Emergence of Territorial Systems of Innovation in El Salvador, Central America

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Abstract

This paper is part of a collaboratory research effort to develop a common theoretical framework and stimulate analysis of the emergence and development of territorial systems of innovation (TSI) within the GLOBELICS research community.[2] The contribution of this article is to further strengthen the conceptual framework for the emergence and initial development of TSI in developing country contexts, with special emphasis on the conceptualization of emergence. And then, to apply this conceptualization to discuss initial research results as to the dynamics by which TSI are emerging in El Salvador. This application exercise is based on evidence gathered from key source interviews related to recent developments in the rural territory of the Jiboa Valley, with a sectoral focus on the territory´s main product of panela (raw non-industrialized sugar).[3] The article concludes proposing a research methodology to be used in a comparative research effort to identify and analysis the emergence of STI in Central America and other regions within the GLOBELICS research community.

Key words: emergence, territorial systems of innovation, territorial development strategies, territorial governance, regional innovation systems, El Salvador, Central America.

[1] This version is uploaded now in order to not miss the September 15th deadline. However, I would propose to send a more final version at a later date directly to person who will be commenting my presentation at the Globelics Athens Conference.

[2] This effort is being promoted by the author along with Abdelkader Deflat; and this paper represents progress in a continued research resulting in papers presented at LALICS Rio de Janeiro 2014 and GLOBEICS Addis Abaeba 2014, Havana Cuba 2015 and Bandung Indonesia, 2016.

[3] The *panela* industry was developed in the Jiboa Valley and other territories in El Salvador, along with the introduction of sugar cane during the colonial and post-colonial periods.[3] The technological trajectory of sugar production in El Salvador was radically changed with the introduction of industrial sugar cane processing mills and concretely the Jiboa industrial sugar processing plant established in 1976.

1. Introduction

With reference to the Globelics 2017 conference themes, conceptualizing and analyzing the emergence of TSI, is focused on the territorially embedded interactions between different types of actors from national and sub-national State entities, as well as business and civil society spheres which explain the emergence of innovation capabilities in localized business networks, the actors directly supporting them, as well as those promoting more general territorial development processes. Our focus extends beyond innovation for business competitiveness to include innovation for sustainable and inclusive development. Strengthening capabilities to innovate and support innovative initiatives within territorial systems of development actors is seen as the key causal mechanism behind the TSI emergence. Theory and evidence from practice suggest that this is an emergent result of synergy at the interface between the territorialization of national innovation relevant policy and endogenous efforts to territorial development strategies that explicitly prioritize innovative transformations.

This paper is relevant for discussion along the tracks related to regional innovation systems, but also the recognition of the syngistic combination of endogenous knowledge developed through the historical evolution of territorial economic networks where micro and small enterprises dominate the landscape, and exogenous sources of innovative knowledge as to technologies, processes, products, business and value chain organization, markets and marketing. The emergence of TSI in El Salvador is also occurring in non-metropolitan areas of historical agglomeration of artisan creative industries, such as ceramics, as well as small scale rural agroindustries. Finally the paper puts forward a proposal for a combination of different qualitative and quantitative research approaches, and highlights the need for innovation relevant data on a regional and local level, that is currently unavailable in Central America.

2. Methodology

The empirical basis for discussion developed in this paper is based, on the one hand on field and documentary research conducted in relation to the emergence and evolution of the ACOPANELA cooperative in the Jiboa River Valley of rural El Salvador. The original focus was on the producers' efforts to meet the challenges facing the traditional industry of small-scale producers of raw, non industrialized sugar – *panela; identified as* 'critical case' as it has 'strategic importance in relation to the general problem' of how to upgrade the production capabilities and competitiveness of traditional agro-industries like *panela* (Flyvbjerg, 2004, p.426). The initial case study was published by Cummings and Cogo (2013).

As a whole the case study, with its widening focus on the emergence of what I understand to be as a TSI in the Jiboa Valle must be considered exploratory designed as a first conceptualized representation of the object of study, that will serve for an intensive and comparative research design to be implemented in the future.

3. **Distinguishing characteristics of Territorial Systems of Innovation**

Territorial systems of innovation (TSI), share similar constitutive elements to RIS and NSI, and should be understood as a variety of territorial innovation models, co – existing within the systems of innovation approach. In this sense we argue that the emergence and consolidation of a regional innovation system depends on the interrelationships between three critical territorial dynamics:

- the development of the localized production structure and especially the emergence of a critical mass of agglomerated and innovative business enterprises,
- the emergence of a complementary configuration of actors specialized in diverse tasks that directly support local enterprise development, such as, universities, technological institutes, etc. focused on knowledge production and diffusion, but also other actors like NGDOs, territorial development programs, financial intermediaries providing specific business support services,
- the relevant actions of local public authorities and the functioning of diverse associational governance mechanisms, where relevant actors can negotiate and coordinate actions in favor of innovative economic initiatives and local economic development, more generally.[4]

However, we argue that territorial innovation systems emerging in the diverse territorial contexts of the developing South, such as Central America, have qualitatively different dynamics, than the regional innovation systems that are of reference in the RIS literature.

To start with, and given the heterogeneity of the realities to be dealt with, the broader territorial term is used, with a reference to sub – national, socially constructed spaces that could include both the dynamics of localities, delimited as the minimal level geographical space where the state, civil society and the market and economic actors meet and interact, and different types of regions, which we understand as coherent wholes comprised of multiple localities. In these spaces, the localities maintain and develop their own identities, but also take on a complementary regional identity (Boisier 1991, 1998). There is thus recognition of heterogeneity and complexity within territorial spaces that is important to understanding innovation dynamics and the territorial reach and impact of national systems of innovation; for example, between metropolitan areas, intermediate cities and their surrounding smaller towns and rural areas.

The territorial concept is on the one hand a focusing mechanism to recognize heterogeneity, multi dimensionality of dynamics, but also systemic integrality and the connections between different territorial levels (sub national localities and regions, and national and supra – national regions as well). In this sense, the specific territoriality of the sub - national innovation systems, is often recognized as relevant as context, but not really dealt with in any coherent explicit way in the RIS literature. In this respect, territorial

[4] Authors´ definition based on Cummings 2007 with reference to complementary definitions of systems of innovation proposed by Orozco (2004), Segura (2000), Edquist (2001), Gregersen and Johnson (1998) and Freeman (1987).

system of innovation explicitly assume diverse but specific modes of governance, geographic localities, societal actors and intermediate institutions working both in network setting and in disparate modes of action (Djeflat 2010).

Yoguel, Borello and Erbes provide as a basic definition of a local innovation system, with reference to the Argentinian context, as an "interaction space defined by the relationships between companies (both cooperative and competitive nature) and business and institutions [other public bodies and private], in the context of a common geographical location." They also stress that these systems are "heterogeneous, ranging from very simple to those that are very complex. The complexity of these has to do with the number and characteristics of the elements that form them and the relationships between them. Any such system is located in a range of situations." (2006: 7).

The territorial innovation system, especially as the distances from the center of innovative knowledge increases, both in geographical, but also cognitive terms (Loasby 2001, 2002, 2003), must more explicitly deal with the identification, contacting, negotiating or leveraging this knowledge, and then dynamically assimilating it (Bell 2007, Muller 2005, Cummings 2007, 2012) into their endogenous, territorially embedded networks of knowledge diffusion and application, as a complement to their own in depth more tacit knowledge bases. The complexity of the associational governance of these knowledge assimilation processes must be explicitly addressed, especially the relative power of those intermediate institutions bridging or even gate – keeping actors that facilitate (or could limit) them (Szogs, Chaminade and Cummings 2010; see also Guiliani in relation to actors playing this role in geographically delimited economic clusters).

The role of intermediate organizations, notably local authorities are important, as Cassiolato and Lastres (2002), emphasize in some Local Production and Innovation Systems[5] studied in the MERCOSUR countries. They play a key role in the diffusion of 'best practices', success stories on top of their conventional role of developing public services (roads, ports, airports, etc.).

