# Average wage level as a new port performance indicator: A method and illustration of U.S. port counties

César Ducruet, Bianca Dumay, Peter W. de Langen

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César DUCRUET, PhD*
Bianca DUMAY
Peter W. De LANGEN, PhD**

Erasmus University Rotterdam
School of Economics, Faculty of Applied Economic
Burg. Oudlaan 50, Woudestein
P.O. Box 1738, 3000 DR Rotterdam, The Netherlands

**Abstract**

Port-related impacts are often presented in terms of quantity, e.g. employment generated in the port. The quality of jobs, in terms of average wage level is hardly discussed. This is surprising given the fact that most economists (and macro-economic models) assume labour markets work relatively efficiently. Thus, it is assumed people employed in the port would not be employed elsewhere if there was no employment in the port sector. This paper argues that in advanced economies, the average wage level is a better indicator of the role of ports in realizing economic wealth in a given area. Methodological issues are discussed and an empirical analysis of US port counties is presented. Results show that average wage level in core activities - transport and warehousing - are related to the size of the counties (e.g. population and workforce) and to their economic specialization. Notably, specializing in freight-related activity strengthens wage levels while additional specializations such as manufacturing, trade, and logistics are associated with lower performance of port counties. These patterns may be explained by the importance of central place over coastal locations in the firms' networks in terms of spatial division of labor.

Keywords: Average wage level, County, Impact, Performance, Port, USA

* Corresponding author: ducruet@few.eur.nl; Tel. +31 (0)10-408-1678 / Fax +31 (0)10-408-9141
** Presenter, Port of Rotterdam authority

# AVERAGE WAGE LEVEL AS A NEW PORT PERFORMANCE INDICATOR; A METHOD AND ILLUSTRATION OF U.S. PORT COUNTIES

## 1. INTRODUCTION

Ports, alike other major transport infrastructures, are known to have an impact on local and regional employment, trade, and the economy as a whole (Banister 1995). However, "convincing studies on this topic are scarce" (De Langen 2005). Reasons for that include the lack of methodology but, also, the growing gap between scholars' perception of port impact and the reality of the port itself. On one hand, most studies on port-related employment define the impact in quantitative terms by assessing how many jobs are created locally and regionally by the port. This focus on employment quantity is surprising given the fact that most economists (and macro-economic models) assume labor markets work relatively efficiently. Thus, it is assumed people employed in the port would not be employed elsewhere if there was no employment in the port sector. No studies have demonstrated that unemployment levels in port regions that have witnessed a decline in port related jobs due to containerization are significantly lower than in other regions.

Even though the relevance of employment numbers is limited, few studies have measured the quality of this employment (e.g. educational or wage level), We argue that in a context of dramatic jobs decrease and changing characteristics of employment in an age of global logistics, the impact of a port on its economic and social environments (especially in advanced economies) may be better defined by the *quality* of employment rather than by the *volume* of employment. Several models of port - and port/city - evolution indicate the growing importance of the tertiary sector compared to the industrial sector (Ducruet and Lee 2006). Indicators of port performance shall be adapted to this

evolution from core functions (e.g., loading, unloading) to broader functions, with the "increasing variety of products and services provided by a variety of firms" (de Langen et al. 2006).

Throughout history, port activities have been associated with low-skilled workforce, insecurity, immigration, and polluted environments. Although this negative image has gradually changed due to active urban regeneration, this image is still present. The increased competition between regions for investments and the related attention for "good business environments" has left port cities struggling to bend investors' perceptions. Urban attractiveness rankings in Europe show lower scores of port cities compared to non-port cities. However, as seen in the U.S., the period following the deregulation stemming from the Shipping Act (1984) has seen an increase in the number and wage of the dockworkers, due to more bargaining power for negotiation from labor unions, and the need for improved port services from shipping lines (Peoples and Talley 2004). It is believed that the outcomes of such negotiations vary from one port area to another within the same country, depending on local and regional conditions. Thus, attention for qualitative indicators of a port's impact on the regional economy through a comparative approach is warranted.

The first section of the paper introduces the advantages of shifting from usual port performance / impact measures to qualitative measures, and introduces the average wage level (AWL) as a new port performance indicator. The second section raises a series of methodological issues concerning the appropriate application of the AWL to ports. The third section provides an application of the AWL to the case of U.S. port counties. Finally, conclusions are drawn and implications for further studies in the field of port performance evaluation discussed.

