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Chapter 1

Collaboration: Long-Term Partnerships for Local Development[1]

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Additional information is available at the end of the chapter

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Abstract

Collaboration, as a process of social learning, facilitates the integration of different perspectives, forms of knowledge, and approaches to encounter multifaceted issues, such as climate change, energy transition, globalization, etc. Thus, political decision-makers increasingly involve a broad variety of actors in order to improve the efficacy and legitimacy of solutions. Also, for local development, the participation of citizens in processes of decision-making or planning has widely turned into common practice, but often does not reach beyond brief "on-off" involvement of citizens into government controlled activities. As the ability of local actors to interact and collaborate in a continuing social learning process is seen as a prerequisite for sustainability and resilience, obtaining knowledge on how governments and citizens may collaborate and work together successfully in the long run is of high relevance. This chapter follows the question on how to develop flexible, but reliable, local collaboration structures. Therefore, it moves beyond Sherry Arnstein's theory of participation, and introduces Elinor Ostrom's design principles for the management of the commons as valuable reference points. It concludes that acknowledging time-consuming group processes, the joint development of common goals, structures, and collaboration rules as well as flexibility and openness towards adaptive processes are prerequisites for long-term oriented collaboration.

Keywords: collaboration, local development, participation, social learning, co-management

1. Introduction

Collaboration is often referred to as a twenty-first-century trend and concurrently as the key to sustainability and resilience building [1–4]. Indeed, we can observe a notable global trend towards the formation of alliances and partnerships in order to develop sustainable solutions

[1] The chapter presents parts of the author's PhD-thesis as submitted in May 2017.

for everyday real-world problems [4–8]. One may not only think of initiatives such as food cooperatives, urban gardening, energy collectives, or crowdfunding initiatives but also of partnerships between governments and non-state actors for the purpose of joint policy- and decision-making.

The growing need in society to think and work together derives from an increasing complexity of current challenges, such as climate change, energy transition, globalization, or other multi-faceted issues and the resulting need to integrate a broad variety of actors, knowledge bases, and perspectives. Collaboration is expected to increase the substantive quality and legitimacy of solutions and decisions to mitigate conflicts among competing interests, to value lay knowledge and expert knowledge equally well, to build trust in institutions or to educate and inform the public [9, 10]. Thus, even local decision-makers are challenged to develop new forms of collaboration with their citizens, as processes of collective learning, planning, and decision-making are widely seen as key components towards viable, liveable communities, and cities as well as for sustainable development at large [11, 12].

But one might say this is nothing new, and indeed, citizen involvement in issues of community development has already turned into common practice. However, in the last years, we can notice a trend away from more occasional forms of *citizen participation* (case-related "on-off"-participation) towards long-term oriented processes of *collaboration* (local co-management). An increasing number of communities and cities are searching for alternative approaches to integrate their citizens into reliable and future-oriented partnerships, in order to develop common future visions, development goals, and implementation strategies, and to jointly bring concepts into life.

This trend raises the following questions: How can collaboration agreements be designed—in contrast to long-experienced case-related forms of citizen participation? And which structures, processes, regulations, incentive systems, etc. are necessary to allow meaningful collaboration in the long run?

Based on a comprehensive literature review, this chapter briefly discusses limitations of "more traditional," case-related forms of citizen participation and in contrast reflects on the characteristics of collaboration and the requirements of meaningful long-term collaboration (moving beyond "on-off"-participation). It follows the question on how to develop flexible, but reliable, local collaboration structures, and therefore relates to Elinor Ostrom's design principles for the management of the commons as valuable reference points. Finally, it presents empirical insights from the city of Korneuburg (Austria), in order to illustrate one possible solution pathway for long-term collaboration among actors at the local level.

2. Of ventures and marriages: participation and collaboration in local development

In order to provide a better understanding of the issue at hand, we first take a closer look at the terminology. What does the term collaboration exactly mean? And what is the difference to what we recognize as participation? To cut a long story short, there is no single definition or

consistent use of the term collaboration, neither in our everyday language nor in the scientific discourse [13, 14]. It is derived from the Latin word *collaborare*, that is, to labor (work) together and it is often used interchangeably with cooperation. Yet, there is a considerable difference in meaning, as illustrated by the following metaphor: "*Dating is a cooperative venture, while marriage is a collaborative one*" [15]. This quote points at the different levels of commitment and involvement required for these interactive processes. Following this idea, cooperation may refer to a less closely intertwined, additive working process characterized by the division of labor and functions [16, 17], while collaboration requires participants to share the process of knowledge creation [18] and comprises the "*development of the mode of joint planning, joint implementation, and joint evaluation between individuals or organizations*" [15]. Collaboration involves different actors "*who use shared rules, norms, or organizational structures to act or make collective decisions*" [19] and who commit to a process of mutual learning [13].

In turn, the term participation stems from the Latin word *participare* (pars: part and capere: to take) and refers to the action or state of taking part in something, or to become involved into something. Citizen participation in particular allows for direct involvement of citizens in public decision-making. Participation may range not only from voting in elections but also to additional (non-mandatory) forms and tools, where again the actual depth of involvement may vary considerably (from mere information to consultation or even joint decision-making). Typically, these processes remain within the regimes of the public government and governmental actors hold a strong position, inviting citizens to assume a consulting role [20–22]. Broadly speaking, participation in this sense may rather be understood as a cooperative approach (clear division of tasks and accountability, hierarchical structures) than as a collaborative relationship.

These considerations based on etymology and simplified definitions of course only offer rather vague interpretations of the phenomena at hand. Thus, we will take a closer look on differences and meanings in the following.

2.1. Why a ladder is not an appropriate tool to break down hierarchies

As already indicated in Section 1, the participation of citizens in local decision-making has widely turned into common practice [23]. Thereby, site-specific participation cultures may differ considerably, as the respective situation, purpose, demands, and objectives of course vary from case to case. In some communities, eye-level partnerships and stable processes of co-management are already well implemented, while in others, participatory processes neither reach beyond the frequently cited fig leaf nor result in effective collaboration. This may inter alia be traced back to the fact, that processes mostly continue to be unilaterally controlled by governments and that traditional hierarchies remain [21, 22]. Citizens usually get only involved after the problems have been pre-defined by government representatives. Then they are invited to express their opinions, needs, and ideas, and finally may again be excluded once again from solution finding and decision-making at the end [21, 24]. This common practice contrasts not only with findings from theories on collaboration, group work, and social learning but also with participation literature itself, which emphasizes the importance of joint problem framing, early involvement, and partnership at eye-level (dissolving hierarchical

structures) [4, 25–27]. Furthermore, citizens themselves are usually not empowered to actively prompt and initiate their own participation [28].

The theoretical foundation of citizen participation builds on Arnstein's pioneering work from 1969. Her ladder of citizen participation [29] strongly influences the conceptualisation of participation as well as its implementation in practice to date [22, 26, 30]. With her metaphor —developed at a time, when governments slowly began to involve citizens—Arnstein pictured participation as the re-allocation of case-related decision-making power from government to citizens [22]. She illustrated "*the extent of citizens' power determining the end product*" as hierarchical rungs, ranging from levels of non-participation (manipulation and therapy) through levels of tokenism (informing, consultation, and placation) to levels of citizen power (partnership, delegated power, and citizen control) [29] (for a more comprehensive review on Arnstein's theory see for example [22, 26, 31]). Thus, the ladder as hierarchical metaphor measures the quality of citizen participation by the intensity of case-related participation—suggesting higher levels to be preferable to those on lower rungs [32–34]; but it lacks a process- and actor-oriented perspective by ignoring changing demands during the runtime of participatory processes or the complexity of social learning processes [9].

Yet, socio-political conditions and the relationship between citizens and governments are transforming [30, 35]. Arnstein's hierarchical conception of participation fails to capture the full complexity of the shift from a traditional government perspective (hierarchical and central steering, "top-down") to governance (interactive policy-making, involving society on a common ground) and towards collaborative partnerships. In fact, given our present democratic system, local authorities still play the leading role in city or community management, but this does not necessarily mean, that it has to be the predominant one [30], and that hierarchies cannot be dismantled or flattened to some extent. Arnstein's focus on the allocation of power may even support an adversarial picture of participation, as a struggle between citizens trying to move up the ladder and the government [36], and may prohibit and exclude opportunities for trustful collaboration, meaningful learning processes, sharing of experience and knowledge, harnessing multiple perspectives and for shared decision-making [27, 36]. Thus, it seems worth to shift the focus from traditional hierarchies towards arenas of social learning on eye-level [31–33, 36].

2.2. Collaboration—entering an arena of shared creation and social learning

In contrast to hierarchical organized and additive working processes, collaboration describes an inseparable and synchronized process of co-construction and self-directed interactive processes of exchange (partners do the work together) [16]. It tends to solve a problem via divergent thinking, resulting in "*collective creativity*" [37] and it requires close relationships and connections [38]. Schrage [39] defines collaboration as "*the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event. In this sense, there is nothing routine about it. Something is there that wasn't there before*." Collaboration aims "*to draw together partners with diverse relevant attributes*" [40] and thus harvests its benefits "*from differences in perspectives, knowledge and approaches, solving problems while at the same time offering benefits to all those involved in the process*" [4].

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As a practice that uses collective creativity to process issues that are novel in nature, collaboration is inextricably linked with social learning [37, 41]. Social learning may change mental models and behaviors, allows to deal with new circumstances and thus is supposed to have wide transformative potential [42, 43]. It takes place through processes of knowledge sharing and deliberation, and fosters co-creation of knowledge and means, required to transform a situation, and therefore it leads to concerted collective action [26, 44]. It starts at an individual level, being the vital base for group, organizational, and social learning; whereby in a group the "*combined intelligence in the team exceeds the sum of the intelligence of its individuals, and the team develops extraordinary capacities for collaborative action*" [43]. Social learning processes, therefore, may lead to an increase of knowledge and a growing capacity to make use of the knowledge but also to "*increasing ownership of solutions by different stakeholders, active, democratic and responsible citizenship, inclusive governance and self-governing capacities*" [41]. **Figure 1** illustrates the role of social learning for changes on individual and collective level in order to support collaborative efforts for future. It becomes obvious that collaboration is much about trial-and-error processes and learning by doing; participants learn how to collaborate by collaborating [14].

These considerations emphasize the creative and innovative potential of collaboration with respect to processing problems that cannot be solved by means of well-known procedures and (expert) knowledge as they are novel in nature and involve and affect a broad variety of actors asking for creative solutions and new knowledge to be generated. This makes collaboration promising for complex sustainability issues and participatory approaches—from joint problem definition to joint planning, implementation, and evaluation [15].

2.3. Support and obstacles for meaningful collaboration on eye-level

Within collaborative settings, actors with different mindsets, experiences, knowledge bases, etc. come together, at best to share a common vision and to reach a common goal. Thus, it is a deeply human activity and quality, success or failure is directly shaped by the humans involved. Hence, long-term collaboration is no easy endeavor and the results often do not meet the expectations, as conflicts and obstacles hinder meaningful partnerships [2]. That is why

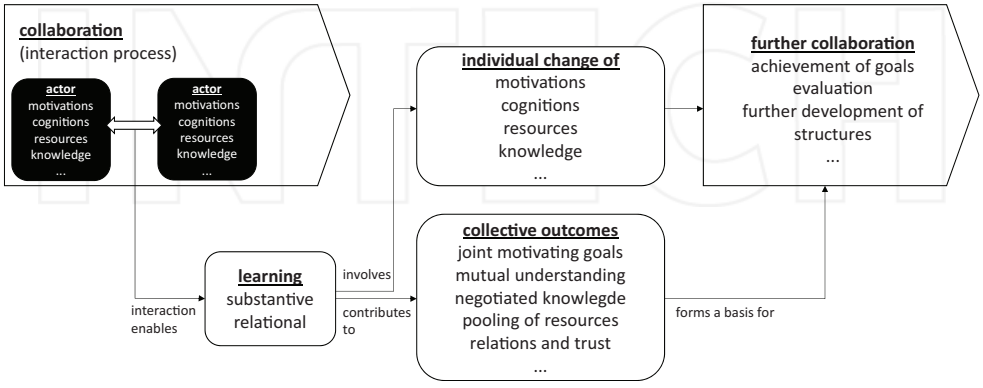

Figure 1. Relations among learning, individual, and collective outcomes in the context of collaboration (altered according to [44]).

obtaining knowledge on how people may learn and work together successfully and on how to design fruitful collaboration frameworks is of high relevance for local decision-makers [25].

In order to promote social learning and long-term collaboration, it is necessary to facilitate interactive settings, "*in which actors can share and reflect upon different perspectives, experiences, and types of knowledge*" [44]. Thus, the role of power relations and hierarchies is of particular importance [45]. Situations can be characterized as collaborative if there is a certain degree of symmetry in the interaction (symmetry of action, knowledge, and status), that is, "*peers are more or less at the same level, can perform the same actions, have a common goal and work together*" [46]. Related thereto, mutual respect, understanding, and trust, the clarity of roles within the group as well as open and frequent communication are of core relevance [47]. Furthermore, clarity of shared goals, a common vision, an appropriate cross-section of members (i.e., a representative variety of group members with regard to the community affected by activities) as well as the flexibility of the group to organize itself (and if necessary to vary its ways of organization) can be referred to as being crucial. Even previous history of collaboration, sufficient funds, and shared risks the support successful collaboration [47].

Of course, collaboration also faces many inherent difficulties which are directly related to personal and organizational capacities of the humans involved. On one hand, collaboration causes costs, more specifically coordination costs, which refer to the "*operational dependence between the activities of the different actors*" [4]; and on the other hand, information flow, bargaining (how to split gains and to deal with intangible gains and values) or free riding are challenging efforts. Furthermore, incompatible or conflicting needs and interests as well as latent conflicts may impede successful collaboration. A lack of trust between the actors involved, "*difficulties in relinquishing control, the complexity of a joint project, and differential ability to learn new skills*" can also be referred to as barriers to meaningful collaboration [48].

3. How to design reliable and long-lasting partnerships for local development?

Referring to the success factors and stumbling blocks of collaboration as briefly described in Section 2.3, conceptual thinking about participation according to Arnstein's ladder hardly offers reference points for designing long-term partnerships for local development [26]. Accentuating traditional hierarchical structures and a focus on power allocation lacks a processual dimension where sufficient priority for underlying social learning processes, joint problem framing, or for time consuming trust building is missing. Moreover, it neglects citizens as active agents and hardly fulfills the preconditions for meaningful collaboration or inclusive involvement of all actors [9]. "On-off" public participation thus cannot be considered as urban co-management, which requires "some institutionalized arrangement for intensive user participation in decision-making" [49]. Thus, it seems necessary to learn from other fields of research, to gain insights into supportive structures for collaboration in local development.

For this purpose, Ostrom's design principles for the sustainable management of the commons [50, 51] have proofed as valuable suggestions for the design of effective long-term

collaboration [22]. In order to find out how and why self-organized and collective management of shared natural resources (such as forests, pastures, or waterbodies) turns out to be successful in the long run, Ostrom carried out a profound analysis of a large number of case studies. Based on her findings, she identified eight design principles, which support robust, long-surviving institutions for collective resource management [51]. They explain, "*under what conditions trust and reciprocity can be built and maintained to sustain collective action*" [52]. These design principles are listed below [22, 51, 52], and possible concluding questions for collaboration agreements for local development are added in italics:

1. Well defined boundaries: social (community of users) und physical (spatial extension of the resource system) boundaries; *"Who is in and who is out? What is (not) part of the system (task) at hand?"*
2. Proportional equivalence between benefits and costs: congruence between costs incurred by users and benefits received by users via their participation in collective action; *"Are earnings worth efforts of collaboration? Is there a fair and balanced relation/distribution among actors?"*
3. Collective choice arrangement: individuals affected by operational rules can participate in defining and modifying the rules; *"Can participants really govern themselves? Are they empowered to define and alter their own collaboration rules?"*
4. Monitoring: compliance with regulations to facilitate rule enforcement and to understand the behavior of those who comply with the rules; *"How can the behaviour of group members, changing conditions of the system, effectiveness of rules etc. be monitored?"*
5. Graduated sanctions: for deterring participants from (excessive) violations of community rules; *"Are sanctions for non-compliant behaviour transparent and actually executed?"*
6. Conflict-resolution mechanisms: low-cost conflict resolution to resolve conflicts *"Is the collective able to solve developing conflicts? Are there fair conflict resolution mechanisms the group can draw on? "*
7. Minimal recognition of rights: the right of local users to make their own rules should be acknowledged by governments (or higher level authorities); *"Do governmental authorities acknowledge self-organization and rule setting power of the collective?"*
8. Nested organizations: governance activities are organized in multiple nested layers (more relevant for larger systems); *"Is there effective interlinking to the local government as the next higher level as well as to relevant higher levels (e.g., in terms of policies facilitating local development, funding agencies etc.)?"*

The relevance of establishing common sense rules and procedures (which is subject of several design principles from different perspectives), to make collaborative efforts successful in the long run, was already identified as a core success factor in Section 2.3 and is also highlighted by Imperial [14]: "*One way to make productive collaborative relationships endure is by institutionalizing them in a higher order set of rules or by creating new organizational structures.*" Collaborative efforts often have an evolutionary and emergent character, and starting point for their

institutionalization is repeated and frequent interaction which facilitates a common understanding, mutual learning and trust building and therefore allows for added benefits in contrast to "on-off"-participation, where actors usually are not included into more profound learning processes: *"[...]When individuals or organizations interact frequently in a specific decision situation, the level of common understanding will be higher than when individuals participate sporadically on different issues. Thus, collaborative organizations ensure that interactions are repeated over long periods of time, which in turn promotes the development of strong social networks, cooperation, and, most important, trust*" [14 referring to 53].

As also indicated by Ostrom, the attitude and openness of local authorities towards collaborative approaches, and the acknowledgement of rules and decisions made by the collective, play a central role in the success or failure of joint efforts. Local authorities can be seen as the *"key entity in creating an atmosphere of collaborative action"* in a community or city [30]. Half-hearted cooperation, insufficient transparency of decision paths or the omission of collective needs, rules or resolutions will inevitably lead to loss of trust or even distrust, discourage participants, and can sustainably damage the will to collaborate among all actors. Thus, cities and communities heading for close collaboration with their citizens should carefully weigh up in advance, if and to what extent they are willing to share responsibility and to enter an open-minded process of co-management. In some cases, the principle of "less is more" might be the better approach in order not to risk unfulfilled expectations and broken promises at the end.

Also, the question of how to dissolve or at least flatten traditional hierarchies may challenge local collaborative efforts. It might be feasible to facilitate an eye-level approach, almost free of hierarchies, within processes of negotiation and discussion; nevertheless formal decisions finally are made within the democratically legitimized political system. While this is the most legitimated, adequate, and proven procedure for the majority of tasks that are necessary to manage urban life, it contrasts with principles of learning processes on eye-level and co-developing solutions and may threaten trustful collaboration.

Besides the benefits associated with the institutionalization of collaborative efforts [14], the resultant stability also bears risks in terms of inflexibility or even gridlock, as *"organizational processes that promote stability also make it difficult to adapt and respond to changing environmental conditions"* [14]. This also refers to the question of membership (balancing between experienced members and new participants), in order not to end up as a freezing "exclusive circle."

4. Practical implementation of collaboration for local development: the City of Korneuburg

The Austrian city of Korneuburg, with approximately 12,800 inhabitants, is one recent example for the institutionalization of collaborative structures for local development. In a multi-annual process, the city established a long-term oriented "urban advisory board" comprising governmental actors (from politics and administration) as well as citizens. The case affirms the emergent character of collaborative processes, as it evolved from what we could call a "traditional" and clearly delineated citizen participation project towards a written and implemented

long-term collaboration agreement among local government and citizens. The whole process was supported by an interdisciplinary team of scientists (from landscape planning, regional development, geography, architecture, spatial planning, also including the author of this chapter) and professional facilitators. For managing the process, a steering group was established comprising up to 42 local political and administrative actors as well as citizens. Additionally, all citizens of Korneuburg were invited to participate at several process steps. Finally, the city's endeavor was awarded with the Austrian Sustainability Award 2016 (ÖGUT Umweltpreis) in the category of participation and civic engagement and was honored as URBACT good practice city in 2017.[2]

It all began in 2011, when engaged citizens of Korneuburg convinced the local government to start a participatory process in order to formulate a common vision for the cities' future development. From the very beginning all actors involved were aware that the mere elaboration of a common vision for the city's future development will not be enough to undergo a meaningful urban transformation process and that specific implementation steps were needed to be defined. The mission statement, which was finalized in 2014 and unanimously adopted by the municipal council, comprises values and goals for urban development and specific development targets for nine core fields of action, that is, urban planning, mobility, social issues and health, environment and energy, communication and participation, diversity and culture, habitats and leisure, economy, as well as education and learning. Moreover, it set a clear focus on social cohesion and active citizenship as a guiding principle for the city's future.

In order to bring the visions of the mission statement to life, a master plan with almost 120 implementation measures for all 9 core fields of action was completed in 2016. One key element of the master plan is a charter for citizen participation, which entails rules, structures, and processes for long-term collaboration between citizens and the local government. Here, the urban government commits itself to a regulatory framework for long-term urban co-management with the citizens. As conditions (political, environmental, social, etc.) may change over time, the design of flexible and adaptive instruments for urban planning (a dynamic master plan document) seemed at least as important as learning structures and institutions, which allow for ongoing adaptation to changing frameworks. Thus, the charter of citizen participation aims at securing the commitment and structures for long-term collaboration, and also comprises mechanisms for monitoring and adoption. This is of specific importance as the process revealed that the trust in collaborative efforts, which is significantly shaping the success, depends on the actual persons involved, their individual characteristics, credibility, and engagement. Of course the rules set in the charter document cannot prevent changes in the collaborative attitude (e.g., as result of changing power structures after elections), but at least they may create a stronger commitment for urban co-management.

Centerpiece of the charter is the establishment of a steering committee (local advisory board) with a working period of 5 years (analogous to municipal elections) where citizens and municipal actors are equally represented (7 citizens among 14 members plus 2 substitute members each). It supervises the implementation of the measures according to the mission

[2] URBACT is a European exchange and learning program promoting sustainable urban development (http://urbact.eu/).

statement and the master plan, as well as quality and effectiveness of the long-term collaboration between citizens and the government itself. The commitment of the local council to an ongoing collaboration with this committee paves the way for future urban co-management.

Acknowledging frontiers, costs, and efforts for long-term oriented collaboration, the charter for citizen participation comprises both, structures and procedures for case-related citizen participation as well as the strategic collaboration within the committee (as shown in **Figure 2**). While participation in the committee requires membership for a certain period and asks for a high level of time commitment, willingness to collaborate, and certain openness to learning processes and innovation, low-threshold offers for citizen participation are also provided. Thus, engaged citizens can choose whether to get active for urban development in the long run or just to participate case-related on project level.

The process in the City of Korneuburg showed that what had started more or less as "traditional" citizen participation project has developed its own dynamics and thus has come up against boarders of conventional participation projects. During the design of long-term co-management structures, especially the institutionalization of the advisory board, questions arose on the legitimacy and transparency of the committee (Who is in and out—membership criteria?) as well as on efforts and earnings (How can time resources be managed in a responsible way? Most of work by citizens is done voluntarily and unsalaried while representatives from the city administration or council members often complete tasks during their working time.). But even questions of how to formulate effective and useful collaboration rules challenged the process.

In the constitutional rules that define the citizen members of the steering committee, to date there is no consensus on a valid and viable procedure guaranteeing representativeness and increased legitimacy. Even coordination costs for all actors involved are quite high, which

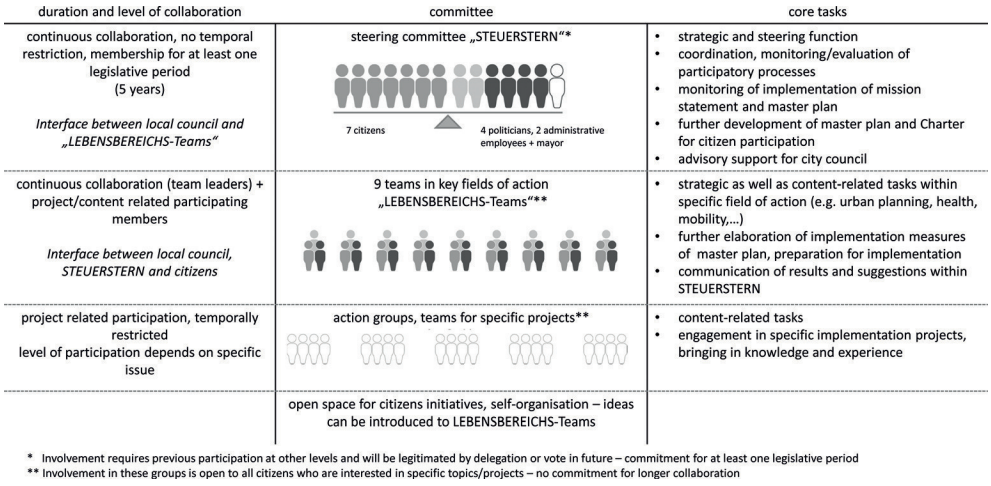

Figure 2. Levels of collaboration and participation as defined within the charter for citizen participation [22].

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bears a risk of returning to former strategies of acting separately and relying only on representative democracy. As accepting the efforts require a high degree of motivation and conviction of the usefulness of the undertaking, it is much too early to draw final conclusions about the long-term perspective of the process in the City of Korneuburg. For deeper insights into the process, results, and challenges see [22, 54].

5. Conclusions

Against the background of sustainability and resilience, the ability of local actors to interact and collaborate as well as to continuously adapt and transform their collaborative structures is deemed to be of central importance. Nevertheless, collaboration among a broad variety of actors is no easy endeavor and asks for quite different conceptualisations, criteria, and instruments/procedures than well experienced forms of case-related citizen participation. Effective long-term collaboration requires for acknowledging time-consuming group processes, the joint development of common goals, structures and collaboration rules as well as flexibility and openness towards adaptive processes (which often challenges our given democratic system or "streamlined" process designs).

Ostrom's design principles for the management of the commons offer some useful reference points to overcome restrictions of case-related citizen participation. Especially, the design principles 1, 3, 4, 6, and 7 (social boundaries, collective-choice arrangements, monitoring, conflict resolution, and minimum recognition of rights) were confirmed as highly relevant by the case study of the city of Korneuburg, despite the lack of attention they gained in traditional participation literature [22]. However, the design principles focus first and foremost on self-organized communities of resource users, and consider governments and formal regulations as external, contextual factors. Thus, they only provide restricted insights on how to bridge the perceived gap between government and citizens and on how to design arenas with "both groups" collaborating on eye-level.

Currently, an increasing number of cities and communities are heading to institutionalize citizen participation and local co-management. Of course, not all attempts will directly lead to meaningful collaboration and even well-meant collaboration agreements may lack shared responsibility, reliability, or transparency. To date, best practice experiences and findings often remain unshared and without reflection in broader communities or networks. If we are to learn from individual cases as well as from already more generalized insights, the exchange and collaboration on an intermediary level (including research and practice) is of core importance. Networking among communities and actors from science and society, and pioneering examples can provide useful insights and may prevent every community from reinventing the wheel when designing collaborative structures. Against the background of local co-management, a systematic scientific analysis of different collaborative approaches developing within site-specific circumstances would be promising in order to differentiate context-specific aspects such as agency and local communication culture from generalizable institutional patterns.

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Chapter 2

Evolution of Marketing in Smart Cities through the Collaboration Design

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Additional information is available at the end of the chapter

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Abstract

Our time sees more and more cities striving to grow into smart cities, which makes this market to grow with a considerable pace. However, there are many challenges of these processes such as municipal budgets, disposability of skilled staff, privacy and cyber security concerns, etc. Besides, by the technology-driven smart city development, an essential thing has been lost on the way—the human dimension. While the world has started to recognize this deficiency, the hunt for the right methodology to do better has begun, and so an open run to understand the relations among humans, technology, and society in order to manage their effect on business and economy. This development will eventually enter the perspective of the electoral body of democratic societies, thus influencing public policy. It will provide the room to a new equilibrium within the triad: people, businesses, and public policy. Being close to the population and their everyday needs (smart), cities will no doubt act as a push factor to these developments. Propelled with technology change and new values, the private-public-people partnerships (PPPP) will earn the pace. The communicators, bringing new relationship to life, are in this way challenged by metadesign: designing for the "new" designer(s)—the empowered end user. Therefore, for the communicators, the next challenge for marketing in smart cities is the creation of tools and methodologies for the new forms of the collaboration design. After presenting the unique factors that are driving the growth of smart cities in different parts of the world, authors identify important challenges that still need to be overcome in different markets. Special focus will be given on the discussion of contemporary challenges of public policy seen through smart cities development, which by requiring new marketing design is exercising pressure on public policy. Smart cities marketing design will be discussed from the perspective of the need to hear human needs, and at the same time to support the functionality of the 4Ps. Its concrete role will be in bringing understanding of the need for collaboration, which can reduce costs of public policy, thus enlarging benefits of collective action in smart cities.

Keywords: smart cities, marketing of smart cities, collaboration design, PPPP, economic policy

1. Introduction

Unfortunately, smart city has become one of the very popular buzz words [1, 2]. Even more, what might be meant by a "smart city" has become a kind of inspiration for imagination of the communication experts in many tech corporations as well as public institutions striving to warrant trust around projects sometimes small, but often very big. We say unfortunately, because we know that buzz words quickly loose in popularity and disappear, while the interest to improve the efficiency of community/urban services and guarantee a sustainable well-being needs to remain.

There really is chaos around the naming and definition of this important field evolving already for decades. Its vivid evolution, additionally to a complex mix of technologies, has been shaped also by social and economic factors, governance arrangements, and policy and business drivers, has brought many expressions with overlapping concepts in use today: "Intelligent City," "Knowledge City," "Sustainable City," "Talented City," "Digital City," "Eco-City," etc. [3].

On one side, "Smart cities are anticipated to create huge business opportunities with a market value of $1.565 trillion by 2020 on global level" [4]. On the other side, we are facing the reality in which a vast amount of new technologies and "smart projects" never start "to get life," or better said, entire "smart districts" are built in which nobody really wants to live. By the technology-driven smart city development, an essential thing has been lost on the way—the human dimension.

We recognize, at this stage of development, the important role of communication experts is to steer the development in the right direction by simplifying concepts in order to make them understandable for everyone—from mayor to the citizen—in order to create an ecosystem in which future cities can flourish.

The second part of the chapter will try to clear the reasons why PPP—meaning public-private partnership should be extended to PPPP—public-private-people partnership. The third part will discuss the challenges which economic policy meets due to course of development of the idea of smart city (marketing). In the fourth part of the chapter, we will represent state of the art of the evolution of marketing in smart cities. Fifth part of the chapter brings conclusions.

2. Understanding the development toward 4Ps

As an example of an approach by introducing communication experts, we use the definition used in the vocabulary of the survey Smart Municipalities 1.0 just running among all municipalities in Slovenia by PROPI[1]. For better understanding here, main concepts are simply explained: *Smart municipality optimally uses all available sources to create solutions for problems and fulfill citizen needs with the aim to guarantee the quality of life in the municipality ecosystem in a way that permits every member to contribute at her highest level of utility* [5].

[1] PROPI is a project office co-founded by Association of Municipalities and Towns of Slovenia and intiators of FLAPAX – European Smart Community Accelerator which server as the connector and enabler of the smart city development among Slovene municipalities.

Figure 1. From smart place to smart community. Source: [3].

This new way of communication around smart development is fruit of understanding of the development by stepping aside and avoids the discussion about the right smart expression of the field. We rather try to understand the essentials of the evolution toward smart community and possible further development. We tried to demonstrate this point of view with the help of **Figure 1**.

To better serve research and study of the communication streams and challenges in the development instead of the term "smart city" in the figure is used the term "smart place" to emphasize the big shift between the technology-centered view, focused on the development and optimization of the space as such, and the upgrade to smart community. If we walk through main milestones, we see Smart place 1.0 focused on how ICT can improve functionality of a place, the 2.0 upgrade still place and technology driven although already addressing issues of good city governance, starting building public-private partnerships for urban management and putting emphasis also on sustainability and inclusivity. The big change is where we are standing now, with the urge for a shift in mindset—shift from technology to human-centered approach in which technological solutions follow and serve human needs. We are starting to talk about smart community, which stands for new partnerships and with it the raising of the concept of PPPPs, public-private-people partnerships, which fully embraces the idea of citizen-centered approaches.

As it will be later presented, the so-called 4Ps open many new challenges for marketing development as well as for economic policy in smart cities, and with them rises the urge for collaboration design. But this is not only a marketing domain. Marketing is only part of a system in which everything and everyone is connected as knots of a net; we need to understand city or municipality as an ecosystem. In order to do so, the development and effects in economic policy will first be analyzed.

3. Challenges for economic policy

Here, we discuss the challenge that is being put in front of economic policy due to the processes of emerging of smart cities. We will look for most typical factors that will influence

the economic policy practice. The perspective and theoretical ground used here will refer to economic policy being faced with changes in technology and with changes of electoral body reasoning. Here, we are not going deep in the study of literature on crisis of democracy as we just want to list the facts presented in literature that prove the environment democracy is faced with when entering its specific forms when collaboration in smart cities is concerned.

Moving closer to the population as is the case in (smart) cities, no doubt represents a new challenge to traditional state and its economic policies. Already, we have quite a pressure on representative democracy, which sometimes is slowing carrying out of economic policy decisions met by the national economic policy. The traditional solution here has been delegation of economic policy functions from the national to regional level. When talking about the changes in structures in the course of smart cities development, the population interested for action is defined by the city rather than by region and has specific requirements if compared to the regional level. Therefore, to design the collaboration and supply it with competencies and responsibility will, apart from reorganizing arts of inclusion in cities, require also delegation of functions, which up to now were reserved for the national level. Typically, it has been the case with environmental issues. However, in our case, one would expect higher interest also in areas such as education, health care, transportation, and so on. Besides, there is also a qualitative dimension of this restructuring: in the same nation, different cities may have different perspectives, comparative advantages, and will therefore want to participate with the use of different instruments of economic policy—related to the fields stressed above. Furthermore, we must understand that due to different emphasis of different cities also other elements will vary—such as inclusion of population, art of collaboration, marketing, environmental requirements, logistics and transport, international connections, security issues, and so on. Therefore, it must be clear that with so many criteria to follow, "no practical design can realistically hope to fulfill the rigorous demands of any particular model" [6].

Abstention of population from political life derives from their disaffection with (representative) democracy and became one of central concerns in the EU [7] Citing literature [8] recognize these as factors that harm representative democracy: disaffection with politics, lack of political literacy, dissatisfaction and mistrust toward government and politicians, the decline of membership of political parties, increasing power of actors without electoral accountability, failure and ineffectiveness of representation of common or special interests, and complex governance arrangements evading transparency and accountability.

The fact that modern representative democracy is in crisis should be offset in falling of *voters' turnout*, deteriorating numbers of *party membership*, lowering of *trust in politicians*, and general loss of *interest in politics* [9], and is pointing to the fact that these downturns of democracy are more felt in times when there little seems to be at stake.

In their well-oriented systemization of literature [8] are with the help of citing the literature pointing to the facts that have influenced theory and practice of democracy in recent years. They are the shift from government to governance, depolitization of former policy issues bringing in the influence of experts and managers without electoral accountability, malpractice of democrats, neoliberal minimalist view on public sphere and democracy, transformation from ideology-driven to issue-specific politics, concentration of media on sellable stories, and emerging democratic innovation.

From the facts presented above, it seems that political parties no more are an adequate instrument to attract and to steer people's interests. We believe that here information technology and social media bear quite a responsibility for such trends. In the field of IT, we have witnessed the developments from huge computers in cellars of companies with limited number of monitors being placed in offices. The dependence of users from the main computer has been reduced ultimately after personal computers overruled the scene. Now, a cell (smart) phone has enough capacities, memory, and programs, so it can actually act as a computer. People now are free to gather information and to link at any time. They, of course, use this technology also to shape their networks according to their individual criteria and interests. What is the hampering function of political parties is that they actually find hard to assemble these networks into a certain form of clusters. Besides, once there, they can in no time change their orientation and (interest) environment, when actions of a party or of a group of politicians are no more in position to address the problems they see or treat as relevant.

Therefore, the first issue is how to establish an environment for collaboration between all stakeholders. Here, it is no doubt that despite complexity and stochastic environment it is a public authority that is needed for promotion and organization of participation [6]. The authority success to attract collaboration will further enhance democracy [10] as it "will only thrive if people engage with it" [11].

After accepting and mastering of such approach, economic policy will only come over its first task. The next one will be joining forces and gain support for the planned action by gathering the interests of informed and benevolent population—collaborates. Here, one should expect widening of up to now often experienced public-private partnership into public-private-people partnership, which we discuss below. From the point of economic policy here, we have direct inclusion of so-called derived agents of economic policy[2]—interested population. This task will, however, be far from simple. Recently, there have been number of studies [12] proving that private sector practice is intensively eroding democratic principles.

From the side of economic policy and collective action, the situation when they are determined for action sometimes resembles of chaos. It is not unusual for a public attitude that in such situations the discussion on a benevolent dictator steps in. As much as it may seem strange to Western way of thinking, we do not have to look much around and in the past to find an example, where electoral body has prized a politician who openly promoted him/herself as intolerant to institutions of democratic order. We should not ignore recent developments in the field where "the world is facing a democratic crisis through unprecedented restrictions on the freedoms of expression, association, and peaceful assembly" [12]. Here, we will, however, presuppose that in a smart city, the democratic culture will prevail and that economic policy

[2] Typically, original agents of economic policy have been government as a body with competencies acquired at general elections and central banks, international organizations plus regulatory bodies without electoral accountability. So-called derived agents of economic policy, who also do not possess electoral accountability, also influence economic policy measures. Here we include formally organized interest groups such as trade unions, chambers of commerce and other interest groups such as individual (big) companies and projects (e.g. a project to build an underground transport network in a city) pensionists, students and interested population.

will be looking for a path where it will try to form a consensus first by unveiling its plans and stepping forward with transparent action.

4. Evolution of marketing in smart cities

As we have learnt, the world has started to recognize that the smart city development has lost the human dimension on the way. The hunt for the right methodology to do better has begun and so also an open run to understand the relations among humans, technology, and society in order to manage their effect on business and economy[3].

In this process, the communicators can and should play a very important role and help steering the development into the direction of inclusion of population. Therefore, we now bring the focus back to communication and marketing. We want to analyze the challenges arising with the urge to develop new ways of collaboration within city or municipality ecosystem and possible sources of inspiration for development of right approaches.

4.1. Redefining the roles

The communicators in smart cities are forced to bring new relationship into life and redefine the roles of members of the city ecosystem. Experiences show that traditional approaches need to be upgraded. But, where to start? The imperative is to start from the scratch: put humans in the center and rethink the current methods and perceptions.

If really starting from scratch, the first thing to recognize is the end of the era of "A sells a product or service to B"—the one-direction relationship between a seller (in our case a city) and a buyer (citizen) in which B has very limited or almost no possibility to influence the development of the product or service. In most cases, he is only forced to use it. New media and technologies are perfect tools to bring dynamics into this relationship(s). And, we can see how fast these dynamics find place in the business environment.

In product business, new ways of manufacturing and distribution are emerging that can effectively scale mass manufacturing down to small series of products marketed over the internet, or even unique products manufactured at home. The industrial designers need to rethink their role with modern methods of fabrication and distribution in which end users participate as designers. Designers become, therefore, the role to design the tools and techniques to support end users, as the designers and makers of the products they need, want, and desire [13].

Maybe an analogy with the industrial designers can help communicators in smart cities understand their new role. The challenge for the industrial designer will be in metadesign:

[3] Cyberneticists have already started this mission at the early beginnings of the development of computers in 1950s. They envisioned an evolutionary co-learning by exploring and redesigning our own organism to organism/multipleorganism relations/machines as groups and communities led by pioneer enterprises like Biological Computer Lab and the institute Matriztica [14].

designing for the "new" designer(s)—the empowered end user. And so is for the communicators: the next challenge for marketing in smart city is about the creation of tools and methodologies for the new forms of the collaboration design for the empowered citizens.

To use this analogy efficiently, we need to analyze the changes in the city ecosystem facing the digital transition. First, everything changes at a much faster pace. Second, cities need to create more products and services to sustain our society as ever before, hopefully in a way that bring more meaning to us and not vice versa. Third, not only more, also faster and better should the novelties be. Last, but not least, they should be sustainable—survive in a future different from today.

Cities limited their role so far rather to those who institute policy and procedures, develop urban planning, and create services. But this needs to change. Analysis and simple extrapolation governed by political processes will have to give way to imagination and more original creation [15]. What preconditions are needed to create space for new relationships and collaboration? How to hack the so called 1% rule which states that in online communities only 1% of the users actively create new content, while the other 99% of the participants only lurk, observe [16]? Unfortunately, the soft skills that are necessary to build sustainable communities are often overlooked in smart city and technology programs [17].

4.2. Culture of collaboration

In the era of optimization, there is a basic concept that many miss; if we want to increase the efficiency, we need to understand the inefficiency. We can take inspiration from the energy business, where first companies are already boosting the efficiency through this kind of approach [14, 18]. It is only a question of focus, which helps understand and therefore easily make improvements.

Let us simply use it for our purposes. If we step away from the focus on how to increase the development of smart city field and try to find the inefficiency in its development, we learn that the problem is not in technology or in lack of funding, although these are generally most addressed issues; the main bottleneck is lack of collaboration. International studies show that conflict costs managers 20–30% of their time [19]. One can simply make the math and understand gravity of this aspect.

Not only neglected, if addressed, often this issue remains tagged with the shallow conclusions. Lack of collaboration is due to lack of interest; this is indeed the fastest conclusion, but the real work to be done is to dig for true reasons behind lack of interest [20]. Here we find trust, different level of knowledge and expertise level, insufficient information about the personal impact through involvement, etc.

Cities or municipalities have a double task, they need to find way and space to grow culture of collaboration inwards (within own employees and structures) and outwards (with citizens and other stakeholders). Trying to take advantage by use of existing methodologies, such as DESI —The Digital Economy and Society Index—a composite index that summarizes relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness, rather ends with frustration. Also, with other similar indexes, we very

quickly turn back to technology-driven perspective in which skills such as using a mailbox, editing tools, installing new devices, etc. are addressed [21].

The other way is the re-discovery of soft skills. Talking about them, it is worth remembering that we lived in tribes for millennia, long before we learned how to speak. Emotional connection is our default. We only added words and symbolic logic much later [22]. The force of logic therefore cannot be the driver by the collaboration design. The real issues are recognition and ability to define own needs, trust, status, culture, peer pressure, intergenerational dynamics, and many other things which marketers will need to manage in order to foster the collaboration.

The question that arises quickly in discussion about citizen involvement is whether more is really better. Decision-making at a government level is about large-scale, long-term projects bound to regulatory, financial, and political constraints. Again a hint from industrial design sector: for social innovation, where designers operate in a social context, professional designers estimate that about 5% of their colleagues possess the necessary skills to deal with new and different complexities [15]. In other words, 95% of colleagues are estimated not to have the necessary skills. Involving larger public to co-creation of solutions would mean the involvement of untrained and unskilled participants. Here enter the communicators, who need to distinguish between different scopes and create processes, which empower participants in a way that compensates for their lack of experience.

For more reasons, we can learn from the good praxis of citizen involvement through the NASA Space Apps Challenge, coined as the world biggest mass-collaboration and an unprecedented international cooperation among governmental, academic, and business world. Space Apps is the NASA incubator innovation program focused on inspiring creative souls regardless of their background or skill level to engage with open data and address real-world problems, on Earth and in space. The challenge occurs annually over 48-h in 2017 in 180+ cities with 25,000+ participants from all over the world. NASA publishes real challenges in more categories and participants contribute to solve them [23].

There are many initiatives organizing the so-called hackathons around the world. The reason for Space Apps to be the largest and to grow so fast might also be in its topic. Space is something that unites and not divides. Talking about space bring persons forget about their local "divisions." Additionally, space field has a long history of interdisciplinary collaboration.

It would be too fast to conclude that we have found the perfect formula and cities just need to copy it in order to involve citizens. After 6 years of the "classic hackathon" format in which participants get a table, some of them sit and work there also over night, eating pizza and drinking energy drinks, first findings come that this is actually not the best way to foster innovation. This year, a team at the Vienna location, not by chance lead by a cyberneticist, was analyzing the last findings in neuroscience and study ways in which through movement and contact with nature humans could innovate better. Especially if aspiring to create cross-generational collaboration, including younger and older citizens. Quoting the team lead Dr Pawlik "We need to understand life and organisms better. This will help us, human organisms, to evolve and redesign our communities on Earth and design new communities in space, on other planets, in a community-building way that permits every member to contribute at her best." [23].

4.3. Creating space(s)

We have been addressing many aspects and opened many questions. For communicators to act concrete tools should be developed to help them design the collaborations. As stated before, cities need to act outwards and inwards. When addressing citizens the hardest lost is, if in any way an initiative has awoken interest, to lose that. Therefore, before starting anything, it is smart to think also of how will the awoken collaboration stay alive. In which direction to move and in which better not to move?

As stated before, cities need to create sustainable services and solutions that should survive in a future different from today. We can only aspire to find the right way, if we know where the development is going. Here, a glimpse to the possible future: *Imagine a world of people and machines. A world … where everyone and everything is connected all the time as knots of a net; where traditional barriers, such as time, distance, and cost are eliminated or drastically reduced; where culture is not a matter of geography, but of personal interest; where mobility without movement exists; where people and machines communicate in different ways on three communication levels; person-to-person, person-to-machine, and machine-to-machine. Imagine a world where people and machines work, study, entertain…and live together. Welcome to the world of Netlife."* [24].

Let us not fall in the usual trap and limit all our attention to our concerns around the new role of technology gained through artificial intelligence and forget all the rest. Communicators can only exercise their mission if focused on collaboration and the challenge to bring the 1% active user society toward "Netlife." Yes, machines will play an important part, but hopefully only in the role of fulfilling human needs.

Where to focus now? What should be considered by communicators, while creating space(s) for collaboration? According to the facts stressed above and our suggestions, we believe that a holistic approach to action could be presented in a form such as The Collaboration Sensometer presented in **Figure 2**. It illustrates the situation and helps identifying the main factors.

It complements the innumerable sensors of the current smart city projects with a new task—to help sense the citizen collaboration. As long as citizens are merely faced with the launch of new services with the only possibility of choice to use/buy them or not, it has little or no sense to organize hackathons just for sake of doing it. A hackathon is a momentarily very popular collaboration format, which is only gaining its meaning, if a city or municipality wants to involve citizens in the co-creation of the new solution from the very beginning. A hackathon is not the right format, if only comments for a chosen concept are desired. There are many formats at hand (in the figure for the illustration just some of them) and the virtue is to find the right mix of them. By misusing the formats, authorities often do more harm than good. At best, different formats for different projects fostering the collaboration in different stages of the process.

Transforming users into active participants is the right way to go and strive toward supporting as many as possible to become proactive initiators. Not to forget here is that once the collaboration has built tighter relations and citizens have been experiencing co-creation, it is important never to make the steps back and at once give them by a new project only the possibility to comment. Once a user has entered the space of a participant and experiences its possibilities, he/she will very likely disagree to have the door of this space closed, and even more, if one has

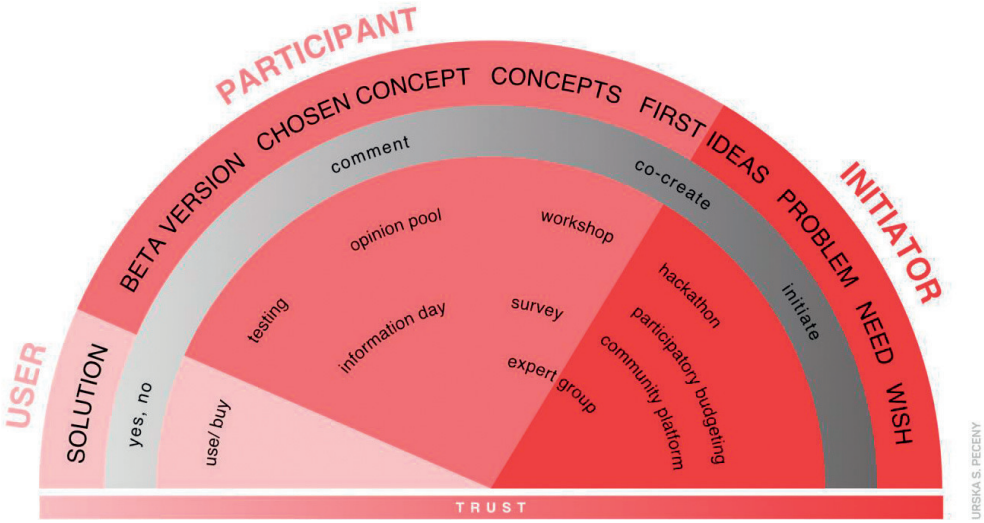

Figure 2. Collaboration sensometer.

experienced the space of initiators and for example participatory budgeting[4]. The way back is bound to loss of trust.