The creation of diverse mechanisms which serve as "interactive learning spaces" (Sutz and Arocena 2002), facilitating innovative knowledge flows, well as establishing informal social relations, has proved to be an important vehicle of confidence and spontaneous cooperation. This is important for the strengthening of the networks and the creation of further closeness (organisational, cognitive and cultural) amongst the enterprises of the sector and the other system actors. This contributes to the strengthening of their bargaining power both internally and externally and a better coordination from an organisational and temporal point of view. Informal relations appear to be relatively important in conducting business as a result of complex institutional environment which is not highly conducive to exchange of flows of capital, knowledge, know-how and immaterial asset in general.

[5] Arrainjos Productivos Locales (APLs) which are a conceptual and empirical hybrid combination of agglomerated productive arraingements (clusters), with elements of territorial innovation systems.

Cassiolato and Lastres, emphasize that diversity and heterogeneity are defining characteristics of the Local Production and Innovation Systems studied in the MERCOSUR countries. They report that in the "cases where the innovative strategies are based on adding value to production experienced increased commitments to innovation and co-operation. Also new institutional arrangements were devised as part of this upgrading. Some of these institutions were created to provide information (market and technological), foster co-operation, spread the high costs of R&D and to reduce uncertainty. Others were created to coordinate efforts of firms belonging to clusters. Some were sponsored by external institutions (such as in Argentina) and most have different participation of federal, state and local government…. These were not only determined by needs to satisfy norms concerning the quality and certification of products and processes but, most important, because firms decided to upgrade their insertion in the global economy. However, the diversity of situations suggests that a general model for institutional development is not to be found" (2002: 47-48).

As a final point, as to some distinguishing aspects of our TSI conceptualization, it is necessary to emphasize that conflicts, exclusion and exploitation are also the rule rather than the norm in the power relations between actors in the territorial innovation systems in the neo-peripheral South.

4. State of the art: How and why do regional innovation systems emerge in the North? in the "Catching-up" South?

Based on a reasonably extensive literature search on regional innovation systems and other related concepts such as local or territorial systems of innovation, there is almost no specific systematic conceptualization of how to understand the process by which these sub – national territorial systems of innovation come to be, i.e. emerge, and in general there is little theorization as to how to understand their evolutionary dynamics.[6]

This weakness in the RIS literature is explicitly recognized by Flanagan, et al (2011) as they argue that despite the importance attached to institutions in explaining uneven regional development, the roles they may play remain poorly understood (citing Gertler, 2010; Doloreux and Parto, 2005). The specifically state that there is "a tendency to take an ahistorical view of actors and institutions, potentially downplaying or underexploring their *emergence*, evolution, restructuring and disappearance over time. More research is needed to understand actors and the roles they play over time, and across different systems, recognising that the roles actors may play are not always those analysts or policy-makers may expect or intend them to play."

[6] Tracing the use of emergence, emerging, emerge, in relation to RIS or other similar territorial innovation models, the terms are generally used either to describe the emergence of the RIS concept itself. Specific mention of emergence is made to recognize that it would be important object of greater analyisis, but also to characterize weak RIS that could be understood as emerging and discuss proxies like system RIS building, mostly from a normative standpoint. Due to the scope and recent dynamics of this literature, this review is necessarily partial.

In what follows I synthesize the key arguments put forward by recognized researchers within the RIS tradition, as well as others using similar territorial innovation models, that are relevant for analysing the emergence of coherent system of innovation components at a sub – national territorial level.

Cooke (2002), looks into "examples of regional system-building to enhance innovation and competitiveness of firms" in the regions of Kyongbuk-Taegu in South Korea and Santa Catarina in Brazil, as well as other regions that demonstrate the heterogeneity of RIS and mechanisms related to their emergence (eg. Market processes vs. regional public intervention). More specifically in relation to the emergence of RIS, he recognizes that "There are different routeways along the trajectory to regional innovation system status, and maybe different types of trajectory and destination." This is, however, as far as he goes in exploring this specific phenomenon.

Crescenzi (2005) suggests a duality of perspectives and possible processes by which regional systems of innovation emerge as coherent phenomenon. Following Howells (1999) RIS could be understood as emerging from territorial discontinuities or heterogeneity of key aspects of "national components of the system (governance structure and institutional arrangements, regional industry specialization, educational policies, etc.) or from the different ways in which both national institutions and regulatory frameworks actually work at a local level."

From a more bottom up, network or associational perspective, the RIS are "key building blocks and the engine of the innovative process", emerging from the diverse "territorialized processes responsible for the economic performance of each economic space" and specifically "the relationships and flows between the various actors and parts of the innovation system itself (Cooke 1997)". Most specifically, Crescenz argues that "The regional development problem associated with building . . . different systems of innovations thus turns essentially on building the capacities for reflexive, collective action and the forms of coordination consistent with the kind of action required in each world (of production)" (Storper 1997: 126)." (Crescenzi (2005: 4).

These arguments are further developed by Crescenzi with Rodriguez – Posé who argue for the need to develop an integrated framework for the comparative analysis of territorial innovation dynamics in both developed and emerging countries, identify different types of cognitive, organizational, social and institutional proximities "that – together with physical or geographical proximity – make it possible to diffuse and absorb knowledge, shaping the innovative potential of regions and territories (Boschma, 2005)." They argue that the combination of these different types of proximities is "crucial for the generation of innovation by allowing the *emergence* of complex innovative network relationships, operating between and across different scales (from local to transnational)." (Crescenzi and Rodriguez – Posé 2012: 520).

With direct reference to TSI emergence, Crescenzi and Rodriguez-Pose go on to argue that:

> "The macro national-level institutions that provide the broad framework conditions for the genesis of innovation interact with the microlevel behaviour of firms, research centres and universities giving rise to highly localized meso-level conditions: a series of 'external conditions in which externalized learning and innovation occur' (Cooke, 1997, p. 485), which can be identified across innovation systems and on which comparative analysis can be based. This set of localized conditions act as the unique combination 'of innovative and conservative components, that is, elements that favour or deter the development of successful RIS' (Rodrıguez-Pose, 1999, p. 82) in every space." (2012: 520)

This argument thus identifies the existence of multiple types of proximities that facilitate the multi-level interaction of macro national level "institutions" [organizations?] and micro level behavior of different types of actors localized in a determined geographical context, that give rise to the meso level "external" conditions that limit or make possible the development or in other words, the emergence of a TSI (Crescenzi and Rodriguez – Posé 2012: 521).

Trippl also makes specific reference to the emergence of RIS in the specific context of cross border areas between developed European countries. The questions asked are directly relevant for our proposed research effort: "What are the specific features, potentials and constraints of cross-border RIS? Under which conditions can a cross-border RIS emerge and evolve dynamically over time? What is the role of the state in promoting the development of cross-border RIS?" (2009: 150-1). In looking to answer these questions, the autor identifies specific socio-economic, cultural, organizational and institutional factors as the "main building blocks and crucial dimensions of RIS" that they argue are necessary for the emergence of cross border regions in advanced economies."

One key system TSI component, the localized emergence of innovation capabilities in localized innovative processes in territorial economic fabrics, has in and of itself been discussed with specific conceptual and empirical attention to the details of the emergence process by Cummings (2007, 2009, 2012) and also other authors such as Hall and Clark (2010). From this research, a conclusion relevant for understanding TSI emergence is that the localized emergence of significant innovation capabilities, is a medium to long term process, that draws on the development endogenous networking capabilities of some type of intermediary organization (NGOs, producer cooperatives or other type of association, …) to identify and leverage innovative resources from exogenous sources and dynamically assimilate them into the localized production systems. The development of this type of endogenously embedded intermediary organization seems to be key to the sustainability of the innovation process that is not possible to achieve through endogenously driven innovative economic development projects that do not contribute to creating and/or strengthening this type of intermediary organization that can continue to work with local economic agents to develop their innovation capabilities long after the initial project has ended.

