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IMPROVING TRAINING AND EDUCATION IN CLUSTERS; LESSONS FROM THREE PORT CLUSTERS

Paper for the ERSA Congress 2005, Free University Amsterdam

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Abstract

The quality and availability of labour is important for the economic performance of clusters and consequently regions. The availability of labour in clusters is superior compared to locations outside clusters, because labour in clusters is relatively mobile, education services in clusters are relatively good and employees have a high willingness to invest in specific skills. Apart from these effects that arise ‘spontaneously’, firms and governments also actively aim to improve the quality of the labour pool in the cluster. Since clusters differ in the extent to which relevant stakeholders manage to improve the labour pool, these efforts have an effect on the performance of clusters.

This paper presents an analysis of these efforts of firms and governments to improve the quality of the labour force in three seaport clusters. In this paper the concept of a ‘training and education regime’ is presented as an approach to analyse efforts of firms and governments to improve the labour pool. This approach uses insights from various institutional economic theories. Important results of three case studies include first, the observation that the quality of training and education regime differs substantially per cluster. Second, the presence of a ‘regime manager in Rotterdam adds to the quality of Rotterdam’s training and education regime. Such an organisation may be effective across countries and clusters. Finally, the presence of leader firms, willing to invest in training and education also improves an education regime.

Key-words: clusters, labour, performance, collective action, institutions, cases, seaports

1 Introduction

The quality and availability of labour is essential for the economic performance of clusters. Marshall (1920) already pointed out the role of labour in clusters, and Krugman (1991) identifies the presence of a labour pool as one of the three ‘agglomeration forces’, forces that lead to spatial clustering of related economic activities. Once clusters have developed beyond a certain size (in terms of jobs or number of firms) the quality and availability of specialised labour in clusters is better than outside clusters, for a number of reasons. First, employees with specific skills required in the cluster will move to the cluster, to enhance their employment opportunities and career development. Second, for employees in the cluster, it is more attractive to further invest in specialised skills, because these skills are useful for a variety of firms in the cluster. Specialised skills do not limit employability. Third, due to the substantial demand for specialised training and education, the quality of training and education services in the cluster is relatively high. This attracts new employees to the cluster and enhances the investments of employees in training. Furthermore, it increases enrolment of students in studies related to the cluster (Wolfe and Gertler, 2004). These effects that lead to a high quality and availability of labour in a cluster arise ‘spontaneous’ as a result of decisions of individuals investing in their careers (Krugman, 1991).

Apart from these effects that arise ‘spontaneously’, firms and governments also actively aim to improve the quality of the labour pool in the cluster. Such investments do not arise spontaneously and depend on various institutional factors (see Amin, 1999). Clusters will differ in the extent to which relevant stakeholders invest in improving the labour pool. Such differences can be substantial and persist over long periods of time (see Storper, 1995 and Rodrik et al. 2004 for the influence of institutional differences on economic development in general). These efforts have an effect on the performance of clusters. Thus, effective *cluster governance* is a potential source of competitive advantage of a cluster. Whereas the influence of universities and knowledge centers on ‘learning and innovation systems’ has been relatively widely discussed (See Boucher et al., 2003 and Keane and Allison, 2003), the efforts to improve the labour force as a whole has received very limited attention, while such initiatives may be very relevant for a large number of relatively small or ‘non-hightech’ clusters (see Wolfe and Gertler, 2004).

This paper presents an analysis of the efforts of firms and governments to improve the quality of the labour force in three seaport clusters. Seaports are relevant cases for

understanding labour in clusters, they are clearly clusters (De Langen, 2004) and are generally characterised by relatively much cooperation between public and private actors. Finally, port clusters are of interest because of the special role of ‘port authorities’, public organisations that play a large role in ports (De Langen, 2004). These port authorities act to some extent as ‘cluster managers’. Such a role may be relevant in other clusters as well. The cases may provide new empirical insights that are relevant in the largely theoretical debate on the relation between institutions and regional development.

In the following section, the approach to analyse efforts of firms and governments to improve the labour pool is discussed. Next, the results of three case studies of ports are discussed. A concluding section finalises this paper.

