



World Conference on Transport Research - WCTR 2019 Mumbai 26-31 May 2019

A critical analysis of seaport research field classifications: Explicit and implicit shortcomings in methodologies and categorizations

Krenar Ibrahim^{a*}, Silvia Ibrahim^b

^a*Independent researcher, Avni Rustemi street 21, Vlore 9402, Albania*

^b*Master student at the University of Tirana, Zogu I Bulevard, Tirane 1001, Albania*

Abstract

The last decades have produced a lot of papers reviewing specific port research issues. Only a few papers aimed to review and/or classify former studies in a specific, single or multiple, port research field (PRF). Single PRFs reviewed and/or classified mainly are port management, economics, and geography, with port economic impact, performance, operations research, competition and cooperation as subfields. Multiple PRFs reviewed and classified are 'port economics, policy, and management' and 'port policy, management, and operations', the latter called 'port research' by its authors. No one study tried to classify the whole port research up to date, if not the last two. The said papers used various methodologies in selecting former research in the PRF they choose to review and/or classify and, obviously, had a specific classification as their main result. This paper aims to make a critical review of these papers by descriptive and comparative research and content analysis, detailing the main elements of the methodology used and classification achieved. Methodological elements will include the number of authors, papers' objective, definition of PRF, port, and unit of analysis, number and publication source and period of the selected port research works, approach/method of both selection and classification of the selected port research works, and framework elements like research paradigm, strategy, and methods, discipline base, theoretical models and concepts, and techniques of data analysis used by selected port research works. Critical classification elements will include the number, name, nature, ranking and position of and interrelation among various port research categories, subcategories, and issues. This analysis finds explicit and implicit shortcomings due to selected methodological and categorization elements. Evidences show also how the choices of methodological elements influenced or not the classification of PRFs. A conclusive discussion and further research will close the present paper.

©2018 The Authors. Published by Elsevier B.V.

Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.

Keywords: Port research field classification; port economics, geography, policy, governance, management, operations research, performance, competition, and cooperation; port research selection and classification methodology; position and interrelations of port research (sub)categories.

* Corresponding author. Tel.: +355-(0)68-526-7-527; fax.

E-mail address: krenaribrahimi@gmail.com

1. Introduction

The seaport (henceforth, port) research has significantly grown in the last decades, with an increased attention to shipping in the 1960s, accelerating in many port and port-related topics since 1973 – the 1st year of publication of the journal *Maritime Policy & Management* (MPM), initially named *Maritime Studies & Management* (Heaver 2006) – considered a reference year for port economics (Heaver 2006) and port management (Suykens and Van der Voorde 1998). The scale of port research increased substantially during 2000s and has become a dominant theme in the area of maritime economic studies (Woo et al. 2012). It is a matter of fact that numerous scholars have since more than a century contributed in various port research fields and issues. But, only a few efforts in the past aimed to classify some single or multiple port research fields (PRFs), also called areas, categories, themes, topics, issues, etc.

Since the beginning, the classification problem is strongly related with the question: which terms using? Will we opt for research areas or research fields, themes or categories, topics or issues? It seems to be a never ending debate. Standardized data are needed in scientific disciplines, universities, research institutions, and research instrumentation in most of countries and regions, as demands grow for internal management, research information systems, raising the research institutions' profile, evaluation and monitoring, etc. (Fischer et al. 2013). A significant example is the 'business and management' field, so called by the UK's Association of Business Schools (ABS) whose guide covers "the range, subject matter and relative quality of journals in which business and management academics publish their research" (ABS 2015), also called a discipline and "a wide and disparate research area" by Mingers and Leydesdorff (2015), who qualify ABS journal list of 22 fields a de facto standard. The 22 fields are called subject areas by ABS and all UK university schools, as London Business School, which groups its "academic faculty expertise into 7 subject areas – Accounting, Economics, Finance, Management science and operations, Marketing, Organizational behaviour, and Strategy and entrepreneurship – each with its own programme of events, research centres and specialist knowledge" (website, 2018). The 22 fields of ABS include economics, general management, operations research and management science, regional studies, planning and environment (newly created), sector studies, and strategy, among others. They changed labels and ranking from the 2010 edition to the 2015 edition: for instance, economics was added by econometrics and statistics, and general management by ethics and social responsibility (ex-ethics and governance), psychology was split in two, etc.

The terminology remains still a problem with the classification product constituted by classes/categories and their subs. German Research Foundation (DFG 2017) classifies scientific disciplines as 'humanities and social sciences' in research areas like 'social and behavioral sciences', which then are divided in 'review boards' like 'economics', which is again divided in 'subject areas' like economic theory, economic policy and public finance, business administration, statistics and econometrics, and economic and social history. For Japan Society for the Promotion of Science (2015), 'humanities and social sciences' is a category composed by areas like 'social sciences', which includes disciplines as 'economics' and 'management' respectively divided in 'research fields' as economic theory, economic policy, etc., and management, commerce and accounting, respectively. These examples show how economics as a discipline may be understood differently by considering its composing German subject areas or Japanese research fields. Categorical distinctions define units by their class or category membership - by their *having something in common* (Krippendorff 2004) that UK, German, and Japan scientific institutions of the highest representation level did not identify to unify, as shown for the fields of economics and management.

As it may be observed by these few general examples, another major problem arises here: how will be named a given-level category and which will be its subcategories in number, names, nature, ranking, and interrelations? As Mingers and Leydesdorff (2015) argue, "Unfortunately, at the moment these [fields or subcategories] are created in an ad hoc manner with no underlying rigor". This coding process of "describing the units or classifying them in [...] categories of the analytical constructs chosen [may be evaluated by 2 criteria], reliability as measured by intercoder agreement and relevance or meaningfulness, [which] are often at odds" (Krippendorff 1989).

Port research authors did not escape to the shortcomings of this reasoning in their classifying efforts by content analysis of single or multiple PRFs. Single PRFs contain only one field, e.g., 'port economics' or 'port management', while multiple PRFs contain more than one field, e.g., the triple fields '(port) management, policy, and operations' and '(port) economics, policy, and management'. Multiplicity theoretically goes from 1 to infinite: 'port research', a comprehensible field used by scholars, is the most feasible multiple PRF with as much as possible single PRFs. In fact, the 'port research' field has no name and is a wise solution found by some port scholars, taking the high risk of

involving as many as possible single PRFs. In the most of cases, PRF names are keywords mostly taken for granted and not defined in papers classifying port research. But the series of problems with papers classifying PRFs go well beyond the terminology, reaching the main elements of methodology used and categorization achieved.

Methodological elements include the number of authors engaged, paper's objective, definition of PRF, port, and unit of analysis, number and publication source and period of selected port research works, approach or method of both selection and classification of the selected port research works, including the classifying framework elements used as, e.g., research paradigm, strategy, and methods, discipline bases, theoretical models and concepts, techniques of data analysis, citation and other ratios. Categorization elements may include the number, name, nature, ranking, position in the table or diagram, if any, and interrelations among PRFs and respective (sub)categories and issues.

This paper aims a critical review of these terminological, methodological, and categorization elements used or not used in papers reviewing or classifying PRFs. These papers' authors choose those elements by neglect or confusion sourced in the implicit instead of explicit reasoning, which has produced a lot of oddities that will be evidenced in details in the following sections. The key methodological and categorization elements will be critically analyzed in sections 3.1 and 3.2 respectively, after an overview of the said papers in sections 2.1 and 2.2.

2. An overview of existing PRF reviews and/or classifications

This section gives a general overview of the main terminological, methodological and categorization elements of port studies having reviewed and classified former studies. All elements, distinguishingly overviewed for single and multiple PRFs, will be critically reviewed in section 3. Before, we recall the tree classification system, so necessary when dividing a specific PRF in its categories, subcategories, and issues, applying the logic of sets and subsets. With this in mind, readers may create an idea of the categorization used by different authors in their research works.

2.1 The tree classification system

The fundamental idea behind a tree-form classification system is that of subsets starting from a tree trunk or root to reach its fruits by passing successively through its branches. The same system uses a computer to range files in a disk folders: you have a disk name, say D, then you create first-level folders in it, later you may create other second-level folders inside the first-level ones, and so on. In each folder, you may have folders of the successive level, in which case only the last-level folders have files, or a mix of files and successive-level folders. In our story, single or multiple PRFs are disks or roots/trunks: as such a thing is not permitted, PRFs will be categories/folders of the first-level (main branches) on disk D, subcategories start from second-level folders (secondary branches); research papers published everywhere, books, reports, working papers, data, etc., are files or fruits. So, the essence of this computer system is to store or range and show how to arrive to files which are the fruits of the tree.

Those working on a computer, including all researchers, range a multitude of files in their computers as described here. When they want to range a new file, they search for the subcategory it may pertain. If no subcategory is found, this single file will be ranged with the first-level categories. This means that single papers/files simultaneously are as subcategories with their research area named, say, to a zip-file, while an n -level subcategory will be created only if at least 2 files may enter into. If files grow in number within a subcategory of level n , it may be possible creating its subcategories of level $n+1$, each with at least two files inside pertaining to the same research subarea, and so on.

It should be stressed that single PRFs may be considered as scientific disciplines, say 'port economics', categories (or first-level folders) within this discipline are sub-disciplines as 'port microeconomics' and 'port macroeconomics', first-level subcategories (or second-level folders) are research subfields as 'economic policy', 'industrial economics/organization', or 'economic geography', second-level subcategories (or third-level folders) are research topics as 'port regulations', 'port competition', 'port cooperation', 'ports in transport' or 'port in supply chains', fourth-level folders or third-level subcategories are research issues like 'port concessions and PPP', 'inter-port competition', or 'mergers and acquisitions', and so on. In the case of multiple PRFs as, say 'port economics, policy, and management', as categories will serve the single PRFs which are 'port economics', 'port policy' and 'port management'. If the multiple PRF name is 'port history', then as categories will serve as much as possible single PRFs similar to those named above.

To further divide research issues in a research framework elements as research paradigms, strategies, or methods, theoretical models and concepts, or data analysis techniques, each of these newly ranged research issue elements

will be considered as the last-level folder with its pertaining files. However, files cannot be simultaneously ranged in more than one folder: would we be prevented from no simultaneously linking any file (that is, research paper) to its framework elements it pertains to? The file manager is ready to help with a perfect solution: the shortcuts may add any file into any folder, still being actually ranged in only one. This idea may be used even if a port research paper is simultaneously related to many PRFs: it may have multiple considerations and serve as a cited reference in all PRFs.

2.2 Single PRF reviews and/or classifications

This section will chronologically present former reviews and/or classifications of 7 single PRFs, which not all pertain to the same level, as we will show. Attention will be paid to PRFs like 'port management', 'port economics', and 'port geography', respectively (co)authored by Suykens and Van de Voorde [SV] (1998), Heaver (2006), and Ng (2013, first published in May 2012), the latter publishing two papers with Ducruet [ND] (2012, 2014). For Heaver, Ng, and acronyms used for space motives, the year will be shown only if necessary or denoting their other works.

2.2.1 Port economic impacts

Port economic impact studies seem to be the firsts that has been reviewed, defended, criticized, and/or classified by Waters (1977), Chang (1978), Little (1979), Davis (1983), Coto-Millán et al. (2010), Dooms et al. (2015), etc. Classifications have been mainly related to the methodology used to select, define and measure various – primary, or direct, and secondary, composed of indirect and induced (Little 1979) – socio-economic impacts resulting from the interrelationships of ports with their surrounding businesses, communities, governments, and environments.

Port economic impacts is not classified as a category of single PRFs but subcategory of multiple PRFs (§2.3), functional perspective and issue of 3 geography-related categories in the single PRF port geography (§2.2.6).

2.2.2 Port management

SV reviewed a quarter of a century [1973-1998] of academic publications in a specific PRF, used to be port management, considered as an area of port *economics*. More than reviewing 21 all kind references, SV dealt with the significant change and developments brought in the port *management* field in terms of the *objectives* sets and the *tools* used by port authorities (PAs). SV combined findings from scientific (empirical) references - not related to port management but to port economics and policy - with practical knowledge, making no classification efforts.

SV paid special attention to *four* crucial issues, because of their consequences, to any port management: (1) port *policy*, which, at whatever level, is first and foremost a question of the *role of the state*; (2) port *infrastructure*, especially *maritime access* to ports, as a *public good*; (3) inter-port *competition*, taking the new form of competition among logistics chains [later on called supply chains], where ports make part; and (4) *cooperation* through strategic alliances among market players in logistics chains. SV affirm a close relationship between the objectives sets by PA and the port economic function that they borrow from Goss (1990/1) and develop further. SV noted the decreasing comparative power of PAs, concluding that PAs should create and efficiently apply a set of tools with insights into the cost structure of their own ports and related logistics chains in order to avoid being pushed out.

Port management is considered as a single PRF into 2 multiple PRFs (§2.3), part of a category into a multiple PRF (§2.3.2) and part of a multiple PRF-like category into a single PRF (§2.2.6).