## 2. AVERAGE WAGE LEVEL COMPARED TO OTHER PORT PERFORMANCE INDICATORS

### 2.1 Definition and usual measures of port performance

As indicated by the French geographer Roger Brunet (1993), *performance* can be defined by the "capacity to produce positive results" that is, therefore, depending on expectations. This also applies to ports, where quantitative measures of performance a widely used (see e.g. Marlow and Casaca 2003), but benchmark levels are rarely established. Table 1 summarizes the main port performance indicators (PPIs).

Among those indicators, value added and employment are the widely used for comparing the economic performance of seaports. They reflect the nature of a port as a "logistics and industrial centre, playing an important role in global industrial and logistics networks" (Notteboom 2001). De Langen et al. (2006) distinguish three different port products, the transport node, the logistics product and the manufacturing product, each with different port performance indicators. This is because the competitive position, infrastructure requirements, market structure and dynamics, and governance mechanisms of these three products differ substantially. This study provides an overview of existing and new port performance indicators, but does not provide methods to calculate new port performance indicators, nor addresses issues of data availability, collection and comparability.

*[Insert Table 1 about here]*

As seen in Table 1, most indicators of port performance are based on a *volume*, of goods, value added or employment. This approach has remained unchanged since the beginning

of the container revolution (Bird 1973; Chang 1978; Vigarié 1979; Vallega 1983). However, recent studies criticize economic impact studies because ports are no longer generators of revenues or employment in the context of increasing mechanization, industrial relocation and port-city separation (Benacchio et al. 2001). It is increasingly impossible to provide a convincing method to identify port related industries. Many economic activities located in port regions are to some extent port related. Most case studies dealing with port-related employment concentrate on one single place, while a minority deals with nationwide or European samples, but no uniform method to quantify port employment has been developed[1].

Although port-related employment volumes are still center stage in economic impact studies of ports, it does not do justice to the role of ports in advanced economies (Vallega 1996; Seassaro 1996; Pesquera and Ruiz 1996; Haynes et al. 1997; Silva and de Sousa 2001). Several authors have argued that ports have refined their activities to broader services, encompassing a wide set of impacts in the maritime-urban tertiary sector (Le Chevalier 1992; Vérot 1993; Amato 1999; Baudouin 2001; Beaurain 2001; Ducruet and Lee 2006). Because the complexity of port performance cannot be entirely measured with traditional tools, additional performance indicators are needed, together with the widening of the concept of port performance itself.

### 2.2 Advantages of the average wage level as PPI

As opposed to the *volume* of employment generated in a given place such as port area, port city, and port region, the average wage level of port industries (hereafter 'AWL')

[1] Some scholars have managed to measure some elements of port performance on a European and world scale in order to verify general rules and regional factors, but the quality and precision of local data gets lower as the sample of ports gets larger (see Table 1).

focuses on the *quality* of the contribution of a port to the regional economy[2]. The measurement of AWL is relevant for the prosperity and economic performance of geographical areas. Porter (2003) uses average wage levels for all industries as main indicator to assess the performance of regions.

Wage levels depend on the nature of jobs and therefore indicate the wealth of a given area (Blanchard 2000). Wage levels reflect the educational level, skills and knowledge, in terms of human capital (Pigou 1928; Davenport and Niven, 1997) and the broader interaction between knowledge and economic activity (Kuznets 1971). Furthermore, there is recognition that human capital has an impact on regional innovation (Verspagen 1997; Florida 2002; Howells 2005) which, in turn, fosters regional economic growth.

This particularly applies to ports, where multiple activities of different nature take place, from routine to decisional activities. Given the diversity of economic linkages between port activities and other activities (industry, tertiary), ports are seen as clusters of economic activities. Consequently, performance indicators applied to clusters, such as average wage level (Porter, 2003) can also be applied to ports. However, applying AWL necessitates important clarifications of methodological issues.

## 3. AVERAGE WAGE LEVEL; METHODOLOGICAL ISSUES

Three questions have to be addressed to develop a method to calculate the average wage level of port industries in port regions:

1. What industries are regarded as port industries?
2. What regions are considered as ´port regions´?
3. How can the average wage level of port industries be compared across regions?

[2] This is in line with performance measurement in general. Kaplan and Norton (1996) in their 'Balanced Scorecard' explicitly consider skills and knowledge of major importance, in addition to financial indicators such as profit and turnover.

These questions are addressed in the following three paragraphs. The application of the method to the US is presented in the last paragraph

### 3.1 Defining port industries

Based on the North American Industry Classification System (NAICS), which replaced the U.S. Standard Industrial Classification (SIC) in 1997, De Langen (2004) has provided a typology of port-related industries (Table 2).

*[Insert Table 2 about here]*

### 3.2 Defining port regions

The lack of currency and language difference makes the data for the average wage level in the USA relatively easy to compare. Europe, for example is a more difficult ground to study port wage level because a comprehensive database is lacking.