2 Improving the quality of the labour pool

Firms and other organisations in a cluster can purposefully create ‘positive cluster externalities’, for instance by jointly investing in the quality of education. Such investments create ‘externalities’ because the benefits of a better labour force spill over to all firms in a cluster, through mobility of labour in the cluster, a large inflow of new potential employees and less scarcity of skilled labour with a downward effect on wages. Private investments in the quality of the labour force, especially through improving the training and education infrastructure are problematic because the benefits of such investments cannot be ‘internalised’ by individual firms, but spread to all firms in the cluster, regardless of their contribution to the investments. Unless one ‘leader firm’ has a dominant position in the cluster, joint investments are required. However, even when (collective) benefits of co-operation exceed (collective) costs, co-operation does not (always) develop spontaneously, because the collective action problem (Olson, 1971) is relevant in clusters (De Langen 2004). Individual firms can ‘free-ride’ at the expense of other firms in the cluster, and this threat may prevent collective action in the first place.

Cooperative efforts are relevant for various types of investments. Frequently mentioned examples include ‘training and education’, innovation and marketing (see De Langen and Visser, 2004, Fuller et al, 2004 and Ryan and Phillips, 2004). The presence of ‘collective action problems’ explains the emphasis placed on trust and ‘community involvement’ in clusters (see Maskell and Lorenzen, 2004), because both can help to overcome these collective action problems.

We propose the concept of ‘collective action regimes’ (CAR’s) to analyse the quality of cluster governance. For instance, the ‘training and education regime’ consists of all collaborative efforts of actors in the cluster to in the field of training and education. In different clusters, different regimes are relevant. Central in creating effective regimes is the ability to commit resources, such as capital and managerial involvement and commitment, to investments with shared benefits for firms in the cluster.

This general definition of ‘collective action regimes’ (CAR’s) can be applied to specific regimes, such as the training and education regime (TER). Thus, the training and education regime can be defined as *‘the set of collaborative initiatives, taken by the relevant actors in the port cluster with the aim to improve the quality of the labour pool’*.

An analysis of the training and education regime requires attention for the roles of different *modes of coordination* in this regime. Six general modes of coordination can be distinguished (see Hollingsworth and Boyer¹, 1997, Williamson, 1985 and De Langen, 2004 for a more substantial discussion of the role of these modes of coordination).

1. Markets;
2. Corporate hierarchies (firms);
3. Interfirm alliances (joint ventures);
4. Associations;
5. Public-private partnerships;
6. Public coordination.

Markets are used when coordination beyond price is not required while hierarchies are used when activities can best be integrated in a single firm. Corporate hierarchies often result from vertical integration, for instance to reduce uncertainty. Public coordination is used to provide services with a ‘public good character’. Apart from these three ‘ideal type’ forms of coordination, three coordination mechanisms that are a mixture of the above mentioned three forms, are frequently distinguished: interfirm alliances, associations and public private

¹ Hollingsworth and Boyer (1997) also identify six modes of coordination, five of which we use as well. We add public-private partnerships and do not include ‘communities’, because communities are in our opinion no modes of interaction.

partnerships. *Interfirm alliances*² are used to facilitate cooperation between a relatively small number of firms. Alliances between firms are more responsive to dynamic environments than corporate hierarchies (Best, 1990). *Associations* are collective organisations of firms in similar or related markets that provide collective goods (Hollingworth et al, 1994) for the members of the association. Associations are set up to enable cooperation between a large group of firms with shared interests. *Public-private organisations* are used to enable cooperation between public and private actors. Each of these modes of coordination has advantages and disadvantages. Consequently, different modes play complementary roles in a (training and education) regime.

The mix and roles of different coordination mechanisms in a regime is relatively stable and *path dependent*³ (see Westlund, 1999). Firms do not necessarily have sufficient incentives to change a regime⁴. *Therefore, relatively inefficient regimes can persist.* Consequently, regimes differ substantially, between countries, industries and clusters (see Hollingsworth et al (1994), who even argue that differences in regimes are central in the competition between clusters).

The quality of the training and education regime depends on the ability of actors in the port cluster to create coalitions willing to invest in the *training and education infrastructure*. A large variety of firms in the port cluster, such as cargo handling firms, port industries, warehouse operators and transport companies benefit from a better labour pool. However, since individual firms cannot fully appropriate the benefits of improving training and education, inter-organisational arrangements (coalitions) are necessary to attract resources to invest in the quality of the training and education (see Olson, 1971). Five variables influence the quality of the training and education regime (see De Langen 2004 for a more detailed discussion):

² We do not use the general term networks but the more narrow concept of 'interfirm alliances' that only include relatively tightly coupled networks of firms.

