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The effect of container terminal concessions on port performance

A Dynamic Approach

Master Thesis

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Abstract

Ports are being privatized in the belief that enterprise-based ports can react faster to global changes and are therefore more efficient than public ports. In the past years many concessions have been granted in order to privatize port facilities. However, if the public authorities and governments want to obtain more benefits from these concessions, more insights into concession characteristics are needed to develop more innovative contractual arrangements.

This thesis provides insights into the container terminal concessions by first investigating whether the concessions lead to a better port performance and then focussing on two important characteristics of container terminal concessions, namely the duration of the concessions and the private entities participating in the concession. The port performance is measured in port throughput and in order to get an unambiguous measurement the thesis focuses on one specific terminal. The focus is on container terminals because containerized trade flows have increased rapidly in the last three decades, implying that it is in an interesting market to observe. By utilizing a dynamic panel model, we try to capture the short- and long-term effects of container terminal concessions on the port performance. The dynamic panel model we used is the Bårdsen Error Correction Model. We estimate the Bårdsen ECM with the Newey and West standard errors in order to correct for serial correlation and with the Driscoll and Kraay standard errors in order to correct for serial correlation and cross-sectional correlation. Only the use of Driscoll and Kraay estimators has shown a positive influence of concessions on port throughput.

Keywords: Concessions; Container Terminal; Port Performance; Bårdsen Error Correction Model; Newey and West standard errors; Driscroll and Kraay standard errors; Effect

Preface

This research is the final project of the Master Program Economic and Business, specialization Urban, Port and Transport Economics at the Erasmus University Rotterdam. The research proposal for this thesis has been formulated in cooperation with Royal HaskoningDHV in order to get more insight in container terminal concessions. Concessions in seaports in general have recently received more attention in academic circles; this makes it still an emerging field in the port economic research.

First of all, I would like to express my gratitude to both mr. Nijdam and mr. van Reeven for their supervision during the writing process. I would like to thank Mr. van Reeven for his contributions in constructing the economic model. I would also like to thank Royal HaskoningDHV, and especially mr. Arends and mr. van den Brink for giving me the opportunity to graduate at the Maritime and Waterways division in Rotterdam. Special thanks go to mr. Verschuure for supporting me during the project at Royal HaskoningDHV.

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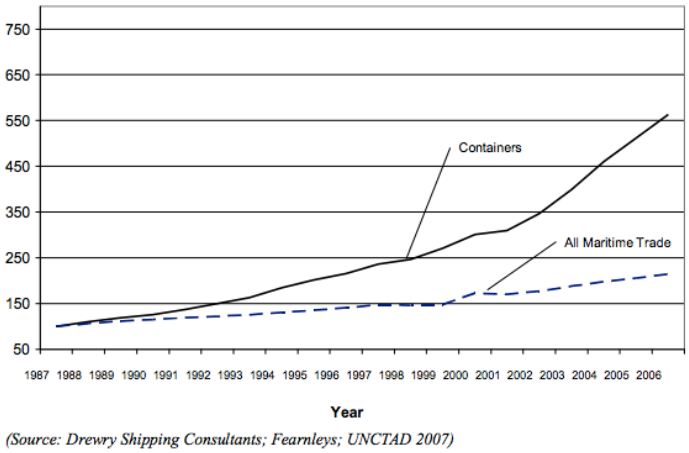
1. Introduction

Terminals in many countries around the world are being privatized in the belief that enterprise-based port services and operations allow for greater flexibility and efficiency in the market (Notteboom, 2007; Notteboom et al, 2012). Moreover, privatizing ports allows for using extensive private knowledge and quick responding to changes in the economic environment (Shaw et al, 1996). UNCTAD (1998) states that concessions are one of the most common instruments to privatize ports. Over the years the number of concessions has increased, according to the World Bank Private Participation in Infrastructure (PPI) Database. Granting concessions allows the government or the public port authority to retain some control over the organization and structure of the supply side of ports, i.e. the services a port delivers towards the clients. Moreover, concessions give the private entities the opportunity to operate terminals.

Although the assumptions that port services become more efficient and flexible, little to no research was found on quantifying the effect of concessions on the port performance. According Farrell (2012), governments will have to develop more innovative contractual arrangements, if they wish to benefit from concessions. "*It will be necessary for them to take the initiative in redesigning concession agreements, rather than relying on market competition*" (p.25). For port authorities it is important to know if and how concessions make the ports perform better. Therefore creation of better understanding of the effects of different characteristics of the terminal concessions on port performance is needed. Although predictability in performance indicators has been researched more generally, little attention has gone towards the role of terminal concessions on the performance indicators.

This thesis wants to contribute to the question what the effect of the characteristics of terminal concessions, more specifically container terminal concessions, on the port performance is and how to quantify this effect. The main reason for focusing on container terminals is that the container market is an important market; the last three decades the containerized trade flows have increased rapidly (see Graph 1.1) (de Langen et al, 2010) and in 2007 more than sixty per cent of the world cargo transported over sea was carried in containers (World Bank, 2007). The focus of the thesis will be on developing countries because the World Bank Private Participation in Infrastructure database provides the projects with private involvement in these countries.



Graph 1.2 The growth of the total maritime trade and the container transport (Index 1987 = 100)
Source: UNESCAP, Regional Shipping and Port Development

Therefore, the research question of this thesis is: *What is the effect of the characteristics of container terminal concession on the port performance?*

In order to be able to answer the research question it is important to clearly define all elements of it. Therefore, chapter 2 will explore the definitions of port performance, for which different researches are scrutinized. The literature presents many possible port performance indicators and in this thesis we need one clearly defined port performance measure, which can be measured across different ports. Chapter 3 describes the determinants of the port performance indicator, chosen in chapter 2 as the best measure for this research. After this chapter, the second important element of the research question, namely the container terminal concessions, is explored. Chapter 4 provides an overview of concessions and their main characteristics. The hypotheses are presented in chapter 5 and the methodology for measuring the effects of concessions will be discussed in chapter 6. After this, the empirical results will be presented and analysed in chapter 7. The discussion will be presented in chapter 8, followed by the conclusion in chapter 9. Finally, chapter 10 will discuss the limitations and of the research and will give some suggestions towards future research in this field.

2. Port Performance

Port performance indicators are analysed to evaluate the performance of a port. They are "*various aspects of the port´s operation*" (UNCTAD, 1976). Port performance indicators have, according de Langen et al (2007), three functions: the indicators provide port management insight in the operation of key areas; the indicators are used for communication with (different) stakeholders and the indicators can be used to compare performance of the countries or companies. This can be done by observing trends in the performance levels and comparing the performance with a defined target. Besides of the functions mentioned by de Langen et al, "*the indicators can be used as input for (…) port development and port tariff considerations*" (UNCTAD, p. 3). In order to plan and develop the port, control over the port operations is needed. This control is only possible when there is some form of feedback on the port performance. In other words, port performance indicators can be used as control mechanisms for the port authorities to manage the port as well as possible (UNCTAD). However, the changing role of ports as becoming a part of the supply chain and the diversification of port activities beyond traditional logistics activities into value added logistics services (de Langen et al, 2007) broaden the scope of activities of ports. This makes the measurement of port performance hard to capture. Therefore, to give the stakeholders and the port management insights in the operations, different indicators can be analysed depending on the objectives of the port. For example, the port authority of Rotterdam uses the modal split of the port as a performance indicator; their objective is to achieve a certain modal split on long-term. However other ports may pursue other goals concerning the modal split.

As a result of the diversification of port activities, the literature gives several classifications of indicators. Chung (1993) and the World Bank divide the indicators in operational performance indicators, asset performance indicators and financial performance indicators. De Langen et al (2007) classify three types of port products, cargo handling product, logistics product and manufacturing product. For every port product, port performance indicators can be analysed to check how the port performs on this product. As indicated in table 2.1 (defined from de Langen et al (2007)),

Product	**Port Performance Indicator**
Cargo handling Product	Port Throughput, Ship handling time, Investment level in the port
Logistics Product	Value added in logistics, m^2 logistics space
Manufacturing Product	Value added and investment level in port related manufacturing

Table 2.1 Port Products and their Port Performance Indicators

Some other often heard port performance indicators are port related employment or value added generated in the port (de Langen et al, 2007). The reason for so many different indicators is that

"*seaports are complex service organizations and the port output can be multidimensional depending on the objective that ports want to achieve*" (Tongzon et Heng, 2005, p. 413). Looking at the division of Chung, the operational performance indicators are generally measured in terms of the speed with which a vessel is dispatched. It can be measured as ship turn-round time (i.e. ship handling time) and tonnage handled per day (port throughput per day). A measure of asset performance is the total tonnage handled at the berths or the total tonnage handled per meter of quay. Financial performance indicators are determined from the financial statements and most consider the income generated in the port or the profit of the port. These numbers in absolute form are not comparable: the top ports generate more income than small, local ports. Therefore ports can relate their income generation to the total tonnage of cargo handled at the port, so these figures become more comparable.

The backbone of ports is cargo handling (de Langen et al, 2007), "*the port only functions if it is an efficient node in the transport networks*" (p.26). The port performance indicators that focus on the cargo-handling product are very important to analyse. In table 2.1 three possible indicators concerning cargo-handling products are given. Since the effect of concessions will be investigated across different ports, this research needs a port performance indicator that can be measured in a uniform way. Port throughput is the most widely used in the port industry (de Langen et al, 2007) since it can be measured uniformly. Also, port throughput, to a large extent, is a determinant for the other port performance indicators. For example, the size of logistics space depends on port throughput volumes. If a port has higher throughput volumes, the logistics capacity has to increase with the throughput volumes. This also applies for the value added generated in the ports and the port related employment. Other potential indicators can be found in Chung's division of indicators. He states that to evaluate the operational performance, the ship turn-around time is a good indicator. However the ship turn-around time does, in its basic form, not mean much. The vessels' length of stay depends on the volume of the cargo, the available facilities and the composition of the cargo (Chung, 1993). Tonnage handled per ship day or ship hour is obtained by dividing the port throughput measured in tonnages by the total number of hours that the vessels are in the port. Chung furthermore states that the asset performance is influenced by the total port throughput: generally this is measured as total throughput divided by the meters of quay or number of berths. To make the financial performances comparable with other ports, they are stated relatively, meaning in ratio to the port throughput. In general, the other port indicators are (indirectly) determined by port throughput.

From these examples we can clearly see that port throughput is the most important indicator and it will therefore be used as port performance indicator of this thesis. Talley (2007) states that performance indicators are choice variables for optimizing the port's economic objective. Tongzon (1995) also states that using port throughput as port performance is based on the assumption that ports try to maximize throughput. Traditionally the performance of ports has been evaluated by comparing the actual throughput with its optimum throughput (Talley, 2007). However, "*if performance indicator*

standards are unknown, a port's performance can be evaluated just by knowing the actual values of its performance indicators" (p. 514).

Ports handle different commodities and for each commodity dedicated ships and terminal facilities are required. These commodities can be classified in commodity groups: "dry bulk", "liquid bulk", "neo-bulk", "containers", "Ro-Ro", "conventional general" and "project cargo". The measurement of port throughput depends on the commodity group. For example, dry bulk can be measures in tonnages, while containers are measured in twenty-foot equivalent units (TEU). Adding up the different throughput volumes to one aggregated throughput figure limits the value of comparison between ports (de Langen et al, 2007). Furthermore terminals specialized in different commodities do not compete with each other because of the need of dedicated ships and facilities. Also the customers, the growth prospects and the resource needs differ per commodity group (de Langen et al, 2008). Therefore to increase the value of comparison, it is better to focus on terminals that handle one specific commodity. These findings are in line with of Tongzon's views (1995). He states, "*given the multiplicity of ports and cargoes handled, it is necessary to restrict the scope of the analysis to a limited number of ports and a specific type of cargo*" (p. 245).

2.1 Conclusion

This chapter has presented a summary of the possible port performance indicators. Port throughput is to a large extent the determinant of the other port performance indicators and will therefore be the port performance indicator of this thesis. The scope of the study is limited to container terminals, in line with the statement of Tongzon (1995). Another statement of Tongzon (1995) on port throughput implies that the assumption in this thesis is made that the objective of a container port is to maximize throughput. The indicators will be evaluated on the actual values, while the performance standards of the different ports are unknown (Talley, 2007).