Here, we come back to the mentioned point that before starting anything, it is smart to think also of how the awoken collaborations will stay alive. The strategy needs to define how will trust be respected and cultivated. The largest the space of collaboration, the more extensive information, better tools, more refined methods, and deeper shared values are required. The right speed to drive from mainly passive user community to proactive initiator community depends on the context. As stated before, cities or municipalities have a double task; they need to find way and space to grow culture of collaboration inwards and outwards. Before approaching citizens, the sensometer can also help understand collaboration inwards.

5. Conclusion

In this chapter, we tried to point to the facts that have already been changing not only the idea of smart cities but also the idea of economic policy and smart cities marketing. The fact is that despite being one of triggers of changes in direction of smart cities there is the point where technology as well as idea of cybernetics that it ones brought should be controlled.

[4] Participatory budgeting offers citizens at large an opportunity to learn about government operations and to deliberate, debate, and influence the allocation of public resources. It is a tool for educating, engaging, and empowering citizensand strengthening demand for good governance [25].

The idea of smart cities will flourish as long as it is successful in bridging the gap that technology and business developments has caused in last decades—the position and inclusion of people. When connected with the smart city (place) growth and development here a typical instrument of coordination of investment must be addressed: public-private partnership. The idea which decades ago still offered (budgetary) sustainability to bigger projects has become obsolete. The reason is fast development of independence of population regarding information gathering and network building independence. Therefore, it is natural from the basic understanding of nature of technology development that armed with new technology devices and options the population should be included as a partner in most important projects in their environment public-private-people partnership (PPPP).

What seems a simple organizational task becomes very complex when we try to forecast people's attitude and reactions on proposals on collective actions in their living environment. When their reactions and actions are expected to be stochastic, we can logically expect bigger costs of any action (investment). Here, even well designed economic policy is not enough, as it still comes from (mostly) national level. In order to meet this challenge, logical decision will introduce smart city marketing. This marketing will not be based only on sustainable information, but will have to be supported by special communicators, who will understand the difference between collective design of economic policy and custom approach appropriate for local community of the smart city (place).

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INTECH

Chapter 3

Social Media Use and Citizen Engagement in Local Government of Thailand

Sataporn Roengtam

Additional information is available at the end of the chapter

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Abstract

This chapter aims to present the situations of social media use for developing local governance in Thailand. The main objective is to study how social media can be applied for improving citizen engagement in local administration. So, this chapter would like to demonstrate these results through a case study, Phuket municipal. This study would present how Phuket municipal has applied social media to improve internal operations and relationship with people; how people can use social media for engaging with the municipal in several dimensions; and what are the impacts of those works in terms of local governance development.

Keywords: social media, local governance, citizen engagement, local government, S-government

1. Introduction

The growing of social media use in government and the interaction between citizens and government via government website encourage change in internal government bureaucracy. Lazer et al. [1] found that digital government data need to be analyzed and interpreted in order to understand to what extent they support government's mission. There is no prior study on social media use by local governments in ASEAN countries. Many agencies are however reluctant to measure their online interactions, or are even prevented by their interpretation of existing laws and regulations [2]. Even though social media improve the communication between citizen and government better than e-government sites, with a sense of personalization or community, it may hinder rather than facilitate the delivery of services [3]. In South Korea, social media connections had considerable influence on citizen engagement via Twitter that serves as a source of public information on important topics such as safety and health, but the government's efforts to connect with citizens are less effective in communicating with citizens and responding to their needs [4].

The application of ICT means profound organizational challenges to government agencies especially in two crucial respects: (1) restructuring of administrative functions and processes; and (2) coordination and cooperation between different departments and different levels of government [5]. However, in many e-governments, projects are not always good stories, not only in developing countries but also in developed countries. Chadwick [6] found out that the failure of the "TechCounty," an online citizen project in the US, was due to the institutional variables: the e-government team was free-floating rather than embedded in the county executive's office and was therefore unable to drive change; departmental rivalry and different decision-making cultures; ambivalence on the part of elected representatives; technologically-aware leadership was lacking; and, an eagerness to avoid bad publicity. Other researchers call for the concept of transformation in using ICT, including social media for government [7]. They conclude that transformation is a complex problem to which no universal approach exists and for which different types of models can be used [7]. Managers want models that help them realize the transformation, whereas policymakers are more interested in models that help them shape the right direction and identify relevant elements [7].

Meanwhile, there are very limited number of research on the relationship between technology and organizational form and function. Between 1996 and 2005, only 2.8% of 1187 research published in four leading journals focused on the relationship between technology and organizational form and function [8, 9]. In their research article, Zammuto, et al. concluded that it is very important to study how information is socially and organizationally made sense of because organizing takes place around those understandings and subsequent actions, not only around information acquisition and transmission, and to study how affordances emerge and evolve with changing technological and organizational features [8], and to understand the impact of affordances on boundary conditions. Zammuto et al. [8] use the term affordance that refer to affordances for organizing depend not only on the functionality characterizing the information technology, but also on the expertise, organizational processes and procedures, controls, boundary-spanning approaches, and other social capacities present in the organization.

Social media is one of the most popular digitalized tools that can support people to deeply participate with local government. Even though there are many ordinary tools such as public meeting, public hearing and referendum, but these kinds cannot make impact to local government as much as expectation. That mean they cannot be used to change local government more because they are always controlled by the local government.

This research investigates the impact of using social media on organizational form and function of selected local governments in Indonesia, Thailand and the Philippines. What is the current level of social media use in three cities of ASEAN namely Bandung, Indonesia; Phuket, Thailand; and Iligan, Philippines? What are the challenges to the internal capabilities of Indonesian, Philippines and Thailand local government agencies in using social media and its contribution to policy making?

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2. Theoretical review

2.1. S-government and organizational transformation

Oginni [10] said that social media can transform government organization into s-government. Transformation is capability to enable organizational change, which requires the management of projects or programs to develop or integrate systems, leadership and change in culture or organizational factor. There are some transformations that will happen as follow.

2.2. Organizational factor

Government organization is one unit of the social system and is strongly affected by it. In a social system, organizations conduct experiments that concur with our everyday experience with them [11]. According to Luhmann, organization belongs to the class of autopoietic system as a result of decisions and function, as decision premises for follow-up decisions, and is quite different from the normal textbook definition of "goal searching systems, goal realizing system, goal directed combination of capital, people, and information" [11]. Furthermore, Luhmann argued that organizations as merely consist of goals and/or means to realize them is to mistake results of organizing for organizing itself [11]. The theory of autopoiesis was developed by the two Chilean cognitive biologists Humberto Maturana and Francisco Varela in the 1960s and early 1970s. The basic building block of social systems is communication. Communication consists of information, utterance and understanding, and is that which allows for a system's self-constitution. Luhmann defines social systems as being principally boundary-maintaining systems [12]. Luhmann [13] conceives of communication as a combination of three components: (1) information; (2) utterance; and, (3) understanding, each of which Luhmann conceptualized as selection.

What are the elements of organizations? Elements of organizations are communications that communicate a selection as a selection [11]. Communication has inner structure as a selection of a set of selectable options, and it can be recognized as a decision and connected to prior decisions and thereby can contribute to the self-production of the organization [14]. Organization needs a structure to support the production of elements by elements, namely decision premises. Decision premises involves three aspects: normative points of reference providing a focus for the production of follow-up decisions; decision premises contribute to the regulation of the production of decisions by marking decisions from them; and new decision take into account existing decision premises as presuppositions [11].

2.3. Membership

How do decision premises work in organization? There are eight types of decision premises namely: membership, communication pathway, decision programs, personnel, positions, planning, self-description, organization culture and cognitive routine [11]. In an organization, only members can contribute to the generation of decisions. However, using social media, citizens

influence direction and outcomes of government, improve the government's situational awareness, and may even help execute government services on a day-to-day basis [15]. In other words, citizens are members of government organization who can contribute to the generation of government decision on a day-to-day basis. Governments' transition from Web 1.0 to Web 2.0 will require fundamental organizational and administrative changes as many of the emerging social-collaborative technologies sit uncomfortably with public sector hierarchies and decision-making processes McNutt [16].

2.4. Organizational culture and cognitive routine

Like other organization scholars, Luhmann [17] argues that organization has undecided decision premises, namely organizational culture and cognitive routine. Organizational culture as basic values woven into the fabric of the organization as well as undecided rules for decent behavior or for the attribution of blame or praise is also an example of cultural decision premises [11]. Cognitive routines are a by-product of ongoing practices in the organization's relation to its social and non-social environments. One character of the government is a joined-up or integrated government service delivery; governments have to deal with the problem of fragmentation of government within the constitutional, legal, and jurisdictional limits [18]. Today, the most significant barriers to social media adoption are organizational, cultural, and legal: not technological [16]. Government organizations should be willing to investigate whether more playful interactions with citizens can help to engage on serious issues [19].

2.5. Communication and organizational structure

The second type of decision premise is communication pathway, prescribing the "route" that should be followed in operations, to be counted as decision in an organization [11]. Luhmann [14] argued that communication pathway does not necessarily involve "hierarchy, but also a lateral communication one." Luhmann's fundamental idea was that organizations decide by themselves, which is considered as a decision [20]. This applies to decision communication as well. Personnel and position in public administration are organizational structuring variables [21]. Luhmann argues that competencies and experience are very important for decision premises. Another research recommended that government organization should implement its networking strategy by mobilizing Twitter accounts of various government institutions and promoting their cooperation instead of following Twitter accounts of citizens or networking with them [4]. In other words, Klievink and Janssen [7] proposed the integration of ICT into government organization. Integration in government can be defined as the "forming of a larger unit of government entities, temporary or permanent, for the purpose of merging processes and/or sharing information" [22]. Hence, integration extends to both process integration and information integration (sharing) [23] and pertains to the institutional dimension and in part to the high-level functional dimension [24].

2.6. Personnel and position

Personnel and position in public administration are organizational structuring variables [21]. Luhmann [20] argues that competencies and experience are very important for decision

premises. Information factors consist of communications and Information and Technology [25]. Those aspects are important variables regarding the relationship between government organization and citizen used to study Arlington County. The influence of ICT use on organization transformation process in the Netherlands confirms these previous findings [7]. Fulla and Welch [26] furthermore expect that the organization can choose among five options for response to an asynchronous query: non-response, generic response, direct informational response, referred informational response, and referred action.

Meanwhile, the response level is dependent on the performance of the virtual team a in certain organization, the link between virtual team members more social and psychological in nature [27]. The virtual teams are run on trust rather than on control, which requires lateral communication and active involvement from each individual under a flat organizational structure, participatory management practices and novel schemes of shared responsibility [27]. The Luhmannian perspective developed here helps us to address the relatively neglected questions of how the operating and strategy routines of an organization are related to each other, and how both are related to the generation of strategic change [28]. Social systems for Luhmann are not, therefore, systems of action, structured in terms of the thoughts and behaviors of individual actors, but systems of communications in which the communications themselves determine what further communications occur. Luhmann introduces his concept of episode in the context of societal change, and it does not feature explicitly in his accounts of organizations.

The insight, which again challenges the exceptionalist view, is that for the line management of an organization, strategic episodes are the routine focus of strategic practice. The other insight concerns the relationship between organizational strategy and the practices of 'strategists'. Government organization culture in the emerging "Digital Era Governance" (DEG) and "Transformational Government" (t-gov) paradigms is such that "citizens and businesses will increasingly co-produce most individual outputs using electronic processes, leaving agencies to provide only a facilitating framework" [28] and "citizen empowerment" [29].

2.7. Public policy making

Decision programs are regulative conditions for correct or incorrect decision behavior, namely goal program and conditional program [11]. Goal programs specify goals (desired) that should be pursued, depending on the circumstances or expected side-effect, and conditional programs have a general form that allows for different levels of specification [11].

When government organization managers face the growing demand from citizens via social media, they are not producing sequential decision, producing one decision after the other, but they can produce multiple coherent decisions at the same moment in time and at different moments in time [11]. Luhmann defines those decisions as planning. However, organizations have other means of integrating decision premises, namely self-description. Self-description function is a means to bring the multitude of decision premises to a unity [11]. This means organizations are not "sequential mechanisms" producing one decision after the other, but at the same time organizations must coordinate "event-like" (via social media) character of decision, called planning [11, 17]. In each stage of policy processes, technology has an important role to

play in the digital age. The policy process requires quality inputs, decision making and feedback mechanisms to be successful.

3. Impact of social media in the decision making of local public organizations

Social media was widely used by the Thailand government and citizens during the flooding crises in 2001, 2011 and 2012, where more than 13.6 million people were affected. Social media became an ineffective communication tool during the crises since many rumors were left to proliferate faster than the Thai government could control [30]. Evidences shown by a study suggest that people used Facebook to request for help, criticize government, and unveil suspicious activity of the Flood Relief Operation Center.

In order to present the situations of social media use in Thailand, this chapter would like to present a lesson from one municipal to be case study. It is Phuket city municipal. According to the head of Government Administration, the Phuket city municipality has been using many types of social media such as Line, Website, Facebook, Twitter, and YouTube. The first type that got permission was a line application, namely, "PR Ted-sa-ban-na-korn-phu-ket." The subscribers are mass media groups in Phuket. This group, including teamwork of Phuket city municipality, has often connections within the group. The group has just been founded in 2015. In this line group also provides a service for customer complaints, namely, "Srang-ban-pang-muang." This subgroup includes heads from various public parts, members and committees from municipalities, etc.

The process for customer complaints is that a customer will post a complaint(s) in Line-Srang-ban-pang-muang. Once the problem complaint is shown up in the Line-Srang-ban-pang-muang, the office staff will print out the complaint statement to report the relevant departments. The complaints and their number will be reported in a meeting every month in order to find a solution and improve service.

Moreover, the Phuket city municipality has been managing public relations via the website – www.phuketcity.go.th for spreading it information. In the website, customer complaints can be done as well, including discussion board for general topics. Making a complaint via this website requires that a form that appears in its particular webpage is filled by the customer who complaints. The filled form would be printed out and sent to hierarchical higher administrators to make considerations every month. Subsequently, the administrator will make a decision that which department or person should take an action or a responsibility for that complaint. The assigned department or person needs to find a solution to solve that problematic complaint.

For Facebook, the Phuket city municipality created "Na-ri-sorn" as a fan page. The subscribers can give opinions, complaints, or information. Phuket city municipality has used this social media to make public relations for its activities as well. Presently, there are thousands of subscribers following Na-ri-sorn. Complaining via Facebook is not popularly used. The process is similar to other options mentioned above.

For YouTube, the Phuket city municipality has uploaded TV programs of the municipality in YouTube. The Phuket city municipality has also used Twitter; however, this social media is not popular and it is during development.

The office of the Phuket city municipality has information service center located in the first floor on the left. This center was established to serve "Official Information Act, B.E. 2540 (1997)." The Act stated that the center needs to provide the relevant documents such as municipal law, budget, development plan, and procurement.

Another channel for the customer service center is a phone call numbering 1132 and 119. The next channel is an annually activity report. It is made every year by the Phuket city municipality to declare budgets for projects, including future plans by post a notice at customer service center, the Phuket city municipality.

The last channel is Damrongtham center of Phuket city municipality where people can send a complaint to. Additionally, the Phuket city municipality has used a LED screen to spread information. The LED screen is located at the information counter service, Office of Civil Registration.

The advantages of social media are to expand communication channels, increasingly exchange information between people from different groups, access to target group easier, reduce PR cost, quickly report any activities of the municipality any time, and decrease traveling cost of customers who want to make a request or complaint. Also, social media enables the Phuket city municipality to response complaints effectively.

4. Impact of social media in the efficiency of local public management

Previously, the Phuket municipality received complaints by phone call 1132 and 199 for fire cases. However, that channel had a limited response. It did not serve all people with different needs. Thus, the Phuket municipality created the website. However, it seems that it served people quite not well. Later, the municipality created a Facebook account. Each office created its own Facebook account. With Facebook, the numbers of people who follow has been increasing. Lastly, Line, a two-way communication tool has been used as part of the Phuket municipality as well. Each office has its own Line either. Line has been used for subgroups (within municipality groups) such as an executive group, head of department group, civil-servant group, etc.

Social media group at community level refers to the group for people in the communities, namely, "Old Phuket Town." This group includes executives and people in communities. Some social media may be created with a specific purpose; for example, the Line, an application, for improving environment that includes staff who have been working for environment within the group. This type of Line groups is informal and open for everyone. A formal Line group is "Sang-ban-pang-muang." The subscribers are the members of public organizations. Line "Sang-ban-pang-muang" enables the staff to gather complaint issues and send to upper levels to find solutions. Civil defense volunteer has used social media for management, solve problems, and service the people in communities. This one helps in sending pictures. It can keep

and tract completed jobs. When a problem occurs, the person who needs help can send a picture via Line to show a cause of the problem, and then the group would help solve the problem. A complaint issue becomes more critical when a relevant picture is show as strong evidence. Therefore, Line is more advantage than old phone call 1132 and 119.

In the past, when number of problems or complaints increase, some problems might be missing and then the problems did not be solved. Line helps spread the problems in a formal way (step by step); however, in emergency case, Line can quickly send the problem so that the problem will be fixed as fast as possible. For example, if line pumps are broken and then someone sends this problem in Line, the officer who usually watches out in the Line would perceive. Tt is possible that this problem may be fixed within just 1 day. Compared to other types of social media, Line is most effective. About 80% of all of the complaints/problems is via Line.

Presently, almost 100% of the people in communities have perceived that they can contact to the Phuket municipality by using social media. To illustrate, the group of "Old Phuket Town" includes 140 members from about 200 houses located on the Tha-lang street. The Civil Defense Volunteer Group that is responsible for the society has about 180 more members. However, some people such as elders do not know how to us IT. Complaining by elders will be increase later.

Typically, when people complaint they have often asked for solutions to fix the problems right away, but the Phuket municipality may not able to solve them in a short time. For example, when grilles on streets get damaged, the process may take time. When electricity power becomes blackout, the municipality can only pass the information to Provincial Electricity Authority-PEA, but cannot fix the problems. The problems of using bad words in written complaints or suggestions in social media tools often occur. Arguments between pros and cons may be sent back and forth. Consequently, other readers may be misunderstood in some issues and have negative attitudes to the municipality. The Phuket municipality will fix these cases by directly talking to the people. For example, putting water pumps into old trenches or buried electric wires under grounds was result in misunderstanding of some people. They thought that it could have been a cause of flood and made the story exaggerate later as they might not know that the municipality already put another pump to let water out.

In my personal view, I still agree that using Line for the municipality jobs is the right answer of the solution as it allows both pictures/images and letters, which help improve good connections. It is superior than typical phones that allows only sound. Previously, executives were afraid that using social media in organizations might have destroyed the systems or formal structures in the organization because employees might merely texting on Line or Facebook and then ignored their works. Ministry of Interior has announced to ban using social media during works. Rather, using social media in the organization makes works more effective and improves performances. This is because social media makes works faster, reduces cost of computer resource. With personal devices such as I-phone, I-pad, or other mobile phones of employees can serve using social media well.

One more interesting issue is that in a real practice employees cannot sit at in front of their computers all the time. Sometimes, they have to work outside the office. Social media would be benefit for such case too. Wherever they are, their boss can give their orders.

Using social media also is a good choice for the people who prefer texting to talking. In meetings, some people may feel not comfortable to speak in front of many audiences. They may feel nervous. Other people can communicate by using writing skill better than speaking skill. In such case, texting through social media would be a good alternative for them.

One benefit of using social media for communication is to protect face-to-face argument. When opinions of a group are different, a conflict and fighting via words may occur. Avoiding face-to-face conflicts by arguing on social media tools would be a good choice.

Social media has been used as an evaluation tool to tract works of the municipality. People can see works and projects of the municipality via social media; for example, pictures of a road with construction ongoing. People can see the process or how much their works finished.

Social media may be used as a tool for census, pooling ideas, or voting. When the Phuket municipality wishes to start a new project, the municipality can ask for the communities' opinions before starting the project to protect future possible problems. For example, "Peun-Phuket group" concerns that if the development of the communities grows too fast, it is possible to get consequence impacts. This group will discuss in various impact issues.

For example, Facebook can provide statistics or percent of audience accessing as well. An advantage of social media is a new channel as communication innovation for people. Presently, it influences our society and is increasingly used. Embracing social media do not make us do more jobs; rather, it makes a complaint process and finding solutions for people easier. Solving problems for the people is our duty.

5. Social media and local governance

Development of social media allows people to communicate to each other faster and broader. It is a tool that makes people come closer together. The people can directly communicate, request, or complaint to the municipality. This makes a municipality perceive information and problems that lead to planning, making policies, finding solutions. Using social media helps increase communication channels. Previously, a few channels of communications between people were available. We are like blocked from information. With social media, there is no longer or harder to block information from people. Social media application, allows both images (pictures) and messages (letters); thus, it is better than regularly complaint approach.

Using social media in municipalities is not like using a communication tool. Rather, it seems to be a decision-making tool**.** It makes a decision faster. If a problem cams with a picture, it can be printed out as empirical evidence and ready to be sent out for further actions. It is obvious that Line is better than regular way as it will not waste time for filling a form.

Presently, almost all local public organizations use social media in communication between local public organizations and their people. All of them have their own websites and Facebook pages. Most of them use websites and Facebook pages to make public relationships of their completed and ongoing projects such as checking swamps and dragging canals.

Social media can create the power of community. When an important issue is posted, other members come into the group to share their opinions. For example, in case of excavating a tunnel, most of group members disagree. Thus, once the issue was posted, they gave messages to resist that project. They have a harmony. The power of community comes from the power of social media. Although social media cannot be panacea to cure all problems, it is a good tool for groups to send their voices to city council members or Mayor.

It may be a new thing in the context of Thai that leads to wrong usage. Sometimes, someone shares what posted without carefully thoughts. However, it is started seeing the development of using social media. Previously, people have wasted time for long meeting and traveling. But nowadays we can have a meeting in applications. Complaining in old fashion requires traveling to the organizations. People need to learn more using social media continuously.

Finally, using social media can drive dynamics of society to be better. Learning social media of Thai people should be supported. Social media in organizations is used not only for spreading the local government's information to the community but also create power of communities. This is the way to develop local governance to be happened in Thai societies continuously and sustainably.

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Chapter 4

Urban Planning in Decentralization and Local Autonomy Era: A Case Study on the Relationship Between Local Government and Civic Group in Development and Budget Planning in Malang City (Indonesia)

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Additional information is available at the end of the chapter

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Abstract

This study aims to explore the relationship between local government and civic groups in the budget planning process of the government of Malang during 2015. Using a grounded theory approach, qualitative methods are applied in this study. The unit of the study is Malang, East Java, Indonesia. Malang is selected as the unit of study because of the many civic groups. The findings of this study show that there exists a relationship between local government and civic groups but that the relationship does not represent the principles of democracy (equality, participation, and justice) in the budget planning. Local government has dominated civic groups in budget planning so that the budget policy does not take public interest into consideration. However, civic groups such as Malang Corruption Watch (MCW) and Education Forum of Society (FMPP) have developed different strategies to develop collective lobbying to direct the development of public awareness through education. These findings contribute to developing budget planning in Malang that establishes a democratic budget policy process that is more responsive to public needs. The local government should realize that public participation is a way to achieve democratic budget process. In this context, elected and appointed officials should provide access for civic groups to be involved in all stages of budget planning. At the same time, civic groups should build civic awareness and a willingness to participate in budget planning.

Keywords: budget planning, local government, civic groups, local autonomy

1. Introduction

In 1998, Indonesia underwent political reform. At that time, there arose a great awareness of good governance in Indonesia, following on from the multidimensional crisis experienced by the country in 1997. One of the major factors in the crisis was weak public sector governance resulted in corruption, collusion, nepotism, and monopolistic behavior. Consequently, the Indonesian government has changed several regulations, from rules based on an authoritarian system to rules according to the democratic system. However, a democratic system has not been successfully implemented, including in terms of budget planning affairs at the local level [15].

This issue has been illustrated by the results of research conducted by scholars such as Franklin et al. [3], Davenport and Skandera [1], Vissanu and Salahudin (2016), Souza [11], and King et al. [9]. They have indicated that local government has dominated civic groups in the budgetary process. Vissanu and Salahudin (2016) revealed that local government's domination in arranging budget and expenditure policy (APBD) was very resilient. The findings of the research indicate that the aspirations of the people, supported by civic groups, do not feature as part of the policy design, as people are not invited or asked to participate in determining budget policy documents, and civic groups are considered as rivals rather than partners. In line with Jainuri's research, Souza [11] noted that local government dominated budget planning. The local government applies a bureaucratic system during the budget planning, a system which does not provide an opportunity for civic groups to take part. In addition, Souza explained, according to his research conducted in a local government in China, the budget process is based on a political paradigm in which the involvement of politicians, such as via political parties and parliament, is part of the civic group participation. This means that civic groups in the budget process are represented by politicians.

In addition, Souza [11] reveals that the relationship between local government and citizens is dominated by the role of government officials. They arrange the budget established on legal procedures, commonly designed to map the bureaucratic budget. In this context, civic groups have a limited time to become involved in the budget process. Therefore, the final approved budget may be seen as taking the side of the administrators of public affairs. As highlighted by Franklin et al. [3], budget planning is underlined by the actions of administration officials. This causes a disproportionate distribution in favor of government over social affairs in budget policy [15].

Referring to these issues, Franklin et al. [3] suggested that, in accordance with democratic values, budget planning should be related to citizens, public services, and public goals. Hence, public participation in the budgetary process is an important way to ensure that budget policy is responsive to citizens' needs. They recommend that local officials select a participatory mechanism more deliberatively once the outcomes desired from citizen participation in budgetary decision-making are articulated. Davenport and Skandera [1] assert that relevant civic groups play a distinctive and vital role in a democratic society. They develop core virtues and values that enable individuals to contribute to society's needs and to help design political institutions adopting public policies supportive of citizen preferences [15].

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A democratic political system requires the active role of civic groups in carrying out their respective functions in shaping and determining public policy, including budgetary policy. As recommended by Huntington [6], the active role of society in the political process is to minimize the political interests of political and bureaucratic elites. Locke [10] believed that through public participation, the problems of life in a society could be solved. In addition, a society would gain knowledge and understanding, develop a sense of social responsibility, and reach new perspectives beyond the boundaries of personal life.

Davenport and Skandera [1] explain that the main role of community organizations is to empower the people so that they have room to advocate their aspirations to government. In the principle, the core role of civic groups is to empower the people and advocate to help the people to have access and to defend their rights. The contribution of civic groups, including NGOs and non-political organizations, covers advocacy and their performing role as a catalyst in the process of public participation toward good governance in Indonesia. This means increasing the awareness of the executive and the legislature in order for them to open up to public participation or involvement, thus increasing the awareness of citizens regarding their rights and needs, in order for them to participate in the regional regulations drafting process.

Thompson [12] asserts that the relationship between local government and civic groups in the regional budgetary process (budget planning) should be related to the democratic principles of justice, equality, propriety, and proportionality. Therefore, Franklin et al. [3] state that democratic values are fostered when public bodies and the implementation of government are open, when opportunities and procedures exist for civic groups to permeate the system and when responsibility is assured.

The Indonesian government has established laws to foster democratic values in government processes and affairs, including budget planning at the local level. Law Number 12 of 2011 on the establishment of legislation aims to ensure participation and transparency in the relationship between the state (including local government) and civic groups in the preparation of public policy (budget planning): "The principle of 'openness' is that the process of establishing legislation, starting from the planning and drafting, through to discussion, are transparent and open, whereby the whole of society (relevant stakeholders) have the widest possible opportunity to provide input into the legislative processes."

Law Number 17 of 2003 on state finances declares "State finances (including local government finances) should be managed and in order, be subject to laws and regulations, be efficient, economical, effective, transparent, and accountable with regard to fairness and propriety." This position is reaffirmed in Law Number 33 of 2004 on Financial Balances: "Regional finances should be managed in order, be subject to laws and regulations, be efficient, economical, effective, transparent and accountable with regard to fairness, propriety, and benefit to society."

In addition, Law Number 37 of 2014 legislates guidelines for the preparation of the regional budget for 2015, stating that the preparation of regional budgetary policy should be showing the following principles: "(1) The budgetary policy should be prepared in accordance with the needs of the regional administration; (2) the budgetary policy should be prepared in a timely manner according to the stages and schedules; (3) the preparation of the budget is conducted

in a transparent manner, which allows people to find and gain access to information about the budgetary policy; (4) the budget planning should involve the community; (5) the budget should consider fairness and propriety; and (6) the substance of the regional budget should not be contrary to the public interests, higher regulations and other regional regulations." Furthermore, Law Number 14 of 2008 on the public disclosure of information backs the principle of openness in public affairs, including the preparation of the budgetary policy (the budget planning of local governments).

Unfortunately, the laws have not been implemented optimally, proceeding from previous studies such as those conducted by Jainuri and Salahudin [7], Salahudin (2012), Wijaya (2003), Widowati [14], FITRA [2], and Wahyudi and Sopanah [13]. The relationship between local government and civic groups in budget planning at the local level in Indonesia does not reflect democratic values. This is due to the lack of socialization on the part of city governments and parliament, the fact that the mechanism at development planning meetings is just ceremonial and the fact that the awareness of the people, especially middle- and low-income groups, is still relatively small. Civic groups' access to active participation is also undermined by local government. Local government, from the executive (regional head and the administration officials) through to the legislative members (parliament), fully controls and directs the major body of budgetary policy. Consequently, budget policy does not incorporate citizens' needs [7].

The research in the current study was focused on this core issue, divided into two main points. These were (1) to explore the relationship between local government and civic groups in budget planning and (2) to explore efforts to build relationships with local government to design a budget policy to meet citizens' needs. In short, the results of this study indicate that local government dominates budget planning, while civic groups do not participate actively in the budget process.

2. The relationship between local government and civic groups in budget planning (the *Musrenbang* process) in Malang City

2.1. The *Musrenbang* process and the political interests of elites: politicians and bureaucrats

Under the government law of Indonesia Number 13, 2006, about guidelines for local budget planning, the purpose of the Musrenbang (Public Consultation on Development Planning) is to formulate development programs based on the aspirations and needs of the community and the integration of the cross-sector development programs, among regional-level work units (SKPDs), realizing a pro-people budget. However, as indicated by the findings from the fieldwork of this study, these objectives cannot be properly achieved due to the power of the politicians and bureaucrats, who have a low level of willingness to determine a direction for development in Malang that is pro-people.

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Mahfud, a member of Malang Parliament (the regional legislature or DPRD) elaborated "The Musrenbang is not as imagined in the academic literature and in the existing law. The Musrenbang theoretically is an attempt to accommodate the aspirations of the community to serve as a benchmark for budget policy. Nevertheless, the Musrenbang is often ineffective. The results of the Musrenbang appear to demonstrate a low commitment to serving as a reference budget policy. The results of the Musrenbang are disconnected because of the many invisible interests of the elite and the effect on the circles of power. The Mayor should understand the interests of the elite; if not, the preparation of the budget policy may not proceed well, and it may cause several protests. Consequently, the Mayor fully understands it and follows the political climate (Interview, 2 March 2016)."

The legislator's statement above shows that the Musrenbang is ineffective due to the behaviors and attitudes of a pragmatic political elite and the status quo as supported by the regional head (the Mayor of Malang). The Mayor of Malang has reduced the power of civil society groups deemed willing to criticize his performance and leadership by providing a budget faithful to pragmatic groups or individual politicians in Malang. Furthermore, Mahfud said "The Mayor of Malang is very influential. He is able to control the executive, judicial, and legislative branches. Three institutions have been established by the Mayor to follow and obey orders well. One of the many ways of the Mayor is to control the three institutions is specifying the format of a stable political coalition. The PDIP as the biggest political party in Indonesia embraces influential parties such as the Democratic Party and Golkar Party. With a strong political format, the Mayor is able to control the three institutions, retaining an impact on political stability. In this present era, the interests of a political opponent are very important. This interest has been controlled by the Mayor through budget policy (Interview, 2 March 2016)."

Indeed, based on the explanation of the above key informant, the political power of local elites, for example, the Mayor of Malang, is very influential in terms of creating a pseudo-democratic space included in the Musrenbang process. Overall, the local elite leadership's behavior, as stated above, greatly affects the dynamics of the Musrenbang process. Politicians and bureaucratic elites at the village level, subdistrict, and even the neighborhood level have implemented the Musrenbang without incorporating the real meaning of democracy as explained by Thompson [12], namely, social justice, participation, and transparent governance. Suaib, an activist of the Learning Community Forum (FMPP) of Malang, revealed "People have never been involved, even the organizers of public participation. Local government already involves the community leaders, but it is just a normative commitment. Even if there are programs, they are not really completed for the reason of limited budgets. Even if there is one, it is not in accordance with the quota (programs) filed by communities. One example is house repair, as part of the Musrenbang process (Interview, 10 March 2016)."

Moreover, political and bureaucratic elites at the level of subdistricts and villages do not require people to be involved in the Musrenbang process. This stance is caused by elite behaviors that do not make democratic sense. It is also influenced by a lack of public understanding of the meaning of the Musrenbang process. For instance, Suaib noted "The public does not understand the goals of the Musrenbang process. Nevertheless, the practice may be different

from that. Society does not know the Musrenbang processes and the objectives; the community has very limited understanding of the Musrenbang process. They do not understand. Even the neighborhood chiefs just do not know about this (Interview, 10 March 2016)."

Most people do not understand how to become involved in budget planning. This is influenced by a lack of elected and appointed officials willing to build the social capacity for civil society to take part in the budget process. In fact, the administrators apparently believe that the budget policy process should be conducted without citizen participation. However, when the local government officials write reports of the actual budget planning, they state that it is based on democratic values. This means that the democratic principles are only on paper, not in the actual planning system. Furthermore, Suaib explained "In each report by local government it is stated that the Musrenbang has been implemented according to democratic principles because it involves public figures, whereas in practice, people perceive that this has not been delivered yet. Finally, I know those criteria; I read them all. It turned out what is written (the reports of the Musrenbang) do not match the real situation in the field when it states the Musrenbang has been implemented by actively involving the community leaders of five people from each village. On the contrary, I have never been involved. This is fictitious. Therefore, there must be a reform-driven improvement of society (Interview, 10 March 2016)."

The active role of the elite at the Community Empowerment Organization at the village level (LPMK) is expected to be a companion and the voice of the community. However, they build a collusive relationship between the formal structure of the village and subdistrict government. Suaib lamented "LPMK is one of civic group organization. People hope that the LPMK can involve actively in the Musrenbang process. In fact they participate actively in Musrenbang process, however, they just build the collusive relationship with the elected government officials. It is the character at the grass root communities, the bottom level. When they are put in such a structural situation, they would join and become passive. This is due to their interests to obtain benefit from the budget policy (Interview, 10 March 2016)."

Some neighborhood leaders cheat when determining the village-level development program, with collusive action among them. The game of power and authority of the lower level colors the process of designing development programs. The collusive manner of bureaucratic structures at lower levels is increasingly visible during the implementation and management of a program. They support each other in the bad management, as it is beneficial for them to multiply the income of each other. Every effort is made, including falsely claiming positive results for governmental programs and making false statements. Wahyudi, the manager of a group of houses in the same neighborhood (RT) in Merjosari, Lowokwaru, explained "The village development program is only used and enjoyed by village officials, such as LPMK staff, village government staff, and other figures that come into play. The budget is available and it is given, but government officials cut it. We got only 10–11% of the budget. However, we must report it as 100% of the budget and village officials request blank receipts. They cooperate to lie about the budget. They take a photo of the development site before the proposed development, that is, a destroyed building. Well, we do it independently. Budgets from villages go straight to our independent programs; a photo is taken, copied, and made into a report.

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Well, we were making blank receipts for villages and reports. We do not complain about it. This attitude means that even if we complain, it may be overlooked. I once made a complaint, and my neighborhood has not received any programs since then. This happens everywhere (Interview, 15 March 2016)."

This collusion is so strong that it causes development programs to lose direction and brings no positive results for the people. Development programs are only used as a way for those in power to embezzle money from the country. The political and bureaucratic elites are not responsible for the fact that the programs often do not correspond to the needs of the community. In addition, Wahyudi stated "These existing programs were done last year. The program has no budget. The program is not the result of our proposal. We do not know anything, as we are not invited. This is fake. The budget is also made carelessly as it does not cost that much for the pavement program. If such a budget is released, we would be happy and the development program would be very successful. We pay ourselves for the development program as much as IDR 350,000 per home, please ask the people here. Some development programs depend on the contacts, family, friends, acquaintances; you know, collusion among them. If you do not collude, then you could fall on hard times (Interview, 15 March 2016)."

Referring to the explanation of Wahyudi above, the Musrenbang process has been manipulated by local government officials and some politicians. In addition, they have pressured society to accept their programs. One example is in Merjosari village as part of the subdistrict in Lowokwaru of Malang. There, we can find a development program that is not responsive to the need of the local community: the development of a landfill wastewater treatment plant. This development, by the company Pall, was not very important because the villagers still have an area for sewage. However, because of the interests of the elite, including the head of the neighborhood and the village officials, the construction continues despite opposition from local residents.

Furthermore, Wahyudi noted "There is a program in our area but not required by our citizens. The Landfill Wastewater Development of the World Bank has a budget of approximately IDR 300 million. We do not need Pall because our housing is still very spread out. The Landfill Wastewater is only suitable for a small residential area. There is no area for sewerage. In our neighborhood, each resident has sewerage. In addition, our area has no running water, and The Landfill Wastewater needs water flowing. The Landfill Wastewater development project is only seeking profits through the purchase of facilities and infrastructure. Well, it is really a risk for future housing residents. Since the residents refused, they finally moved into other neighborhoods, but the people continue to object, even though some agreed. This causes serious problems, the people refuse it and want to stop it; the government has spent a lot of money (Interview, 20 March 2016)."

The key informant's explanation above shows that the relationship between government officials and society communities in arranging the local programs is not a good relationship in terms of democratic principles and of collaborative governance principles (Emerson, 2011; Thomson, 2010). In addition, Wahyudi revealed "Residents living around the construction of The Landfill Wastewater want to build a Mushollah, a place of worship for Muslims. So, residents' plan cannot be realized because the construction site for the Mushollah was used

for The Landfill Wastewater building. The Landfill Wastewater development replaces the Mushollah development. The residents have a plan to build a small mosque, and they had collected IDR 3 million in savings from the villagers. The people were happy when they saw the place was cleared, thinking that the government will build their Mushollah. They came to see, and they were disappointed as it was the Landfill Wastewater being built (Interview, 20 March 2016)."

As can be seen, the development programs provided by the local government are not proposed by the community and not in accordance with the needs of the community. The people have resisted this program. This creates new problems in terms of regional development. The collusive manner at the bottom level of the decision-making structure, including neighborhood heads, means that every development is part of efforts to gain personal advantage (**Figure 1**).

To sum up, the relationship among the stakeholders illustrated above shows that *Musrenbang* process is not implemented according to the existing regulations. These problems are caused by (1) the leadership behavior in favor of the status quo by local elites, (2) the pragmatism of the local elites, and (3) the collusive manner among government structures. These factors have led development programs to be implemented contrary to the needs of society, and the programs do not have a significant impact on the regional development of Malang. These findings confirm other researches suggesting that although the democratic system has been

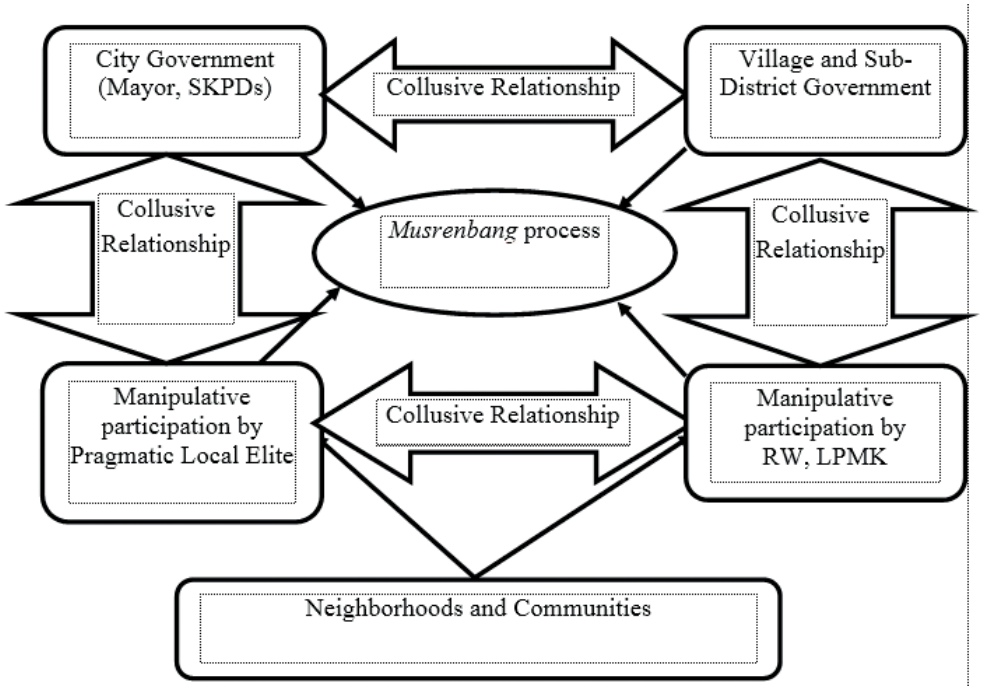

Figure 1. The relationship between citizens and government officials in the *Musrenbang* process.

implemented, there may be no guarantee that local government can implement the entire system successfully. To conclude, the local government has arranged public policy according to the conventional participation that society participation in the public policy process is limited [5, 7, 9, 11].

2.2. The civic groups' efforts build the relationship with local government in budget planning

Based on the laws of the government of Indonesia, the budget is the main delivery mechanism for public welfare. However, based on the data described previously, the main factors in planning the budget do not favor the community. The issues are caused by (1) a lack of access to the public in order for them to get involved in the preparation of *Musrenbang* due to a lack of information and awareness, as well as the decision of government to limit the elements of the community becoming involved in planning forums and (2) the strong influence of political elites (regional legislatures/DPRD and local heads) in directing the budget toward their own interests. Below are the viewpoints and efforts of civic groups to realize the budget in accordance with the system and in favor of people.

2.2.1. Optimization of the rule of law, moral force, and growth of goodwill

The legal regulations of the Indonesian government have already given the public an opportunity to become involved in state policies, including the budget policy process. Nevertheless, the regulations and laws have not been implemented optimally due to there being no responsibility shown by the government, especially the DPRD as representatives of the people. Therefore, the key steps that must be completed are to optimize the rule of law and strengthen moral force through the improvement of political behavior when choosing a member of the DPRD. Suaib elaborated "If we look at the legislation and laws from public services and human rights, they are good but have little or no moral structure. The next question is how to build a moral structure? We begin by fixing the politics—although we do not participate directly in political parties, we are partisans. Politics has three functions: controlling government officials, making laws, and making budget policy. We are governed by politics, including budget planning meetings and part of the political process, only our political process is still not good. The *Musrenbang* process was a procedure to provide input on existing programs in the area, one of which should include members of DPRD, as legislators are powerful allies. We should involve the DPRD and the teachers (Suaib, personal communication, 20 July 2016)."

Agreeing with Suaib, Mahfud concurred that from the existing legal regulations, internal monitoring is required from within the government and for politicians. As said by Mahfud, the supervision is not through the government system but via the responsibility of government officials and politicians, who are to run the system or implement the existing laws so that rules are made to be obeyed. Mahfud explained "It was supervision but not the control, as we understand it, even until now. The people do not supervise the government, but it is defined as the attitudes and behaviors of controlling people. It is the attitude of the government, DPRD, and other elements to have the willingness to carry out the mandate in accordance with legal procedures. The government, the DPRD, and the public so far do not really

having the willingness. After the *Musrenbang*, programs are based on community needs; these results should be supervised by a pact of trust. We do not have this, so it is difficult to realize a good budget policy. Even Islamic parties are not guaranteed to have an attitude of trust (Mahfud, personal communication, 20 July 2016)."

In line with Suaib, many DPRD members do not have a good enough understanding to ensure good governance, including the governance of budget policy. Therefore, Suaib required "We need the political intelligence of the community in selecting DPRD members. Building political intelligence can be done through education." Moreover, Suaib explains, "We are going to give political education through the MCW, now we want to be involved. The goal is to improve voting patterns and to supervise the actions of candidates. I am involved there, and it is not easy work. MCW are outsiders, so they do not understand the character of Malang citizens and areas (Suaib, personal communication, 20 July 2016)."

Suaib acknowledges that amid the apathy of the community, the implementation of political education is not an easy job, as it requires the collective action of civil society such as the MCW and the mass media. Currently, the community benefits from the existence of a democratic political system that gives people the chance to publish publications that facilitate and strengthen political education. In addition, Suaib explained "Yes, as I said earlier, it is hard, especially as the political education of prospective voters only started in 1995. There was none before. Now political communication has been very broad through newspapers, TV, the Internet, seminars and workshops, and all sorts, they are already very open. The position of the public, however, is still weak (Discussion, 20 July 2016)."

Suaib's statement as an education activist, Sailendra's statement as a bureaucrat, and Mahfud's statement as a member of DPRD Malang focus on one issue, which is the lack of awareness and goodwill of the government, politicians, and the public to follow the existing laws. As noted by Suaib, government officials, politicians, and the society need to be made more aware through political education.

2.2.2. Organizing the community: MCW established FMPP

Political education is considered to be an important force in building a collective consciousness to become a hegemonic force to balance the power of the dominance of the state (local government). The step taken by MCW to form the FMPP (*Forum Masyarakat Peduli Pendidikan*) was an effort to build collective awareness to balance the power of the government and politicians in Malang through monitoring and advocacy activities. Faruk, an activist for the political education and anti-corruption measures of the MCW, explained "The *Education Forum* (FMPP) is under the supervision of MCW. The FMPP was established to carry out the functions of monitoring and advocacy, especially in the field of education. Established early on, the FMPP has a coordinator for the implementation of activities, but after an evaluation it was found out that the coordinator often cheated, so MCW eliminated this function. Therefore, the FMPP is supervised, but the FMPP retains autonomous in performing the roles and duties of advocacy and monitoring. There are situations where the FMPP takes action but it encounters problems in handling the case in which MCW intervenes (Discussion, 20 July 2016)."

In carrying out the functions of monitoring and advocacy, the FMPP is supported by a management partnership with MCW. MCW supervises, directs, and educates the FMPP so that advocacy and monitoring run in such a systematic, large-scale, and professional manner. In addition to the function of monitoring and advocacy, the FMPP becomes a public information center. Faruk stated "The FMPP is said to be the center for public information because it is available in each subdistrict. However, in running monitoring, FMPP members in each subdistrict coordinate and help each other. MCW oscillates between acting as a monitor and as a partner (Discussion, 20 July 2016)."

Therefore, the goal of FMPP is to balance the power of the government and politicians in Malang in the preparation, implementation, and evaluation of policies, including the budget policy. The partnership between FMPP and MCW is a testament to the vision and mission of ensuring good governance for the benefit of society, that is, the public interest. Recalling Gaffar (2005), civil society, based on a social movement, will be able to achieve hegemonic powers to influence state power, including the government and politicians in Malang. The existence of MCW and MFPP has made a major impact on the behavior of the bureaucracy in Malang as described in the last part of the discussion of this study.

