CENTER FOR REGIONAL- OG TURISMEFORSKNING

Evaluating role of commercial ports in the regional economy

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Overview

- This paper presents the main results from our project for Danish Ports
- The aim of project is to evaluate the economic and employment impact of the Danish commercial ports in the regional economy.
- Method applied in the project is innovative, as we apply an econometric model to estimate the ***direct employment effects*** of commercial ports, then the inter-regional macroeconomic model is applied to evaluate the derived effects.
- Data for the econometric model is collected at post district level; while the regional model is based on the data at the municipal level.

Note: Danish Ports is the organisation for commercial harbours in Denmark.

Port activities and direct effects

- Commercial ports are signified by landing and embarking goods and persons.
- Such port activities generate employment directly among firms in different sectors in the commercial port.
- There could be network effects, such that landing and embarking goods in other ports also have direct effects on employment of firms in different sectors in the port.
- Specification issues – what sectors are directly dependent on port activities and what port activities?

Main results from the project (1)

Direct employment effects of Danish commercial ports in the local districts

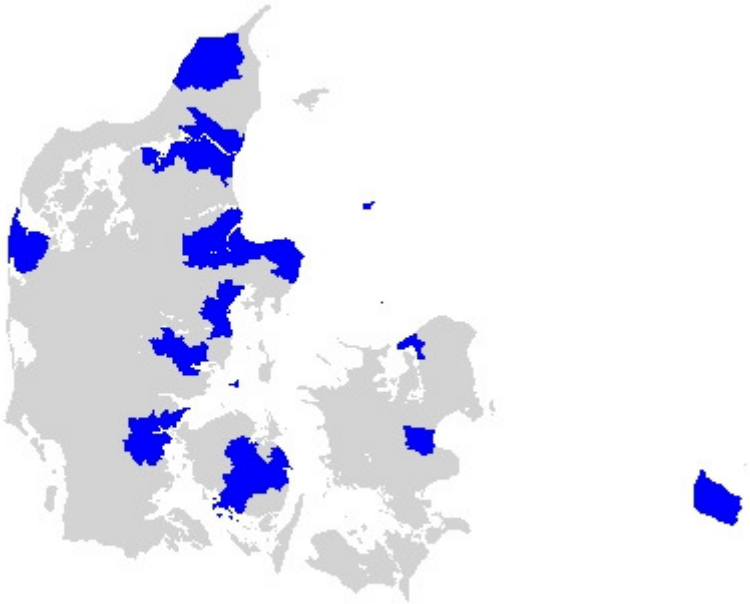
Note 1: the map shows the location of 16 commercial ports by post district.

Commercial port	Post district code	Direct job effects
Hirtshals Havn	9850	2,245
Aalborg Havn	9000	5,894
Thyborøn Havn	7680	1,039
Randers Havn	8900	1,715
Grenaa Havn	8500	2,031
Aarhus Havn	8000	4,930
Horsens Havn	8700	1,601
Hvide Sande Havn	6960	666
Fredericia Havn	7000	5,419
Kolding Havn	6000	2,354
Faaborg Havn	5600	768
Lindø Port Havn	5000	3,609
Nyborg Havn	5800	481
Hundested Havn	3390	521
Køge Havn	4600	1,931
Rønne Havn	3700	1,979

Note 2: Job is presented by number of full-time equivalent jobs.

Main results from the project (2)

Direct and derived employment effects of Danish commercial ports in the local municipalities



Municipality	Kommune code	Total job effects in municipality	Total job effects in Denmark
Hjørring	860	4,758	5,093
Aalborg	851	12,006	12,965
Lemvig	665	1,519	2,577
Randers	730	2,376	2,906
Norddjurs	707	2,555	3,474
Aarhus	751	8,082	9,560
Horsens	615	2,277	2,992
Ringkøbing-Skern	760	832	1,277
Fredericia	607	8,086	13,281
Kolding	621	3,321	4,200
Faaborg	430	961	1,342
Odense	461	5,308	6,479
Nyborg	450	630	914
Halsnæs	260	683	1,013
Køge	259	2,694	3,691
Bornholm	400	2,466	3,028

Note: the map shows the location of 16 municipalities where the commercial ports are.

Summary from the project

A special version of the model is constructed for this project, focusing on the special sets of industries and education groups of employees.

We find that commercial ports

1) create the economic development basis for the local, regional and national economy through solving its transport tasks, while creating direct and derived jobs, income and production;
2) ensure that production companies - which use the commercial port as shipment point, have access to markets so they can export and import goods and services on and off;
3) direct job effects depend on each port activities (types and size, etc);
4) derived job effects depend on the local municipality (geography, size of population, specialization in production, supply of labor, etc.)