³ Campbell et al (1991) argue that 'When actors have already established associations (...) and thus the capacity for selecting far sighted cooperative strategies, they can more easily devise new multilateral governance mechanisms than actors from a sector where short sighted bilateral mechanisms dominate the governance regime (Campbell et al 1991, p. 331). This shows the path-dependence of regimes.

⁴ Instead of investing in the quality of regimes firms can also leave the cluster when regimes are not efficient or 'free-ride' on the investments of others.

- The *presence of an infrastructure for collective action*, consisting of associations and public-private organisations, since these organisations provide a fertile ground for collective action, but do not develop automatically.
- The *role of public organisations*, since public organisations can contribute to the formation of coalitions and can be an important partner in coalitions.
- The *voice* (see Hirschmann⁵, 1970) of firms. Voice is important because associations, public and public-private organisations face only limited ‘selection pressure’. Thus, voice adds to the performance of such organisations.
- A ‘sense of community’ (Bennet, 1998), since a higher willingness to invest in the ‘port community’ enables the formation of coalitions.
- The involvement of *leader firms*, since these firms have incentives and resources to invest in improving the training and education regime and can play a leading role in the development of coalitions.

3 Training and education regimes in three port clusters

In this section, the results of three case studies are discussed. The case studies, Rotterdam, Durban and the Lower Mississippi Port Cluster (LMPC) are based on desk research, an interview with port experts, and results from a survey filled out by the majority of these experts (see De Langen and Chouly, 2004, for some more information on these port clusters and the selection process of the experts). The interviews for the case of Rotterdam were conducted in spring 2002 (43 interviews), Durban in June 2002 (34 interviews) and the Lower Mississippi in September 2002 (31 interviews). In this paper, the results of the survey questions related to the training and education regime are discussed.

Table 1 shows the importance of five relevant collective action regimes for the performance of the port cluster (see De Langen, 2004 for an elaboration). Table 1 shows all five regimes are important for the performance of the cluster and the training and education regime is

⁵ Hirschman discusses three possible reactions when confronted with an unsatisfactory situation (in his case working conditions): exit, voice and as a third possibility, ‘silence’. The first two are sources of pressure, the third is not. When applied to association members, exit means that firms do not use services of associations. Exit does not directly contribute to the quality of a regime.

regarded as especially important in Durban, while it is regarded as less important in the LMPC.

Table 1: the importance of five collective action problems in seaports

CAP	LMPC	Rotterdam	Durban	Overall importance
Hinterland access	4.8	4.6	4.8	4.7*
Training & Education	4.1	4.4	4.8	4.4
Marketing & Promotion	4.6	4.3	4.0	4.3
Innovation	4.5	4.1	4.4	4.3
Internationalisation	4.4	N.R.	4.0	4.1**

Scores on the scale of 1 (not important) to 5 (very important)

* Significantly more important than other regimes

** Significantly less important than other regimes

The experts were also asked to evaluate the quality of the training and education regime (TER), based on the five variables that influence this regime, discussed in the previous section. Table 2 shows the results of this evaluation, for all three cases.

Table 2: evaluation of the quality of the training and education regime

Variable	Rotterdam	Durban	LMPC
Leader firms	1.6*	-0.3	-1.9** *****
Organizational infrastructure	2.0* *****	-0.4	-1.3
Public actors	0.8	0.2	-0.8
Community argument	1.1	0.7	-1.0**
Voice	1.0*	-0.6	-0.4***
Overall score	1.1*	-0.1	-1.1**

Average scores on a scale from -5 (very bad) to +5 (very good)

* Significantly higher score than in other two port clusters

** Significantly lower score than in two other port clusters

*** Significantly higher score than average of all factors in same port cluster

**** Significantly lower average judgment of all factors in same port cluster

Three conclusions can be drawn on the basis of these figures. First, the training and education regime is relatively well developed in Rotterdam. However, even this regime is not evaluated as very good, the score is no more than 1.1 on a scale ranging from -5 to +5. This indicates that, according to the experts, there are opportunities to improve the regime in all three cases.