2.2.3. The strengthening deliberative forum for civic groups

In various discussion forums, the researchers follow Jayadi, an activist of MCW, who always says that the importance of deliberative forums is to build the strength of civil society. Democracy without deliberative forums will make the political system and the government ineffective. Deliberative forums can be built through nonformal activities, such as informal discussion forums in coffee houses or formal discussions through workshops, focus group discussions (FGDs), and seminars. According to Jayadi, deliberative forums are directed at the public, politicians, governments, community organizations, NGOs, and businesses, for them to understand the nature of public policy for the welfare of society.

Jayadi stated "Deliberative forums are very important to define the meaning and essence of a law (local regulations). Governments cannot explain the meanings in the regulations, such as the meaning of participation. The definition of participation should be clarified in the direction of democracy and for addressing the people as the subjects of a policy (local regulations). We also (MCW) have not fully understood the meaning of participation. During this time, we see participation as a form of generosity of individuals or groups such as community leaders for others (Discussion, 20 July 2016)." In addition, Jayadi suggested, "Although the present era is the era of democracy, we still find coercion in the behavior of state officials through policies including local regulations. There are cases where teachers are arrested by the police. In my opinion this is not good because teachers are teachers and it is inappropriate to prosecute them in the legal process. They deserve a special mechanism regulated by a regional regulation. The mechanism used is a persuasive approach (Discussion, 20 July 2016)."

Based on the results of monitoring conducted by MCW, repressive behavior by local governments occurs at every level of policies, including budget policy. Budgets, which were made unilaterally and applied to the public, represented a form of state coercion against citizens.

In this era of democracy, state coercion against citizens is forbidden. Therefore, Jayadi said "Well, this is actually the key. We really want to find out the mechanism as an executor so that the board of education has a role. The Parliament and the party must have the initiative to open up to the public, to do what is right. In Malang, there is no mechanism that regulates such matters (Discussion, 20 July 2016)."

Deliberative forums as explained by activists above are associated with the concept of the historical block as outlined by Thompson [12]. The historical block is a popular education forum for intellectual and moral reform toward collective strength as a counterweight to the coercive force, hegemony, and domination of the state.

2.2.4. Formation of the social movements of civic groups

The results of interviews with an activist from the FMPP demonstrated the positive effect of the social movements of MCW on the development of a public awareness to participate in public affairs, including budget policy. Suaib, an activist of the FMPP educated by MCW through FMPP, noted "I do not have any insight into it, but I had a passion for knowledge, and I learn from those understanding it, such as Faruk (Coordinator of Anti-Corruption Division of MCW). That's my background, so I was often invited to seminars at UB, UM, UIN, UNISMA, UMM, in Widya Gama (all universities in Malang City) (Discussion, 20 July 2016)."

Suaib's explanation above shows that there are changes in his mind-set before and after assistance from MCW. The intelligent mind-set provides a critical level of analysis and provides courage in monitoring and advocating further. As stated by Gaffar, intelligence, courage, and the criticality of the community are evidence of a productive social intellectual movement. The results of productive intellectual movement are apparent from the changes in the structure of the state because of activists' intelligence, courage, and the criticality of the community. Suaib recounted "In 2010, Malang experienced problems in the *Musrenbang* process, as developments were not in accordance with the existing budget. Then I was thinking about encouraging people to demand their rights, so that they could depose the head of the village through audits. Although I did not understand the audit, I was using simple language—a program needs this much funding, then it will be announced, then the results expected are this much, just that simple. This way is how I could do it right, deposing a head of a village. MCW knows all of the problems (Discussion, 20 July 2016)."

In short, the efforts of civic groups emphasize the collective power of civic groups to build awareness, courage, and criticality to address political forces and government so that the budget policy formulations can be run according to the principles of democracy.

Finally, realizing the budget policy (APBD) in favor of society requires a good relationship between the civic groups and local government, reflecting democratic principles, namely, participation, equality, and justice as shown in **Figure 2**. Thompson [12] says that the participatory principle means civic groups, including organizations, being involved in the Musrenbang process for budget planning. The equality principle means that civic groups and local governments have the same position in the Musrenbang process. The justice principle

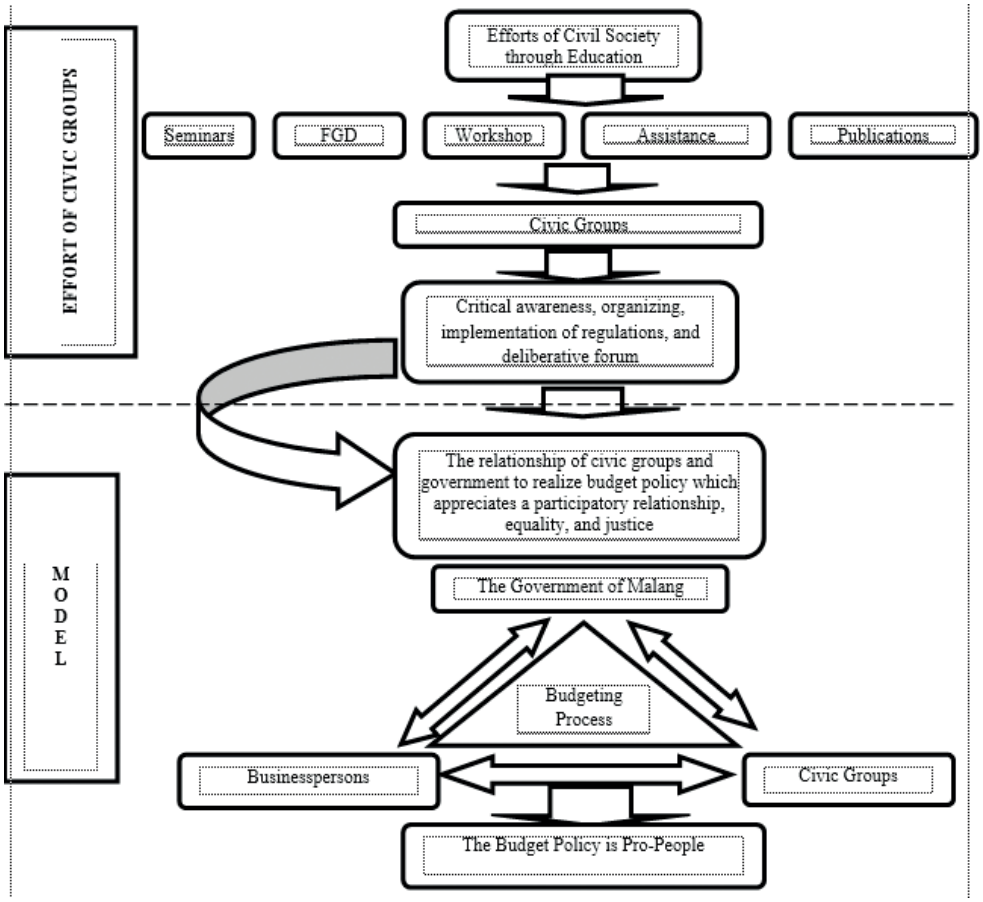

Figure 2. The relationship between local government and civic group in budget planning.

means that civic groups and local government interact to develop policy based on the principle of justice.

3. Conclusion

This study clearly indicates that local government dominated the civic groups and that the civic groups did not participate actively in the budget planning. The dominant role of the regional government in budget planning (the Musrenbang process) occurs through collusion between the Head of the Region, the Regional House of Representatives, and the Head of the SKPD (local government units). This finding is supported by a theory of state following Manan (2005), who argues that institutional states, like local government, tend to dominate all

the stages of the public policy process. In this case, the local government arranges the content of public policy based on officials and administrators' perspectives and interests. This is due to the local government having stronger authority and power than civic groups in the public policy process.

Therefore, civic groups, such as Malang Corruption Watch (MCW) and the Education Forum for Society of Malang (FMPP), work against the dominant role of the regional government through policy advocacy and civic education. The advocacy refers to supervision over the regional government during the establishment and implementation of the local government budget, while civic education refers to seminars, workshops, focus group discussions (FGDs), publications, training, and research. The purpose of education is to develop public awareness of good democracy and public participation in the establishment of the policy related to the regional government budget. In these ways, Gaffar [4], Jones [8], and Thompson [12] elaborate that the good ways to improve society's awareness are applying civic and political education and public discussion.

As indicated by the findings of this study, revealed above, the relationship between regional government (the executive-legislative) and civic groups in budget planning needs greater efforts toward creating a relationship based on democratic principles, such as participation, equality, and justice. There are some suggestions that would be useful for developing a constructive relationship between the local government and civic groups. Civic groups need to develop critical awareness to participate actively during the establishment of the regional government budget. Some methods to develop public awareness comprise education, seminars, workshops, FGDs, publications, training, and democratic schools for the society.

Firstly, civic groups should develop a collective force to make sure that the local government budget is allocated according to the public interest. Public awareness, as a collective force, should be able to compete against political force and bureaucracy so that the regional government budget emphasizes the needs of the local society. *Secondly*, instead of treating the regional government as opponents, local civil society should consider the government as partners in order to establish public-oriented regional government budgets. *Thirdly,* politicians and local bureaucrats should provide access to civic groups during the process of regional government budget policy-making so that the budget policy becomes a fair and responsible one.

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INTECH

Chapter 5

The Key Role of Integral Extension in Socio-Environmental Innovation towards Sustainable Rural Development

Aida Huerta-Barrientos

Additional information is available at the end of the chapter

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Abstract

In Mexico, traditional extension models have been linear, also they lack orientation towards the demands of the producers and the demands of the markets, the approach has been in general paternalistic and the attention is by individual producers. These extension models have not been sufficiently effective in promoting and adopting socio-environmental innovations to create value along the supply chain. The principal purpose of this chapter is to understand, on the one hand, the elements of a novel integral extension model, and on the other hand, its key role in socio-environmental innovation for contributing to achieve sustainable development in rural areas in Mexico. The integral extension model proposes the participation of extension workers as facilitators of the learning process to orient the change of attitudes and behaviors of local/regional actors, carrying out the socio-technical-environmental support to producers throughout the value chain perspective. Also, traditional and science-based knowledge need to interact synergistically ensuring that further value is added to traditional knowledge of local producers. In conclusion, integral extension system plays a crucial role in the implementation of strategies for sustainable rural development in Mexico because it promotes models of interactions among local/regional actors consistently with future as well as present needs.

Keywords: extension systems, value chain, socio environmental innovation, rural development

1. Introduction

Extension has been defined as a system aimed at facilitating producers, their organizations and other market actors, access to knowledge, information and technologies [1]. The extension is

intended to facilitate its interaction with its strategic partners in research, education, agribusiness and other relevant institutions, supporting them to develop their own technical, organizational and managerial skills and practices. At the global level, it has been recognized that extension systems constitute the most effective path to creatively reconstruct the entrepreneurial, social and ecological capacities of people in rural areas to successfully engage in production and livelihood activities that demand competitive orientation and sensitivity about the environment [2]. Extension in the world started in the sixteenth century, but until the nineteenth century, it was documented, particularly in Cuba where teaching process was developed in order to help small producers (SP) with last advances in science and technology. In fact, many conferences were promoted to SP in Europe and the United States [3]. As observed by Dart et al. [4], along time agricultural extension, has shifted from a focus on production to productivity-based agriculture and more recently, it emphasizes sustainability aspects. Also, institutional changes and participatory learning process have led the empowerment of local capacities [5]. In the 1950s decade, different programs were established worldwide based on recommended technology packages but without taking into account the farmer point of view [6]. Later, in the mid-1980s decade, the Farming Systems Research and Extension approach was introduced integrating the participation of farmers through the identification of their own needs and solutions [5]. Additionally, at this time, professionals were viewed as experts, so new technologies were passed from the scientific community to farmers via extension workers [7]. More recently, in the 1990s decade, rural development programs worldwide recognized the local participation of inhabitants as crucial to the sustainable adoption of new technologies [5]. Studies presented in [8–11] indicate that the main focus of extension work during the last decades has been the increment of food production and the diffusion of the benfits for adopting best practices. On the one hand, Allahyari [12] observed in Middle Eastern countries that the model for transferring technology was the prevalent practice for developing and spreading innovations, under the assumption that both transfer of technology and scientific knowledge to farmers will trigger the development. On the other hand, Garforth and Lawrence [13] observed in Asia that although extension programs had included the adoption of new technologies, the extension approaches and methods in the public sector continued to reflect the technology transfer paradigm.

Particularly, in Mexico, the traditional extension public service was established in the mid-1950s, oriented mainly by the federal government priorities with interest on basic crops to diffuse new technologies generated by agricultural research through a network of small producers [3]. Mexico started to shape its agricultural extension model by adopting some characteristics of the prevailing system in the United States [14]. The extension model was called "training and visit". This model was followed up by the beginning of the 1990s. In 1995, the National System of Training and Integral Rural Extension (SINDER) was established under the scheme based on the incorporation of technicians paid through subsidies to small producers and oriented to the attention of production systems with national priority. Within this framework, two programs were established and operated until the year 2000: Special Training and Extension Program (PECE) and Elemental Technical Assistance Program (PEAT). In these cases, the main role of extension workers was to reduce technological gaps through technical advice, exchange tours, demonstration plots and training workshops, that is, the same as in

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traditional extension. The result of such programs in terms of innovation was limited, given the lack of specific technical structures by the government agencies related to the rural environment, these began to occupy extension workers as managers of the programs. Another disadvantage of such programs was the low flexibility of interventions due to bureaucratic barriers. In addition to the dispersion of activities carried out by PEAT and PCE technicians, as well as the lack of justification for maintaining two independent extension programs. Six years later, the SINDER was canceled and a new extension model emerged, largely known as the Special Professional Services Program (PESPRO). The fundamental difference with the previous scheme was the design and implementation, suggested by PESPRO, of business productive projects taking into account the population served. The training and follow-up program was established through the INCA-Rural (National Training and Rural Technical Assistance Service). At the beginning of 2010, Chapingo Autonomous University and Postgraduate College carried out a study on the analysis on the Mexican Technical Assistance and Training Component operated by the Agriculture, Livestock, Rural Development, Fishery and Food Secretariat (Secretaría de Agricultura, Ganaderia, Desarrollo Rural, Pesca y Alimentación, SAGARPA) in the 32 federal states of Mexico. In this study, it was concluded that the Mexican extension system has had a low incidence in the capacity development of the actors involved in productive activities. Such conclusion was based on the occurrence of facts such as the perception that the extension system has not provided sufficient value to the actors involved, the low valuation of its capacity development and the low quality of the knowledge flows throughout the system [14]. One year later, in 2011, the OCDE carried out another study on the extension system in Mexico [15]. Among other conclusions, the OCDE highlighted that although Mexico has had many or all of the components of an innovation system such as PSPs (professional service providers), research centers, universities, etc., it was lacked of interaction among governmental institutions and collaboration and feedback channels that are characteristic of effective innovation systems.

According to Osorno Magaña [16], nowadays Mexico has all the elements for a rural extension system, but it cannot be considered as a system since there is no link between research and extension services. In this direction, the central problems of Mexican extension system are the lack of experience in articulation instances functionality, the poor strategic planning for extension and innovation, the isolated intervention of extension agents and other knowledge services, the strategies with lack of definition in their relevance, the lack of focus on training, extension and innovation actions, professionals with limited capacities to meet the needs of the rural population, strategies inadequate to the needs of rural territories, the limited change in technological or organizational practices. The negative effects that cause the problems before described are the following: lack of competitiveness of territorial agri-food chains, agricultural, livestock, fishery and aquaculture activities with low productivity and income, disruption among the public, social and private actors in rural extension and innovation [3]. Traditional extension models in Mexico have been linear, also they lack of orientation towards the demands of the producers and the demands of the markets, the approach is, in general, paternalistic and the attention is by individual producers [17]. This kind of extension models has not been sufficiently effective in promoting and adopting socio-environmental innovations to create value along the supply chain. So, it is necessary to develop and implement an

integral extension model in Mexico. The principal purpose of this chapter is to understand, on the one hand, the elements of integral extension model, and on the other hand, its key role in socio-environmental innovation for contributing to achieve sustainable development in rural areas in Mexico. Although public extension services suffer from restricted financial and human resources, it plays a crucial role in the implementation of strategies for sustainable rural development [18] because most developing countries have rural-based economies whose sustainability and productivity are linked to natural resources and management [5]. Within the sustainability paradigm, organizations must become a learning-adaptive organization where their learning-adaptive agents must able to respond to changes due to interactions with the complex environment. In this direction, new Weltanschauung, concepts, values, methods and behavior will emerge from the interactions among learning-adaptive agents.

The chapter is divided into five main sections. In Section 2, the current situation of Mexican extension systems is highlighted. The model of integral extension system in Mexico is described in Section 3. The key role of integral extension in socio-environmental innovation is analyzed in Section 4. Finally, the conclusions are drawn in Section 5.

2. The current situation of Mexican extension system

In Mexico, there are 117 million inhabitants of which 26–36 million counts as rural inhabitants. According to Dominguez Vizcarra [19], in Mexico, there are 4.34 million small producers of which 3.9 million have low access to technology, self-consumption and subsistence, whereas 442 thousand are in transition. As OCDE [20] states, in Mexico, the Article 27 of the Constitution recognizes two forms of land property:

- Small property also called the private property that is regulated by the civil right and controlled by the public registry of the property.
- Social property that is regulated by the agrarian right and controlled by National Agrarian Registry (RAN) structured in two modalities:
    - Ejidos, characterized by the fact that their origin is derived from the agrarian distribution of land, whose owner can dispose also for common use.
    - Communal land, characterized by the fact that its origin derives from the confirmation or restitution of land to indigenous communities that originally were established there and made use of them.

Figure 1 shows the distribution of land property regimen in Mexico. As it is observed, 52% of the land in Mexico is considered social property and just 38% is considered as private property.

Recently, it has become necessary to rethink a new model of extension in Mexico as one of the fundamental elements to overcome the conditions of poverty and marginalization suffered by many rural inhabitants, as well as to increase food production and conserve natural resources. For this reason, the SAGARPA through the Subsecretariat of Rural Development in conjunction with INCA-Rural, have been given the task of developing and making available the System of

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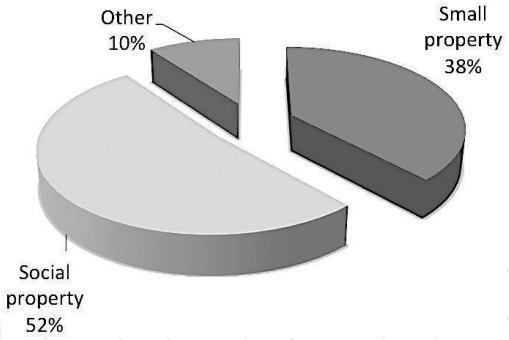

Figure 1. Distribution of land property regime in Mexico.

Mexican Rural Extension called SERMexicano (S = System ER = Rural Extension M = Mexican), as a useful tool in the promotion and socialization of services and results inherent to the new Mexican rural extension. SERMexicano system rescues, in essence, the useful elements of traditional extension and incorporates innovative actions and tools to form the new Rural Integral Extension, taking as a guiding axis, the work and leadership of extension workers [21]. The operation and implementation of SERMexicano are intended to bring the following benefits:

- To adequately orient the lines of action to promote and consolidate the new Mexican rural Extension through a meeting space, knowledge management, debate, exchange of experiences and collaborative work among actors involved in the Component of Extension and Productive Innovation, assisting producers in the solution of their specific problems classified by region, climate and product.
- Stakeholders, including farmers and producers, will be users of information flows since they are directly linked to the processes of rural development policies.

As Lopez Barbosa [22] explains: in Mexico, there are almost 4000 extension workers with contract, more than 100 extension workers-coordinators with contract and almost 400 university-extension workers (see **Figure 2**).

Figure 3 illustrates the distribution of extension workers by gender in the Northern, Central and Southern regions in Mexico. The participation of women in extension is prevalent in the Central region. Contrary, the participation of men in extension works is prevalent in Northern and Southern regions.

The technical skills of extension workers are shown in **Table 1** and **Figure 4**. The technical training is predominantly on agricultural sciences and veterinary. Additionally, extension workers have been invited to participate in certification programs in order to improve their qualifications in areas [22] such as:

- Provision of training courses for human capital in a group face-to-face manner.
- Formulation of rural investment project design.

- Formation of trainers for sustainable rural development.
- Facilitation of processes of innovation of competitive improvement with people.
- Design of collective human capital training courses face-to-face.
- Design of in-person training courses.
- Coordination of actions for the implementation of rural sector investment projects.
- Coordination of actions for sustainable rural municipal development.
- Consultancy for rural companies.
- Calibration of fertilizer planter for conservation tillage.
- Consulting.
- Application of good use and management of agrochemicals field section.

On the one hand, OCDE [15], in a study of the Analysis of Agricultural Extension in Mexico, argues that there is no specific agricultural extension service as such. Rather, farmers have technical assistance in accessing the various SAGARPA support programs as an integral

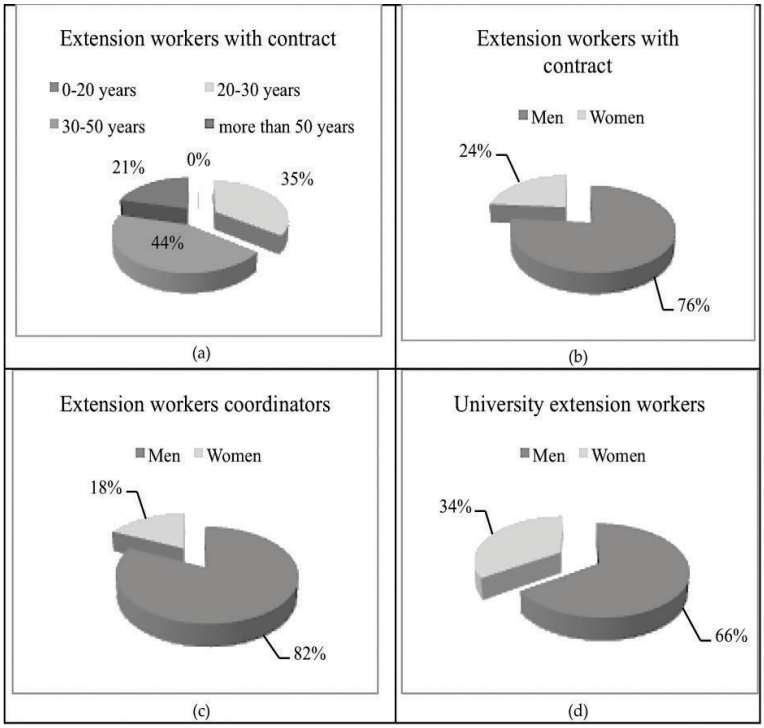

Figure 2. Distribution of (a) extension workers with contract by age, (b) extension workers with contract by gender, (c) extension workers-coordinators by gender and (d) university extension workers by gender.

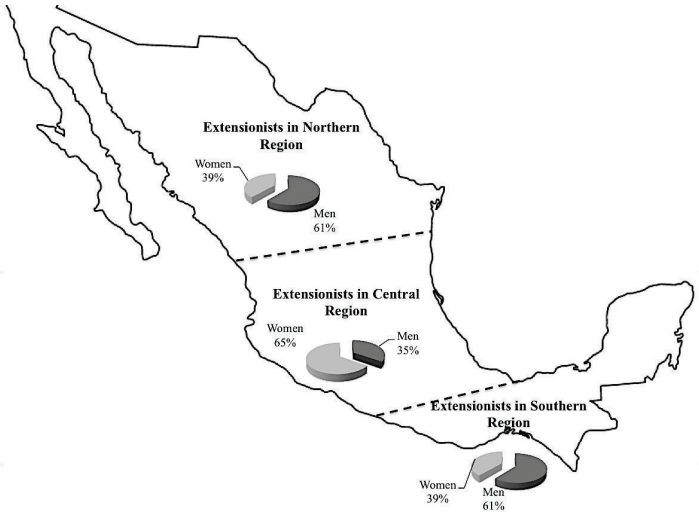

Figure 3. Distribution of extension workers by gender in the northern, central and southern regions in Mexico.

Technical skill	Percentage
Agricultural sciences	56.1
Vet	20.2
Biologist	5.8
Management	4.5
Other	4.4
Industrial production and food	2.3
Accounting	1.7
Fishing	1.5
Commerce	0.9
Forest sciences	0.7
Managerial information	0.6
Building	0.4
Social service	0.4
Farm equipment	0.3
Electricity and electronic	0.1
Travel services	0.1

Table 1. Technical skills of extension workers in Mexico.

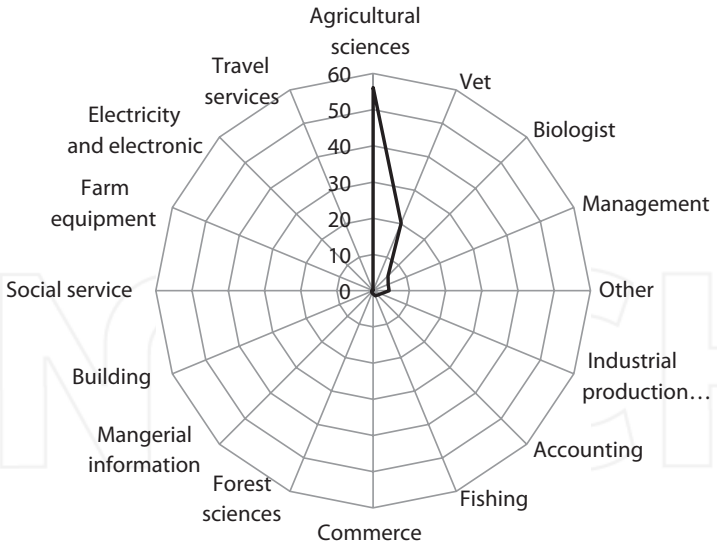

Figure 4. Technical skills of extension workers in Mexico.

part of them. Also, technical assistance is provided through private sector contractors, i.e. professional service providers (PSP), whose function is to implement the programs at the farm level. Then, professional services defined for this purpose include strategic planning, project formulation, access to public resources, technical advice, business strategies and training, among others and its objective is to support farmers to increase their efficiency and facilitate their incorporation into value chains. On the other hand, Robles Berlanga [23] makes the point that the technical assistance and training services of extension in Mexico remain disconnected from results, the range of population included in the extension program is still small, even lower than those granted in 1991, the support for production, technical services and financing are decoupled, and the training system is inefficient, that means high cost in relation to its coverage and poor quality of service. Finally, security is missing for service providers. In consequence, small producers have not access to productive water, improved seeds, fertilizers and technology, their participation in organizations to prevent economies of scale for production, marketing and access to public goods, is weak. As reported by Vega [24], although extension service has changed in Mexico, now as a private service with public payment, with more flexible work programs and a significant budget, however, it has not yet established itself as an important element of socio-environmental innovation.

3. A model of integral extension system in Mexico

In Ref. [22], the main characteristics of integral extension work in Mexico are proposed to be as follows:

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- The rural producer must be human before an economic agent.
- Collaboration among actors to expand and strengthen actions.
- Incorporation of technological tools for the registration, selection and monitoring of the activity of extension worker.
- Promotion of innovation and technological development.
- Creation of competent markets.
- Development of human, social and economic capacities.
- Innovative vision on the market, process, product, social, institutional and personal.
- Strengthen the roots of the earth.
- Orientation to the change of attitudes and behaviors.
- Transformation of public welfare policies towards productivity.
- Encourage partnership among rural producers.

In this direction, the training needs of extension workers must arise from the innovation needs of the value chain to which they provide their services [19]. So, the role of extension workers needs to change from transferring knowledge and technology to consultants and facilitators of the learning process [25].

As Villareal [26] states, the five basic elements of the global value chain are innovation, supply chain, manufacturing, logistic distribution and marketing. The basic elements must be conceived as processes within a system, so none of them functions in isolation as is shown in **Figure 5**. Thus, Villareal [26] adds that in the first place, commercial capital is linked to intel-

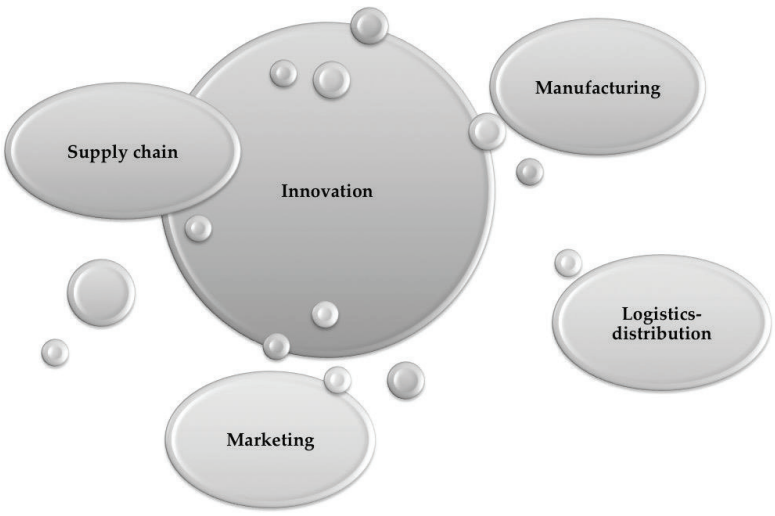

Figure 5. The five basic elements of the global value chain [26].

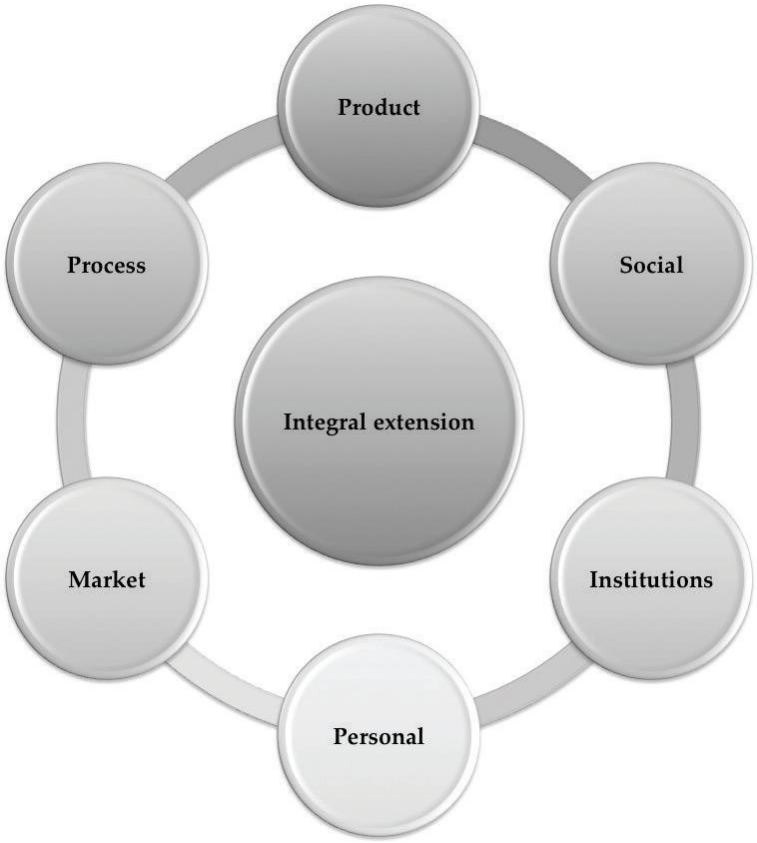

Figure 6. Innovation dimensions for supporting the value chain proposal.

lectual capital, establishing a close link among all the links in the chain. Second, supply chain, distribution and logistics systems must be responsive and reliable to put the right product on the counter before the competition does. Thirdly, manufacturing must be flexible in order to be able to rapidly adapt the production system. Finally, the articulation of a value chain must be effective and efficient.

According to SAGARPA, the extension workers should have an integral vision, carrying out the technical support to producers, throughout the value chain perspective supported by six innovation dimensions illustrates in **Figure 6**. The product dimension includes the improvement of the primary production and transformation processes. The social dimension promotes the improvement in association among rural producers. The institutions dimension promotes the innovation in the design and implementation of public policies generating synergy among all actors. The personal dimension promotes increasing the belonging feeling of rural producers with respect to their own communities. The market dimension promotes to produce what is sold. Finally, the process dimension promotes attending the real demand of products.

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4. The key role of integral extension system in socio-environmental innovation

In Ref. [27], the socio-environmental innovation is defined as a process of gradual change through action research in localized territories, which implies that a set of actors, based on their own interests, mission and capacity, participate in specific activities (scientific, technological, environmental, cultural, organizational, financial and commercial) whose orientation is not only to give a creative answer to linked problems of rural development and conservation of natural resources, but also to generate learning that lead to the autonomy of the actors and structural transformations that are reflected in the collective benefit. Following Ref. [27], the socio-environmental innovation seeks to generate a flow of relevant information through channels and networks of interaction, promote the process of generation and diffusion of innovations and emphasize as a central aspect the interconnection of these channels and networks. In this direction, the participation of extension workers in the socio-environmental innovation process needs to be as facilitators of the learning process to orient the change of attitudes and behaviors of local actors, promoting the adoption of innovations for local/regional development.

FAO [3] has made some recommendations, including the need to change the focus on the type of extension needed to develop the capacities of producers and to promote innovation, and points out that this approach should consider, among other things:

- Multi-disciplinary, with the transfer of research technologies, towards access to markets and climate change.
- The research and extension system must respond more to the needs and demands of producers to motivate innovation.
- Education institutions should be involved in this process, with the development of training materials on productive management, marketing, cooperation, etc.

The FAO-Capacity Development Framework [28] discusses functional and technical capacities across three levels: individuals, organizations and the political-institutional environment. For instance, the individual technical capacities include the competences for the evaluation of the diagnosis of the innovation capacity of systems, the technical and functional capabilities to promote appropriate innovations and technologies, the understanding of participatory approaches, the training in organization and associativity, the understanding of markets and value chains, the understanding of changing forms on climate, social and economic vulnerability and the use of new information and communication technologies (ICT). While the individual functional capacities include the mobilization of communities, the development of farmers' organizations, the directed self-reflection training, the expert advice to achieve improvement, the reflective learning, the mediation in conflicts, the negotiation, the intermediation in the creation of relations among a wide range of actors, the development of networks and associations, the changes in policies and institutions, the leadership ability to inspire and motivate, the resource management (human and financial), the critical thinking, the problem-solving, self-reflection and learning based on errors, the mentality of service; accountability, responsibility; commitment to work in multi-organizational and working with rural women.

Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment [29]. These sophisticated sets of understanding, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview. Following Ref. [29], traditional knowledge supports the decision-making at local level about aspects of day-to-day life such as hunting, fishing, gathering, agriculture, preparation, conservation and distribution of food, location, collection and storage of water, coping with disease and injury, interpretation of meteorological and climatic phenomena, manufacture of clothing and tools, construction and maintenance of shelter, management of ecological relationship of society and nature and adaptation. It is important to note that at the local level in territories, traditional and science-based knowledge should interact synergistically in the socio-environmental technology-based innovation and other creative processes, ensuring that further value is added to traditional knowledge being relied upon by small producers [30]. In this direction, traditional knowledge must be revalorized for providing local people with the strategic capacity for the harnessing of extra-local forces in a market economy [31]. In Ref. [32], the following principles for the use of traditional knowledge in achieving goals relating to sustainable development:

- Ensure the full and effective participation of traditional knowledge holders during all stages of elaboration of sustainable development policies, plans and programs, alongside the scientific and technological community.
- Acknowledge and respect the social and cultural bases, including the authority structures within which traditional knowledge is embedded.
- Recognize the rights of traditional people to own, regulate access and share benefits of their unique sets of knowledge, resources and products.
- Ensure that traditional knowledge holders are fully informed of potential partnerships and that these are only entered into with prior informed consent.
- Promote models for environmental and sustainable governance that incorporate principles of genuine partnership and collaboration between scientific and traditional knowledge;
- Promote training to better equip young scientists and indigenous people to carry out research on traditional knowledge.

5. Concluding remarks

Extension, worldwide started in the sixteenth century, has been defined as a system aimed at facilitating producers, their organizations and other market actors, access to knowledge, information, new technologies and last advances in science. Extension systems have been considered as the most effective path to creatively reconstruct the entrepreneurial, social and ecological capacities of people in rural areas to successfully engage in production and livelihood activities that demand competitive orientation. However, in Mexico, some prob-

lematic situations such as the isolated intervention of extension workers, the lack of focus on training, extension and innovation actions, the extension workers with limited capacities to meet the needs of the rural population, etc., have delayed the adoption of innovations in rural areas. This chapter presented the elements of a novel integral extension model and described its key role in socio-environmental innovation for contributing to achieve sustainable development in rural areas. The importance of the integral extension system is based on the collaboration among local/regional actors for incorporating technological advances and promoting the adoption of innovations. In this case, extension workers must act as facilitators of the learning process of local/regional actors, carrying out the socio-technical-environmental support to small producers, throughout the value chain perspective. So, the training needs of extension workers must arise from the innovation needs of the value chain to which they provide their extension services. In conclusion, integral extension system plays a crucial role in the implementation of strategies for sustainable development in rural areas in Mexico because it promotes models of interactions among local/regional that incorporate principles of exploitation of resources, the direction of investment, the orientation of technological development and institutional change consistently with future as well as present needs.

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INTECH

Chapter 6

Export, Import, Economic Growth, and Carbon Emissions in Bangladesh: A Granger Causality Test under VAR (Restricted) Environment

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Additional information is available at the end of the chapter

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Abstract

Purpose: This paper examines the causal and cointegrating relationship between economic growth and CO_2 emissions in a multivariate framework by including imports and exports as others control variables for an emerging economy like Bangladesh.
Design/methodology: The paper applied vector error correction model (VECM) Granger casualty test for assessing the direction of causality and variance decomposition to explain the magnitude of the forecast error variance determined by the shocks to each of the explanatory variables over time. LB (Q-stat) test is to determine data properties and WILD test is to assess short run causality from independent variables to dependent variable.
Findings: The study results revealed that variables are integrated in the same order. The results of Johansen Juselius cointegration tests indicate that there is a unique long-term or equilibrium relationship among variables. Again, Granger causality test revealed that short run unidirectional causality are running from carbon dioxide emission to exports, GDP to import, and from import to carbon dioxide emissions. Variance decomposition function shows that the positive shocks in error term will produce positive effects on all variables in the long run. Therefore, a concerted effort from all national and international stakeholders, i.e., enterprises, consumers, and governments are expected to take measures to offset carbon emission and pursue environment-friendly trade plan for better managing the cities and regions in order to fight against global warming and climate change risk.

Keywords: GDP, exports, CO_2 emission, imports, VECM, climate change, carbon management

1. Introduction

Rise of global average temperatures and its impacts on climate change is now a burning issue. The Intergovernmental Panel on Climate Change (IPCC) often claimed that any given level of warming is associated with a range of cumulative CO_2 emissions. Scientists emphasize on climate targets, carbon budgets, and emission reductions pathways to meet the 2°C target. Evidence shows that industrial revolutions and trade liberalization afterwards have made excessive use of energy, (i.e., gas, coal, electricity, fossil fuels, etc.), infrastructures (i.e., road, buildings), which resulted in deforestation, aviation services, and other forms of transportation for making goods available in other countries through export & import and business trips worldwide, which has emitted thousand tons of carbon. In depth analysis perhaps will lead to the conclusion that all the dimensions of globalization somehow affect the natural environment. Globalization accelerates structural change, thereby altering the industrial structure of countries, and hence resource use and pollution levels increase [1]. It has been widely accepted that trade is the part of development of the modern economy and in the globalization era, trade is considered as the power of economic development. Moreover, globalization intensifies trade liberalization, and trade-related activities and trade activities effect on the environment when all goods and services produced in the economy directly and indirectly associated with uses of power and energy (various petroleum, oil, gas), which are obvious for all countries [1]. Therefore, intensive research is required in identifying causal relationship among international trade, economic development, and environmental pollution, so that countries can well articulate appropriate environmental policies without affecting economic growth. Countries having weak and inappropriate environmental regulations can attract more harmful trade negotiations. Copeland and Taylor [2] argued that under certain circumstances, the pollution-intensive industries migrated to countries having economic growth with weaker environmental regulation. The purpose of this study is to investigate the causal relationships between the export and import, CO_2 emissions and economic growth in Bangladesh for the period between 1972 and 2013; and examine the stability properties of the variables as a prerequisite for cointegration and error correction analyses. The questions this study seeks to answer are formulated as follows:

- Is there a (Granger) causal link between export-import and GDP?
- Is there a (Granger) causal link between GDP and CO_2 emissions? What is the direction of this causality?

The next sections of this study are organized as follows: section two focuses literature on climate change, carbon emissions, and their causal link with trade and economic growth; section three explains material and methods used in the study; section four shows findings of unit root test, cointegration test, vector error correction model (VECM) with impulse function; and finally based on findings, section five draws conclusion and recommendation for carbon cap and sustainable trade implication.

2. Carbon emission: global warming & climate change

CO_2 emissions attract worldwide attention now-a-days as it is claimed that they are the main contributors to global warming, which are created mainly by burning fuels like petrol, organic-petrol, oil, natural gas, diesel, organic-diesel, and ethanol. While some say that global warming is resulting from a natural process like respiration and that there have always been greenhouse gases; however, it is frequently observed that the Industrial Revolution had a big part to play in the amount of atmospheric CO_2 being released. Live science produced detail reports about the causes of carbon emissions along with their remedy [3]. According to the 2010 Global Forest Resources Assessment, nearly a billion tons of carbon are being released to the atmosphere every year due to deforestation. More importantly, global warming, however, is resulting from atmospheric circulation, which influences rainfall patterns, plant and animal extinctions, ocean acidification, as well as, leads to big environmental and social changes, and challenges like extreme weather, rising sea levels, and unprecedented social upheaval for people all across the globe.

3. Drivers of carbon emissions and rational to study their causal dimension

Population and the size of the economy are two major drivers of absolute emissions. From the chart, we can see that the largest absolute emitters comprised 61% of global population and 75% of global GDP in 2012 [4]. The top 10 emitters produce around 70% of global emissions, based on historical emissions data from CAIT Climate Data Explorer (**Figure 1**).

Economic growth of countries impels an intensive use of energy, which results in growing CO_2 emissions, so pollution is directly linked with economic growth and development; such strong association induces researches over the decade to explore directional relations between them. Çakir and Başarir [5] find evidences of unidirectional causal relationship between the tourist arrivals and financial development. Their study also found a bidirectional causality relationship between CO_2 emission, financial development, and energy and tourist arrival. Attention toward exploring causal relationship between energy consumption, CO_2, and economic growth is dramatically increasing now-a-days, as global warming and climate change poses threats to all living beings in the planet. State governments' planning toward economic growth must consider the determinants of economic growth and potential contribution of such determinants toward the environments. Economic growth very often are achieved through rapid industrialization, increased trade in the forms of import & exports, growing urbanization, which contributed toward deforestation and resulted in global warming, climate change, and environmental degradation. Thereby, numerous studies conducted in many regions in the world attempted to investigate the causal link among CO_2 emissions, energy consumption, industrial development, and economic growth [6–20]. Most of the studies found either unidirectional or bidirectional relations and reaches to conclusions that the higher economic growth rates are very often associated with the

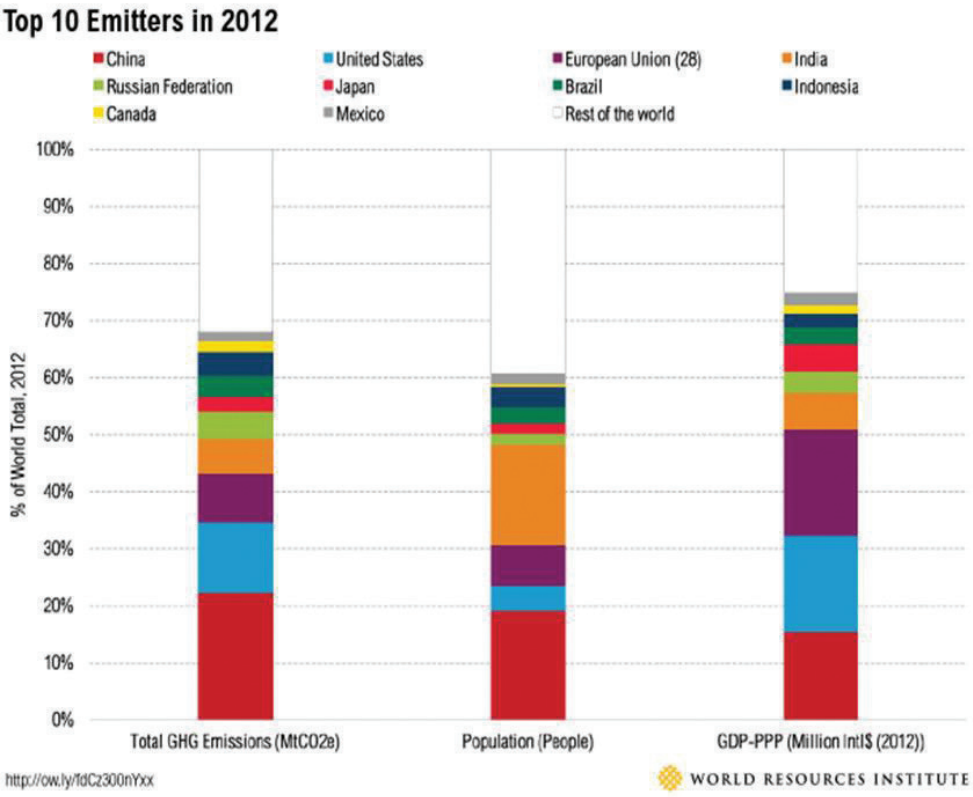

Figure 1. Top 10 emitters in 2012.

consumption of larger quantity of energy, which in turn has the impact on carbon dioxide emissions. There however, remains a confusion regarding whether energy consumption is a stimulating factor for or a result of economic growth. Therefore, a renewed interest in examining the relationship between these variables are still required for improved policy initiative and adaptation of appropriate and efficient technology to fight against global warming in order to mitigate climate change effects.

Although small developing and underdeveloped economies are not the major CO_2 emitter; however, consequences of global warming will affect everyone. Moreover, the global emissions profile has been changing due to international pressure of carbon budget (**Figure 2**) and carbon tax. In response to building decarbonized economy, developed countries are more capable in adopting innovative and efficient technologies to reduce the effect of global warming. Kelly Levin reported that in 1990, 66% of global emissions came from developed countries; while in 2013, that figure had dropped to 38% (i.e., EU set example by reducing 5.9% emission during

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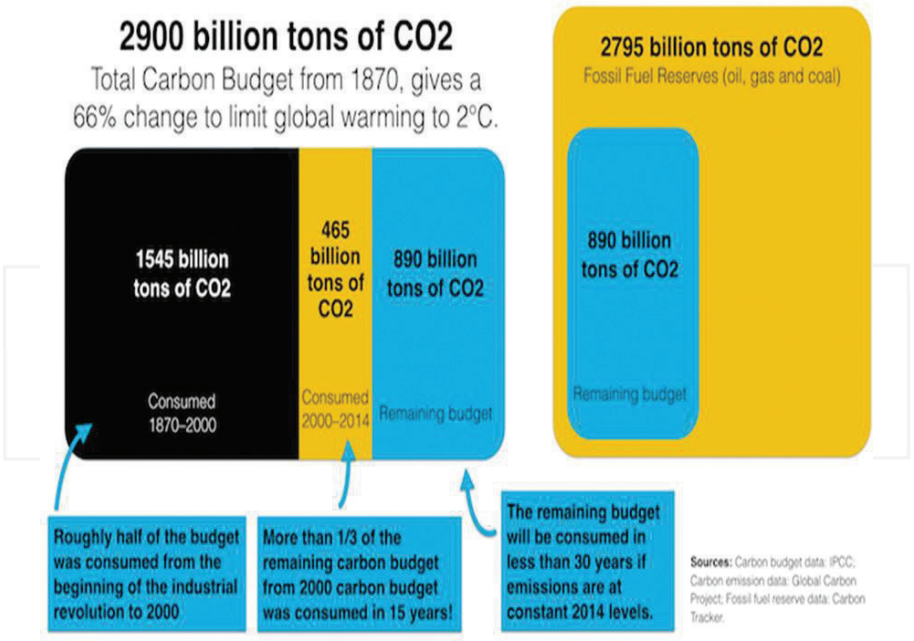

Figure 2. Carbon budget.