2.2.3 Port performance and/or efficiency

There are a huge number of papers concerning port performance's practical and theoretical approaches, which can be grouped into three broad categories (Bichou 2007): (1) *performance metrics and indices*, with (i) financial metrics and productivity measures, and (ii) physical or operational productivity measures, which can use single, multi, partial or total factor(s); (2) *frontier approaches of efficiency*, which can be either parametric, or econometric, requiring a functional form and statistical estimation of an inputs-outputs set as Stochastic Frontier Analysis, or non-parametric, using linear programming into Data Envelopment Analysis; and (3) *economic impacts*, area of applied research criticized because of the selection of limited industrial categories and considering ports as regions rather than firms, which depicts two separate lines: (i) port economic impacts, a branch of economic geography, extended to the field of urban planning and environmental economics, using input-output, computable general equilibrium or gravity models; and (ii) port trade efficiency, assessing port efficiency in relation to transport and logistics costs.

Estache et al. (2001, 2002), Cullinane and Wang (2007), Gonzalez and Trujillo (2008), Panayides et al. (2009), etc., review port efficiency measures, explain the efficiency concepts and methods used, and inform on the kinds of port activity and data, port(s) and period measured, models and variables used, measures, functional forms and estimating methods, the latter two used only for the parametric approach.

Port performance is used as a single PRF's (semi)category (§2.2.5, §2.3.2) and, with port efficiency, subcategory (§2.3.1) or issue (§2.2.6). Port efficiency and port economic impacts are subsets of port performance (Bichou 2007).

2.2.4 Port operations research [OR]

Two papers review the literature of OR methods used in ports, especially in container terminals [CT]. Steenken et al. [V+] (2004) describe and classify key CT processes – (i) ship planning, involving berth allocation, crane split, and stowage planning, (ii) storage and stacking logistics, and (iii) quayside and landside transport and crane transfer – handling equipments, transport vehicles, systems, and decision problems of routing, pickup, delivery, and assignment. They survey 212 references of all kinds in (optimization) OR models and logistics applications, mainly since 1990s, describing the exact, heuristic, and simulation-based methods. Stahlbock and Voß [V+] (2008) update and extend to the state of the art the former paper. They review 252 references, adding human resources [HR] to CT systems and analytical approach and artificial intelligence (multi-agent systems) to integrative optimization.

In other studies, port OR is not considered as a single PRF's category but subcategory (§2.3) and issue (§2.2.6).

2.2.5 Port economics

Heaver studied the evolution and challenges of *port economics*, focusing 116 all kind references mainly since 1973. Heaver argued: “Given the *interdependence* among aspects of port economics, identifying categories of topics involves *arbitrary* divisions. However, *for convenience*, developments and issues in port economics are discussed under six topics”, with subtopics for two of them: (1) relationship of ports with ship costs; (2) issues of port costs and pricing; (3) industrial organization related to ports, with: (i) ports' public administrative organization, and (ii) strategic issues in the new industrial organization; (4) competitive relationship among ports; (5) assessing port performance; and (6) specialized studies, with: (i) labour wage rates, (ii) economic rents in the port context, (iii) services of harbor tugs, and (iv) maritime security. “The review concepts as 'port economics' the range of topics and approaches typical of the meetings of the International Association of Maritime Economists (IAME) and associated journals”, argued Heaver. However, most of his topics may be also port management and administration issues, like cost and pricing, performance, strategy, administrative organization, etc.

He does not claim that articles cited have been scientifically selected. Heaver did not follow himself (1993) when categorized maritime economics topics but Winston's (1985) conceptual approach reviewing transport economics. It is not clear if Heaver follows Cullinane and Talley (2006) in the definitions they gave to port and port economics at the introduction of the same book or other writers he refers to (Svendsen, Thorburn, Jansson and Shneerson, etc.).

Port economics is used as a single PRF within a multiple PRF (§2.3.1), with Heaver's topics and beyond being considered as such or dispersed within various (sub)categories in single PRFs (§2.2.6, §2.3) or even disappeared. By saying that “Heaver classified port economics research into 6 areas illustrating significant differences with [t]his categorization”, Ng compared the categories of 2 different single PRFs: his own port geography and port economics. Section 3 will focus 'port economics' and 'port management' PRFs with components scattered through other PRFs.

2.2.6 Port geography

Ng undertook a review of 155 articles related to port geography and published in 26 journals within the human geography discipline for the period between 1956 (as fundamental transformation within maritime industries started to take place in the late 1950s, referring to Heaver (2002) and the 1st container shipping service of the refitted tanker ship, *Ideal X*, in April 1956) and 2011. ND (2012) analyzed through a systematic analysis the evolution and research trends of 314 port geography papers published in 36 human geography journals during 1950-2011, while ND (2014) analyzed the changing tides of port geography using a bibliometric analysis of 399 port geography papers published in 36 geography journals - extended with 329 papers from non-geographic journals based on 3 inclusive criteria - during 1950-2012 (still referring to Heaver (2002) for choosing 1950 instead of 1956).

Ng undertook a very careful categorization through a not straight-forward process, as many papers investigate more than one issue and different categories may overlap and interrelate with each-other, facilitated through

literature review on port and transport geographies, similar previous studies (Pallis et al. 2010, Woo et al. 2011), and informal discussions he had with several reputable scholars in human and transport geography. For Ng, “undeniably, categorization can be a *very subjective* exercise ... further complicated by 2 factors: (1) many papers were linked to general urban and regional development [with] studies investigating conflicts of port and urban land use, waterfront development, port-city relationship, and port development impacts on surrounding regions; (2) recent development in international trade, globalization and shipping line restructuring had [notable] implications for port management, strategies, and development, with ports being increasingly integrated within multimodal transportations and supply chains. ... Contemporary ports can be understood as different systems [which] on some occasions reflect an inter-relationship with other transport, economic, and social components.”

Ng explained his categorization approach in this way: first, most papers were categorized according to different glocal spatial scales. This first step was difficult for papers involving the philosophy of port geography (its meaning, definition, taxonomy, trends, researcher identity, etc.) and port management, policy and governance (public-private partnerships, privatization, institutional systems and port reform, strategies of terminal operators, etc.), which were placed into separate categories. Second, a set of headings was needed to organize the ideas applied to each category: after a detailed review, papers of spatial scale categories could be further categorized into 3 functional perspectives: locational, operation, and impacts [It is clear that 'operation' is the unique term to be justified as functional and the adjective 'locational' is inappropriate compared to the other 2 names]. Finally, categorization is completed through further classifying papers based on their specific focus of research. Ng argued that his categories summarize the research outputs of geography journals (Table 1) and do not cover every aspect of port research, the considerable work on port performance and efficiency that engineers and management scientists undertook by OR techniques.

A multiple PRF, port 'management, policy, and governance', serves to Ng as a category, while each of the single PRFs composing it is used either as a single PRF within multiple PRFs or as categories in other preceding studies (§2.3). Several research focuses and issues of the single PRF 'port geography' were used as (sub)categories or issues by the same two preceding studies, in addition to Heaver's. All these will be critically reviewed in section 3.

Table 1. Port geography research in 5 categories, 3 functional perspectives (FPs), 12 focuses and 38 issues (Ng 2013).

Categories	FPs	Research focus [subcategories]	Research issues
1. Foreland and maritime space (global)	Locational	Port system	Port hierarchy; port clustering; development of continental/national port ranges
	Operation	Port connectedness	Connections of ports with foreign markets
		Port choice, competition and cooperation	Port attractiveness; competition and cooperation
Impacts	Port's place in shipping strategies and networks	Concentration and de-concentration; hub development; impacts of technological advances on ports; relation between ships and ports; impacts of shipping lines and ship-owner strategies on ports	
2. Hinterland (regional/national)	Locational	Catchment areas & supply chain linkages	Shrinking hinterland; evolution over time
	Operation	Port, intermodal transportation, and supply chain	The role of ports in the development of multimodal transportation & logistics; port's inland connection; relation between port and cargo sources/shippers
		Inland/satellite terminal	Functions and operation of inland terminals, and their relations with ports
Impacts	Port and regional development	Feasibility studies, impact assessments of port projects & intermodal facilities on regional and non-urban surroundings, including port development, climate change & environment issues, port and international trade; impacts of economic development on ports	
3. The port (local)	Locational	History and location	Geographical characteristics; cost-benefit analysis in port site selection; history of port international trade
		Evolution over time	Composition of the port community; stages of port development; port morphology
	Operation	Port operation	Berth allocation; port planning and marketing; port performance, efficiency, service quality; port pricing; safety & security issues; information for port planning & operation
Impacts	Port-city relation	Port and urban development, waterfront re-development, port-urban land use conflicts, port and transport labor issues	
4. Management, policy and governance		Politics, policies and institutional system of port management and governance, including deregulation, devolution, privatization, public-private partnership; strategies of terminal operators; maritime organizations and port management and governance	
5. Philosophy and epistemology		The definition, meaning and understanding of ports geography; the problem of taxonomy; analysis of port research trend; identity of port geographers, and their relation with other (non-)geography sub-disciplines	

2.2.7 Port competition and cooperation

There is a huge research in port competition and cooperation but quite no reviews. Lagoudis et al. (2017) analyze papers in academic journals falling under the port competition umbrella to identify niche research areas. Results show that most works focus on four topics: port selection, efficiency, performance, and competitiveness, suggesting future research in geographic comparisons of ports and terminals, financial indicators linked with environmental efficiency, efficiency in liquid cargo terminals, port competitiveness and IT systems, port management related issues

to strategy and marketing management, and intra-port competition. As competition, “cooperation, integration, and coordination are much researched themes in mainstream economic and management literature”, argue Notteboom et al. (2018) in a journal volume themed on port cooperation. This 'port cooperation types, drivers, and impediments' volume focused on port cooperation schemes, strategies, and policies, with a specific emphasis on managing bodies of ports (or PAs) as a unit of analysis. The co-operation among PAs comes in various forms going from ad hoc schemes of bodies charged with specific and limited functions or project initiatives involving two/many ports to the most far reaching structural cooperation platforms and mergers between two ports of similar size or between small and large ports within a country or in cross-border between two countries (Notteboom et al. 2018).

Port competition has been considered by Heaver as a category of the single PRF port economics, a semi/category of two multiple PRFs (§2.3) and a research focus within the category 'foreland' of the single PRF port geography (§2.2.6), while port cooperation has been considered as a subcategory within the category 'port governance' (§2.3.1) and only an issue termed integration by Heaver, which has published several papers on port cooperation, however.

2.3 Multiple PRF reviews and/or classifications

Two groups of researchers have produced a series of papers reviewing and classifying multiple PRFs, presented first in conferences and then in journals. The first is Pallis et al. (2008, 2010), a group of 3 authors, and Pallis et al. (2011), a group of 4 authors, including the former group. The second is Woo et al. (2010a, 2010b), a group of 3 authors, and Woo et al. (2011, 2012) adding a fourth researcher to the same former group for the journal versions of both former papers. For space motives, this paper will use the acronyms P+ for Pallis et al. and W+ for Woo et al., using the year only if necessary for the issues to be discussed in the following sections or denoting their other works.

2.3.1 Port economics, policy, and management

P+ (2008) reviewed 287 research papers from 35 journals for the period 1997-2006 and P+ (2010, 2011) did it for 395 relevant research papers from 51 journals during 1997-2008, both in port economics, policy, and management.

P+ (2008) aim to provide a comprehensive classification of port research by using a systematic content review of academic journal papers in a multiple PRF they named as '*port economics, policy and management*'. After having criticized Heaver that not used a systematic approach to identify and analyze his research output in port economics, P+ say to build their study on Heaver's. But, P+ do not precise if they follow his arbitrary division as methodology of classification or the specification of 6 port economics topics, of which they kept trace only for 'port competition', with all the others disappeared or dispersed more within their subcategories than categories (Table 2). Heaver said to not follow his previous paper (1993) categorizing topics in maritime economics but Winston's (1985) conceptual approach in reviewing transport economics. Winston surveyed 269 papers, theses, books, and reports to (i) explore conceptual developments in supply and demand analysis, and (ii) use these concept-based developments to evaluate efficient pricing and investments and government regulation impact on the resource allocation in transport.

“All papers can be classified into 7 *fields* according to the core theme formulating sub-datasets seeking to answer similar questions or put forward similar paths for research”, argued P+ (2008): (1) terminal studies, (2) ports in transport and supply chains, (3) port governance, (4) port planning and development, (5) port policy and regulation, (6) port competition and competitiveness, and (7) spatial analysis of ports (Table 2). These 7 fields are also called *categories* in the Table composed by P+ (2008), then *subfields* by P+ (2010) and *themes* by P+ (2011).

P+ (2008) argue that “port research can be classified in different categories, based on the *unit of analysis* and the *scope of empirical research*”, which can be global, regional, national, port or terminal specific. P+ added to their global scale “also pure theoretical publications that conceptualize port management, economics, and policy, without empirical analysis”, which arguably are outside the unit-scope perspective. P+ combined also *commodities* with the geographical scope, with 131/287 of papers unspecified and the other half (143/287) container-related.