Comparison between the two ports

Commercial port	Køge	Aalborg
Direct job effects	1,931	5,894
Total job effects in municipality	2,694	12,006
Total job effects in DK	3,691	12,965
Spill over effect on local	1.4	2.0
Spill over effect on the whole DK	1.9	2.2
employment in municipality	25,519	106,084
% of direct job effects	7.6	5.6
% of total job effects	10.6	11.3
Population (2014)	59,000	204,000
Geography	upland to the metropolitan	third largest city
Port activities	diversified	concentrated
Specialisation	Yes	Yes
Education center	No	Yes

Note: Job is presented by number of full-time equivalent jobs.

Factors in comparison:

- Population size
- Geography
- Port activities
- Specialization
- Education center
- Commuting
- Inter-regional trade
- Shopping and tourism

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Data inputs for estimation

Two data sources are used:

- Open statistical source, such as www.statistikbank.dk.

  Production data is collected by this source, for example, transport activities at a port by tons of containers goods, or bulk goods; or by how many passenger, number of cars/ trucks, etc.

- Through a research access to the detailed register personal data.

  Employment data is collected by the detailed register person data.

Data is collected by sector in a period 2000 – 2013 and by postal code.

Location quotient is calculated by

- $$Location\ quotient = \frac{Activity_{\ kommune} / Activity_{\ whole\ DK}}{Number\ population_{\ kommune} / Number\ population_{\ whole\ DK}}$$

Data presentation for Køge and Aalborg Ports

	Køge	Share in Denmark (%)	Specialisering (location quotient[1])
Passenger, 1000	57	0.14	0.13
Personal cars	13,388	0.12	0.11
Truck freight, 1000 ton	403	1.88	1.72
Total goods	1,624	1.84	1.68
Liquid bulk	76	0.34	0.31
Fixed bulk	1,008	3.23	2.95
Goods in container	-	-	-
Ro-ro goods	403	1.65	1.51
General cargo	137	2.93	2.68

	Aalborg	Share in Denmark (%)	Specialisering (location quotient[1])
Passenger, 1000	-	-	-
Personal cars	-	-	-
Truck freight, 1000 ton	-	-	-
Total goods	5,054	5.74	1.57
Liquid bulk	717	3.18	0.87
Fixed bulk	3,632	11.63	3.17
Goods in container	361	6.68	1.82
Ro-ro goods	-	-	-
General cargo	344	7.36	2.00

Specification issues

- Which sectors?
  - Interview with experts from the Danish harbour organization pointed to a total of 11 out of 19 sectors, where employment may in part directly be dependent on harbour activities. Among these, there are subsectors that are 100 percent dependent on harbours.
  - Take out the employment in the subsectors that are a 100 percent dependent on harbours (e.g.) in the shipping business and add an estimated dependence of any remaining employment in sectors on harbour activities (where employment can only in part be assumed to depend on harbour activities:
  - Employment in sector becomes $E = \tilde{E} + Z$, where Z is the employment 100 percent dependent on harbour activities and $\tilde{E}$ is the estimated employment in remaining sectors only partly dependent on harbour activities
- Harbour activities?
  - Obtain information on different types of landing and embarking goods and persons from statistics (official data from statistical bureau and some special statistics acquired from public authorities particularly on landings of fish)
  - A total of 43 different harbour activities

Empirical model

- Empirical model:

$$\tilde{E}^s = \alpha^S + W\tilde{E}^s + \theta^S H + \tau^S WH + +\mu_i^s + \mu_t^s + \varepsilon_{it}^s$$

- Where $\tilde{E}_{it}^s$ is the remaining employment in sector after full dependent employment has been subtracted of sector S, $H$is harbour activities and W is contiguity matrix with 1 if postal codes are neighbours