Devoreax (2002: 259–260), based on a critical review of the RIS literature, prioritizes the need for new empirical application to remedy the fact that "only a few empirical studies have applied this approach to peripheral regions, rural areas, and declining economies," especially as the basis for more soundly justifying the policy suggestions that are frequently put forward based on empirical applications in dissimilar contexts in developed countries and metropolitan regions. "The RSI research agenda is still highly focused on metropolitan regions or successful regions. Indeed, we do not know how valuable this concept is and how effectively it can be applied to structure action–policy in remote areas." An important discussion of the application of the RIS conceptualización to less developed regions in Europe is provided by Morgan (2007).[7]

These types of conditioning factors could also be considered as the building blocks of TSI in general, especially where this process would be based on interaction between actors from a centralized NIS and those of non-metropolitan area RIS. As in all such analysis, these conditions must be relativized for the national and sub – national territorial contexts in developing countries, but without losing their essential nature. From the perspective of analyzing the emergence of territorial innovation systems, we propose a methodological - analytical strategy of systematically asking and exploring how and why the essential characteristics of these different types of systems came into being in the territorial (sub – national and national) contexts in which they have emerged and developed. An essential analytical question is to be able to differentiate between a situation where certain elements or the "building blocks" of a TSI are emerging and innovation is occurring in the territorial economic structure, but where the existing configuration cannot yet be characterized as a TSI. And, conversely, when the existing configuration meets the minimum criteria to be defined as a functioning TSI, evolving as it consolidates its particular institutionalized configuration and the quality of endogenous and exogenous actor network relations, embedded in its territorial context.

The delimitation of the spatial dimensions of the RIS is an important issue that has been discussed but frequently is not made explicit by determined authors. In addition, we would emphasize the further need to make explicit how territories are in fact understood as social constructions and their own specific dynamics, and in relation to other surrounding sub national territories and the national territory itself.

[7] We thus agree with Flanagan, et al, in proposing that the research agenda and conceptual and methodological framework proposed here for analyzing TSI emergence in the South, could also be of relevance in developing a more robust analysis of this phenomena in lesser developed regions in the North.

5. Basic Understanding TSI emergence

5.1 Emergence of TSI from a complex systems and Critical Realist[8] perspective

Following Robert and Yoguel in their progressive effort to integrate a complexity approach to systems analysis into the systems of innovation analysis, our TSI are complex open and multi-dimensional systems, characterized in their essence by: "i) micro- heterogeneity, ii) network architecture, iii) interactions, disequilibrium and divergence and iv) emergent properties." [9] Of specific interest here are the emergent properties of these systems, including innovations, which are "the result of multiple interactions on different scales of analysis. The fact that complex systems present various scales of space and time means that the results of each scale cannot be derived linearly from lower scales, each of which show specific attributes in each case. The macroscopic regularities which support small-scale variability are itself an emergent property of the system." (forthcoming: 2).

In our case, we argue that TSI are in and of themselves, emergent properties of the larger systemic dynamics of the NSI and multiple sectorial systems of innovation cutting across national and sub – national territorial boundaries. In the following sections we propose in synthesis, the essence of a conceptual framework for understanding the emergency of territorial systems of innovation.[10] This proposal is at once an initial attempt to better orient our empirical research effort and a hypothesis to be tested in dialogue with the findings this research will produce. Our aim is to thus develop these ideas as a more robust grounded theoretical framework, at one structuring and evolving through feedback from the advances in our empirical understanding, of this complex and most certainly very heterogeneous process across multiple territorial realities, within the GLOBELICS research community.

5.2 Emergence of social reality

Tony Lawson in his book Reorienting Economics, proposes a Transformational Model of social activity in which emergence is a central phenomenon in the transformational process. In synthesis her argues that "all relatively enduring structures, including norms and conventions, not only condition human practices but become reproduced (and transformed) through that practice…. So little if anything stays unchanged." (2003: 259, see also Lawson 1997).

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[8] The Critical Realist perspective is a school of thought within the philosophy of science and the social sciences that focuses on explaining the causal mechanisms behind social phenomenon, with special attention to emergence. Their thought is reflected in the book *Explaining Society: Critical Realism in the Social Science*s by Danermark, Ekstrom, Jakobsen and Karlsson 2002. In the social sciences similar focus on the dialectical relationship between the human agency of actors and structural facilitating or restraining conditions, as the motor for societal transformation, as proposed by the sociologists / social anthropologists of development, Long (2003) and De Sardan (2005)

[9] Each of these dimensions is disaggregated into multiple aspects; a discussion of which is beyond the immediate scope of this paper.

[10] This is a synthetic representation of the conceptual framework for understanding TSI, which is very much still a work in progress, in dialogue with empirical exploration of how and why TSI are emerging as a novel phenomenon in Central America.

In this sense, "… social reality is recognized as being continuously reproduced or transformed…. Social structure is the (often un-acknowledged) condition of our actions, an its reproduction/transformation the (often unintended) outcome." The dynamics of social reality are structured in different ways: "vertically (it includes underlying powers and tendencies as well as actualities such as social practices and other events), and horizontal (practices are differentiated), and consists in social rules, relations, positions and institutions, amongst other things." (Lawson, 2003: 40, 57).

Social reality is a process characterized by emergence. "…. the social realm is emergent from human (inter)action, though with properties irreducible to, yet capable of causally affecting, the latter." This emergent realm is "dependent upon, though irreducible to, inherently transformative human agency, and consisting of stuff that is intrinsically dynamic, i.e. everywhere a process, highly internally related and often relatively enduring, amongst much else." Emergence of social structure, is dependent on human agency, but also possessing powers that are irreducible to it, suggests that, "social structure are as explanatory of (condition or facilitate) the things individuals do, as the actions of individuals in total are explanatory of the reproductions and transformations of social structure." (Lawson 2003: 44, 57)

"A stratum of reality can be said to be emergent, or as possessing emergent powers, if there is a sense in which it:

(i) Has arisen out of a lower stratum, being formed by principles operative at the lower level;
(ii) Remains dependent on the lower stratum for its existence; but
(iii) Contains causal powers of its own which are irreducible to those operating at the lower level and (perhaps) capable of acting back on the lower level." (44).

Change is an essential characteristic of what social structures are, "they exist as processes of becoming (and decline)." 44

Put another way, "…. emergence is conceived in terms of entities and their properties found at a particular level of reality, but composed out of entities (components) existing at a lower level of reality. Specifically, an entity and its properties are said to be emergent from some lower (or different) level where they arise through the relational organising of lower level elements and the emergent properties in question are not possessed by any of the lower level elements that get to be organised." (2012: 348)

In characterizing the processes of emergence, Lawson makes an important distinction that "there is more than one form of (or there are different aspects to any) emergent involved. Specifically, along with the emergence of an entity or whole and its 'global' powers of efficient causation, emerges the entity's organising structure. Though the entity as a whole and its structure appear on the scene simultaneously, they are not identical, the emergent structure clearly being a property of the emergent whole…. the organising

structure is an essential causal component of the totality, but one that is extrinsic, and so additional, to the powers of the various components." (2013: 2 – 4).

In this sense Lawson (2012: 9-10) argues:

> "In addition to being reflexive and relatively autonomous, they are always culturally situated, and act in accordance with (including reacting to, or contesting) pre-existing community conventions, rights and obligations, and so forth…. But always the organisational structure that emerges will be formed out of pre-existing context specific collective practices; including the rights and obligations they carry…. In other words, the emerging organisational structure, and so totality and its powers, are rarely if ever created a new, but rather are formed out of pre-existing aspects of social structure. This structure is extrinsic to the human individuals whose interactions are organised by it; it is not reducible to, and so is not entirely explicable in terms of, though it depends upon, the (organised) interactions of its human components."

Lawson (2012:12) describes these synergistic dynamics as: "a process that circulates (or spirals) within a system, with initial (lower level) dynamics reoriented by an extrinsic … input. The effects of the latter are continually fed back into the lower level interactions producing a transformation or deviation in the pattern of these interactions that is thereafter reproduced or propagated throughout the system. Where influences of this sort become persistent, the effects of biases can dominate the distributive tendencies characteristic of non-recurrent dynamics of emergence considered above, and give rise instead simple recurrent dynamics of emergence. For such dynamics to be underway it does not matter whether the biases are intrinsic or extrinsic to the system. But they can be, and seemingly are usually, extrinsic."