3. Determinants of Port Performance

After determining the port performance indicator for this thesis, the determinants of the port throughput have to be defined. The literature defines possible independent variables that determine the port throughput. Some studies use macro-economic variables as determinants; according those studies, port throughput depends on the economic activity of the country, the openness of the economy, the value density and the level of trade flows. Other studies focus on the port choice of port users as the determinant of port throughput, these studies show that the characteristics of the port are very important to make the decision to call at a specific port.

To give a clear overview of all the potential determinants of port throughput, the classification "macro-economic variables" and "port variables" is made to include the different researches. This is in line with Tongzon (1995) who states that the determinants of cargo flow, in this research the port throughput, are a combination of port characteristics and the economic activity of country. The classification "privatization" is added, because globalization has given the port industries the pressures of international competition. Therefore port services must be provided on an internationally competitive base (Tongzon, 1995) which can be accomplished by privatizing ports. In the next paragraphs the potential independent variables per classification are given.

3.1 Macro-Economic Variables

In the literature we can find several macro-economic variables are found, which are used to determine the port throughput. According to de Langen (2003) port throughput is a part of the trade of a country. Furthermore, he states that OCS (Ocean Shipping Consultants) use trade growth as one of the parameters to explain container growth for forecasting. This is in line with Wiegmans' et al (2007) statement that the demand for international container shipping is derived from global trade flows. The total throughput of a port includes both import and export. Therefore it is important to add the total value of the trade of a specific country (Fung, 2002) to measure the throughput of a port. Trade, in turn, depends on the economic activity of the country (de Langen, 2003; Behar and Vernables, 2010), the openness of the economy, the importance of the country as a trade nation (de Langen, 2003). The openness of the economy is seen as very important to measure the level of port throughput. Harrison (1996) investigated the relation between openness of the economy and economic growth. Her conclusion was that greater openness is associated with the higher economic activity of a country. The level of openness in the economy determines the level of trade. Trade in its turn intensifies the economic competition in a country and enhances the economic growth of a country. Reuveny and Li (2003) state that countries export products that intensively use their abundant production factors and import products that intensively use their scarce factors.

De Langen (2003) also uses the value density to forecast the port throughput. Shah (2009) states that products with high value density can be transported with faster and more expensive transport modes while products with low value density have to be transported with slower and cheaper modes because a small change in transport costs can change the profitability of the product in a significant way.

Moreover, according Behar and Vernables (2010) and Coto-Millán et al (2005), freight costs have a significant impact on trade flows. The economic activity of a country can be measured by using the gross national product (GNP) or the gross domestic product (GDP) of a country. Krugman (2009) argues that movements in GDP and GNP do not differ greatly. The difference between both measures of national economic activity is that "*the GDP does not correct for the portion of the countries production carried out using services provided by foreign-owned capital*" (p. 293). Most studies, however, use GDP as a measure of economic activity (de Langen, 2003; Vanoutrive, 2010; Liu, 2010). GDP is defined as the market value of the goods and services produced by labour and property located in a country (Marrewijk et al, 2007, p. 8). It therefore influences trade, e.g. high economic growth of a trading partner implies a larger market for domestic exports to satisfy foreign demand or for foreign production of goods such as commodities. The demand for port services is a derived demand, meaning that it only occurs because of interaction between individuals or sectors within an economy (Tongzon, 1995). This implies that the demand for port services depends on the level of economic activity within a country and between countries. The GDP also determines a part of the imports, because the production resources or capital have to be imported. The demand for industrial goods is in its turn derived from the demand for consumer goods (Wiegmans et al, 2007) and the production of the country. The quantum of the imported commodities and resources therefore depends on the size of production, which is derived from the economic activity. Liu (2010) used similar parameters as de Langen (2003). The author used international trade as an important determinant of overall demand for container transport and handling services. Moreover, Liu states that GDP is one of the main drivers in the boost of container transport and handling industry. Vanoutrive (2010) explored the link directly between GDP and port throughput, he concludes that the GDP of other countries also play an important role determining the port throughput. Fung (2002) developed an error correction model to forecast the container flows in Hong Kong's container flow. The variables he includes in his analysis are the log of the handled containers of the port of Hong Kong, the log of the handled containers in the region (Shenzhen, Singapore), the total value of the China's foreign trade, the tariffs of Hong Kong and the tariffs of the ports in the region (Shenzhen, Singapore). The reason for including containers in the region is that the services offered by the container ports are similar and they have the same technologic level.

3.2 Port Variables

Several scholars (Tongzon, 1995; de Langen, 2003) have researched the factors influencing cargo flow. Other studies (Tongzon et Heng, 2005; de Langen, 2007; Wiegmans et al, 2007; Chang et al, 2008; Tongzon, 2002; 2009) have focussed factors influencing the choice of ports. These studies are interdependent since the cargo flow depends on the port choice of port users. Using these findings is particularly interesting in order to understand which variables can be included in the model.

Obvious advantages such as the location of the port and the distance to the consumer markets play an important role in the volume of port throughput. However, more characteristics of ports determine the port throughput volumes. Tongzon (1995) determines that cargo flow is dependent on the following factors. The first factor is the geographical location of a port. If the port is located on an easily accessible location by different modalities, more cargo is likely to flow to that specific port. The second factor is the frequency of ship calls. The higher the frequency of ship calls, the higher the port throughput. The third factor is the terminal efficiency. This indicator can be measured by looking at the container mix, the crane efficiency, the size of the vessels and cargo exchange (economies of scale), average number of container handled per hour. Tongzon states that port charges could also be included as variable in the model. However their contribution to the total costs is relatively small.

Several scholars (Tongzon et Heng, 2005; de Langen, 2007; Wiegmans et al, 2007; Chang et al, 2008; Tongzon, 2002; 2009) have identified the factors influencing the choice of port users. The studies determine choice factors of different port users. These studies are relevant for this thesis since the choice of the port users determine the cargo flows to the ports. The most discussed variables from these studies are, besides the location, the physical and technical infrastructure, the port efficiency, the hinterland connections, the port charges and the available (logistic) services. The physical and technical infrastructure includes port physical characteristics such as the depth of the water, the type of cranes in the port and the meters of quay. These variables indicate the limits of the capacity of the port and so the possible port throughput.

The port competition has had an impact on the port choice factors. Containerization has lead to standardization in the maritime industry, implying that ports cannot rely on specialization to maintain their market share and to generate revenues as much as they used to do (OECD, 2008). By containerization, ports in the same region became closer substitutes for the port users. Furthermore, port competition has moved from competition between ports to between transport chains (de Langen et al, 2010). Hinterland connections are of vital importance for a port, because container ports are nowadays a link in a logistics chain (de Langen et al, 2010). This implies that the quality of the hinterland connections and the diversity of the modalities available determine the level of port throughput. Additionally, the costs of hinterland have become relatively important. OECD (2008)

states that the cost per kilogram per km on the hinterland is 5 to 30 times as high (this depends on the hinterland transport mode) as the shipping cost by sea. Also port charges have an influence on the competitive position of the port; they include taxes, administration costs and shipping tariffs. Port users prefer the port with the best price/quality ratio. However port charges are not the most important choice influencer since this indicator is mentioned lower in the list compared to the other determinants in several studies. Tongzon (1995) also states that port charges form an extremely low proportion of the overall costs of international trade. To make a link between port competition and the psychical and technical infrastructure: when these infrastructures are strongly congested, their quality decrease and this weakens the ports competitive position.

Port efficiency will be further discussed in the next paragraph, whereas it also has an influence on port privatization.

3.3 Port Privatization

While ports are the vital link in the overall trading chain, the performance determines to a large extent the nation's international competitiveness (Tongzon, 1995). Over the years privatization of ports has been emerging as an international trend (Cullinane et Song, 2002) due to globalization. Moreover, containerization of cargo has increased port competition. Many mechanisms exist to privatize ports: through concessions, management contracts, divestures, leases, or by outsourcing (Shaw et al, 1996). According to the different researches (UNCTAD; Tongzon, 1995; UNESCAP, 1997; Baird, 2002; Notteboom, 2007) the objective of privatization is to make the port (or terminal) more efficient and flexible. To put this differently, privatization is done to increase the terminal efficiency (also known as port efficiency) and therefore has a positive influence on the general efficiency. With the privatizing of terminal operations the following advantages are attempted to be achieved: it leads to the opportunity to bring technical expertise and foreign management into the country (UNCTAD) and it lowers the costs (Cullinane et Song, 2001). Moreover, privatization of terminal operations gives "*greater potential for the diversification of activities*" (UNCTAD, p. 4). Last but not least, the private operator has the freedom to subcontract any activity to third parties, when it does not want to pursue it itself. In this case other parties may enter the market and every entity can focus on their specialty. Additionally, port privatization leads to quicker response to changes in the market and faster adaptation to changes in the maritime transport technology and intermodal transport (UNESCAP, 1997; Tongzon et Heng, 2005). To be a successful port and stay competitive, the port must constantly be prepared to adapt new roles to manage with the changing market environment (Tonzong et Heng, 2005). The studies, which try to identify the factors influencing the port choice, mention port efficiency often as an important decisive factor. This shows the importance of port efficiency for the level of port throughput.

While port efficiency will not be measured in this research but port throughput is, it is of importance to show the link between both definitions. In this thesis we assume that privatization has an (direct) influence on port throughput by 'ignoring' the middle step. This is in line with the findings of Tongzon (1995; et Heng, 2005; 2009), who identifies the factors that determine the port throughput; one of these determinants is the port efficiency. What are these port efficiencies gained by privatization? The UNSCEP provided a list with the advantages of port privatization. Advantages of port privatization are that there are stronger management capabilities, potentially leading to a larger knowledge base to get ideas from on how to deliver services more efficiently. Another advantage of port privatization, freedom to operate outside bureaucratic constraints, allows them to be more respondent to market needs or changes in the business environment. The port efficiency gained by privatization is providing port services that are adjusted to the competitive world of global trade, which can also mean an adjustment in port charges. The role of the Port Authority becomes that of a landlord. The port authority is no longer involved in the operation of the facilities or the provision of the services. The role of the port will be on policy-making and planning, on regulatory functions, performance monitoring and port promotion. (UNCTAD)

The following figure illustrates the above-discussed relationships between the three variables. The red arrow presents the direct relationship measured in this research.

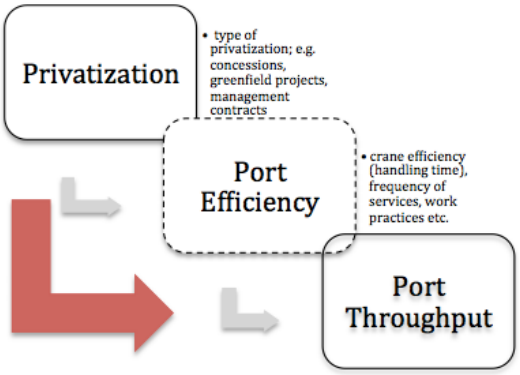


Figure 3.1 The relation between privatization and port throughput

Figure 3.1 shows that the determinants for port efficiency can also be used to determine port throughput. Therefore we will briefly look at studies that try to define port efficiency (Notteboom et al, 2000; Sun et al, 2006; Liu, 2010). From these studies we find different variables that determine the port throughput; most mentioned determinants are the number of berths, length of quays, terminal area and number of cargo handling cranes. All those determinants are concerning the infrastructure of the port and can therefore be classified under the determinants on port level.

3.4 Conclusion

To conclude, the literature has given several potential determinants to determine port throughput. From the macroeconomic perspective we can see that various variables are important to give a clear overview of the economic activity in the country. The variables presented in table 3.1 partly overlap in their explanatory value but all capture a part which determines the port throughput. On port level, there are many determinants for port throughput; the most mentioned in the literature are presented in the table. The port level determinants can be divided into determinants concerning the geographical location, the port physical and technical infrastructure (Wiegmans et al, 2007) and the "service related" determinants. The latter group is an aggregation of all the variables that cannot be determined in the first two groups.