Second, the main strength of Rotterdam's regime is the quality of the organizational infrastructure. This evaluation underlines the relevance of public private cooperation, and is further discussed when describing the TER in Rotterdam.

Third, the main shortcoming of the LMPC's regime is the lack of *leader firms*. These firms are crucial for an effective TER. The TER's are further discussed in the following paragraphs.

3.1 The training and education regime in the LMPC

Apart from operational 'training-on the job' there are no specific education programs in transport and logistics for middle managers or senior executives yet. The universities in the area (greater New Orleans) do not provide port related education programs at the bachelor/master level. The Port of New Orleans organizes a training program for foreign port managers from developing countries, but this program is not aimed at 'local' participants. Thus, it does not significantly improve the quality of the LMPC labour market.

In the past, an initiative to develop an education program for firms in the cluster failed to materialize, because of a lack of private commitment. No single firm was identified frequently as a 'leader firm' in the TER. Not sufficient firms were willing to invest in the education of their workforce, by sponsoring a joint program. This fact explains the negative evaluation of the involvement of leader firms in the regime (see table 2). The pilots in the LMPC, for instance, regularly grant scholarships to education institutions outside the state, but have expressed the need for such education programs in the cluster. They recently agreed to create institution specific scholarships for a new education program under development at the University of New Orleans (UNO) (see below).

Cooperation, either between firms, between governments, or public-private, has improved recently (De Langen and Visser, 2004). This improvement is also demonstrated by new efforts to improve the TEP. The University of New Orleans has developed four courses in the field of ports and logistics. One course description argues 'despite the large number of

employment opportunities in the metropolitan area, very few educational offerings within Louisiana are related to these opportunities' (University of New Orleans, 2004). Furthermore, one of the university colleges of the University of New Orleans (College of Urban and Public affairs, CUPA), intends to set-up a bachelor of science in Transportation Studies (College of Urban and Public affairs, 2004). Such a study program would be a major step forward for the TEP in the LMPC, since the annual demand for transport related personnel is substantial (Louisiana Department of Labor, 2004).

The proposed new program received substantial industry support, for instance from the members of the Transportation Committee of the World Trade Center (61 senior managers from firms in LMPC's port cluster), various pilots associations and individual firms, such as maritime law firms. This shows the market for such a program. However, firms have not agreed (so far) to dedicate resources to the program. The new program will probably start in 2005, and will be, when successful, the largest achievement in LMPC's TER in the past decades.

3.2 The training and education regime in Durban

The training and education regime in Durban is regarded as very important by the experts. The involvement of various organizations in the TER is given in table 3.

Table 3: Investments in Durban's training and education regime

organizations	Relevant investments
(leader) firms	Firms have an incentive to invest in the training of their employees. The firms mostly contract education suppliers individually.
Interfirm alliances	Interfirm alliances do not play an important role in the training and education regime.
Associations	Associations play a limited role. They do not engage in 'collective bargaining' for their members, nor do they strive to improve the education infrastructure.
Public-private partnerships	No public private partnerships have developed yet, the Portnet Academy (see below) could become such a venture.
Public organizations	The Portnet Academy has the ambition to become the central provider of cluster related training and education. Currently, the Academy only trains the Portnet labour force. Training programs from basic vocational training to specific short courses in port management are offered. The university of Natal offers port related education programs, amongst others an MBA. The university has good links with firms in the port cluster.

The key issue in Durban's TER is the quality of the 'education infrastructure'. This education infrastructure is good for higher education: the University of Natal offers a port related master program. On the vocational level the training infrastructure is poor, as no institution offers good port related training programs.

Specific to Durban are the South African regulations related to education. These regulations are roughly organized as follows: firms have to pay an education tax to a national education fund, but these tax contributions can be (partially) refunded if the firm can prove it has invested in training its employees. This regulation is a quite elegant method to provide firms with clear incentives to invest in training and education of their staff.

The regulation has also led to a surge of new education providers that aim to earn a living by providing training and education services. Even though such firms may provide adequate services for some segments of the market, many professional training and education services require scale. Only large numbers of students allow for investing in (computer) facilities and advanced training techniques, such as simulators. Currently, the lack of one professional port related education provider is a weakness of Durban.