This leads us to discuss Lawson´s "third type of dynamics of emergence" which he argues "takes the form of first and/or second order dynamics of emergence coming to interact with each other, in a manner which sustains or facilitates the development of the interacting lower order components as parts of an organised multi-part emergent totality." (2012: 13).

> "Effectively the process I have in mind is one of 'natural selection' wherein selection is made from the set of possible relations (of reciprocity) between different emergents; and in the first instance between those that have resulted from first and/or second order processes of emergence. Any relation that remains, or is seemingly 'selected', where one does indeed survive, is simply one found to be less susceptible than others to certain prevailing pressures to go under, i.e., whose relata are least (or anyway not destructively) incompatible." (Lawson; 2012: 13).

Along these lines, Lawson continues arguing; "whatever the level of organisation, there is a related fundamental set of absences or needs-waiting-to-be-met or system incompleteness, along with some human experimentation underpinning a tendency to

meeting these absences, to reaching pre-existing target forms of order, that complex recurrent processes of dynamics achieve. However we view this, the driving factors here are extrinsic to lower level components and their interactions" (2012:15).

In characterizing this most complex emergence process, Lawson states: "Notice that the relations connecting any two forms of emergents are clearly extrinsic to either the components of those emergents or their interactions, but rather are 'selected' because of purposes served, or at least according to features found to be beneficial, at the level of the totality. Indeed instead of micro level efficient causation determining outcomes, it may even seem like there is a form of final causation involved in the sense that a set of emergent high level potentials for serving pre-existing needs or wants are selectively met." (2012: 15).

In synthetic conclusion Lawson (2012: 18) argues:

> "If a social totality exhibits powers of a sort not possessed by any of its components, and is typically not explicable totally in terms of the interactions of the latter, I recognise of course that such causal powers nevertheless emerge only through the relational organisation (involving, in the social domain, an empowerment) of its components, and are exercised, as mechanisms or processes, only through the inter-actions of its relationally organised (human) individual component."
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> "But equally, if individuals are empowered (and constrained) through being positioned as members or participants in a community, the positional powers are always system properties and individuals remain the agents of these powers only when appropriately positioned and relationally organised as components of the system."

5.3 Emergence of Territorial Systems of Innovation

This section builds on the previous one, applying Lawson´s general theoretical arguments to propose a basic conceptual framework for TSI emergence and initial configuration from a Critical Realist perspective.

In this sense an emergent TSI would be conceived as an emergent social entity characterized by a certain configuration of dynamics, actors, their relations and formal and informal institutional framework and properties, especially its causal powers related to the generation, diffusion, and utilization of innovations within the territorial economic networks. The characteristics of each TSI as an emergent entity and its properties are conditioned by and dependent upon the lower level elements from which it was configured, these characteristics are not merely a sum of those possessed by these elements, but something qualitatively different marked by the configuration process itself.

The emergence of TSI is a complex non-linear process and can be analyzed as a resulting from a combination of what Lawson (2012:16) characterizes as "non-recurrent dynamics of emergence; simple recurrent dynamics of emergence; and complex recurrent dynamics of emergence."[11]

Within this process there are events of non – recurrent emergence which Lawson explains as involving "processes of mutual cancelling" where the "the interactions of particular elements leads to a cancelling of opposite or opposing forces, whilst serving to reinforce any interactions that turn out to be mutually compatible.… "as well, the emergent totality has is powers of efficient causation" (Lawson, 2012: 6-7.

Thus I argue that TSI emergence and initial configuration results from synergy between causal mechanisms operating in a necessary dialectical relationship between endogenous territorial dynamics and exogenous ones generated by the NSI's actors and its sectorially specialized sub systems. The generation of synergy, as the energy catalyzing the emergence process, is based on leveraging potential complementarities between the capabilities of the different endogenous and exogenous actors involved, coordinated in a progressively more intentional and strategic way. This depends on a convergence of development visions and more specific programmatic interests at an organizational level, as well as the motivations and particular capabilities of the individual people collaborating over a significant period of time.

Emergent TIS possess qualitatively different characteristics – causal powers and liabilities – as integral wholes, not reducible to the sum of their component elements: people working in multiple and complex networks, diverse organizational configurations and the quality of relations between these organizational actors, and an evolving institutional set – up, formalized and not. This means, for example, that during the process of emergence process and initial configuration, functioning, institutionalization of a STI, the causal powers and liabilities revealed in the strengthening the innovation capabilities of the territorial economic fabric would related directly to essential systemic elements: i) the specific micro – heterogeneity in the networks of endogenous and exogenous actors involved and the potential complementarities between their capabilities and motivations, ii) network architecture or configuration among the key endogenous and exogenous actors involved, especially the "territorialization" of the more specialized networks from the NSI and sectorial systems, interacting positively (or not) with endogenous actor networks, iii) the quality of the spontaneous and intentional interactions, disequilibrium and divergence from existing dynamics as iv) emergent properties – new innovation capabilities arise.[12]

The emergence of STI will necessarily be heterogeneous over divergent territorial contexts within and between countries and larger regions in the South. For example, within

[11] "Processes involving these dynamics can thus be respectively termed first, second and third order processes of emergence (and their products termed first, second and third order emergents)."
[12] Explicit reference to systemic elements emphasized by Robert and Yoguel (forthcoming).

countries the endogenous territorial dynamics of metropolitan areas and the proximity of its actors to those of the NSI and specialized sectorial systems, will produce certain dynamics in the emergent process of its TSI, that will necessarily be different from those territories in an intermediate position, with respect to their level of urbanization, characteristics of their territorial economic networks, educational infrastructure, etc., and these both will produce divergent results from even more peripheral territories, where innovation relevant resources are even more scarce. TSI configurations will also be shaped by multiple contingent time – place specific forces, in divergent country and regional contexts which leads to an even higher level of heterogeneity. The represents a challenge in developing a flexible framework that can help structure our understanding of this high degree of heterogeneity, looking for common patters that could be the basis for typologies of emerging TSI.

TSI are open multi – dimensional complex systems, configured by people embedded in interpersonal networks and different types of organizations that are responsible for system dynamics through their agency. People acting as entrepreneurs and workers in different types of firms, as well as professionals in different types of intermediary organizations with greater or lesser degrees of territorial embeddedness, supporting business development and strengthening of innovation capabilities in the territorial economic networks, in different ways. Also, there will be people working as policy makers and technical staff in municipalities and their associations. As these people interact in many different ways, the micro diversity existing in their personal agency capabilities and how they are motivate to put them into practice, will necessarily produce a complexity of outcomes in relation to the strengthening of innovation capabilities, building new network architecture through relationships that generate positive “social capital” and start to involve their organizations, etc.

Their agency capabilities are enabled or constrained by the organizational configurations and the formal and informal institutional set – ups in which they are embedded. For example, the agency capabilities of people working in central governmental agencies motivated to support endogenous territorial actors in key processes of their building a TSI, are enabled or constrained by political decision-making as the organizational priorities and investments in this direction and the organization´s territorial reach in the implementation of its programmatic agenda and instruments. Similar constraints or enabling conditions would be present for similar people working in NGO that provide business development services and want to develop more specifically innovation relevant services, or in universities interested in promoting greater territorial focus to university research and outreach activities. The same principles apply, but the enabling and constraining conditions to the application of the innovation relevant agency capabilities of small business owners or skilled workers within larger business organizations with operations in determined territories will be quite different, as will those working in new local economic development offices within municipalities and their associations.

The formal and informal institutional set ups that facilitate or hinder the exercise of agency capabilities in initiatives to strengthen innovation capabilities will surely be heterogeneous, but should include elements such as those related to adversity or willingness to take the risks involved in innovative initiatives, on behalf of the different actors involved, and formalized mechanism that enable financing risky innovative ventures. The existence and dynamics of development strategies that represent a shared territorial development vision and priorities between endogenous and exogenous actors, facilitating their collaboration in innovative initiatives, and policy instruments that provide incentives for public and private investments to favor their emergence, are also key elements of this institutional set-up.

