive urban development and social inclusion, 2) Human capital development with a global perspective, 3) Human capital development with technological integration.

A focal finding from this research is the identification of the necessary conditions for generating SC. International Projection (Intl) and Urban Planning (UP) conditions were identified as almost necessary for developed countries. In contrast, for developing countries, 1) Human Capital (HC), 2) Technology (Tech), and 3) Social Cohesion (Sc) were deemed almost necessary conditions. These necessary conditions demonstrate that these factors consistently accompany the SC outcome. The primary contribution of this research is to provide new pathways and typologies for the development of SC by conducting a configurational analysis in both developed and developing country contexts. Thus, it offers a reference framework for policymakers and theorists trying to create SC within similar contexts.

5.1 Limitation, Validity, and Future Research

In general, there is a lack of access to public information, so it remains one of the significant challenges in this Smart Cities investigation, particularly in developing countries. This research encountered the limitation of access to a more substantial number of cases from cities in developing countries, which hindered an increase in the sample to find more empirical cases supporting the configurations of necessary conditions and to avoid issues related to limited diversity. While the results display fairly acceptable adjustment levels, the outcomes could vary if a different index is considered. This issue does not refer to the limitations of the QCA approach but to the lack of standardization concerning the number and type of indicators that should be measured to analyze the dimensions of SC, which are scrutinized as conditions in this study.

References

[1] Al Nuaimi, E., Al Neyadi, H., Mohamed, N., & Al-Jaroodi, J. (2015). Applications of big data to smart cities. Journal of Internet Services and Applications, 6(1), 1–15. https://doi.org/10.1186/s13174-015-0041-5

[2] Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. Journal of Urban Technology, 22(1), 3–21. https://doi.org/10.1080/10630732.2014.942092

[3] Alderete, M. (2022). CAN SMALL CITIES FROM DEVELOPING COUNTRIES BE SMART CITIES? THE CASE OF ARGENTINA. 17(4), 36–51. https://doi.org/10.2307/27181034

[4] Antwi-Afari, P., Owusu-Manu, D. G., Ng, S. T., & Asumadu, G. (2021). Modeling the smartness or smart development levels of developing countries' cities. Journal of Urban Management, 10(4), 369–381. https://doi.org/10.1016/j.jum.2021.06.005

[5] Antwi-Afari, P., Owusu-Manu, D. G., Simons, B., Debrah, C., & Ghansah, F. A. (2021). Sustainability guidelines to attaining smart sustainable cities in developing countries: A Ghanaian context. Sustainable Futures, 3. https://doi.org/10.1016/j.sftr.2021.100044

[6] Becker, J., Chasin, F., Rosemann, M., Beverungen, D., Priefer, J., Brocke, J. vom, Matzner, M., del Rio Ortega, A., Resinas, M., Santoro, F., Song, M., Park, K., & Di Ciccio, C. (2023). City 5.0: Citizen involvement in the design of future cities. Electronic Markets, 33(1). https://doi.org/10.1007/s12525-023-00621-y

[7] Bellini, P., Nesi, P., & Pantaleo, G. (2022). IoT-Enabled Smart Cities: A Review of Concepts, Frameworks and Key Technologies. In Applied Sciences (Switzerland) (Vol. 12, Issue 3). MDPI. https://doi.org/10.3390/app12031607

[8] Benoît Rihoux, C. C. (2009). Configurational comparative methods : qualitative comparative analysis (QCA) and related techniques.

[9] Berrone, P., & Ricart, E. (2022). Índice IESE Cities in Motion.