The states in the USA are divided into geographical subdivisions: counties. Because the borders of ports are often not equal to the borders of a county, multiple counties can embed a part of the port and thus can have employment in port activities. Porter states in 'The Economic Performance of Regions' (2003) that essential determinants of economic performance can be found on a regional level. One of the determinants that can be used to measure this economic performance is the average wage level of the region.

The collection of wage level data is not available for ports as an entity, but personal wage data at county level is available. Although administrative boundaries are often mismatched with the port or urban influential local areas, which are more of functional nature, county-based employment and wage level is very precise and comparable throughout the country. The US labor department has a database with wage level and

employment statistics at county level for individual North American Industry Classification System (NAICS) codes. To exclude possible state differences, wage levels in port counties are compared to state levels. This method has been fruitful to analyze port impacts in Europe in a recent study (Rozenblat 2004). Notably, the ratio between local and national unemployment rates helps putting in question the inevitable worsened social situation of port cities in general, while indicating which port cities are more struck by unemployment than others.

The ports that are included in the case study are selected based on their throughput. The port sample is established by selecting the 10 largest US ports in tons of throughput in the year 2004 and the 10 largest ports in TEU container throughput for the same year. A sample of 17 ports remained because some ports are selected by both selection criteria.

The port counties are selected based on:

- Presence of port activities in the county;
- Substantial specialization in port activities.

The county specialization in port activities is calculated based on the specialization of employment and the number of establishments in 2003. The criteria for which counties are port counties are based on number of establishments and the employment in NAICS code 4883 "support activities for water transportation", which encompasses the basic port activities[3]. The final selection of the port counties is done by the following criteria, resulting in Table 3 and which are all related to the NAICS 4883:

- > 20 establishments; or
- one establishment only and,

[3] The US Census Bureau gives the exact activities.

- 1.5 x the specialization of the state and,
- 2 x the specialization of the USA and,
- 100 employees and,
- county location quotient of at least 1.5 compared to the state.

*[Insert Table 3 about here]*

Following the identification of port counties, their economic specialization is analyzed through the importance of the different port industries. The types are distinguished according to the following criteria based on location quotients:

- Freight-related activities: LQ establishments + LQ employment > 4
- Logistics activities: LQ establishments + LQ employment ≥ 3
- Manufacturing activities: LQ establishments + LQ employment ≥ 6
- Trade activities: LQ establishments + LQ employment ≥ 3

Based on these specialization ratios, 6 types of port counties are distinguished according to the combinations of activities:

- Value added port: freight / logistics / manufacturing
- Trade and manufacturing port: manufacturing / trade
- Manufacturing port: manufacturing
- Logistics port: logistics
- Gateway port: freight
- Non-specialized port: no remarkable specialization

### 3.3 Comparing wage levels across industries

A first application on a state level is provided in Figure 1. Variables are restricted to port-related data such as employment and average income in water transportation for states and related port counties, together with total port traffics by state. It shows to what extent previous PPIs such as traffic volumes of total employment are limited to differentiate port regions. For instance, average wage levels for the state or the port counties are not well matched with the ranking of traffic volumes or employment totals, except for Louisiana and Texas. Similarly, New Jersey, Louisiana, Kentucky and Washington states generate lower employment volumes while their average wage levels (state and port counties) are higher than in other areas. Conversely, four states combine low scores in all variables: South Carolina, Virginia, West Virginia, and Ohio. At the end, correlations among the different PPIs are quite low, as showed in Table 4.

*[Insert Figure 1 about here]*

*[Insert Table 4 about here]*

## 4. APPLICATION TO U.S. PORT COUNTIES

### 4.1 Preliminary outcomes

The evaluation of differentials between wage levels in port industries and wage levels in general is stressed by a single formula:

$$PCP = (WL^{c}_{port} / (WL^{st}_{port}) / (WL^{c}_{overall} / WL^{st}_{overall})$$

Where:

PCP denotes port county performance

'$WL_{port}$' is the average wage level in port-related activities

´$WL_{overall}$' is the average overall wage level

'c' denotes the relevant county, while 'st' denotes the state

According to the results of the formula, it is possible to know whether the performance of port regions stems from port industries or not. Values higher than '1' would indicate a higher performance of port industries compared to other industries, and relatively to the rest of the wider area - here the State. Conversely, values lower than '1' would illustrate a lower performance of port industries. Due to the current limitations of data we will limit the application of this formula and consider only port-related activities.