Factors	
On Macro- Economic Level	
GDP	
Trade	**Determinants**
	Freight Costs
	Openness of the Economy
	Industry Production
Value Density	
Port Level	
Geographical Location	**Elements**
	Location of the port
	Distance to the Market
Port psychical and technical infrastructure	**Elements**
	Depth of the water
	Hinterland Connections
	Meters of Quay
	Type of Cranes
Service related determinants	**Elements**
	Availability of Port Services
	Quality of the Port Services
	Port Charges
On Privatization	
Concessions	
Management Contracts	
Divestitures	
Leases	

Outsourcing

Table 3.1 The factors of port throughput

As stated before, there are many mechanisms to privatize a port and those are given in the table. All these mechanisms are assumed to have a positive effect on the port performance. Baird (2002) has done research on the privatization of ports, by interviewing 100 top container ports. He states that the most used mechanism to privatize ports is by granting a concession. Additionally, in the World Bank Private Participation in Infrastructure (PPI) database the most port projects are privatized by concessions. The main difference between concessions and the other mechanisms is that by granting concessions the government retains ultimate ownership of assets and some part of the commercial risk of providing or operating the assets is transferred to the private entity (Shaw et al, 1996). Important to note is that research of Tongzon and Heng (2005) has shown that the best extent of private sector in container terminals/ports to maximize port operation efficiency is between, what they call, the private/public mode and the private mode. This implies that the best scenario for the government is to limit the private participation by introducing private finance, operating and managing the terminal. The government itself takes over the regulatory function and retains the ultimate ownership. This finding shows that concessions, despite being the most used mechanism, have the most influence on maximizing port efficiency. In the case of concessions, the government retakes the facilities after the concession has expired, implying that the ultimate ownership stays with the government. Therefore in the next chapter we will focus on concessions in general.

4. Concessions

Concessions have the following important characteristics (Shaw et al, 1996). In a concession, the government defines and grants specific rights to a company (or several). Furthermore, concessions have a defined term and are geographically limited. The concession agreement describes the objectives and directly allocates the commercial risk of operating the facilities. In the next paragraphs the definition and objectives of concessions and the characteristics of concessions are discussed.

4.1 Concession Structures

In the literature (UNCTAD; Shaw et al, 1996; Notteboom, 2007) many alternative structures of concessions (e.g. BOT, BROT, BLT, BOST, ROT, BLO and RLT) are given, the structure depends on the objective of the agreement. In table 4.1 the different concessions are listed and defined to give more insight in the different aspects of concessions. The main differences between the different types of concessions are the risk division between a government and a concessionaire (World Bank).

Type of arrangements	*Definition*
Rehabilitate-Operate-Transfer (ROT)	In a ROT system the government or port authority grants a concession to a private entity to rehabilitate or modernize the terminal. The entity is allowed to operate and obtain revenue for the concession structure duration. At the end the government retakes the facility.
Build-Operate-Transfer (BOT)	In a BOT system, the private entity is granted to build a new facility and operates it during a specified time. At the end of the arrangement the government or public authority retakes the terminal facilities.
Build-Lease-Operate (BLO)	Through a long-term concession the port authority leases the construction of the whole or part of the port to a private entity. The private entity constructs the terminals, berths and other facilities and the port authority receives an annual payment and controls the rights during the concession duration.
Build-Lease-Transfer (BLT)	A private entity builds a new facility at own risk, then the ownership is transferred to the government and the private entity leases the facility from the government and operates it at own risk At the end of the arrangement the government retakes the facilities.
Build-Operate-Share-Transfer (BOST)	Similar to BOT, only this time the government or public authority should assure a specific quantity of throughput for revenue. The commercial risks are shared among the

	government and the private entity. At the end of the arrangement the government or public authority retakes the terminal operating facilities.
Build – Rehabilitate – Operate-Transfer (BROT)	The BROT is a variant of the BOT structure. However in this arrangement the new facility is not only build, but also rehabilitated and modernized after some time. At the end of the arrangement the government or public authority retakes the terminal operating facilities.
Rehabilitate-Lease/Rent-Transfer (RLT)	In a RLT structure the private entity rehabilitates the existing terminal facilities at own risk. After that the private entity operates and maintains the facility for the contract period At the end the government or public authority retakes the terminal facilities.

Table 4.1 Different concession arrangements and definition

These concessions types can be roughly divided into brownfield concessions (e.g. ROT, RLT, BROT) or Greenfield concessions (e.g. BOT, BLT, BOST, BLO). Strictly defined, the term 'concessions' refers to brownfield concessions, which include rehabilitating already operating port facilities or terminal expansion rights. Greenfield concessions, better known as Greenfield projects, refer to newly built facilities or port development at new locations, which implies that their characteristics are very different. Greenfield projects are for that reason often classified as another type than concessions (World Bank Private Participation in Infrastructure, PPI).

4.2 Objectives of Concessions

Granting a concession holds several advantages for the government. Although private operators take over the terminal, the government can still retain some control of the organization and the structure of the supply side, the port services, and the port market (Notteboom, 2007, p.438). The World Bank states that by granting concessions, the government or port authority can enhance the operational efficiency, improve the allocation of the resources within and between the different sectors in the port and protect and improve social equity and the environment. UNCTAD states that concessions give the opportunity to bring foreign management and technical expertise into the country. Another objective for granting concessions is that they ensure competition (Shaw et al, 1996; Notteboom, 2007) through the bidding procedure. Concessions nowadays are mostly granted by a bidding procedure (Notteboom, 2007), in order to treat the candidates equally and limit favouritism in awarding the concession. The threat of future competition after the concession has expired, ensures that pressure on the private entity will be maintained throughout the concession duration which leads to better performance of the

private entity (Shaw et al, 1996). Therefore concessions have become one of the most important tools for port authorities to influence the port community (Notteboom, 2007).

4.3 Concession Duration

In most cases the public authorities and the governments decide on the term of the concession (Notteboom, 2007). In some cases the private operator is allowed to indicate the concession duration in the bidding. Pallis et al (2008) state that private terminal operators usually prefer long-term concessions, but do not specify the length of long-term concessions. Governments (Shaw et al, 1996) however often prefer short-term concessions as they intend to have more competitive pressure. Theys and Notteboom (2010) conclude that investment specific conditions (including the investment division between the public authority and the private entity) are the key elements in the determination of concession durations.

Theys and Notteboom (2010) have made an overview of the conditions for long and short duration concessions. The first condition is that the investment requirements for the private operator determine for a long or short duration. Longer concessions give private port operators opportunities to have learning-by-doing processes and to achieve a reasonable ROI (return on investment) (Notteboom, 2007; Theys et Notteboom, 2010). If the port authority wants to obtain high transaction specific investments, a longer duration is required. However when there are high site-specific investments by the governments (site-specificity refers to the assets on a specific location), it is better to grant a short-term duration. In that case there is less risk for the provider, so there is no need for granting a long-term concession. The second condition is about the economic life of transaction specific investments and it is related with the first condition. The economic life of an investment refers to the expected time that an asset is useful for its owner by producing competitively services or goods. If the economic life of the investments is long, the concession will also be long. This is done to have a reasonable ROI and to earn the investments back. The third condition concerns information asymmetries. If the government wants to provide incentives for non-observable investment or if the evaluations of the value of the assets that are invested by the operator are difficult, it is better to grant a long-term concession.

The other conditions are according to the experience, performance and behavior of parties. A condition to grant a long-term concession is that the private company or companies should be more experienced or financially strong parties. Also some contractual conditions are given. High transaction costs or negotiation costs lead to the commissioning of a long-term concession, this in order to minimize these costs in the future. If there is high probability that the contract will be renegotiated, short-term concessions are preferred to decrease the risk of renegotiating. Furthermore, when the involved parties are flexible, a short-term concession can be granted.

Several scholars criticize long-term concessions: they limit the opportunities of newcomers, while they create a degree of protection against the new entrants (Pallis et de Lange, 2007; Pallis, 2008). According Notteboom (2007) new players can still enter the market. This can happen through a merger or acquisition of a local operator or when, the concession of a new terminal expansion is granted by the newcomers. All over the world, legislators have developed rough guidelines on concession durations, in order to safeguard fair competition in the port industry. The EU has proposed a maximum period for concessions of 30 years for concessions when there are investments in immovable assets. This is in order to find the right balance between reasonable payback periods and guarantee entrance of new players (Theys et Notteboom, 2010). Furthermore, in unstable economic and political countries, the risk valuation of private companies will be high. The price that firms want to pay for the concessions will only increase when the concession duration is longer (Pallis et al, 2008).

From the overview of Theys and Notteboom (2010) it can be concluded that the experience and the performance of the private entities are important for the determination of the concession durations. In the next paragraph these participants in concessions will be discussed.

4.4 Concession Participants

Through concessions the temporary ownership of container terminals has changed over the last years. Farrell (2012) states that half of the concessions, whose ownership could be tracked, were awarded to one company. She states that concessions, which involved new entrants "*are more likely to involve multiple participants than those awarded to incumbents*" (p.16). The explanation is that new entrants often feel the need for well-connected local partners for assistence. Sometimes cooperation between different participants is needed to attract enough funding; for bigger players in the container industry attracting funding is easier. The participants are only involved in partnerships when additional advantages can be granted. The division in the partnership depends on the interests of the participants. The reasons to establish a partnership, in her research these partnerships are called Special Purpose Vehicles (SPVs), are given above, e.g. to have well-connected local partners, to attract enough funding, to guarantee throughput.

By winning concessions private entities expand their activities to terminal operations and, in effect, they become terminal operators. Since these companies have a wide range of possible backgrounds, skills and experiences, knowing why they expanded their business operations to the area of terminal operation can provide interesting insights. In order to learn more about the background of the participants, we will have a look at it in the next paragraph.

4.5 Type of Entities

The experience, behavior and the performance of the private parties play a role in the theory on the setting of a concession (Theys and Notteboom, 2010). Several classifications on the concession participants are found in the literature. The most recent classification is by Sheila Farrell (2012). She distinguishes eleven different types of concession structure participants. The groups are as following, Global Terminal Operator, Regional Terminal Operator, Stevedores, Shipping Lines, Freight Transport companies, Construction companies, Equipment Manufactures, Property Developers, Industrial Conglomerates, Public Authorities and Financial Institutions.

The table 4.2 presents all the concession participants, defined by Farrell and includes a short definition is given per participant.

Type of participant	*Definition*
Global Terminal Operators (GTO)	Global Terminal Operator is a terminal operator, which operates on global level. They granted concessions around the world and have built a large global network across countries where they speak different languages or have different cultures.
Shipping Lines (SL)	Under Shipping Lines not only the lines themselves are meant who operate a terminal, but also terminal operators owned by or associated with Shipping Lines.
Regional Terminal Operators (RTO)	Regional Terminal Operator operates on regional or local level. The terminal concessions are within a single region or in countries where they speak the same language.
Stevedores (STE)	Stevedores are engaged in the loading and unloading of vessels. They are involved in concessions to handle the containers at one port.
Freight Transport Companies (FT)	Freight Transport Companies is a broad term of freight service providers, such as shipping agents; freight forwarders and logistics service providers.
Construction Companies (CC)	Construction Companies are large engineering firms. According Farrell, they are involved in concessions to secure the terminal construction contracts.
Equipment Manufacturers (EM)	Equipment Manufacturers are small companies that have moved into concessions.
Property Developers (PD)	Property Developers are companies that have diversified from commercial/residential development into the provision of infrastructure.

Industrial Conglomerates (IC)	Industrial Conglomerates are mostly holding companies or large manufacturers. These entities are considered by the governments to have the capacity to develop strategic assets.
Financial Institutions (FI)	Financial Institutions include banks, pension funds, and international financial institutions. The FI mainly bought themselves into established concessions or purchasing shares to become an entity in the concession.
Public authorities (PA)	Public authorities are the public port authorities and regional governments who have expanded their activities to other ports and broaden their spatial base.