P+ (2008) used a *citation analysis* “for measuring the coherence of the research (sub)fields via the analysis of the 'citation relations'”. Because citation ratios expressing the coherence within and between port research categories are very low (less than 0.069), with only values close to 1 showing a high coherence, P+ argue in their section 6 (Citation analysis) that these low values suggest a relatively low coherence of port studies. In their section 7 (Conclusions), P+ argue that the citation analysis confirmed the validity of the content classification of the 287 papers reviewed, without having argued a similar thing in their section 6.

Table 2. Port research in 7 categories and 29 (Pallis et al. 2008), 30 (Pallis et al. 2010) and 40 subcategories (Pallis et al. 2011).

Categories [Issues' nr]	Subcategories in Pallis et al. (2008, 2010)	Subcategories in Pallis et al. (2011)
1. [Port] Terminal studies [17]	Performance measurement of terminals Terminal operations Description (of strategies) of TOCs [Terminal Operating Co.]	Terminal efficiency Terminal capacity and size Strategies of TOCs // Optimization of TOs
2. Ports in transport and supply chains [17]	Shipping (networks) and implications for ports Supply chain trends and implications for ports & PAs Logistics activities in ports Information flows in supply chains; issues for ports (Hinterland chains) [added in 2010, as everything in (...)]	Theorizing the role of ports in supply chains Changing logistics strategies of ... and its impact on ports Role of port terminals // Hinterland access & supply chains Local pressures on ports Supply chains and liner service networks // The role of IT
3. Port governance [19]	Port models and port reform The role of Port Authority Industrial relations in ports The port community, cooperation in ports	Theorizing ... governance // Comparing port gov. models Port governance reforms, national scale: results // potential Industrial relations in ports // Institutional issues The role of PAs in contemporary port governance
4. Port planning and development [12]	Trends and developments // Forecasting Descriptive case studies of ports and port development Economic impact studies of ports (and cost estimates) Port expansion projects // Tendering - concessions in ports	The port community, cooperation in ports Governance through cooperation between ports Port planning // Port development Impact studies // Tendering - concessions
5. Port policy and regulation [15]	Port pricing, state aid (and national policy) Environmental, safety and security regulations in ports Anti-trust regulation issues in ports Supranational port policies	Market access // Pricing mechanisms Environmental // Safety and security Financing // Institutional issues Competencies of policy-making levels
6. Port competition and competitiveness [6]	Port competition // Port choice Strategy analysis // Port performance	Port choice // Theoretical advances // Descriptive analysis Port competitiveness // Modelling port competition
7. Spatial analysis of ports [14]	Spatial change in ports Spatial studies of port networks Spatial change of port cities and the port city interface Analysis of port hinterlands	Port city development Port system development Interaction between port system and hinterland networks Modelling optimal port location and system configuration

P+ (2010) are more clear on that issue, arguing that “many of the citation ratios are low, yet these ratios confirm the existence of these 7 research subfields because, in 6/7 cases, articles in one subfield cite relatively many other articles in the same subfield” (Table 3, a). P+ (2010) confirm what P+ (2008) said, arguing: “The citation analysis suggests that the content classification of the 395 papers developed in this paper is valid.” Concerning citation ratios within and between different themes, P+ (2011) say there are “relatively many citations to other papers that address the same theme. This frequent 'within theme' citation suggests that the content classification is valid and useful” (Table 3, b). One is wondered to see how the values of citation ratios have been radically transformed from very low in P+ (2010) to more than ten-fold in P+ (2011) (Table 3, a, b), without explanation by the latter, which, however, continue to argue in conclusions that “Port studies are somewhat fragmented and lack coherence”. In any case, the Authors of the present paper judge no reasonable that a content classification may be confirmed by citation ratios.

P+ (2010) explain thus their categorization methodology: “In an iterative process, we grouped together papers on the same topic and defined research themes, such as 'performance measurement of terminals' and 'port choice', clustered in broader categories, such as 'terminal studies' and 'ports in transport and supply chains'. This led us to

Table 3. Coherence as citation ratios within and between port research categories in Pallis et al. (2010) (a) and Pallis et al. (2011) (b).

Ratio = number of times Category A cites a given Category B / number of times that Category A cites the Category 'that is most cited by Category A'.		Cited to						
Cited from	Cited to	Terminal studies (38)	Ports in transport & supply chains (56)	Port governance (54)	Port planning & development (48)	Port policy & regulation (62)	Port competition & competitiveness (71)	Spatial analysis of seaports (32)
Terminal studies (30)	Terminal studies (38)	0,087	0,020	0,012	0,027	0,008	0,035	0,004
Ports in transport & supply chains (34)	Ports in transport & supply chains (56)	0,011	0,060	0,019	0,025	0,008	0,025	0,019
Port governance (46)	Port governance (54)	0,021	0,031	0,053	0,027	0,011	0,015	0,011
Port planning and development (47)	Port planning & development (48)	0,010	0,015	0,011	0,024	0,008	0,010	0,016
Port policy & regulation (48)	Port policy & regulation (62)	0,003	0,009	0,016	0,017	0,021	0,013	0,003
Port competition & competitiveness (52)	Port competition & competitiveness (71)	0,037	0,020	0,015	0,035	0,006	0,057	0,007
Spatial analysis of seaports (29)	Spatial analysis of seaports (32)	0,006	0,034	0,007	0,011	0,002	0,011	0,031

Cited from		Cited to						
Cited from	Cited to	Terminal studies (38)	Ports in transport & supply chains (56)	Port governance (54)	Port planning & development (48)	Port policy & regulation (62)	Port competition & competitiveness (71)	Spatial analysis of seaports (32)
Terminal studies (30)	Terminal studies (38)	1,00	0,23	0,15	0,31	0,10	0,40	0,05
Ports in transport & supply chains (34)	Ports in transport & supply chains (56)	0,20	1,00	0,32	0,42	0,14	0,42	0,32
Port governance (46)	Port governance (54)	0,40	0,58	1,00	0,51	0,20	0,28	0,22
Port planning and development (47)	Port planning & development (48)	0,44	0,65	0,48	1,00	0,34	0,43	0,69
Port policy & regulation (48)	Port policy & regulation (62)	0,18	0,43	0,78	0,82	1,00	0,61	0,15
Port competition & competitiveness (52)	Port competition & competitiveness (71)	0,65	0,35	0,27	0,62	0,11	1,00	0,12
Spatial analysis of seaports (29)	Spatial analysis of seaports (32)	0,19	1,00	0,20	0,34	0,06	0,32	0,92

identify 7 subfields and scrutinize the classification of the papers ... based on the reviews of both the abstract and the content of each paper.” P+ added: “... some papers can be classified in more than one subfield. ... The categorisation of such papers was based on the focus of the research ... acknowledging that this might be somewhat *arbitrary* for some papers. However, for most papers, we all made the same classification independently.” P+ (2011) made a detailed analysis of research contributions in the multiple PRF 'port economics, policy, and management' [that they call 'port *studies*'] by “developing a *taxonomy* for port studies and surveying the different research themes in detail. The classification of 395 papers in 7 research themes is to some extent *subjective* ... The taxonomy was developed according to this process: each author classified the papers independently. There was agreement on the vast majority of the papers. The remaining papers were discussed in detail and classified jointly. The resulting classification is a valuable and necessary part of a comprehensive overview of port studies.” P+ (2011) link the seven port research categories with headed arrows (Fig. 1, a), based on citations of Table 3(b) to/from the different research themes.

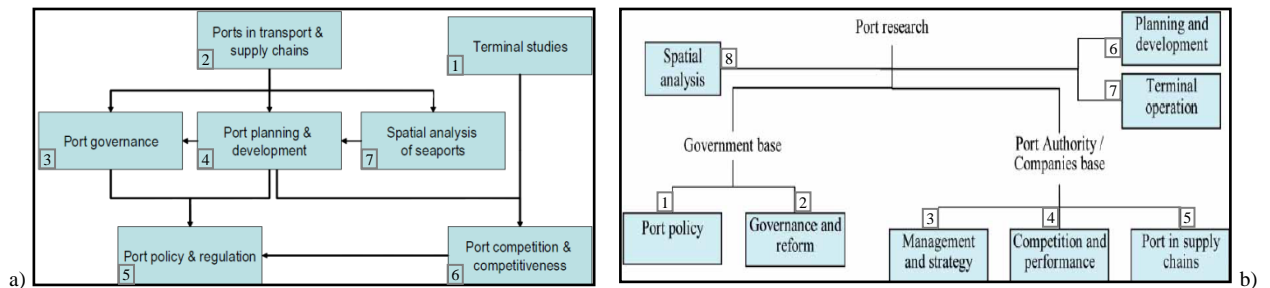


Fig. 1. Relationship among (a) seven (Pallis et al. 2011) and (b) eight (Woo et al. 2012) categories of port studies (numbered by Authors).

P+ did not explain why in the multiple PRF 'port economics, policy, and management' included these 3 terms and not others, and why ranking them in that way. Excepting port policy that figures out added by regulation among the 7 categories, which of the 6 pertain to 'port economics' and to 'port management'? Bennathan and Walters (1979) see pricing and investment policy as “one important aspect of port economics”, where “policy issues remain” (Heaver), while SV see management within economics. Further questions may be added by considering the subcategories in Table 2, where a significant arbitrary change on their number and name is evidenced from P+ (2008, 2010) to P+ (2011), perhaps made possible by the simple fact that the number of papers in each theme is not shown.

2.3.2 Port policy, management and operations

W+ (2010a, 2012) analyzed 840 relevant academic papers from 125 journals for the period 1980-2009, searching for papers relating to 'port policy, management and operations' called 'port research', excluding port history, marine engineering, and waterfront redevelopment, but including terminal OR, instead of P+. A more comprehensive and structured literature review was required to fully understand changing trends and themes in port research, classifying selected papers depending on research themes and subjects, referring to the existing reviews but avoiding à priori classification determined in advance. Rather, undertaking a temporal content analysis in an inductive and iterative 4-round review (Figure 2) process avoids classification ambiguity and ensures exhaustive and mutually exclusive categories. After further cross-review and assessment, W+ revised the structure to 8 themes and 38 topics (Table 4). Reliability and validity of categorization was ensured through the review process by consideration among authors.

In their categorization structure (Fig. 1, b), W+ detached government-based (1-2) from port authority-/company-based (3-5) themes, considering themes 6-7 as topics providing the first 5 themes with information used in decision-making, and theme 8 as relevant to all port policy and operational activities.



Fig. 2. Review process producing 8 port categories called themes and 38 topics (Woo et al. 2010a, 2012).

Table 4. Port research in 8 themes and 38 topics (Woo et al. 2012) and the disciplinary distribution of themes (Woo et al. 2011).

Research themes (%)	Topics	Disciplinary distribution of themes (%)
1. Port policy (8.9%)	Supranational port policy // National port policy Regulation and market // Public involvement Safety and security regulation // Environmental regulation	Economics (39%) Geography (12%) Environmental studies (7%) // Others (42%)
2. [Port] Governance and reform (9.8%)	Port governance model Port governance reform Port labour reform	Economics (29%) Industrial relations (26%) Geography (5%) // Others (39%)
3. [Port] Management and strategy (19.6%)	Port strategy // TOC strategy // Port pricing Human resources management Information and knowledge management Safety and security management // Environmental management	Economics (19%) Strategic management (11%) Industrial relations (9%) Others (61%)
4. [Port] Competition and performance (19.3%)	Port competition // Port selection Port performance // Port efficiency Port competitiveness	Economics (60%) Geography (9%) Operations research [OR] (5%) // Others (26%)
5. Ports in supply chains (5.2%)	Redefining ports in supply chain context Integration along supply chain Land-side logistics	Logistics/SCM (33%) OR (16%) Marketing (7%) // Others (44%)
6. [Port] Planning and development (14.9%)	Demand analysis // Supply analysis Financing, risk, and project appraisal // Development cases Economic impact studies Strategic planning and decision-making	Economics (56%) OR (17%) Regional planning (5%) Others (22%)
7. Terminal operation (11.0%)	Review and methodology // Terminal as a whole Seaside operation // Yard operation // Landside operation	OR (99%) Economics (1%)
8. Spatial analysis of ports (11.3%)	Port system // Network analysis Port-city relationships	Geography (93%) // Economics (3%) OR (2%) // Others (2%)

W+ observed by descriptive statistics the evolution of port research and its relation to maritime economics and transport studies, adopting Heaver's (1993) approach for the latter. They divide journals publishing the selected port studies into 8 categories: *maritime studies*, *transportation*, *geography*, *OR*, *planning and development*, *economics*, *business and management*, and *others* (public administration, computer science, sociology, and safety science).

W+ (2010b, 2011) classified 840 selected papers into 6 methodological contexts: research paradigm (4), strategy (5/6), and methods (9), discipline base (5), theoretical models and concepts (22), and techniques of data analysis (19). W+ examined research paradigm and strategy for a philosophical approach and discipline and theoretical base for disciplinary characteristics. They raised questions about the categorization process: Are categories appropriate for port research? Are the results of categorization reliable? Is it possible to categorize all the papers exclusively?