Based on the data collected and provided in Annex table, a series of tests is made possible to verify the fundaments of the degree and distribution of AWLs. The quality of the port's environment and the degree of port performance may be influenced by various factors that make every place unique. In parallel, there might be some 'rules' which underlie the formation of an AWL.

As seen in Figure 2, AWL county/state ratio shows interesting relationships with county/state concentration ratios for population and employment in transport and warehousing for most port counties:

- Port counties with a lower population / employment relative concentration have also a lower - or comparable - AWL than the state, except for 7 counties

(Norfolk, Portsmouth, Richmond, St. Bernard, St. Charles, St. James, and Wayne);

- Port counties with a higher population / employment relative concentration have also a higher - or comparable - AWL than the state, except for 4 counties (Hudson, Charleston, Jefferson, and Pierce).

*[Insert Figure 2 about here]*

Despite the low correlations between AWL state ratio and population (0.238) and transport employment (0.243) concentrations, the 'weight' of the county within its outlying territory has undoubtedly some significance in the level of wages in port-related activities (Table 5). Reasons could be that denser urban environments are more competitive markets and have more efficient labor regulations than suburban areas or relatively isolated economic zones. However, several cases are not matched. Also, the geographical distribution of those cases is not consistent enough to explaining AWL variation by regional factors. Thus, further verification is needed, by looking at the economic specializations of the port counties.

**4.2 Economic specialization and average wage level**

At first glance, there is no direct relation between types and AWL on an individual basis. Low and high AWL are relatively mixed. However, 'value added port', 'gateway port', and 'non-specialized port' have higher scores on an average basis, despite internal differences within each category. Also, the level of population and employment concentration is diversely distributed among the different types when compared with Figure 1. But still, 'logistics port' and 'non-specialized port' categories have an important

share of counties concentrating population and employment. This may illustrate that urban areas are more diversified than other areas, but also the need for logistics activities to "stay as close to their customers as possible" (Goetz and Rodrigue 2004), i.e. within or nearby densely populated areas, like New York and Los Angeles.

*[Insert Table 5 about here]*

On the other side, 'trade and manufacturing port' and 'manufacturing port' combine lower AWL and lower urban / employment concentrations compared to state levels. This would also apply to 'value added port' if St. Charles county was excluded. Thus, socio-economic environments share a common logic with the relative size of local units, but still this is not sufficient to explain AWL differentials. In every category can be found a high and a low AWL, except for 'gateway port' but this is funded on only two counties and should be researched more.

The different categories proposed in the typology need a more scrutinized analysis. On the one hand, specialization in freight tends to increase wage levels, but on the other hand, additional specializations in manufacturing, logistics and trade have a negative effect on the county/state ratio. The few remarkable exceptions (i.e. Harris, Union, and King) are those located within very large urban areas (New York, Los Angeles). It means that for port counties located outside main urban areas, the apparent economic diversity hides a domination of lower-skilled workforce around the port. Office workers are not attracted by port functions and tend to locate in the remotely / centrally located head office, i.e. outside the port county in the related State. Still, the relative importance of blue-collars and white-collars is important to differentiate the levels of port performance among a given area. It would also mean that the activities attracted by the port - the port

cluster - bring less prosperity and are potentially less innovative than the same activities outside the port. Conversely, port counties specialized in their core activity, with a lesser importance of other industries, have a higher performance in terms of average wage levels in transport and warehousing. For those counties, the port is the leading economic engine and is not likely to be challenged by equivalent activities in other parts of the State. Only the counties corresponding to the central areas of large cities are able to perform positively while operating other functions than the port.

## 5. CONCLUSIVE REMARKS

The majority of port performance studies have measured port impacts in terms of size indicators (e.g. volumes of throughput, employment, and value added). This research argues that qualitative measures are at least equally important, especially in advanced economies. Average wage level is an interesting qualitative performance indicator, because it reflects the quality of the ports' economic and social environments. In several countries, maritime office activities tend to follow the urban hierarchy rather than the hierarchy of port volumes, such as the Canadian (Slack, 1989) and Australian (O'Connor, 1989) cases. This may be partially explained by the limited attractiveness of port cities for ´knowledge workers`. This paper presents a study of average wage levels in port counties, to get a better understanding of factors that drive wage development in port cities. It turns out that there is no straightforward relation between the specialization of a port and its relative average wages. The size of the port city does seem to have an effect, but further research is required to fully understand what drives wage levels in port regions. Further research could also pay more attention to the size (MNCs, small and medium) and statute (public or private, head office, branch or outsourced) of port related companies.