Given the incentives for firms to invest in training, *collective action* to make sure that one or a few organizations can develop to large scale education providers would substantially improve the education infrastructure. This opportunity is widely acknowledged, but no organization, either a cluster association or a strong leader firm has managed to organize the firms in Durban's port cluster.

Perhaps the most obvious candidate to develop into Durban's leading port related education provider is the Portnet Academy. This organization provides all kinds of training to employees from South African Port Operations (SAPO), the largest port operator in the country, that is currently publicly owned, but likely to be privatized in the coming years. Portnet Academy has established cooperation with foreign large scale education providers, especially Rotterdam's Shipping and Transport College and has sufficient scale. However, currently, the vast majority of training programs are for SAPO staff, not for firms in Durban's port cluster.

3.3 The training and education regime in Rotterdam

The main characteristics of the training and education regime are given in table 4.

Table 4: Investments in Rotterdam’s training and education regime

Organization	Relevant initiatives/investments
(leader) firms	Huntsman and Shell are leader firms for training in the chemical industry. They put efforts in a joint training facility.
Interfirm alliances	Interfirm alliances are of limited importance in this regime
Associations	<p>Associations, especially Deltalinqs, invest in the quality of the training and education infrastructure, for instance through sponsorship of the chair port economics at Erasmus University Rotterdam.</p> <p>Deltalinqs also plays a role in finding resources for the ‘education and information center’ and the ‘process college’ (see below for a description of both initiatives).</p> <p>Third, Deltalinqs is involved in setting up a ‘young roundtable’ for young ‘high potentials’ in the port, in order to improve learning and networking and create an environment fertile for the ‘creative class’ to work in.</p>
Public-private partnerships	<p>Education and information center (EIC, http://www.eic-mainport.nl/) hosts visits from students of all ages and arranges company visits of schools to firms in the port. The center also provides educational material for primary schools.</p> <p>Process college (http://www.procescollege.nl/) a public private partnership to provide training for process operators in the chemical industry. The partners are four schools and the port related chemical industry.</p> <p>Knowledge infrastructure mainport Rotterdam (KMR, http://www.kmr.nl/), is a ‘network organization’ aiming to free up resources to invest in training and education infrastructure. All relevant stakeholders are represented in the organization. KMR aims to develop/support coalitions, not to provide training. The process college’ and EIC are supported by KMR.</p> <p>Academic Center TransPORT (ACTP) is a partnership between universities, regional governments and the business community to invest in knowledge transfer and high quality education.</p>
Public organizations	<p>The training and education infrastructure is relatively good and consists of at least five education providers, four of which cooperate under the name ‘Rotterdam Transport Schools’.</p> <p>The port authority (Port of Rotterdam, PoR) finances university chairs in port economics (together with Deltalinqs) and in cargo handling technology. PoR also financially contributes to EIC and ACTP.</p>

Table 4 shows that the training and education regime in Rotterdam consists of a large number of initiatives. Various coalitions are formed to improve the quality of the training and education infrastructure, and to increase the attractiveness of working in the port cluster. The large number of initiatives can be explained by the scarcity of well-trained labor in some segments of the labor market, especially for vocational technical training. The coalitions are successful: the region has become the center of training for many port related functions.

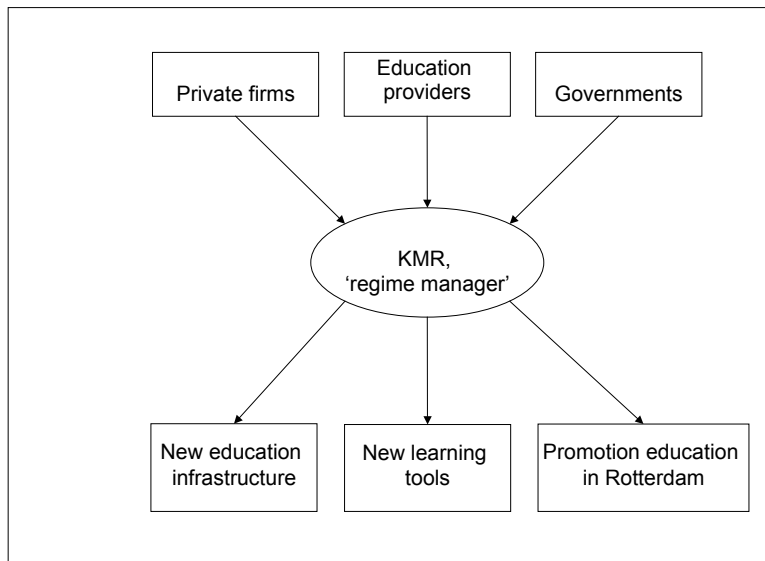
Central in the TER is the organization Transport and Shipping College (STC). This organization provides all kinds of port related training, from the most basic vocational level to the master's level. STC provides various training programs for industry professionals and also some in-house training for large terminal operating companies. STC is technologically advanced, as demonstrated for instance by their 'simulators' for nautical training, ship cranes and supply chains. STC has recently also moved in providing education for the petrochemical port industries.