2013–2014) [21]. Therefore, identifying the casual relations among CO_2 and economic growth dynamics may help to develop appropriate carbon management plan for sustainable economic growth (**Figure 2**).

4. Material and methods

Vector autoregression (VAR)-based Granger causality test is employed in order to determine the causal link between the chosen variables. The data for the study are of the time series form and were collected from several reliable sources. Data related to the exports and imports of Bangladesh, have been collected from the Bangladesh Bureau of Statistics (BBS) (www.bbs.gov.bd). Economic growth has been used as a proxy of real GDP, which has been collected from the database of world Bank (http://data.worldbank.org/country/bangladesh) and data related to the environmental pollution, especially carbon (CO_2) emissions, have been collected from the Carbon Dioxide Information Analysis Center (CDIAC) (www.cdiac.ornl.gov). Data have been measured for 41 years, which were covered from 1972 to 2013 time periods. Data from 2013 onward were intentionally avoided as the climate change action plans were mostly designed before 2013 but not being pursued rigorously within that time period. Summary of descriptive statistics are given in **Table 1**.

	CO_2	Export	GDP	Import
Mean	25772.48	90.30788	4.96E + 10	103.2684
Median	23422.96	60.65112	4.38E + 10	77.25993
Maximum	57069.52	382.5200	9.93E + 10	407.6765
Minimum	7638.361	11.32173	2.32E + 10	25.89463
Std. Dev.	15577.69	94.08567	2.21E + 10	94.09631
Skewness	0.649886	1.478441	0.743401	1.657838
Kurtosis	2.185320	4.589869	2.432816	5.169804
Jarque-Bera	3.137481	15.02778	3.376373	20.93568
Probability	0.208307	0.000545	0.184854	0.000028
Sum	824719.3	2889.852	1.59E + 12	3304.589
Sum Sq. Dev.	7.52E + 09	274415.5	1.51E + 22	274477.6

Table 1. Descriptive statistics of dependent and independent variables.

The model intends to establish the relationship among export, import, GDP, and CO_2 emissions of Bangladesh where it can be expressed in the following basic multivariate model.

$$Y_t = \alpha + \beta\ Exp_t + \beta\ \mathrm{Im}p_t + +\beta GDP_t + \varepsilon_t \tag{1}$$

where Y_t is total carbon emissions, Exp_t is export, Imp_t is import, and GDP_t is real gross domestic product t, and ε_t is white noise. Logarithmic transformation of the above equation and inclusion of a trend variable would leave the basic equation as follows

$$LY_t = \alpha_0 + \alpha_1 t + \beta\ Exp_t + \beta\ \mathrm{Im}p_t + \beta GDP_t + \varepsilon_t \tag{2}$$

where, t is the trend variable.

In this study, Granger causality test will be used in order to test the hypothesis regarding the presence and direction of causality among carbon emissions, export, import, and economic growth.

A stationary time series refers to the series with a constant mean, constant variance, and constant auto covariance for each given lag [22]. The use of nonstationary data usually leads to spurious regressions. Thus, there is a need to conduct a unit root test to determine the order of integration of the variables using the Augmented Dickey Fuller test Dickey and Fuller [23]. The Augmented Dickey Fuller regression

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \Sigma\ \beta_i \Delta Y_{t-I} + U_t \tag{3}$$

where $\Delta Y_t = Y_t - Y_{t-1}$ is the difference of series Y_t.

α_0, γ, β_i, are parameters to be estimated and Ut is a stochastic error term. The null hypothesis of nonstationarity (presence of unit root) is accepted if $\gamma = 0$, while the null hypothesis of nonstationarity is rejected if $\gamma < 0$. This implies that if H_0 cannot be rejected, then the series has a unit root but if otherwise, then the series does not have a unit root.

The Granger method in this study involves the estimation of the following equations:

$$LY_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} LY_{t-i} + \sum_{i=1}^{q} \beta_{2i} LExp_{t-i} + \sum_{i=1}^{q} \beta_{2i} L\,\mathrm{Im}\,p_{t-i} + \sum_{i=1}^{q} \beta_{2i} LGDP_{t-i} + \varepsilon_{1t} \quad (4)$$

$$LGDP_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} LY_{t-i} + \sum_{i=1}^{q} \beta_{2i} LExp_{t-i} + \sum_{i=1}^{q} \beta_{2i} L\,\mathrm{Im}\,p_{t-i} + \sum_{i=1}^{q} \beta_{2i} LGDP_{t-i} + \varepsilon_{1t} \quad (5)$$

$$LExp_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} LY_{t-i} + \sum_{i=1}^{q} \beta_{2i} LExp_{t-i} + \sum_{i=1}^{q} \beta_{2i} L\,\mathrm{Im}\,p_{t-i} + \sum_{i=1}^{q} \beta_{2i} LGDP_{t-i} + \varepsilon_{1t} \quad (6)$$

$$L\,\mathrm{Im}\,p_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} LY_{t-i} + \sum_{i=1}^{q} \beta_{2i} LExp_{t-i} + \sum_{i=1}^{q} \beta_{2i} L\,\mathrm{Im}\,p_{t-i} + \sum_{i=1}^{q} \beta_{2i} LGDP_{t-i} + \varepsilon_{1t} \quad (7)$$

5. Result of the analysis

5.1. Correlogram test

Analysis of inherent properties of variables is imperative in time series analysis under different models. In order to determine the nature of data, we use Correlogram test. From **Table 2**, it is obvious that variables are nonstationary at level but after first differentiation, variables become stationary, which is considered as a predominant condition for a number of time series analysis model.

Selection of optimal Lag is inevitable for time series analysis when data are nonstationary at level and stationary after first difference. We chose Akaike information criterion (AIC) Model for Lag selection and the results have been shown in **Table 3**.

Variables	At level (Ljung-Box)			First difference (Ljung-Box)		
	Q-stat	P-value	Decision	Q-stat	P-value	Decision
GDP	111.87	0.000	Nonstationary	92.895	0.1525	Stationary
CO_2	108.54	0.000	Nonstationary	17.053	0.382	Stationary
Import	65.321	0.000	Nonstationary	10.551	0.394	Stationary
Export	72.926	0.000	Nonstationary	12.672	0.243	Stationary

Table 2. Results of LB (Q-statistics).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−1123.406	NA	2.18e + 31	83.51152	83.70350	83.56861
1	−994.0011	210.8814	4.99e + 27	75.11119	76.07107*	75.39661
2	−982.4785	15.36339	7.59e + 27	75.44285	77.17064	75.95661
3	−956.7385	26.69334*	4.70e + 27	74.72137	77.21706	75.46347
4	−929.5737	20.12210	3.53e + 27	73.89435	77.15794	74.86478
5	−893.2059	16.16348	2.61e + 27*	**72.38562***	76.41711	73.58439*

*indicates lag order selected by the criterion.
LR, sequential modified LR test statistic (each test at 5% level); FPE, final prediction error; AIC, Akaike information criterion; SC, Schwarz information criterion; HQ, Hannan-Quinn information criterion.

Table 3. Lag selection models outcome.

5.2. Unit root test

Summary results of different unit root tests (**Table 4**) reveal that at level, all methods of P-value is significantly higher than 5%, so we cannot reject the null hypothesis rather we accept that there is a unit root that means that data are nonstationary at level. After first difference of unit root test, results show that P-value of each method is lower than 5% of critical value, which means that we can reject null hypothesis, rather we can accept alternative hypothesis which means that data are stationary at first difference.

Unit root test conforms that after first difference, data become stationary such that nature of time series data motivates to go for testing cointegration among variables.

5.3. Cointegration analysis

There is a need for cointegration test in order to examine whether there is a long-term equilibrium among $LnCO_2$, LnGDP, LnExport, and LnImport. Johansen Juselius's cointegration test is

Null: unit root (assumes common unit root process)				
	At level		**First difference**	
	Statistic	**P value**	**Statistic**	**P value**
Levin, Lin, & Chu t*	1.50156	0.9334	−7.77291	0.0000*
Null: unit root (assumes individual unit root process)				
Im, Pesaran, and Shin W-stat	3.57258	0.9998	−10.2802	0.0000*
ADF–Fisher Chi-square	0.42572	0.9999	91.0505	0.0000*
PP–Fisher Chi-square	1.64834	0.9900	154.096	0.0000*

*Null hypothesis is rejected at 5%.

Table 4. Summary of units root test results.

Hypothesized no. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None*	0.604939	51.51861	47.85613	0.0218
At most 1	0.250739	17.15617	29.79707	0.6285
At most 2	0.160272	6.475462	15.49471	0.6393
At most 3	0.000335	0.012396	3.841466	0.9111

Trace test indicates one cointegratingeqn(s) at the 0.05 level.*denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values.

Unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized no. of CE(s)	Eigenvalue	Max-eigen statistic	0.05 critical value	Prob.**
None*	0.604939	34.36244	27.58434	0.0058
At most 1	0.250739	10.68070	21.13162	0.6791
At most 2	0.160272	6.463066	14.26460	0.5545
At most 3	0.000335	0.012396	3.841466	0.9111

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level.*denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values.

Table 5. Johansen-Juselius cointegration tests results.

used because data satisfy two important criteria such as data are stationary at level and integrated at same level, which means that after first difference data become stationary (**Table 5**).

The results from JJ cointegration tests indicate that there is a unique long-term or equilibrium relationship between variables. Both trace statistics and λ-max statistics show that there exists one cointegrating vectors at 5% significance level (**Table 6**).

So, long run cointegration can be developed under VAR (restricted) environment.

$$LY_t = 1.695 - \sum_{i=1}^{q} 16.595 LExp_{t-i} + \sum_{i=1}^{q} 41.364 L\,\mathrm{Im}\,p_{t-i} - \sum_{i=1}^{q} 23.389 LGDP_{t-i} + \varepsilon_{1t} \quad (8)$$

	Coefficient	Standard error	t-statistics
Imports(−1)	41.36380	(2.14208)	[−19.3101]
Exports(−1)	−16.59512	(1.39595)	[11.8881]
GDP(−1)	−23.38893	(1.09083)	[21.4415]
Intercept	1.649468		

Table 6. Long run cointegration equation coefficient under VECM.

Null hypothesis	Obs	F-Stat	Prob.	Outcome
DGDP does not Granger cause DCO_2	35	2.25	0.0844	Does not Granger cause
DCO_2 does not Granger cause DGDP		1.99	0.1192	Does not Granger cause
DEXPORTS does not Granger cause DCO_2		0.88	0.5062	Does not Granger cause
DCO_2 does not Granger cause DEXPORTS		2.89	0.0373*	CO_2 emission Granger cause exports
DIMPORTS does not Granger cause DCO_2		2.75	0.0445*	Imports Granger cause CO_2
DCO_2 does not Granger cause DIMPORTS		0.93	0.4800	Does not Granger cause
DEXPORTS does not Granger cause DGDP		2.21	0.0894	Does not Granger cause
DGDP does not Granger cause DEXPORTS		1.40	0.2623	Does not Granger cause
DIMPORTS does not Granger cause DGDP		1.73	0.1674	Does not Granger cause
DGDP does not Granger cause DIMPORTS		5.35	0.0023*	GDP ganger cause imports
DIMPORTS does not Granger cause DEXPORTS		0.67	0.6464	Does not Granger cause
DEXPORTS does not Granger cause DIMPORTS		1.12	0.3770	Does not Granger cause

Table 7. Pairwise Granger causality tests.

5.4. Granger causality test

Test of cointegration conformed that there is a long run association among variables, which means that in long run variables move together. But still there is a scope to establish directional relationship among variables. The result of Granger causality test on $LnCO_2$, LnIm, LnEx, and Ln GDP is illustrated in **Table 7**.

The findings indicate that short run unidirectional causality running from carbon dioxide emission to exports, import to CO_2, and GDP to import in Bangladesh. Although previous studies in Malaysia [24, 25] found that an increase in economic growth causes an increase in CO_2 emission. In this study, GDP has been used as a proxy of economic growth. Bangladesh is mainly characterized as a rural-based poor economy, which is moving toward rapid urbanization through industrialization and deforestation, which increases CO_2. Industrialization ultimately will lead to export and import along with CO_2 emission. Thus, the Granger causality results are very relevant with this situation. However, as economic growth Granger causes imports, there is enough scope to purchase more carbon offset, i.e., innovative source of renewable energy and sustainable technology which, in the long run, can intensify more sustainable economic growth of the country.

5.5. Vector error correction model

Since, it is obvious from cointegration test that variables are cointegrated, a valid error correction model should also exist among variables. We, therefore, priced to test VECM to establish long run relations between dependent and independent variables. **Table 8** shows model results under restricted vector autoregressive (VAR), it is revealed from VEC Model that there is a long run causality from imports, exports, and GDP to CO_2.

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$$\begin{aligned}D(CO_2) = {} & C(1)^*(CO_2(-1) - 41.3637963874^*IMPORTS(-1) + 16.5951217241^*EXPORTS(-1) \\ & + 23.3889289266^*GDP(-1) - 1.64946834684) + C(2)^*D(CO_2(-1)) \\ & + C(3)^*D(CO_2(-2)) + C(4)^*D(CO_2(-3)) + C(5)^*D(CO_2(-4)) + C(6)^*D(CO_2(-5)) \\ & + C(7)^*D(IMPORTS(-1)) + C(8)^*D(IMPORTS(-2)) + C(9)^*D(IMPORTS(-3)) \\ & + C(10)^*D(IMPORTS(-4)) + C(11)^*D(IMPORTS(-5)) + C(12)^*D(EXPORTS(-1)) \\ & + C(13)^*D(EXPORTS(-2)) + C(14)^*D(EXPORTS(-3)) + C(15)^*D(EXPORTS(-4)) \\ & + C(16)^*D(EXPORTS(-5)) + C(17)^*D(GDP(-1)) + C(18)^*D(GDP(-2)) \\ & + C(19)^*D(GDP(-3)) + C(20)^*D(GDP(-4)) + C(21)^*D(GDP(-5)) + C(22) \end{aligned} \quad (9)$$

CointegratingEq:	**CointEq1**			
$CO_2(-1)$	1.000000			
IMPORTS(−1)	−41.36380			
	(2.14208)			
	[−19.3101]			
EXPORTS(−1)	16.59512			
	(1.39595)			
	[11.8881]			
GDP(−1)	23.38893			
	(1.09083)			
	[21.4415]			
C	−1.649468			
Error correction	$D(CO_2)$	D(IMPORTS)	D(EXPORTS)	D(GDP)
CointEq1	−0.005225	−0.002942	0.052260	−0.010698
	(0.00500)	(0.01568)	(0.01117)	(0.00797)
	[−1.04416]	[−0.18767]	[4.67733]	[−1.34169]
$D(CO_2(-1))$	−0.333024	−0.192240	0.654389	−0.403684
	(0.27644)	(0.86621)	(0.61728)	(0.44053)
	[−1.20468]	[−0.22193]	[1.06011]	[−0.91636]
$D(CO_2(-2))$	−0.631720	−0.546011	−0.256822	0.235995
	(0.24304)	(0.76156)	(0.54270)	(0.38730)
	[−2.59924]	[−0.71697]	[−0.47323]	[0.60933]
$D(CO_2(-3))$	0.063992	0.634957	−9.58E-05	0.033521
	(0.22272)	(0.69789)	(0.49733)	(0.35492)
	[0.28732]	[0.90983]	[−0.00019]	[0.09445]
$D(CO_2(-4))$	−0.441036	−0.367313	−0.139453	0.023142
	(0.20042)	(0.62802)	(0.44754)	(0.31939)
	[−2.20051]	[−0.58488]	[−0.31160]	[0.07246]

CointegratingEq:	CointEq1			
D(CO_2(−5))	−0.561520	−0.748745	0.086342	−2.54E-05
	(0.21334)	(0.66848)	(0.47637)	(0.33997)
	[−2.63209]	[−1.12007]	[0.18125]	[−7.5e-05]
D(IMPORTS(−1))	−0.390623	−0.590689	1.291104	−0.307429
	(0.21073)	(0.66032)	(0.47056)	(0.33582)
	[−1.85365]	[−0.89455]	[2.74378]	[−0.91546]
D(IMPORTS(−2))	0.008323	−0.087034	1.322422	−0.304978
	(0.18439)	(0.57778)	(0.41174)	(0.29384)
	[0.04514]	[−0.15064]	[3.21180]	[−1.03789]
D(IMPORTS(−3))	−0.375320	−0.405511	0.899360	−0.169091
	(0.16273)	(0.50991)	(0.36337)	(0.25932)
	[−2.30640]	[−0.79526]	[2.47505]	[−0.65205]
D(IMPORTS(−4))	−0.285832	−0.224405	0.358266	−0.398754
	(0.12840)	(0.40234)	(0.28671)	(0.20462)
	[−2.22609]	[−0.55775]	[1.24956]	[−1.94878]
D(IMPORTS(−5))	−0.077385	−0.013157	0.454985	−0.096369
	(0.12027)	(0.37687)	(0.26856)	(0.19166)
	[−0.64342]	[−0.03491]	[1.69414]	[−0.50280]
D(EXPORTS(−1))	0.287169	0.454061	−1.545865	0.345068
	(0.16100)	(0.50449)	(0.35951)	(0.25657)
	[1.78366]	[0.90005]	[−4.29996]	[1.34494]
D(EXPORTS(−2))	0.327490	0.647337	−1.238350	0.423040
	(0.16489)	(0.51669)	(0.36820)	(0.26277)
	[1.98607]	[1.25286]	[−3.36324]	[1.60992]
D(EXPORTS(−3))	0.175561	0.225170	−1.137877	0.208423
	(0.13838)	(0.43361)	(0.30900)	(0.22052)
	[1.26868]	[0.51929]	[−3.68245]	[0.94513]
D(EXPORTS(−4))	0.215072	0.343157	−0.751545	0.156784
	(0.12514)	(0.39212)	(0.27943)	(0.19942)
	[1.71864]	[0.87513]	[−2.68952]	[0.78619]
D(EXPORTS(−5))	0.203798	0.280932	−0.300601	0.056137
	(0.07676)	(0.24052)	(0.17140)	(0.12232)
	[2.65503]	[1.16802]	[−1.75380]	[0.45893]
D(GDP(−1))	0.288925	1.072414	1.583191	0.486659
	(0.21698)	(0.67988)	(0.48450)	(0.34577)
	[1.33160]	[1.57735]	[3.26768]	[1.40747]

CointegratingEq:	CointEq1			
D(GDP(−2))	−0.138598	−0.856794	0.180661	−0.419163
	(0.10763)	(0.33725)	(0.24033)	(0.17151)
	[−1.28775]	[−2.54056]	[0.75173]	[−2.44391]
D(GDP(−3))	−0.142222	0.081684	0.460852	0.190960
	(0.13090)	(0.41016)	(0.29229)	(0.20860)
	[−1.08651]	[0.19915]	[1.57669]	[0.91545]
D(GDP(−4))	0.124918	−0.213654	0.189876	−0.130303
	(0.10923)	(0.34228)	(0.24391)	(0.17407)
	[1.14359]	[−0.62421]	[0.77846]	[−0.74856]
D(GDP(−5))	−0.016156	0.163734	0.313926	0.277035
	(0.13590)	(0.42584)	(0.30347)	(0.21657)
	[−0.11888]	[0.38449]	[1.03447]	[1.27918]
C	0.069315	0.022427	0.025685	0.012545
	(0.01856)	(0.05815)	(0.04144)	(0.02957)
	[3.73519]	[0.38569]	[0.61985]	[0.42422]
Model summary under vector error correction model				
R-squared	0.868595	0.778007	0.913920	0.811754
Adj. R-squared	0.617731	0.354202	0.749586	0.452375
Sum sq. resids	0.002522	0.024761	0.012575	0.006404
S.E. equation	0.015141	0.047445	0.033810	0.024129
F-statistic	3.462414	1.835766	5.561356	2.258767
Log likelihood	109.5826	71.89211	83.07273	94.20507
Akaike AIC	−5.308035	−3.023764	−3.701378	−4.376065
Schwarz SC	−4.310363	−2.026092	−2.703706	−3.378393
Mean dependent	0.030335	0.040099	0.043490	0.032667
S.D. dependent	0.024490	0.059040	0.067565	0.032606

Table 8. Results of VECM.

It is obvious from **Table 9** that coefficient of error correction term {C (1)} is negative in sign, which means that there is long run causality from imports, exports, and GDP to CO_2. **Table 10** shows coefficient diagnostic test result and it is revealed that there is a short-term causality from imports and GDP to CO_2 and no causality from exports to CO_2 in short run.

So, we can conclude from VECM outcome that there is long run casualty from imports, exports, and GDP to CO_2 but in case of short run, only imports and GDP have causality toward CO_2.

	Coefficient	Std. error	t-Statistic	Prob.
C(1)	−0.005225	0.005004	−1.044161	0.3188
C(2)	−0.333024	0.276441	−1.204684	0.2536
C(3)	−0.631720	0.243040	−2.599238	0.0247
C(4)	0.063992	0.222721	0.287318	0.7792
C(5)	−0.441036	0.200424	−2.200513	0.0500
C(6)	−0.561520	0.213336	−2.632092	0.0233
C(7)	−0.390623	0.210732	−1.853647	0.0908
C(8)	0.008323	0.184391	0.045139	0.9648
C(9)	−0.375320	0.162730	−2.306396	0.0416
C(10)	−0.285832	0.128401	−2.226085	0.0479
C(11)	−0.077385	0.120272	−0.643418	0.5331
C(12)	0.287169	0.161000	1.783656	0.1021
C(13)	0.327490	0.164894	1.986070	0.0725
C(14)	0.175561	0.138381	1.268676	0.2307
C(15)	0.215072	0.125141	1.718642	0.1137
C(16)	0.203798	0.076759	2.655030	0.0224
C(17)	0.288925	0.216976	1.331596	0.2099
C(18)	−0.138598	0.107628	−1.287753	0.2243
C(19)	−0.142222	0.130898	−1.086511	0.3005
C(20)	0.124918	0.109233	1.143586	0.2771
C(21)	−0.016156	0.135903	−0.118883	0.9075
C(22)	0.069315	0.018557	3.735187	0.0033
R-squared	0.868595	Mean dependent var		0.030335
Adjusted R^2	0.617731	S.D. dependent var		0.024490
S.E. of regression	0.015141	Akaike info criterion		−5.308035
Sum squared resid	0.002522	Schwarz criterion		−4.310363
Log likelihood	109.5826	Hannan-Quinn criter.		−4.972349
F-statistic	3.462414	Durbin-Watson stat		2.082039
Prob(F-statistic)	0.018882			

Table 9. Short run coefficients of cointegration under VECM.

Variables	Null hypothesis	Chi-square	P-value	Decision
Imports	C(7) = C(8)…. = C(11) = 0	12.85853	0.0120	Short run causality
Exports	*C (12) = C(13)… = C(16) = 0*	7.615243	0.1788	No short run causality
GDP	*C(17) = C(18)…C(21) = 0*	14.94731	0.0106	Short run causality

Table 10. Coefficient diagnostic (WALD test).

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5.6. Variance decompositions (VDCs) and impulse response functions

The results of variance decomposition presented in **Table 11** explain the magnitude of the forecast error variance determined by the shocks to each of the explanatory variables over time. The cells in the variance decomposition represent percentages of the forecast variance (error) in one variable at different time periods induced by innovations of the other variables. These percentages help to determine the relative contribution the innovations make toward explaining movements in the other variables.

Variance decomposition indicates to what extent a shock or impulse (innovation) may cause on dependent variable in long run and short run. Here, we consider period three as short run and period 10 for long run. Model 1: In short run, a shock or impulse to CO_2 cause 83.59% of variance fluctuation in CO_2, whereas exports, imports, and GDP may cause 2.34, 10.58, and 3.48% fluctuation to CO_2, respectively. In long run, an innovation or impulse to CO_2 causes 62.94% fluctuation to CO_2 whereas an impulse on exports, imports, and GDP may cause 4.11, 14.29, and 18.63% variance fluctuation to CO_2, respectively, so we can say that in long run, a shock to CO_2 from both imports and GDP can cause variance fluctuation significantly. **Table 11** also manifests that for Model 2: In short run, an innovation to imports cause 69.93% of variance fluctuation in imports whereas, an impulse to CO_2 causes 22.78% of variance fluctuation in imports. On the other hand, in long run, an innovation to GDP and imports causes 36.20 and 45.55% of variance fluctuation to imports, respectively.

Period	S.E	Ln_CO_2	Ln_Imports	Ln_Exports	Ln_Gdp
Model 1: Variance decomposition of CO_2					
1	0.015141	100.0000	0.000000	0.000000	0.000000
3	0.025100	83.58684	10.58374	2.342176	3.487247
10	0.036526	62.94419	14.29237	4.114592	18.64885
Model 2: Variance decomposition of imports					
1	0.047445	22.98996	77.01004	0.000000	0.000000
3	0.088757	22.78454	69.93553	2.168897	5.111029
10	0.156676	11.13882	45.55258	7.102613	36.20599
Model 3: Variance decomposition of exports					
1	0.033810	93.25995	0.911852	5.828195	0.000000
3	0.072762	21.06030	16.60876	11.44612	50.88482
10	0.148897	7.612917	8.412356	13.24554	70.72918
Model 4: Variance decomposition of GDP					
1	0.024129	0.544248	59.02425	4.180525	36.25098
3	0.057256	7.744674	62.79744	4.522423	24.93546
10	0.140051	7.842519	60.31108	4.898937	26.94747

Table 11. Variance decomposing results under VAR environment.

Model 3: Both in short run and long run, an innovation to GDP causes significant variance fluctuation to exports 50.88 and 72.72%, respectively. Whereas, from Model 4, it is evident that both in short run and long run, a shock to import and GDP causes similar level of variance fluctuation in GDP. Impulse responses identify the responsiveness of dependent variables in the VAR system when a positive shock is put to the error term. Any shock in error term will change dependent variable and simultaneously change independent as well as dependent variables in next period.

It is obvious from **Figure 3**: that one standard deviation of innovation in CO_2 has positive effect on both GDP, imports and CO_2 as well, but significant effect occurs in GDP having positive trend and export shows negative affect because shock on CO_2 decreases effect on exports and eventually goes negative after period 5. It also manifests that a positive shock in error term of GDP will produce positive effect to all variables itself as well, which means that any innovation in GDP may have significant effects on variable in long run, meaning that all the variables are associated with GDP in long run. Impulse response of exports revealed positive effect on variable in long run. So, we can say that both GDP and exports have long run association and any positive shock in GDP and exports causes positive effect in long run.

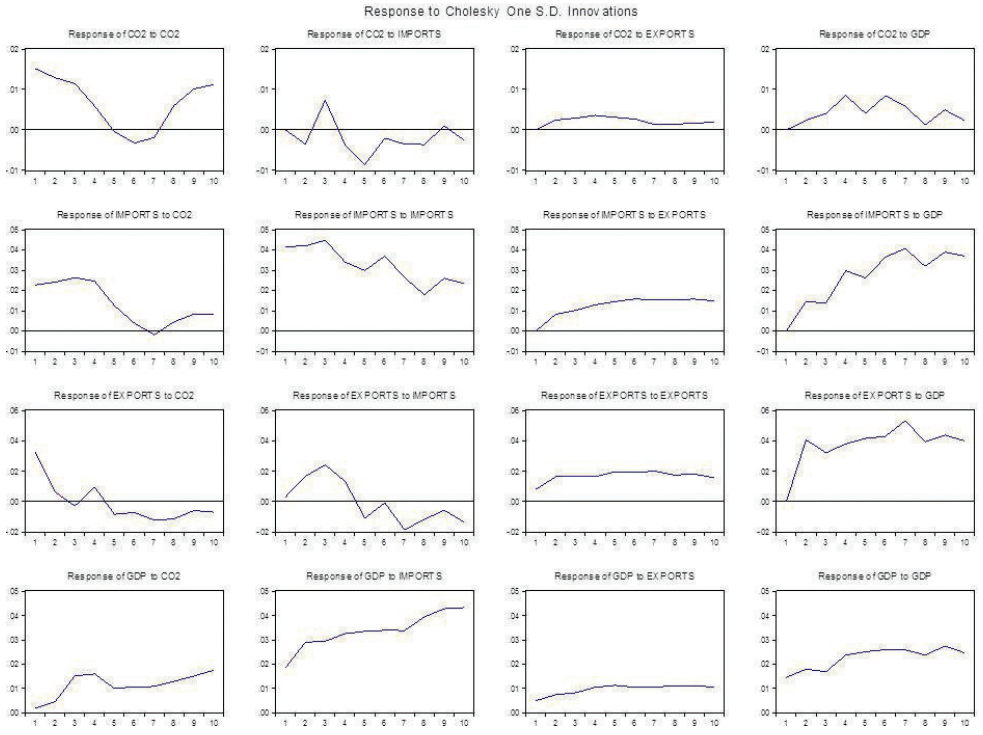

Figure 3. Impulse response of endogenous variables under VECM.

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6. Conclusion

This study employed a vector autoregressive analysis to investigate the link between Bangladesh's exports, imports, GDP, and carbon dioxide emissions. Study variables show that all the variables are nonstationary at level but data become stationary after first difference such that nature of data motivates to apply different time series models for analysis. In order to get optimal outcome from time series models, it is inevitable to choose appropriate Lag. This study selects optimal Lag if 5 on the basis of Akaike Information Criteria (AIC) in selecting optimal Lag based on the empirical analysis. Granger Causality shows short run unidirectional causality running from carbon dioxide emission to exports, GDP to import, and from carbon dioxide emissions to exports in Bangladesh. Test of JJ cointegration results revealed that there is one cointegration vector exist among explained variables. Considering both unit root test and JJ cointegration, we process to apply VAR restrict well-known VECM, in order to assess VECM Granger casualty of variables. Test result revealed that there is long run association from imports, exports, and GDP to CO_2 during the study period. Granger causality test shows that there is unidirectional causality running from carbon dioxide emission to exports, GDP to import, and from carbon dioxide emissions to exports in Bangladesh.

7. Recommendation

Being a low-lying coastal country, Bangladesh is the most climate vulnerable country in the world although industrialization still remains limited to some urban and semi-urban peripheries; villages occupied the major land of Bangladesh, which are also deprived from adequate electrification; and being a poor country, majority of the population cannot afford luxurious consumption. Therefore, Bangladesh might seem to be reluctant to embrace the new paradigm of low carbon resilient development, which seeks to reduce emissions, often referred to as climate change mitigation, and climate change adaptation together in one agenda. However, the government of Bangladesh formulated the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008, incorporating comprehensive strategy for adapting to the effects of climate change, despite the problems being created mostly by rich countries thousands of miles away. However, it is perhaps surprising that the government of Bangladesh has plans to introduce measures to reduce greenhouse gases, such as introducing solar powered irrigation systems and adopting new energy efficient technologies.

Findings of this study revealed long run casual relations between exports, imports, GDP, and carbon emissions. Therefore, for sustainable business and environmental development, organizations are recommended to set up a mechanism whereby individuals or companies can purchase "carbon offsets", i.e., finance various projects that increase renewable energy resources (e.g., wind power, solar power, biofuels, geothermal, and hydrothermal) or increase energy efficiency (e.g., improved cooking system, installation of insulation) or destroy various pollutants (e.g., plant trees to absorb CO_2). Government needs to be sincere in implementing carbon management policies and consumers need to be encouraged to take wise decision in redesigning their eco-consumption decision. A concerted effort from all national and international

stakeholders to offset carbon emission and pursuing environment-friendly trade plan is highly expected from all the poor and rich country to remain in win-win situation. Carbon tax from rich countries should be utilized for supporting poor countries' carbon management initiatives. Some of the most carbon-intensive emissions scenarios could be avoided if low- or no-emissions growth continues and countries implement their climate action plans.

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INTECH

Chapter 7

Water Challenges of an Urbanizing World

Sheetal Sharma

Additional information is available at the end of the chapter

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Abstract

The urban landscape has many impacts on the local climate such as reduced average wind speed due to the blocking effect of buildings and greater frequency of flash flooding owing to the higher proportion of ground sealed with concrete and asphalt and a corresponding reduction in natural drainage. Detailed estimate of climate change impacts and landscape modifications on water resources at the regional and local level are currently inaccurate due to inadequate data for water cycle and hydrogeology relations. Physical planning though equipped with modern means and best technologies is still lagging behind from the hands of urban planners due to their insufficient knowledge of natural systems and their correlations. Physical development as part of regional development such as construction of buildings, housings, roads, bridges and public utilities are continuously increasing due to the development in all sectors. Physical developments require land space and give positive impacts for the benefits of the people. However, it also creates negative impacts to the physical environment. It can be understood since a physical development is directly related to the land where constructions stand on, where water occurs as a source for water supply of men living on it and where the air is available for supporting life.

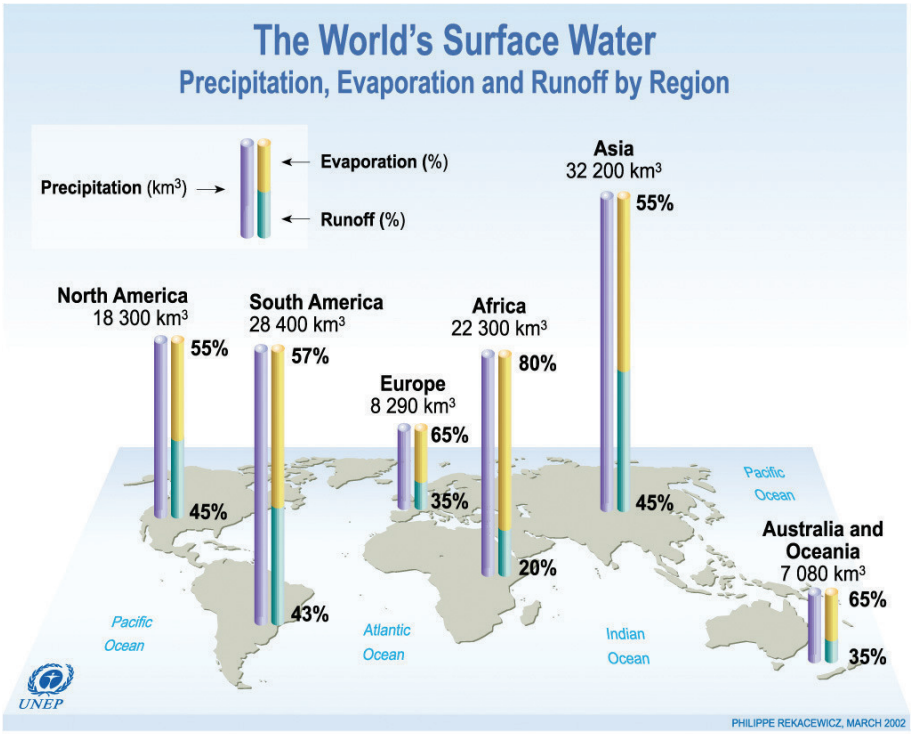
Keywords: urban development, runoff, recharge, hydrological changes, land use planning

1. Introduction

Natural systems are already responding increasingly making their presence by extreme weather events in the recent decades such as floods, droughts, tsunamis, earthquakes along with world's rivers, lakes, wildlife, glaciers, permafrost, coastal zones, disease carriers and many other elements of the natural and physical environment leading to imbalance and natural hazards. Many activities like UNESCO, UNEP, Intergovernmental Panel on Climate Change (IPCC) and UNHSP at the international level during the last decade have been developing a basis for the rational use and conservation of the resources of biosphere to overcome

the impacts of climate change for the improvement of the relationship between man and environment within the natural and social sciences (ScienceDaily-IPCC 2007) [1]. The assessment reports of IPCC 2007 and 2013 have stated that warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, the sea level has risen and the concentrations of greenhouse gases have increased. Each of the last three decades has been successively warmer at the earth's surface than any preceding decade since 1850. Confidence in precipitation change averaged over global land areas since 1901 is low prior to 1951 and medium afterward. (E.B, The State of Resource, Chapter 4 2004) (Hengeveld) [2, 3].

The most notable changes observed are related to the urban and hydrological system where urban areas have increased from 100,000 to 500,0000, and as per United Nation's projections, half of the urban population would live in urban areas, and by 2050, 64.1 and 85.9% of the developing and developed world respectively will be urbanized. Built-up associates with urban areas have also had a noticeable change of 145.68% as compared to 54.05% change in population growth from the year 1971 to 1999 (**Figure 1**). Also UN report of 2013 stated that



Source: Peter H. Gleick, *Water in Crisis*, New York Oxford University Press, 1993.

Figure 1. Variations in Worlds Surface water. (Gleick, Chapter 1. Peak Water, World's water 2008–2009). Note: It is observed that world's surface water has runoff and has a prime component varying with precipitation [8].

the urban population will increase from 29.1% in 1950 to 66.6% in 2050. As per the State of resource, UNESCO reported that (UNESCO, State of Resource Chapter 4) water is predicted to be the primary medium through which early climate change impacts will be felt by people, ecosystems and economies. (White 2006) [2]. As per the UNEP and IGRAC, hydrology has suffered drastic changes in its components and felt changes in recharge that dropped from 45 to 50% in 1961 to −10 to −30% in 2050.

Hydrological changes may have impacts that are positive in some aspects and negative in others. For example, increased annual runoff may produce benefits for a variety of both in stream and out-of-stream water users by increasing renewable water resources, but may simultaneously generate harm by increasing flood risk (IPCC, Linking climate change and water resources 2007) [4]. Water scarcity, on the other hand, is expected to become an ever-increasing problem in the future for various reasons. First, the distribution of precipitation in space and time is very uneven, leading to tremendous temporal variability in water resources worldwide (Climate 2007–2010) [1]. Second, rising temperatures are accelerating the hydrological cycle and causing rivers and lakes to freeze later in the autumn. Scientists are increasingly confident that, as global warming continues, certain weather events and extremes will become more frequent, widespread or intense. According to IPCC 2007, human activities and urbanization are likely to affect climate change, which in result will impose extreme weather events (M. Stephenson 2004) [5].

Both observational records and climate projections provide strong evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by the increasing urban areas. Possible impacts of climate change due to changes in extreme precipitation-related weather and climate events, based on projections to the mid- to late twenty-first century indicate areas with heavy precipitation increasing intensities, increase in areas affected by droughts, and intense tropical cyclone increase, damage to crops, soil erosion, land degradation, lower yields, damage to ability of land to cultivate. More intense rainfall events will increase runoff percentages and will overload the capacity of sewer systems and water and wastewater treatment plants more often. One reason is that precipitation variability is *very likely* to increase, and more frequent floods and droughts are anticipated.

Thus, changes in land use and land cover due to urbanization are likely to impact water requirement as some places are suffering from water scarcity and some with flash floods. Dynamic land use changes and transitions bring challenges not only for social systems but also for ecological systems and decision-making processes, creating an urgent need for planning and developing parallel solutions to changing world.

Broad-scale changes in land systems influence climate in several ways. Vegetation affects the physical characteristics of the land surface, which affect water evaporation and transpiration, the reflection or absorption of solar radiation and the transfer of momentum with atmospheric flows. These processes determine water and energy exchanges with the atmosphere at its lower boundary and can exert a major influence on climate at all scales. Land systems also affect the cycling of chemical elements, the most prominent and well-known being the carbon cycle, in particular, the role of land systems in modulating atmospheric concentrations of the greenhouse gases such as carbon dioxide and methane.

From several studies and worldwide reports of World Water day 2007,2010, IPCC 2008, (CARA 2006) (Booth 1991) (White 2006) [6, 7], it is observed that when an area is developed for housing or other urban purposes, the immediate hydrologic effect is to increase the area of low or zero infiltration capacity and to increase the efficiency or speed of water transmission in channels or conduits and in physical terms the most obvious landscape-level change is the extent to which previously natural surfaces are covered with engineered, impervious ones. Once vegetation and soil is replaced with buildings and paved surfaces, the infiltration potential for precipitation is greatly reduced, resulting in increased surface runoff, decreased lag time and increased peak discharge in streams and roads leading to flash floods and ponding. (Booth) [7]

In regional development, if spatial usage is not wisely regulated, then spoiling of its usage and deterioration of spatial quality might occur. Therefore, physical planning is required to arrange its usage on magnitude of activity, type of activity, location function, space quality and environmental esthetic bases.

Looking at one of physical planning objectives, the role of hydrogeology delivers a significant contribution, that is, how to establish the arrangement of spatial usage whether an area as a groundwater protection or groundwater development area.

As long as groundwater resources are concerned, a wise physical planning which is based on its usage, balance and preservation principles would support the sustainability of groundwater. It established eventually a better quality of life.

Some facts at the global level observations verify these changes as sensitive issues for urban areas that are given in **Figure 1**.

Urbanization can be termed as a social phenomenon and a physical transformation of landscapes by the people and for the people. Most of the changes in natural systems such as floods, droughts, climate changes and global warming, due to urban development are irreversible and give a very strong reflection of impact of anthropogenic activities on it.

As per present world facts and conclusions from various summits, conferences, researches and programs, it has been observed that there is a dramatic change in urbanization and in natural systems all over the world. The facts of increasing urbanization and variations in natural systems are identified by different organizations, scientists and various departments such as IPCC (IPCC 2007), UNEP, USGS, Rio Summit, MDG, etc. The panelists at World Water Day 2011 (Worldwater 2007) [8] identified rapid urbanization, poor planning, inadequate investments and overdependence on external resources as the main challenges facing water management in cities. Thus, urbanization has become one of the main reasons for the overdependence as well as over exploitation of resources, and also poor planning cannot be ruled as a result of unplanned developments in many places around world.

Hence, it is necessary to know about urbanization and how it affects the vital parameters of these natural systems. The relation between these is to learn first to tackle future possibilities of both affecting each other. To start with a short description of urbanization, its meaning in different ways and facts about its rapid increase are discussed. Following this, a short description of

hydrology (water cycle) is discussed with its main components, and facts for present variations of it are illustrated. Then a relation between these two is identified with different scenarios like within undeveloped (natural) state, urbanized state and with climate change.

2. Effects of urbanization on hydrological cycle

2.1. **Urbanization**

Urbanization is the process by which large numbers of people become permanently concentrated in relatively small areas, forming cities. A country is considered to urbanize when over 50% of its population live in the urban areas. Historically, human populations have led rural lifestyles as hunters, gatherers and farmers. However, since the industrial revolution, human societies have been transitioning from a rural lifestyle to a more urban one, at an exponential rate. From 1800 to 1900, the number of people who lived in urban areas increased from less than 5 to 14% of the total population. Between 1900 and 1950, rates of urbanization more than doubled up to 30% and by the year 2000, 47% of the human population, or 2.8 billion people, lived in urban areas. By 2030, demographers estimate that approximately 65% of humans will live in urban areas. (umich.edu 2008) [9].

Urbanization results in rapid development of landscape and housing leading to physical modification of habitats, which often results with degradation of the ability of ecosystems to maintain their structures and properties, thus providing ecosystem imbalances. When an area is developed for housing or other urban purposes, the immediate hydrologic effect is to increase the area of low or **zero infiltration** capacity and to increase the efficiency or speed of water transmission in channels or conduits (Dunne and Leopold) [10].

Perhaps the most obvious landscape-level change to accompany urbanization is the extent to which previously natural surfaces are covered by engineered, impervious ones (May 1997). Once vegetation and soil is replaced with buildings and paved surfaces, the infiltration potential for precipitation is greatly reduced, resulting in increased runoff, decreased lag time and increased peak discharge in streams. Urbanization has steadily replaced open spaces and forced dramatic changes to watersheds in the process. Natural drainages have been replaced by changes in hydrological components:

Changes in many subsystems and components of hydrological systems are observed worldwide as per IPCC 2007 and World Water Day report of 2007, 2011. **Table 1** shows the simulated changes of the global values of groundwater recharge, total runoff from land and total cell runoff (which include evaporation from lakes and wetlands as well as evaporation of the water that is withdrawn for human water use).

While both runoff values increase by approximately 9% between 1961–1990 and the 2050s (in the case of the ECHAM4 A2 scenario, with an increase of continental precipitation of 4%), groundwater recharge increases by only 2%.

The effect of neglecting increased future climate variability on groundwater recharge as computed by WGHM cannot be estimated without actual computations of groundwater recharge

	1961–1990 (A)	2050s (ECHAM4,A2)(B)	Change between A and B (%)
	Km^3/a	Km^3/a	
Ground water recharge	122,882	13,112	+1.8
Total runoff from land	38,617	42,062	+8.9
Total cell runoff *	36,621	39,755	+8.6
Continental precipitation	107,047	111,572	+4.2

Including the water balance of lakes and wetlands and evapotranspiration of withdrawn water (assumed to remain unchanged, and equivalent to the renewable water resources).

Source: page no 13. Global-Scale Estimation of Diffuse Groundwater Recharge, August 2005, (Flörke 2005) [11].

Table 1. Simulate changes for recharge and runoff globally.

under the impact of changed climate variability, as the effect is expected to be both cell-specific and depending on the precise change of climate variability.

2.2. **Effects of urbanization**

Studies carried out at University of California-USC libraries and online sources like HOMER, USC Library and Guide book on Hydrologic Effects of urban land use by LUNA Leopold (1968) (Leopold 1968) state that there are some separable effects of land use changes on the hydrology of an area.

2.2.1. *Changes in hydrological system*

Human activities accompanying development can have irreversible effects on drainage basin hydrology, particularly where

- Subsurface flow predominated.
- Vegetation is cleared and soil is stripped and compacted.
- Roads are installed, collecting surface and shallow subsurface water in continuous channels.
- Degrading eliminates previously undrained depression.
- Subsurface utilities intercept yet deeper subsurface water and rapidly pipe out subsurface water out of the basin as surface flows.
- Construction adds impervious areas that intercept rainfall before it can reach the soil surface.
- The most measurable effect in the hydraulic response of a drainage basin is the increase in the maximum discharge associated with floods.

- Hydraulic equation stated that: Rainfall-losses = runoff.
- Water losses, interception losses due to surface vegetation.
- Evaporation from water surface and from soil surface.
- Transpiration from plant leaves.
- Evapotranspiration from irrigated or cropped land.
- Infiltration into the soil at the ground surface.

2.2.2. *Changes in urban systems*

As people are increasingly living in cities, and as cities act as both human ecosystem habitats and drivers of ecosystem change, it has become increasingly important to foster urban systems that contribute to human well-being and reduce ecosystem service burdens at all scales.

There are numerous subsystems and corresponding resources:

A. Natural

- Water
- Energy

B. Urban

- Financial,
- Urban lands,
- Land Use land cover.
- Transport.
- Waste
- Social Systems
- Economic.

2.2.3. *Urbanizations leads to*

Urbanization results in rapid development of landscape and housing leading to physical modification of habitats, which often results with degradation of the ability of ecosystems to maintain their structures and properties, thus providing ecosystem imbalances. An area when developed for housing or other urban purposes, the immediate hydrologic effect is to increase the area of low or **zero infiltration** capacity and to increase the efficiency or speed of water transmission in channels or conduits ((D. &. Leopold 1978). [10].

Perhaps the most obvious landscape-level change to accompany urbanization is the extent to which previously natural surfaces are covered by engineered, impervious ones. Once vegetation

and the soil is replaced with buildings and paved surfaces, the infiltration potential for precipitation is greatly reduced, resulting in increased runoff, decreased lag time and increased peak discharge in streams. Urbanization has steadily replaced open spaces and forced dramatic changes to watersheds in the process. Natural drainages have been replaced by human structures, or reengineered for human purposes.

New data collection from CIESIN's Global Rural Urban Mapping project (GRUMP 2005) [12] shows that as much as 3% of the Earth's land area has already been urbanized, which is double previous estimates**.** While the world's urban population grew very rapidly (from 220 million to 2.8 billion) over the twentieth century, the next few decades will see an unprecedented scale of urban growth in the developing world. By 2030, the towns and cities of the developing world will make up 81% of urban humanity. (UNFPAChapters 2007).

As per report, an increase in urban land area of 58,000 km^2 from 1970 to 2000 was observed worldwide. India, China, and Africa have experienced the highest rates of urban land expansion, and the largest change in total urban extent has occurred in North America. Across all regions and for all three decades, urban land expansion rates are higher than or equal to urban population growth rates, suggesting that urban growth is becoming more expansive than compact.

This chapter aims to detect the changes and correlate the parameters like built-up and runoff areas with geological endowments and use this correlation for urban planning and management, in accordance with bye-laws and guidelines. The study is to develop an understanding of relationship between surface water runoff and ground water replenishment with respect to changes in land characteristics resulting from urbanization in the city of Bhopal.