[10] Bıyık, C., Abareshi, A., Paz, A., Ruiz, R. A., Battarra, R., Rogers, C. D. F., & Lizarraga, C. (2021). Smart mobility adoption: A review of the literature. Journal of Open Innovation: Technology, Market, and Complexity, 7(2). https://doi.org/10.3390/joitmc7020146
[11] Blasi, S., Gobbo, E., & Sedita, S. R. (2022). Smart cities and citizen engagement: Evidence from Twitter data analysis on Italian municipalities. Journal of Urban Management, 11(2), 153–165. https://doi.org/10.1016/j.jum.2022.04.001
[12] Bouskela, M., Casseb, M., & Bassi, S. (2016). La ruta hacia las Smart Cities Migrando de una gestión tradicional a la ciudad inteligente.
[13] Caragliu, A., & Del Bo, C. F. (2019). Smart innovative cities: The impact of Smart City policies on urban innovation. Technological Forecasting and Social Change, 142, 373–383. https://doi.org/10.1016/j.techfore.2018.07.022
[14] Caragliu, A., del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. Journal of Urban Technology, 18(2), 65–82. https://doi.org/10.1080/10630732.2011.601117
[15] Carayannis, E. G., Dezi, L., Gregori, G., & Calo, E. (2022). Smart Environments and Techno-centric and Human-Centric Innovations for Industry and Society 5.0: A Quintuple Helix Innovation System View Towards Smart, Sustainable, and Inclusive Solutions. Journal of the Knowledge Economy, 13(2), 926–955. https://doi.org/10.1007/s13132-021-00763-4
[16] Chuan Tao, Y., Zhang, X., Hui, C., Jing Yuan, W., Daven, C., & Bertrand, D. (2015). A literature survey on smart cities. Science China Information Sciences, 58(10), 1–18. https://doi.org/10.1007/s11432-015-5397-4
[17] Costa, E. M., Oliveira, Á. D., Costa, E. M., Oliveira, Á. D., Frodeman, R., Klein, J. T., & Pacheco, R. C. S. (2017). Humane Smart Cities. The Oxford Handbook of Interdisciplinarity, 1–12. https://doi.org/10.1093/oxfordhb/9780198733522.013.19
[18] Dameri, R. P., Benevolo, C., Veglianti, E., & Li, Y. (2019). Understanding smart cities as a glocal strategy: A comparison between Italy and China. Technological Forecasting and Social Change, 142, 26–41. https://doi.org/10.1016/j.techfore.2018.07.025
[19] Deepti, P., & Tooran, A. (2020). What Makes Indian Cities Smart? A Policy Analysis of Smart Cities Mission. Telematics and Informatics, 55(Journal Pre-proofsWhat makes Indian Cities Smart?-A Policy Analysis of Smart Cities MissionDeepti Prasad, Tooran AlizadehPII:S0736-5853(20)30125-). https://doi.org/10.1016/j.tele.2020.101466
[20] Dowling, R. (2018). Smart Mobility: Disrupting transport governance? Governance of the Smart Mobility Transition.
[21] Duygan, M., Fischer, M., Pärli, R., & Ingold, K. (2022). Where do Smart Cities grow? The spatial and socio-economic configurations of smart city development. Sustainable Cities and Society, 77. https://doi.org/10.1016/j.scs.2021.103578