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| Type | Principles | Advantages | Disadvantages | Examples |
|---|---|---|---|---|
| **Throughput(s)** | Ports as transshipment nodes | Provided by most port authorities and usually comparable | Difficulty to compare different cargo traffics and lack of precision of traffic totals | Backx (1929)<br>UNCTAD (1976)<br>Tongzon (1995)<br>Slack (2005) |
| **Value Added** | Expenses on labor, depreciation and profit | Better reflects the value of cargoes passing through the port (cf. *weighting rules*) | Difficult to measure and compare; diversity of the activities involved (e.g. cargo reprocessing, packing, repacking, labeling, inspection, etc.) | Vleugels (1969)<br>Randall (1988)<br>Suykens (1989)<br>Charlier (1994)<br>Haezendonck (2001)<br>Langen de (2004) |
| **Employment** | Ports as clusters of economic activities | Direct indicator of port economic impact on the local / regional areas | Difficulty to assess the effective linkages between port activities and various industries | Witherick (1981)<br>Krugman (1991)<br>Gripaios & Gripaios (1995)<br>Gripaios (1999)<br>Stopford (1997)<br>Gordon & McCann (2000)<br>Musso et al. (2000)<br>Langen de (2004)<br>Nijdam & van der Lugt (2005) |
| **Others** | • Port connexity index in the world maritime system (Joly, 1999)<br>• Intermodalism from infrastructure benchmark (Joly & Martell, 2003) or employment (Ducruet et al., 2005; Ducruet & Lee, 2007)<br>• Position among a port range, such as market share by port / shipping line (Fremont & Soppe, 2005)<br>• Port-urban relative concentration index (Ducruet & Lee, 2006), gradients of centrality / intermediacy (Ducruet, 2005), types of transport chain integration (Ducruet, 2007)<br>• Regulations, such as environmental issues (Comtois & Slack, 2005), port governance (Wang & Olivier, 2003)<br>• Port attractivity for firms, specializations, urban radiance, continental accessibility, unemployment rate, redevelopment dynamics at the port-city interface, image marketing and communication (Rozenblat, 2004) | | | |

**Table 1: Types of port performance indicators**

| | NAICS Code | Description | Specialization |
|---|---|---|---|
| Manufacturing | 22111 | Electric power generation | 0.70 |
| | 23712 | Oil & gas pipeline and related structures construction | 0.98 |
| | 3112 | Grain & oilseed milling | 0.81 |
| | 311211 | Flour milling | 0.55 |
| | 311225 | Fats & oils refining and blending | 1.32 |
| | 311412 | Frozen specialty food manufacturing | 1.46 |
| | 31142 | Fruit & vegetable canning, pickling and drying | 0.83 |
| | 3221 | Pulp, paper & paperboard mills | 0.69 |
| | 324 | Petroleum refineries | 1.01 |
| | 3251 | Basic chemical manufacturing | 1.44 |
| | 3252 | Rubber and fibers manufacturing | 1.15 |
| | 3315 | Foundries | 0.84 |
| | 336611 | Shipbuilding and repairing | 3.17 |
| | 8113 | Commercial & industrial machinery and equipment | 0.95 |
| Trade | 4235 | Metal & mineral (except petroleum) merchant wholesalers | 1.42 |
| | 42386 | Transportation equipment & supplies (except motor vehicle) merchant wholesalers | 2.41 |
| | 42393 | Recyclable material merchant wholesalers | 1.11 |
| | 4246 | Chemical & allied products merchant wholesalers | 1.23 |
| | 4247 | Petroleum & petroleum products merchant wholesalers | 0.89 |
| | 52313 | Commodity contracts dealing | 2.53 |
| | 52314 | Commodity contracts brokerage | 1.92 |
| Transport | 48 | Transport & warehousing | 1.03 |
| | 483 | Water transportation | 3.15 |
| | 483111 | Deep sea freight transportation | 3.46 |
| | 483112 | Deep sea passenger transportation | 2.87 |
| | 483113 | Coastal & Great Lakes freight transportation | 3.40 |
| | 483211 | Inland water freight transportation | 3.41 |
| | 48411 | General freight trucking, local | 1.05 |
| | 48412 | General freight trucking, long distance | 0.64 |
| | 4842 | Specialized freight trucking | 0.66 |
| | 4861 | Pipeline transportation of crude oil | 1.47 |
| | 4862 | Pipeline transportation of natural gas | 0.89 |
| | 4869 | Other pipeline transportation | 0.89 |
| | 492 | Couriers & messengers | 1.17 |
| Cargo handling | 488 | Support activities for transportation | 1.74 |
| | 48831 | Port & harbour operation | 2.55 |
| | 48832 | Marine cargo handling | 4.10 |
| | 48833 | National services to shipping | 3.52 |
| | 48839 | Other support activities for water transportation | 3.74 |
| | 4884 | Support activities for road transportation | 1.09 |
| | 4885 | Freight transportation arrangement | 2.03 |
| | 4889 | Other support activities for transportation | 1.41 |
| Logistics | 493 | Warehousing & storage | 1.15 |
| | 49311 | General warehousing & storage | 1.19 |
| | 49312 | Refrigerated warehousing & storage | 0.95 |
| | 49313 | Farm product warehousing & storage | 0.48 |
| | 49319 | Other warehousing & storage | 1.28 |