In selecting port disciplines evolved as depicted in Figure 3 – *economics* 31.54%, *geography* 15.7%, *operations research* 16.3%, *management* 13.2% (HRM, information/communication, and organizational studies in addition to subfields in Figure 3), *others* 5.65%, and *not specific* 17.7% – W+ refer to Burgess et al. (2006) which “classified articles into discipline categories which, in [their] opinion, appear most relevant”. In selecting research methods and data analysis techniques, W+ referred to Mentzer and Kahn (1995), Sachan and Datta (2005), and Min and Zhou (2002), not saying how and why they selected those sets of research methods and data analysis techniques.

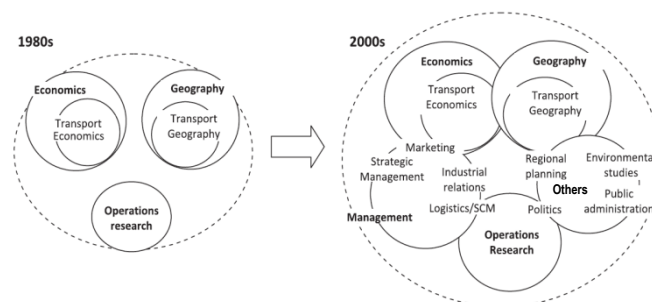


Fig. 3. Disciplinary evolution of port research from 1980s to 2000s (Woo et al., 2011).

3. A critical analysis of PRF reviews and/or classifications

This section analyzes the above cited works that review and/or classify single or multiple PRFs, highlighting their choices in respect of some key methodological and classification elements, as they appear in the following sections.

This critical review will apply as methodology both (1) *a critical reading* “assessing the extent to which authors [of the main papers cited and overviewed in §2.2-3] have provided adequate justification for the claims they make. This assessment depends partly on what [those] authors have communicated and partly on other relevant knowledge, experience and inference that [Authors of the present paper] are able to bring into the frame.”, and (2) *a self-critical writing* “in convincing the readers to accept our claims [as Authors of this paper] ... achieving this through effective communication of adequate reasons and evidence for these claims.” (Wallace and Wrey 2011).

Other than some thoughts expressed in the preceding sections, the critical review will concern terminology and key methodological and categorization elements, the first being considered inside the other two.

3.1 Methodological elements of PRF classifications

As announced in introduction, the elements related to the methodology used by the papers cited in §2.2-3 concern the objective of papers, definition of PRF, port, and unit of analysis, number and publication source and period of selected port research works, number of authors engaged in writing the papers, approach or method of both selection and classification of the selected port research works, including the elements of the classifying framework used, e.g., research paradigm, strategy, and method, discipline base, theoretical model and concept, data analysis technique, citation and other ratios. This section will critically review the choices made by the authors of the cited papers as regards these elements and to what extent these choices are justified, searching for the logical reasons behind them. The influence of these methodological elements on the results of the categorizations will be also evaluated.

3.1.1 Objectives of PRF reviews and/or classifications

In general, all the cited papers have stated an objective and have realized it somehow, with a great exception.

SV reviewed a single PRF that used to be port management by using 21 references in port economics and policy, dealing with the significant change and developments *brought in* the port management field. In fact, SV paid special attention to 4 *forces* having their consequences to any port management that they consider more a body (PA) than a field: port *policy* as a role of the state, port *infrastructure* as a *public good*, inter-port *competition*, and *cooperation* through strategic alliances among market players in logistics chains. The first 2 issues concern port economics and policy, while the other 2 a mix of port economics and PAs at the highest strategic level of decision-making, which is related to port corporate governance more than port management, which deals with port’s day-to-day operations and strategy through the internal functions of PAs and port related actors. Devolving port activities and privatizing port resources was the argument in moving ports to the landlord model (Word Bank 2001, Brooks and Cullinane 2006).

SV review is in Goss’s style in 4 papers published in MPM (1990) entitled “Economic policies and seaports: 1. Economic functions of seaports, 2. Diversity of port policies, 3. Are PAs necessary?, and 4. Strategies for PAs”. Goss (1987) expressed these thoughts when investigated the structure and organization of Australian PAs. As Goss, what SV reviewed is clearly much more port economics, policy, and governance than port management.

This is the most singular case of confounding paper’s objective with its achievement through the paper and is one of the sources of error and bias identified by Mackie and Preston (1998). As it will be seen in the following section, other authors do not say in their papers what they intend by PRFs like port management, port economics, etc., where putting and how interrelating PRFs and various PRF components in their categorizations.

3.1.2 Definition of port research fields in PRF reviews and/or classifications

Most of the cited papers did not define the PRF they aim to review and/or classify, though PRF classification is the central object of their paper. Does it mean that defining crucial terms like PRF is not evident and authors escape to a duty? What may be said for sure is that missing PRF definitions do not help but blur all PRF classifications.

SV did not define but consider port management as an area of port economics and a body incorporated to PAs, whose objectives are in close relationship with port economic function, which “essentially benefit those whose trade passes through them, i.e., through providing increments to consumers' and producers' surpluses (Goss 1990/1)”.

Heaver's chapter is part of a book edited by Cullinane and Talley (2006), which argue in Introduction that "*Port economics* is concerned with the study of the economics of port services ... provided by port service providers (...) [and] used by port users, which include transport carriers, shippers and individuals providing cargo and passengers, demand port services and utilize ports as part of the transport process of moving cargo and passengers. Port economics and shipping economics form maritime economics." Heaver opinion is missing on this definition, but his review accepts as 'port economics' the range of topics and approaches typical of the IAME meetings and associated journals. However, Heaver recalls Svendsen's (1958) definition of shipping economics as "the application to sea transport of the same methods and analytic means used in economics" and his key lessons on "*the arbitrary nature of the field of port economics* and important role of institutions and individuals in the development of the subject." Heaver argued also that "Port economists are still challenged to find effective measures of port efficiency".

Ng noted the evolution of port geographers' focus of research and discussed on port geography field of research, asking a key question left without answer: what is or should port geography be?

P+ and W+ did not define their multiple PRFs. However, it is clear that their 'port research' is not comprehensive as both excluded papers in port/marine engineering, waterfront redevelopment, and port history. Meanwhile, P+ (2010) excluded even papers in terminal OR, "as the reviews published by V+ [cited above] show that this research field is very distinctive from research on port economics, policy and management". This is simply not true, clearly showing authors' understanding on their multiple PRF. Not only because OR as research subfield "provides crucial information for decision-making in port planning and development", as argue W+ (2010a, 2012), which include terminal OR in their port research database, unlike P+. "As its name implies, operations research involves research in operations ... applied to problems that concern how to conduct and coordinate the *operations (activities)* within an organization. ... (In fact, the term *management science* is also used as a synonym for OR.)" (Hillier and Lieberman 2015). "Although Charles Babbage made significant contributions to management science – "also referred to as OR, decision sciences, quantitative methods or quantitative analysis" (Taylor 2013) – Frederick Taylor is viewed as the founder of the field. [His paper] 'A piece-rate system' developed a set of management techniques to stimulate worker productivity and efficiency and help in decision-making." (Mitcham and Briggles 2005). Therefore, terminal OR is not at all very distinctive from port management research, as P+ unduly argued, but its substantial part.

More on the definition of single and multiple PRFs and their composing categories will be said in §3.2.

3.1.3 Definition of ports and units of analysis in PRF reviews and/or classifications

Not all the cited papers define the port as central subject of their research or the port unit of analysis. In any case, they do not share the same definitions. Does it show how evident is to define the port and the port unit of analysis?

SV first borrow Goss's (1990) definition of a port as "a gateway through which goods and passengers are transferred between ships and shore", then argue that "the term 'port' is rather problematic. Clearly, it concerns much more than a merely geographical concept: an area of commerce located near deep water. After all, EU regulations apply to companies that do business in port as well as to port managers".

Heaver did not give any opinion about Cullinane and Talley's (2006) definition of ports as "places that provide for the vessel transfer of cargo and passengers to and from waterways and shores, nodes in a transportation network, and economic units that provide a transfer service ..." Instead, he underlined "the valuable perspective" on ports of Thorburn (1960): "The objective suggested (the economically rational performance for harbour activity as a whole) implies that the total activities are regarded as a *unit* ... [of analysis, where] the total costs of the services with the same turnover of goods are to be kept as low as possible. ... To attain co-ordination between the building of vessels and the design of harbours ... both shipping and harbour activities ... should be included in the same calculation."

Ng considers "ports as nodal points affecting the development of shipping networks and supply chains, that have gradually transformed from just pure sea-land exchange points for the transfer of passengers and cargoes (Bird 1971) to crucial elements of logistical supply chains, where their facilitating role is becoming particularly important (Notteboom and Winkelmans 2001)". He noted the evolution of port role and functions and port geography research clear shift from a port traditionally seen as an *independent unit of analysis* (1956-1990) to a contemporary *global system of ports* as analytical framework (1990-on). However, the global free trade [passing through ports] started in 1950s, due to oil, welded steel hulls, bulk shipping, and containerships, argued Stopford (2010, 2015).

P+ (2008) defined the port in line with Notteboom (2006): "A logistic and industrial centre of an outspokenly maritime nature playing an active role in the global transport system and characterized by a spatial and functional

clustering of activities that are (in)directly involved in transformation and information processes in supply chains”. In fact, that reference does *not* contain any port definition and even 'logistic' appears only one time as 'logistics': Pallis, leading author in P+ (2008, 2010, 2011), and Notteboom, author of the referred definition, did not answer my question about. In my port research database of 27.5 GB, with 15,300 files on July 10, 2018, Notteboom's definition most closer to that cited by P+ is written in 1998 for the 113th round table of ECMT (2001): “A sea port is a logistic and industrial node in a global transport system with a strong maritime character in which a functional and spatial clustering of activities takes place, activities that are directly or indirectly linked to seamless transportation and transformation processes within logistic chains.” “Port research can be classified in different categories, based on the *unit of analysis*”, which can be global, regional, national, port or terminal specific, argue P+ (2008, 2010).

W+ did not define the port, being aware that port research diversified to reflect the evolution of the port industry and ports and their changing role in supply chains and logistics. W+ call 'port research' their triple PRF undefined, as the most comprehensive possible, not reflecting their choice to exclude PRFs like port history, port engineering, etc. As Olivier and Slack (2006), W+ discern a growing focus on business strategies of TOCs in the 2000s that changed the *unit of analysis* from the port as a whole to the TOCs developed through private investments in world's CTs.

Studies concerning port performance, impact, OR, competition, and cooperation do not all define ports and their respective port research (sub)fields. These reviews and classifications will not be developed here for missed space.

3.1.4 Publication source, period, and number of selected works in PRF reviews and/or classifications

It is evident that all above cited papers did not use the same data: with data are understood the publication source, period, and number of selected papers and other research work. Some questions arise here: Which are the logical reasons that justify the choice of some papers' author(s) selecting only journal papers and excluding other sources to review and classify a PRF? How the number of selected works and their source and period of publication influence single or multiple PRF classifications? Some of these questions find answers by analyzing the cited papers.

V+ did not limit the database on journal papers, considering also conference and working papers, PhD/master theses, reports, books, and internet sources, including even anonymous authors to classify their OR research subfield and terminal equipment. SV and Heaver did the same, while Winston (1985), who is followed by Heaver on which P+ are based, added also a very large literature of economics and policy to transport economics.

Heaver published his port economics review and classification in a ... book chapter. Though P+ and W+ present their initial paper in a conference, they selected only academic journal papers. “Because most maritime and transport journals are not included in the ISI web of science (...), all academic journals published by international publishers and with blind and rigorous review methods were included. Journals published by institutions (...) were excluded. Contributions to edited books were also excluded from the analysis, because books generally focus on specific topics and review procedures are less clear. The same applies for books, conference papers, and dissertations”, said P+ (2008) in a conference paper. W+ (2010b) replicated this still in a conference paper, adding that “The reason is that [academic journals' papers] have been [selected] through peer review procedure and are more appropriate for the investigation of port research from both theoretical and methodological perspectives than other [excluded] sources.” Ng/ND did the same as P+ and W+, selecting “representative articles related to port geography published in internationally recognized journals within the human geography discipline”, excluding the other sources.

The reasons given by P+, W+, and Ng/ND are much questionable. Cullinane and Toy (2000) that W+ referenced for the classification process argue the contrary: “The database comprises a *variety of source* literature. An attempt [is] made ... to limit the analysis to *refereed academic output*. This includes journal papers, conference proceedings, textbooks, etc. The actual size of the sample [75 works] has been determined by certain practical limitations ...”

“While a majority of port research reviews have used *convenience samples* of articles and thematic analysis, [our] approach analyzes *all relevant obtainable literature* ... in order to obtain a *complete picture and framework* for port research”, argued W+ (2010a, 2012). This is aimed by most of cited papers and is better achieved by selecting as much as possible papers. By selecting only peer-reviewed journal papers, the concerned authors have simply chosen the wrong selection methodology to achieve their paper objective. If a paper aims to categorize PRFs, and authors using content analysis know, important is to find topics in a given set of research papers and how many researchers deserve time, money, and energy to these topics, not the quality of phrases using them. It is the quantity of selected papers that matters, not their quality. Therefore, to find as much as possible research themes or topics, the only task should be to select papers everywhere they exist, not only in peer-reviewed journals.