Table 4.2 Classification of concession participants (from Farrell, 2012)

Bichou and Bell (2007) have proposed a classification of terminal operating companies. They state that there are terminal operating shippers (TOS), which are mainly active in non-containerized cargo operations. Firms such as Shell and Cargill belong to this category. Terminal operating shipping lines (TOSL) operate port facilities through concessions or long-term leases and concession agreements; an example of TOSL is APM Terminals. There are terminal operating port authorities (TOPA), which include port authorities that expanded their activities to terminals and ports beyond their spatial bases, and there are terminal operating companies (TOC). This last group includes companies that held activities in logistics operations, property development or related business venture and expanded those into international port operations and management. Companies as HPH, ICTSI and SSA Marine belong to this category. Slack and Fremont (2005) defines terminal operating companies as transnational terminal operating companies (TTOs) and international shipping lines. Parola and Musse (2007) classifies three groups, the pure stevedores, integrated carriers and hybrid terminal operators.

Two of these concession participants stand out in the different studies. Farrell highlights the key role of Global Terminal Operators and Shipping Lines in concessions by studying the SPVs. Research has found out that international terminal operators are the dominant players in the container handling industry. Notteboom and Rodrigue (2012) state that the top ten terminal operators operate 64.4% of the world total handlings. The global terminal operator can switch equipment and management resources around the world as a response to the changes in the market. The size, reputation and independence of these companies score high in biddings for tenders (Farrell, 2012). It is assumed that global terminal operators are "*more successful in bringing in new businesses, although this is far from proven*" (Farrell, p. 25). Global Terminal Operators are seen as market seekers (Notteboom et Rodrigue, 2012) and they choose their locations carefully.

A fast-growing market segment is the single-user terminals operated by global container carriers (Wiegmans et al, 2007). Shipping lines are securing terminal capacity at key locations, by vertically integrating into port operations. It gives them more control on the global door-to-door services. The idea is that when shipping lines operate a terminal it will result in efficiency gains, the delivery of value added and cost reductions (Slack et al, 2005). Also the involvement of shipping lines in terminal operations can lead to guarantees in throughput volumes, because they vertically integrate in the supply chain. Farrell (2008) states that of the new companies that have entered the terminal operation market relatively few companies other than shipping lines have succeeded so far. According to Notteboom and Rodrigue, (2012) shipping lines are more eager on locations when the value creations towards the entire supply chain are higher.

4.6 Conclusion

First it is important to note that the literature makes a clear distinction between brownfield concessions and Greenfield concessions. Because the objectives of both concessions structures are very different, we cannot observe both concessions structures in one dataset. Therefore we will look at the narrow definition of concessions and only include brownfield concessions in the research.

When looking at the different characteristics of the concessions, the literature review reveals that the concession duration, the number of participants in the concession and the participants of the concession are the most important characteristics of the concessions.

The findings of Farrell (2012) concerning the number of entities in concessions show that this is an important factor to analyze, because the number of companies participating in the concession depends on the experience level of terminal operating activities of the entity or entities. The term "new entrants", next to referring to companies that enter the terminal operating market, can also refer to a big player in the container industry that enters a 'new' region. In this last case the company also feels the need for well-connected local partners for help. These different assumptions on "new entrants" lead to the output on this variable needing to be analyzed carefully. To put differently, when the concession is granted to one entity this means that it is granted to a big player with experience in the terminal operating industry and who is familiar with the region of the port. However, when the concession is granted to more entities, it is likely that parties with less experience in the container industry are involved in the concession but it can also possible mean that it is granted to a big player who enters a new market. Additionally, when a concession is granted to partnerships or SPVs different reasons or different interests could have led to forming the partnership, such as attracting enough funding or entering a new region or new industry. Since there are more possible scenarios when the concession is granted to more parties, it is difficult to analyze the output and therefore this variable will not be included as most important characteristic of the concession.

Important to note is that the awarding process of concession terminals has not received a lot of attention in the academic field. This is due to the fact that the details of the awarding process are rarely made public. These details are of importance to see whether the companies were selected first, before the negotiations started, or if first the concession duration was determined and then parties were included.

Despite that the literature inclines to state that the most important components of the concession are the private entities, because depending on their experience, behavior and the performance of the entity the duration of the concession and the number of entities participating in the concession are determined, we will argue in this thesis that the duration of a concession is the most important component of a concession. A public authority or government has specific goals with the port and mostly decide on the length of the concession (Notteboom, 2007). Depending on the length of the concession, the participant can decide for itself if it still wants to enter the concession or not. The reasons for using this framework is that a concession has several components and those components are interrelated. For example, concessions can have the duration of 25 years and the private company who is participating in the concession is a shipping line. In the next figure these interactions are made visible. The split of the concession durations will be explained in the next chapter.

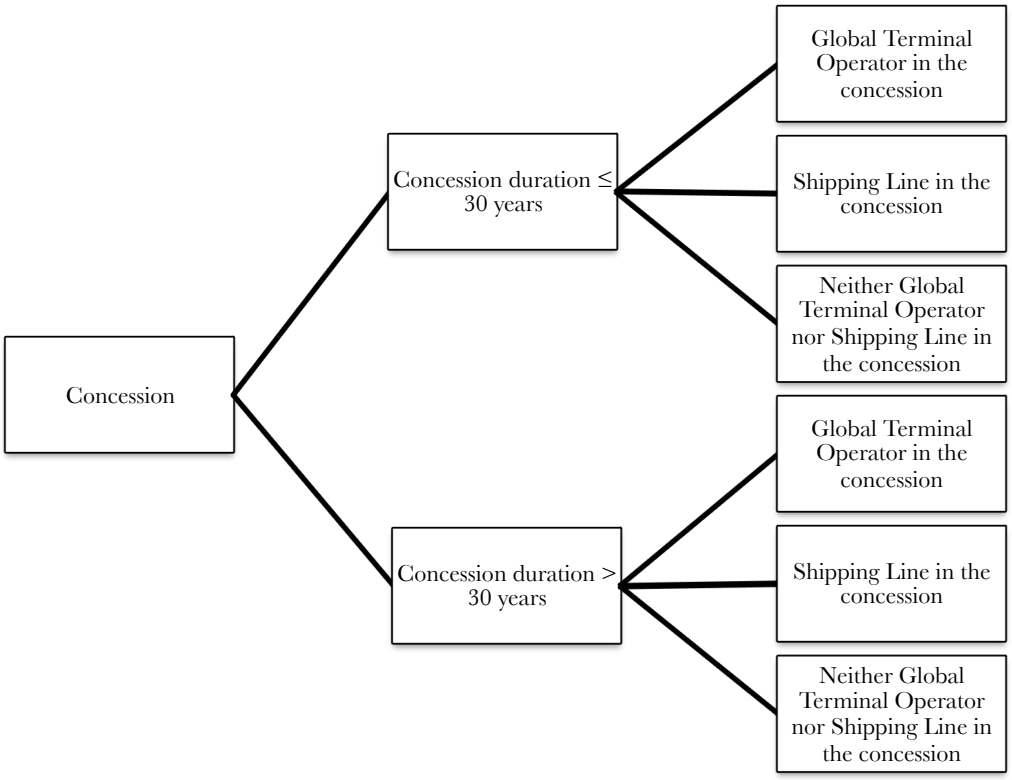


Figure 4.1 The relations of the concession characteristics

5. Hypotheses

The focus of this research on the different characteristics of the concessions is based on Farrell's statement that if the governments want to obtain a larger slice of benefits of concessions, better understanding of the effects of different characteristics is needed. From the literature it has become clear that the most important characteristics of concessions are the durations of the concessions and the background of entities.

Our first hypothesis investigates whether a concession leads to a better port performance. To understand the effects of different characteristics, we first have to investigate if concessions in general lead to a better port performance. The first hypothesis is: The presence of a concession has a significant positive effect on the port performance.

The second hypothesis is regarding the duration. As we can see from the literature review, many pros and cons for long and short concession durations exist. However, the public authority needs to find the right balance between reasonable payback periods and still providing incentives for a good performance of the private parties (Theys et Notteboom, 2010). The EU has proposed maximum concession durations of 30 years, which implies that they assume that the balance of concessions above 30 years is not right. We assume that when the right balance is found the port performance will be higher compared to other durations, because the private companies have enough incentives to operate as well as possible because of the pressure of competition. The World Bank also refers to the maximum of 30 years for seaport concessions (Shaw et al, 1996). If we look at the concession durations given in the World Bank PPI database, we can see that half of the granted concessions have a period of 16 to 25 years and half of the granted concessions are in the period between 45 to 60 years. Because there was no clear specification found according long-term and short-term concessions by scholars, we assume that concession under or equal to 30 years are short-term concessions. Concessions longer than 30 years refer to long-term concessions. Therefore, the second hypothesis is as follows: A concession with the duration under or equal to 30 years shows significantly higher port performance compared to concessions with longer durations.

To zoom in on the background of the entities, literature stated that two companies are the most important players in the market, the Global Terminal Operators (GTO) and the Shipping Lines (SL). The global terminal operators own a large part of the world container handling and have much expertise on the market (Notteboom et Rodrigue, 2012). Therefore we expect the most growth when a Global Terminal Operator is present in the concession. Shipping lines are emerging in the container handling industry; moreover they are one of the few new entrants in the terminal operating market who have succeeded so far (Farrell, 2012). Shipping lines can also guarantee throughput by vertical integrating in the transport chain, this makes them a preferred party to the port authority. We can

assume that their presence in a concession will lead to a growth in port throughput. The third and fourth hypothesis are as follows: The presence of a Shipping Line in a concession will lead to a better port performance and The presence of a Global Terminal Operator in a concession will lead to a better port performance.

6. Model & Data

In order to analyze the effect of concession characteristics on the port performance, the first paragraph (6.1) presents the model in its functional form. In the second paragraph (6.2) the data are discussed and the variables that will be included in the model are presented. Paragraph 6.3 will discuss the preliminary results and is followed by the definition of the final model in paragraph 6.4.

6.1 Functional Form

The mentioned determinants from the literature bring us to the following functional form, which describes port throughput. Tongzon (1995) stated that port throughput is a combination of economic activity and port characteristics. Port privatization is added in the functional form, because globalization has led to international pressure on the port industry and to the need for competitive services, which can be realized by privatizing the terminal facilities.

$$y = f(x1, x2, x3)$$

y = port throughput

x1 = macro-economic variables of a country including GDP and trade volumes

x2 = port specific characteristics including the geographical location of the port, the infrastructure of the port and terminal and the port service indicators.

x3 = concession characteristics including the duration, involvement of shipping line or global terminal operator

Different studies (Tongzon et Heng, 2005; de Langen, 2007; Wiegmans et al, 2007; Chang et al, 2008; Tongzon, 2002; 2009) have shown that there are many determinants influencing the port choice. Table 6.1 gives an overview of the potential determinants with the link to the theory.

Determinants of port performance		Link to theory
Dependent Variable		*y*
Port Throughput		
Macro- Economic Level		*x1*
GDP		
Trade	Determinants	
	Freight Costs Openness of the Economy Industry	

Value Density		
Port Level		*x2*
Geographical Location	Elements	
	Location of the port Distance to the Market	
Port physical and technical infrastructure	Elements	
	Depth of the water Hinterland Connections Meters of Quay Type of Cranes	
Service related determinants	Elements	
	Availability of Port Services Port Charges	
Privatization		*x3*
Concessions	Characteristics	
	Duration Shipping Line (involved) Global Terminal Operator (involved)	

Table 6.1 Potential Factors

6.2 Data

Data collection

A panel dataset covering the period 1990-2010 is collected. The Private Participation in Infrastructure (PPI) dataset of the World Bank starts from 1984 and the first port concession in this database is commissioned in 1986. Throughput data before 1990 were hard to collect, therefore the dataset does not cover the period 1984-2010. The dataset is unbalanced, meaning that the data are not complete. Figure 6.1 shows the geographical location of the ports that are included in the dataset.

Besides the information about ports provided by the PPI dataset, we have collected the throughput of all the ports of the countries in the PPI dataset, like Fung (2002) did in his research, as control variable. For these ports it is assumed that they are not privatized: no information about them is published in the PPI dataset.