**Table 2: Specialization levels in port-related activities**

| Port | Port Counties | State |
|---|---|---|
| Baton rouge | West Baton Rouge | Louisiana |
| Beaumont | Jefferson | Texas |
| Charleston | Berkeley, Charleston | South Carolina |
| Corpus Christi | Nueces | Texas |
| Hampton Roads | Norfolk, Portsmouth, Newport News, Chesapeake | Virginia |
| Houston | Harris | Texas |
| Huntington | Wayne, Lawrence, Boyd | West Virginia, Ohio, Kentucky |
| LA/Long Beach | Los Angeles | California |
| New Orleans | Jefferson, Orleans, ST. Bernard | Louisiana |
| New York & New Jersey | Richmond, Union, Hudson | New York & New Jersey |
| Oakland | Alameda, Solano | California |
| Savannah | Chatham | Georgia |
| Seattle | King | Washington |
| South Louisiana | St. Charles, Ascension, St. John the Baptist, St James | Louisiana |
| Tacoma | Pierce | Washington |
| Texas City | Galveston | Texas |

**Table 3: Selected port counties**

| | State Average Income | Employment in port counties | Total State Traffics (tons) | AWL in port counties |
|---|---|---|---|---|
| State Total Employment | 0.378 | 0.804 | 0.370 | 0.117 |
| State Average Income | - | 0.465 | 0.248 | 0.434 |
| Employment in port counties | - | - | 0.425 | 0.163 |
| Total State Traffics (tons) | - | - | - | 0.304 |

**Table 4: Correlation levels of selected PPIs among U.S. states, 2003**

| *[Absolute]* | Average income | Total population |
|---|---|---|
| Average income | 1.000 | 0.302 |
| Total employment | 0.394 | 0.972 |

| *[Relative]* | Average wage level | Population concentration |
|---|---|---|
| Average wage level | 1.000 | 0.238 |
| Employment concentration | 0.243 | 0.863 |

**Table 5: Correlation indexes**

| Port | Port Counties | Freight | Logistics | Manufacturing | Trade | AWL | AWL (average) |
|---|---|---|---|---|---|---|---|
| Value added port | West Baton Rouge | 1 | 1 | 1 | 1 | 0.95 | 1.12 |
| | St. Charles | 1 | 1 | 1 | 1 | 1.35 | |
| | Wayne | 1 | 1 | 1 | 0 | 1.07 | |
| Trade & manufacturing port | Jefferson LA | 1 | 0 | 1 | 1 | 0.93 | 0.99 |
| | Ascension | 1 | 0 | 1 | 1 | 1.01 | |
| | St. John | 1 | 0 | 1 | 1 | 0.90 | |
| | St James | 1 | 0 | 1 | 1 | 1.09 | |
| | Jefferson TX | 0 | 0 | 1 | 1 | **0.84** | |
| | Harris | 0 | 0 | 1 | 1 | **1.23** | |
| | Boyd | 0 | 0 | 1 | 1 | 0.96 | |
| Manufacturing port | ST. Bernard | 1 | 0 | 1 | 0 | 1.08 | 0.91 |
| | Galveston | 0 | 0 | 1 | 0 | 0.90 | |
| | Nueces | 0 | 0 | 1 | 0 | 0.86 | |
| | Newport News | 0 | 0 | 1 | 0 | 0.80 | |
| Logistics port | Berkeley | 0 | 1 | 0 | 0 | 0.93 | 0.96 |
| | Chatham | 0 | 1 | 0 | 0 | 0.80 | |
| | Union | 0 | 1 | 0 | 0 | **1.24** | |
| | Pierce | 0 | 1 | 0 | 0 | **0.93** | |
| | Chesapeake | 0 | 1 | 0 | 0 | 0.99 | |
| | Hudson | 1 | 1 | 0 | 0 | **0.89** | |
| Gateway port | Norfolk | 1 | 0 | 0 | 0 | **1.24** | 1.20 |
| | Richmond | 1 | 0 | 0 | 0 | 1.17 | |
| Non-specialized port | Charleston | 0 | 0 | 0 | 0 | **1.00** | 1.01 |
| | Portsmouth | 0 | 0 | 0 | 0 | 1.13 | |
| | Lawrence | 0 | 0 | 0 | 0 | 0.92 | |
| | Orleans | 0 | 0 | 0 | 0 | **1.03** | |
| | Los Angeles | 0 | 0 | 0 | 0 | **1.07** | |
| | Alameda | 0 | 0 | 0 | 0 | - | |
| | King | 0 | 0 | 0 | 0 | **1.12** | |
| | Solano | 0 | 0 | 0 | 0 | 0.83 | |
| AWL | **All counties** | 1.06 | 1.01 | 0.99 | 1.02 | | |
| | **Exclusive** | 1.20 | 0.97 | 0.91 | - | | |