Leader firms also contribute to the TER: especially firms in the petrochemical industry have invested substantially in new education facilities. These private investments would not have been made in the absence of leader firms backing the initiative.

The training and education regime in Rotterdam has *not* been successful with regard to the re-training of 'redundant' port workers. Due to containerization, labor requirements in the cargo handling industry have diminished rapidly. Labor *mobility* could effectively reduce this redundancy, but in the Dutch context, forced mobility (firing employees) is very expensive. A program to re-train employees for enrolment outside the cargo handling industry could be an instrument to solve labor redundancy. In Rotterdam, this has not been successful, with as a consequence persisting labour problems. Given the fact that labour costs are important in the cargo handling industry, this hampers Rotterdam's performance (De Langen et al, 2003). Currently, the labour redundancy is virtually solved (De Langen et al, 2003), but labour relations are still rather conflictive.

The organizational structure of this regime in Rotterdam is interesting: it is the only example where one organization, 'Knowledge-infrastructure Mainport Rotterdam' (KMR) is specifically set up to improve the quality of the regime. The - stylized - role of KMR is visualized in Figure 1.

Figure 1: The regime manager in Rotterdam's TER.



This 'regime manager' is a network organization, where all relevant organizations (municipality, port authority, cluster association, private firms, education providers) are represented. KMR is truly a 'network organisation' with a small staff (in this case two persons). It aims to accelerate investments in the education infrastructure, but has no interest in developing such services in-house. The organization is effective in acquiring (inter)national resources to invest in Rotterdam's TER. The value added of KMR is reflected in the positive evaluation of the organizational infrastructure in Rotterdam (see table 2).

4 Conclusions

Huge differences in the training and education regime between the three cases can be observed. In the LMPC, coalitions are hardly created and even though the potential benefits of collective action are recognized, actors are reluctant to invest (time) in improving the regime. In Rotterdam, the formation of coalitions is almost a routine. Various initiatives have been set up and add to the quality of the regime. Local and national governments play an 'enabling role' in this regime by providing funds. Leader firms contribute to the TER by providing industry support for investments in training and education.

The 'regime manager' contributes to the quality of Rotterdam's TER. Opportunities to improve the regimes in the three cases are given in table 5.

Table 5: Opportunities to improve the training and education regime

Port cluster	Opportunities to improve the training and education regime
LMPC	Initiative to attract external resources to improve the regime.
Durban	Collective action to improve the training and education infrastructure.
Rotterdam	Re-training to solve labour redundancy problems.

For each of the three port clusters, these opportunities are important. Labour issues have recently received more attention in all three port clusters. This is likely to lead to ongoing initiatives to create an effective training and education regime.

These cases provide some insights that are relevant in the theoretical debate on the relation between institutions, cluster governance and regional development.

First, the TER is becoming more important. The relevance of training and educations is widely recognised. In all three clusters new initiatives have been taken or are considered. This leads to more attention for arrangements that enable effective investments in the TER.

Second, the cases suggest leader firms are indeed important for the TER. This is especially relevant given the ongoing internationalisation of firms. As a consequence, leader firm behaviour is less based on historic roots of a firm in a region, and more on the quality of institutions that enable and are responsive to leader firm behaviour. This seems an important implication for policy makers in clusters.

Finally, the concept of a ‘regime manager’ may be a relevant concept for understanding governance in clusters and more specifically the quality of collective action regimes. This concept is an addition to the existing literature on governance and education in clusters (Keane and Allison, 2003). The case studies suggest such an arrangement is effective in one port cluster, it may be instrumental for improving the quality of the TER in other clusters and other ‘regimes’ as well.

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