[22] Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. Academy of Management Journal, 54(2), 393–420. https://doi.org/10.5465/AMJ.2011.60263120
[23] Garcia-Rio, E., Palos-Sanchez, P. R., Baena-Luna, P., & Aguayo-Camacho, M. (2023). Different approaches to analyzing e-government adoption during the Covid-19 pandemic. Government Information Quarterly, 40(4). https://doi.org/10.1016/j.giq.2023.101866
[24] Giffinger, R. (2007). Smart cities Ranking of European medium-sized cities. Research Institute for Housing, Urban and Mobility Services, 16(October), 1–24. http://linkinghub.elsevier.com/retrieve/pii/S026427519800050X
[25] ITU-T SG20. (2017). Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals. Recommendation ITU-T Y.4903/L.1603, 1–50.
[26] Jiang, H., Geertman, S., & Witte, P. (2023). The contextualization of smart city technologies: An international comparison. Journal of Urban Management, 12(1), 33–43. https://doi.org/10.1016/j.jum.2022.09.001
[27] Kim, J. S., & Feng, Y. (2024). Understanding complex viewpoints in smart sustainable cities: The experience of Suzhou, China. Cities, 147, 104832. https://doi.org/10.1016/j.cities.2024.104832
[28] Kumar, K., Saini, G., Nguyen, D. M., Kumar, N., & Shah, R. (2022). Smart Cities: Concepts, Practices, and Applications. CRC Press. https://doi.org/10.1201/9781003287186
[29] Kummitha, R. K. R., & Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. Cities, 67, 43–52. https://doi.org/10.1016/j.cities.2017.04.010
[30] Lai, C. M. T., & Cole, A. (2023). Measuring progress of smart cities: Indexing the smart city indices. Urban Governance, 3(1), 45–57. https://doi.org/10.1016/j.ugj.2022.11.004
[31] Lee, S. K., Kwon, H. R., Cho, H., Kim, J., & Lee, D. (2016). International Case Studies of Smart Cities Institutions for Development Sector Fiscal and Municipal Management Division. June, 1–48.
[32] Linde, L., Sjödin, D., Parida, V., & Wincent, J. (2021). Dynamic capabilities for ecosystem orchestration A capability-based framework for smart city innovation initiatives. Technological Forecasting and Social Change, 166. https://doi.org/10.1016/j.techfore.2021.120614
[33] Mandić, A., & Kennell, J. (2021). Smart governance for heritage tourism destinations: Contextual factors and destination management organization perspectives. Tourism Management Perspectives, 39. https://doi.org/10.1016/j.tmp.2021.100862
[34] Mao, C., Wang, Z., Yue, A., Liu, H., & Peng, W. (2023). Evaluation of smart city construction efficiency based on multivariate data fusion: A perspective from China. Ecological Indicators, 154. https://doi.org/10.1016/j.ecolind.2023.110882

[35] Medina, I., Castillo, P., & Álamos, P. (2017). Análisis cualitativo comparado (QCA).
[36] Medina, Iván. (2017). Análisis Cualitativo Comparado (QCA). Centro de Investigaciones Sociológicas.
[37] Mello, P. A., & Tanja, D. (2021). Qualitative Comparative Analysis: An Introduction to Research Design and Application.
[38] Micozzi, N., & Yigitcanlar, T. (2022). Understanding Smart City Policy: Insights from the Strategy Documents of 52 Local Governments. Sustainability, 14(16), 10164. https://doi.org/10.3390/su141610164
[39] Mora, L., Deakin, M., & Reid, A. (2019). Strategic principles for smart city development: A multiple case study analysis of European best practices. Technological Forecasting and Social Change, 142, 70–97. https://doi.org/10.1016/j.techfore.2018.07.035
[40] Mukhtar-Landgren, D., & Paulsson, A. (2021). Governing smart mobility: policy instrumentation, technological utopianism, and the administrative quest for knowledge. Administrative Theory and Praxis, 43(2), 135–153. https://doi.org/10.1080/10841806.2020.1782111
[41] Mundada, M., & Mukkamala, R. R. (2020). Smart cities for sustainability-an analytical perspective. Proceedings of the World Conference on Smart Trends in Systems, Security and Sustainability, WS4 2020, 770–775. https://doi.org/10.1109/WorldS450073.2020.9210379
[42] Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. ACM International Conference Proceeding Series, 282–291. https://doi.org/10.1145/2037556.2037602
[43] Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in smart city initiatives: Some stylised facts. Cities, 38, 25–36. https://doi.org/10.1016/j.cities.2013.12.010
[44] Oana, I.-E., Schneider, C. Q., & Thomann, E. (2021). Qualitative Comparative Analysis Using R. In Qualitative Comparative Analysis Using R. Cambridge University Press. https://doi.org/10.1017/9781009006781
[45] ONU. (2019). World Urbanization Prospects. In Demographic Research (Vol. 12). https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf
[46] ONU. (2022). The World Cities Report 2022: Envisaging the Future of Cities. https://onuhabitat.org.mx/WCR/
[47] Osman, A. M. S. (2019). A novel big data analytics framework for smart cities. Future Generation Computer Systems, 91, 620–633. https://doi.org/10.1016/j.future.2018.06.046
[48] Palos-Sanchez, Robina-Ramirez, & Velicia-Martin. (2019). What Role does Corporate Governance Play in the Intention to Use Cloud Computing Technology? Symmetry, 11(10), 1253. https://doi.org/10.3390/sym11101253
[49] Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set Qualitative Comparative Analysis (fsQCA): Guidelines for research practice in Information Systems and marketing. International Journal of Information Management, 58. https://doi.org/10.1016/j.ijinfomgt.2021.102310