**Table 6: AWL by port county and specialization in 2003***

** Bold values represent a higher concentration of population and employment*

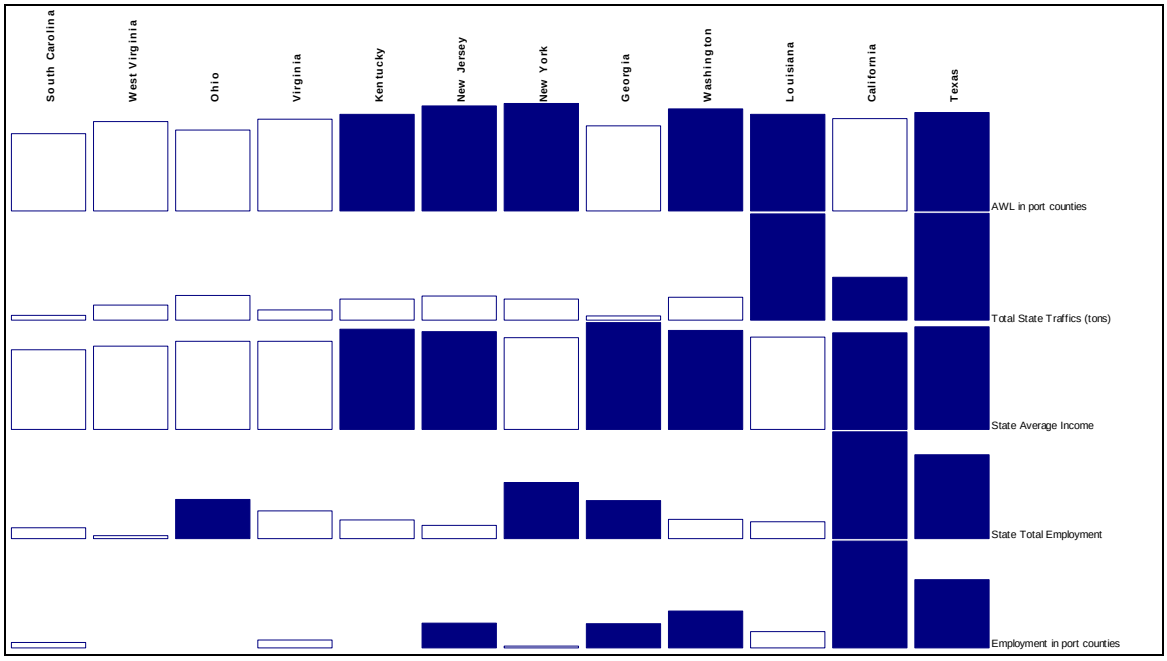


**Figure 1: Comparison of selected PPIs by U.S. state, 2003***

Data source: US Census Bureau

** values in bold are higher the row's average*

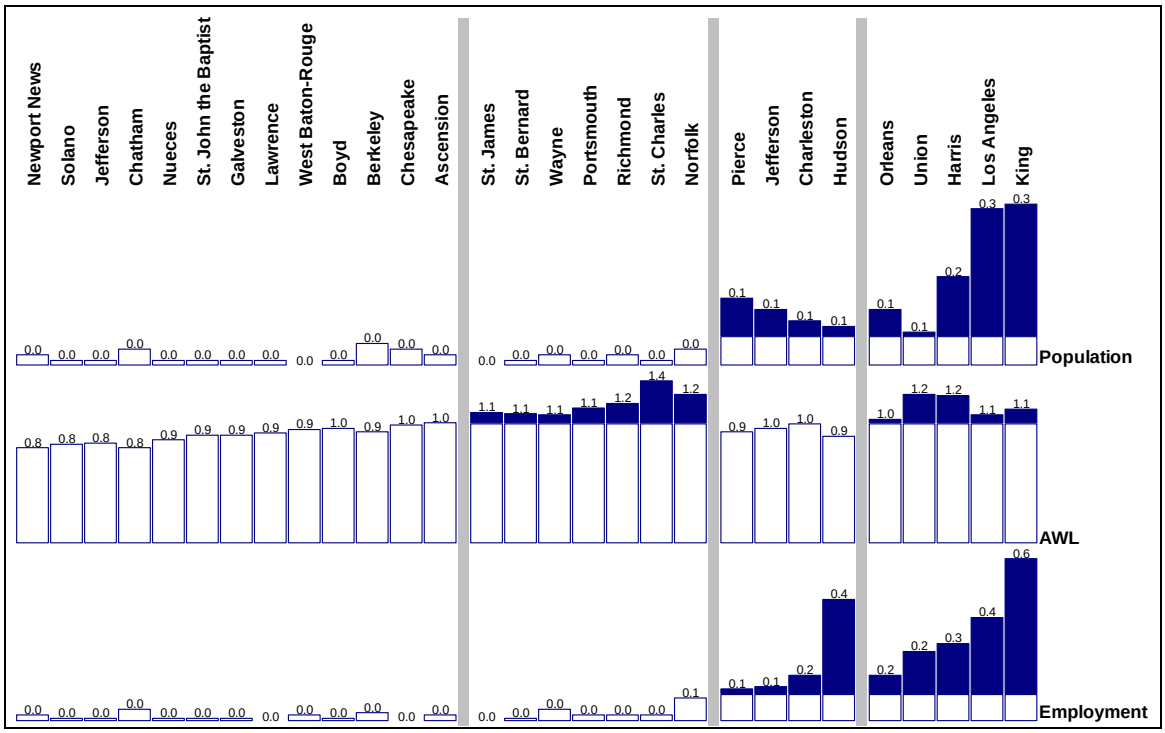


**Figure 2: County/state ratios for AWL, transport employment and population, 2003***

Data source: US Census Bureau

** values in bold are higher the row's average*

## APPENDIX 1

| State | Employment | AVG income (a) | Port county | Employment | AVG income (b) | Ratio (b) / (a) |
|---|---|---|---|---|---|---|
| South Carolina | 47173 | 32560 | Berkeley | 1612 | 30530 | **0.93** |
| | | | Charleston | 7735 | 32877 | **1.00** |
| West Virginia | 15993 | 34030 | Wayne | 664 | 36548 | **1.07** |
| Ohio | 152185 | 35828 | Lawrence | 700 | 33103 | **0.92** |
| Virginia | 108829 | 35844 | Chesapeake | 43 | 35627 | **0.99** |
| | | | Newport News | 2362 | 28827 | **0.80** |
| | | | Norfolk | 8567 | 44603 | **1.24** |
| | | | Portsmouth | 1639 | 40591 | **1.13** |
| New York | 214953 | 37313 | Richmond | 4144 | 43689 | **1.17** |