The evidence shows a various publication period (section 2) and number of selected papers in *single* (116 in Heaver, 155 in Ng (2013), 212 in V+ (2004), 252 in V+ (2008), 314 in ND (2012), 399 and 728 in ND (2014)) and *multiple* (287 in P+ (2008), 395 in P+ (2010, 2011), 840 in W+) PRFs. How much these facts influenced the number and nature of (sub)categories and issues in single and multiple PRFs? Let's read the facts.

Every update or new version of the original work published by V+, P+, or ND increased the publication period and number of selected papers. Changing the publication period from 1956–2011 in Ng to 1950–2011 in ND (2012), for the same reasons referring to the same Heaver (2002), is simply ridiculous. However, the number, name, and nature of categories in single and multiple PRFs have not changed. Only the number of subcategories and issues was slightly increased in V+, as it is reasonable after 4 years, and seriously modified from P+ (2010) to P+ (2011), after a year only, as it will be analyzed in §3.2.3. The latter kept the same number of selected papers, 395, in relation to its precedent version, making the said serious modifications not serious at all.

W+ asserted to have generated contrasting results with P+ to some extent. The evidence proves that W+ added only 1 category to the 7 ones devised by P+, seriously modifying the names of (sub)categories added by 8 toward P+ (2008, 2010). It is easy to discover that this contrast is in fact not real: with few exceptions, (sub)categories include the same topics with other faces. This is surely not due to the temporal approach that W+ adopted toward P+ with 3 decades instead of 1 and 840 papers instead of 395. Is it due to the experience of W+? The same evidence shows also that the systematic review of 840 papers did not produce a real difference compared to 395 papers of P+. But, this does not show what the effective size of a sample can be: 395 in P+ are still enough to see that adding a new author in P+ (2011) in relation to P+ (2008, 2010) may produce big changes qualified as not serious.

3.1.5 Number of authors in PRF reviews and/or classifications

The number of authors in the cited papers varied from 1 in Heaver and Ng to 2 in SV, ND, and V+ (2008), 3 in V+ (2004), P+ (2008, 2010), and W+ (2010a, 2010b), and 4 in P+ (2011) and W+ (2011, 2012). How and why they made certain choices in their PRF reviews and/or classifications is not evident. But, the changing number of authors did not change the number and nature of categories in specific or multiple PRFs. This may be verified from V+ (2004) to V+ (2008), from Ng (2013) to ND (2012, 2014), from P+ (2008, 2010) to P+ (2011), or from W+ (2010a, 2010b) to W+ (2011, 2012). From these, only V+ and P+ undergone changes on subcategories and issues as above discussed (§3.1.4), decreasing and increasing the number of authors by 1. Based on these and above data on period and number of selected papers, it would be difficult to draw a conclusion on the role of each factor separately.

3.1.6 Approaches and frameworks for the selection and classification of PRF papers/works

The methods used to select and classify former papers or works in PRFs are intertwined through the same review process, underlined in §2.2 and §2.3. The selection clearly relates to the sources of publication, which is already discussed above (§3.1.4). The method of classification may reach an analytical framework, with several elements on which the classification may be realized. This framework is the most explicit and large in W+ (2010b, 2011).

P+ used a framework with the triangle (1) unit of analysis, (2) scope of empirical research and authorship, and (3) commodity, also analyzing citation ratios with serious problems, as commented in §2.3.1. W+ used a 6 dimensional framework with research paradigm in 4 units; research strategies in 2 then 3 for each (6 in total); research methods in 9; discipline bases in 6 including 'other' and 'not specific', indiscernible disciplinary traits 17.7% (a huge quantity) of 840 papers; theoretical methods and concepts in 22; and data analysis techniques in 19 units; all of which observed in their 3 decadal evolution. Other 2 elements in W+ (2010a, 2012) may be added: port research place in the maritime research and 8 categories of the 125 journals where W+ selected their papers.

“The papers selected were classified depending on research themes and subjects. This classification process was a primary aspect of this research since category construction is regarded as the area of content analysis requiring the most consideration and having the greatest influence over the results”, said W+ referring to Cullinane & Toy (2000).

But, how to classify all scientific works that clearly have multiple objectives and a multi-/trans-/inter-disciplinary approach? This is a false question that W+ asked explicitly, while P+ and Ng/ND implicitly, as they all use the same method: 1 paper should be counted once, according to the principle of mutual exclusivity. This is wrong, because important is how many papers treat a given port topic: this means that we have not to find ratios that sum up to 1, as their sum does not matter. The relationship of papers with topics is not of the type 1-1 but 1-*n*, with *n* the number of topics per paper: researchers show the inter-disciplinary papers increasing, argued W+. Recall the shortcuts in §2.1.

Which port categories to choose, denominate, and classify? Why, how? Which is their relation to port disciplines or journal categories? The cited papers are not clear. The most evident reasons shown are either “authors know” or authors send the readers to other authors giving “their opinion” in their papers. Heaver was so explicit and more than sincere when asserting to have identified 6 topics in port economics *for convenience* and qualified them as *arbitrary* divisions. Also P+ (2011), W+, and Ng accept the subjective nature of categorization for single/multiple PRFs: this means that this process may produce other numbers and names for port research categories and themes if other author(s) added to or taken instead of the cited papers’ authors to review and classify any group of selected papers. The simple fact that P+ and W+ did not produce the same number and names of categories for their triple PRFs that are similar in their essence and neutrally called by both as ‘port research’ proves that.

However, be this diversity superficial or profound, it hides the fact that most of these authors, if not all of them, do not define the single or multiple PRFs and their composing (sub)categories, using taken-for-granted definitions, which are only implicit and still of the kind “authors or their references know”. “The beginning of wisdom is the definition of terms” is not by chance credited to Socrates, having exactly said “The speaker must define the terms in the beginning of the speech” in Plato’s Phaedrus about the rhetoric principles. Section 3.2 will analyze some terms.

3.2 *Categorization elements of PRF classifications*

As announced in introduction, the elements related to the categorization achieved by the papers cited in §2.2-3 concern the number, name, nature, ranking, position in table/diagram, and interrelations among PRFs and respective (sub)categories and issues. This section will critically review the choices made by the authors of the cited papers as regards these elements and to what extent these choices are justified, searching for the logical reasons behind them. The influence of the methodological elements on the results of the categorizations will be also evaluated.

Before examining PRF (sub)categories and issues, it is worth to note that single PRFs like port economics, port policy, port governance, port management, port geography, and port operations research have been classified alone in SV, Heaver, V+, and Ng/ND, as a mix within triple PRFs in P+ and W+ or as categories in P+, W+ and Ng/ND.

Port economics was a single PRF in Heaver, a single PRF mixed in the triple PRF ‘port economics, policy and management’ in P+, but is even not a category in P+, W+, or Ng/ND. Meanwhile, for their triple PRF ‘port policy, management and operations’, W+ chosen the categories of port policy, port governance, and port management, that are mixed by Ng/ND in a triple PRF-like category by putting first port management in a single PRF, port geography, while P+ used the categories of port policy and port governance and reform, excluding port management. To this PRF, W+ added strategy in one of their categories, separated the port management discipline from port economics, qualified Heaver’s review in port economics as review in port management and ranged it with SV who consider port management as an area of port economics and Olivier and Slack (2006) whose paper reviewed 93 references in port geography and economics, with at most 10 references in port management.

Section 3.2 will show that the categorization of port economics, policy, and management is the most explicitly non understandable issue of all cited papers classifying single and multiple PRFs. Contradictory views may coexist if definitions and positions of the single PRFs are not pre-established in a way or another.

3.2.1 *Number, names, and natures of categories in PRF classifications*

As already seen in §2.2 and §2.3, the number of categories in the main classifications of single and multiple PRFs is: 6 categories in the single PRF, port economics (Heaver); 5 in the single PRF, port geography (Ng/ND); 7 in the triple PRF, port economics, policy and management (P+); and 8 in the triple PRF, port policy, management and operations (W+). OR is a subfield of port management which is not yet classified to the knowledge of the Authors.

As it will be explained later, both triple PRFs have redundancy like economics and policy in P+ and management and operations in W+. Redundant terms have also the categories labeled as ‘policy and regulation’, ‘governance and reform’, ‘management and strategy’, ‘competition and competitiveness’, ‘port planning and development’, and ‘philosophy and epistemology’. All these redundancies are unnecessary duplications and wastes: the second term is part of, implied by or serves the first, for which reason one must be cut off, better the second than the first.

All categories are a mix of various natures or characters. The first 3 categories in Ng/ND, ‘foreland’, ‘hinterland’, and ‘port’ in their ‘locational’ components have a geographical nature which counts 93% for ‘spatial analysis of ports’ in W+ (Table 4). Also ‘ports in (transport and) supply chains’ in P+ and W+ is of a geographical character mixed

with sectorial (transport) and inter-disciplinary nuances of economics, policy, governance, and management. The latter mainly has the strategic management form as part of supply chain management [SCM], which Hammervoll (2016) fundamentally asks for: “Which unit of analysis - organizational entity for which researchers aim to describe and explain constructs - is useful in SCM research? [This is] a seldom raised question [as] dominant theories in SCM research dictate the transaction or the firm as unit of analysis. As the main objective of SCM is a collaboration and concerted action involving a group of firms, it is not obvious that knowledge on the characteristics of individual transactional firms contributes to new knowledge on SCM. Ideally, SCM research should ... seek to understand and explain collaboration and coordination between organizations forming supply networks or other key characteristics of [these]”. The activities necessary to successfully implement a SCM model – the inter-corporate coordination of material, information, and financial flows – are mutuality, integration, cooperation, and relationship among partners (Mentzer et al. 2001). This is why the 'ports in (transport and) supply chains' category pertains to port industrial organization that Heaver rightfully considered as a category in port economics, and includes strategy and policy issues essentially constituting the governance of markets and industries, which may be government-based for policy and regulations or corporate-based for the strategic management of firms within these markets or industries.

In fact, “economic geography is a sub-discipline of geography and a growing [sub-]field of study in economics. It is concerned with the spatial configuration of firms, industries, and nations within the emerging global economy in all its manifestations”, argue Clark et al. (2000) prefacing a book aiming to define the field and capture its scope by intersecting with economics, sociology, and institutional and organizational research, asking fundamental questions like “Geography or economics?: Conceptions of space, time, interdependence, and agency” (Sheppard 2000), asked similarly by Amin and Thrift (2000). Ng tried to note the trends of port geography from the traditional (1956-1990) to the contemporary (after 1990) period, when the analysis of port location, evolution and impacts was uninterested in port operational aspects and declined, promoting emergent port choice, competition and cooperation, intermodal transport and supply chains, thus blurring and changing the port geography identity. In such a blurring of research characters, the 'impact' and 'operation' components of the first 3 categories mix port economics, management, and governance, though Ng/ND show research focuses like 'ports in transport and supply networks'. Blurring are also their last 2 categories, port 'management, policy, and governance' and 'philosophy and epistemology'. The first is related to the devolution and privatization of port infrastructure and the roles of institutions in affecting port reforms (Ng): these issues mainly concern policy and governance, rendering not necessary 'management' in Ng's 4th category, with the notable exception of 'port operation' research focus. The second must reduce either philosophy or epistemology, the latter being a branch of the former (e.g., Runes 1942 on the definition of both terms).

P+ and W+ show also other categories like port 'policy (and regulation)' and 'governance (and reform)', where the second term used, if any, is redundant as it is implied by the first one. These 2 categories are in fact the two faces of the same process: port governance by economic policies – by [the theory of] which Robbins (1952) meant “the general body of principles of governmental action or inaction - the *agenda* or *non-agenda* of the state as Bentham [1843] called them - in regard to economic activity” – and reforms at governmental level and by strategic decisions at corporate level of PA/port companies in budgeting, financing, investments, concessions, mergers & acquisitions, etc. Therefore, they merit be respectively denominated 'government policy' and 'corporate governance', or mixed in a category 'port governance', which is both government- and PA/company-based, as said 2 paragraphs above.

The 'planning and development' category is the unique with the same label in both P+ and W+. Planning is a management process at strategic (corporate), tactical (business) and operational (functional) levels, treated as such since Fayol (1916) to all management textbooks (Griffin 2005, Daft 2010, Hitt et al. 2012, etc.). This suggests its combination with 'management ...' in a unique 'management' category in W+, while in P+ it may be replaced by this missing category. The 'planning and development' is redundant, as functions in a business strive for its development. The economic development is related to the flows of resources and products of a social-economic activity – Robbins (1968) used it “in the sense in which, since the days of ... *The Wealth of Nations*, it has been used in the ... theory of production [i.e.] in relation to the movements in real income per head and to potential in this respect - real income being conceived as a stream of availability of goods and services as distinct from the experiences or satisfactions to which it give rise.” – i.e. to its functioning, thus being better in the term management that reflects the day-to-day operations. The term development is blurring; a more concrete term, investment, may better represent it.