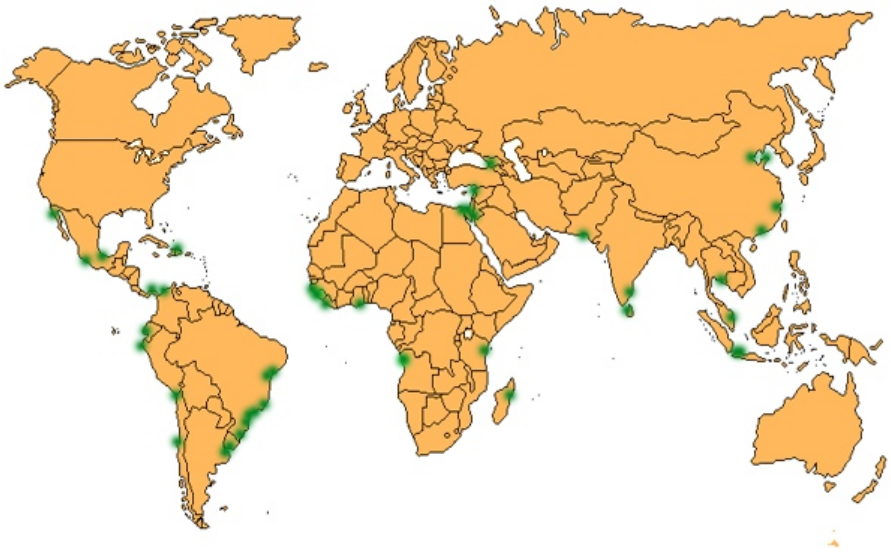


Figure 6.1 The geographical location of the by concession commissioned ports included in this research

Dependent variable

The port throughput is measured in Twenty-foot Equivalent Unit (TEU), a standardized container measure. The collected throughput data are from *Containerization International*. Royal HaskoningDHV already compiled the data per port over the years. The missing throughput data are collected from different sources, a full list is presented in Appendix A. Some throughput figures were over a different time span than January – December. If the time span of the given throughput was a year, then this was neglected (for example July-June). In the few cases that the information was only available over a couple of months, the data was extrapolated. To get more insights into the port throughput data, boxplots are displayed of the different ports (Appendix A). A boxplot provides information about the median, the minimum and the maximum value of the port throughput. It also identifies outliers in data. The boxplots show that there are only 4 ports dealing with an (maximum) outlier. The boxplots show that the observations above the median are more disperse. Furthermore the boxplots show that none of the distributions of the port throughput is symmetric.

Independent variables

The independent variables also have the time span of a year. The data on the concessions are published by the World Bank in its Private Participation in Infrastructure Database and include all types of private participation in the infrastructure in low-income and middle-income countries. The published data consists of 360 observations of PPI in seaport projects, 168 of the observations are about container terminals. The World Bank defines concessions as ROT (rehabilitate – operate – transfer), RLT (rehabilitate – lease or rent – transfer) and BROT (build – rehabilitate – operate – transfer). The characteristics of the concessions were also given in the database. The concessions

characteristics are converted into dummies. The dummies cover the most important concession characteristics: the type of company involved in the concession and the duration of concessions. The type of company will only include the global terminal operator (GTO) and the shipping line (SL); seen from the literature they are the most important players in the terminal operating industry. A third dummy is added for the cases where no GTO or SL is involved in the concession. The companies are classified according Farrell's classification (2012) and the business activities of the company are obtained from the company's website. An extensive list with the classification per company and the sources used is given in the reference list. The duration of concessions is divided in two groups: concessions under or equal to 30 years and concessions longer than 30 years. The longest concession duration found in the database was 60 years. In the group concessions under or equal to 30 years, most concessions were in the between the 20 and 30 years. In four cases the concession length was 10 years and in three cases a concession of 15 years was granted.

To get more insights into the data, as was discussed earlier, the following two frequency tables of the concession duration and the participants are compiled.

Concession Duration Interval (in years)	Frequency
0 – 15	6
16- 30	34
31 – 45	2
46 – 60	8
Total	*50*

Table 6.2 Frequency Table Concession Durations

Participants	Frequency
Shipping Line	8
Global Terminal Operator	24
Neither Global Terminal Operator or Shipping Line	18
Total	*50*

Table 6.3 Frequency Table Participants

Many port variables are not collected and included in the model due to limited availability. These variables include the variables concerning the geographical location and the port charges. Furthermore, if the variables were collectable, these were not available in time-series. These variables were the type of cranes, the meters of quay and the availability of the port services. The Containerisation Yearbook provided this information, however not every Yearbook was accessible. IHS Fairplay SeaWeb only provided the current port facts. The only variables, which were collectable, are the port depth and whether the port was connected to a rail network. The latter variable is given in as a dummy variable. Both variables were published at SeaWeb. The same problems as with the other

port variables occur; therefore we assume in this research that it is more likely that these variables were constant over time.

The GDP in constant US$ is collected from the World Bank World Development Indicators. We include only the GDP of the country where the port is located, although Vanoutrive (2010) states that the GDP of neighboring countries also should be taken into account. The reason is as follows: the study of Vanoutrive (2010) focuses on the port of Antwerp, which has an extensive cross-country hinterland to serve and is located in a highly developed port range. This is on the hand due to the Schengen Convention and on the other hand due to the fact that most of the mainland of Europe is contestable hinterland (de Langen et al, 2010). Our dataset includes countries such as China and Brazil. The size of these countries makes it less likely that the throughput of these ports will be transshipped to the neighboring countries. Furthermore van Niekerk (2005) states that developing countries are normally characterized by a lack of hinterland connections. This may imply that the neighboring countries do not influence the level of port throughput because the cargo cannot be transshipped to these countries.

The value of the import and the export from the World Bank World Development Indicators Database is collected. Both values are added to obtain the trade of a nation. The value density is obtained by the following formula: ([Import Value + Export Value]/ [Import Volume + Export Volume]). The openness of the Economy is acquired by the following formula: ([Import + Export]/GDP) (Rodriguez, 2000). However the openness of a country will not explicitly be included in this research. The components of openness of country, respectively the GDP and trade, are included in the research and consequently those will control for the openness of a country. The variable industry (value added) is collected from the World Bank World Development Indicators. Industry (value added) comprises value added in mining, manufacturing, gas, electricity, construction and water.

As hinterland connection only rail was considered. The modality, which represents the hinterland connections in the model, is rail transport. Inland or Short Sea shipping is not included because it is only actively promoted within the EU[1], USA[2] and China[3], from which only China is included in the database. For the other countries, due to geographical restrictions, inland shipping is not possible. Road connections are also not included in the model because every port is connected to a road in order to transport employees and cargo. Air transport is not included because different commodities are transported by air and by sea.

Freight costs were not available in the period 1980-2010 and are therefore not included as variable in the research.

[1] http://ec.europa.eu/transport/maritime/short_sea_shipping/short_sea_shipping_en.htm
[2] http://aapa.files.cms-plus.com/SeminarPresentations/Red.pdf
http://www.aapa-ports.org/Issues/USGovRelDetail.cfm?itemnumber=892
[3] http://www.apec-tptwg.org.cn/new/projects/project%20finalreport%20shortseashipping.pdf

No	Port	Country	Project Name according World Bank	Conce-ssion Closure	Private Entity involved (may include more parties)	Dura tion
1	Luanda	Angola	Luanda Container Terminal	2007	SL	20
2	Tema	Ghana	Douala Container Terminal	2003	Neither GTO or SL	25
3	Conakry	Guinea	Pointe-Noire Container Terminal	2009	Neither GTO or SL	25
4	Monrovia	Liberia	Port of Monrovia	2010	SL	25
5	Toamasina	Madagascar	Port of Toamasina	2005	GTO	20
6	Dakar	Senegal	Dakar Port	2008	GTO	25
7	Freetown	Sierra Leone	Port of Freetown Container Terminal	2010	Neither GTO or SL	20
8	Dar-es-Salaam	Tanzania	Dar-es-Salaam Container Terminal	2000	GTO	10
9	Tianjin	China	Tianjin Port	1998	GTO	10
10	Guangzhou	China	Guangzhou Container Terminal	2001	GTO	50
11	Ningbo	China	Ningo Beilun Port Phase II	2002	GTO	50
12	Shanghai	China	Shanghai Pudong International Container Terminals Ltd, Shanghai East Container Terminal	Shanghai Pudong Internatio nal Container Terminals Ltd, 2003; Shanghai East Container Terminal, 2003	GTO; SL	50; 50
13	Yantai	China	Yantai Rising Dragon International Container Terminals Ltd	2007	GTO	50
14	Tanjung Priok	Indonesia	Tanjung Priok Koja Container Terminal; PT Jakarta International Container	1995 (both concessio ns)	GTO; GTO	20; 20
15	Tanjung Perak	Indonesia	PT Jakarta International Container	1999	GTO	20
16	Makassar	Indonesia	Terminal Petikemas Makassar (TPM)	1999	GTO	10
17	Kuantan	Malaysia	Kuantan Port	1997	Neither GTO or SL	60
18	Klang	Malaysia	Port Klang	1986	Neither GTO or SL	27
19	Laem	Thailand	Laem Chabang	B1 1995;	Neither GTO or	27; 30

	Chabang		Terminal B1 & C3	C3 2003	SL; GTO	
20	Batumi	Georgia	Batumi International Container Port Terminal	2007	GTO	48
21	Buenos Aires	Argentina	Buenos Aires Puerto Nuevo Terminal 1,2; 3; 5	BAPN 1,2 1994; BAPN 3 1994; BAPN 5 1994	GTO; GTO; GTO	25; 25; 18
22	Santos	Brazil	Santos Terminal 37; Santos Terminal de Conteineres	Santos Terminal 37 1995; Terminal de Conteineres 1997	Neither GTO or SL; Neither GTO or SL	20; 20
23	Rio Grande	Brazil	Rio Grande Terminal de Conteineres	1997	Neither GTO or SL	50
24	Rio de Janeiro	Brazil	Rio de Janeiro – Terminal de Conteineres (Tecont 1, Tecont 2)	1998 (both concessions)	Neither GTO or SL; Neither GTO or SL	25; 25
25	Paranangua	Brazil	Paranagua Port – Container Terminal (TCP)	1998	Neither GTO or SL	25
26	Salvador	Brazil	Salvador Port Containers Terminal (Tecon Salvador)	2000	Neither GTO or SL	25
27	Suape	Brazil	Port of Suape Container Terminal	2002	GTO	30
28	Convicon	Brazil	Convicon Container Terminal	2003	Neither GTO or SL	15
29	Imbituba	Brazil	Tecon Imbituba	2009	Neither GTO or SL	25
30	San Antonio	Chile	San Antonio Port Northern Terminal	1999	Neither GTO or SL	30
31	Arica	Chile	Consorcio Puerto Arica (CPA)	2004	SL	30
32	Cartagena	Colombia	Cartagena Port	1993	Neither GTO or SL	40
33	Manzanillo	Dominican Republic	Manzanillo Port	2001	Neither GTO or SL	10
34	Manta	Ecuador	Manta Port Concession	2006	GTO	30
35	Veracruz	Mexico	Veracruz Container Terminal	1995	GTO	20
36	Ensenada	Mexico	Ensenada Container Terminal	1997	GTO	20
37	Lazaro Cardenas	Mexico	Lazaro Cardenas Container Terminal	2003	GTO	30
38	Colon	Panama	Colon Container Terminal	1995	SL	20

39	Paita	Peru	Paita Port	2009	Neither GTO or SL	30
40	Montevideo	Uruguay	Terminal Cuenca del Plata	2001	Neither GTO or SL	30
41	Alexandria	Egypt	Alexandria International Container Terminals	2005	GTO	25
42	Damietta	Egypt	Damietta Port	2008	SL	40
43	Aqaba	Jordan	Aqaba Container Terminal	2006	SL	25
44	Tartous	Syrian	Tartous International Container Terminal	2006	GTO	10
45	Chennai	India	Chennai Container Terminal Pvt Ltd	2001	GTO	30
46	Karachi, Qasim	Pakistan	Qasim International Container Terminal	1995	GTO	30
47	Karachi	Pakistan	Karachi – International Container Terminal	1997	GTO	30
48	Colombo	Sri Lanka	Colombo Port	1999	SL	30

Table 6.4 Ports (details)

The table below shows us the variables and their specifications, which are included in the model. The corresponding source of the collected information is also here presented.