| Louisiana | 68208 | 37532 | Ascension | 1292 | 37921 | **1.01** |
| | | | Jefferson | 8167 | 36048 | **0.96** |
| | | | Orleans | 10818 | 39009 | **1.03** |
| | | | St. Bernard | 712 | 40741 | **1.08** |
| | | | St. Charles | 1172 | 51012 | **1.35** |
| | | | St. James | 332 | 41159 | **1.09** |
| | | | St. John the Baptist | 678 | 34117 | **0.90** |
| | | | West Baton-Rouge | 1101 | 35882 | **0.95** |
| California | 406254 | 39421 | Alameda | - | - | **-** |
| | | | Los Angeles | 144396 | 42518 | **1.07** |
| | | | Solano | 2910 | 32739 | **0.83** |
| New Jersey | 54210 | 39910 | Hudson | 22858 | 35806 | **0.89** |
| | | | Union | 12852 | 49864 | **1.24** |
| Washington | 77394 | 40379 | King | 43555 | 45392 | **1.12** |
| | | | Pierce | 8291 | 37676 | **0.93** |
| Kentucky | 75783 | 40738 | Boyd | 1040 | 39444 | **0.96** |
| Texas | 319405 | 41704 | Galveston | 1938 | 37593 | **0.90** |
| | | | Harris | 85638 | 51629 | **1.23** |
| | | | Jefferson | 3160 | 35077 | **0.84** |
| | | | Nueces | 3997 | 36082 | **0.86** |
| Georgia | 147487 | 43568 | Chatham | 6481 | 34888 | **0.80** |

**AWL county/state differentials in "transport and warehousing" by port county in 2003**

*Source: US Census Bureau*