The 'competition and competitiveness' and 'competition and performance' categories bring together two terms of a different nature: the first reflects a process or relationship between rivals striving for more customers, e.g., cargo

and passengers; based on the second, an attributive state, entities decide to enter competition. Port cooperation is not a category but a subcategory within port governance in P+, while it is not considered at all by W+. Instead of P+ and W+, Ng/ND consider 'competition and cooperation' as a research focus only for the 'foreland ...' category, while 'ports in intermodal transportation ...' consider a research focus of the 'hinterland' category (further discussed in §3.2.2). Competition, cooperation, and performance mix port economics, policy, governance, and management.

The nature of the 'terminal operation' category – the substantive 'studies' of the counterpart category in P+ must absolutely disappear, as §3.2.2 will explain – combines geography and management disciplines, the latter in the OR form, counting for 99% as for W+. Ng/ND considered 'port operation' as a research focus of the 'port' category. It is a key subcategory of port management. The terminal is the port basic unit and operated by PA or port operators that variously share responsibilities in service, tool, landlord, or private ports (World Bank 2001). Port operations have not to do with research *per se*, but port engineering or management to which it pertains, the first being a wholly part of management functions in all PAs. Research on operations enters to OR (management science) with engineering concerns or to R & D, a well known management function. In any case, are not port operations but port management a research area, which means that operations are simply a redundant, therefore, unnecessary term in 'management and operations' used as part of the triple PRF in W+. W+ used for their categories the names of 2 out of 8 journal categories they denominated arbitrarily, 'planning and development' and 'management', the latter being the unique out of 6 arbitrarily denominated disciplines used in the form of 'management and strategy', a redundancy.

3.2.2 Rankings and positions of categories in PRF classifications

Categories in the classified single and triple PRFs discussed above (§3.2.1) are ranked and shown in Tables (1, 2, 4), and positioned in diagrams if they exist, as in P+ (Figure 1, a) and W+ (Figure 1, b). It is not so clear why the respective authors chosen such a ranking of categories, implicitly denoting their interrelation if no diagram exists.

The diagram in P+ suggests that information flows so complicatedly from 1 to 6 and 4, then from 6 to 5, from 2 to 3, 4, and 7, and from 3 and 4 to 5, with 7 reporting to 4 and this to 3. In W+, categories are so enumerated that information flows naturally from 6, 7, and 8 to government-based categories 1 and 2 or corporate-based 3, 4, and 5, the first 2 not being related to the lasts 3. It is not clear why P+ positioned 'spatial analysis of ports' as category 7 and put it at the center of their diagram and why three categories numbered by 3, 4, and 7 from left to right at the center of the diagram are not so numbered to successively report one another, e.g., 3, 4, and 5 from right to left, in which case 'port policy ...' would be numbered 7. It is difficult to see why W+ put the numbered 8 'spatial analysis of ports' category to the opposite corner of 6 and 7, not opting to put, e.g., either categories 7 and 8 or 6 and 8 on the left corner. Unlike its counterparts in P+ and W+, ND's (2012) diagram, not shown here, indexed categories from 1 to 5; subcategories from 1.1 to 1.3, 2.1 to 2.3, 3.1 to 3.3, and issues from 1.1.1 to 1.1.4, 2.1.1 to 2.1.4, 3.1.1 to 3.1.4.

From 6 categories that Heaver suggested in port economics, port 'competition' kept trace within 'port competition ...' (P+) and 'port competition ...' (W+) categories, and 'port choice, competition and cooperation' research focus of the category 'foreland ...' (Ng/ND). Heaver's other category, '... port performance', kept trace within the same cited categories in W+ and P+, as 'port performance' subcategory in P+ (2008, 2010) that disappeared in P+ (2011), being 'performance measurement of terminals' subcategory of 'terminal studies' category in P+ (2008, 2010) transformed to 'terminal efficiency' in P+ (2011), and an issue 'Port performance' of 'port operation' research focus in Ng/ND.

The other categories of port economics are dispersed in subcategories in P+, W+, or Ng/ND or even disappear. Thus, the 'relationship of ports with ship costs' category disappeared as a category but it may have been included in 'port pricing'- or 'shipping'-like subcategories. The first is closely related to Heaver's 'port cost and pricing' category, that may be found as a subcategory within the 'port policy ...' category in P+ and port 'management ...' in W+, or as issue of 'port operation' research focus in Ng/ND. The second is a subcategory, 'shipping networks and ... ports', in the 'port in transport ...' category in P+ (2008, 2010) and 'changing logistics strategy of ... shipping lines ...' in P+ (2011); does not figure in W+; and is a research focus, 'port's place in shipping strategies ...' of 'foreland ...' category in Ng/ND. From the 4 topics of Heaver's 'specialized studies' category, security was kept within the category 'port policy ...' in '... safety and security ... in ports' subcategory in P+ (2008, 2010), reduced to '... safety and security' in P+ (2011); as 'safety and security ...' subcategory within the 'port policy' category in W+; and as 'safety and security issues' within the 'port operation' research focus of 'port' category in Ng/ND. Port labour was kept only in W+, in 2 subcategories named 'labour reform' within the 'governance and reform' category and 'HR management' within the 'management and strategy' category. The topics of economic rent and tug services disappear.

Heaver's 'industrial organization ... ports' category is related to 'ports in (transport and) supply chains' and 'spatial analysis (of ports)' categories in P+ and W+, while it is part of most subcategories at location, operation, and impact levels in Ng/ND. "Industrial organization concerns the workings of markets and industries, in particular the way firms compete with each other ... The main reason for considering industrial organization as a separate subject is its emphasis on the study of the firm *strategies* that are characteristics of market interaction ... [While] microeconomics typically focuses on ... cases of monopoly and perfect competition, industrial organization is concerned primarily with the intermediate case of oligopoly (...). For these reasons, a more appropriate definition of the field would be ... *economics of imperfect competition* ... [T]he goal of industrial organization is to address ... 4 questions related to the market power, [which] may be defined as the ability to set prices above cost ... If there is no market power, then there is little point in the study of industrial organization." (Cabral 2000). In a Nobel laureate's words, "industrial organization is ... the functioning of markets, a central concept in microeconomics. However, it took a long time ... for industrial organization to become one of the main fields of economics" (Tirole 1988).

Industrial organization must not be confounded with 'industrial relations' that W+ included as a subfield in 'port management' discipline (Figure 3), though it counted for 26% to the 'port governance ...' category versus 9% to 'port management ...' (Table 4), not placing it as a subcategory as did P+ in 'port governance'. Industrial relations denote, as HR management joining it since 1980s, the management of people and an academic inquiry area (Edwards 2003).

It results clear that the cited authors P+, W+, and Ng/ND did not put within homologous categories the issues of port economics as port competition, cooperation, performance, industrial organization, costs, pricing and security. By comparing the 8 categories in W+ to the 7 categories in P+, as well as changes in numbering and labels, it results that W+ added the port 'management and strategy' category and 2 semi-categories, 'performance' to port 'competition ...', cutting off and adapting the 'competitiveness' semi-category of P+, and 'reform' to 'port governance', while subtracting 'transport' from 'ports in transport ...', and 'regulation' from 'port policy ...'

3.2.3 Interrelations among (sub)categories in PRF classifications

Interrelations among categories in single and multiple PRFs are denoted but not expanded for port management elements by SV, arguing that "their obvious inter-relatedness must not be neglected", and by Heaver, underlining "the *interdependence* among aspects of port economics". After having considered the nature, ranking and position of categories (§3.2.1), finding interrelations among (sub)categories is a much easier twofold task that must be found out within each specific, single or multiple, PRF as well as between single and multiple PRFs.

Among the long names Heaver chosen for his first 5 categories, the 1st category name is blurring: more than ports are port costs that relate to ship costs, as "the uncertainty of port-ship cost trade-offs" is considered "in the total cost picture" by Heaver. His first 2 categories being port cost-related, they may be gathered in a unique category called e.g., 'shipping and port costs & pricing', where the term costs may be reduced, being part of pricing. If one considers a new 'port investments' category that Heaver mentioned with cost issues, then the more adapted names for the first 2 categories would be: 'shipping and port investments' and 'port pricing', still related through costs. Furthering such an analysis, it results that the 'inter-port competition' category must change in the short named 'port competition', including the competition within ports, even among its terminals, as Heaver (1995) said: "Terminals are the major focus of competitive strategy, not ports." After having listed his topics in port economics, Heaver argued to point out topics that appear to be neglected. Port policy was largely analyzed with the first port industrial organization's topic that he ended thus: "[Port] policy issues remain in port economics". Heaver did not mention port cooperation, whose principal forms he noted in Heaver et al. (1999, 2001), but replaced it with integration through mergers and alliances. Port competition and cooperation might be so well considered as parts of port industrial organization.

In port geography research, Ng/ND considered port competition and cooperation as a research focus only within the 'foreland ...' category: did they mean there is no competition and cooperation between a port and its hinterland or within a port itself, for instance, between transport modes and port operators? "Seaports mainly compete for ocean carrier patronage and short sea operators (feeders) as well as for land-based truck and railroad services", argued V+ (2004), and "The description of competition among ports changed from characterization as competition for common hinterlands (and forelands) to competition among alternate logistics systems of which ports are a part," said Heaver. Why Ng/ND consider 'port's place in shipping ...' as a research focus at impact level and 'port, intermodal transport ...', that could be otherwise named 'port's place in transport ...', as a research focus at operation level? Is not shipping an important part of transportation? Both these research focuses treat development problems. Why 'port, intermodal

transport ...' pertains only to hinterland? Did Ng/ND mean that supply chains that must be used in plural form, not in singular, stop in ports? Why the research focus 'port evolution over time' pertains neither to operation nor impact but location level? Why the 'port economics, management, and governance' category has policy and governance issues and only strategic management, while real management issues pertain to 'port operation' research focus in the 'port' category? The position of port research focuses in geography's categories is much questionable.

It seems evident to say that multiple PRFs sum up single PRFs composing them. Knowing the triple PRF in P+, 'port economics, policy and management', and in W+, 'port policy, management and operations', with composing elements neither defined nor explained, any correlation would be blurring as they seem different, having in common port policy and management, with economics in P+ and operations in W+. This is the most implicit knowledge that these authors do not pass to readers, making not easy the analysis of unexposed ideas. However, if port management is an area of port economics, as for SV, if port policies are and remain important issues in port economics, as for Bennathan and Walters (1979) and Heaver, and if operations are part of management, both triple PRFs proposed by P+ and W+ cannot stand up, as port economics would be more than sufficient. Strangely, P+ and W+ do not even have a port economics category, with P+ ejecting even port management. Does it mean that port economics is the same thing with port operations? Unlike SV, W+ did not consider management as an area of economics (Figure 3 in 2000s), except marketing that inexplicably is found at the intersection of both areas. W+ argued that port economics and other disciplines moved toward an increasing interdisciplinary research from 1980s to 2000s (Figure 3), using increasingly theories, methods, and tools from each other, with the port economics discipline counting for 60% to the 'port competition ...' category, 56% to 'port planning ...', 39% to 'port policy', 29% to 'port governance', and 19% to 'port management ...' (Table 4). Did these numbers mean that, for instance, port planning and development is 17% more than port policy part of port economics? A yes would cast a serious shadow on results.

Interrelations among categories in both diagrams in P+ and W+ (Figure 1, a, b) show serious problems, while a close examination of (sub)categories in both classifications shows similar results.

P+ named their first category 'terminal studies', with the last term, used only in Heaver's last category 'specialized studies', unnecessarily blurring relationships with 'port competition ...' and 'port planning ...' categories that concern terminal operations and resources, not terminal studies. Though is talking about port research, i.e. port studies, the term is inappropriate as port issues must be explicitly shown, not studies as such. This category is badly positioned and interrelated: terminals are the basic units of ports and all port issues depend on terminal operations. This means that this category must be at least related to those numbered 2, 3, and 7, though there are still terminal issues that interest 'port policy ...'. In this respect, W+ had better named and related 'terminal operation' to all other categories, but the position of this categories and those numbered 6 and 8, discussed above with alternatives (2nd paragraph in §3.2.2), is blurring. For these 3 categories should be known who provides the information they further address if not PA and/or companies themselves. Saying that categories 6-7 "are generally regarded as topics which provide governments, PAs and companies with information used for their decision making" and category 8 "is relevant to all port policy and operational activities", W+ admitted a vertical information flow. At the same time, they exclude categories 6-8 from paternity, though these categories are issues concerning PAs and/or companies, according to the organization model of port resources, functions, and actors, with category 6 pertaining also to government policy.