Dependent Variable	*Description*	*Unit of Measurement*	*Source*
Port Performance			
Lnthr	Container throughput of the port	TEU	Containerization International
Explanatory Variables	*Description*	*Unit of Measurement*	*Source*
Privatization			
con	Indication of whether a concession is commissioned or not	(0,1)	World Bank PPI database
condur1 *	Indication of a concession duration under of equal to 30 years	(0,1)	World Bank PPI database
condur2 *	Indication on a concession duration above 30 years	(0,1)	World Bank PPI database
GTO *	Indication whether a Global Terminal Operator is participating in the concession	(0,1)	World Bank PPI database / Company website / Farrell (2012)

SL *	Indication whether a Shipping Line is participating in the concession	(0,1)	World Bank PPI database / Company website/ Farrell (2012)
NOGTOSL *	Indication when neither Global Terminal Operator nor Shipping Line is participating in the concession	(0,1)	World Bank PPI database / Company website / Farrell (2012)
Macro Level			
LnGDP	GDP is measured as the GDP in constant US dollars. Constant series are used to measure the true growth, while current series are influenced by the effect of the inflation[4].	US $	World Bank World Development Indicators
Lnopen	The openness of the economy.	%	Self constructed
Lntrade	The sum of trade of a nation, obtained by adding up the lnexpval and lnimpval.	US $	Self constructed; lnexpval + lnempval are conducted from the World Bank World Development Indicators
Lnvalden	Value density of the Trade.	%	Self constructed
Lnindus	Industry, value added. The variable value added is obtained by *the net output of a sector after adding up all outputs and subtracting intermediate inputs*[5].	% of GDP	World Bank World Development Indicators
Port Level			
Rail	Indication of whether port is connected to a rail network or not.	(0,1)	IHS Fairplays Sea-web
Depth	The deepest point in the port.	meters (m)	IHS Fairplays Sea-web

*These dummy variables are interacted with each other in the model (see Chapter 4)

Table 6.5 Variables

[4] http://data.worldbank.org/about/faq/specific-data-series
[5] http://data.worldbank.org/indicator/NV.IND.TOTL.ZS

6.3 Preliminary Results

We are testing the model on the assumptions of *ordinary least squares (*OLS). OLS is a method used for measuring unknown parameters in linear regressions and there are five basic assumptions (linear in parameters, random sampling, no perfect collinearity, zero conditional mean, homoscedasticity) and all five have to be taken into account before the model can be tested. Furthermore testing for stationarity is necessary because we are dealing with time series. We assume that our dataset meets the assumptions of linear in parameters and random sampling. Before we start with the preliminary results, the variables will be transformed into logs. This is in order to prevent heteroscedasticity and this allows us for measuring in elasticity's.

Multicollinearity

When including the explanatory variables, the issue of multicollinearity has to be taken into consideration. Multicollinearity addresses the situation in which two or more explanatory variables are highly linearly related i.e. there is correlation between two independent variables. Wooldridge (2009) argues "*some correlation, perhaps a substantial amount is expected and certainly allowed*" (p. 84). Therefore we assume strong correlation between variables when the correlation is above 0.7. These variables are eliminated from the model and when doing so, the remaining variables serve as proxies for the eliminated ones.

	lnthr	lngdp	lntrade	lnvalden	lnindus
lnthr	1.000				
lngdp	0.272***	1.000			
lntrade	0.290***	0.943***	1.000		
lnvalden	0.114***	0.018	0.117***	1.000	
lnindus	0.223***	0.818***	0.896***	0.019	1.000

Table 6.6 Correlation Matrix (*** = acceptance under p = 0.05)

The correlation matrix (table 6.6) shows us that value density is not significantly correlating with the variables industry and GDP. This non-significant correlation does not imply that the variables are unrelated; it could be that the relationship is non-linear.

Multicollinearity can also be detected by a variance inflation factor (VIF). The VIF is measured by the correlation between one explanatory variable and the other explanatory variables. Wooldridge states that the value of 10 often is chosen to determine that the VIF is "too high". The test (Appendix C) shows that the very high VIF value of 12.53 indicates that the variables trade, value density and industry are highly correlated with the GDP. Given the outcome of the tests, we would exclude GDP from the model. Zhang and Jiawei (2002) also address the fundamental problem with empirical analysis that performing regressions with trade and growth the OLS estimator is likely to be biased.

However Wooldridge states that a high degree of correlation between certain independent variables can be irrelevant as to how well we can estimate other parameters in the model. Excluding relevant independent variables will imply that all the other variables are biased. And this omitted bias is, of course, not desired. Therefore we will not exclude GDP, given the importance of the variables for determining the port throughput. The variable industry will be excluded given the highly significant relationship with both GDP and trade. The production of the industry depends mainly on the GDP of a country. The production of industry determines the level of trade and the level of GDP, yet researchers (de Langen, 2003; OECD) include trade and GDP as an explanatory variable and the variable industry is not often mentioned, therefore we decide to do the same here.

Stationarity

The variables are checked for being stationary. The reason for doing so is that regressions with non-stationary variables can lead to a spurious regression problem; i.e. there is no sense in which y and x are related, but the OLS regression will often indicate a relationship between the variables (Wooldridge, p. 585). Non-stationary variables are characterized by the fact that they are consistently increasing over time and therefore have changing means and variances over time. To see if we are dealing with the spurious regression problem, we will test for unit root and perform a Maddala and Wu test. A unit root can be used to determine if trending data should be (first) differenced to make the data stationary. The Maddala and Wu test does not require a balanced dataset, as we are working with an unbalanced dataset. For the Maddala and Wu test we have to specify the lag and indicate if there is a deterministic trend in the associated regression.

A deterministic trend means that there are constant increases over time; only the variable may fluctuate above or below its trend line randomly. Zorn states that it is quite common to check for time trends and it is worse to omit a trend from a model than to include it. Therefore we will include a time trend in the unit root test.

Determining the value of p is very important; too few lags will leave autocorrelation in the errors while too many lags will reduce the power of the test statistic. Therefore we have to balance the marginal benefit of including an extra lag against the marginal cost of increased uncertainty of the estimation. Because the true model is not known, the Akaike Information Criterion (AIC) and Bayes Information Criterion (BIC) can help specify the model. The big difference between AIC and BIC is that BIC is not designed to produce forecast models, while the AIC can be used to predict forecast models.
The formulas of AIC and BIC are as follows:

$$AIC\ (p) = \ln\left(\frac{SSR\ (p)}{T}\right) + \frac{2}{T}\ (p+1) \qquad \text{(S1)}$$

$$BIC\ (p) = \ln\left(\frac{SSR\ (p)}{T}\right) + (p+1)\frac{lnT}{T} \qquad (S2)$$

The value p is the number of lags and T stands for the time. The SSR stands for the sum of the squared residuals and can be written in the following formula:

$$SSR = \sum_{T=1}^{T}(y_t - \hat{y}_t)^2 \qquad (S3)$$

We perform this test for the variables GDP, trade and value density. To determine the p value a range of values for p has to be estimated with the use of an AIC/BIC test to determine the best option (Zorn). The outcome where AIC or BIC is smallest will be chosen as optimal p-value. Perasan and Shin (2009) have advised to have a lag of maximum two with annual data (van Reeven, 2011). Also Wooldridge (2009) states this. If we look at the outcome of the AIC and BIC test, the values are the lowest at 2 lags (Appendix D). Therefore we will determine the lags at two.

The outcome of the tests (Appendix E) show that we are dealing with the unit root in the variables. This implies that the regression results might indicate relationships between two (or more) related time series, simply because both variables have a trend, while actually the relationships do not exist. The presence of a unit root also indicates that the mean and variance are changing over time. In order to obtain more reliable results, we therefore have to transform the non-stationary data into stationary data; differencing transforms the data into stationary data. A dynamic panel allows us to do so.

Serial correlation in errors

Before further specifying the model, our variables are tested for serial correlation. This is in order to test for the zero conditional mean. Serial correlation means that in the panel data model the correlation between the errors in different times exists. If we consider the following OLS slope estimator in the simple regression model:

$$y_t = \beta_0 + \beta_1 x_t + u_t \qquad (SC1)$$

The estimator of $\hat{\beta}_t$ is as follows:

$$\hat{\beta}_t = \beta_1 + SST_x^{-1} \sum_{t=1}^{n} x_t u_t \qquad (SC2)$$

$$SST_x = \sum_{t=1}^{n} x_t^2 \qquad (SC3)$$

The variance of $\hat{\beta}_t$ is then as follows:

$$Var(\hat{\beta}_t) = SST_x^{-1} Var\left(\sum_{t=1}^{n} x_t u_t\right) \qquad (SC4)$$

The presence of serial correlation implies that the standard errors in different time periods are serially correlating. If we ignore the serial correlation, the estimated variances will be biased (Wooldridge). Wooldridge states that the serial correlation is mostly higher than 0. This means that when there is a high degree of positive serial correlation the variance of the OLS slope is substantially underestimated. In that case we will tend to think that the OLS estimator is more precise than it is. If the serial correlation is negative, the OLS variance will overstate the true variance of $\hat{\beta}_t$ because it is difficult to determine the sign of the variance. To conclude, the variance estimator will be biased because of the presence of serial correlation.

We preform the xtserial test, that tests for serial correlation in the idiosyncratic errors of a linear panel model (Appendix F). The xtserial test tests whether the residuals from the regression of the first differenced variables have an autocorrelation of -0.5. This means that the coefficient on the lagged residuals in a regression of the lagged residuals on the current residuals should be -0.5. The result of the test shows that we are dealing with serial correlation also known as autocorrelation. This implies that we have to correct for serial correlation because non-controlling violates the basic assumptions of *ordinary least squares (*OLS). This means that we need to compute robust standard errors in order to have no biased beta coefficients.

Serial Correlation Consistent Standard Errors

We have to compute standard errors that correct for autocorrelation. Hoechle (2007) states that heteroscedasticity and autocorrelation consistent standard errors can be obtained by the approach of Newey and West. To explain the Newey and West Serial Correlation Consistent Standard Errors, we start with the linear regression.

$$y_t = \beta_0 + \beta_1 x_{t1} + \cdots + \beta_k x_{tk} + u_{t0} \qquad (1)$$

t = 1,2, …, n.

If we rewrite x_1 as the linear function of the remaining variables and the error term, we will get the following function.

$$x_{t1} = \delta_0 + \delta_2 x_{t2} + \cdots + \delta_k x_{tk} + r_t \qquad (2)$$

The r_t is the error term and it is assumed to have a zero mean and is uncorrelated with x_{t1}, x_{t3}, …, x_{tk}. The zero (conditional) mean can be written as $E(\hat{\theta} - \theta) = 0$, i.e. $\hat{\theta}$ is an unbiased estimator of θ. In words, given any value of the explanatory variables, the error term will be equal to 0.

Normally the asymptotic variance of OLS estimator $\hat{\beta}_t$ is the following formula. The asymptotic

variance is the variance of an asymptotic distribution that is a hypothetical distribution. The most well known asymptotic distribution is the normal distribution.

$$Avar\left(\hat{\beta}_t\right) = \left(\sum_{t=1}^{n} E(r^2)\right)^{-2} Var\left(\sum_{t=1}^{n} r_t u_t\right) \qquad (3)$$

Under the assumption of OLS there is no serial correlation, $\{a=r_tu_t\}$ (the error term) is serially uncorrelated. This means that the standard errors and the heteroskedasticity-robust standard errors will be valid. When the OLS assumption is not valid, the correlation between a_t and a_s (when $t \neq s$) should be taken into account in the (asymptotic) variance.