[50] Ragin, C. (1987). The Comparative Method Moving Beyond Qualitative and Quantitative Strategies. University of California.
[51] Ragin, C. (2000). Fuzzy-Set Social Science.
[52] Ragin, C. (2008). Redesigning Social Inquiry Fuzzy Sets and Beyond. The University of Chicago Press.
[53] Ragin, C. C. (2006). Set Relations in Social Research: Evaluating Their Consistency and Coverage. Political Analysis, 14(3), 291–310. http://www.jstor.org/stable/25791854
[54] Ragin, C., & Strand, S. I. (2008). Using qualitative comparative analysis to study causal order: Comment on caren and panofsky (2005). Sociological Methods and Research, 36(4), 431–441. https://doi.org/10.1177/0049124107313903
[55] Reyes-Menendez, A., Saura, J. R., & Palos-Sanchez, P. (2020). Cybersecurity and the Internet of Things: Anticipating the Leverage of Cyber Crimes with Interconnected Devices. In The Evolution of Business in the Cyber Age (pp. 263–291). Apple Academic Press.
[56] Rihoux, B., & Ragin, C. (2009). Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques. SAGE Publications, Inc. https://doi.org/10.4135/9781452226569
[57] Rodríguez Bolívar, M. P., Alcaide Muñoz, L., & Alcaide Muñoz, C. (2023). Identifying patterns in smart initiatives' planning in smart cities. An empirical analysis in Spanish smart cities. Technological Forecasting and Social Change, 196. https://doi.org/10.1016/j.techfore.2023.122781
[58] Ruhlandt, R. W. S. (2018). The governance of smart cities: A systematic literature review. Cities, 81, 1–23. https://doi.org/10.1016/j.cities.2018.02.014
[59] Schneider, C. Q., & Wagemann, C. (2012). Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis.
[60] Sharif, R. Al, & Pokharel, S. (2022). Smart City Dimensions and Associated Risks: Review of literature. In Sustainable Cities and Society (Vol. 77). Elsevier Ltd. https://doi.org/10.1016/j.scs.2021.103542
[61] Sharifi, A. (2020). A typology of smart city assessment tools and indicator sets. Sustainable Cities and Society, 53. https://doi.org/10.1016/j.scs.2019.101936
[62] Silva, B. N., Khan, M., & Han, K. (2018). Towards sustainable smart cities: A review of trends, architectures, components, and open challenges in smart cities. In Sustainable Cities and Society (Vol. 38, pp. 697–713). Elsevier Ltd. https://doi.org/10.1016/j.scs.2018.01.053
[63] Smiciklas, J. (2017). Collection Methodology for Key Performance Indicators for Smart Sustainable Cities United.
[64] Staletić, N., Labus, A., Bogdanović, Z., Despotović-Zrakić, M., & Radenković, B. (2020). Citizens' readiness to crowdsource smart city services: A developing country perspective. Cities, 107. https://doi.org/10.1016/j.cities.2020.102883