In this limited literature concerning the emergence of RIS, there is an emphasis on the structural conditions enabling or hindering this process. I recognize that these certainly do exist, for example, adequate educational infrastructure and services oriented towards developing innovative capabilities in youth, or the existence of a secure environment where innovative economic initiatives do note face special risks as visible targets for extortion. However, I prefer to recognize their importance and the ways they enable or constrain agency, but allow their identification to be a matter of empirical enquiry rather than ex-ante theorization.

The exercise of agency in turn transforms the TSI structures, its organization configuration and institutions, introducing system dynamics, and conditioning future emergence events. For example, we could imagine a confluence of the types of people mentioned above, representing their respective organizations in a multi – actor exercise to elaborate innovation specific proposals within a territorial development strategy; combining their respective knowledge bases in reflecting on how to best strengthen innovation capabilities and generate innovative initiatives in the territorial economic networks, but also developing their interpersonal connections, and a formalized network and strategy to convince organizational decision makers to coordinate investments of time and resources to supporting a process to build and TSI, thus contributing to its gradual emergence.

More specifically, TSI emergence is a multi-layer phenomenon both in terms of the social actor / network / structures involved and in terms of its spatial scope.

On the first level are diverse types of interaction between people within and across organizational boundaries. The quality of interaction (intensity, content, trust, etc.) is key to explaining emergence. The emergent objects from individual interactions relevant for innovation and TSE emergence are new or transformed organizational structures / organizational innovation (teams, initiative networks, technological innovations (product, organizational processes, technique, knowledge in people and embodied in the technology, etc.). This action is enabled or constrained by structural forces at the organizational and inter – organizational levels, but also directly from the wider social – institutional contexts in which these organizations are embedded. Some of these forces are endogenous to the territories in mention and some are exogenous, influencing action

through cognitive awareness of their existence and thus self - regulation or of actors that take on the role of enforcing institutional constraints on individuals.

The emergent objects have their own irreducible nature and causal powers in relation to the larger process of TSI emergence.

The second level of dynamics that can lead to emergence occur between organizational actors at a systemic level. From the more or less institutionalized – routinized interactions between relevant organizational actors, can emerge new innovation relevant organizational networks, technological innovations "owned" by the organizations or organizational networks (product, organizational processes, technique, knowledge in people and embodied in the technology, etc.) and institutional innovations on a systemic level.

The organizational actor agency, in interaction with other organizational actors, is enabled or constrained by diverse structural forces, especially formal and informal institutions that inform decision-making. These structural forces originate from a diversity of socio – institutional contexts, endogenous or exogenous to the territory of reference for specific processes of TSI emergence.

Organizational interaction is mediated through personal inter-actions, but not reducible to them. While individuals most greatly influence organizational level dynamics, organizations have greater causal powers at a systemic level, while in turn enabling or constraining the actions of people belonging to their organizational configuration or directly related to the organizations in some organic form. Thus it is principally organizational actors that have the causal power necessary to influence the process of TSI emergence.

5.4 Modes of TSI emergence

TSI modes of emergence are an issue rarely explored in the literature, in particular in the South´s neo-peripheral countries. In North Africa countries investigating the formation of innovative clusters in the ICT industry, with certain territorial embeddedness in Algeria, Djeflat et al (2013) found two types of emergence: 'spontaneous type' and 'programmed' (or governed) type of emergence. These development modes are likely to rely on different development policies. Each type is inclined to obey different types of attractiveness 'traditional attractiveness' for the first one and 'territorial attractiveness' for the second one using Léon et Sauvin´s expression (2005).

Taking into account these empirical references and also initial evidence from Central America, as well as the fundamental dynamics of how territorial systems of innovation and thinking critically as to how these dynamics might come to be – emerge – from a

previous situation in which they were not present, we propose three types of situations through which these elements are generated.[13]

- TYPE 1 TSI emergence is based on recent historical process of emergence and strengthening of innovation capabilities in the territory´s economic fabric, promoted by certain networks of actors providing innovative knowledge and other key resources for innovative initiatives. These networks have a varied territorial embeddedness, but frequently actors providing key knowledge and other resource inputs are exogenous, intervening in the territorial context with development interests.
- TYPE 2 TSI emergence, is an endogenous approach to construction of a territorial institutional and organizational set – up, with public and private actors that prioritizes the construction of innovation capabilities within the context of a coherent territorial economic development strategy.
- TYPE 3 TSI emergence is initially an experience of Type 2, based on the construction and implementation of an endogenous economic development strategy, adding the value of innovation focused services, through enrolling the organizational capabilities of the state agencies at the center of the National Innovation System.

These types of processes extend the National Innovation System's boundaries into sub – national (possibly cross – border) territories, previously beyond the reach of its mechanisms to generate innovation in a systematic way. As such, the emergence and development of territorial innovation systems, especially in areas with greater developmental challenges (higher poverty rates, under-employment especially of women and youth, out immigration, environmental degradation, vulnerability to disaster risks, etc.) are the basic building blocks for robust National and Sectorial Innovation Systems with a significant impact on inclusive and sustainable development.

6. Characterizing the emergence process: dialogue between theory and practice

Within the context of this initial conceptualization of TSI emergence, this section characterizes and initial empirical evidence as to the generation of initial conditions and the process of emergence of what could be understood as a territorial innovation system in the non – metropolitan region of El Salvador: the Jiboa Valley. A dialogue is generated between the nature of this process, the arguments put forward Tony Lawson in developing his Critical Realist conceptualization of the emergence in the social realm, and the conceptual framework proposed for TSI emergence their configurational dynamics.

At the center of what I argue is the initial emergence of what could become an TSI in the Jiboa Valley, is the story of the ACOPANELA cooperative, emerging out of a traditional sector of family based production of a solid raw sugar product – panela --, in the development of innovative capabilities as leading producers of a novel export product:

[13] These types of situations are coherent with an initial approximation to the reality of the emergence process of TIS in an extreme case of El Salvador as a small lesser developed country (unpublished paper presented in Globelics 2014 Addis Ababa).

granulated panela. A basic description of this process is provided as a general reference for the reader in Box 1.

Box No. 1

ACOPANELA – innovating in the small scale rural agroindustry in El Salvador

Emergence and expression of innovative capabilities

ACOPANELA´s innovative capabilities have emerged through an effort to organize the family based artesanal production units – trapiches – in a cooperative organization in order to rescue the culturally rooted basis for their family livelihoods and local employment from the "creative destruction" of the traditional *panela* industry, set in motion through the creation of the industrial sugar processing plant - Ingenio Jiboa - as foreign direct investment in the 1970s. (Luc Soete, presentation Globelics 2013).

ACOPANELA´s innovation capabilities have emerged from the processes to introduce better manufacturing practices in traditional panela mills - small scale family agribusinesses - and the construction of the first "model *trapiche*," with higher production capacity to meet the demands of dynamic national and international markets for a hygienic, high and uniform quality product.

They developed their capacities through the discovery of granulated *panela* as an innovative alternative, with significant market advantages over their traditional solid *atado* presentation, including a dynamic demand in the international market for natural sugars. However, the development of granulated *panela* production as an innovative alternative came to a dead end, as the investments needed for the up - grading of traditional mills to produce the required quality and quantity of granulated *panela* were not feasible for the majority of the cooperative members. This path of technological modernization also implied a risk to the cultural heritage and value attached to the traditional way of producing *panela* in their *trapiches*.

However, through their networking and interactive learning capabilities, they learned about innovative technological trajectories for granulated *panel*a production in Colombia, and were able to mobilize the resources necessary to capture and import this innovative technology to El Salvador. They were thus able to avoid technological lock – in to a dead end path, and create a new innovative trajectory through establishing a medium-sized industrial plant producing export quality granulated *panela*. With this alternative, the plant represents a secure market for an intermediary product from the traditional *trapiches* – with some up-grading but not the need to substantially alter their production technology. This alternative thus provides economic sustainability for the small scale trapiche enterprises, while maintaining the cultural value of their production processes, so as to exploit their potential as basis for rural community tourism initiatives.