The 'port competition ...' category is not related to other categories but 'terminal studies' in P+. It is even more incomprehensible as P+ (2008) found that "papers examining port competition and competitiveness seem to be of great importance for studies of port planning and development". This means that to plan a port future business is necessary what competitors plan to do or which are their strengths and weaknesses. But, the missed links of 'port competition ...' category to 'ports in transport ...' and 'spatial analysis of ports' categories simply mean that PAs need not know where competitors are located and what development phase they have actually or will have in the future. The diagram in W+ again avoids these problems, but shows another one. By dividing port research in non-related categories based on government and PAs/companies, W+ prevent 'port policy' and 'governance ...' to be addressed to and aware of 'management ...', 'competition ...' and 'ports in supply chains'. Observing the missing links, 2 questions arise: to who port policy and governance and reform is addressed if not to port stakeholders? Are they all into?

3.2.4 Number, names, natures, and positions of subcategories and issues in PRF classifications

A first important problem is if the number of (sub)categories and issues must be equal or differ, in which case the how much question arises. This problem arises among papers classifying either single or multiple PRFs. It is natural

that single PRFs have different numbers of (sub)categories and topics, but this is not if multiple PRFs supposedly reaching a complete picture of the same port research reality have a lot of differences concerning the number of port issues. This is worst when the same group of authors shows various numbers of issues in successive editions of the same idea, many of which bear even different names as occurs with 29 subcategories in P+ (2008), 30 in P+ (2010), and 40 in P+ (2011), who listed 100 port issues, against 38 subcategories in W+ (2010a, 2012). In classifying their single PRFs, Heaver for port economics and Ng/ND for port geography not listed subcategories for some categories. Each of these must count for 1 subcategory as a category must have at least itself as a subcategory to exist (see the discussion on files and folders in §2.1). Hence, 6 categories in port economics have 10 topics (subcategories), while 5 categories in port geography include 14 research focuses (subcategories) totalizing 38 issues.

The main problem is if (sub)categories and issues of the same level should have the same nature or not and which nature must be the most preferred. It seems natural that going from first-level to last-level subcategories the nature similitude must change incrementally from identical to very different, while issues may be of different natures, as for different research strategies, theories, methods and techniques of analysis researchers may use. Another problem that is associating the nature of (sub)categories and issues is their denomination, which often may dictate the former. However, it seems that not all cited papers had this in mind before achieving their classification results, as the above detailed analysis has discovered for single and triple PRFs and their categories (§3.2.1-3).

A last main problem with port research (sub)categories and issues is if they have the right position and relations, that is, linkages, within their higher-level (sub)categories, knowing that a subcategory of level n is considered of higher level than that of level $n+1$. After a detailed analysis of the positioning of categories and their interrelations in single and multiple PRFs, for missing space, only most important issues will be analyzed as regards the position, as treating the interrelationship between issues is out of reach of this paper, because of issue technicalities.

To what is already said above for port economics issues, it may be added that their number is small and that some of the issues not counted among those that Heaver detailed explicitly, in particular, port policy, port investment and port cooperation, the latter discussed as integration, merited having a significant place in his categorization.

Besides some port geography's research focuses and issues analyzed above, other issues seem still problematic in Ng/ND. They associate port attractiveness, an issue of the research focus 'port choice ...', to the pertaining category 'foreland ...', that is, to shipping operators, while W+ (2010a, 2012) consider port selection as "a traditional topic analysing shipping liners' or shippers' port choice behavior"; otherwise Robinson's (2002) new paradigm would be false: "Ports will compete not simply on the basis of operational efficiency or location ... but on the basis that they are embedded in supply chains that offer shippers greater value. Chains compete, not individual ports." Chains here are supply chains which, as said above, relate to all the triptych foreland-port-hinterland or 'port system', which has again the same concern with port clustering and port competition and cooperation, issues of multiple players within a port and its hinterland. By arguing that "Maritime industries form a vital link in global supply chains", ND (2012) surely mean that supply chains include the port and its hinterland, as they have not other definition of port foreland from Weigend (1958), Bird (1971), Rodrigue et al. (2013), etc. For the same reason, issues within the research focus 'port, intermodal transportation ...', as this name implies, relate to hinterland as well as port and foreland.

In addition to the above analysis on (sub)categories and issues related to P+ and W+, other concerns are alive. There are (parts of) 12 subcategories in P+ that are not in W+ and vice versa and (parts of) subcategories being in both P+ and W+, bearing different names in homologous categories or dispersed between or gathered from more categories, like port strategy, port pricing, etc. However, classifications in P+ and W+ remain so close to each other, with more or less the same port research issues. In such conditions, this question arises: How can this be possible when the real difference should be between 2 totally different single PRFs, port economics in P+ and port operations in W+? Furthermore, OR covered at most three subcategories in 'terminal operation' category, which is part of both classifications as well as port policy. This issue raises questions about how authors in P+ and W+ considered port economics and OR in their mind, still remained implicit. P+ included port economics as a single PRF in their triple PRF and W+ did not, though observing a high % of economics in their 5 categories. Though P+ (2008, 2010) admitted to exclude terminal OR papers, P+ (2011) considered the subcategory optimization of terminal operations. Contrarily, W+ admitted OR in their research and placed it as a subcategory.

Port pricing is variously considered by all cited papers as regards the (sub)category it pertains to. It is a category with port costs in Heaver's port economics; a subcategory 'port pricing' within the category 'port management ...' in W+ or part of a subcategory, 'port pricing, state ...' in P+ (2008, 2010) renamed 'pricing mechanisms' in the category

'port policy ...' in P+ (2011); and an issue of research focus 'port operation' in the category 'port' in Ng/ND. This analysis may hit (sub)categories as port strategy or topics even not considered as port investments, clusters, etc.

The main differences noted between classifications in P+, W+, and Ng/ND relate to subjective perceptions and evaluations due to different experiences and knowledge that 3 groups of authors had during their academic life and research more than to a selected period of 1, 3 or 6 decades gathering respectively 395, 840, or 399 selected papers.

4. Conclusion and further research

This paper aimed to review and critically analyze all former works whose objective was to review and/or classify PRFs like port economics, policy, management, operations, or geography either in single or multiple combinations. As the critical analysis methodology implies, a critical reading of former works, comparing and contrasting them, and a self-critical writing is applied by using an in-depth screening of choices in two dimensions: methodology used and categorization, i.e. results, achieved by these former works.

Methodological elements include at first the objectives of the research works reviewed above, which are papers in journals as those of SV and V+, in conferences and journals like the several papers of P+, W+ and Ng/ND, or a chapter in an edited book like Heaver's. The research works analyzed here respect and realize somehow their stated objectives, except SV who reviewed more port economics, policy, and governance than port management that they consider more a body to be incorporated to PAs than a research field in a paper following a Goss style.

Other methodological elements that have been analyzed are the definition of PRFs, ports and units of analysis. No research work has defined the PRF it used to review or classify, except Heaver having recalled other authors and made part of a book that defined port economics at introduction, and Ng having discussed and asked a key question: what is or should be port geography? They mostly used taken-for granted, i.e. implicit definitions for their PRFs, not available to readers. As a direct consequence, single PRFs are uselessly nested in triple PRFs, like port economics and policy and port management and operations respectively in P+ and W+ for their triple PRF, and a triple PRF-like, port management, policy and governance that Ng/ND introduced as a category in a single PRF. Meanwhile, not all papers defined ports and port unit of analysis, which are not considered in the same way, if any.

Several authors like SV, V+, Heaver or Winston that Heaver follows, have reviewed any kind of research work, while P+, W+ and Ng/ND restricted entries in their database to journal papers only, replacing the principle that one paper may include many research issues by an inutile mutual exclusivity of papers in their content analysis: they forget that the concern is finding the number of research works treating a specific research topic. This reason is sufficient to consider the results of various issues within their analytical framework, which is explicit only in W+, as inexact or false that cannot represent the reality covered by the announced principle.

Methodological elements like publication sources, period, and number of selected former works and number of authors in the cited and analyzed works, though different, not influenced the categorizations. This paper's Authors do not accept citation ratios as an argument confirming the classification of single or multiple PRFs.

The method of classification, as the last methodological element, is accepted by the cited authors to be subjective. Heaver was explicit and sincere arguing that he divided arbitrarily, for convenience, port economics in 6 topics. The approach used by many was "authors know" or "other references know", which give "their own opinion", without any justification. The issue for researchers selecting research works and classifying a PRF in (sub)categories is not to propose a specific classification "in their opinion" or refer the reader to other researchers saying the same phrase, but to explain why they have their opinions and in which logical reasons these are based, missing for most of issues.

Categorization elements regards at first the single PRFs, which are used as such in SV, V+, and Heaver, mixed in triple PRFs in P+ and W+, as single categories within P+ and W+, and as a triple PRF-like category in Ng/ND. Though single PRFs were included in 2 triple PRFs, P+ did not use as one of their 7 categories port management or port economics, which was even not included in the triple PRF that W+ classified, finding that port economics was in high % values from 19% to 60% in their 5 out of 7 categories, thus casting a lot of shadows over their results of disciplinary distribution in research themes or categories (Table 4). Seemingly different triple PRFs have quite the same (sub)categories, at most 40 in P+ and 38 in W+, though bearing different labels from which 12 are found in P+ and not in W+ and vice-versa, not still positioned in homologous categories.

Other categorization elements analyzed are the number, name, and nature of (sub)categories and issues. The names that the cited authors chose for both triple PRFs and several categories have been plenty of redundancies that

surely could be avoided if the key terms were defined and the respective choices explained at the beginning of the story. The nature of categories is either clearly appurtenance to a single PRF or mainly a given combination of 6 single PRFs: port economics, policy, geography, governance, management and operations. W+ used only 2 out of 8 labels of their journal categories and 1 out of 4 port disciplines for naming their categories.

The ranking and position of categories shown in tables and diagrams create difficulties for the information flow in P+, while W+ created 8 categories, of which 2 government-based, 3 PA/company-based, and 3 without paternity. Heaver's categories for port economics are disappeared or dispersed in the subcategories of other classifications, excepting port competition that remained a semi-category, while others did not put in homologous categories port economics issues like competition, cooperation, performance, industrial organization, costs, pricing, security, etc. W+ considered industrial relations as part of management discipline, while it counts for 26% to the 'port governance ...' category and only 9% to 'port management ...', but not included it in their (sub)categories like P+.

Interrelations among categories are noted but not expanded by SV and Heaver. Authors not include their former contributions in their categories, like Heaver with intra-port competition and port cooperation or put subcategories in 1 out of many possible categories, as Ng/ND put 'port system' and 'port choice, competition & cooperation' only into foreland, 'ports, intermodal transportation and supply chains' into hinterland, and many real management problems into port and not the triple PRF-like category 'port management, policy and governance'. Both diagrams in P+ and W+ show missing links among certain categories, as 'port competition and competitiveness' related only to 'terminal studies' in P+, government-based not related to PA/company-based categories and categories numbered 6-8 not having paternity like the precedents in W+. Even though having a significant difference in denominating their PRFs, and in number and decades of the research papers selected, with 395 instead of 399 and 840 papers and 1 instead of 6 and 3 decades, classifications results in P+, Ng/ND and W+ remain so close to each other, having at most 40 subcategories including 100 issues in P+ (2011), 14 including 38 issues in Ng/ND and 38 in W+.

Port pricing as various issues is variously considered by all cited papers as regards the (sub)category it pertains to, being even a category in Heaver. Other key issues like port investments or port clusters are not figuring out at all.

In any case, no paper tried to get more profundity to the logical reasons on which basing their classification of PRFs. This is the main argument for further research in classifying single or multiple port research fields. Other interesting direction for future research may be any shortcoming this paper evidenced in respect of the chosen elements in both methodology used and categorization results achieved by various authors of the cited papers. Other researchers might not have the same taste of observations with the Authors of the present paper.

For researchers is obligatory to know in what direction their research is going, in order to position themselves and issues they are searching for in the right branches of the port knowledge in order to reap the fruits they merit due to their huge efforts, including experience, time, energy, and money.

Acknowledgements

We are much indebted to two unknown reviewers for their valuable comments, and to our friends Xhorxhi Qirici and Sulejman Hoxha for their invaluable financial help via their firms, respectively Mondoffice and Vip Saloti.

References

- ABS, 2015, Academic Journal Guide 2015. UK, pp. 54.
- Amin, A., Thrift, N., 2000, Intervention: What kind of economic theory for what kind of economic geography? *Antipode* 32.1, 4-9.
- Bennathan, E., Walters, A., 1979, *Port Pricing and Investment Policy for Developing Countries*. A World Bank Research Publication, Oxford University Press, pp. 250.
- Bentham, J., 1843, *A Manual of Political Economy*, in: *The Works of Jeremy Bentham*, Vol. 3 (1843). The Online Library of Liberty, pp. 60-145.
- Bichou, K., 2007, Review of Port Performance Approaches and a Supply Chain Framework to Port Performance Benchmarking, in: *Devolution, Port Governance and Port Performance*. In: Brooks, M., Cullinane, K. (Eds.). JAI Press, Oxford, pp. 567-598.
- Bird, J., 1971, *Seaports and Seaport Terminals*. Hutchinson & Co, London, pp. 240.
- Brooks, M., Cullinane, K., 2007, *Devolution, Port Governance and Port Performance*. Idem (Eds.). JAI Press, Oxford, pp. 701.
- Burgess, K., Singh, P., Koroglu, R., 2006. Supply chain management: a structured literature review and implications for future research. *International Journal of Operation & Production Management* 26.7, 703-729.