3. Observations

Urban watersheds of Bhopal were observed for the changes in land cover and variations in runoff and water table. The observations were based on GIS Maps and SWMM modeling. Following figures show the catchments and their related variations in runoff (**Figures 2–5**).

a. BSHC-S1

Increase in built-up is 42.75% and simultaneously increase in runoff is 56.63%. Increase in runoff was gradual till 1991–2001, but sudden increase was observed in after 1991 from 2.01 to 45.24%. Though built-up has marginal increase in 0.29% at 2001 to 2011, runoff increased 20%. Coefficient of determination is 0.68 and value of R^2 is 0.874.

b. BOBC-S3

Basically, a slum area out of the city municipal limits having kaccha houses and less R.C.C Construction near the paths of water flows has now turned to developing colonies over the hill tops and rapidly converting hills to flat mounds by excessive excavation of rocks. It also consists of a natural park along its natural drains in one part. The increase in built-up was observed gradually but being a peri-urban area, it did not affect runoff till 1995 and showed a weak relation till then. The runoff increased after 2001.

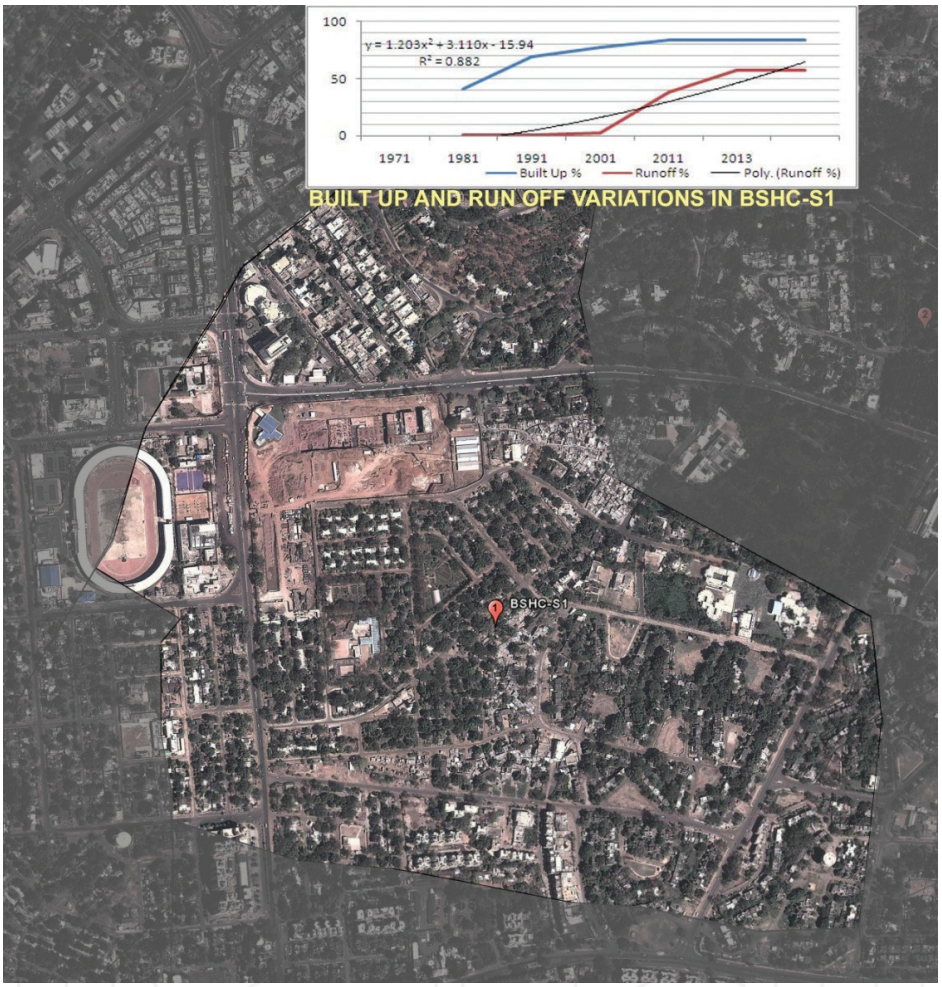


Figure 2. Built-up and runoff variations in catchment BSHC-S1.

c. BSHC-S6

This catchment has a part with geological characteristics of alluvium soil and has experienced increase in built-up from 2.36 to 87.18% and runoff from 0.18 to 64.77%. The roughness values for this catchment showed a variance for impervious surface of 0.012 roughness to 0.011 and for pervious 0.13 to 0.05, before and after predevelopment as most of the natural area was made impervious, though some natural parks and open spaces are still restored as natural ones. The recharge potential for this area is too high and has maintained satisfactory water levels in all seasons.

Coefficient of determination = 0.915 and $R^2 = 0.906$.

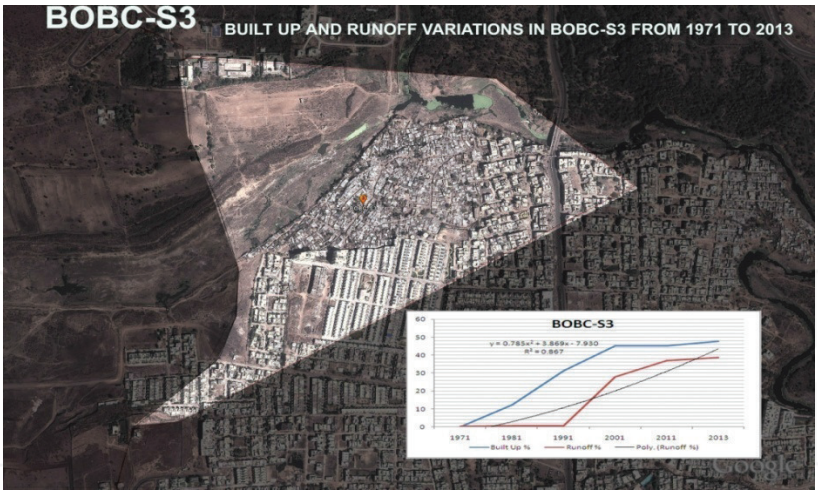


Figure 3. Built-up and runoff variations in catchment BOBC-S3.

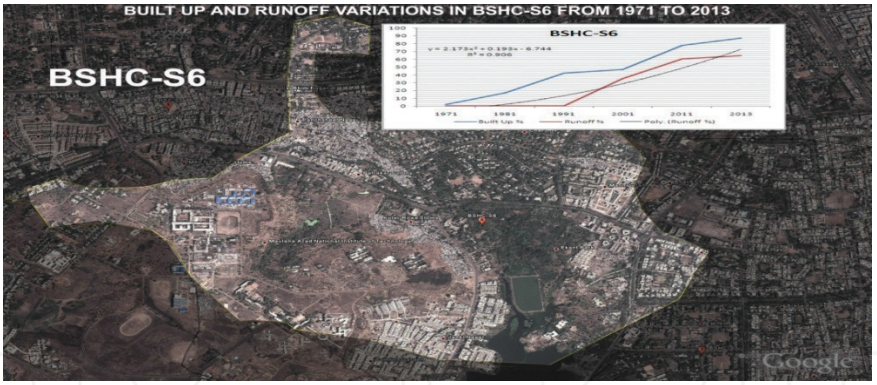


Figure 4. Built-up and runoff variations in catchment BSHC-S6.

d. BSHC-S9

This catchment has water body around 50% of its area and experiences increase in build-up from 0.49 to 46.25% and resulting runoff from 0.0031 to 5.14%. The commercial activities in and around the water body has disturbed the peak flows for this area still maintaining the overall runoff very much less thus helping the recharge potential a lot. Water levels in this area show satisfactory recharge.

Coefficient of determination = 0.749 and $R^2 = 0.830$.

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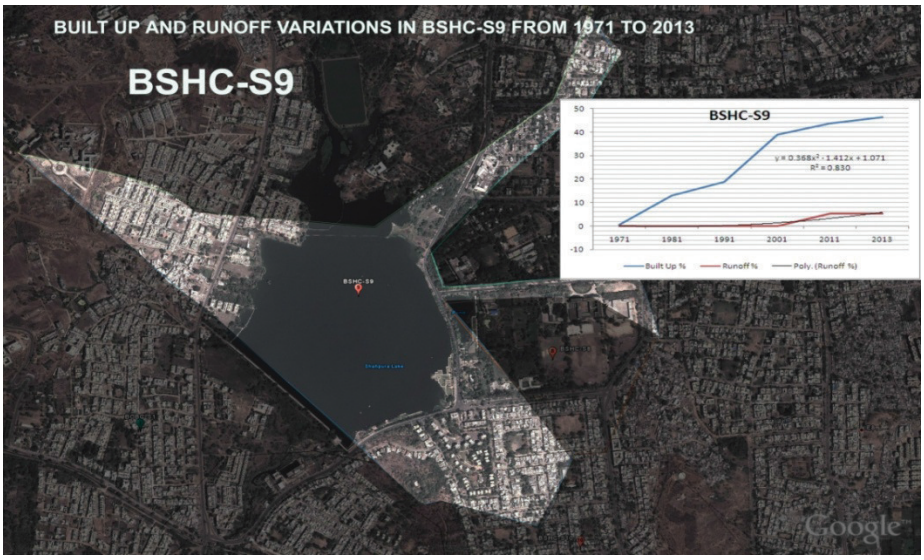

Figure 5. Built-up and runoff variations in catchment BSHC-S9.

4. Conclusions

Urban land cover changes the natural capacity of land and working cycle. Increasing built-up and resulting runoff with different land cover roughness and a broad range of built-up that allows satisfactory recharge are considered as acceptable features of physical planning along with some man-made efforts needed for better performance. "Catch water where it falls"—we have to catch water as soon as it falls in the form of precipitation because once it is converted into runoff, it is difficult to control and catch. The soil or urban land needs to be planned in such a way that as soon as water falls on it, it should percolate below.

Land use like residential with 40–50% with open spaces left in natural state and developed with efforts with grass, bushes and trees, minimizes the intensity of runoff. Infiltration gets very much affected in basalt soil as it is poor in holding runoff. Hence, special land cover planning is must for this soil group.

Alluvial soil and basalt soil result in peak runoff, but alluvial if treated merely with grass and natural soil state pockets also helps in fast infiltration, whereas basalt does not allow infiltration of rain so easily with normal land covers. It needs proper land use allotment and planning to work satisfactorily. Impervious and pervious areas like 25 and 15% as in mixed land use have more runoff generation but since sandstone infiltrated rain water easily, peak runoff can be avoided in such areas with land use and land cover planning. Hence, planning in urban areas with mostly roughness values of 0.011–0.017 are to be planned wisely for the resulting runoff.

Thus, it is concluded that natural system sustains its working till its carrying capacity is exceeded and with some planning principles and man-made efforts; this capacity can be extended to support the normal working of natural system in developed conditions.

- Runoff in urban areas varies from 25.15 to 88.21%.
- Some catchments produce more runoff than others though having same built-up percent.
- Catchments with connected open spaces have less runoff, whereas unconnected pervious areas act as interception storages at bigger scale.
- Runoff from 5.35 to 50% can be manipulated with the help of basic use of hydrological knowledge in planning urban landscapes.

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INTECH

Chapter 8

The Spatial Structure of Ecuador: Analysis Using Market Potentials

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Additional information is available at the end of the chapter

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Abstract

The goal of this chapter is to analyze the spatial structure of Ecuador, that is, to find out if the economic activity in this country is clustered in or around several provinces and/or regions. In other words, we want to establish from a geographical economics perspective which provinces are considered belonging to the so-called core and which ones to the periphery. We will carry out the analysis by computing each region's market potentials. The methodological approach of this study is based on the well-known Harris, 1954, market potential concept of the regional economics literature. For each province and using as the time frame the period 2007–2014, we have computed its Harris, 1954, market potential, which takes into account the economic activity in the surrounding locations weighting them by the inverse of the distance. With regard to the weighting scheme, we will use two different proxies: on the one hand, the distance measured in kilometers between the capital of each province, and on the other hand, the distance measured in terms of the time needed to travel from the capital of one province to the other.

Keywords: market potential, regional development, center-periphery pattern, Ecuador, economic activity

1. Introduction

Without any doubt, one of the key concerns of the economics science is the study of the levels of wellbeing of the citizens and the process of income distribution which affects the wellbeing levels. From this perspective, it is very difficult that a country is able to fully accomplish the needs of its citizens. It is a very well-known feature that the economic activity is concentrated in few locations in the space and therefore this fact makes difficult to achieve a balanced

development of the different territories within a country and therefore to achieve good levels of citizens welfare. For instance, in the case of Ecuador according to the figures provided by its National Statistical Institute, only 1.9% of the population belongs to the upper class, 11.2% are upper-middle class, 22.8% are middle class, 49.3% are middle-low class and 14.8% are low class. Moreover, around 8% of the population lives with less than 1 dollar a day. On the other hand, it is well known that economic activity is concentrated in space and the identification of core-periphery patterns which are common to many countries are also present in the case of Ecuador. Without any doubt, there are two provinces that are acting as "core" from a geographical economics point of view, whereas the remaining ones would be acting as "periphery." Our main goal is to analyze whether the spatial distribution of the economic activity in Ecuador follows a core-periphery pattern which is clearly observed in other geographical settings in the world, such as in the European Union, Spain, Portugal, Romania, etc. In order to deal with this issue, we will resort to the computation of the Harris [1] market potentials for the Ecuador provinces. The results of the computations will be shown in a map which will provide us with a macroscopic picture of the spatial distribution of economic activity within Ecuador and will also be informative about the potential existence of a core-periphery structure in terms of spatial distribution. The remaining part of the chapter is structured as follows: in the next section, the theoretical background of the Harris [1] market potential concept is presented. Section III looks at the analysis of the spatial structure of Ecuador based on the market potential computations over the period 2007–2014. Section IV looks at the analysis of the distribution of economic activity in Ecuador by means of Lorenz curves and associated Gini indexes. The last section of the chapter contains the main conclusions.

2. Theoretical background

Following Harris [1], the market potential of a geographical observation (region i is defined as the summation of markets (M) accessible to i divided by their "distances" (d_{ij}) to that point i.When the calculation is done on areal units, a correction for the size of the internal market of each area (self-potential) is necessary in order to measure the accessibility of its firms to the markets. Therefore, considering the $R - 1$ possible markets of other j regions, the Harris ' s Market Potential of region i can be decomposed into its *Internal Market Potential* (*IMP*) and *External Market Potential* (*EMP*) components:

$$HM\,P_i = \sum_{j=1}^{R} \frac{M_j}{d_{ij}} = \frac{M_i}{d_{ii}} + \sum_{j=1}^{R-1} \frac{M_j}{d_{ij}} = IM\,P_i + EM\,P_I \tag{1}$$

where the distance to the own regional market (d_{ii}) is measured by within region distances, as discussed below. Part of the focus of this chapter is on the construction and interpretation of External Market Potential. Versions of this last variable have been called "non-local" Head and Mayer [2], "surrounding" Blonigen et al. [3] or "foreign" Brakman et al. [4] market potential.

The distance between the locations i and j (d_{ij}) is going to be measured as follows:

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a. In first place, we will proxy this distance by considering the distance between the capitals of the provinces measured in kilometers. The use of physical distances allow to capture not only the trade costs but also the "relative" trade costs Yotov [5] and the barriers which are not related to trade and other sort of interactions Linders et al. [6].

b. On the other hand, we will consider also the distance measured in travel time between the capitals of the provinces. This weighting scheme allows to control the quality of the infrastructure. It might well happen in case that comparing vis-à-vis two locations that are in terms of physical distance of equal distance but in terms of travel times are quite different on account of the quality of the infrastructure, physical geography of the region, etc., and therefore the centrality levels of the locations could be biased in case we only take into account a measure of physical distance based on kilometers.

As we see from the expression the market potential of a location can be broken down into a domestic or internal component and a foreign or external one (market potential generated by the surrounding locations excluding the location for which the computations is being made).

When facing the computation of the domestic market potential, the definition of the internal distance within each location (d_{ii}) is critical issue. The standard methodology assumes that the spatial units (in our case the Ecuadorian provinces) are circular and the internal distance is proxied as proportional to the square root of each province area. We follow Keeble et al. [7] and use our measure of internal distance as

$$d_{ii} = 1/3 \cdot r_i = 1/3\sqrt{\text{area}_i/\pi} \tag{2}$$

This measure allows the potential concentration of economic activity in and around the center. This way of computing internal distances increases the role of the internal market in comparison with other proxies, such as 2/3 of the radius used by other authors. Finally, as the proxy for the volume of economic activity M_j we have chosen on the one hand the provincial population and on the other the real per capital GDP. In both cases, we have a time series that goes from 2007 to 2014.

According to the theoretical background, the market potential indicators we have defined are the following:

(A) Indicators of market potential using a distance matrix based on kilometers:

1. pmp represents the Harris [1] market potential computed from data on population of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in kilometers.

2. pmvyar represents the Harris [1] market potential computed from data on real gross value added of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in kilometers.

(B) Indicators of market potential using a distance matrix based on travel times:

1. pmpt represents the Harris [1] market potential computed from data on population of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in minutes of travel time between locations. For the computation of the internal distance, we consider a cruise speed of 60 km/h.
2. pmvyar represents the Harris [1] market potential computed from data on real gross value added of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in minutes of travel time between locations. For the computation of the internal distance, we consider a cruise speed of 60 km/h.

The datasets for our computations have been obtained from different sources: Central bank of Ecuador, National Statistical Institute [8], Service of internal rents. In order to represent the indexes of market potential, we will use a geographic information system (ESRI from Arc map).

Harris's approach has been widely used in Regional Economics. One reason is that it offers a way of capturing Tobler´s [9] first law of Geography, which would be much quoted later by the Spatial Econometrics literature: "Everything is related to everything else, but near things are more related than distant things." In the 1990s, Krugman's general equilibrium setting provides microeconomic foundations to the physical analogies of Harris's indicator Krugman [10]. The NEG's "wage equation" predicts that regional wages are a function of the size of the markets available to each region. Here, the final basic equation is presented following Head and Mayer [2] and Combes et al. [11].

3. Spatial structure of Ecuador: 2007–2014

3.1. A short descriptive view of Ecuador

Ecuador with an area of 283.561 km^2 and a population of 16.298.217 inhabitants [8] is located on the northwestern part of South America. Its borders are in the North Colombia, in the South Peru and in the East and West the Pacific Ocean. The political capital is Quito whereas the economic and most populated city is Guayaquil. The official language of Ecuador is Spanish and its population is mostly catholic. Ecuador is considered one of the countries endowed with more biodiversity in the world Jaramillo [12]. From a geographical point of view, Ecuador is divided into three regions: coast, valley and East and the insular region. These three regions group the 24 provinces in which the country is divided for administrative purposes.

Historically, Ecuador is characterized by being a primary sector-export-oriented economy where the agricultural goods have been the main resource both in production and employment with the handicap that the economy relies on only one export product, cacao. At the

beginning of the twentieth century, the cacao was the main national product for foreign markets. The fall in the international prices of cacao and several diseases which affected this commodity were at the hearth of the shrink of this industry in Ecuador. At the end of 1940s, the cacao production was substitute by the banana production to convert Ecuador the first supplier of this fruit worldwide. However, from 1970s onwards, the oil production took the lead and from that moment onwards it was the more important trading commodity in the Ecuador economy. Currently, exports of oil account for 40% of total Ecuador exports and it represents a similar share in the Ecuador government budget. At the end of 1990s and influenced by a series of political and military circumstances jointly with the implementation of bad economic policies, Ecuador suffered the worst economic crisis of its history. The economy was dollarized in order to readjust the economic situation and since then Ecuador was able to keep the stability allowing the people to improve their standards of leaving.

3.2. Spatial structure of Ecuador: a provincial level analysis, 2007–2014

The next section contains the analysis of the main results.

Ecuador is divided into 24 provinces. This analysis does not take into account the insular province of Galapagos, so the analysis is carried out for the remaining 23 provinces. The first set of tables shown (**Tables 1** and **2**) contains the results of the computations of the market potentials using population as a proxy for the economic activity and as a distance matrix, one based on kilometers (**Table 1**) and another based on travel times (**Table 2**). The time period or this study is 2007–2014.

Our results show that there are two provinces with top ranking in terms of market potential: Guayas and Pichincha. In this sense, if we measure the demand accessibility using as our distance matrix the one based in travel times the top provinces in terms of market potential are the same. From a more general perspective, it can be appreciated that the provinces located along the coast Guayas, Manabí, Los Ríos and El Oro and those located in the central valley Pichincha, Bolívar, Cotopaxi, Tungurahua, Chimborazo, Santo Domingo have average values which are higher than for those provinces located in the Eastern (Morona Santiago, Napo, Pastaza, Sucumbíos, Orellana, Zamora Chinchipe) and Northern parts of the country (Carchi, Esmeraldas).

Tables 3 and **4** analyze the growth of the market potential based on population and distance matrix based on both kilometers and travel times over the period 2007–2014. The average growth rate of the period has been normalized to 100 and therefore the values presented in the table are deviations from it.

It can be seen that all provinces have experienced positive growth rates in terms of market potentials. The national average growth rate over this period was 20.6% and if we look at the average growth rates of the different regions the figures are pretty similar: coast 21.56%, valley 19.33% and east 21.98%. However, it is worth mentioning that the market potential growth experience by the provinces of Pichincha and Guayas is slightly above the remaining regions (with the exception of Santo Domingo and Santa Elena which in the past belonged to the

Province	Average	Maximum	Minimum
Azuay	92652.5705	100791.5361	83470.1759
Bolívar	102640.904	234778.2186	76385.87953
Cañar	84303.3891	92911.62696	75910.50379
Carchi	50203.8387	54774.91131	45791.56436
Cotopaxi	110749.6981	123452.41	101855.5623
Chimborazo	103211.5082	132311.1641	89189.67389
El Oro	92977.9622	99164.8545	86016.72381
Esmeraldas	56438.9936	61845.87432	50175.04418
Guayas	201438.9578	220138.0792	177975.4394
Imbabura	83868.7818	90205.37271	76674.98228
Loja	55531.8701	60488.38733	50222.18871
Los Rios	131864.6442	149285.0045	117676.4483
Manabí	99230.4968	107262.4807	89197.96576
Morona Santiago	44158.7542	50886.02031	38882.54179
Napo	53332.5414	61321.42445	47078.29336
Pastaza	63813.2107	74588.42534	56635.53775
Pichincha	185364.005	204115.2439	163019.6668
Tungurahua	124468.8505	130730.6259	113257.9825
Zamora Chinchipe	37087.2701	41173.98091	33073.5494
Sucumbíos	40942.0633	45593.58817	36212.60124
Orellana	37632.1285	42857.03254	33034.47325
Santo Domingo	95227.0321	104779.1647	83177.55473
Santa Elena	76081.575	84762.81198	65266.78877

Source: Own elaboration.

Table 1. Market potential based on population and distance matrix based on Kms (pmp): 2007–2014.

provinces of Pichincha and Guayas, respectively). Therefore, the results of this analysis show that besides the fact that Pichincha and Guayas are the provinces with the highest market potential values they are also the provinces which grow more. This is in line with a process of

Province	Average	Maximum	Minimum
Azuay	92592.5568	100731.3599	83412.5499
Bolívar	102535.049	234672.077	76284.2360
Cañar	84192.9403	92800.8791	75804.4493
Carchi	50222.8078	54793.9317	45809.7787
Cotopaxi	108774.2513	121471.615	99958.7109
Chimborazo	101570.0002	130665.2119	87613.4751
El Oro	93046.4709	99233.5486	86082.5068
Esmeraldas	56624.9354	62032.3196	50353.5881
Guayas	201426.2849	220124.8887	177963.2707
Imbabura	83938.1960	90274.9748	763741.6347
Loja	55535.9395	60492.4677	50226.0962
Los Rios	131932.0897	149352.6326	117741.2104
Manabí	99146.3469	107178.103	89107.1638
Morona Santiago	44148.7933	50876.0324	38872.9772
Napo	53051.8262	61039.9491	46808.7466
Pastaza	62876.0065	73648.6837	55735.6212
Pichincha	185307.6088	204056.5448	162965.5144
Tungurahua	121159.0108	127283.9717	110173.8251
Zamora Chinchipe	37246.9290	41334.0713	33226.8560
Sucumbíos	41281.7371	45934.1816	36538.7607
Orellana	37619.5657	42844.4356	33022.4102
Santo Domingo	95318.2998	104874.1591	83265.1912
Santa Elena	76293.5317	84975.3425	65470.3125

Source: Own elaboration.

Table 2. Market potential based on population and distance matrix based on travel times (pmpt): 2007–2014.

increasing concentration of economic activity in the Ecuadorian space in the aforementioned provinces. In short, we are facing with a core-periphery spatial type of structure in terms of economic development in Ecuador.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	90.0894	107.6601	19.5036
Bolívar	74.4205	88.7624	19.2714
Cañar	90.0444	107.2954	19.1583
Carchi	91.2112	106.3728	16.6225
Cotopaxi	91.9691	105.6850	14.9135
Chimborazo	86.4144	104.9252	21.4209
El Oro	92.5130	105.8198	14.3873
Esmeraldas	88.9013	108.5106	22.0573
Guayas	88.3520	109.2827	23.6901
Imbabura	91.4225	106.7099	16.7217
Loja	90.4384	107.1129	18.4373
Los Rios	89.2403	107.0655	19.9743
Manabí	89.8795	107.5099	19.6155
Morona Santiago	88.0517	107.8498	22.4846
Napo	88.2731	107.6785	21.9834
Pastaza	88.7520	106.6445	20.1600
Pichincha	87.9456	110.1159	25.2089
Tungurahua	90.9930	105.0307	15.4272
Zamora Chinchipe	89.1776	107.9099	21.0056
Sucumbíos	88.4484	108.6017	22.7854
Orellana	87.7826	108.4066	23.4944
Santo Domingo	87.3465	110.0309	25.9704
Santa Elena	85.7852	111.1875	29.6115

Source: Own elaboration.

Table 3. pmp Market potential growth: (2007–2014, Ecuador = 100).

Tables 5 and **6** show the market potential computations (along with the maximum and minimum values) based on the data on real gross value added and a weighting scheme based on kilometers (**Table 5**) and travel times (**Table 6**) over the period 2007–2014.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	90.0855	107.6624	19.5112
Bolívar	74.3980	88.7466	19.2859
Cañar	90.0365	107.2997	19.1734
Carchi	91.2130	106.3720	16.6192
Cotopaxi	91.8955	105.7141	15.0372
Chimborazo	86.2592	104.9388	21.6552
El Oro	92.5156	105.8185	14.3791
Esmeraldas	88.9247	108.4961	22.0089
Guayas	88.3515	109.2831	23.6911
Imbabura	91.4263	106.7078	16.7145
Loja	90.4389	107.1127	18.4365
Los Rios	89.2438	107.0640	19.9680
Manabí	89.8743	107.5128	19.6257
Morona Santiago	88.0499	107.8507	22.4881
Napo	88.2321	107.6976	22.0616
Pastaza	88.6437	106.6826	20.3499
Pichincha	87.9432	110.1177	25.2145
Tungurahua	90.9332	105.0553	15.5301
Zamora Chinchipe	89.2069	107.8935	20.9474
Sucumbíos	88.5107	108.5464	22.6569
Orellana	87.7798	108.4081	23.4999
Santo Domingo	87.3548	110.0252	25.9519
Santa Elena	85.8137	111.1678	29.5455

Source: Own elaboration.

Table 4. pmpt Market potential growth: (2007–2014, Ecuador = 100).

These results are also in line with the previous ones. The provinces of Guayas and Pichincha have the highest values in terms of the average values and also in terms of the maximum values. In the context of the Ecuadorian economy, the "center" of the economic activity is

Province	Average	Maximum	Minimum
Azuay	330790.0639	383810.751	288514.5
Bolívar	273622.048	318956.125	240500
Cañar	286376.6592	332880.842	250222.1
Carchi	187513.0012	218350.91	163299.4
Cotopaxi	389992.9367	455835.274	340354.1
Chimborazo	324140.4994	380217.919	282906.2
El Oro	307187.3137	372297.719	258022.4
Esmeraldas	196345.2721	219066.09	179702.8
Guayas	764554.4936	894921.42	680397.1
Imbabura	306003.2275	363380.632	262102.1
Loja	171716.7066	197779.8	147479.6
Los Rios	425388.5919	497077.361	371446.8
Manabí	301730.1684	354520.917	260227.1
Morona Santiago	160526.4038	185596.329	138712.1
Napo	223371.077	257049.974	197712.7
Pastaza	239690.2167	273774.265	207511.4
Pichincha	918315.932	1103744.33	810267.4
Tungurahua	413451.5802	481996.649	359893.1
Zamora Chinchipe	122847.6793	141977.57	106111.3
Sucumbíos	268916.6845	291250.95	219804.3
Orellana	300660.5064	368926.973	218269
Santo Domingo	339282.25	397740.056	299168
Santa Elena	267274.6315	295592.854	251272.2

Source: Own elaboration.

Table 5. Market potential based on real gross value added and a distance matrix based on kilometers (pmvyar): 2007–2014.

directed toward these two provinces and once again to those located in the central valley and the Ecuadorian coast. These results also show that the so-called "economic periphery" is located in the Eastern and Northern provinces of the country. Finally, **Tables 7** and **8** show the results of the market potential growth based on data on real gross value added and the

Province	Average	Maximum	Minimum
Azuay	330618.2731	383612.472	288366.2
Bolívar	273319.0349	318606.39	240238.4
Cañar	286060.4965	332515.93	249949.2
Carchi	187567.3008	218413.582	163346.3
Cotopaxi	384338.1643	449308.582	335472.6
Chimborazo	319441.6361	374794.53	278849.9
El Oro	307383.4219	372524.066	258191.7
Esmeraldas	196877.536	219680.425	180162.3
Guayas	764518.2169	894879.55	680365.8
Imbabura	306201.9275	363609.97	262273.6
Loja	171728.3554	197793.245	147479.6
Los Rios	425581.6565	497300.194	371613.5
Manabí	301489.287	354242.894	260019.1
Morona Santiago	160497.8905	185563.42	138867.5
Napo	222567.5215	256122.516	197019
Pastaza	237007.443	270677.83	205195.6
Pichincha	918154.4962	1103558	810127.9
Tungurahua	406200.8457	473343.502	354129.3
Zamora Chinchipe	123304.7073	142505.068	106505.8
Sucumbíos	269889.0104	292373.2	220725.2
Orellana	300624.5449	368887.902	218234.9
Santo Domingo	339543.5064	398041.596	299393.5
Santa Elena	267881.3637	296293.139	251795.9

Source: Own elaboration.

Table 6. Market potential based on real gross value added and a distance matrix based on travel times (pmvyar): 2007–2014 (pmvyart): 2007–2014.

two weighting schemes (kilometers and travel times) over the period 2007–2014. Once again we have normalized the average growth rate of the country to 100 and the figures for each province represent deviations from the average.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	87.2198194	116.028501	33.02997119
Bolívar	87.8949485	116.568137	32.62211257
Cañar	87.375178	116.238818	33.03414102
Carchi	87.0869815	116.445744	33.71199958
Cotopaxi	87.2718546	116.882956	33.92972661
Chimborazo	87.2788727	117.300344	34.39717997
El Oro	83.9951413	121.195669	44.28890396
Esmeraldas	91.5238707	111.571869	21.90466624
Guayas	90.1252275	117.051358	29.8763528
Imbabura	85.6533821	118.750588	38.64086286
Loja	85.879565	115.17796	34.11567701
Los Rios	87.3194179	116.852537	33.82193743
Manabí	86.2449577	117.496013	36.23522562
Morona Santiago	86.4107578	115.617322	33.7996855
Napo	88.5130982	115.077555	30.01189339
Pastaza	86.5748493	114.220042	31.93212884
Pichincha	88.5659937	120.192222	35.70922363
Tungurahua	87.0460036	116.578742	33.92773567
Zamora Chinchipe	86.3763184	115.572041	33.80061028
Sucumbíos	90.7023646	108.305273	19.40733141
Orellana	82.4137243	117.040982	42.01637301
Santo Domingo	88.1767193	117.229845	32.94874843
Santa Elena	94.0127261	110.595178	17.63851794

Source: Own elaboration.

Table 7. pmvyar Market potential growth: (2003–2014, Ecuador = 100).

The results show a positive market potential growth for all provinces being the average around 32.64%. The Oro province stands out as the leading province in this period.

Overall, our results show a clear core-periphery structure in the spatial distribution of economic activity across the Ecuadorian territory. The provinces of Pichincha and Guayas are the

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	87.2202	116.0288	33.0296
Bolívar	87.8966	116.5694	32.6209
Cañar	87.3763	116.2397	33.0334
Carchi	87.0867	116.4454	33.7119
Cotopaxi	87.2857	116.9044	33.9330
Chimborazo	87.2929	117.3280	34.4072
El Oro	83.9966	121.1919	44.2819
Esmeraldas	91.5098	111.5822	21.9347
Guayas	90.1254	117.0514	29.8761
Imbabura	85.6538	118.7484	38.6376
Loja	85.8795	115.1779	34.1156
Los Rios	87.3189	116.8518	33.8218
Manabí	86.2448	117.4976	36.2372
Morona Santiago	86.4107	115.6173	33.7997
Napo	88.5210	115.0763	29.9988
Pastaza	86.5776	114.2064	31.9121
Pichincha	88.5663	120.1930	35.7095
Tungurahua	87.1808	116.5294	33.6640
Zamora Chinchipe	86.3761	115.5714	33.8002
Sucumbíos	90.6865	108.3309	19.4563
Orellana	82.4132	117.0411	42.0174
Santo Domingo	88.1752	117.2284	32.9493
Santa Elena	93.9953	110.6061	17.6719

Source: Own elaboration.

Table 8. pmvyart Market potential growth: (2003–2014, Ecuador = 100).

leading regions. These regions are followed by those located in the coast and some of the ones located in the central Valley. The economic periphery is made up of the provinces located in the Northern and Eastern parts of the country.

4. Lorenz curves and Gini index: an alternative analysis of concentration of the economic activity in Ecuador

To complement the analysis carried out in the previous section and with the goal of getting a more complete picture of the distribution of the economic activity in Ecuador, this section presents the results of the spatial concentration of population and GDP in space by computing the Gini index and plotting the associated Lorenz curves for 2007 and 2014.

The results of **Table 9** are quite remarkable. Of the total population, 41.5% in Ecuador is concentrated in the two provinces in which the highest market potentials values are reached, Guayas and Pichincha. However, in terms of space, these two provinces only represent a 10.1% of the total area of the country. Additionally, 66.2% of the total Ecuadorian population is concentrated in six provinces; four in the coast regions and two in the valley regions. These regions represent 25.3% of the total area. The Eastern provinces represent around 46.8% of the national territory but only the 4.7% of the total population.

As **Figure 1** shows, the Lorenz curve for 2007 is far from the equal distribution line. The value of the Gini coefficient for this year was 0.54. Comparing these results with those of 2014 (**Table 10**) gives the same image. Guayas and Pichincha keep concentrating a big share of the total Ecuadorian population. The figure for 2014 is 43.3% which means an increase in terms of concentration of population in these two provinces close to 2% over the course of these 7 years. Of the population, 66.69% is concentrated in the six provinces mentioned for 2007 (four in the coast and two in the valley). So, these data speak out clearly about a gradual process of increasing the concentration of population in Ecuador over the course of these 7 years of our analysis.

The 45% of the total Ecuadorian population is concentrated in six provinces; four in the coast regions and two in the valley regions (**Figure 2**).

In order to finish the analysis of the concentration of the economic activity in Ecuador, we replicate the computation but instead of working with population data we work with gross value added data. **Tables 11** and **12** show the results of the computations. In the year 2007, around 51.4% of the total national GDP was concentrated in Guayas and Pichincha. Therefore, the remaining 48.6% of the total Ecuadorian gross value added is distributed over the 21 provinces left with the reinforcing effect that five provinces of the Eastern part of Ecuador generate 2.5% of the gross value added (GVA) but represent 32.3% of the total area of the country. Moreover, these data also show that production is more concentrated than population in the space.

The fact that more than 50% of the Ecuadorian GVA is concentrated in less than 10% of the territory reflects quite clearly the center-periphery pattern of the spatial distribution of economic activity in Ecuador. Again, the Lorenz curve (**Figure 3**) associated with these data shows the lack of an equal distribution of GVA in space.

The results for the year 2014 are repeated (**Table 12** and **Figure 4**). Over the course of these 7 years, the concentration of GVA in space was quite stable: Guayas and Pichincha still concentrate

a share of GVA similar to that of 2007. Amazonia provinces continue to have a marginal share in the national aggregate.

The associated Lorenz curve for 2014 shows again the lack of an equal distribution in terms of GVA in space.

Province	POP 2007	POP index	Area	Area index
Ecuador	13180564	100	247576.91	100
Guayas	3216811	24.4057	15430.4	6.2325
Pichincha	2260935	17.1535	9535.91	3.8516
Manabí	1264524	9.5938	18939.6	7.6499
Los Ríos	736363	5.5867	7205.27	2.9103
Azuay	668715	5.0734	8309.58	3.3563
El Oro	619616	4.7009	5766.68	2.3292
Tungurahua	508166	3.8554	3386.25	1.3677
Esmeraldas	481426	3.6525	16132.23	6.5160
Cotopaxi	456378	3.4625	6108.23	2.4672
Loja	423997	3.2168	11062.73	4.4684
Imbabura	405041	3.0730	4587.51	1.8529
Chimborazo	387216	2.9377	6499.72	2.6253
Santo Domingo	302931	2.2983	3446.65	1.3921
Santa Elena	238158	1.8068	3690.17	1.4905
Cañar	223151	1.6930	3146.08	1.2707
Carchi	166646	1.2643	3780.45	1.5269
Sucumbíos	163631	1.2414	18084.42	7.3045
Morona Santiago	123012	0.9332	24059.4	9.7179
Orellana	107167	0.8130	21692.1	8.7617
Napo	94720	0.7186	12542.5	5.0661
Zamora Chinchipe	81418	0.6177	10584.28	4.2751
Pastaza	73652	0.5587	29641.37	11.9725
Bolivar	176880	1.3419	3945.38	1.5935

Source: Own elaboration.

Table 9. Concentration of population in space: provincial analysis for 2007.

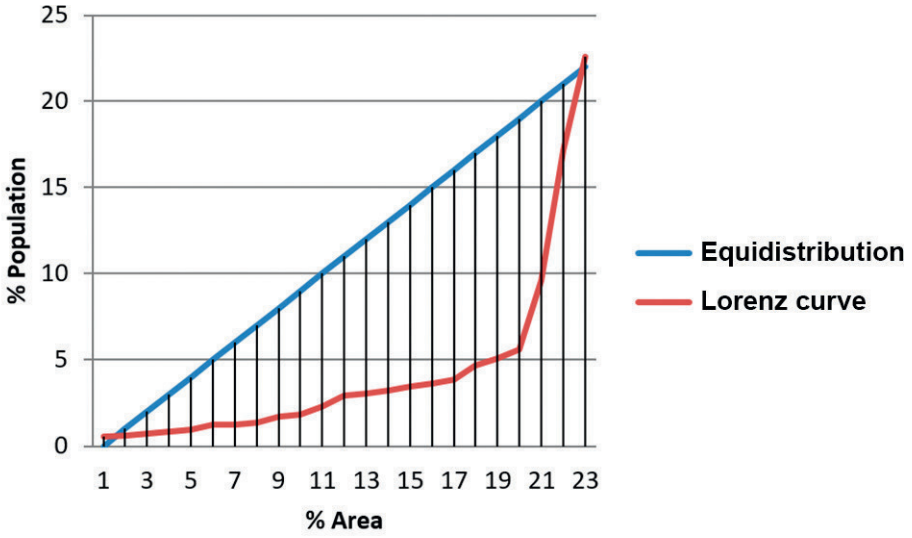

Figure 1. Concentration of population in the space: Lorenz curve (2007).

Province	POP 2014	POP index	Area	Area index
Ecuador	15990499	100	247576.91	100
Guayas	4024929	25.2160	15430.4	6.2325
Pichincha	2891472	18.1149	9535.91	3.8516
Manabí	1481940	9.2843	18939.6	7.6499
Los Ríos	853622	5.3479	7205.27	2.9103
Azuay	796169	4.9879	8309.58	3.3563
El Oro	662671	4.1516	5766.68	2.3292
Esmeraldas	590483	3.6993	16132.23	6.5160
Tungurahua	550832	3.4509	3386.25	1.3677
Chimborazo	496735	3.1120	6499.72	2.6253
Loja	490039	3.0700	11062.73	4.4684
Cotopaxi	450921	2.8250	6108.23	2.4672
Imbabura	438868	2.7494	4587.51	1.8529

Province	POP 2014	POP index	Area	Area index
Santo Domingo	411009	2.5749	3446.65	1.3921
Santa Elena	350624	2.1966	3690.17	1.4905
Cañar	253863	1.5904	3146.08	1.2707
Sucumbíos	200656	1.2571	18084.42	7.3045
Bolivar	199646	1.2507	3945.38	1.5935
Carchi	178228	1.1165	3780.45	1.5269
Morona Santiago	170722	1.0695	24059.4	9.7179
Orellana	148573	0.9308	21692.1	8.7617
Napo	117465	0.7359	12542.5	5.0661
Zamora Chinchipe	105213	0.6591	10584.28	4.2751
Pastaza	97093	0.6082	29641.37	11.9725

Source: Own elaboration.

Table 10. Concentration of population in the space: provincial analysis for 2014.

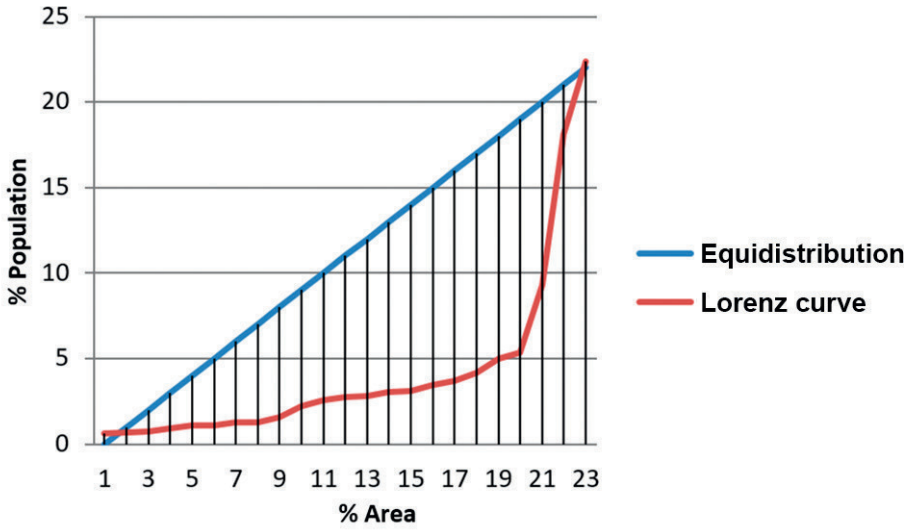

Figure 2. Concentration of population in the space: Lorenz curve (2014).

Province	Gross value added 2007	2007 GVA index	Area	Area index
Ecuador	50190086.88	100	247576.91	100
Guayas	13214750.89	26.3294	15430.4	6.2325
Pichincha	12611133.3	25.1267	9535.91	3.8516
Orellana	3358202.066	6.6909	21692.1	8.7617
Manabí	2688008.696	5.3556	18939.6	7.6499
Sucumbíos	2634997.387	5.2500	18084.42	7.3045
Azuay	2372847.61	4.7277	8309.58	3.3563
Esmeraldas	1535676.76	3.0597	16132.23	6.5160
El Oro	1485376.498	2.9595	5766.68	2.3292
Los Ríos	1610362.868	3.2085	7205.27	2.9103
Tungurahua	1307735.864	2.6055	3386.25	1.3677
Santa Elena	967550.6039	1.9277	3690.17	1.4905
Loja	886069.4937	1.7654	11062.73	4.4684
Santo Domingo	873247.841	1.7398	3446.65	1.3921
Imbabura	847935.3511	1.6894	4587.51	1.8529
Cotopaxi	813526.0521	1.6208	6108.23	2.4672
Chimborazo	805359.6217	1.6046	6499.72	2.6253
Cañar	492437.3047	0.9811	3146.08	1.2707
Pastaza	453855.0913	0.9042	29641.37	11.9725
Carchi	329638.4857	0.6567	3780.45	1.5269
Napo	308168.7469	0.6140	12542.5	5.0661
Bolívar	279234.4877	0.5563	3945.38	1.5935
Morona Santiago	180071.2014	0.3587	24059.4	9.7179
Zamora Chinchipe	133900.6612	0.2667	10584.28	4.2751

Source: Own elaboration.

Table 11. Concentration of GDP in the space: provincial analysis for 2007.

Province	GVA 2014	GVA index 2014	Area	Area index 2014
Ecuador	96149947.22	100	247576.91	100
Pichincha	24891270.92	25.8879	9535.91	3.8516
Guayas	24521159.48	25.5030	15430.4	6.2325
Orellana	7777765.855	8.0892	21692.1	8.7617
Manabí	5613352.904	5.8381	18939.6	7.6499
Azuay	4544320.808	4.7262	8309.58	3.3563
Sucumbíos	3555555.515	3.6979	18084.42	7.3045
El Oro	3514434.05	3.6551	5766.68	2.3292
Los Ríos	3290664.887	3.4224	7205.27	2.9103
Tungurahua	2529219.117	2.6304	3386.25	1.3677
Esmeraldas	2226630.386	2.3157	16132.23	6.5160
Imbabura	1874820.421	1.9498	4587.51	1.8529
Loja	1730412.907	1.7997	11062.73	4.4684
Santo Domingo	1669825.878	1.7366	3446.65	1.3921
Chimborazo	1645283.493	1.7111	6499.72	2.6253
Cotopaxi	1569886.543	1.6327	6108.23	2.4672
Santa Elena	1294825.234	1.3466	3690.17	1.4905
Cañar	955807.2926	0.9940	3146.08	1.2707
Pastaza	755638.0963	0.7858	29641.37	11.9725
Carchi	658539.5995	0.6849	3780.45	1.5269
Bolívar	504711.7462	0.5249	3945.38	1.5935
Morona Santiago	412703.5292	0.4292	24059.4	9.7179
Napo	344159.0745	0.3579	12542.5	5.0661
Zamora Chinchipe	268959.4799	0.2797	10584.28	4.2751

Source: Own elaboration.

Table 12. Concentration of GVA in the space: provincial analysis for 2014.

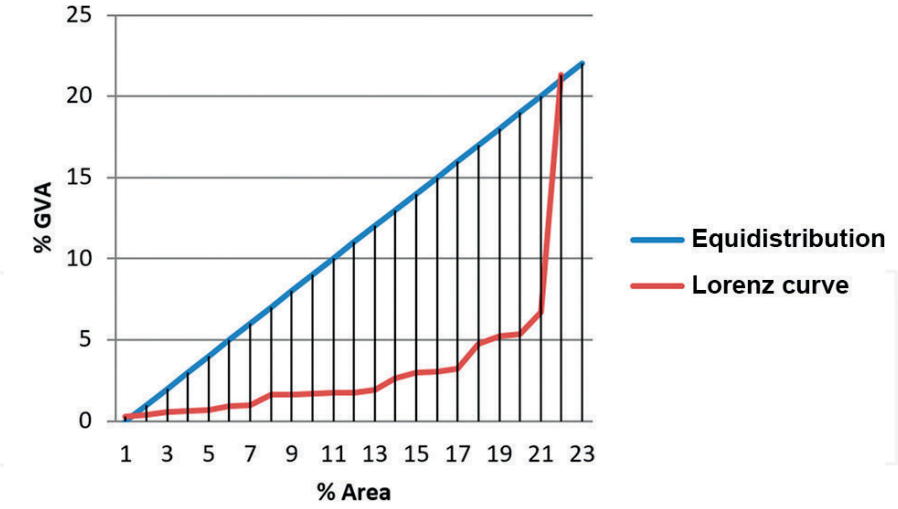

Figure 3. Concentration of GVA in space: Lorenz curve (2007).