[65] Syed, A. S., Sierra-Sosa, D., Kumar, A., & Elmaghraby, A. (2021). Iot in smart cities: A survey of technologies, practices and challenges. Smart Cities, 4(2), 429–475. https://doi.org/10.3390/smartcities4020024
[66] Tan, S. Y., & Taeihagh, A. (2020). Smart city governance in developing countries: A systematic literature review. Sustainability (Switzerland), 12(3). https://doi.org/10.3390/su12030899
[67] Tang, Z., Jayakar, K., Feng, X., Zhang, H., & Peng, R. X. (2019). Identifying smart city archetypes from the bottom up: A content analysis of municipal plans. Telecommunications Policy, 43(10). https://doi.org/10.1016/j.telpol.2019.101834
[68] The World Bank. (2022). GNI per capita. https://data.worldbank.org/indicator/NY.GNP.PCAP.CD
[69] Trindade, E. P., Hinnig, M. P. F., da Costa, E. M., Marques, J. S., Bastos, R. C., & Yigitcanlar, T. (2017). Sustainable development of smart cities: A systematic review of the literature. Journal of Open Innovation: Technology, Market, and Complexity, 3(3). https://doi.org/10.1186/s40852-017-0063-2
[70] Ullo, S. L., & Sinha, G. R. (2020). Advances in smart environment monitoring systems using iot and sensors. In Sensors (Switzerland) (Vol. 20, Issue 11). MDPI AG. https://doi.org/10.3390/s20113113
[71] UNPD. (2023). Landlocked Developing Countries. https://www.un.org/ohrlls/content/landlocked-developing-countries
[72] Verdejo, Á., Espinilla, M., López, J. L., & Melguizo, F. J. (2022). Assessment of sustainable development objectives in Smart Labs: technology and sustainability at the service of society. Sustainable Cities and Society, 77, 103559. https://doi.org/10.1016/j.scs.2021.103559
[73] Vis, B. (2012). The Comparative Advantages of fsQCA and Regression Analysis for Moderately Large-N Analyses. Sociological Methods and Research, 40(1), 168–198. https://doi.org/10.1177/0049124112442142
[74] Yigitcanlar, T. (2016). Techology and the city (First).
[75] Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., da Costa, E. M., & Yun, J. H. J. (2018). Understanding 'smart cities': Intertwining development drivers with desired outcomes in a multidimensional framework. Cities, 81(April), 145–160. https://doi.org/10.1016/j.cities.2018.04.003
[76] Yigitcanlar, T., Kamruzzaman, M., Foth, M., Sabatini-Marques, J., da Costa, E., & Ioppolo, G. (2019). Can cities become smart without being sustainable? A systematic review of the literature. In Sustainable Cities and Society (Vol. 45, pp. 348–365). Elsevier Ltd. https://doi.org/10.1016/j.scs.2018.11.033
[77] Zaheer, A., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. Cities, 89(November 2018), 80–91. https://doi.org/10.1016/j.cities.2019.01.032
[78] Zhao, F., Fashola, O. I., Olarewaju, T. I., & Onwumere, I. (2021). Smart city research: A holistic and state-of-the-art literature review. Cities, 119. https://doi.org/10.1016/j.cities.2021.103406

Appendix 1

Table A.1 1. Selected Cities (Sample)

Ranking	City	Developed Country	Performance	GNI		Ranking	City	Developed Country	Performance	GNI
1	London	United Kingdom	H	HI		38	Melbourne	Australia	RH	HI
2	New York	United States	H	HI		39	Lyon	France	RH	HI
3	Paris	France	RH	HI		40	Canberra	Australia	RH	HI
4	Tokyo	Japan	RH	HI		41	Frankfurt	Germany	RH	HI
5	Berlin	Germany	RH	HI		42	Miami	United States	RH	HI
6	Washington	United States	RH	HI		43	Prague	Czech Republic	RH	HI
7	Singapore	Singapore	RH	HI		44	Cologne	Germany	RH	HI
8	Amsterdam	Netherlands	RH	HI		45	Montreal	Canada	RH	HI
9	Oslo	Norway	RH	HI		46	Dallas	United States	RH	HI
10	Copenhagen	Denmark	RH	HI		47	Geneva	Switzerland	RH	HI
11	Munich	Germany	RH	HI		48	Stuttgart	Germany	RH	HI
13	Chicago	United States	RH	HI		49	Eindhoven	Netherlands	RH	HI
14	Zurich	Switzerland	RH	HI		50	Ottawa	Canada	RH	HI
15	Vienna	Austria	RH	HI		51	Birmingham	United Kingdom	RH	HI
16	San Francisco	United States	RH	HI		52	Austin	United States	RH	HI
17	Hamburg	Germany	RH	HI		53	Gothenburg	Sweden	RH	HI
18	Dublin	Ireland	RH	HI		54	Denver	United States	RH	HI
19	Rotterdam	Netherlands	RH	HI		55	Vancouver	Canada	RH	HI
20	Helsinki	Finland	RH	HI		57	Milan	Italy	RH	HI
21	Toronto	Canada	RH	HI		58	San Diego	United States	RH	HI
22	Los Angeles	United States	RH	HI		59	Auckland	New Zealand	M	HI
23	Seattle	United States	RH	HI		60	Philadelphia	United States	M	HI
24	Boston	United States	RH	HI		61	Liverpool	United Kingdom	M	HI
25	Stockholm	Sweden	RH	HI		62	Warsaw	Poland	M	HI
27	Madrid	Spain	RH	HI		64	Dusseldorf	Germany	M	HI
28	Bern	Switzerland	RH	HI		65	Rome	Italy	M	HI
29	Basel	Switzerland	RH	HI		66	Glasgow	United Kingdom	M	HI
30	Houston	United States	RH	HI						
31	Barcelona	Spain	RH	HI						
32	Manchester	United Kingdom	RH	HI						
33	Reykjavik	Iceland	RH	HI						
35	Edinburgh	United Kingdom	RH	HI						
36	Sydney	Australia	RH	HI						