If $\hat{r}_t$ are the residuals of the auxiliary regression of x_{t1} on x_{t2}, x_{t3}, … , x_{tk}, then $g > 0$ the following formula is developed. The $\hat{v}$ is estimating the variance of the model. The g stands for the number of lags in the model.

$$\hat{v} = \sum_{t=1}^{n} \hat{\alpha}_t^2 + 2 \sum_{h=2}^{g} [\frac{1-h}{g+1}] \left(\sum_{t=h+1}^{n} \hat{\alpha}_t \hat{\alpha}_{t-h}\right) \qquad (4)$$

When g = 1 the formula will be as follows:

$$\hat{v} = \sum_{t=1}^{n} \hat{\alpha}_t^2 + \sum_{t=2}^{n} \hat{\alpha}_t \, \hat{\alpha}_{t-1} \qquad (5)$$

The se $(\hat{\beta}_t)$ is the standard OLS standard error and $\hat{\sigma}$ is the standard error of the regression (also known as the root mean squared error) of formula (1).
The serial correlation-robust standard error is of $\hat{\beta}_t$ is:

$$se(\hat{\beta}_t) = ["se(\hat{\beta}_t)"/\hat{\sigma}]^2 \sqrt{\hat{v}} \qquad (6)$$

However the Newey and West approach assumes that the residuals in the panel model are not cross-sectionally dependent or to put it differently, that the residuals are spatially and temporally uncorrelated. This assumption is artificial and inappropriate since in practice the residuals are in most cases spatially and temporally uncorrelated (Hoechle, 2007). Driscoll and Kraay (1998) standard errors are also standard errors that are heteroscedastic, possibly correlated between the groups and autocorrelated up to some lag (Hoechle, 2007). Only these errors allow for cross-sectional and

temporal dependence when the time dimension becomes large, which makes them more realistic than the Newey and West standard errors.

To explain the Driscoll and Kraay standard errors, we start with the linear regression. The formula of the linear regression model is as follows.

$$y = x'_{it}\theta + \varepsilon_{it} \quad \text{i = 1, …, N, t = 1, …, T} \qquad (7)$$

The x_{it} is the (K+1) * 1 vector of independent variables and its first element is 1. The θ is the (K+1) * 1 vector of the coefficients. TheI is the cross-sectional units and t denotes time. The observations can be written as

$$y = [y_{1t1}, y_{1T1}, y_{2t2}, y_{Ntn}]'$$
$$\mathrm{X} = [x_{1t1}, x_{1T1}, x_{2t2}, x_{Ntn}]'$$

We assume that the regressors r are uncorrelated with the error term e for all time periods t and s. Only the error terms themselves are allowed to be heteroscedastic, autocorrelated and cross-sectionally dependent. These presumptions mean that we can estimate the θ as follows.

$$\hat{\theta} = (\mathrm{X}'\mathrm{X})^{-1}\,\mathrm{X}'y \qquad (8)$$

This means that the Driscoll and Kraay standard errors are obtained from the formula. The standard errors are obtained as the square roots of the variance matrix of random vector X, where S_T stands for the Newey and West standard errors.

$$V(\hat{\theta}) = (\mathrm{X}'\mathrm{X})^{-1}\widehat{S_T}(\mathrm{X}'\mathrm{X})^{-1} \qquad (9)$$

The Driscoll-Kraay estimator computes standard errors when the residuals of a linear panel model are cross-sectionally dependent. Cross-sectionally dependent implies that unobserved effects or the presence of common shocks become part of the error term, such as political or cultural factors. If cross-sectional dependency is present but not taken into account, the fixed effects (FE) estimator is consistent but not efficient and the estimated standard errors of the estimates of the regression parameters are biased. De Hoyos and Sarafidis (2006) developed a method to test for cross-sectional dependence in panels with many cross-sectional units. Unfortunately we cannot perform this test due to data limitations. STATA notes that there are not enough observations to perform the Peresan, Frees or Friedmans tests. We can argue that it is more logical that we will compute the Driscoll and Kraay standard errors. Hoechle states that when, next to cross-sectional dependence, spatial dependence is present then Driscoll-Kraay standard errors are far more “robust” than Newey-West standard errors.

As we can see from the literature review, the throughput of port depends on the geographical location of the port and the hinterland connections of the port. Therefore there is a high probability that the errors are correlated with the characteristics of a port. In the field of economic geography Tobler (1970) states the following "*everything is related to everything else; but near things are more related than distant things.*" (p. 236) This is in line with Fisher (1935) who states "patches in close proximity are commonly more alike ... than those further apart." (Sarafidis and Wansbeek, 2012)

Important to note is that the serial correlation robust standard errors are mostly larger than usual OLS standard errors when there is the case of serial correlation. The reason for this is that errors are positively serially correlated (Wooldridge, 2009).

Bårdsen Error Correction Model

Since we are dealing with non-stationary data, we will perform a dynamic panel model. We will not estimate a static model while this model does not correct for non-stationary data. The general dynamic panel is the auto-distributed lag (ADL) model (de Boef et Keelen, 2005) that is defined as follows. We assume that there are no contemporaneous dependent variables on the right side of the model, meaning that the ADL model can be estimated by OLS.

$$Y_t = \alpha_0 + \alpha_1 * Y_{t-1} + \beta_1 * X_t + \beta_2 * X_{t-1} + \varepsilon_t \qquad \text{(ADL1)}$$

This model allows us to estimate both short run effects and the long run equilibrium relationship among the variables. Both β_1 and β_2 measure the short run effects and are called the impact multipliers. They show the immediate effect on Y_t at a specific time t. In terms of this research β_1 tells us how the GDP, value density and trade influences the port throughput. The coefficient β_2 shows us how the previous levels of GDP, value density and trade affect the port throughput in the following years. The dependent and independent time series share long run equilibrium at any time, for this reason we can express one as a function of the other. When the equilibrium between the dependent and the independent series is disturbed, we expect a change in port throughput in the next period back towards the equilibrium; this is also known as the *error correction*. The interest in this rate of return is, according de Boef and Keelen (2005), "*often motivated by the desire to understand how responsive a process is*" (p. 7).

The inclusion of lagged variables, on the right side of the model, is fundamentally about capturing temporal aspects of GDP through statistical specification. Lagged variables are included "*to account for historical factors that cause current differences in the dependent variables that are difficult to account for in other ways*" (Wooldridge, 2009, p. 310). By including the lagged throughput, we are more likely to get an unbiased estimator of the causal effect of concessions on the port performance. This is in line with the statement

of Vanoutrive (2010): when linking economic growth to port throughput different time lags have to be taken into account.

A specification of the ADL model is the Bårdsen Error Correction Model (ECM) transformation. The Bårdsen transformation is assumed *"to be more useful with applied data*" than the ADL transformation (de Boef et Keelen, p.13). Also with the Bårdsen model, unlike the ADL, a direct estimate of the error correction rate and its standard error is provided. To obtain the Bårdsen transformation, first the first difference of Y_t is taken and then $\beta_0 X_{t-1.}$ is added and subtracted from the right side, this in other to get the first difference of X_t. In the Bårdsen model, the lagged dependent variable is the error correction rate. This reflects the speed of adjustment towards the equilibrium (van Reeven, 2011, p.374). The interest in the error correction rate is "*motivated by the desire to understand how responsive a process is"* (de Boef and Keelen, 2005, p.7). In this thesis we estimate how responsive port throughput is on changes in the GDP, trade and value density.

The Bårdsen model is specified as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 * Y_{t-1} + \beta_1 * \Delta X_t + \beta_2 * X_{t-1} + \varepsilon_t \qquad (B1)$$

$\beta_1 * = \beta_0 = \lambda_1$ and $\alpha_1 * = (\alpha_1 - 1)$ and $\beta_2 * = \beta_1 + \beta_0$

Long run coefficients can be calculated by using the following formula:

$$k_1 = \frac{\beta_2}{\alpha_1} = \frac{(\beta_1 + \beta_0)}{(\alpha_1 - 1)} \qquad (B2)$$

6.4 Model

The final model that will be tested in this research is as follows.

$$\Delta lnPT_t =$$
$$\alpha_0 + (\alpha_1 - 1)\Delta lnPT_t + \beta_1 \Delta lnGDP_t + \beta_2 \Delta lntrade_t + \beta_3 \Delta lnopen_t + \beta_4 lag.lnGDP_t +$$
$$\beta_5 lag.lntrade_t + \beta_6 lag.lnopen_t + \beta_7 lag.lnPT_t + \delta_1 dummies + \varepsilon_t \qquad (X1)$$

The dummies are specified in figure 6.2. First we start with performing a model to test if concessions in general have an effect on port performance (marked blue in figure 6.2). Then we continue with performing a model in order to observe the effect of different concession durations (marked red in figure 6.2). Last but not least, we will perform the final model to measure the effect of the durations and the different parties (marked green in figure 6.2). In the final model the dummies are interacted as explained in Chapter 4.

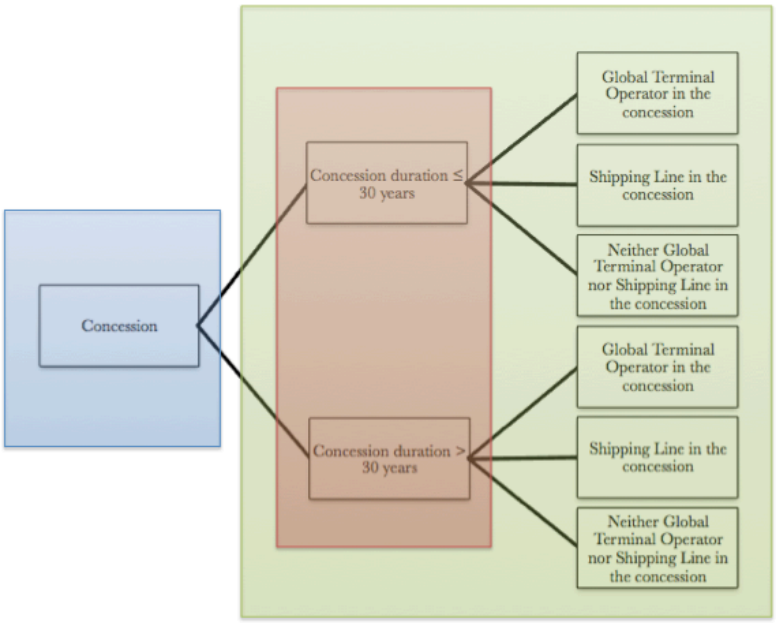


Figure 6.2 The relationship of the dummy variables in the model. Blue represents the dummies tested the first model, red represents the dummies tested the second model and green represents the dummies tested in the final model.

Fixed Effects

The Hausman test checks whether a Random Effects (RE) estimator or Fixed Effects (FE) estimator has to be performed. The Hausman test tests whether there is correlation between the alpha and the explanatory variables (x_{it}), while "*the key issue that determines whether we use FE or RE is whether we can plausibly assume alpha is uncorrelated with all* x_{it}" (Wooldridge, p. 493). The Fixed Effects allows for arbitrary correlation between alpha and the explanatory variables, while the Random Effects does not. The outcome of the test shows that we have to reject Ho, implying that the coefficients are not similar (Appendix G). As a consequence we have to prefer the Fixed Effects estimator as the appropriate estimator for this thesis.

Fixed effects estimator concentrates on differences "within" the entities. This implies in this thesis that the fixed effects estimator concentrates on differences within the ports, e.g. before and after the concession. Moreover the fixed effects estimator estimates for each port a different intercept term where the port specific characteristics are included, such as the location of the port. When using a fixed effects estimator it is possible to control for some omitted variables even without observing them. Furthermore with fixed effects the effect of time-constant variables is removed, so we can analyze the impact of variables that vary over time and their net effect is assessed. This implies that the port characteristics, depth and rail connection, are omitted, while they are assumed to be constant over time.

Other Assumptions

It is conceivable that there are not only individual specific fixed effects but also time-specific fixed effects. In this study to see whether there are events in the global economy (e.g. reaching new trade policy agreements, wars or a global economic crisis) that have affected the port throughput and thus the outcome, we will include the time trend.

Furthermore, to test the hypotheses, in this research will be differentiated between three categories for significance. Results, that are denoted by ***, are accepted under the significance level of 0.01. Findings at the 0.05 level are denoted by ** and the findings at 0.1 level by *. Results accepted in the last group are might not be that reliable.