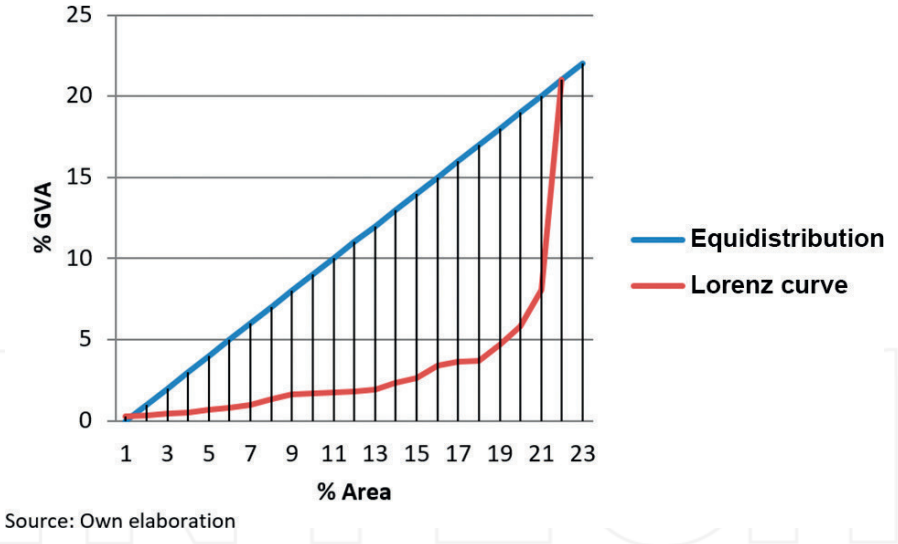

Figure 4. Concentration of GVA in space: Lorenz curve for (2014).

5. Conclusions

This chapter carries out an analysis of the spatial distribution of Economic activity in Ecuador over the period 2007–2014. The methodology followed was the computation of the so-called

Harris [1] market potential values as well as the analysis by means of the Lorenz curves and associated Gini indexes.

Our results are very conclusive about the so-called core-periphery spatial distribution of activity in space. Guayas and Pichincha provinces characterized by being the economic and political capitals of Ecuador concentrate the biggest shares of population and GDP in a fairly small amount of space. Moreover, from and geographical perspective, the so-called economic center of Ecuador is made up of the provinces located in the center and the coast.

From this perspective, the Guayas province, the main Ecuadorian port, with a steady growth in terms of agriculture, industry and services, is endowed at the same time with a very good airport and road infrastructures. It has been the economic policy in the last 10 years in Ecuador to improve the infrastructure quality of this part of the country. The potential growth of this region can be seen by taking into account that in the year 2015 the DP World company was assigned the building and administration of the Posorja port which is located in the province of Guayas with an amount of 1200 millions of dollars.

Pichincha, the province of the Ecuadorian capital, keeps its development based on the agricultural activities (growing flowers) services and industrial activities. Similarly, to the Guayas province, it has also an international airport and very good infrastructures. Both provinces are also important touristic destinations.

In the other hand, the "economic periphery" is located in the Eastern and Northern parts of Ecuador. These areas are characterized by a low economic development with very low qualification levels of its population (most of this population is made up of indigenous). The provinces in the Eastern parts of Ecuador although they are very well-endowed with minerals, especially oil, they were not fully exploited due to various political and economic reasons which limited the private investment.

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Chapter 9

The Economic Geography of Most North-Western Region of Spain: Galicia and the Effect of Market Access on Regional Development Levels

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Additional information is available at the end of the chapter

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Abstract

This chapter estimates the nominal wage equation of the geographical economics literature using data on the Galician regions over the period 2003–2013. The results of the estimations show the existence of a spatial wage structure across the Galician regions with a clear West-East gradient. Additionally, we have controlled for the inclusion of potential covariates that might be influencing the levels of regional per capita income such as educational attainment levels and technological levels. The results are robust to these alternative estimations

Keywords: regional economics, market potential, Galicia, center-periphery, geographical economics

1. Introduction

Economic activities tend to cluster in space (Florence [1]; Hoover [2]; Fuchs [3]; Enright [4]; Ellison and Glaeser [5]; Dumais et al. [6]; Porter [7]). Hall and Jones [8] note that high-income countries are concentrated in small areas in the northern hemisphere and that per capita productivity declines as the distance to cities in New York, Brussels and Tokyo increases. The theory of the new economic geography (NEG) (Krugman [9, 10]) also known as geographic economy (Brakman et al. [11]) has emerged as a very prominent branch within the space economy to analyze the concentration of economic activity in space and the center-periphery patterns that present economic activities at different levels of spatial aggregation. In this theoretical context, Redding and Venables [12] reached a conclusion similar to that of Hall and Jones [8] when estimating the nominal wage equation for a world sample of countries.

Breinlich [13], Bruna et al. [14], Lopez-Rodriguez and Faiña [15], among others, resorting to geographic economics literature, also show that the spatial distribution of income in European regions follows a clear center-periphery pattern. At the country level, the concentration of economic activity was also widely covered and analyzed by geographic economics literature (see Fally et al. [16]; Lopez-Rodriguez and Nakamura [17]; Mion [18]). The concentration of economic activity is also manifested at levels of aggregation below the national scale such as at regional level within each country, suggesting that the location of economic activities in space has a fractal character. Therefore, forces similar to those that operate when we study concentration patterns worldwide or at European level could be relevant to explain the location of economic activities at smaller scales. In this chapter, we intend to apply the geographical economy literature approach to help understand the disparities in per capita income levels observed in the Galician regions over the period 2003–2013. The rest of the chapter is structured as follows: Section 2 presents the theoretical foundations of the center-periphery model of economic geography. Section 3 contains the econometric specifications, the data source, and the construction of the variables. Section 4 presents the results of the estimates and unravels the channels of influence by examining possible cofactors that could affect per capita income levels at the county level and which are related to the market potential and, finally, Section 5 contains a summary of the main contributions of the chapter.

2. Theoretical background: the nominal wage equation of the core-periphery geographical economics models

The so-called "wage equation" of the NEG (multiregional version of Krugman 1991 model)[1] relates the regional wages with the size of the markets available to each region. It explains the equilibrium nominal wages in the manufacturing sector of each region *i* (*wi*) as a weighted sum of the volume of economic activity in the surrounding locations $j = 1,\ldots,R$. More specifically, on one hand it takes into account the region *j*'s volume of demand of individual manufacturing varieties. This element is the quotient between their demand of manufacturing goods (μjEj) and an index capturing the level of competition in *j*'s market (*Sj*), where *Ej* and μj are *j*'s total expenditure and manufacturing share of expenditure, respectively. On the other hand, the second element determines *j*'s demand of the specific variety produced in region *i*. It is the transport cost from region *i* to *j* destination (*Tij*), to the power of one minus the elasticity of substitution among the varieties of industrial goods ($\sigma > 1$) or range of product differentiation. A market-clearing condition defines the wage equation:

$$w_i = \left[\sum_{j=1}^{R} \frac{E_j \mu_j}{S_j} T_{i,j}^{1-\sigma}\right]^{1/\sigma} = [HMP_i]^{1/\sigma} \quad (1)$$

In the geographical economics literature, the right-hand side of Eq. (1) is referred to as market access (Redding and Venables [12]) and real market potential (see Head and Mayer [20]).

[1]Other related NEG models can be seen in Fujita et al. [19].

This simplification of the nominal wage equation is very similar to the Harris [21] market potential function in the sense that economic activity is more important in those regions which are close to large markets.

3. Econometric specifications

If we take logarithms in expression (1), the cross section estimate of the nominal wage equation for the regions $i = 1,\ldots, n$ is based on the estimation of the following expression:

$$lnw_i = \alpha + \beta \ln HMP_i + u_i \tag{2}$$

where u_i is the error term that reflects the effects of the omitted variables and therefore the deviations of the assumptions raised in the theoretical model, and the other variables correspond to the definitions given in the previous sections. Eq. (1) relates the nominal wage in region i to income in other regions, weighted by distance.

However, the estimation of Eq. (1) could be simply capturing a correlation with omitted variables such as infrastructure, human capital, levels of innovation, and so on. Therefore, to avoid these problems, we carried out an estimation of an extended regression equation of the following type:

$$lnw_i = \alpha + \beta \ln HMP_i + \sum_{n=1}^{N} \gamma_{in} X_{in} + u_i \tag{3}$$

where X_{in} is a vector of control variables and γ_{in} are the coefficients associated to the vector of control variables.

Eqs. (2) and (3) have an intercept (α) that collects all model parameters that are assumed to be common to all regions.

If we generalize the notation of the econometric version of the cross section estimates Eqs. (2) and (3) to a notation for the estimation of the previous equations using panel data and assuming that we have T periods, the expressions would be

$$lnw_{it} = \alpha + \beta \ln HMP_{it} + u_{it} \tag{4}$$

$$lnw_{it} = \alpha + \beta \ln HMP_{it} + \sum_{n=1}^{N} \gamma_{int} X_{int} + u_{it} \tag{5}$$

4. Data source and variable construction

The data used for the estimation of Eqs. (2)–(5) are data collected for 53 regions in which Galicia is divided during the years 2003–2014. The data come from different statistical sources: Socio-Economic Atlas Caixanova (2005–2009), Galician Institute of Statistics (IGE, in

Galician[2]), Michelin guide online,[3] Ministry of Finance and Public Administration, Survey of Infrastructure and Local Equipment, Bank of Spain, and Continuous Register of Inhabitants.

In relation to the dependent variable, wages, these have been approached using both nominal per capita income and per capita income in constant terms of 2006. This approach is frequent in the geographic economy literature (Redding and Venables [12]; Brakman et al. [22]). In a more precise way, the variables are as follows:

1. Nominal per capita income (Y): represents annual GDP per capita at the county level expressed in euros in current terms for the period 2003–2014. Sources: Socio-Economic Atlas Caixanova (2005–2009) and Galician Institute of Statistics (IGE).
2. Real per capita income (YR): Represents annual real per capita GDP at the county level (expressed in constant euros (base 2006)). Sources: Authors' calculations based on data on nominal per capita income along with the 2006 base CPI provided by the Instituto Galego de Estatística (GCE) for each of the years of the specified period.

With respect to the key variable in the estimation of the nominal wage equation, the market potential, we use the market potential definition of Harris [21] to construct this variable. The way in which the market potential of Harris [21] is constructed using the inverse of the distance as a weighting scheme allows one cross section to be compared for different periods of time. Both Head and Mayer [23] and Breinlich [13] obtain similar results in their estimates of the nominal wage equation for European regions by using both the measures derived from the structural equation of the center-periphery model of the geographic economy and the measure more ad hoc of the market potential of Harris [21]. Although the geographic economy framework remains here as a starting point, the use of Harris''s market potential [21] allows us to focus on the effects that the relative location of some regions in relation to others has on the levels of local per capita income. Therefore, for each region we construct an index of market potential that considers the sum weighted by the distance of the volume of economic activity Mj in the adjacent regions. The weighting scheme is a function that decreases with the increase in the distance between the locations i and j. The distance between places i and j (d_{ij}) is to be measured in two different ways:

a. On the one hand, the distances between regions i and j are approximated considering the kilometers that separate the capitals of the regions i and j. The use of physical distances can represent not only trade costs but also "relative" trade costs (Yotov [24]) and capture non-trade barriers (Linders et al. [25]) and spillovers.
b. On the other hand, we also consider the distance expressed in terms of time necessary to cover the distance separating the capitals of regions i and j. This weighting scheme allows controlling for the quality of the infrastructure, since two regions for which the physical distance is the same can have different access times depending on the quality of the infrastructure, physical geography of the region, and so on, and therefore the level of centrality of the region could be biased in case of using a weighting based only on the

[2]Website of the Galician Institute of Statistics (IGE): http://www.ige.eu/
[3]Website of the Michelin Guide: http://www.viamichelin.es/

distance expressed in kilometers. For the calculation of the access times between regions, the information obtained from the website of the Michelin Guide has been used by choosing the route that represents the shortest time.

The calculation of the local market potential has a domestic or internal component (market potential created by the region itself) and an external one (market potential created by the rest of the regions that compose our space analysis unit). In relation to domestic market potential, we need to know the internal distance within each region (d_{ii}). The standard methodology assumes that the spatial units (in our case the regions) are circular and the internal distance is approximated by a function that is proportional to the square root of the area of each region. Taking into account that we consider the circle-shaped space units, the radius of region i is $r_i = \sqrt{\text{area}_i/\pi}$. In this chapter, two measures of internal distance are used to build the domestic market potential. On the one hand, the work of Keeble et al. [26] chooses as measure of internal distance $d_{ii} = 1/3r_i = 0.188\sqrt{\text{area}_i}$ to allow the potential concentration of economic activity in and around the center. On the other hand, the formulation was followed by other authors such as Crozet [27], Head and Mayer [28], and Nitsch [29] as internal distance measure $d_{ii} = 2/3r_i = 0.376\sqrt{\text{area}_i}$. The calculation of the domestic market potential by approaching internal distances to Keeble et al. [26] increases the role of the internal market compared to the use of the 2/3 approximation of the radius used by other authors. Cambridge Econometrics [30] also calculates the internal distance between the regions of the European Union by approximating it by 40% of the radius, therefore its weighting is between the two measures used in this chapter.

If we exclude domestic market potential (DMP_i) in our formulation of market potential, we would be including measurement errors since we are substantially reducing the contribution that the most economically important regions are generating to the market potential indicator (Breinlich [13]; Head and Mayer [23]). A problem arising from its inclusion is that it aggravates the endogeneity problem associated with the use of the potential market variable in our estimates. Taking into account, on the one hand, what was commented earlier, and that according to the structural equation of the geographical economy model it is necessary to measure the accessibility of the companies to all the markets and considering that for each region i the companies have access to R-1 markets Potential within the community, the market potential of Harris [21] for each time period $t = 1, \ldots, T$ can be formulated mathematically so as to separate the domestic or internal component and the external component:

$$HMP_{it} = \sum_{n=1}^{N} \frac{M_{jt}}{d_{ij}} = \frac{M_{it}}{d_{ii}} + \sum_{j \neq 1}^{R-1} \frac{M_{jt}}{d_{ij}} = DMP_{it} + FMP_{it} \tag{6}$$

The second addend of the market potential expression of Harris [21] has received different names in the literature, "non-local" market potential (Head and Mayer [23]), "surrounding" (Blonigen et al. [31]), or "foreign" (Brakman et al. [22]).

The Harris approach has been widely used in regional economics. One of the reasons is that it offers a way to capture the first Law of Geography of Tobler [32], which would be quoted later by the literature of Space Econometrics: "everything is related to everything else, but things

nearby are more related than things far away." In the 1990s, Krugman's [9, 10] works in the field of international economics and geographic economics using general equilibrium frameworks provided the microeconomic foundations for the physical analogies of the Harris' [21] indicator (see Krugman [9, 33]).

In this chapter, we have approximated the variable that collects the economic activity M_j through different proxies:

a. Nominal GDP of each region.

b. Real GDP of each region.

c. Population of each region.

As variables of control, we have decided to incorporate variables that include aspects related to human capital (HSESCOL) and technological capital of each of the regions (PCTADSL). In addition, we have also controlled by the percentage of banking offices per region (POFB) as well as by the percentage of companies dedicated to the manufacturing activities in information and communication technologies (ICT) (PEMTIC). We believe that all these variables could be affecting the per capita income values of the different regions through market potential. The definition of these control variables is as follows:

1. PEMTIC: number of companies dedicated to the ICT manufacturing activities on the population of each region (number of companies/1000 inhabitants). It includes the following headings of the 1993 CNAE: 300 (manufacture of office machines and computer equipment); 313 (manufacture of insulated electrical wires and cables); 321 (manufacture of valves, tubes, and other electronic components); 322 (manufacture of radio and television transmitters and devices for radiotelephony and radiotelegraphy with wires); 323 (manufacture of sound, video recording, and reproducing devices); 332 (manufacture of instruments and devices for measuring, checking, controlling, navigating, and other purposes, other than control equipment for industrial processes); 333 (manufacture of industrial process control equipment). It includes the following sections of the CNAE 2009: 261 (manufacture of electronic components and printed circuits assembled); 262 (manufacture of computers and peripheral equipment); 263 (manufacture of communications equipment); 264 (manufacture of electronic consumer appliances); 268 (manufacture of magnetic and optical media). The time period analyzed includes from 2003 to 2007 and the years 2010 and 2012). Source: Own elaboration based on the classification according to the definition of ICT in WPIIS (2002 and 2007) and the data extracted from the Directory of companies and local units (IGE).

2. HSESCOL: Represents the percentage of students enrolled in second-level studies in general-regime centers (excluding adult mode) divided by the population of theoretical age to take these studies (region population between 12 and 18 years old). Secondary studies include compulsory secondary education (ESO in Spain), ordinary higher secondary-education course, basic vocational training, ordinary medium-level training courses, ordinary higher-level training courses, and professional qualification programs. The data

available for this variable are for the periods 2005–2012. Source: Own elaboration based on the data extracted from the statistics of non-university education in Galicia, an operation facilitated by the Department of Culture, Education and University Management and the Continuous Register of Inhabitants (IGE).

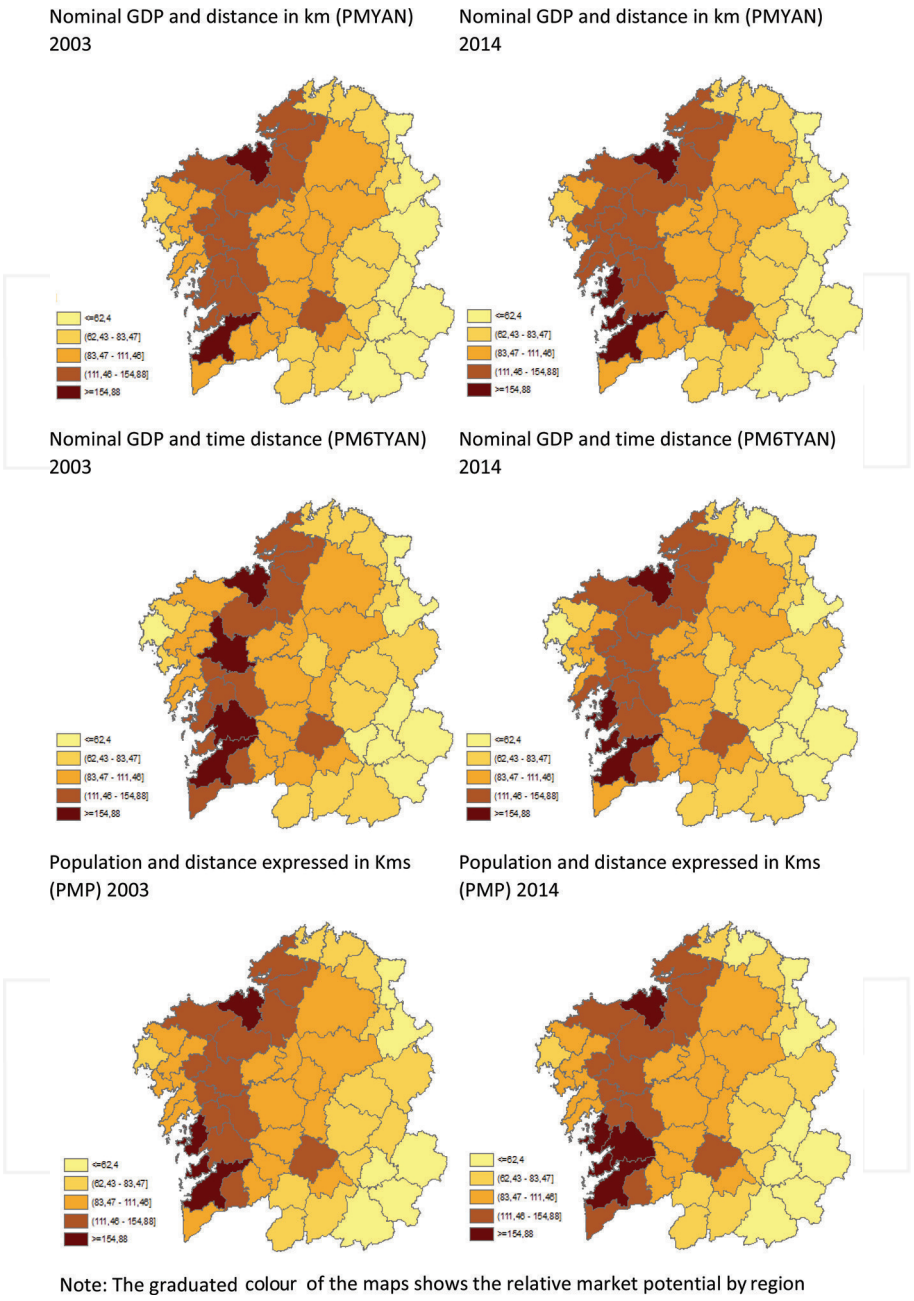
3. POFB: Represents the percentage of offices of credit institution on the inhabitants of each district (credit entities/100 inhabitants). Source: Own elaboration based on the data provided by the Statistical area of the Bank of Spain (as of December 31) and Continuous Register of Inhabitants, on January 1 of the following year (IGE). The data available for this variable are for the 2005–2012 periods except for 2008, 2009, and 2011.

4. PCTADSL: Represents the percentage of homes with access to the wireless network. This is the best known network (Asymmetric Digital Subscriber Plan). It combines the virtualities of RTB and ISDN so that it soon became the most popular type of connection. It takes advantage of the wiring of the RTB and offers a greater speed, although the speed of descent (discharge of files of Internet) is greater than that of rise. Bandwidth can be reduced by user location. Maximum theoretical bandwidth: 8 Mbps. The data available for this variable correspond to the years 2005, 2010, and 2012. Source: Infrastructure and Local Equipment Survey prepared by the Ministry of Finance and Public Administration. Municipalities with more than 50,000 inhabitants do not fall within the scope of the survey.

All control variables are ratios for which population data have been used from the statistical exploitation of the 2001 and 2011 censuses and the Continuous Register of Inhabitants.

5. Empirical results

The set of maps represented in **Map 1** represents the relative market potential of each Galician region in 2003 and 2014 (Galicia = 100) using different variants when calculating market potential. The first two maps are used to construct the index of market potential nominal GDP and the regional distance expressed in kilometers between capitals of each comarca; the following two maps use the same indicator of the volume of economic activity, nominal GDP, but the distance is expressed in minutes of travel using the shortest route provided by the Michelin guide between the capitals of the regions, and finally the last two maps use the population as an indicator of the volume of economic activity and the regional distance expressed in kilometers between the capitals of each region. As can be seen in all maps, Galicia has a clear center-periphery structure. The market potential in the more Western regions is greater than the market potential in the more Eastern regions. Therefore, there is a clear west-east gradient in the total market potential regardless of the reference year. Nevertheless, if we compare the evolution in time of the west-east gradient of 2003 with that of 2014 of the first two maps and of the last two, we observed in both cases a slight increase of the same. The evolution of the gradient when we measure accessibility in terms of travel time between regions seems to follow a more stable pattern.



Map 1. Local market potential based on nominal GDP and population in relation to the distance between regions 2003 and 2014 (Galicia = 100). Source: See the text.

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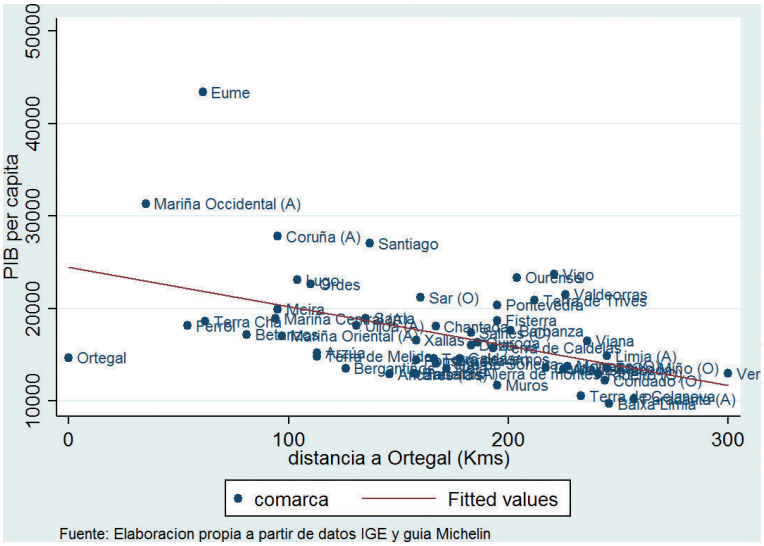

Figure 1. GDP per capita and distance to Ortegal (2012).

The "center-periphery" structure we have represented in terms of market potential (**Map 1**) can also be visualized through a clear spatial gradient for county per capita income levels.

Figure 1 shows the regional per capita income in relation to the distance to the region of Ortegal, a region located in the northwest of the province of A Coruña. The results clearly show that as we move away from the Ortegal region, the average per capita income level (on average) decreases.

Finally, **Figures 2** and **3** show the existence of a positive relationship between the market potential values at the county level and the per capita income levels in the county for both 2003 and 2014. It is, therefore, corroborated from the graphical point of view that the Galician counties with a greater market potential are also the regions that have the highest levels of income per capita. It can be observed that the relationship is robust and is not due to the influence of a few regions.

This "center-periphery" spatial pattern observed at the regional level for Galicia is commonly observed when reference is made to the analysis of the spatial distribution of income in broader geographical environments, for example, for the analysis of countries around the world (Lopez-Rodriguez et al. [34]), regions (NUTS2) within countries (see Lopez-Rodriguez et al. [35]), regions of Europe (see Lopez-Rodriguez and Faiña [36], Lopez-Rodriguez et al. [37]).

The objective of finding a causal relationship between these two variables, market potential and levels of per capita income shown in **Figures 2** and **3** and which has its theoretical basis in the literature of geographical economics, constitutes the central core of the analysis that we carry out in the following sections of this chapter.

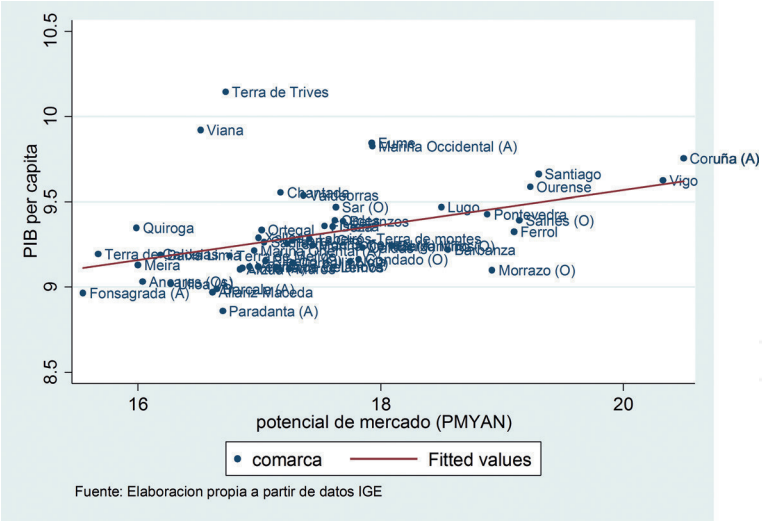

Figure 2. GDP per capita and market potential (2003).

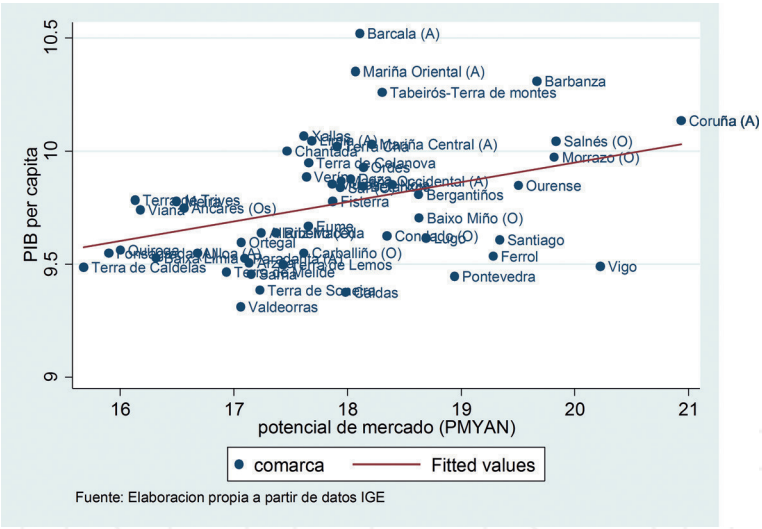

Figure 3. GDP per capita and market potential (2014).

6. Unraveling channels of influence: preferred estimates

Although the list of potential variables that affect local per capita income levels can be very numerous, for the analysis carried out in this chapter we have chosen to include those variables whose influence may be affected by our market potential indicators. Among the variables

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chosen as control variables are, on the one hand, educational levels (HSESCOL). In relation to educational levels, and from a theoretical point of view, Redding and Schott [38] derive a theoretical relationship between human capital and market potential within a center-periphery model of geographic economy. According to these authors, those locations that have high levels of market potential provide long-term incentives for the accumulation of human capital, basically through an improvement in pay schemes for workers with higher qualification levels. Redding and Schott [38] obtain these results in the case that intermediate goods and goods in transport costs are also the relatively more intensive goods in the use of qualified human capital. The theoretical predictions derived from the Redding and Schott [38] model have been contrasted by the same authors using a worldwide sample of countries. Additionally, Lopez-Rodriguez et al. [35, 37] conducted estimations of the Redding and Schott [38] model for the regions of the European Union and for the case of the Romanian regions and Can Karahasan and Lopez-Bazo [39] for the case of the Spanish provinces. In all these cases, the results obtained show that the locations with greater market potential have a greater incentive to the accumulation of qualified human capital. Breinlich [13] and Bruna et al. [40] also use human capital as control in estimating the nominal wage equation for the regions of the European Union.

As can be seen in **Figures 4** and **5**, human capital stocks are highly correlated with market potential, also for the case of the regions in Galicia (at least for our analysis period). These graphs represent the students enrolled in secondary studies over the proportion of students from each region in theoretical age to study those studies for the years 2005 (**Figure 4**) and 2012 (**Figure 5**).

Other variables incorporated as controls are the percentage of dwellings within each region with access to the ADSL communications network (PCTADSL) and the number of companies engaged in the ICT manufacturing industries (PEMTIC). Finally, the number of bank offices

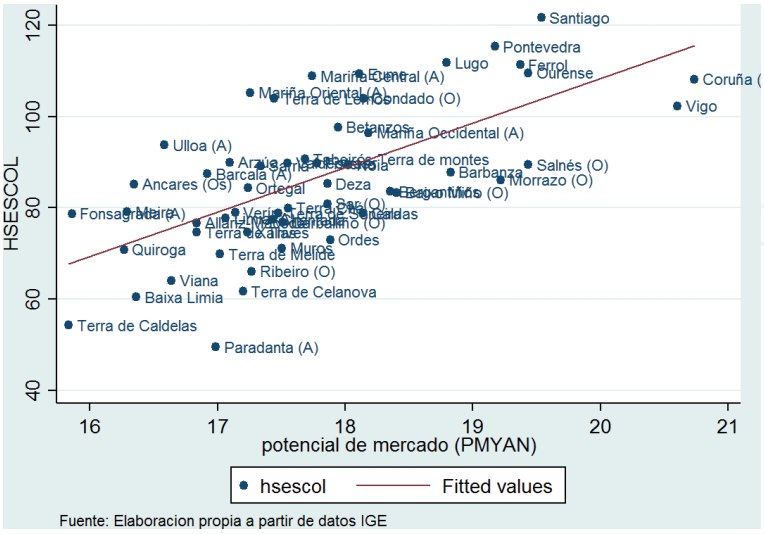

Figure 4. Market potential and high-school student ratio (2005).

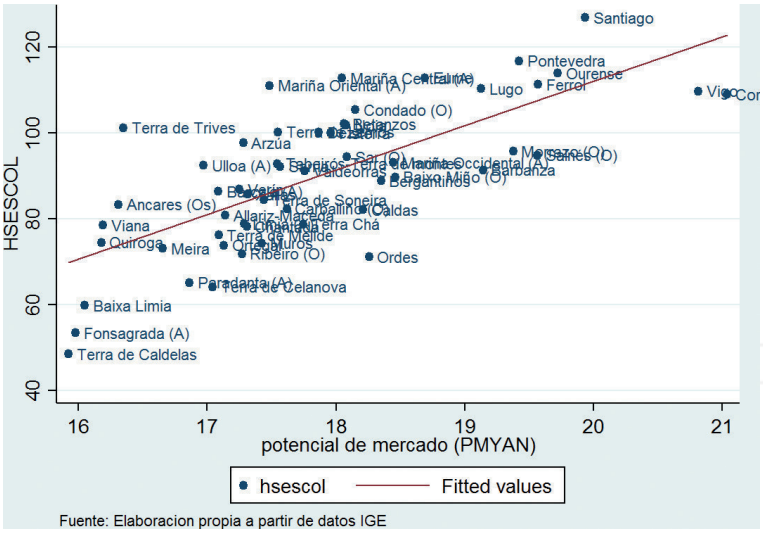

Figure 5. Market potential and high-school student ratio (2012).

per 100 inhabitants (POFB) is also included as a control variable. In this case, the banking offices are usually located according to profitability criteria where they have access to a greater potential number of clients. The market potential as an indicator of accessibility is also guiding the size of the potential demand of each region and therefore a positive relationship between the two variables.

Taking these results into account, one way of unraveling the effects of market potential on local per capita income levels is to incorporate human capital into our initial estimates as an additional regressor. If human capital is included in our initial regressions and they maintain the positive and statistically significant coefficient of market potential, it would mean that the potential market variable is really important in determining income levels for the regions in Galicia.

Table 1 presents the results of the combined effects of market potential, human capital, percentage of banking offices over the county population, percentage of households in the region with ADSL lines, and percentage of companies in the medium- and high-technology sectors over the level of income per capita. For the estimates in column 1, the market potential is constructed using the regional GDP aggregate in constant euros of 2006 as a variable that approximates the economic activity, and the distance between regions is approximated by the distance in kilometers between the capitals of the regions calculating the internal distance with expression $d_{ii} = 2/3r_i = 0.376\sqrt{\text{area}_i}$. In column 2, the market potential is constructed using the regional GDP aggregate in euros constant of 2006 as variable that approximates the economic activity, and the distance between regions is approximated by the distance in kilometers between the capitals of the regions calculating the internal distance with the expression $d_{ii} = 1/3r_i = 0.188\sqrt{\text{area}_i}$. In column 3, the market potential is constructed using the local population as a variable that approximates economic activity, and the distance between

Dependent variable	Log of per capita income			
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Constant	5.88** (1.10)	5.68** (0.90)	7.59** (0.62)	7.56** (0.51)
HSESCOL	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)
POFB	3.72** (0.59)	3.75** (0.57)	3.55** (0.61)	3.59** (0.59)
PCTADSL	0.0015** (0.0005)	0.0016** (0.0005)	0.0015** (0.0005)	0.0015** (0.0005)
PEMTIC	0.30** (0.11)	0.27* (0.11)	0.32** (0.11)	0.32** (0.11)
PMYAR	0.13* (0.05)			
PM3YAR		0.14** (0.04)		
PMP			0.08* (0.06)	
PM3P				0.08* (0.05)
Estimate	PLS	PLS	PLS	PLS
R^2	0.44	0.45	0.42	0.43
R^2 adjusted	0.42	0.43	0.41	0.41
Prob. (*F*-statistic)	0.00	0.00	0.00	0.00
Number of observations	159	159	159	159

Note: The table shows the coefficients for LS estimates and robust standard errors for Huber-White heteroskedasticity in parentheses. HSESCOL represents the proportion of the population enrolled in secondary studies on the theoretical population of the age to study these studies; POFB, percentage of bank offices, PCTADSL, percentage of households with access to ADSL network; PEMTIC, number of ICT companies; PMYAR, PM3YAR, PMP, and PM3P are the market potentials of the period 2003–2013 according to the details given in the text. For data sources, see text * and ** mean statistical significance at the levels of 10 and 5%, respectively.

Table 1. Unraveling the channels of influence of market potential (2003–2013): distance in km.

regions is approximated by the distance in kilometers between the capitals of the regions, calculating the internal distance with the expression $d_{ii} = 2/3r_i = 0.376\sqrt{\text{area}_i}$. Finally, in column 4 the market potential is constructed using the local population as a variable that approximates economic activity and the distance between regions is approximated by the distance in kilometers between the capitals of the regions, with the internal distance being calculated with the expression $d_{ii} = 1/3r_i = 0.188\sqrt{\text{area}_i}$

The results of the estimates of the first two columns show that, despite the inclusion of control variables, the coefficient associated with market potential continues to show a positive and statistically significant value at the 5% level. In addition, the magnitude of the coefficient still

shows a high degree of stability compared to the results obtained in the previous estimates with a value in the environment of 0.13–0.14. Human capital and other control variables are statistically significant at the 5% level and the signs are in line with both theoretical predictions and economic intuition. The results of the estimates presented in columns 3 and 4 show that the market potential is not statistically significant at the 5% level.

We also proceeded to repeat the estimates in **Table 1** using as a distance indicator, in relation to the construction of the potential market variable, the distance measured in minutes of access between the capitals of each region taken from the Michelin Guide and measuring the distance within each region as the necessary minutes to travel the same at three different speeds, 60, 80, and 100 km/h. The variable used to approximate the economic activity in all the estimates has been the aggregate GDP in euro constant in 2006. The results of these estimates are presented in **Table 2**.

The results show that there are no significant changes in relation to previous estimates. Irrespective of whether the construction of the market potential indicator is made taking into account access times between regions, the market potential coefficient remains in line with the theoretical predictions of the geographic economy model and the variable is shown to be statistically significant. In addition, the coefficient shows a great stability around the value 0.13 for all the estimates.

Dependent variable	**Log of per capita income**					
Regressors	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	6.01**	5.81**	5.91**	5.82**	5.84**	5.85**
	(1.14)	(0.92)	(1.05)	(0.83)	(0.98)	(0.78)
HSESCOL	0.01**	0.01**	0.01**	0.01**	0.01**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
POFB	3.68**	3.72**	3.71**	3.73**	3.72**	3.73**
	(0.59)	(0.57)	(0.57)	(0.56)	(0.56)	(0.56)
PCTADSL	0.0016**	0.0017**	0.0016**	0.0017**	0.0016**	0.0017**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
PEMTIC	0.29*	0.27*	0.27**	0.26*	0.27*	0.25*
	(0.11)	(0.11)	(0.01)	(0.11)	(0.11)	(0.11)
PM6TYAN	0.12*					
	(0.06)					
PM6T3YAN		0.13**				
		(0.06)				
PM8TYAR			0.13**			
			(0.05)			
PM8T3YAR				0.13**		
				(0.04)		
PM10TYAR					0.13**	
					(0.05)	
PM10T3YAR						0.13**
						(0.04)

Dependent variable	Log of per capita income					
Regressors	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Estimate	PLS	PLS	PLS	PLS	PLS	PLS
R^2	0.43	0.45	0.44	0.45	0.44	0.46
R^2 adjusted	0.41	0.43	0.42	0.43	0.42	0.44
Prob. (*F*-statistic)	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	159	159	159	159	159	159

Note: The table shows the coefficients for LS estimates and robust standard errors for Huber-White heteroskedasticity in parentheses. HSESCOL represents the proportion of the population enrolled in secondary studies on the theoretical population of the age to study these studies; POFB, percentage of bank offices, PCTADSL, percentage of households with access to ADSL network; PEMTIC, number of ICT companies; PM6TYAN, PM6T3YAN, PM8TYAR, PM8T3YAR, PM10TYAR, PM10T3YAR are market potentials for the 2003–2013 periods calculated according to the details given in the text. For data sources, see text * and ** mean statistical significance at the levels of 10 and 5%, respectively.

Table 2. Unraveling the channels of influence of market potential (2003–2013): distance in time.

Tables 3 and **4** present the estimates corresponding to **Tables 1** and **2** but using five time delays of the market potential variable to control for the potential problems of endogeneity between our dependent variable and our main regressor.

Dependent variable	Log of per capita income			
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Constant	6.28**	6.00**	7.59**	7.55**
	(0.14)	(0.11)	(0.64)	(0.52)
HSESCOL	6.28**	0.01**	0.01**	0.01**
	(0.14)	(0.00)	(0.00)	(0.00)
POFB	3.89**	3.96**	3.55**	3.59**
	(0.73)	(0.70)	(0.61)	(0.59)
PCTADSL	0.0023**	0.0024**	0.0015**	0.0015**
	(0.0006)	(0.0006)	(0.0005)	(0.0005)
PEMTIC	0.47**	0.45**	0.33**	0.32**
	(0.14)	(0.14)	(0.11)	(0.11)
L5.PMYAR	0.10			
	(0.07)			
L5.PM3YAR		0.12**		
		(0.05)		
L5.PMP			0.08	
			(0.06)	
L5.PM3P				0.09
				(0.05)

Dependent variable	Log of per capita income			
Regressors	**(1)**	**(2)**	**(3)**	**(4)**
Estimate	PLS	PLS	PLS	PLS
R^2	0.52	0.53	0.42	0.43
R^2 adjusted	0.50	0.51	0.40	0.41
Prob. (*F*-statistic)	0.00	0.00	0.00	0.00
Number of observations	106	106	159	159

Note: The table shows the coefficients for MCO estimates and robust standard errors for Huber-White heteroskedasticity in parentheses. HSESCOL represents the proportion of the population enrolled in secondary studies on the theoretical population of the age to study these studies; POFB, percentage of bank offices, PCTADSL, percentage of households with access to ADSL network; PEMTIC, number of ICT companies; L5.PMYAR, L5.PM3YAR, L5.PMP, and L5.PM3P are the market potentials of the periods 2003–2013 lagged five periods. For data sources, see text * and ** mean statistical significance at the levels of 10 and 5%, respectively.

Table 3. Unraveling the channels of influence of market potential (2003–2013): lags and distance in kilometers.

Dependent variable	Log of per capita income					
Regressors	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	6.48** (1.43)	6.12** (1.15)	6.27** (1.31)	6.10** (1.04)	6.17** (1.22)	6.12** (0.97)
HSESCOL	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)
POFB	3.85** (0.74)	3.93** (0.71)	3.89** (0.72)	3.94** (0.70)	3.92** (0.71)	3.96** (0.69)
PCTADSL	0.0024** (0.0006)	0.0024** (0.0006)	0.0024** (0.0006)	0.0024** (0.0006)	0.0024** (0.0006)	0.0024** (0.0006)
PEMTIC	0.47** (0.14)	0.44** (0.14)	0.45** (0.14)	0.43** (0.14)	0.45** (0.14)	0.43** (0.14)
L5.PM6TYAR	0.09 (0.07)					
L5.PM6T3YAR		0.11 (0.06)				
L5.PM8TYAR			0.103 (0.06)			
L5.PM8T3YAR				0.11** (0.05)		
L5.PM10TYAR					0.11* (0.06)	
L5.PM10T3YAR						0.11** (0.05)

Dependent variable	Log of per capita income					
Regressors	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Estimate	PLS	PLS	PLS	PLS	PLS	PLS
R^2	0.52	0.53	0.52	0.53	0.52	0.53
R^2 adjusted	0.49	0.50	0.50	0.51	0.50	0.51
Prob. (F-statistic)	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	106	106	106	106	106	106

Note: The table shows the coefficients for MCO estimates and robust standard errors for Huber-White heteroskedasticity in parentheses. HSESCOL represents the proportion of the population enrolled in secondary studies on the theoretical population of the age to study these studies; POFB, percentage of bank offices, PCTADSL, percentage of households with access to ADSL network; PEMTIC, number of ICT companies; L5.PM6TYAN, L5.PM6T3YAN, L5.PM8TYAR, L5. PM8T3YAR, L5.PM10TYAR, and L5.PM10T3YAR are the market potentials of the period 2003–2013 lagged five periods. For data sources, see text * and ** mean statistical significance at the levels of 10 and 5%, respectively.

Table 4. Unraveling the channels of influence of market potential (2003-2013): Lags and distance in time.

The results of the estimates show that the market potential is shown to be positive and statistically significant at the 5% level in those estimates where the domestic market potential is calculated through the approximation to the internal distances within each region as $d_{ii} = 1/3r_i = 0.188\sqrt{\text{area}_i}$

This would be showing that the estimates are sensitive when defining the domestic market potential in the composition of the total market potential of each region. In other words, the relative importance of the region's own activity in relation to the construction of market potential is very relevant.

Finally, the results of this set of regressions confirm the results of the theoretical model and thus show that market potential is an important variable when analyzing the difference in per capita income levels in the regions of Galicia. On the other hand, our results point to the fact that human capital could be playing an important role in the determination of income levels in the Galician regions.

7. Conclusions

In this chapter, we have presented a standard center-periphery model of geographical economics and estimate the so-called nominal wage equation using data from the regions of Galicia for the periods 2003–2013. The main results of the estimates are in line with the theoretical predictions of the model, showing that there is a spatial structure of per capita income levels in the Galician regions. The results of the initial estimates of per capita income levels against market potential have shown that even by controlling for variables that are influenced by market potential, it continues to play an important role in explaining per capita income disparities in Galicia. The results of the estimates have been tested for robustness to

control for endogeneity problems by means of past-value estimates (market potential lags) to control for the problems arising from shocks associated with spatially correlated variables, but inter-temporally not correlated. The results of these alternative estimates have also shown that market potential remains positive and statistically significant in the explanation of per capita income levels in the Galician regions. In addition, to unravel the effects of the variables that work through accumulation incentives and that could therefore be linked to the market potential (human capital case), we have extended the base estimates by incorporating as a control in the estimates a proxy for the human capital defined as the proportion of secondary school students over the school-age population of the region. In addition, other control variables such as percentage of banking offices, households with access to ADSL, and percentage of ICT companies within each region were added to the initial estimate. The results of the estimates have shown that the market potential is still relevant in the determination of the levels of income per capita.

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Chapter 10

Some Perpetually Old and New Development Issues in the EU Regions: Competitiveness, Resilience, and Convergence: Where Do the New Member States Stand?

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Additional information is available at the end of the chapter

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Abstract

Competitiveness, resilience, and convergence were topics that for decades were listed among the hot issues that have animated the scientific and political debates in the area of economic growth and economic development. For the new member states (NMS) of the European Union, which have accessed the Union since 2004, competitiveness and cohesion became from the first days of their EU membership key topics on their national policy agendas, both as directives of the EU policies to be transposed and implemented nationally and as genuine domestic concerns to be addressed by each of the NMS, while resilience revealed its importance a little bit later, on the occasion of the global economic crisis of 2008–2010 and subsequent recession. Considering their importance for the current and future socioeconomic development of the new member states, the authors present and briefly analyze the topics of competitiveness, resilience, and cohesion in a joint framework, at regional level, based on their common roots within the economic growth and development theories, with the help of a minimal, but powerful, set of relevant indicators, over three significant recent periods: ante-crisis, crisis, and post-crisis. The findings point toward both different and similar competitiveness, resilience, and convergence developments within the new member states and across countries, regions, and periods, also revealing growth and adaptation patterns similar to those found in the more developed regions and countries of the EU, especially in the wake of the global economic crisis.

Keywords: regional competitiveness, regional resilience, convergence, new member states, GDP per capita, productivity, employment, growth and development patterns, adaptation

1. Introduction

Competitiveness, resilience, and convergence: irrespective their ordering, such topics were found for decades among the hot issues (however, not exclusive) that have animated the scientific and political debates in the area of economic growth and economic development, especially in the European Union but also worldwide. The entire policies and programs were explicitly dedicated to them, for instance, the Lisbon Strategy of the European Union during the 2000–2010 period, with its explicit (and overambitious) goal of making the EU the most competitive territory of the world. Under new forms, these topics reemerged as foundations of the current Europe 2020 Strategy, with its emphasis on smart, sustainable, and inclusive growth, and objectives, targets, and indicators of the previous more explicit policies are included among the instruments of the policies implemented during this programming period in the EU and its member states. In the same line of argument, newer approaches on competitiveness, resilience, and convergence appeared in the economic science or older ones were upgraded, data bases were updated and improved, and new techniques were employed to solve increasingly complex and interdisciplinary-related topics.

