



Scarcity theory and maritime clusters: From paradox to modelling

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ARTICLE INFO

Keywords:

Strategic management
Industrial cluster
Scarcity principle
Scarcity paradox
Innovation modelling
Cluster modelling

ABSTRACT

Clusters of industry are widely accepted as important aspects of the regional economies wherein they are dispersed, since within them, complementarities of the cluster members are witnessed to provide synergies and positive externalities. These forces deliver the cornerstone of collective sustainability, that is exhibited within healthy industrial clusters. One type of clusters that is deemed of distinct reputation, is the sort that is formulated around a core of maritime activity. Maritime clusters are discrete and volatile cases of the concept, since the maritime sector bears exemplary effect on any given economic cycle and simultaneously, markets riddled with shipping activities portray near-perfect competition. Maritime clusters have provided research and practice with a fertile ground to formulate and assess theories, though we are far from a unifying one. In addition, the literature is not without paradox. One paradoxical instance that affects all clusters, is that of the scarcity principle's applicability within the rudiments of a cluster, as it pertains to a domain that hasn't been researched extensively. This work relinquishes a baseline model that deconstructs the scarcity paradox within maritime clusters, that will hopefully provide a feasible stepping stone for further theoretical and empirical research, with distinct implications for management, governance, and policy.

1. Introduction

Clusters of industry comprise an agglomeration of relational firms, agencies, and institutions, that support a central activity and/or industry, in a specific locality. Within this general interpretation, the distinction of firms and institutions is present, to portray the characteristic of operational diversity within an industry cluster. Many clusters exhibit semblance to centralized constructs, as the sum of their operations revolves around a unifying activity. The core can bear the role of the cluster instigator as well and can be assigned not only to an economic entity, but to a tertiary education institution, a research centre, or, recently, a cluster organization. Each type of member within a cluster has its own role in solidifying and sustaining the health of the collection of entities. In addition, the outcome of cluster health will contain not only each member's contribution to the cluster, but all the members' relations with each other. The three pivotal roles within a cluster are used in the representation provided above, to symbolize the most basic of cluster characteristics, that of relational proximity.

Firms compete and cooperate with one another to innovate and create the marvel of dynamics exhibited within a cluster. Knowledge creation institutions are active within a cluster to provide the necessary

kindling for the system of innovation to start its volatile expansion. Simultaneously, agencies (governmental, international, or even private bodies) are necessary to provide the cluster with discrete governance and policy. The qualifier 'discrete' is used, since policy alone can only assist and facilitate operations, not dictate them. If anything, when a cluster is formulated, it has a will of its own, that not one member within it, no matter how important, can twist it towards its own accord. The types of cluster members presented above, are merely indicative; knowledge creation can originate from firms and policy can remain a latent quality. In addition, cluster members can evolve and interchange roles and operations within a cluster, since nothing within a cluster of industry remains static.

Clusters expand their function within a region to such an extent, that they may overshadow any other operation; to the point that the region itself is characterised by the cluster's principal industry. Examples such as Hollywood and Silicon Valley are particularly familiar. This would seem as a predominant characteristic of cluster manifestation: the locality wherein its activity resides, is painted with the colour of operations within the cluster. These operations include the centralised effect referenced in the classification provided, as clusters seem to include a centralised activity, where all the cluster branches

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stem from. The final analytical aspect that should be referenced per the provided cluster description, is the relational characteristic. Each cluster member forms proximate and diverse relations with other members, to provide an interconnected system very similar in function to a super-system such as an ant colony, a bee hive, or a living organism. Within a diverse array of subsystems, the cluster member performs its own respective function, but also cooperates with its environment, to fulfil the existential purpose of the system. Therefore, all members of the cluster have their own duty to perform, towards the cluster's strong constitution. Simultaneously to their function, they hold their respective stake, that most always involves the well-being of the other cluster members, as well. With this rationale, the necessary culture of mutualism within a cluster of industry derives even from the simplest notions, based upon a generic representation, such as the one presented at the beginning of this section.

The problem with clusters arises, as with many circumstantial topics that may gather bulk attention, with what they encompass; and that is the promise of prosperity, given that the cluster culture is respected. Understandably, in recent years, public policy in many regions has focused in cluster manifestation, providing a range of effectiveness within its results [86]. Research has shown varied outcomes as to the concept that cluster manifestation is better left to systemic, or natural circumstances, away from policy and decision-making. But this would not mean that the drive to investigate the phenomenon should be left to halt, but rather that, if clusters are understood in more depth, then maybe their threads can be recreated. For this reason, towards the investigation of clusters' governing dynamics, any review of the respective body of knowledge will uncover, that, in many cases, the theory is riddled with paradox. If not paradox, then contrast and at the very least, obscurity.