Continued Table A.1 2.

Ranking	City	Developing Country	Performance	GNI		Ranking	City	Developing Country	Performance	GNI
103	Buenos Aires	Argentina	M	UMI		156	La Paz	Bolivia	L	LMI
105	Kuala Lumpur	Malaysia	M	UMI		157	San Salvador	El Salvador	L	UMI
109	Shenzhen	China	M	UMI		158	Tunis	Tunisia	L	LMI
115	Mexico City	Mexico	L	UMI		159	Brasília	Brazil	L	UMI
117	Kiev	Ukraine	L	LMI		160	Santa Cruz	Bolivia	L	LMI
118	Bangkok	Thailand	L	UMI		161	Amman	Jordan	L	LMI
124	Belgrade	Serbia	L	UMI		162	Mumbai	India	L	LMI
127	Tbilisi	Georgia	L	UMI		163	Rabat	Morocco	L	LMI
128	Minsk	Belarus	L	UMI		164	Johannesburg	South Africa	L	UMI
129	Almaty	Kazakhstan	L	UMI		165	Asunción	Paraguay	L	LMI
130	São Paulo	Brazil	L	UMI		166	Bangalore	India	L	LMI
132	Bogotá	Colombia	L	UMI		167	Guayaquil	Ecuador	L	UMI
133	Rosario	Argentina	L	UMI		168	Tehran	Iran	L	LMI
134	Ho Chi Minh City	Vietnam	L	LMI		169	Salvador	Brazil	L	UMI
135	Córdoba	Argentina	L	UMI		170	Casablanca	Morocco	L	LMI
136	Rio de Janeiro	Brazil	L	UMI		171	Nairobi	Kenya	L	LMI
137	Tianjin	China	L	UMI		172	Belo Horizonte	Brazil	L	UMI
138	Medellín	Colombia	L	UMI		173	Guatemala City	Guatemala	L	UMI
139	Nursultan (Nur-Sultan)	Kazakhstan	L	UMI		174	Kolkata (Calcutta)	India	L	LMI
140	Baku	Azerbaijan	L	UMI		175	Douala	Cameroon	L	LMI
141	Cape Town	South Africa	L	UMI		176	Manila	Philippines	L	LMI
143	Lima	Peru	L	UMI		177	Cairo	Egypt	L	LMI
144	Santo Domingo	Dominican Republic	L	UMI		178	Kampala	Uganda	L	LI
146	Sarajevo	Bosnia-Herzegovina	L	LMI		179	Caracas	Venezuela	L	LMI
148	Cali	Colombia	L	UMI		180	Lahore	Pakistan	L	UMI
149	New Delhi	India	L	LMI		181	Accra	Ghana	L	LMI
152	Jakarta	Indonesia	L	UMI						

Performance: High (H), Relatively High (RH), Medium (M), Low (L), Very Low (VL)
GNP: high Income (H), Upper Middle Income (UMI), Lower Middle Income (LMI), Low Income (LI). Data source: Berrone and Ricart (2022).