For the new member states (NMS henceforth) of the EU, which have accessed the Union since 2004, competitiveness and cohesion were from the first days of their EU membership key topics on their national policy agendas, both as directives of the EU policies to be transposed and implemented nationally and as genuine domestic concerns to be addressed by each of the NMS. Resilience revealed its importance a little bit later, with the onset of the global economic crisis of 2008–2010 and subsequent recession, whose impacts were severe and still not fully accommodated by the more stressed socioeconomic systems of the NMS, barely emerged from the labors of transition to the market economy. With the advance of the environmental and sustainability issues, resilience itself follows the same path of "perpetuation," explicitly or under different (interdisciplinary) forms, within the current topics approached and analyzed in the socioeconomic science and in policy making. All the abovementioned topics of interest were broadly analyzed and debated at national level in the EU and the NMS, but a special interest raised their "territorial detailing" and "descent into the real economy": analysis and/or enforcement at regional, subregional, and local levels.

Considering such ideas, the authors present and briefly analyze the topics of competitiveness, resilience, and cohesion not individually, but jointly, not at national, but at regional level (a more detailed level of analysis needing more writing space), based on their common roots within the economic growth and development theories, with the view to outline an integrated framework of analysis. The analysis is far from comprehensive and focuses entirely on the NMS in their relationships with competitiveness, resilience, and convergence. The paper is organized as follows. Part 2 briefly presents the definitions and some conceptual issues regarding competitiveness, resilience, and convergence; Part 3 presents a literature review on the assessment methodologies and indicators; Part 4 shows the results of the chosen assessment framework; and Part 5 outlines conclusions and further lines of research.

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2. Regional competitiveness, resilience, and convergence: definitions and some conceptual issues

Competitiveness is a topic that animates for years both the scientific and the political arenas, with extensive and often controversial debates covering a wide range of economic approaches, from those originating at company and industry level to those that include international trade and, not least, the *location,* with connections to different streams of economic theory, from Porter's cluster theory to the theories of new economic geography and regional economy, whose roots may be found in the works of P. Krugman (see [1]). Competitiveness is also one of the central interests of the economic policy concerned with the welfare of nations, because the long-term life standard of every nation depends on the ability of the national economy to achieve and maintain a high level of productivity in those sectors and companies that are competitive on the international markets [2]. Nationally, competitiveness involves a *territorial dimension*, the localization of competitive economic agents being usually concentrated within certain areas of the national territory.

Regional competitiveness is a topic of major interests among the decision makers of the European Union and of the member states, lately especially in connection with the *economic and social cohesion* and the consequent policies. Increasing competitiveness of the laggard and less prosperous regions of Europe is a key for achieving the goal of cohesion, especially in the context of the monetary union and of integration of the new member states [3], which, in their turn, induced new theoretical approaches in economics that assign a fundamental place to the localization of economic activities and to the development of regional economies [4]. Moreover, the achievement of Europe 2020 goals regarding the smart, sustainable, and inclusive growth has depended, depends, and to a great extent will depend on the situation of the European regions, and according to the EU vision, *the competitive regions are those regions able to anticipate and successfully adapt to the domestic and foreign economic and social challenges* [5]. However, despite the long-term implementation of the EU regional policy, the existing regional disparities continue to pose problems in terms of cohesion in the EU, especially after its eastward expansion and the 2008–2010 economic crisis.

Different concepts of regional competitiveness, stemming from different opinions, were revealed over years in the theory and practice of economic growth and economic development. Basically, the notion of regional competitiveness captures two different economic categories: productivity and employment [6]. Thus, a study on the key factors of *regional competitiveness in Europe* [7] defines it as "the capability to produce goods and services that meet the market requirements, at the same time maintaining high and sustainable incomes" or, more generally, as "the capability of regions to generate relatively high incomes and employment when facing foreign competition." Similar definitions are those given by the European Commission [8]: "the ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels" and the European Competitiveness Report (see [6, 9]): "competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment, as possible."

Two broad approaches of regional competitiveness were identified [7]: (i) as *aggregate of companies' competitiveness*, the basic assumption being that the interests of the companies and of the regions where they are located are always convergent, which is hard to support given the fact that the companies seek for productivity and profits, while regional competitiveness requires also taking into account the employment, the institutional milieu, and the market structure, and (ii) as *derived from the macroeconomic competitiveness*, the limits of such an approach concerning the fact that some laws that govern foreign trade do not apply at subnational level (the exchange rate dynamics and the wage-price flexibility either do not work properly or do not exist at regional level), while, conversely, the interregional migration of mobile production factors (capital and labor) may turn into a real threat for the regions [10].

However, many other studies consider as unrealistic such an approach of regional competitiveness, since the regions are neither mere aggregations of companies nor lower-scale models of national competitiveness. In this respect, some studies [7, 11] argue that regions compete one against each other on the basis of *absolute advantage* rather than on that of comparative advantage and that a region has an absolute competitive advantage when it also has technological, social, institutional, and infrastructure assets external to the companies but of which they benefit from, which confer high productivity to the respective region. Thus, at *regional/subregional level*, competitiveness must reflect that, besides the presence in each region/subregion of a mix of very competitive businesses/economic structures and uncompetitive others, there are certain common features within each region affecting the competitiveness of all the businesses located there, including, inter alia, the physical and social infrastructure, workforce qualification, and effectiveness of public institutions. *Productivity* is important not only in that it affects the comparative advantage of a region's export sectors but also in a whole range of industries and services in the region [7, 10]. Competitiveness depends on the productivity with which a location uses its human, capital, and natural resources, setting the sustainable standard of living [12]. In this line of argument, a newer approach of the concept of national competitiveness, productivity-based, which may be used to analyze the regional level, is the one proposed by Delgado-Ketels-Porter-Stern (DKPS): the *foundational competitiveness*, defined as the expected output per person of working age, given the overall quality of a country/region as a location for economic activity [13]. *The foundational competitiveness defines the competitiveness in terms of results based on a modified concept of labor productivity*: GDP per capita considering the number of working age population, as an approximation of the potential labor force instead of the real one. In addition to productivity, another indirect result included in this approach is the *maximum use of labor*.

The concept of competitiveness is often perceived as the *ability of a country/region to generate long-term welfare of its inhabitants*. The analysis of competitiveness proposed by Aiginger (see [14, 15]), which considers *competitiveness in terms of welfare* raised a new question mark: what is the measure of economic performance that the notions of competitiveness should analyze (including at territorial level)? The productivity-based approach common in literature presents the *income* (expressed through related indicators, such as *GDP per capita*) as the ultimate measure of economic performance [16, 17]. However, lately more and more criticism was raised about the fitness of monetary income for the aims of a society, in terms of environmental sustainability and the complexity of relations between this and other dimensions of

economic and social progress. As a result, new and related approaches regarding competitiveness have emerged which include goals and indicators of post-GDP type, welfare economics, economics of happiness, etc. (see [15, 17, 18]).

The complexity of the regional competitiveness concept may be also revealed by different multilevel frameworks of analysis. For instance, the *analytical breakdown by four levels* [19], where different types of determinants act, is as follows: (i) the *micro level*, the determinants of competitiveness focusing on the efforts of companies and their collaboration/business networking; (ii) the *meso level*, which aims to create an enabling environment for businesses, the determinants focusing on the physical infrastructure, on the sectoral policies oriented toward competitiveness (education and R&D, industry, environment, promotion of exports), and on the policies with unequivocal territorial focus (regional policy, localization policy, territorial promotion); (iii) the *macro level*, which includes the macroeconomic, political, and legal framework that fosters competition, the main determinants being connected to the monetary, budgetary, and fiscal policy, trade and exchange rate policy, and competition and consumer protection policy; and (iv) the *meta level*, which covers the basic guidelines of society, the determinants referring to the competitive economic system, the ability to develop visions and strategies, the value system that encourages learning and change, the collective memory, the social cohesion, the social capital, and the social status of entrepreneurs. In the regional/subregional/local area, all the four levels are interconnected, even if their degree of relevance is different; but in recent years, the importance of the meta level seems to have increased in the territorial units in terms of choosing the ways and means of development, especially on the medium and long terms [10]. Also, the *pyramidal model* of competitiveness, based on the input–output-outcome relationships, systematizes the impact factors of the complex processes affecting welfare, labor productivity, and employment (see [6, 20, 21]), starting from the basis of success determinants (economic, environmental, and cultural processes and parameters), moving upward through competitiveness factors toward competitiveness outputs (revealed competitiveness indicators, such as gross regional product per capita, labor productivity and employment rate), and the ultimate competitiveness outcome – the standard of living, the quality of life of any region.

However, on a relatively more practical level, other definitions of regional competitiveness emerged. For instance, the definition proposed by the report on the *EU Regional Competitiveness Index 2013* integrates both the companies' perspective and that of the residents of the region: "regional competitiveness can be defined as the ability to provide to businesses and residents a working and living environment attractive and sustainable," sustainability being the capa bility of a region to provide an attractive environment, both on long and on short terms [22, 23]. In this way, it responds to the discussion that gross domestic product (GDP) is insufficient by itself and should be complemented by a broader range of measures [24].

To the already complex domain of economic growth and development where competitiveness is generally discussed, the economics of sustainability and complexity has added a new component – the **economic resilience**, which means identifying ways and means of solving problems of increasing resistance, the ability to stop or recover the negative effects of external shocks, which lately became a fundamental feature at micro and macro level. Resilience deals

with reducing the probability of failure or economic risks, assuming combined analytical and predictive approaches, ex post and ex ante [25], being broadly described as the *ability of an economy to recover from or adjust to adverse exogenous shocks and to benefit from positive shocks* [26].

Similar to the wide-arching economic concept of competitiveness, a universally accepted definition of **economic resilience** is not found in the literature, and there are differences of opinion among experts regarding the content, specificity, and area of coverage. Broadly, two meanings of the notion, not necessarily interfering, have been identified [25]: one based on the analysis of *economic equilibrium* that concerns the ability of an economic system to return to a preexisting state in a unique balance system and another one based on the *theory of complex adaptive systems* that refers to the ability of a system to adapt and to change in response (reaction) to sudden pressures, shocks, and negative impacts. In both meanings, two aspects (coordinates) are important: (a) the ability to return to a previous state of equilibrium (optimal) without the system changing its fundamental structure (a "takeover of valuable, valid tradition/heritage" or, as according to the evolutionary perspective, the strong rooting of resilience of regions in their past legacy, as embodied in their industrial, network, and institutional structures – see [27]) and (b) responsiveness, the system response to external or internal shocks without returning to the previous state but with recovery and stabilization in a new equilibrium (validation of Schumpeterian formula of "creative destruction" in the new conditions that support growth and technological and socioeconomic renewal in a constructive and not "demolishing" way [25] or the capacity of a region to develop new growth paths in the evolutionary approach [27]).

At local level, the phenomenon of **resilience of regions/locations**, as a possible response to the uncertainty and to various rapid and volatile changes in the social and economic environment, began to capture the attention of both researchers and policy makers. The issue of regional "resilience" is, basically, quite old, namely, why some regions manage to overcome short- or long-term economic adversity and maintain the standard of living of their citizens and others fail, but is not limited to regional sensitivity to economic shocks or other shocks, which induce serious economic and social problems (for instance, natural disasters – see [28]). Moreover, a region with high resilience does not only achieve short-term economic success, but it is also able to maintain it on the long term, despite (or perhaps in response to) the continuous pressures toward adaptation induced by changes in the international competition, in the consumer behavior, etc. For these reasons, it is a matter of interest regarding the political discourse and the governance capacity and successful implementation of policies and strategies at regional level.

The **regional resilience** as such is widely discussed in the literature, and several *definitions* may be identified. In principle, this is defined as *the ability of a region to record economic success accompanied by social inclusion, to protect the environment, and ability to overcome (fast) the shocks* [29], by reconfiguring its structure (firms, industries, technologies, and institutions – see [30]) or as the ability of a regional economy to maintain or return to a preexisting state (typically assumed to be an equilibrium state) in the presence of some type of exogenous (i.e., externally generated) shock. Thus, resilience is typically concerned with *the extent to which a regional or national economy is able to return to its previous level and/or growth rate of output, employment, or*

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population after experiencing an external shock [31]. Shocks may be of different kinds, such as shocks caused by downturns in the national economy, shocks caused by downturns in particular industries that constitute an important component of the region's export base (industry shocks), and other external shocks (a natural disaster, closure of a military base, movement of an important firm out of the area, etc.: see [31]). This is connected to the ability to withstand or respond adequately to external pressures (the so-called short-term resilience) and long-term adaptability (or *learning ability*) accompanied by the capacity of governments to engage in actions and processes for implementing appropriate policies and strategies and social learning (the so-called long-term resilience). In such a context, the concept of resilience shows that regions should have a variety of businesses, institutions, and sources of energy and food, the ability to adapt to changing environmental conditions, the ability to reorganize in the event of a shock, many small localized activities (without predominance of a particular sector), a healthy core of households, elements of civil society, and community spirit to share and collaborate to provide essential services [32]. In other words, among the determinants of adjustment and adaptation ability of a region may be mentioned the regional innovation-learning system, modern infrastructure, highly skilled workforce (innovative and willing to engage in entrepreneurial activities), and appropriate funding schemes and diversified sectoral basis [28, 33]—which do not differ from the success factors envisaged by regional competitiveness.

The literature reveals various *types of economic resilience*, based on economic performance, on how to respond to shocks (both negative and positive), and on other determinant factors [34]. An important factor is the time interval used to assess resilience, since the long-term resilience trajectory may be different, even if the end result may be similar and the (possible) path determines the optimal policy for the region [35]. For instance, Martin (see [30]) identifies four *dimensions of regional resilience*: resilience as resistance, recovery, structural reorientation, and renewal or resumption of a growth path. The first two roughly correspond to the concepts of engineering resilience, which focus on the resistance of a system to disturbances and the speed it takes to return to its pre-shock state, and ecological resilience, which analyzes the magnitude of shocks that can be absorbed before the system changes form, function, or position, while the two latter dimensions provide a rather *evolutionary perspective*. Increasing interest in the evolutionary approach to regional resilience was more recently revealed (see, for instance, [27, 28, 36]), which is focused more on the long-term evolution of regions and their ability to adapt and reconfigure their industrial, technological, and institutional structures in an evolving and dynamic economic system. In such a framework, resilience seen as the capacity of a region to sustain long-term development is regarded as important as the capacity of the same region to respond positively to short-term shocks [27]. Resilience depends on the ability of regions to cope with structural change and to create new growth paths, in order to offset inevitable processes of stagnation and decline in their regional economy, but the basic need for fundamental economic renewal is more acutely felt by regions in times of crisis. Resilience is fundamentally a *dynamic process*, implying the ability of a regional economy to reconfigure and adapt continuously its structure in order to maintain an acceptable growth path or the ability to create new variety or novelty in response to external shocks [27, 30]. However, the ability of a region to permanently reinvent itself might be blocked by the regional socioeconomic conditions, and in such a context, disturbances, which are often

reinforced by recessions, may have positive effects by releasing potential for structural adaptation [30]. Resilience trajectory is thus *multidimensional* (with respect to strength (resistance), recovery, reorientation, and renewal) and is directly related to the past economic performance previous to a shock [33].

More recently, interest in regional vulnerability to shocks and their trajectories to overcome and return to growth increased with the onset of the global economic crisis in 2008, a number of European studies highlighting the differences between the different regions of Europe regarding the size of recession and the subsequent economic recovery (see [33, 37–39]).

The crisis hits the EU regions during a phase of progressive **regional convergence**: between 2000 and 2008, the regional disparities in GDP per capita were shrinking, largely due to the positive dynamics of the regions in the NMS of the European Union, a convergence trend that came to a halt and then reverted toward divergence in 2010 and 2011 [40]. In the European Union, the issue of **economic convergence** among the member states and among their regions is linked with the main objective of the Union. Article 2 of the Treaty of Rome, amended by subsequent treaties, lists "a high degree of convergence of economic performance" and "economic and social cohesion" among the objectives of the European Union (EU). The Maastricht Treaty includes three economic objectives concerning convergence: the harmonious and sustainable development of economic activities, the high performance level of economic activities, and the economic and social cohesion and solidarity of the member states. The *economic and social cohesion at regional level* is a fundamental objective of the European Union (EU), being considered as a key driving force for the integration of people and territory. It was especially reinforced in the Treaty of the European Union, which called for balanced development, as well as economic and social cohesion, but the need for policies to promote both regional development and a reduction in the economic disparities across regions has increased remarkably after the latest waves of enlargement [41]. Delivering this objective at territorial level lies at the heart of the Europe 2020 strategy, being also a key theme of "inclusive growth" [42, 43]. In particular, the objective of **regional convergence** aims at reducing regional disparities by helping those regions whose income per capita is below 90% of the EU-27(28) average, but the intentions of the EU national and regional policies are not only to reduce the disparities between the levels of economic development of the various regions and the backwardness of the least favored regions but also to cap the disparities in social welfare and ultimately to improve the EU citizens' quality of life [41, 43].

The *economic convergence* refers usually to the *process of reducing the economic, development, or socioeconomic gaps of the less-developed/emerging countries/regions/territories toward the developed countries, regions, or territories*. Economic growth theories (neoclassical-exogenous growth and endogenous growth) and economic integration theories are often associated with the processes of *convergence or divergence* (see [44–46]). Different definitions of convergence are found in the literature, which correspond to different concepts related to convergence, two *types of convergence* being identified in the *neoclassical growth theories*: (1) *absolute convergence* (also known as the *beta convergence*), which implies that poorer countries or regions tend to grow faster per capita than the rich ones, and (2) *conditional convergence* (the *sigma convergence*), which implies that an economy grows faster the further it is from its steady-state value,

regardless if it is poor or rich [44]. The beta convergence appears to be a necessary, but not a sufficient prerequisite for the sigma convergence, because random shocks can disrupt the convergence of countries/regions, evolving toward different stable states [47]. Though much contested (see [48]), in the literature on economic growth, the groups of economies were identified and analyzed (countries or regions) that present homogeneous economic growth patterns and that converge toward a common steady state, called the *convergence clubs* (see [49–52]). Finally, the integration theories with neoclassical or endogenous growth bases may argue both a tendency toward regional convergence and toward regional divergence in the EU [46].

Real convergence is a process endogenous to each national entity, and the convergence of regions within the member states is very important for improving European cohesion and the competitiveness and efficiency of the Single Market. Currently, the Europe 2020 Strategy that aims at achieving smart, sustainable, and inclusive growth stresses the need for reducing regional disparities, stating that "Regional development and investment also support inclusive growth by helping disparities among regions diminish and making sure that the benefits of growth reach all corners of the EU" [53]. Real convergence was one of the major objectives of the EU cohesion policy in the period 2007–2013, and it has covered the poorest EU regions, defined as convergence regions. The key objective in these regions, eligible for the cohesion policy, involved the stimulation of growth potential to maintain and achieve high growth rates in such regions [54]. The overall objective of the EU regarding real convergence also overlaps with and requires the *territorial convergence*. Sustainability of economic growth and closing the development gaps among the EU countries involve both structural reforms and, especially, a balanced contribution to the national development of regions and subregions, according to their potential, and the cohesion policy reform aims to ensure maximization of regional contribution to growth by adapting the community assistance to the development of each region and by channeling resources to the key sectors for growth.

In accordance with its significance for the national and regional development policies in the EU and worldwide, the **regional convergence** issues were highly debated in the economic literature, especially since the beginning of the 1990s, when a sharp increase in the scholarly interest has occurred in the area of regional income convergence [55]. Regional inequality has been intensively studied since the 1950s, but it has gained increasing attention more recently, mainly because of developments in the fields of economic integration, economic geography, and endogenous growth and development [56]. In literature, *theories of convergence and divergence* examine the reasons for diminishing or increasing the disparities between the rich and the poor regions and, in the case of divergence, explain the persistence of such disparities. As stated by Barro and Sala-i-Martin (see [57]), regional income convergence applies if a poor region tends to grow faster than a rich one, such that the poor region catches up with the rich region in terms of the level of per capita income [55]. Different definitions of convergence can be found, corresponding to different concepts related to convergence, based on *economic growth theories* (neoclassical growth model and endogenous growth theory) or on *economic integration theories* (neoclassical or endogenous growth bases – e.g., [46]). Since the 1990s, the most prominent theoretical and empirical models of regional economic growth convergence were considered to be those established by Barro and Sala-i-Martin [44, 57] and Romer [58].

A large body of devoted literature has suggested the presence of a *polarization pattern* in Europe, including two differentiated groups of regions (or *convergence clubs*): one of relatively poor regions and the other of regions evolving around the mean income. Moreover, such studies also revealed that such a polarization pattern has been a persistent trend especially in the Western Europe over the last three decades (e.g., [49]), making the successful implementation of policies aimed at reducing these disparities essential for achieving the targets of cohesion policies [41]. Moreover, the EU as a whole is accommodating the integration of the new member states and their regions, which at the moment of accession were economies in transition with levels of income per capita far below the EU average [10, 41]. Last but not least, to all these add up the effects of the global financial and economic crisis, which might be of interest from the convergence point of view, since the recession that has disrupted the growth mechanisms has had an uneven impact across regions, affecting countries and regions differently depending on their responsiveness and reaction [41, 59].

Instead of conclusions, we may say that by only examining the definitions and conceptual aspects regarding competitiveness, resilience, and convergence of regions, the complexity and dynamics of these domains are obvious. Though all the three topics were rooted mainly in the older and newer theories of economic growth and development, the conceptual spread, time perspective, and political focus varied, in line with the theoretical developments but also, to a great extent, in response to the impacts of exogenous shocks and/or the changes in the EU, the national and the regional socioeconomic and political priorities and policy agendas. Considering competitiveness, resilience, and convergence of regions as *specific continuous and very dynamic processes*, rooted in the same economic foundations, their relationships and their relationships with other socioeconomic and policy domains reveal as increasingly complex and evolving. None of them is over-comprehensive; all of them may be examined through very different and divergent lenses (without capturing their full meaning but also without diminishing their scientific and analytical relevance), and all of them may be quantified and visualized with the help of the same (or similar) instruments (indicators, models, methods, techniques, and methodologies). Their importance may vary with the momentarily shifts in the social, economic, and political priorities of nations, regions, and unions of nations, and their acuteness may painfully surface on the occasion of man-made or nature-induced events, but they will function as long as the human societies will exist in their current forms. To know and understand them in a comprehensive fashion are a science, but to employ them to the benefit of all humans inhabiting the areas where they manifest themselves may be an art. No region, country, or the EU itself may say that it is "the most talented" at doing that, despite the temporary rankings and even the longer-time trends; all of them, as socioeconomic and political systems – the NMS and their regions included – are continuously learning, experiencing, and living the processes of competitiveness, resilience, and convergence.

3. Assessment of regional competitiveness, resilience, and convergence

The issues of *regional economic growth* and of reducing the development gaps between the EU regions have attracted attention especially after the creation of the Single European Market

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(SEM) and the European Monetary Union (EMU), but at first the empirical research focused mostly on the discussion of *convergence-divergence* and types thereof. Economic theories on **competitiveness** firstly focused largely on economic growth, stressing the importance of rise in revenues and prosperity – in accordance with the definitions of prosperity based on competitiveness. Most studies that modeled competitiveness used the Solow-Swan neoclassical model (see [60]), which operates with assumptions such as the market with perfect competition, the absence of externalities, constant efficiencies of scale, and constant and positive elasticity between inputs of capital and labor.

The most common method to describe the regional competitiveness performance is based on the *decomposition of aggregate macroeconomic indicators*, to identify the factors that determine economic growth, productivity, and regional development. Such a system is usually based on the decomposition of *GDP per capita*, which is a general measure of national, regional, and social competitiveness (see [61]) and is determined by a combination of interrelated factors, among which we first mention labor productivity and unemployment rate, but also others, reflecting different determinants of competitiveness: *main sectors of the economy*, competitiveness being high if the sector with high labor productivity has a high share of employment in total population, and *sectors of economic activity*, the effect of sector labor productivity on competitiveness being dependent on the ratio of sector employment to the total number of population and on the share of sectoral GDP to global GDP.

Measurement of competitiveness based on *competitiveness indices* is also frequently used in literature, but it is difficult to develop an aggregate indicator for the assessment of regional competitiveness using defined elements. The index of competitiveness is a vague concept that cannot be measured directly, and in practice the main indicators of competitiveness are interrelated, being difficult to reveal causality. However, one may distinguish between the factors that determine competitiveness and its results. Most such studies use global indices of competitiveness applied at national level (for instance, the indices developed by the World Economic Forum and the International Institute for Management Development). There are also regional competitiveness studies with fewer indicators than the national competitiveness indices, and examples of such indicators are the World Knowledge Competitiveness Index, the European Competitiveness Index (ECI), the United Kingdom Competitiveness Index (built the company Robert Huggins Associates), the Atlas of Regional Competitiveness (Eurochambres), and the World Competitiveness Index of Regions (WCIR) (see [62]). Examples of composite indices used in studies developed in the NMS to assess regional competitiveness are in Romania, the regional competitiveness index of the Applied Economics Group, regional competitiveness index proposed by IRECSON, and indices of regional competitiveness built on an integrator model [16, 63]; in the Czech Republic, the index of regional competitiveness in terms of economic performance, development of regional innovation system, and quality of life (see [64]); in Poland, the index concerning regional competitiveness in accordance with Huggin's three-factor model of regional competitiveness developed by Bronisz et al. (see [65]); etc.

In the European Union, an *index of competitiveness of the regions has been developed* (*Regional Competitiveness Index: RCI*: for the NUTS-2 regions), starting from the methodology used by the World Economic Forum, which annually publishes the Global Competitiveness

Report of the nations of the world, including 11 pillars and 74 indicators (version 2016) organized into three groups (*basic competencies*, *determinants of efficiency*, and *determinants of innovation*), covering a range of factors wider than the purely economic aspects. The pillars of this indicator are *basic competencies*, (i1) the quality of institutions, (i2) macroeconomic stability, (i3) infrastructure, (i4) health, and (i5) quality of primary and secondary education; *determinants of efficiency*, (ii1) higher education and lifelong learning, (ii2) labor market efficiency, and (ii3) market size; *determinants of innovation*, (iii1) openness to adopting new technologies (technology awareness), (iii2) business sophistication, and (iii3) innovation. The three RCI dimensions – Basic, Efficiency, and Innovation – are linked. The i1–i5 pillars are more important for the less-developed regions while the iii1–iii3 pillars for the more advanced regions (especially for those with a very high development level) but also for the regions in transition from a lower to a higher development level. A region with a good performance in the innovation group is expected to have a good performance in the Basic and Efficiency groups as they are instrumental in increasing levels of competitiveness. In this sense, Basic and Efficiency aspects may be considered as necessary conditions for good levels in Innovation aspects. Conversely, regions with poor or insufficient levels in the Basic group cannot be expected to perform well in the other two groups. It is assumed that as regions move along the development path, their socioeconomic conditions change, and different determinants become more and more important for competitiveness. As a result, improving the competitiveness of more developed regions will require other priorities than for a less-developed region [23, 24]. This is reflected by a weighting system that takes into account the stage of development. In the 2013 and 2016 editions of the RCI, the EU regions were divided into five development stages based on their average GDP per head in purchasing power standard (PPS) expressed as an index (EU-28 = 100). In more than 70% of the cases, the development stage remained unchanged from one period to the other, while about 8% of the regions improved their development stage (from one class to the one immediately above it, regions from Austria, the Czech Republic, Germany, Poland, Romania and Slovakia – see [24]).

The RCI results of 2013 and 2016 showed a *remarkable diversity of regional competitiveness* in the European Union, both among the member states and within them. Some significant differences between the group of "old" member states (EU-15) and the "new" member states (NMS-13) were noticed, both in terms of the RCI and territorial distribution of factors of competitiveness and channels to disseminate it among the regions. The top ten competitive regions of the European Union belonged all to countries of the EU-15 (United Kingdom four regions and the Netherlands, Sweden, Germany, France, Luxembourg, and Denmark one region each – version 2016). In contrast, the last ten regions in the top of competitiveness are almost equally located in the EU-15 member states (Greece five regions and France one region) and NMS-13 (Romania three regions and Bulgaria one region). Although the changes in a region's ranking over time may not be always meaningful, because the rankings are based solely on the sequence of the scores (the ordinal properties) and do not take into account the actual differences between scores [24], one may notice that in most of the EU countries (Austria, Bulgaria, Czech Republic, Denmark, Spain, Finland, Hungary, Poland, Portugal, Romania, Sweden, and Slovakia), the regional scores were quite stable from 2010 to 2016.

Assessment of regional competitiveness based on multilevel systems of indicators is also commonly found in literature: for instance, the abovementioned pyramidal model of competitiveness [6], which builds upon both endogenous growth and development theories. Assessment of competitiveness of the NUTS-2 level regions of eight Central and East European countries (Austria, the Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Slovenia) revealed that the socioeconomic-historical background and past impact still subsist (a conclusion resembling some of the elements of the evolutionary approach of resilience) and the characteristics, institutional background, etc., of a given country still determine the regional characteristics, the differences between countries being stronger than the differences within the analyzed countries (see [6]).

In another perspective, other approaches to assess regional competitiveness are used, such as panel data models and DEA to measure the regional effectiveness; multivariate statistical methods, such as the cluster analysis method; the principal components; and the factor analysis to measure competitiveness factors [66]. More recently, panel techniques were employed to assess regional competitiveness and analyze its factors of influence, due to their advantages over the traditional approach using linear regression and the possibility to use data from different economic levels (micro, meso-, and macroeconomic). For instance, the panel model to assess regional competitiveness in the EU-15 was built by Lukáš and Jan (see [1, 67]), in which regional productivity and competitiveness were analyzed in relation to the theories of economic growth. A nonlinear panel model was estimated for 35 NUTS-2 regions of the EU-15 over the period 2000–2008, and the global competitiveness in the EU was approximated using the average GDP per capita in PPS. The explanatory variables were R&D expenditure, net disposable income, and gross capital formation. An econometric model on panel data was used by Nevima and Melecký [68] to measure the level of regional competitiveness for the Visegrad four countries, in terms of performance indicators that appear in the strategies of economic growth in the European Union until 2010. The explanatory variables were chosen to reflect the competitive potential of the NUTS-2 regions of the Visegrad countries. Among these regions, significant acquisitions of production were noticed in the regions of Prague, Bratislava, Nyugat-Dunántúl, and Közép-Magyarország. Three regions of Poland were found to be the least productive: Lubelskie, Malopolskie, and Łódzkie. For Romania, regional competitiveness was assessed by Iordan et al. (see [69]) based on a dynamic panel for 42 counties in Romania, including Bucharest, between 2000 and 2012. The authors showed that the current GDP depends on the number of employees and the GDP of the previous period. Researches on economic development and competitiveness of the regions of Romania analyzed in terms of GDP per capita and determinants thereof [16, 70, 71] have suggested a wide gap between regions, with rising trend, revealing three potential "performance levels": "engine regions" (Bucharest-Ilfov), "follower regions," and "lagging regions." Pelinescu et al. (see [1]) examined the extent to which the Romanian regions generate sustainable revenues, expressed by the GDP growth, and create jobs, finding among the counties of Romania a significant positive correlation between the rate of real GDP and the employment rate, a region/county being the more competitive as it had a higher degree of employment. Analyses undoubtedly showed the need to raise employment at county level in Romania, because it has concentrated mainly in the [54 and 64%] range, far from the 70% level foreseen in the Europe 2020 Strategy.

As regards measuring the **regional economic resilience**, two approaches are commonly used (see [72]): one that examines regional properties or characteristics that reflect economic resilience, such as macroeconomic stability, microeconomic market efficiency, governance, and social development [73]; the degree to which resources are owned locally, the organizational capacity of residents, and the local capacity of institutions to adapt and reorganize in response to a shock; local knowledge network structure; income equality, economic diversification, regional affordability, and business environment [74], and another that analyzes changes to a region's representative measure in response to a shock, by using, for instance, correlations between unemployment and gross domestic product (GDP), population, share of manufacturing, construction, finance, and public infrastructure investment [72, 75]; structural composition of employment change across industries; regional employment change rates during recessionary and recovery periods [30]; and employment and employees' dynamics during different periods [76].

The empirical attempts to measure **regional resilience** usually look at *changes in regional indicators*, like the unemployment rate, employment or income level, to assess the impact of an external shock on a regional economy's growth path or the time it needs to recover. From an empirical perspective, the regions differ in their resilience usually in terms of regional growth or (un)employment [38]. Some authors analyzed other determinants of regional resilience, such as firms' growth rate (see [77, 78]) or the degree and nature of regional urbanization, directly and indirectly linked to regional growth [38]. The composition and the size of the population of a region are considered among the most important determinants of regional growth, and the regions that have a more skilled population or work force do perform better, while, by and large, the regions that are more urbanized also outperform less urbanized regions. The possible relevance of the degree and composition of urbanization for resilience is to be found in the fact that urbanization also signals the degree to which cities or regions are able to adjust to shocks [79]. Findings on 255 EU NUTS-2 show that the EU regions with a relative large share of their population in commuting areas are relatively resilient, while, in contrast, the regions with a large share of people living in rural areas or small cities face more difficulties in absorbing shocks [38].

As mentioned above, the resilience of regions in relation to the impact of the 2008 economic crisis became more recently of high interest to the economic specialists and practitioners [80, 81], and the studies found, in general, several categories of resilient regions among the EU regions [39]: *resistant* (not adversely affected by the economic crisis – 12% of the NUTS-2 regions, 16% of the NUTS-3 regions), *recovering* (adversely affected by the economic crisis but have recovered to former peak – 23% of the NUTS-2 regions, 24% of the NUTS-3 regions), *revealing upturn* (adversely affected by the economic crisis but experiencing upturn and yet not recovered to their former peak – 33% of the NUTS-2 regions, 28% of the NUTS-3 regions), and *revealing no upturn* (adversely affected by the economic crisis and not yet experiencing upturn – 33% of the NUTS-2 regions, 33% of the NUTS-3 regions). In the particular case of Romania, such studies showed a greater resilience of Bucharest-Ilfov region's economy and continuing fragility of many other regional economies and the difficulties associated with structural changes and integration into the EU economy (see, for instance, [37, 39, 75, 76]). Other studies found a complex core-periphery pattern [40], with a "core" continental area,

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where the impacts of the 2008 crisis were low or moderately low, including Germany, most of Poland, and partly stretching to the neighboring regions (most regions of Slovakia and the Czech Republic), surrounded by a ring of more peripheral areas where the impacts were high/very high (including most of the regions of Ireland, Spain, parts of Italy, Greece, Cyprus, Lithuania, Latvia, and Estonia).

The link between pre-crisis national *and regional resistance* factors and the short-term regional economic consequences of the recession was the topic of interest for other studies (see [40]), the empirical results suggesting that while the pre-crisis regional development trajectories were highly heterogeneous both in terms of economic growth and employment dynamics, after the crisis a marked center-periphery spatial pattern has emerged. The within-country regional imbalances have shrunk in most of the EU countries, but the regional disparities across the EU as a whole have increased both in terms of gross domestic product (GDP) and unemployment [40]. While some regions of the NMS showed even positive performance during the crisis (the Polish regions in terms of GDP), others were more seriously hit (for instance, regions in Croatia, Slovenia, Cyprus, and Bulgaria in terms of unemployment). Worth noticing is the fact that among the many quantitative features of regional economies that shape their ability to resist and adapt to shocks and change, mostly relevant to the regional resistance were found to be the regional industrial mix and a group of *regional competitiveness*/innovation factors (human capital and skills and innovation efforts [40, 82]).

Finally, the process of **real convergence** of the EU member states and their regions has been extensively studied, either in a macroeconomic context and considering its relationship with the nominal convergence or in connection with the concept of *cohesion* (economic, social, and territorial: see, for instance, [42, 46, 83–86]). The main indicators used to analyze real convergence refer to the differences in *GDP per capita at purchasing power parity* and in *income per capita*, *differences in labor productivity*, and the *price level* (e.g., [87–90]). The literature highlights several indicators that can be used to assess the real convergence process, from *broader indicators* (GDP growth rate, GDP per capita, the ratio of exports to GDP, the intensity of foreign investment, stock market capitalization, unemployment rates, labor costs and R&D expenditures, etc.) to *specific indicators and modeling methods* used to assess the beta and sigma convergence, the convergence clubs, and the concentration and entropy of the process (coefficient of variation, Lorenz curve, Gini index, Atkinson index, Theil index, average logarithmic deviation, Robin Hood index, Markov chains, panel regressions, nonparametric methods, etc.: see [47, 88, 90–94]).

The results of existing empirical studies on the EU provide mixed evidence. Some studies have generally revealed the presence of absolute convergence between the EU member states and their regions, but the pattern and speed of convergence were found to vary sharply across different subperiods and regional subsets (including periods of divergence), with peculiarities for the EU-15 countries and the new member states and also within these groups of countries (see [54, 95–100]). Iordan and Chilian (see [101]) have also found mixed evidence regarding the real convergence in the EU regions, with both peculiarities and similarities for the regions of the EU-15 and NMS13 countries. Both a single highly developed region, usually the region where the capital of the country is located, that has registered the best performance in terms

of real convergence, and the presence of several well-performing "regional growth engines" (in Italy, the Netherlands, Spain, and Finland but in none of the NMS13) were noticed. Also, in the case of the most developed regions from the EU-15 countries (but also in some NMS13 countries), the very high level of GDP per capita and its growth trend up and away from the EU average make the "weak" performance in terms of real convergence as usually defined in literature (as catching-up toward the average) a logical consequence. This might call for a redefinition of the real convergence as, for instance, catching-up not toward the average, but toward the highest regional GDP per capita level, which may dramatically expand the growth gaps and redraw the map of convergence/diverge clubs identified so far among the EU regions [101].

Especially important was the uneven impact of the crisis upon particular countries when examining convergence, with the convergence tendencies of the NMS continuing even after the crisis years of 2008 and 2009 while the periphery countries of the EU-15 diverging remarkably in that period [102]. Also, a more detailed study of convergence of the regions of the EMU countries revealed that even in a currency union, the convergence of regions to the country mean was far from automatic, highly discontinuous, and strongly concentrated on a rather limited number of time periods. Only around half of the regions starting with below national average GDP per capita levels in 1991 experienced a catch-up over the period 1991 to 2009, and only two thirds of the regions starting with above national average GDP per capita in 1991 converged toward the respective country average until 2009 [103]. At the same time, across the EU the conditional convergence was less pronounced, signaling increasing disparities among the regions [46, 95], especially in the EU-15 countries but also in the NMS, revealing the existence of selective tendencies, convergence clubs, and asymmetric shocks, which might lead to greater spatial inequalities (see [104, 105]). Moreover, the European Commission's successive Periodic Reports show that real economic convergence is a long way off and in some countries regional economic disparities have even worsened [106–109]. In the particular case of Romania, different studies assessed the growth process at regional and subregional (county) levels, especially in connection with the process of GDP convergence toward the EU national and regional average levels (see, for instance, [89, 110, 111]). The intra-regional gaps in terms of GDP per capita in Romania revealed an increase in the territorial concentration of economic growth, especially during the post-accession period, including in the more developed regions (Nord-Vest, Centru, and Vest), and significant oscillations during the period of crisis [111]. Such findings suggest that similar to the more developed regions [74], also the more developed counties have benefitted most from the EU accession and were more able to absorb the shock of economic crisis and to return to a path of economic growth, signaling greater resilience and adaptability. However, such developments are not specific only to Romania, but they are also found in other newer or older EU member states (see [10, 112, 113]).

A concept associated to real convergence is the *structural convergence/convergence of economic structures*, developed by Wacziarg, who established that structural convergence occurs if convergence in per capita income is accompanied by sectoral convergence. In order to study the structural convergence/specialization, different dedicated indices may be used, such as the Krugman specialization index, the location quotient, structural coefficients, and other disproportionality measures [114–116]. Different trends in the European industries were revealed by

empirical studies, such as the increase in regional industrial concentration of both declining traditional industries and the growing advanced sectors or the increase in regional specialization in manufacturing. Some findings regarding the NMS revealed a split performance between the capital regions and the regions bordering the EU, which managed to combine a set of positive, structural, and geographical initial conditions with market dynamics, and the other regions, which witnessed the collapse of large parts of their industrial bases, drastically cutting local demand and setting real restrictions to efforts and policies of indigenous growth [117]. Also, in the NMS the patterns of structural change in terms of both output and employment looked very much differentiated, both across time and individual European countries. In general, the structural changes were more pronounced with regard to employment than output (implying large shifts in productivity performance), with broad shifts from agriculture and industry toward services. Romania was one of the NMS that experienced significant structural changes [118]. We may find studies addressing nationally and regionally the relationship between the real and structural convergence, through *indexes of real convergence* and of *structural convergence/divergence* and their combination, which reveal a relative alignment of sector similarity and convergence in terms of per capita income (see, for instance [59, 74, 88, 113]).

The evidence is also mixed regarding the relationship of convergence in income per capita and the *social convergence*. Some studies (see [87]) suggested the presence of a conditional convergence in income per capita and that of an unconditional convergence in income inequality in many regions of the EU, while other studies indicated that the weak or even the lack of economic convergence is not matched by a similar absence of social convergence, as the welfare levels have converged significantly across European regions, although the regions with high social welfare levels may remain advantaged in welfare terms, while the low social welfare regions may continue to lag behind [109].

4. Competitiveness, resilience, and convergence in the new member states

The complexity and peculiarities of the processes of *regional competitiveness*, *resilience*, and *convergence* raise particular problems in terms of assessment. Two of the main questions to be answered by the scientific approach regarding their assessment are as follows: (1) How can they be adequately measured? and (2) How can we enhance and best employ their territorial specific features in such a way to ultimately raise the socioeconomic development and the standard of living of **any** region? The answers to these questions lead to the construction of various systems of indicators and models to assess and/or model such processes and their interconnections and the relationships with other socioeconomic processes at work at macroeconomic, territorial, sectoral, microeconomic, and even international levels.

As previously mentioned, the study presents an analysis of *competitiveness*, *resilience*, and (*real*) *convergence* in the NUTS-1 and NUTS-2 regions of the European Union NMS, based on a joint (but not composite) framework of analysis, in which the three abovementioned processes are considered together, for the moment as a loose reunion of compounds and analyzed in

the sense of process outputs, though for space limitation reasons their relationships and the relationships with the socioeconomic spaces of whom they are components of and in which they are functioning are not fully and deeper investigated. A minimum of specific indicators was chosen from among the most used indicators in such assessments, covering a longer time span (2000–2013/2015, depending on the available data for each indicator), which includes the ante-crisis (2000–2007), crisis (2008–2010), and post-crisis (2011–2013/2015) periods. A common, "root" indicator for all the three "sides" of the framework was first chosen for analysis, namely, the GDP per capita at purchasing power standard (PPP), expressed in relation to the EU average. However, not the absolute levels were chosen, but the gross modifications over each of the abovementioned subperiods, in the sense of gross speeds of change, computed as the ratio of the difference between the absolute levels of the indicator at the beginning and the end of period to the length in years of the analyzed period (see [119]).

Other specific indicators were used to depict each of the three sides of the framework, namely:

- *A productivity indicator* (*gross value added per employment over 15 years of age*: *denoted by GVAE*), for the *competitiveness* side and in order to account for foundational competitiveness, too. This indicator was also computed in relation to the EU-28 average and as "gross modification."
- *The RCI rankings of the NMS regions for 2010*, *2013*, *and 2016*, also for the *competitiveness* side and to account for aggregate competitiveness and its factors.
- *Employment rates* (*denoted by EMPR*), for the *resilience* side and to account for the regions' response to the economic crisis but also to other shocks, computed in relation to the EU-28 average and as "gross modification."
- *Employment levels* (*denoted by EMP*), expressed in thousand persons, also for the *resilience* side, computed as "gross modification" over the analyzed periods, in order to reveal the depth of regional adaptation.
- *An income convergence indicator* (*compensation of employees estimated at PPP: denoted by CPSE*), for the *convergence* side, to account for the developments in the ultimate outcome of convergence – the rise in the living standard of a region's inhabitants. The indicator was also computed in relation to the EU-27 average (excluding Cyprus) and as "gross modification."

The results reveal the following aspects (data available upon request):

Mixed evidence regarding the evolution of competitiveness, resilience, and convergence in the NMS regions was found, with both differences and similarities within and across periods, within and across countries. Thus, in most of the NMS countries, a single highly developed region, usually the capital region of the country, registered the best performance in terms of all the three processes over the *ante-crisis period*, except for the employment rates in the Czech Republic, Hungary, and Romania, pointing toward possible reminiscences of past adjustment shocks determined by the transition to the market economy and by inherited but yet unsolved labor market rigidities. This is more obvious especially in the case of Romania, where the ante-crisis economic growth was accompanied in all the regions except for Bucharest-Ilfov not by overall job creation, but by continuation of labor force downsizing, "delayed" from

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the transition period. Three capital regions (in the Czech Republic, Slovenia, and Slovakia) have already reached GDP per capita levels above the EU average since the ante-crisis period, accompanied by high growth rates. Besides the resilience side, the income convergence has also showed high within-country variability and even decline before the economic crisis in regions of Bulgaria, Poland, and Slovenia, more or less developed. However, the most notable was the positive performance in terms of productivity in virtually all the regions of the NMS – evidence pointing toward real advance in the catching-up process of all the countries.

Some of the "national growth engines" did not fare the same well during the crisis period, especially in terms of productivity, but revealed capability to adjust to the shock of crisis and retain and even create employment (in the Czech Republic and Romania). Different adjustments to crisis and growth paths were revealed within and across the NMS: small advances in productivity and convergence accompanied by layoffs and decline in employment rates in Bulgaria and Slovakia, some declines in productivity but still good performance in convergence, accompanied by smaller job losses and declines in employment rates in most of the regions of Poland and declines in productivity, convergence, and employment, however, accompanied by small gains in terms of employment rate evolution in most of the regions of the Czech Republic, Hungary, Romania, and Slovenia and in the smaller NMS, except for Malta. The crisis struck hard all the NMS regions, and the ones that performed poorly during the crisis were mostly the regions (and countries) with trailing and unsolved development issues.

The post-crisis period insofar revealed another mix of recovery and/or growth paths, but the overall trend looks positive, even for some of the regions that previously recorded only poor performance regarding all the analyzed processes. Except for Poland and Romania, the productivity side seems still affected by the negative impacts of the crisis, while income convergence is again mostly on an ascending path. Even more variation is noticed in the regional employment levels and employment rates, most of the NMS regions seeming to recover the lost jobs by creating others, others still experiencing greater labor force restructuring. It is worth noticing that more capital regions registered GDP per capita and even productivity and employment rate levels exceeding the EU averages (in the Czech Republic, Hungary, Poland, Romania, Slovenia, and Slovakia). As previous studies revealed, the core-periphery patterns of development were accentuated by the crisis also in the NMS, setting on a different (less balanced) footing the catching-up processes within the countries and not only across countries and regions.

However, in the case of the most developed regions of the NMS, we must again mention their very high level of GDP per capita and its growth trend up and away from the EU average, which requires a different scale to assess their performance in terms of competitiveness, resilience, and convergence, probably as catching-up not toward the European average, but toward the highest regional GDP per capita and other indicator levels. This will expand the within-countries growth gaps and will redraw the development maps and patterns identified so far also among the NMS regions, but this calls for another analysis. Redefining competitiveness, resilience, and convergence performance in terms of catching-up toward the (ever-moving) absolute levels of regional GDP per capita and other relevant indicators (distance to a specific or composite development frontier) may bring new insights about how much and for how long have in fact impacted the global crisis such processes.

5. Concluding remarks

The issues of competitiveness, resilience, and convergence among the European regions have generated large academic debates over the past decades, with particular interest after the recent EU enlargements. This study attempted to analyze the topics of competitiveness, resilience, and cohesion not individually, but together, in a reunion of compounds, not at national, but at regional level, based on their common roots within the economic growth and development theories, with the view to outline an integrated framework of analysis, with a direct focus on the regions of the new member states of the European Union. The study contributes to literature in several different aspects. First, it has analyzed a longer time span, namely, 2000–2013/2015, by focusing on three different subperiods delineated by the global economic crisis that started in 2008: ante-crisis, crisis, and post-crisis. Second, considering competitiveness, resilience, and convergence of regions as specific continuous and very dynamic processes, but none of them over-comprehensive, they may be examined through different and divergent lenses and may be quantified and visualized with the help of the same (or similar) instruments (indicators, models, methods, techniques, and methodologies). Their importance was revealed as varying with the momentarily shifts in the social, economic, and political priorities of nations, regions, and unions of nations, but they will function as long as the human societies will exist in their current forms. Third, besides the joint framework of analysis of the three processes, a common, "root" indicator for all the three "sides" of the framework was first chosen for analysis (the GDP per capita at purchasing power standard), accompanied by a minimal set of indicators relevant mainly for each process, but also for the others, depending on the perspective of analysis. Future fields of research (not pursued here due to space limitations) would be to analyze the relationships between the three processes within the chosen framework and their relationships with other socioeconomic processes at work in specific territorial locations and to develop a tree-like, networked system of indicators pertaining to the revealed relationships.