To tackle this issue, at first a theoretical investigation of the paradoxical instances of the theory would require assessment. The outcome of this process would then facilitate the formulation of frameworks and models that may serve as a stepping stone towards greater insight regarding the rudiments of industrial clusters. Such an attempt is relinquished within this work. A conceptual analysis with respect to the obscure characteristics of the theory is provided, to subsequently render a model that explains an elementary paradox within industrial cluster dynamics; one that concerns scarcity, as the latter is at the forefront of attention with reference to any manifestation regarding populous proximity. The process of modelling scarcity to deconstruct paradox is rooted in acknowledging maritime clusters as the instigators of the conceptual definition with respect to the scarcity paradox that is exhibited in all clusters. The model formulated herein aspires to contribute towards a better understanding of the dynamics that are encapsulated within clusters of industry.

2. Industry clusters and maritime paradox

The theory of industrial clusters includes many extracts that could be regarded as ranging from mysterious, to paradoxical. Even from its conception, the theory manifests signs of paradox. Alfred Marshall's [48] 'economies of agglomeration' provide an effective framework to analyse clusters, yet in his work, Marshall mentions that the mysteries of trade within an industrial locality "...become no mysteries; but are as it were in the air and children learn many of them unconsciously." An industry's expected evolution, according to the context set by strategic management, will move from fragmentation towards consolidation [85]. This, due to the simple reason that common business practice will inevitably yield a consolidated result, as mergers and acquisitions will set the foreseeable norm as an industry progresses. The aberration of clusters skews part of this evolution inversely. A cluster could be thought to begin as a consolidated formation, that will in turn strategically evolve into a fragmented state, which will be brought up by the novel industrial activity generated through its system of innovation. That's just one more instance of clusters' paradoxical health

through not only not playing by the rules, but instead thriving through the direct inversion of expected business dynamics.

Many industry cluster characteristics, such as centralization and agglomeration, competition and cooperation, globalization and localization, specialization and diversification, and creative destruction with respect to innovation [2], seem to share conflicting features, as they formulate bipolar dynamics, thereby creating paradox. The latter appears to be imbedded within the theory of the former, that has even been coined as chaotic [83]. Globalization, as Porter [59] points out in his 'location paradox,' should foster the demise of regional importance. Yet, the volatility of clusters seems to be directly correlated with globalization [8,84]; insofar that locally-sourced competitive advantage resonates on a global scale [61]. Another paradox set by Porter that is analysed within the literature (and relevant to scarcity as well), concerns the mutualistic coexistence of competition and cooperation that is documented within clusters [56].

Cluster paradox can entail the issues of a central governance mechanism, as discrepancies arise from its tension among networks of trust [33]. Contradiction in clusters bears many facets and many times surfaces as 'empirical paradox' [47]. Another relevant cluster paradox is the simultaneous existence of "over-embeddedness and under-socialization" within local industrial sectors. This is coined as the 'distanced neighbour' paradox that exposes inconsistencies of regional specialization paired with paradoxical instances of isolation [9]. The 'distanced neighbour' paradox may come in tandem with 'urban paradox' in industrial districts, when rural and urban populations overlap [15]. The role of entrepreneurship in industrial districts may allow instances of paradox, as it is fused with occurrences of 'organized anarchy' that are witnessed in clusters [36]. Paradox resonates with industry clusters of many sectors, yet one could assert that there is a sector which thrives on paradox and simultaneously delivers clusters of global distinction. Maritime clusters exhibit paradoxical traits, yet at the same time they are considered as beacons of excellence for regional economies, as well as indicative benchmarks for cluster theory.

As mentioned, the maritime sector is not devoid of paradox. Instances of paradox within the literature include the international dimension of maritime heritage [46], in addition to paradox in the representation and perceptions of seafarers [11]. The prerequisite of environmental strategies in conjunction with the accentuation of global maritime cargo flows [72] creates paradox, as does maritime-cargo-dependency in contrast with low infrastructure development [65]. The sector homes paradox with reference to technological maritime advancements and required skilling [12], in addition to many paradoxical instances with respect to maritime transportation safety [70]. The 'energy paradox' within transportation systems [6] involves the maritime sector, in addition to the 'globalization paradox,' as global governance specifics intersect with maritime security operations [1].

Paradox can be distinctive of maritime affairs and partake in a region-specific hue, such as the 'Arctic paradox' [57]. Instances of maritime-driven-growth clashing with issues such as deficits in trust and political discrepancies are prevalent [77], along with apparent ramifications of national maritime strategies [62]. Paradox in the maritime sector may even extend to maritime sustainability issues [81], risk management [54], piracy [21], refugee flows [38], and social practices [52]. In addition, paradox can be present in the rudiments of specific maritime clusters, through the fusion of positive externalities with perceived vulnerabilities, such as in the maritime cluster cases of Singapore [32], Portugal [64], and Piraeus [58]. An indicative research question with respect to maritime cluster paradox would involve the governing dynamics of scarcity within a cluster. Maritime clusters provide viable benchmarks for cluster conceptualization and definition [24,26], models' [63,69,87,88] and frameworks' [39,40,53,68] formulation, yet maritime cluster theory is barren with respect to the applicability of scarcity within the threads of a cluster. This concept is rightfully interesting, as the state of scarcity within a cluster gives rise to a novel domain of research potential, especially concerning maritime

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