At the same time, the new production plant´s innovative technology can ensure certifiable quality for exporting granulated *panela*, heating the pre - cooked cane juices, with steam produced in the state of the boiler – that was state of the art tecnology for the panela global value chain. This boiler uses the dried sugar cane husks, and the steam heating provides precise temperature control to maintain the vitamin and mineral content of sugar cane juice in the granulated *panela* product, as well as guaranteeing the necessary hygiene using stainless steel equipment.

Analysis of the emergence and development of ACOPANELA´s innovative capabilities demonstrates the importance of the synergistic integration of interactive learning capabilities, external networking for the mobilization not only of knowledge but of the other resources and technologies necessary to innovate, as well as the internal organization of the cooperative, between the leadership and the conglomerate of trapiche owners, in order to rescue and renew its traditional small scale rural agroindustry.

Source: Author´s elaboration based on Cummings and Cogo 2014, in Willie, , Egbetokun, Adebowale and Olamade eds., also Cummings 2012 and 2013, unpublished presented in Globelics 2013.

With respect to Lawson´s typology of emergency dynamics and the emergence of a potential TSI in the Jiboa Valley, examples of non – recurrent emergence would be the foundation of ACOPANELA, in the context of failed earlier attempts at organizing the

panela producers with a wider territorial focus and a greater number of producers. The cancellation process and be seen in the “roads not taken” within this organizational process as to who would join or not, who would lead and then be elected (or not) to the institutionalized governance structure, etc. Certain configurational dynamics ended up reinforcing each other, like the rather localized territorial scope of the organizational process, while a certain leadership coalition emerged, most certainly from a larger potential group that somehow were de selected in this process.

The ACOPANELA cooperative that emerged from this process is an emergent totality with a determined “relational organization” of its component elements like the panela producers and their families with determined agency capabilities, their production technologies and products, commercialization practices and the quality of the pre- existing interpersonal relations between them. Key elements of the emergent “relational organization” that characterized ACOPANELA at its emergent phase were, for example, the formal and informal rules established for the functioning of the cooperative that emerged from the configuration; conditioned by and dependent, but not reducible to, an existing legal framework, rules and regulations for cooperatives in El Salvador, the perspectives of its founding members, the nature of their negotiations and how these were facilitated, etc.

In this way, the emergent entity in ACOPANELA has “powers of efficient causation” or in other words, powers of agency as a key actor in and of itself with the larger process of TSI emergence in the Jiboa Valley, which is many ways was set on a certain trajectory but its emergence. These powers as an entity seem especially relevant with respect to the external relations of ACOPANELA with other organizational actors key to the TSI emergence, such as the Interamerican Development Bank which ended up financing two foundational projects that transformed ACOPANELA´S production processes, the municipal governments and the association of municipalities they created (MIJIBOA).

ACOPANELA´s “relational organization” also its own “powers of efficient causation”, especially as to the internal dynamics of the organization as a cooperative, for example, democratic governance mechanisms which were determinant as to how crucial decisions were made and how tensions and significant conflicts between members were dealt with over time.

ACOPANELA as an emergent entity would not exist in the same way “without the simultaneously emergent relational organization (Lawson 2012: 8); and at the same time, without the existence of this emergent entity configured as it was, the TSI process in the Jiboa Valley would not have emerged as it has. In this sense, ACOPANELA as an emergent entity with a determined configurational organization, can only be understood in relation to the larger social dynamics of the territorial context of the Jiboa Valley, as well as El Salvador and even Central America.

For example, the organizational structure of ACOPANELA, its governance as well as its organizational productive and commercialization practices, were formed out of the pre – existing relationships between independent family based panela producers, positioned as they were within localized communities as key economic agents generating livelihood opportunities for workers and sugar cane producers, etc. The specific ways in which the productive and commercialization processes were organized, the techniques used, the commercialization channels established, etc. certainly had a high degree of influence over how ACOPANELA, with financial and technical resources made available through the IADB products, tried and did or did not succeed in re – organizing and transforming these practices in order to be able to coordinate the sale of solid and then granulated panela in more dynamic and demanding markets.

The social norms as to how conflicts between actors with differing power positions within the Jiboa Valley and more generally the Salvadoran society certainly influenced the way they were dealt with within the ACOPANELA governance structures. However, the powers created through the emergence of ACOPANELA´s organizational configuration explain in a way that is not reducible to these foundational elements, the capability of the organization to innovate introducing better manufacturing practices, in some producers, but not in others, and generate new rules for purchasing panela from producers to be sold collectively in dynamic markets, that differed significantly from traditional relations with their commercial intermediaries.

The emergence and practices of the leadership coalition within ACOPANELA, which was crucial to the development of their organizational innovation capabilities, was highly influenced by the existing and evolving leadership capabilities of the specific people involved, but is not reducible to these personal characteristics or even the quality of their inter – personal relations. These people´s actions and their relationships are highly influence don the one hand on pre-existing contextual structural factors as to what types of leadership are valued, the norms as to governance, the level of trust or distrust people, especially the panela producers, have in leadership, etc. But also, the organizational structure for governance agreed to for ACOPANELA which enables and constrains their leadership practices in relation to ACOPANELA´s innovative trajectory and the role it would play in the emergence of the TSI in the Jiboa Valley.

As mentioned earlier, the emergence of ACOPANELA was not the first attempt to organized panela producers in order to confront the adverse context that threatened the very existence of artisanal panela production in the postwar period (1992 – 2000+). There was at least one previous attempt made by an exogenous development actor (an US based NGO CLUSA, operating with international development funds) to organize a larger number of panela producers with a wider territorial. However, this effort did not result in a sustainable emergent entity as the powers of the organizational configuration created where not sufficient to overcome the dynamic powers of entropy that existed in the relations between the actors involved.

In this sense, Lawson (2012: 10) stresses that while we can see orderly outcomes in cases like ACOPANELA, this is not the norm, and in many cases "an orderly outcome may not be feasible; the processes that lead to disorder do not always, or even perhaps typically, result in order as remainder." This is very important to understand, especially when thinking about policies to promote the creation of organizational actors like ACOPANELA and strengthening of their innovation capabilities, as well as the more complex task of "building" TSI, as practices that contribute to successful emergence of stable entities with sustainable internal configurational dynamics in one historical - territorial context, are unlikely to automatically work in another, and successive approximations and a continuous reflexive learning process most certainly will be crucial for enabling emergence of a TSI and its crucial actors over a significant amount of time.

This affirmation, leads us into discussion of what Lawson´s "second form of dynamics of emergence" which is characterized by "processes in which particular features or biases do not cancel (with other factors) but are amplified and/or propagated throughout the system", which can be understood as crucial for the diffusion of innovations, but especially the development of an innovative local economic culture; one of the basic criteria established to identify TSI in practice.

With respect to the nature of these synergistic dynamics of second order emergent processes, Lawson (2012:10) argues: "Very often these non-cancelling features are extrinsic both to the lower level components and their interactions. Clearly if any features are to be amplified or propagated (rather than cancelled against others) they need to be repeatedly entered into the component interactions. So the form of process of emergence in question involves a cyclical dynamics, comprising an iteration of component interactions. So my [and thus my] focus now is upon cyclical or iterative processes of component interactions."

With reference to the synergistic dynamics of second order emergent processes, the TSI emergence in the Jiboa Valley, I argue that learning from reflecting on innovative efforts or those of others applied in a determined territorial context, could be seen as one such synergistic mechanism. This would be especially true for the reiterative process of dynamic assimilation of exogenous innovation relevant technological knowledge, like that related to the production of granulated panela in the Jiboa Valley, or substantial innovations in ceramic production introduced after training in Taiwan in the case of Ilobasco, given the more radical transformative effects that these innovative practices would have within the system and to attract new actors to participate.