Though the chosen indicators were simple, but powerful, the results suggest mixed and complex evidence, with both differences and similarities within the NMS countries and across regions and countries. The "history" of past transition shocks was still influencing the recent development and integration paths of the NMS within the European Union, their adaptation processes having to deal with additional socioeconomic rigidities and burdens in an already difficult socioeconomic context. Though the crisis has impacted each country differently, in direct relation to the state of its economic structures and institutions, the post-crisis accentuation of the core-periphery pattern noticed in the "older" member states of the EU was also revealed in the NMS, where the performance of their "national engines" (usually their capital regions) went out of their specific development charts. Such evolutions might even call for redefinition of competitiveness, resilience, and convergence performance in terms of catching-up toward an (ever-moving) absolute levels of regional GDP per capita and other relevant indicators (distance to a specific or composite development frontier), which may bring new insights about the length and depth of crisis impacts on such processes and its subsequent foundational changes and would redraw the current development maps and patterns of the NMS and EU regions.

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INTECH

Chapter 11

Regional Analysis for European Structural and Investment Funds on the Case of Slovenia-Austria Cross-Border Cooperation 2014–2020

Vito Bobek and Anita Maček

Additional information is available at the end of the chapter

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Abstract

In 2012, the EU Commission provided each member state with a country position paper outlining the analysis of the Commission of the main challenges and funding priorities relevant for the European Structural and Investment Funds (ESI) in the programming period 2014–2020, including in relation to European Territorial Cooperation. These position papers have guided the ensuing dialogue with the Commission in particular in relation to the prioritisation of development needs and concentration of support, as well as in terms of the presentation of information. In this chapter, authors are presenting relevant social, economic and environmental aspects of the programme area and describe how the cooperation programme's strategy in the case of cross-border cooperation between Slovenia and Austria for 2014–2020 period has contributed to the delivery of the Union strategy for smart, sustainable and inclusive growth and for achieving economic, social and territorial cohesion.

Keywords: regional analysis, Cross-Border Cooperation Programme Slovenia-Austria 2014–2020, economic, social and territorial cohesion, Slovenia, Austria

1. Introduction

This chapter examines the relevant social, economic and environmental aspects of the programme area, to define the framework, in which the programme of cross-border cooperation between Austria and Slovenia is implemented.

The regional analysis is divided into thematic areas, which include general aspects such as population statistics and labour market as well as specific aspects such as innovation, research and development (R&D) as well as environmental indicators, referring to community and national guidelines for 2014–2020 and to the Europe 2020 strategy. Identification of strengths

and weaknesses, opportunities and threats and, where appropriate, the differences within the programme area is shown in the SWOT analysis, in the third section of this chapter. The cooperation programme's strategy took account of the Common Strategic Framework and the relevant elements of the Commission position paper for the countries involved.

In the chapter, the following is to be outlined:

- the geographical coverage of the programme area and an analysis of the situation of the programme area as a whole in terms of the needs', addressing where appropriate, missing links in cross-border infrastructure;
- how the cooperation programme will address these needs and challenges and thereby contribute to the delivery of the Union strategy for smart, sustainable and inclusive growth, where appropriate with reference to existing national, regional and cross-border/transnational/macroregional/sea-basin strategies coherent with the Union strategy for smart, sustainable and inclusive growth, and the ex ante evaluation.

Data used relates to the NUTS level 3. Partly, if no data on NUTS level 3 was available, NUTS levels 1 and 2 data was used, which affects the precision of the analysis.

2. Socio-economic analysis of the programme area

2.1. Programme area and regional structure

For the programme area, the following Austrian and Slovenian NUTS 3 regions were identified to be included in the cross-border cooperation Slovenia-Austria 2014–2020:

- Slovenian NUTS 3 regions: Gorenjska, Koroška, Savinjska, Podravska, Pomurska, Osrednjeslovenska, Goriška and Zasavska;
- Austrian NUTS 3 regions: Oststeiermark, West- and Südsteiermark, Graz, Obersteiermark Ost, Obersteiermark West, Unterkärnten, Klagenfurt-Villach, Oberkärnten and Südburgenland.

The border between Slovenia and Austria was established with the Treaty of Saint Germain-en-Laye in 1919 and the Austrian State Treaty in 1955. The total length of the land and river border between the countries is 330 km. On May 1, 2004, with Slovenia becoming a member state of the European Union (EU), the border turned into an internal border, which quarantines free movement of goods, capital, services and people. Until December 2007 the Slovenian-Austrian border was the southern border of the Schengen area, which dissolved with Slovenia's membership of the Schengen area. Both events have highly contributed to a more intensive cooperation between the border areas. In **Table 1** eligible regions within the programme area are shown.

The programme area covers 38,353 km^2. The Slovene-Austrian border is 330 km long. The programme area is multifarious and rich in landscape, population and culture. It extends from the Alpine mountain region in the west to the Pannonian lowland in the east.

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Slovenia		Austria	
Region	**Area (km^2)**	**Region**	**Area (km^2)**
Gorenjska	2137	Oststeiermark	3362
Koroška	1041	West and Südsteiermark	2226
Savinjska	2384	Graz	1230
Podravska	2170	Obersteiermark Ost	3254
Pomurska	1337	Obersteiermark West	3060
Osrednjeslovenska	2555	Unterkärnten	3376
Goriška	2325	Klagenfurt-Villach	2030
Zasavska	264	Oberkärnten	4132
		Südburgenland	1470
Slovenia	**14,213**	**Austria**	**24,140**

Source: Refs. [1, 2].

Table 1. Eligible area in km^2 (NUTS 3), January 1, 2013.

2.2. Population development and structure

The main characteristics of the population development and structure in the programme area are decreasing the number of inhabitants and ageing of population. Urban centres are more inhabited as there are a lot of migrations from peripheral areas to the centres happened in the last years.

The programming region consists of almost 3,500,000 inhabitants. The population structure among the participating regions differs and is presented in **Table 2**.

A big problem for the whole programme area presents ageing of population, ascribable to a low birth rate and increasing life expectancy. In January 1, 2013, the ageing index for all named regions exceeded 100.

2.3. Regional competitiveness

2.3.1. Economic strength

The cooperation area is characterised by dynamic core regions (Ljubljana, Celje, Kranj, Maribor, Graz, Klagenfurt and Villach) with some prospering urban areas on one side, while on the other side, it also has a series of rural and peripheral subregions with a significantly lower level of economic development.

Table 3 shows GDP per inhabitant in each NUTS level 3 region in absolute terms, as a percentage of the EU 27 average and regional GDP growth rates (2009–2010). In absolute terms GDP average was 24,500 euro per inhabitant in 2010, while in 2009 it was 23,500 euro per inhabitant, and in 2008 prefinancial and economic crisis, it was 25,000 euro per inhabitant.

NUTS 3	Inhabitants (January 1, 2013)	Population change 2007–2013 (in %)	Population density (January 1, 2013)
Oststeiermark	266,394	−0.7	79.2
West and Südsteiermark	189,889	−0.4	85.3
Graz	410,094	6.1	333.3
Obersteiermark Ost	163,272	−4.0	50.2
Obersteiermark West	102,282	−3.6	33.4
Unterkärnten	151,440	−3.0	44.9
Klagenfurt-Villach	277,846	1.7	136.8
Oberkärnten	126,187	−2.9	30.5
Südburgenland	97,530	0.1	66.3
Austria	**8,451,860**	**2.0**	**100.2**
Gorenjska	203,984	2.04	95.5
Koroška	72,100	−2.06	69.3
Savinjska	260,217	0.67	109.2
Podravska	323,238	1.10	149
Pomurska	118,022	−3.31	88.3
Osrednjeslovenska	541,718	7.50	212.0
Goriška	119,002	−0.40	51.2
Zasavska	43,502	−3.82	164.8
Slovenia	**1,681,783**	**2.41**	**101.6**

Source: Refs. [1, 2].

Table 2. Inhabitants and population density of the eligible area (NUTS 3), January 1, 2013, and development 2007–2013 (in %).

Among the NUTS level 3 regions in the programme area, GDP per inhabitant ranged from 11,400 € per inhabitant in Pomurska region in Slovenia to 38,500 € per inhabitant in Graz in Austria.

In terms of GDP per inhabitant in each NUTS level 3 region as a percentage of the EU 27 average, **Table 4** shows that in the programme area, there are still regions with an average GDP per inhabitant below the EU 27 average, in Slovenia (except Osrednjeslovenska) GDP per capita is even more than 30% below the EU 27 average.

Table 3 shows also the GDP growth between 2009 and 2010. The highest growth rates were recorded in the region West and Südsteiermark (9.5%), followed by Oststeiermark (7.5%), Obersteiermark West (6.9%) and Südburgenland (6.5%). A lot of regions in Slovenia had negative GDP growth in 2010, while the Zasavska region with 1.7% had the most positive growth within Slovenian regions.

NUTS 3	Regional GDP per inhabitant (current market price), 2010	Regional GDP per inhabitant as a percentage of the EU 27 average (EU 27 = 100)	Regional GDP growth rates 2009–2010
Oststeiermark	24,300	99	7.5
West and Südsteiermark	23,000	94	9.5
Graz	38,500	157	1.9
Obersteiermark Ost	27,700	113	−2.8
Obersteiermark West	24,700	101	6.9
Unterkärnten	24,400	100	5.2
Klagenfurt-Villach	34,000	139	5.6
Oberkärnten	22,600	92	−1.3
Südburgenland	21,300	87	6.5
Austria	**34,100**	**140**	**3.0**
Gorenjska	14,400	59	0.7
Koroška	13,000	53	−0.8
Savinjska	15,700	64	1.3
Podravska	14,500	59	−0.7
Pomurska	11,400	47	−0.9
Osrednjeslovenska	24,500	100	−1.2
Goriška	16,400	67	−0.6
Zasavska	11,800	48	1.7
Slovenia	**17,300**	**71**	**0.0**

Source: Ref. [3].

Table 3. Regional GDP per inhabitant (current market price), in absolute terms and as a percentage of the EU 27 average 2010, Regional GDP growth rates 2009–2010.

2.3.2. Business demography

The following section presents statistical data on business demography in the eligible area on NUTS level 2,[1] treating aspects such as the total number of enterprise births and their survival rates. Business demography is an important subject for discussion about increasing the level of employment, since it is one of the main priorities of the EU growth strategy. The birth of new enterprises is often seen as one of the key determinants of job creation and economic growth. In **Table 4**, the data on enterprise birth and deaths are presented.

Looking at birth rates in the eligible area, the number of newly born enterprises in the year 2010 in Burgenland was about 797, in Carinthia about 1686. In these two regions, the highest

[1]Data on NUTS 3 level is not available.

NUTS 2	Enterprise births (2007)	In 2010 still active	Survival rates after 3 years	Enterprise births (2010)
Burgenland	693	502	72.44%	797
Kärnten	1571	1145	72.88%	1686
Steiermark	4039	2352	58.23%	3648
Austria	**26,970**	**19,384**	**71.87%**	**26,172**
Vzhodna	5149	3588	69.68%	6509
Zahodna	7612	5315	69.82%	8816
Slovenia	**12,761**	**8903**	**69.77%**	**15,325**

Source: Refs. [1, 2, 4].

Table 4. Enterprise births and deaths 2010 (NUTS 2).

3-year survival rates were recorded (Burgenland 72.44%, Kärnten 72.88%); both are above the Austrian average.

In Styria 3648 enterprises were founded in the year 2010, caused mainly by enterprises in Graz; however, the survival rate of enterprises founded in 2007, with 58.23%, is below the Austrian average.

In Slovenia in the Zahodna region, there was 8816 enterprise births in 2010, and in Vzhodna region, the number of enterprise births was lower, 6509. In comparison with Austria, Slovenian enterprises had slightly lower survival rate after 3 years (Austria 71.87%, Slovenia 69.77%).

2.4. Labour market

2.4.1. Employment

The financial crisis in 2009 hit the whole eligible area. Within Austria in 2009, the effects of the crisis on employment affected most hardly Styria (besides Carinthia) and extended into 2010.

In 2010 employees in the NUTS 3 region Graz accounted for 248,600—therefore the number of employees increased by 1.4% from 2006 to 2010. The decrease of employed persons in the NUTS 3 region Graz was the lowest within the Styrian NUTS 3 regions in the year 2009. The eastern part of Upper Styria (Obersteiermark Ost) was hit more severe by decreasing employment in the crisis year 2009 (also indicated by trends for the time period 2006–2010). The western part of Upper Styria (Obersteiermark West) was disproportionately affected by decreasing employment. Decreases in employment stabilised in 2010—this is reflected in employment trends for the period 2006–2010. The firm structure of Obersteiermark West corresponds mainly with the Styrian average; however, smaller firms are higher represented in this part of Styria. Employment trends of the eastern part of Styria (Oststeiermark) were above the Styrian average in the period 2006–2010 (+1.0%). Although employment decreased in the year of the financial crisis, it increased in 2010. Similar trends are observed for West- und Südsteiermark: in these regions employment decreased in the year of the financial crisis 2009

and increased in 2010. Carinthian regions were also hit hardly by the financial crisis. However employment in Carinthian regions increased in 2010 (indicating a positive trend for the period 2006–2010). Similar trends can be observed for Südburgenland. Employment increased by 0.4% in the period 2006–2010. The number of persons in employment and annual growth rate of employment between 2006 and 2010 is shown in **Table 5**.

Also in Slovenia the impact of financial crisis on employment can be seen. Only Osrednjeslovenska with the highest number of persons employed (314,300), followed by Podravska (140,200), Savinjska (119,900) and Goriška region (53,800), had positive annual growth rate of employment between 2006 and 2010. Effects of the crisis on employment affected most hardly Pomurska and Zasavska region.

In terms of persons employed by economic activities, there are large differences between the regions in the eligible area. Details are shown in **Table 6**.

Table 6 shows that Oststeiermark in Austria and Pomurska in Slovenia had about one quarter of employees in the primary sector in 2010.

NUTS 3	Number of persons in employment	Annual average growth rate 2006–2010 (in %)
Oststeiermark	122,300	1.0
West and Südsteiermark	76,700	0.6
Graz	248,600	1.4
Obersteiermark Ost	71,100	−0.3
Obersteiermark West	45,100	0.3
Unterkärnten	64,600	0.2
Klagenfurt-Villach	146,100	0.6
Oberkärnten	53,900	0.0
Südburgenland	39,100	0.4
Austria	**4,229,800**	**0.9**
Gorenjska	80,300	−0.1
Koroška	28,900	−1.2
Savinjska	119,900	0.2
Podravska	140,200	0.5
Pomurska	45,600	−1.4
Osrednjeslovenska	314,300	1.2
Goriška	53,800	0.1
Zasavska	14,800	−1.3
Slovenia	**962,500**	**0.5**

Source: Ref. [3].

Table 5. Number of persons employed, 2010 (NUTS 3) and annual average growth rate 2006–2010 (in %).

NUTS 3	Total—all NACE activities	A	B–E	F	G–J	K–N	O–U
		Thereof in %					
Oststeiermark	122,300	19.0	19.1	8.3	23.8	9.6	20.3
West and Südsteiermark	76,700	15.6	20.7	8.7	24.9	9.4	20.7
Graz	248,600	3.1	13.8	5.9	25.7	18.3	33.1
Obersteiermark Ost	71,100	5.3	27.8	6.3	25.5	10.5	24.8
Obersteiermark West	45,100	11.5	22.4	6.7	24.2	9.3	25.9
Unterkärnten	64,600	14.4	24.0	8.7	22.9	9.4	20.6
Klagenfurt-Villach	146,100	4.4	12.7	5.7	29.1	16.0	32.0
Oberkärnten	53,900	14.7	13.5	11.1	31.2	8.2	21.3
Südburgenland	39,100	12.5	16.1	9.2	26.6	9.0	26.6
Austria	**4,229,800**	**5.7**	**15.8**	**6.9**	**28.8**	**15.2**	**27.6**
Gorenjska	80,300	7.3	30.4	8.0	25.3	10.8	18.3
Koroška	28,900	13.1	34.9	6.6	17.3	7.6	20.4
Savinjska	119,900	10.3	31.4	9.3	23.4	8.8	16.7
Podravska	140,200	9.2	22.8	8.8	22.0	16.5	20.6
Pomurska	45,600	19.5	22.4	9.2	21.3	7.2	20.4
Osrednjeslovenska	314,300	3.3	12.9	8.1	27.3	22.6	25.8
Goriška	53,800	10.2	27.1	10.4	19.1	9.9	23.2
Zasavska	14,800	8.1	34.5	7.4	18.2	12.8	18.2
Slovenia	**962,500**	**8.4**	**22.5**	**8.6**	**24.1**	**15.0**	**21.5**

Source: Ref. [3].

Table 6. Number of persons employed, 2010 (NUTS 3), by economic activities (NACE Rev. 2) (in %).

The secondary sector plays an important role in terms of employees in the Slovenian regions, as in Koroška (34.9%), Zasavska (34.5%), Gorenjska (30.4%) and Goriška (27.1%) as well as in Obersteiermark Ost (27.8%) in Austria.

The tertiary sector is especially in the central areas of Klagenfurt-Villach, Graz (Austria) and Osrednjeslovenska (Slovenia) providing jobs for employees.

2.4.2. Unemployment

Unemployment rates differ between the Austrian and Slovenian parts of the region. In 2010, the unemployment rates of all Slovenian participating regions were higher than for Austrian participating regions. Podravska and Pomurska regions had the highest unemployment rate within the programme area. Details are shown in **Table 7**.

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NUTS 3	Registered unemployment rate	Registered unemployment rate of woman	Registered unemployment rate of men
Oststeiermark	5.7	5.1	6.2
West and Südsteiermark	7.1	6.6	7.5
Graz	7.6	6.6	8.4
Obersteiermark Ost	6.9	7.3	6.5
Obersteiermark West	6.7	6.8	6.6
Unterkärnten	8.3	8.2	8.3
Klagenfurt-Villach	9.0	8.3	9.6
Oberkärnten	9.8	9.7	9.9
Südburgenland	8.3	7.8	8.6
Austria	**7.0**	**6.5**	**7.4**
Gorenjska	8.9	9.03	8.83
Koroška	12.2	15.60	9.47
Savinjska	12.7	14.28	11.48
Podravska	14.1	15.35	13.02
Pomurska	17.3	19.38	15.67
Osrednjeslovenska	10.1	9.65	10.49
Goriška	10.3	9.94	10.59
Zasavska	14.7	14.95	14.39
Slovenia	**12.0**	**12.61**	**11.47**

Source: Refs. [2, 3].
Nace Rev. 2: agriculture, forestry and fishing (A); industry (except construction) (B–E); construction (F); wholesale and retail trade, transport, accommodation and food service activities, information and communication (G–J); financial and insurance activities; real estate activities; professional, scientific and technical activities; and administrative and support service activities (K–N); public administration and defence; compulsory social security; education; human health and social work activities; arts, entertainment and recreation; and repair of household goods and other services (O–U).

Table 7. Unemployment rate 2010 (NUTS 3).

In Slovenia the unemployment rate of women was higher than the unemployment rate of men, while in Austria there was higher unemployment rate of men. Pomurska, Koroška and Podravska regions registered more than 15% unemployment rate of women, while unemployment rate of man was higher than 15% only in Pomurska region.

As already mentioned unemployment rates was much higher in Slovenian regions comparing with Austrian. In Austrian NUTS 3 regions of the eligible area, Graz had 7.6% unemployment rate. In terms of gender gap, women have been more affected by unemployment than men. In 2010 the unemployment rate of men compared to women was 8.4–6.6% in Graz.

Among the Styrian regions of the eligible area, Oststeiermark had the lowest unemployment rate (5.7%) in 2010; especially the district of Weiz contributes with an unemployment rate of

4.2% to this positive result. The unemployment rate of women (5.1%) was lower than of men (6.2%).

The unemployment rate within NUTS 3 level was 8.3% in Unterkärnten, 9.0% in Klagenfurt-Villach and 9.8% in Oberkärnten. In all the regions, the unemployment rate was above the average of Austria.

Also the unemployment rate of Südburgenland is above the average of Austria, which recorded an unemployment rate of 8.3%; the unemployment rate of woman with 7.8% was lower than those of men with 8.6% in 2010.

2.5. The regional innovation system: education, research and development and innovation potential

2.5.1. Education level

The strategic framework for European cooperation in education and training adopted a benchmark to be achieved by 2020 that the share of early leavers from education and training should be less than 10%, a level already reached in 2011 by the eligible area regions [5]. Early leavers from education and training may face heightened difficulties in the labour market; data is presented in **Table 8**.

In Slovenia in the year 2012, 4.4% (EU 27 12.8%) of those aged 18–24 were early leavers from education and training, with at most a lower secondary education. The overall share of early leavers from education and training fell by 0.7 percentage points between 2008 and 2012; the share was even lower in Zahodna Slovenija [6]. In Austria the share of early leavers from education and training was higher than in Slovenia; Styria, however, had a large reduction of 3.2 percentage points between 2008 and 2012.

The strategic framework for European cooperation in education and training was adopted in May 2009. It sets a number of benchmarks, including one for tertiary education, namely, that by 2020 the proportion of 30–34-year olds with tertiary educational attainment should be at

NUTS 2	2008	2009	2010	2011	2012
Burgenland	–	–	–	–	–
Kärnten	8.3	:	7.1		
Steiermark	8.1	7.5	7.1	4.6	4.9
Austria	**10.1**	**8.7**	**8.3**	**8.3**	**7.6**
Vzhodna Slovenija	4.8	5.6	5.3	4.7	5.0
Zahodna Slovenija	5.3	5.1	4.7	3.7	3.8
Slovenia	**5.1**	**5.3**	**5.0**	**4.2**	**4.4**

Source: Refs. [2, 3].

Table 8. Early leavers from education and training, 2008–2010 (in %).

NUTS 2	2008	2009	2010	2011	2012
Burgenland		17.8	20.5	19.8	18.0
Kärnten	21.3	25.5	20.2	19.4	25.0
Steiermark	20.4	17.2	20.2	20.5	22.1
Austria	**22.2**	**23.5**	**23.5**	**23.8**	**26.3**
Vzhodna Slovenija	25.9	25.6	28.3	32.9	35.9
Zahodna Slovenija	36.4	38.5	42.2	43.0	42.7
Slovenia	**30.9**	**31.6**	**34.8**	**37.9**	**39.2**

Source: Ref. [3].

Table 9. Population aged 30–34 with tertiary education, 2008–2012 (in %).

least 40% [7]. Just over one-third (35.8%) of the population aged 30–34 in the EU 27 had a tertiary education in 2012. In **Table 9** population aged 30–34 with tertiary education in Austria and Slovenia is presented.

In Slovenia the proportion of 30–34-year-old men and women with tertiary educational attainment was already 39.2% and even higher in Zahodna Slovenija with 42.7% in 2012. Vzhodna Slovenia increased the share of 30–34-year olds with tertiary educational attainment by 10.0 percentage points between 2008 and 2012. Austria, as a well-performing economy, scores low, especially the NUTS 3 level regions, reaching at least above 20%, with the exception of Burgenland, which reached 18.0%. This is linked to their different education systems.

2.5.2. Research and development

The size of the research and development expenditure shows small differences at member state level. According to 2011 Eurostat data, R&D spending in terms of % of the GDP was 2.75% in Austria, while in Slovenia spending was below 2.47%, both countries spending higher than EU 27 average (2.02%).

Breaking down R&D expenditure by sector, the business enterprise sector in Austria with 1.90% spending is among the best performing among member states in this respect (almost 150% of the 1.29% EU 27 average), while Slovenia, with 1.83%, is also in the higher half of the EU 27 member states. Government spending shows bigger difference between Austria and Slovenia (0.14% for Austria and 0.35% for Slovenia). Data for the higher education sector shows that the sector is more active in R&D in Austria (0.73% GERD), less in Slovenia (0.29% GERD).

However, in Slovenia and in Austria, total internal R&D expenditures show some local differences. Details are shown in **Table 10**.

Steiermark in Austria and Zahodna Slovenija in Slovenia have a prominent position with gross domestic expenditure on R&D as high as 4.6 and 3.10% in 2011.

NUTS 2	2007	2009	2011
Burgenland	0.7	0.7	0.6
Kärnten	2.5	2.5	2.8
Steiermark	4.2	4.3	4.6
Austria	**2.5**	**2.71**	**2.75**
Vzhodna	0.93	1.21	1.68
Zahodna	1.86	2.34	3.10
Slovenia	**1.45**	**1.85**	**2.47**

Source: Refs. [2, 3].

Table 10. R&D expenditures 2011 by regions (NUTS 2) in % of GDP.

Among the Slovenian NUTS 2 regions, Zahodna Slovenija expended much more for R&D than Vzhodna Slovenija (3.10 vs. 1.68% of GDP) in 2011.

Among the Austrian NUTS 2 regions, in 2011 the highest R&D intensity was recorded in Styria (4.6%); Carinthia with 2.8% was still on the Austrian average. R&D expenditures in 2011 compared to 2009 were increasing by +17.4% in Styria and +24.1% in Carinthia. In Südburgenland R&D plays a crucial role for the economic development; however, the region reported R&D expenditure accounting for less than 1% of their GDP.

Austria's more advantageous position in the field of R&D is also clear in terms of researchers in full-time equivalents (FTE). The data about R&D personnel is shown in **Table 11**.

In Slovenia the total number of FTE researchers was 15,269; in Austria it was 61,170 in 2011 [3]. The number of R&D personnel is increasing over the last years; nevertheless all NUTS 2 regions could increase the number of R&D personnel.

NUTS 2	R&D personnel (in full-time equivalents)		
	2007	2009	2011
Burgenland	385	464	574
Kärnten	2526	2726	3049
Steiermark	9996	10,665	12,129
Austria	**53,252**	**56,438**	**61,170**
Vzhodna	2471	3041	4061
Zahodna	7898	9371	11,208
Slovenia	**10,369**	**12,410**	**15,269**

Source: Ref. [3].

Table 11. R&D Personnel (in full-time equivalents) from 2002 to 2011 by sectors of performance.

	Total enterprises	Thereof innovative enterprises (%)[2]	Product/process and organisational/marketing innovation	Organisational/ marketing innovation only	Product/process innovation only
			% of all innovative enterprises		
Burgenland	481	49	53	32	24
Kärnten	948	56	50	23	15
Steiermark	2074	51	57	21	21
Austria	**15,968**	**56**	**55**	**22**	**22**
Slovenia	**4158**	**49**	**50**	**30**	**21**

Source: Refs. [1, 3, 9].[3]

Table 12. Enterprises by type of innovation, 2008–2010.

2.5.3. Innovation potential and innovation policy

Innovation is often considered key to maintaining our competitiveness on the global market, creating jobs and improving the quality of life. One of the main objectives of European policies is to encourage innovation in Europe, by providing incentives to stimulate and improve this economic driver [8].

As it can be seen from **Table 12** among the eligible areas, the higher shares of innovative enterprises during the period 2008–2010 were observed in Austria (56% of all enterprises); in line with Carinthia, which has the same amount of innovative enterprises. In the EU 27 member states (excluding Greece), more than half of all enterprises (53%) reported innovation activity; hence, Austria reported innovation activity above, Slovenia below the EU 27 average.

As regards the types of innovation that enterprises engage in, **Table 13** shows innovation broken down by three categories of innovators: product and/or process innovators only (excluding organisational and/or marketing innovation), organisational and/or marketing innovators only (excluding product and/or process innovation) and enterprises that developed both categories, product/process innovation and organisational/marketing innovation.

In Austria and Slovenia, as well as in the Austrian NUTS 2 regions, the share of innovative enterprises that combine product/process and organisational/marketing innovation is the highest.

In terms of combined product/process and organisational/marketing innovation by size class, **Table 14** shows that this combined innovation activities are also developed by a large group of small enterprises. However, it is also important not to lose sight of business structure of the regions, whereas 64% of Austrian and 57% of Slovenian enterprises are characterised by small- and medium-sized enterprises.

[2]Including enterprises with abandoned/suspended or ongoing innovation activities.
[3]All Core NACE activities related to innovation activities (B, C, D, E, G46, H, J58, J61, J62, J63, K and M71).

NUTS 1 and 2	Innovative enterprises[4] of total enterprises	Thereof product/process and organisational/marketing innovation	Thereof product/process and organisational/ marketing innovationby size class		
			From 10 to 49 employees	From 50 to 249 employees	250 employees or more
Burgenland	49%	53%	62%	31%	7%
Kärnten	56%	50%	64%	25%	12%
Steiermark	51%	57%	61%	25%	14%
Austria	**56%**	**55%**	**64%**	**27%**	**10%**
Slovenia	**49%**	**50%**	**57%**	**32%**	**12%**

Source: Refs. [1, 3].

Table 13. Enterprises by size class, 2008–2010.

2.6. Environment and energy

One of the key goals of the European Union is the protection of the environment and the conservation of the natural heritage like rare and valuable natural phenomena such as minerals and fossils, subterranean caves, gorges, springs, waterfalls, rapids, lakes, bogs, streams and rivers with banks, seaside and landscapes. In order to achieve this aim, the European Union launched various policies, programmes and projects and adopted several environmental legislations in order to diminish air, water and land pollution, to reduce waste and noise and to guarantee an overall sustainable economic, social and environmental development for member state citizens and people beyond the EU border.

Environmental protection is an increasingly important item on the Austrian social and economic policy agenda. Because of the complex nature of the problems related to environmental pollution and the traditional distribution of public tasks among a number of regional authorities, measures for protecting the environment are taken by the federal authorities and by province governments and municipalities [10].

In the field of environment, Austria is one of the leading countries in Europe. The standards in force in Austria are very stringent by European comparison. In the fields of waste management, chemicals or air pollution is related to boiler installations. Also in agriculture ecological criteria have increasingly been taken into account. The Environmental Information Act aims at enhancing transparency in the field of environmental information and access to environmental data. Since 2003 Austria has been a party to the Aarhus Convention, therefore information is available to the public, and the collection of data about the environment is computer based. Austrian legislation is thus increasingly taking citizens' health and environmental concerns into account [10].

[4]Including enterprises with abandoned/suspended or ongoing innovation activities.

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Due to the implementation of EU Water Framework Directive, the water quality of Austria's lakes was raised to excellent levels. In order to classify the system, a detailed, state-of-the-art computer-based documentation of all Austrian rivers and lakes was prepared. For environmental protection Austria elaborated a national concept for the rehabilitation of protective forests and took the specific steps with respect to emissions of airborne pollutants that led to considerable reductions [10].

Active care of the environment in Slovenia is included into spatial planning and into any other planning of activities affecting the environment. For reducing adverse environmental impact, economic instruments in the forms of environmental tax based on the "polluter pays" principle or an environmental tax reduction in the case of investment in environmental protection have been introduced [11].

With the Environmental Protection Act in 2004, two chapters concerning the control and reduction of environmental emissions and the phasing-out and substitution of hazardous substances were defined. The main aim of the mentioned act is the promotion of development and the use of technologies that prevent, eliminate or reduce environmental burdens.

A lot of areas within the environment and energy can represent a cooperation field within programme area. One of them could be NATURA 2000 areas, another natural park, renewable energy, etc.

In the past 25 years, one of the central working areas has been the conservation of European Union's biodiversity. Beside on that the European Union launched the NATURA 2000 initiative, one of the biggest challenges is to interact the conservation of NATURA 2000 areas with humans' everyday activities. Of course it is crucial that also other policy fields like transportation, tourism, industry, agricultural or energy became sustainable as well [12]. To overcome mentioned challenges, cross-border cooperation for transferring best practices is needed.

One of the cooperation fields could be natural parks, and others could be cooperation for improving air quality, quality of water, reducing the noise and waste, etc.

The air quality has diminished since the industrial revolution. The main cause of the worldwide climate change is anthropogenic greenhouse gas emissions. Negative consequences of these phenomena represent a bear to humans and the environment itself. Health deterioration in a form of lung problems, drought and floods became a part of the everyday agenda. An important step in reducing the anthropogenic greenhouse gas emissions especially CO_2 has been taken in 2005 with the implementation of the EU ETS. Since then, the Slovenian CO_2 emissions have decreased from 20,309 tCO_2 to 19,509 tCO_2 in 2011, and Austria CO_2 emissions have decreased from 92,895 tCO_2 to 82,842 tCO_2. This thematic field thus represents a possible cooperation area especially as most of the CO_2 emissions come from the industry. Companies from both sides of the border could work together and exchange experiences, thoughts and even technologies in order to make their production environmentally friendly [13].

Very important field for cooperation could also be the renewable energy. Promoting the use of renewable energy sources is important both to the reduction of the countries' dependence on foreign energy imports and in meeting targets to combat global warming.

NUTS 1	2004	2005	2006	2007	2008	2009	2010	2011
EU 27	8.1	8.5	9.0	9.7	10.4	11.6	12.5	13.0
Austria	22.8	23.8	25.3	27.2	28.3	30.2	30.6	30.9
Slovenia	16.1	16.0	15.6	15.6	15.0	19.0	19.6	18.8

Source: Ref. [3].

Table 14. Renewable energy share of gross final energy consumption.

The data of renewable energy share of gross final energy consumption between 2004 and 2011 is shown in **Table 14**.

In Austria renewable energy share of gross final energy consumption amounts to 30.9% in 2011 against 30.6% in 2010; this represents an increase of 0.3 point. In Slovenia the renewable energy share of gross final energy consumption fell from 19.6% in 2010 to 18.8% in 2011.

Activities like traffic, constructions or even recreation activities create noise, which can be harmful and unpleasant for humans, animals and the whole environment. Despite that the European Union has taken measures on this topic, noise is a problem, which is considered to be best handled on the regional or local level. Thus this is also an important thematic field, which can be handled within the programme cooperation area.

3. SWOT analysis

The key strengths, weaknesses, opportunities and threats of the Slovene regions have been identified through:

- The analysis of the statistical data
- Existing regional and national development plans
- Regional analysis

Moreover, regional studies and recent direct information of relevant authorities have been taken into regard. Thus, SWOT analysis offers a wider view than the statistics and analyses of the programme area description.

In order to give a clear and complete overview, the strengths, weaknesses, opportunities and threats identified are presented in **Table 15** for the main sectors/fields identified in Regional Development Programmes 2014–2020, also highlighting specific issues of individual NUTS 3 areas where appropriate.

Regions analysed are those eligible NUTS 3 regions from the core programme area in 2007–2013 period including Gorenjska, Koroška, Savinjska, Podravska and Pomurska on the Slovene side. The NUTS 3 area Osrednjeslovenska is included in the programme on the basis of Art 21 (1) of the Regulation No. 1080/2006 on the European Regional Development Fund.

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Sector	Strengths
Demography/demographic change/ settlements	• Relatively high educational level of the population • Increasing shares of young population in urban agglomerations (students, young families) • Polycentric settlement
Economy/urban development	• Big cities as growth centres • Companies and knowledge, especially in traditional industries in Slovenia; strong internationally competitive and innovative enterprises in Austria • Strong regional industrial core, for example, manufacturing sector • Well-developed food processing sector • Medium-sized domestic multinationals (global/international companies and brand names) are present in the programming area • Regional centres of economic activity • Well-developed regional portfolio of economic activities • Good regional supply with business services
Human resources/employment	• High share of young population enrolled in tertiary education in Slovenia • Growing share of highly educated population • Well-developed education system for all levels • Existing social entrepreneurship • Qualified/skilled labour force/relatively highly skilled regional labour force
Education/research and innovation	• Well-established secondary education network • Good regional endowment with R&D infrastructures and research and technology organisations • Universities with high potential in areas of technological, natural and social sciences; diversified study disciplines and programmes • Strong basis of research and innovation performing enterprises in Austria • Developed educational network; high number of NGOs in Slovenia • Some new study programmes based on demand of the business sector • Technology parks enabling concentration and integration of entrepreneurship, knowledge and development
Environment and energy	• Rich natural heritage, biodiversity • Preserved natural environment with high share of protected areas (natural parks, Natura 2000), relatively environmentally stable space • Good capacity for dealing with environmental problems • Available natural resources (timber, water, thermal water, etc.) • Quality drinking water • Strong potential for the use of renewable resources—wood biomass, hydro- and geothermal energy, etc. • Availability of serviced land • Interrelatedness of urban space and nature
Traffic infrastructure and mobility	• Available transport infrastructure connecting regional centres • Available road network connected to neighbouring regions and macroregions
Tourism and leisure/cultural heritage and cultural resources	• Attractive landscape for tourism (nature, cultural heritage) • Well-known international events • Regional centres of tourism as local development incubators • Awareness of the importance of sustainable tourism development • Richness of traditional, culinary and handcrafts • Developed amateur culture and local cultural performers • Rich cultural offers

Sector	Strengths
Demography/demographic change/ settlements	• Ageing of population in peripheral territories • Negative natural and immigration growth (except for CenSI) • Increasing shares of commuters • Loss of population in peripheral territories
Economy/urban development	• Inward orientation, insufficient cooperation within region • Companies adjusting too slow to increased competition and globalisation • Export limited primarily to traditional nearby markets • Low share of knowledge-based services in GDP and exports • Low inflow of FDI • SMEs: lack of entrepreneurial spirit, low level of internationalisation, new SMEs do not grow, lack of financial resources for SME development • Low level of R&D investments with the exemption of urban areas • Low level of innovativeness in companies (especially SMEs), lack of innovation culture, lack of management/marketing competencies despite high self-evaluation, low share of hi-tech products in exports and high share of low value-added products • Low survival rate of startups • Relocation of economic activity abroad due to cheaper labour force in mature sectors, bankruptcies of companies in mature sectors and lack of financial supporting mechanisms • Too weak linkages between research, education and economy • Long-lasting procedures for obtaining construction permits • High prices of land for business use, lack of suitable sites ready for business activities, non-utilisation of abandoned industrial buildings and infrastructure in Slovenia
Human resources/employment	• Comparatively low level of population with tertiary education in Austria (due to education system) • Level of registered unemployment above average and still growing, unfavourable age and educational structure of unemployed (above 50 and under 29, long-term unemployed) and growing share of unemployed with higher education • Low level of self-employment • Structural imbalances in labour markets and slow adjustments of educational programmes to labour market needs
Education/research and innovation	• Innovation activities of enterprises are highly concentrated • Lack of integration among the economy, universities and research and development institutions in parts of the programming area • Education systems at all levels are rigid and do not react to needs of labour market in Slovenia • SMEs are poorly included in educational and training programmes • Lack of effective investment into research and development which is reflected in poor transfer of knowledge back to the economy in parts of the programming area
Environment and energy	• Absence of a regional planning in Slovenia • There are no comprehensive development strategies and protection for defined areas of "natural landscape" in Slovenia • Regulatory barriers for renewable in regional energy markets • Lack of business models for prosumer markets in the field of renewable
Traffic infrastructure and mobility	• Third development axis missing and poorly maintained state and local road network • Poor and inefficient public transport system in Slovenia • Bad connections in terms of public transport in peripheral territories in Austria

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Sector	Strengths
Tourism and leisure/cultural heritage and cultural resources	• Lack of cooperation/integration among tourist service providers in providing full-range offer, weak cooperation among tourist service providers and organisations for marketing and promotion, lack of advanced integrated tourist products and weak integration of cultural heritage with tourism in the region • Short stay of tourists and visitors with low consumption and concentration of supply/offer in the main season and weak "out of season" offer • Fragmentation of cultural events, low cooperation among programmes and associations in the field of cultural activities • Lack of entrepreneurial initiatives in rural areas (a small number of family SMEs)
Sector	**Opportunities**
Demography/demographic change/ settlements	• Economic crisis as opportunity—young highly skilled people from Greece, Spain and Portugal as potential brain gain for subregions with high knowledge intensity (e.g. Graz, Klagenfurt-Villach)
Economy/urban development	• Strengthening competitive advantages of functional urban areas and promoting active networking with regional centres of the neighbouring countries and regions • Development of an integrated settlement-transport system • Development of dynamic critical mass in leading sectors with the formation of interregional clusters • Good potential for related variety in the economic sectors • Promotion of internationalisation • Increasing recognisability of region as a location for foreign investment and providing land and attracting new investment • Development of a supportive business ecology for SMES and startups • Development of creative industries
Human resources/employment	• Availability and quality of the environment as a factor for attracting creative people and investment • Promotion of entrepreneurial talent and self-employment • Live-long learning as basis for enlarging the regional knowledge base • Rapid activation of young people under 26 years and reactivation of those above 50 years with the help of active employment policy measures • Green jobs
Education/research and innovation	• Linking schools with industry and adapting programmes to the needs of the labour market with the aim of restructuring the high school and other programmes of education/training and the dissemination of a lifelong learning culture • Strong scientific and entrepreneurial innovation potential in the field of KETs • Establish liaison arrangements among industry, university and research and development institutions
Environment and energy	• Building partnerships for a comprehensive programme to protect the environment • *Environmental Resources Management (ERM)* and revitalisation of degraded areas • Protected nature areas-Natura 2000 as a development opportunity • Production of bio-and alternative fuels from waste • Increasing energy self-sufficiency due to potential of renewable energy sources
Traffic infrastructure and mobility	• Moving towards a more sustainable transportation due to changes in travel behaviour

Sector	Strengths
	• E-mobility and innovative service-based transport solutions as response to urban congestion problems • Newly developed public transportation system (S-Bahn) in Austria
Tourism and leisure/cultural heritage and cultural resources	• Regional centres of tourism as local development incubators • The sustainable use of natural and cultural heritage together with existing knowledge and skills in the environment, development of eco-tourism and development of green tourism in Natura 2000 areas • Activation of cultural and artistic potential of the region • Increase the quality of integrated tourist products and joint promotional appearances in order to raise the profile of destination, the development of common brands and their promotion and mobile e-services for the marketing of tourist destinations • Integration of agriculture, tourism, complementary activities and other services in rural areas • Comprehensive revitalisation of cultural heritage
Sector	**Threats**
Demography/demographic change/ settlements	• Brain drain • Accelerated processes of ageing population with the exemption of urban agglomerations • Depopulation of peripheral territories
Economy/urban development	• Excessive rise of real estate prices in urban agglomerations • Increased development gap with the west/central Slovenia and neighbouring cross-border regions could increase pressure for relocation and diversion of FDI potential by providing better conditions elsewhere • Scarcity and lack of competitiveness of locations in the region would further decrease the attractiveness of the region for foreign investment • Relocation of low-technology manufacturing activities abroad due to cheaper labour costs • Credit crunch—insufficient supply of capital • Limited development and investment funds • Failing in successfully restructuring stagnant industries
Human resources/employment	• Shortage of skilled labour force as barrier to growth • Emigration of trained/skilled personnel from the region • Social exclusion • Rising unemployment • Limited access to education and health services • Loss of values and identity
Education/research and innovation	• Budgetary austerity could hamper necessary public future investments in RDI • Insufficient enrolment rates in science and engineering at universities • Continued rigidity of the secondary education system without linkage to economic sector • Danger of one-size-fits-all instruments for a very heterogeneous programming area • Low enrolment to deficient education programmes • Lack of cooperation of regional research and development institutions in international consortia due to development gap in Slovenia • Partly slow response of research institutions/departments in companies to new technologies and new research subareas within nanotechnology, biotechnology, environmental technology, etc.
Environment and energy	• Climate change (increased water shortages for irrigation, hail and floods)

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Sector	Strengths
	• Vanishing small areas important for biodiversity conservation(e.g. wetlands) • Increasing damage due to improper use of flood and land slide areas • Inability of reconciling various interests in the area (agriculture, tourism, nature conservation and cultural heritage) • Mismatch between spatial and development planning • Neglecting ecologically degraded areas • Nonsystemic, unplanned and environmentally problematic use of alternative energy sources
Traffic infrastructure and mobility	• Insufficient funding for construction of communication (especially road) networks • Reduction of air connections due to increasing competition in Europe (i.e. airports and airlines)
Tourism and leisure/cultural heritage and cultural resources	• Increasing relative competitiveness of neighbouring regions and countries in tourism • Loss of traditional cultural landscape • Slow implementation of public-private partnership model for the development of tourism products and infrastructure • Failure in identifying new trends in tourism • Concentration of tourist accommodation facilities in some locations and large companies

Table 15. SWOT analysis.

4. Conclusion

Economic growth in the future must be knowledge driven due to globalisation. Technology improvement, upgrading services and cost efficiency are challenges for all countries, and some of them are easier to overcome with cooperation between countries.

Regional and SWOT analyses show a lot of opportunities for strengthening cross-border cooperation between Austrian and Slovenian regions.

4.1. Demography

Demographic analysis shows that urban areas in both countries are more attractive to inhabitants [1, 2]. Working and educational opportunities, infrastructure and access to social services and health care are the main factors when deciding the place of living. A modest birth rate combined with a progressing life expectation consequently leads to population ageing, which is a big problem in the whole programme area. On January 1, 2013, the ageing index for all named regions exceeded 100.

Economic analysis of the participating regions shows that there is an increasing need for the economic cooperation and network building in the border regions, especially in areas such as innovation and technological development, research, renewable energy and protection of cultural and natural heritage.

4.2. Education, research and development

Good and diverse supply of education on one hand and the problem of lack of knowledge of RDI partners on the other are showing that research and development in the participating regions could play a strong role in cross-border cooperation in the future. Austria has more advantageous positions in the field of research and development, but as both countries are spending for research and development more than EU 27 average and regarding the good infrastructure for research and development in all participating regions, these could present a good base for strengthening research, technological development and innovation. Research and innovation potential together with high educational level of population in participating regions could serve as the basis for cross-border cooperation with an aim of fostering and strengthening innovation activities in the regions.

As a tool for strengthening innovation activities between Austria and Slovenia, networking will be used. Collaboration between the regions' education and business sectors with the innovation poles is here essential.

4.3. Competitiveness of SMEs

Due to the fact that 64% of Austrian and 57% of Slovenian enterprises are characterised by small- and medium-sized enterprises, one key driver of sector-oriented economic development is the industry clusters, especially among SMEs. To a large extent, the economic undertakings in the cross-border area are covered by various clusters, which take up the role as key players in boosting the progression of economic and innovation activities due to cross-border cooperation.

The primary objective of the cross-border cooperation in the field of SMEs is to strengthen their competitiveness. Within this aim the following activities should be included:

- Transferring the knowledge and technology
- Promoting innovation and development of common services

4.4. Environment and resources

The global pollution of the environment is exposing the necessity to take precautionary steps in order to protect and preserve the world's resources. Active care of the environment can be seen in Austrian and Slovenian participating regions. Austria is characterised with high ecological awareness, but also Slovenia has shown a great and increasing interest in the field of protecting the environment during the last few years. Rich natural heritage, biodiversity, good capacity for dealing with environmental problems and strong potential for the use of renewable resources are the main strengths participating regions have in the field of environment and energy; therefore cross-border cooperation in the mentioned fields could play an important role in the next period.

Close cooperation between regions will be useful for transferring know-how and thus for implementing cross-border solutions in the field of environment and resources.

4.5. Institutional capacity and an efficient public administration

According to the EC, "the quality of public administration has a direct impact on the economic environment and is thus crucial to stimulating productivity, competitiveness and growth" [14]. Consequently, the need for increasing the efficiency and effectiveness of public services and the increased quality of public administration should also be one of the areas for cross-border cooperation between Slovenian and Austrian regions.

Strengthening existing networks as well as the creation of new ones is highly important. Therefore, as already mentioned, novel opportunities should be establishing in order to encourage and foster administrative cooperation as well as cooperation between inhabitants and institutions.

One of the objectives within this field will indubitably be the decrease of administrative burden and thus the contribution to a more effective communication between inhabitants and public sector organisations.

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