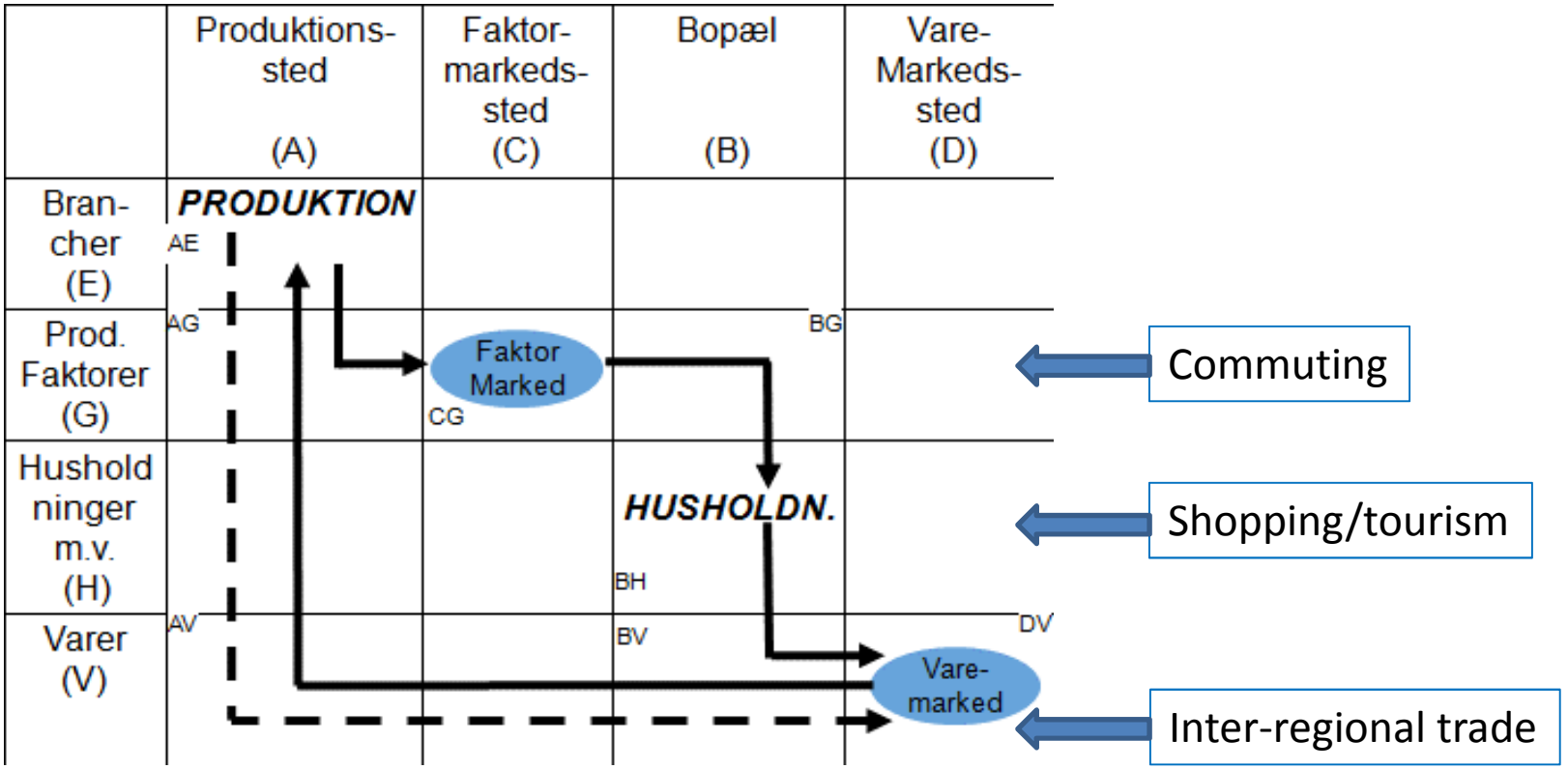
- Modelling at postal code level for employment covering the years from 2001 to 2013 and allows for postal code fixed effects and time fixed effects

- Model is estimated and direct effects of harbour is calculated from predicted value of estimated model when setting all harbour activities to zero for one specific harbour

LINE model
– the inter-regional macroeconomic model for Denmark

- LINE model is applied for evaluating regional economic and employment impacts in the local economies;
- The model is based on the regional input-output structure with SAM;
- Specific as: 1) **regional dimension,** distinguishing the places of production, residence and demand; 2) **SAM** (social account matrices) is a part of main framework; 3) **using 2 by 2 by 2** principles, i.e. there are two players (producers and households), two markets (factor market= labor market and commodity market), and two circuits: the real circuits from production place to the commodity market; cost-price circuit that is counter-clock circle when looking at how the prices is added.
- The three linkages is represented by **commuting, shopping/tourism and trading** between the regions that transform the commodities and service by supply and demand.

Diagram for structure of the LINE model



Main results from the model calculations

The results from the LINE model show both the direct and derived effects of port activities on a number of variables:

- Employment by municipality and sector
- Gross value-added by municipality and sector
- Gross production value by municipality and sector
- Personal income taxes by municipality
- Value-added taxes by municipality
- Other production taxes by municipality
- Import and export
- Etc.

Employment impact of ports by regions

Employment impact of Køge Port in the local, regional and national economy

Number of employment	Køge kommune	Rest of kommuns in the region	Rest of kommunes in the country	Whole Denmark
Direct effects	1.931	0	0	1.931
Derived effects	763	223	774	1.760
Total effects	2.694	223	774	3.691
Employment in 2014	25.519	288.561	2.451.057	2.765.137
% of total effects in employment	10,56%	0,08%	0,03%	0,13%

Employment impact of Aalborg Port in the local, regional and national economy

Number of employment	Aalborg kommune	Rest of kommuns in the region	Rest of kommunes in the country	Whole Denmark
Direct effects	5.894	0	0	5.894
Derived effects	6.112	577	382	7.071
Total effects	12.006	577	382	12.965
Employment in 2014	106.084	165.736	2.493.317	2.765.137
% of total effects in employment	11,32%	0,35%	0,02%	0,47%

Thank you for your attention !

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