The search for, capture and dynamic assimilation of better manufacturing practices but especially granulated panela production technologies, is a reiterative practice that happened in at least three distinct waves through a diversity of relations between actors related to the TSI emergent process in the Jiboa Valley and adjacent Tecoluca municipality and others related to more advanced technological dynamics in Colombia. In synthesis, the Jiboa Valley producers first learned about granulated panela in an event – Panela

Formum – organized by actors related to an international territorial development project (San Vicente Productivo) financed by the EU and run through the Agricultural Ministry.

They then saw and experimented with the techniques, representing a first wave of Colombian technology in Tecoluca at the installations of an NGO (CORDES) project initiative, and based on their ancestral knowledge of solid panela production were able to grasp the ideas and translate them into first practical attempts in their own *trapiches* for artisanal panela, even without the aid of the more sophisticated Colombian technology. The dynamic assimilation of this innovative knowledge then fed back into the lower level interactions of some of the family based panela producers, producing a transformation or deviation in the pattern of these interactions that is thereafter reproduced or propagated throughout the system. Especially important, was the desire to learn more and to create the conditions necessary for more widespread implementation of granulated panela technology from Colombia, as well as improved manufacturing practices necessary to gain entrance into dynamic markets for hygienic solid panela and their new granulated panela product.

These dynamics in localized production systems of ACOPANELA members and especially the motivation of the leadership coalition were causal mechanisms setting in motion a second wave of identification, capture and dynamic assimilation of granulated panela technology from Colombia, in the context of a first major development project, financed by the IADB.

As this alternative of the modernized *trapiche modelo* demonstrated its limitations in relation to taking advantage of the significant market potential demonstrated for hygienic granulated panela, a new dynamic was set in place to search for an additional innovative solution, leading back to Colombia where through their innovative networking connections, to locate, capture and eventually important and work to assimilate a qualitatively new granulated panela production technology. ….

As Lawson argues, this can be understood as “a recurrent process of interactions wherein the impacts of contingent external events [starting with the discovery of granulated panela] lead to biases of structure or arrangement that not only emerge with, and influence, the overall shape at each point, but constrain the manner on which new accretions or aggregations can occur” (2012:13). It is in this ways that ACOPANELA made its way along the discontinuous endogenous trajectory of trial and error, connected to contingent dynamics in Colombia, at the IADB and the Economic Ministry in El Salvador, the international markets for “alternative” sugars, etc., to position itself as an organization with significant innovative capabilities within the landscape of the Jiboa Valley and El Salvador.

However, as Cummings (2013, 2014) argues these first and second order emergent dynamics can be applied to explain ACOPANELA´s emergence as a key actor, with the potential to play a significant role in TSI emergence in the Jiboa Valley, but not yet how

this process began to come about as such. How ACOPANELA´s innovative capabilities, developed through exogenous networking connections and the dynamic assimilation of innovation relevant knowledge and resources over a significant time, would be complemented by: a) the territorial embedding of innovation relevant business development and financial services, and b) a territorial development strategy focused on enabling innovative efforts in panela and other territorial economic activities and the associative governance mechanisms to implement this strategy.

This leads us to discuss Lawson´s "third type of dynamics of emergence". In this sense, the emergence of ACOPANELA, as an innovative cooperative, associating transformed family based panela producers, with demonstrated learning and networking capabilities applied to relatively successful innovative efforts and a significant business and territorial development potential can thus be seen as a first and second order dynamics of emergence with the potential to interact with each other's in a third order dynamic leading to TSI emergence in the Jiboa Valley.

In addition to ACOPANELA, there were extrinsic, parallel and contingent processes under way of first and second order dynamics that explain the emergence of CONAMYPE as a public entity with strengthened organizational capabilities to deliver innovation relevant small business development services, on a progressively more sustainable basis to ACOPANELA and other economic agents in the Jiboa Valley.

The evolution of CONAMYPE represents the territorialization of one element of the Salvadoran National System of Innovation focused on SME development, in a way that has become increasingly innovation relevant. Maintaining the dialogue with Lawson´s arguments as to type 1 non – recurrent emergence dynamics, there are two examples that condition the organization´s role in the emergence of TSI in El Salvador.

The first is an innovative national experience tropicalizing the conceptualization of the Small Business Development Centers from the USA, to create a university – CONAMYPE alliance in the new regionalized SMD Development Centers (CDMYPE). This experience is gradually being extended throughout the country and there is a CDMYPE that is directly responsible for working in the Jiboa Valley run in alliance with the Catholic University of El Salvador (UNICAES). The CDMYPE are a type public – private partnership, where each actor puts up a significant amount of resources to jointly operate a diversity of SMD development programs. The private partners bring significant territorial embedding as part of their contribution, as they are selected based on their previous development work in determined regions. The CDMYPE complement the regional reach of CONAMYPE through its regional offices which have been consolidated into Local Economic Development Centers. Through these centers, CONAMYPE operates its more sophisticated and experimental programs, including the territorialization of economic development policy and programmatic instruments of the Ministry of Economy, with a clear focus on building an innovative local economic fabric. These instruments include the main instrument for financing SNI innovative initiatives in SMEs – the FONDEPRO competitive

fund, and also seeks the future territorialization of the MINECSs specialized services housed in the Technical Development and Innovation, and Quality units directly relevant to the generation capacity for innovation.[14]

The second type one, non-recurrent emergent dynamic is the introduction and dynamic assimilation of the Japanese / Taiwanese One Town One Product territorial development program as a central articulating strategy for introducing a wider territorial economic development focus, beyond the historical limitation of its "sectoral" focus on SMEs. CONAMYPE. This program, in its essence looks to innovatively differentiate localized territorial economic activities around existing potentials, such as the historical specialization of the Jiboa Valley in producing sugar cane and especially panela. The program implies a more proactive role for CONAMYPE in networking with local SMEs connected in different ways to the dynamics of the identified symbolic economic potential. The new relationship with the municipalities and their associations, building synergy with the emergent organizational capabilities of many municipalities in El Salvador and the Jiboa Valley to actively promote local economic development initiatives.

In the identification, capture and dynamic conceptual and methodological / instrumental assimilation of these two program alternatives, initially developed in northern country contexts, CONAMYPE has demonstrated significant learning and networking capabilities in relations with external development actors and also with a diversity of new partners like the universities and also the municipalities and their associations which previously were not part of the organizational network. In part, as Lawson stresses, attention must be paid to the specific evolutionary configuration of key people in decision-making roles as they have worked together and with a significant array of external public and private actors to develop CONAMPYE´s new vision and expanded mission applied in practice to its organizational transformation into a territorial economic development actor.

A third key dynamic is more endogenously territorial to create a more proactive municipal governmental role in local economic development, especially in Verapaz, and then to establish and strengthen an association of municipalities from the Jiboa Valley (MIJIBOA), with an expanded role in territorial economic development. The emergence of MIJIBOA and its innovative enabling capabilities is intrinsically related to exogenous support by actors like the national NGO FUNDE operating with international development funding, and the regional multi-disciplinary extension of the National University in San Vicente (part of the Jiboa Valley). One key area of external support has been to develop a territorial development strategy that prioritizes innovation in the panela and other localized complementary economic activities, like tourism, and to build associative territorial governance mechanisms to implement this strategy. ACOPANELA has participated but did not play a leadership role in this process to elaborate and implement

[14] Based on interviews with the Direction for Productive Promotion, Economic Ministry (2013) and the CDMYPE Director of the One Town One Product (*Un Pueblo Un Producto*) SME development program (2017).

this strategy, but its ex – president did, in his new role as mayor of Verapaz[15] and then as leader in the process to establish MIJIBOA.

Based on the confluence of these three first and second order emergent dynamics, I argue that in the Jiboa Valley there is a process under way that *could* result in the stable emergence of a TSI as a systemic entity with and organizational configuration that confer to it substantial causal powers to enable continued innovative efforts by ACOPANELA and other networks of territorial economic agents.

As Lawson argues, this type three "emergent totality is composed out of lower order emergent forms along with the constraining relations of their mutual dependence"; in this case the mutual co – evolution of ACOPANELA, the MIJIBOA and CONAMYPE and the quality of their interactions.