- Cabral, L., 2000, Introduction to Industrial Organization. MIT Press, Cambridge, MA, pp. 374.
- Chang, S., 1978, In defense of Port economic impact studies. *Transportation Journal* 17.3, 79-85.
- Clark, G., Feldman, M., Gertler, M., 2000, Preface, in: *The Oxford Handbook of Economic Geography*. In: Clark, G., Feldman, M., Gertler, M. (Eds.). Oxford University Press, Oxford, UK, pp. vii-ix.
- Coto-Millán P., Pesquera M., Galán J., 2010, A Methodological Discussion on Port Economic Impact Studies and their Possible Applications to Policy Design, in: *Essays on Port Economics*. In: Coto-Millán P., Pesquera M., Castanedo J. (Eds.), Berlin: Physica-Verlag, pp. 151-160.
- Cullinane, K., Talley, W., 2006, Introduction, in: "Port Economics". In: Cullinane, K., Talley, W. (Eds.). JAI Press, Oxford, pp. 1-10.
- Cullinane, K., Toy N., 2000, Identifying influential attributes in freight route-mode choice decisions: a content analysis. *Transportation research Part E* 36.1, 41-53.
- Cullinane, K., Wang, T-F., 2007, Data Envelopment Analysis (DEA) and Improving Container Port Efficiency, in: *Devolution, Port Governance and Port Performance*. In: Brooks, M., Cullinane, K. (Eds.). JAI Press, Oxford, pp. 517-566.
- Daft, R., 2010, *Management*, 9th edition, South-Western, Cengage Learning, Mason, OH, pp. 699.
- Davis, C., 1983, Regional port impact studies: A critique and suggested methodology. *Transportation Journal* 23.2, 61-71.
- De Langen, P., 2002, Clustering and performance: The case of maritime clustering in the Netherlands. *Maritime Policy and Management*, 29.3, 209-221.
- De Langen, P., 2004, Governance in seaport clusters. *Journal of Maritime Economics and Logistics* 6.2, 141-156.
- DFG, 2017, DFG classification of scientific disciplines, research areas, review boards and subject areas (2016-2019), Germany, pp. 4.
- Dooms M., Haezendonck E., Verbeke A., 2015, Towards a meta-analysis and toolkit for port-related socio-economic impacts: a review of socio-economic impact studies conducted for seaports. *Maritime Policy and Management* 42.5, 1-22.
- Edwards, P., 2003, The Employment Relationship and the Field of Industrial Relations, in: *Industrial Relations: Theory and Practice*. 2nd edition, In: Edwards, P. (Ed.). Blackwell Publishing, Oxford, pp. 1-36.
- Estache, A., Gonzalez, M., Trujillo L., 2001, Technical efficiency gains from port reform: The potential for yardstick competition in Mexico, Policy Research Working Paper 2637, World Bank Institute, The World Bank (slightly modified in 2002, *World Development* 30.4, 545-560).
- Fayol, H., 1916, *Administration Industrielle et Générale*. Edition présentée par P. Morin, Dunod 1979, Paris, pp. 156.
- Fischer, C., Güdler, J., Hahnen, H., 2013, Standardization of classification schemes for evaluative and monitoring purposes - Services of the DFG. Presentation, Bonn, 13 May, slides 22.
- Gonzalez, M., Trujillo, L., 2008, Efficiency measurement in the port industry: A survey of the empirical evidence, Discussion Paper Series n° 07/08, Department of Economics, School of Social Sciences, City University London, UK.
- Goss, R., 1987, Port authorities in Australia. Occasional Paper 84, Australian Government Publishing Service, Canberra, pp. 60.
- Goss, R., 1990, Economic policies and seaports: 1. The economic functions of seaports. *MPM* 17.3, 207-219; 2. The diversity of port policies. *MPM* 17.3, 221-234; 3. Are port authorities necessary?. *MPM* 17.4, 257-271; 4. Strategies for port authorities. *MPM* 17.4, 273-287.
- Hammervoll, T., 2016, Expanding the unit of analysis from firms to supply networks. *Journal of B2B Marketing* 23.3, pp. 193-205.
- Heaver, T., 1993, The many facets of maritime economics, in association (Inaugural address to the International Association of Maritime Economists [IAME]). *Maritime Policy and Management* 20.2, 121-132.
- Heaver, T., 1995, The implications of increased competition among ports for port policy and management. *Maritime Policy and Management* 22.2, 125-133.
- Heaver, T. D. 2002. The evolving roles of shipping lines in international logistics. *International Journal of Maritime Economics* 4.3, 210-230.
- Heaver, T., 2006, The Evolution and Challenges of Port Economics, in: "Port Economics". In: Cullinane, K., Talley, W. (Eds.). JAI Press, Oxford, pp. 11-42.
- Heaver, T., Meersman, H., Moglia, F., Van de Voorde, E., 1999, Do mergers and alliances influence European shipping and port competition? Research Paper, University of Antwerp, pp. 21 (published also in 2000, *Maritime Policy and Management* 27.4, 363-373).
- Heaver, T., Meersman, H., Van de Voorde, E., 2001, Co-operation and competition in international container transport: Strategies for ports. Research Paper 2001-002, University of Antwerp, Belgium, pp. 19 (published also in *Maritime Policy and Management* 28.3, 293-305).
- Hillier, F., Lieberman, G., 2015, *Introduction to Operations Research*. 10th edition, McGraw-Hill Education, New York, pp. 1050.
- Hitt, M., Black, S., Porter, L., 2012, *Management*. 3rd edition, Prentice Hall, New Jersey, pp. 513.
- Japan Society for the Promotion of Science, 2015, Attached Table 1: List of categories, areas, disciplines and research fields, in: *Application Procedures for Grants-in-Aid for Scientific Research-KAKENHI - FY2015*, Japan, pp. 32-34.
- Krippendorff, K., 1989, Content Analysis, in: *International Encyclopedia of Communication*. Vol. 1. In: Barnouw, E., Gerbner, G., Schramm, W., Worth, T., Gross, L. (Eds.). New York, Oxford University Press, pp. 403-407 (retrieved from http://repository.upenn.edu/asc_papers/226).
- Krippendorff, K., 2004, *Content Analysis: An Introduction to its Methodology*. 2nd edition (1st ed.: 1980), Sage Publications, London, pp. 422.
- Lagoudis, I., Theotokas, I., Broumas, D., 2017, A literature review of port competition research. *International Journal of Shipping and Transport Logistics* 9.6, 724-762.
- Little, A., 1979, Port economic impact kit, Prepared for Pacific Coast Association of Port Authorities, US MARAD and US Department of Commerce, pp. 148.
- Mackie, P., Preston, J., 1998, Twenty-one sources of error and bias in transport project appraisal. *Transport Policy* 5.1, 1-7.

- Mentzer, J., De Witt, W., Kebler, J., Min, S., Nix, N., Smith, C., Zacharia, Z., 2001, Defining supply chain management. *Journal of Business Logistics* 22.2, 1-25.
- Mingers, J., Leydesdorff, L., 2015, Identifying research fields within Business and Management: A journal cross-citation analysis. *Journal of the Operations Research Society* 66.8, 1370-1384.
- Mitcham, C., Briggles, A., 2005, Management, in: *Encyclopedia of Science, Technology, and Ethics*, Volume 3. In: Mitcham, C. (Ed.). Thomson-Gale, New York, pp. 1152-1155.
- Ng, A., 2013, The evolution and research trends of port geography. *The Professional Geographer* 65.1, 65-86 (published online: 21 May 2012).
- Ng, A., Ducruet, C., 2012, Port geography papers bibliometrics (1950-2011): Community structure, background and diffusion, *International Association of Maritime Economists (IAME) Conference*, Taipei, Taiwan, 5-8 September.
- Ng, A., Ducruet, C., 2014, The changing tides of port geography (1950–2012). *Progress in Human Geography* 38.6, 785-823.
- Notteboom, T., 1998, Spatial and functional integration of container port systems and hinterland networks in Europe, in: OECD (2001). In: *“Land Access to Sea Ports”*. Report of the 113th round table, European Conference of Ministers of Transport (2000), Paris, pp. 5-55.
- Notteboom, T., Knatz, G., Parola, F., 2018, Port co-operation: types, drivers and impediments. Guest editorial, *Research in Transportation Business & Management - Themed Volume*, 1-4.
- Notteboom, T., Winkelmann, W., 2001, Structural changes in logistics: How will port authorities face the challenge? *Maritime Policy and Management* 28.1, 71-89.
- Olivier, D., Slack, B., 2006, Rethinking the port. *Environment and Planning A* 38.8, 1409-1427.
- Pallis, A., Vitsounis, T., de Langen, P., 2008, Port economics, policy and management: Bibliometric and content analysis of published research. *IAME Conference*, Dalian, China.
- Pallis, A., Vitsounis, T., de Langen, P., 2010, Port economics, policy and management: Review of an emerging research field. *Transport Reviews* 30.1, 115-161.
- Pallis, A., Vitsounis, T., de Langen, P., Notteboom, T., 2011, Port economics, policy and management: Content classification and survey. *Transport Reviews* 31.4, 445-471.
- Panayides, P., Maxoulis, C., Wang, T-F., Ng, A., 2009, A critical analysis of DEA applications to seaport economic efficiency measurement. *Transport Reviews: A Transnational Transdisciplinary Journal* 29.2, 183-206.
- Robbins, L., 1965, *The Theory of Economic Policy*. (1st edition: 1952). Macmillan & Co., Ltd., London, pp. 229.
- Robbins, L., 1968, *The Theory of Economic Development in the History of Economic Thought*. Macmillan St Martin's Press, London, pp. 197.
- Robinson, R., 2002, Ports as elements in value-driven chain systems: The new paradigm. *Maritime Policy and Management* 29.3, 241-255.
- Rodrigue, J-P., (with) Comtois, C., Slack, B., 2013, *The Geography of Transport Systems*, 3rd edition (1st: 2006), Routledge, New York, pp. 432.
- Runes, D., 1942, *Dictionary of Philosophy*. Philosophical Library, New York, pp. 355.
- Sheppard, E., 2000, Geography or Economics?: Conceptions of Space, Time, Interdependence, and Agency, in: *The Oxford Handbook of Economic Geography*. In: Clark, G., Feldman, M., Gertler, M. (Eds.). Oxford University Press, Oxford, UK, pp. 99-119.
- Stahlbock, R., Voß, S., 2008, Operations research at container terminals: A literature update. *OR Spectrum* 30.1, 1-52.
- Steenken, D., Voß, S., Stahlbock, R., 2004, Container terminal operation and operations research - a classification and literature review. *OR Spectrum* 26.1, 3-49.
- Suykens, F., Van de Voorde, E., 1998, A quarter of a century of port management in Europe: objectives and tools. *Maritime Policy and Management* 25.3, 251-261.
- Svendsen, A., 1958, *Sea Transport and Shipping Economics*. Institute for Shipping Research, Bremen, pp. 473.
- Taylor, B., 2013, *Introduction to Management Science*. 11th edition, Pearson Education, Inc., New York, pp. 841.
- Thorburn, T., 1960, *Supply and Demand of Water Transport: Studies in Cost and Revenue Structures of Ships, Ports, and Transport Buyers with Respect to their Effects on Supply and Demand of Water transport of Goods*. Business Research Institute, Stockholm School of Economics.
- Tirole, J., 1988, *The Theory of Industrial Organization*. The MIT Press, Cambridge, MA, pp. 476.
- Wallace, M., Wray, A., 2011, *Critical Reading and Writing for Postgraduates*. 2nd edition, Sage Publications Ltd., London, pp. 265.
- Waters, R., 1977, Port economic impact studies: Practice and assessment. *Transportation Journal* 16.3, 14-18.
- Weigend, G., 1958, Some elements in the study of port geography, *The Geographical Review* 48.2, 185-200.
- Winston, C., 1985, Conceptual developments in the economics of transport: An interpretive survey. *Journal of Economic Literature* 23.1, 57-94.
- Woo, S-H., Pettit, S., Kwak D-W., 2010a, Trends and themes in port research since 1980: A decadal approach. In: *Proceedings of IAME Conference*, Lisbon, Portugal, 7-9 September.
- Woo, S-H., Pettit, S., Kwak D-W., 2010b, Methodological issues pertaining to port research since 1980. In: *Proceedings of IAME Conference*, Lisbon, Portugal, 7-9 September.
- Woo, S-H., Pettit, S., Kwak D-W., Beresford, A., 2011, Seaport research: A structured literature review on methodological issues since the 1980s. *Transportation Research Part A: Policy and Practice* 45.7, 667-685.
- Woo, S-H., Pettit, S., Beresford, A., Kwak D-W., 2012, Seaport research: A decadal analysis of trends and themes since the 1980s. *Transport Reviews* 32.3, 351-377.
- World Bank, 2001, *Port Reform Toolkit*. 1st edition (2nd edition: 2007, pp. 417), New York, pp. 459.