In relation to third order emergence, Lawson argues that "pressures that affect survival include the power-play of groups and/or situated individuals, with different material interests continually seeking to get the upper-hand, tendencies that may stabilise or destabilise any system that contains them, and so on. In all cases of third order processes the reproduction of higher level emergents depends on the simultaneous reproduction of first and second order emergents, just as the reproduction of higher level emergents can lead to lower level emergents being sustained." P. 13

In relation to TSI emergence, in the Jiboa Valley case this argumentation would imply that, as in all such processes, there is an intricate interplay of a) the stated and unstated organizational goals of CONAMYPE, MIJIBOA and ACOPANELA, in each case with their partner / supporting organizations, mediated through situated individuals within each organization exercising their agency in relation to their individual and organizationally assumed interests, within and across organizational boundaries. This intricate interplay of organizational and individual agency, *could* lead to coordinating activities to identify common goals, complement each other's learning and networking capabilities to create synergistic outcomes, create innovation relevant social capital (Woolcock …), driving virtuous spirals of achieving innovation relevant tangible results, reflecting on practice and designing new innovative initiatives. Or it could lead to a diversity of conflictive outcomes where one or more of the parties involved would be motivated to extricate themselves from this relationship or exercise its agency in a way that would block or limit the establishment and achievement of "goals" related to a theoretical optimum of TSI functioning and performance.

In relation to the relevance of extrinsic or exogenous contingencies, Lawson argues "whatever the level of organisation, there is a related fundamental set of absences or needs-waiting-to-be-met or system incompleteness, along with some human

[15] Verapaz municiality is the geographical center for ACOPANELA ´s productive activities and the location for its granulated panela production facility.

experimentation underpinning a tendency to meeting these absences, to reaching pre-existing target forms of order, that complex recurrent processes of dynamics achieve" (2012:15).

In this sense, I would argue that the current, very initial and not yet stable emergent state of what we can understand as the Jiboa Valley´s TSI, and its ongoing process of organizational configuration, as it is, has expressed causal powers, but also significantly more potential causal powers as related to theoretically more optimal outcomes. At the systemic level, we could analyze the gaps between best practice or bench mark performance for more advances TSI in comparable contexts and current demonstrated performance of the Jiboa Valley TSI, as well as the organizational configurations of these more advanced systems in terms of the characteristics and capabilities of the actors involved, the quality of relations between actors and the formal and informal institutional framework for system functioning, as a measure of system incompleteness. Also in both cases, the ongoing dynamics of individually mediated organizational agency oriented toward common goals set for system performance. While, it would be important to analyze the particular first and second order emergence dynamics, configuring and re-configuring each of these three actor coalitions/networks, the explanation for TSI emergence is in the dialectical interplay of these multi – layered dynamics as they co – evolve over time.

In characterizing this most complex emergence process, Lawson states: "Notice that the relations connecting any two forms of emergents are clearly extrinsic to either the components of those emergents or their interactions, but rather are 'selected' because of purposes served, or at least according to features found to be beneficial, at the level of the totality. Indeed instead of micro level efficient causation determining outcomes, it may even seem like there is a form of final causation involved in the sense that a set of emergent high level potentials for serving pre-existing needs or wants are selectively met." (2012: 15).

This would suggest that as they co – evolve the actors involved would develop a progressively complementary and confluent vision of the overall nature and functioning of the emerging entity – Jiboa Valley TSI – and the way it should be organizationally configured to achieve this shared vision.

However, it seems relevant to again state that this may only really happen in rare cases, and that within these systemic dynamics, there are equally potentials for entropy and system disintegration, that may be endogenous to the TSI as an organized entity or any of the three actor / network organizations but could also have exogenous roots, for example if a new central government entered into power in 2019 and radically altered the current trajectory of CONAMYPE´s actions.

In summing up, it is worth remembering Lawson´s synthetic conclusion to this argument:

> "If a social totality exhibits powers of a sort not possessed by any of its components, and is typically not explicable totally in terms of the interactions of the latter, I recognise of course that such causal powers nevertheless emerge only through the relational organisation (involving, in the social domain, an empowerment) of its components, and are exercised, as mechanisms or processes, only through the inter-actions of its relationally organised (human) individual component."
>
> "But equally, if individuals are empowered (and constrained) through being positioned as members or participants in a community, the positional powers are always system properties and individuals remain the agents of these powers only when appropriately positioned and relationally organised as components of the system." (2012: 18).

The implications of this argument for our analysis of the emerging TSI in the Jiboa Valley and other territories in Central America are that we must understand the powers emerging entities in terms of their overall systemic innovative performance, not only in the territory´s economic agent networks, but also in terms of organizational and institutional innovation, creating innovation relevant social capital, complementarity and thus synergy that will drive its evolutionary development as an open system deeply connected to sectoral, national and international systems of innovation dynamics. This would be the basis for then critically examining Lawson´s argumentation as to the causal mechanisms explaining these systemic performance outcomes, generated through relational organization of the TSI in its ongoing process of emergence; and how these are extrinsic but still related to the causal powers of the particular organizational dynamics of key actor / networks that are elements of this system, the dynamic quality of the relations between these organizational actors and others exogenous to the system, and the evolution of the formal and informal institutional framework. It also implies careful analysis of how these organizational, relational and institutional dynamics are relationally organized at a systemic level through agency exercised by people empowered and restrained in their action within and between their particular organizational boundaries.

The complexity of this process underway in the Jiboa Valley is, as Lawson (2012: 15) says, "a form of dynamics in particular that underpins a tendency now to heterogeneity"; suggesting that TSI emergence and the resulting entities and their configurational organizational structures will tend towards significant diversity, even though some of the first and second order emergent dynamics involved similar actors and contexts: small family based economic enterprises producing artisanal products (panela and ceramics), associated in different types of organizational configurations, CONAMYPE as its programs extend into non-metropolitan but not exclusively rural territories, in alliance with universities and supporting NGOs, municipalities activated in their role in local economic development and with an increasing tendency to create micro – regional associations to work territorial development issues like innovation driven economic development.

7. Conclusion: A complex research challenge

Based on this discussion, what initial conclusions can be drawn in relation to design of an in-depth and comparative analysis of this case and other similar ones in El Salvador, Central – America and possibly other non-metropolitan regions of the developing globalized South?

The complexity of such a research venture represents a significant challenge but as Lawson (2012: 19) argues in general, it is justified as "analyses of how novel entities actually emerge is rarely made or brought to bear"; in this case to understand TSI emergence dynamics and be able to better empower the actors involved in their collective efforts towards innovation driven competitive, inclusive and sustainable territorial development.

A central contribution of this research effort would be to meet the challenge identified by key authors as to understanding the emergence and initial development of diverse types of territorial innovation systems.

Additionally, it would represent a contribution to the development of a social science that

> "can legitimately concern itself with the study of forms of (and processes of emergence of) domain-specific (synchronically irreducible) emergent global causal powers, where the latter are found to be the properties of (synchronically irreducible) emergent forms of systems or organisations in process. And fundamental to understanding any emergent global powers of a social system is the latter's emergent relational structure that serves to organise human individuals (along with their artefacts) as components. This relational structure includes social positions and their associated rights and obligations that are so familiar and indeed ubiquitous.
>
> As a result, social science is found to be a discipline that is especially concerned with the study of the organising relational structures of social systems. That is, a focus of significant relevance is the manner of the production, reproduction, distribution and redistribution of positioned power in all its numerous monetary, industrial/corporate, financial, educational, legal, gendered, age, inter-regional, communicative, familial, religious, tribal, cultural, ethnic, etc., forms." Lawson (2013: 15).

This kind of in depth explanatory research on the emergence and development of innovation capabilities and territorially embedded innovation systems, would, following the argument of De Sardan (2005: 108), provide a "way in to the phenomenon of social change and of development." He argues that this would be especially true if it was done, as we propose, in an intensive comparative way as to the impact of similar of similar innovation dynamics (ej. Innovation in territorially

agglomerated SME manufacturing / agroindustrial systems) on territorial development and how similar territorial societies react to innovation in their development processes. In this way it would represent a valuable contribution to the innovation driven sustainable and inclusive development goals of the GLOBELICS community.

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