7. Analysis

In this chapter the outcomes of the formulated Bårdsen ECM models in the previous chapter are presented and analyzed. In paragraph 7.1 the model with Newey and West standard errors is presented. The outcomes of Newey and West Approach are given in appendix H. In paragraph 7.2 the models with the Driscoll and Kraay standard errors are presented. The outcomes are shown in Appendix I. The long run effects are estimated by using STATA. The output of those tests is presented in Appendix J.

7.1 Newey and West Standard Errors

Our first Bårdsen ECM model with the Newey en West Standard Errors tests whether concessions have a significant influence on the port performance. The interpretation of the macro-economic variables in the three models (Table 7.1, 7.2 and 7.3) is the same. The significant coefficients of these variables can be interpreted under the ceteris paribus assumption. We see that the values of the macro-economic variables in the three models with Newey and West standard errors have changed a little. However, we cannot identify major differences.

The interpretation of the macro-economic variables is as follows, taking the first model as an example. The first model tests whether concessions have a significant positive influence on the port throughput. The outcome of the model shows that an increase in GDP of 1% leads to short run effect of 1.42% increase in port throughput. Furthermore we can state that when trade increases with 1%, the port throughput will increase in the short run by 0.3%. Both coefficients can be interpreted under the ceteris paribus assumption. If we look at the coefficients of the lagged variables, we can see that trade has a significant coefficient. This means that an increase of 1% in trade of two years ago, leads to an increase of 0.23% in port throughput this year.

The long run multiplier can be obtained by the formula B2 from chapter 6, namely $k_1 = \frac{\beta_2}{\alpha_1}$. This effect can also be obtained by STATA using the *nlcom* code. We prefer using the STATA code, as it provides the estimation of the long run multiplier with the standard errors. This shows that the long run effect on port throughput of GDP has the magnitude of 0.81% but is insignificant. The coefficient of the long run multiplier of value density has the magnitude of 0.16 and is also insignificant. Besides this the model shows that trade has a significant positive long run effect on port throughput. This outcomes are as expected from the literature. The error correction model assumes that GDP, trade and value density and port throughput are in equilibrium at any time. The short run increase in GDP, trade or value density disturbs this equilibrium. As a result, port throughput will adjust with the speed of -0.29% to get back to the equilibrium, this value is the error correction of the model. The measured effects of these macro economic variables are as expected from the consulted literature.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity (k_1)	
Δln(GDP)	1.42***	Ln(GDP)	0.81
Δln(trade)	0.30*	Ln(trade)	0.80*
Δln(value density)	0.29	Ln(value density)	0.16
Dummy (δ_1)		Lagged Variable(β_2)	
concession (con) (obs: 48)	0.07	$\ln GDP_{t-1}$	0.25
		$Ln(trade)_{t-1}$	0.23*
		$Ln(value\ density)_{t-1}$	0.04
		$Ln(Port\ Throughput)_{t-1}$ (α_1)	-0.29***
n: 2126			

Table 7.1 Newey and West Estimator the effect on concessions on port throughput

As we can see the coefficient of the dummy whether a concession in granted or not is not significant. Therefore the first hypothesis concessions have a significantly positive influence on port performance will be rejected.

Although the first hypothesis is rejected, we will still test the second hypothesis in order to check if specific durations have a significant influence on the port performance (Table 7.2). The second hypothesis is a concession with the duration under or equal to 30 years show significantly higher port performance compared to concessions with longer durations.

In the second Bårdsen model concessions are split up in concessions shorter than or equal to 30 years (condur1) and in concessions longer than 30 years (condur2). Both are formed into dummies to indicate the change in the time series. However in this model both concession durations of shorter than 30 years and longer than 30 years are not significant. Therefore we will reject the second hypothesis. This outcome is not expected as what the literature states. Apparently the concession duration does not determine any specific growth.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity(k_1)	
Δln(GDP)	1.39***	Ln(GDP)	0.81
Δln(trade)	0.31*	Δln(trade)	0.80*
Δln(value density)	0.30	Δln(value density)	0.16
Dummy (δ_1)		Lagged Variable(β_2)	
concession duration ≤ 30 years (condur1) (obs: 40)	0.02	$Ln(GDP)_{t-1}$	0.23
concession duration >	0.07	$Ln(trade)_{t-1}$	0.23*

30 years (condur2) (obs: 10)			
		Ln(value density) $_{t-1}$	0.05
		Ln(Port Throughput)$_{t-1}$ (α_1)	-0.29***
n: 2126			

Table 7.2 Newey and West Estimator the effect on concessions on port throughput

The third Bårdsen model tests hypothesis three the presence of a Shipping Line in a concession will lead to a better port performance and hypothesis four the presence of a Global Terminal Operator in a concession will lead to a better port performance. There is no explicit hypothesis formulated on the concessions where no Shipping Line or Global Terminal Operator is involved. This is due to the difficulties according the different backgrounds of the other companies and the literature made no clear assumptions on the other concession participants.

To obtain the dummies in this model, the concessions are split up in longer and smaller concessions as done in the second model. These concession duration dummies are interacted with the type of company. The following two dummy coefficients can be interpreted under the ceteris paribus assumption. The first one that can be interpreted is the coefficient which states whether a concession duration under or equal to 30 years and includes a Shipping Line. This coefficient can be interpreted under the p-value of 0.1. Holding all other factors fixed the presence of concession with duration of above 30 years and includes a Shipping Line as concession participant lead to a decrease of 18% in port throughput. The second dummy coefficient that can be interpreted is the coefficient of a concession with duration of over 30 years and including neither a Global Terminal Operator nor a Shipping Line. If such a concession is granted, there is an increase of 13% in port throughput. The backgrounds of these dummy outcomes are given later in the chapter. The other dummy coefficients were all non-significant and can therefore not further interpreted. Therefore, the third and fourth hypothesis can both be rejected.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity (k_1)	
Δln(GDP)	1.40***	Ln(GDP)	0.81
Δln(trade)	0.32*	Ln(trade)	0.80*
Δln(value density)	0.31*	Ln(value density)	0.16
Dummy (δ_1)		Lagged Variable (β_2)	
Concession duration ≤ 30 years and GTO (obs: 19)	0.00	Ln(GDP)$_{t-1}$	0.24
Concession duration ≤ 30 years and SL (obs: 6)	0.02	Ln(trade) $_{t-1}$	0.24*
Concession duration ≤	0.03	Ln(value density) $_{t-1}$	0.05

30 years neither GTO or SL (obs: 15)			
Concession duration > 30 years and GTO (obs: 5)	0.13	Ln(Port Throughput)$_{t-1}$ (α_1)	-0.29***
Concession duration > 30 years and SL (obs: 2)	-0.18*		
Concession duration > 30 years neither GTO or SL (obs: 3)	0.13*		
n: 2126			

Table 7.3 Newey and West Estimator The effect of the concession duration and the participants on the port throughput

7.2 Driscoll and Kraay Standard Errors

As stated before in Chapter 6 the Driscoll and Kraay Standard Errors are more applicable than the Newey and West Standard Errors, whereas they allow for spatial and temporal dependence.

Idem to the Newey and West Standard Errors, the macro-economic variables in the Driscoll and Kraay estimators can be interpreted the same in the three models (table 7.4; table 7.5; table 7.6). We can identify small differences between the magnitudes of the coefficients. The interpretation of the macro-economic variables is as follows. The output of the first model shows us that GDP, trade value density and trade have significant positive effect on port throughput, respectively 1.42, 0.29, and 0.30. When looking at the lagged coefficients we see that the coefficient of the lag of trade is significant and has the magnitude of 0.23. This implies that an increase of 1% two years ago in trade leads to an increase of 0.23% port throughput in this year. This variable also can be interpreted under the ceteris paribus assumption. The long run effects are, as in the Newey and West Standard Errors, obtained by the STATA code *nlcom*. The long run multipliers of GDP and value density are respectively 0.81 and 0.16. Both coefficients are insignificant. The long run multiplier of trade is significant and has the magnitude of 0.80. Again, we also assume that the series are in equilibrium and when there are changes in the level of port throughput, we expect a change in the throughput in the next period back toward the equilibrium. The error correction rate of port throughput is -0.29. The outcomes of the macro economic variables are as expected from the consulted literature.

We start with a simple model to determine port throughput by the macro economic variables and the fact that concession is present or not. This model is determined to give an answer to our first hypothesis: the presence of a concession has a significant positive effect on the port performance.

The result of the test shows us that granting concessions has an influence on the port throughput. An increase of 7% in port throughput happens when a concession is granted. The p-value of the

concession coefficient is 0.054, when strictly applying the categories of the significance level. We will accept this coefficient under the p-value of 0.1. The first hypothesis is therefore accepted.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity (k_1)	
Δln(GDP)	1.42***	Ln(GDP)	0.81
Δln(trade)	0.30***	Ln(trade)	0.80*
Δln(value density)	0.29**	Ln(value density)	0.16
Dummy (δ_1)		Lagged Variable (β_2)	
concession (con) (obs: 48)	0.07*	$Ln(GDP)_{t-1}$	0.25
		Ln (value density) $_{t-1}$	0.23*
		$Ln(trade)_{t-1}$	0.04
		$Ln(Port\ Throughput)_{t-1}$ (α_1)	-0.29***
R squared: 0.1698			
n (groups): 212			
n (observations): 2126			

Table 7.4 Driscoll and Kraay Estimator: the effect on concessions on port throughput

The second hypothesis, whether a concession with a duration shorter or equal to 30 year show significantly higher throughput than a concession that lasts longer than 30 years, is tested with estimating a second model. None of the dummy variables have significant coefficients. This means that no significant influence is measured when a dummy concession under 30 years or above 30 years is granted. Therefore we will reject the second hypothesis.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity (k_1)	
Δln(GDP)	1.39***	lnGDP	0.81
Δln(trade)	0.31***	Ln(trade)	0.80*
Δln(value density)	0.29**	Ln(value density)	0.16
Dummy (δ_1)		Lagged Variable (β_2)	
concession duration ≤ 30 years (condur1) (obs: 40)	0.02	$Ln(GDP)_{t-1}$	0.23
concession duration > 30 years (condur2) (obs: 10)	0.07	Ln (value density) $_{t-1}$	0.23*
		$Ln(trade)_{t-1}$	0.05
		$Ln(Port\ Throughput)_{t-1}$ (α_1)	-0.29***
R squared: 0.1693			
n (groups): 212			
n (observations): 2126			

Table 7.5 Driscoll and Kraay Estimator: the effect on concession durations on port throughput

The third hypothesis tests whether the presence of a Shipping Line in a Concession leads to a higher port throughput. The fourth hypothesis tests whether the presence of a Global Terminal Operator in a concession leads to a higher port throughput. These hypotheses are tested in one model.

From the six dummies coefficients two coefficients can be interpreted under the ceteris paribus assumption. The Driscoll and Kraay estimator shows us that the concessions longer than 30 years and granted to a Shipping Line lead to a decrease of 18% in the port throughput. This coefficient is significant under a p-value of 0.05. Furthermore the outcome shows long-term concessions granted to a Global Terminal Operator or Shipping Line lead to an increase in the port throughput with 13%. This coefficient can be interpreted under a p-value of 0.1. Given these results we cannot accept hypothesis three and hypothesis four. Therefore these two hypotheses will be rejected.

$\Delta ln(Port\ Throughput)$			
Short run elasticity (β_1)		Long run elasticity (k_1)	
Δln(GDP)	1.40***	Ln(GDP)	0.81
Δln(trade)	0.32***	Ln(trade)	0.80*
Δln(value density)	0.31**	Ln(value density)	0.16
Dummy (δ_1)		Lagged Variable(β_2)	
Concession duration ≤ 30 years and GTO (obs: 19)	0.00	$Ln(GDP)_{t-1}$	0.24
Concession duration ≤ 30 years and SL (obs: 6)	0.02	$Ln(trade)_{t-1}$	0.24*
Concession duration ≤ 30 years neither GTO or SL (obs: 15)	0.03	$Ln(value\ density)_{t-1}$	0.05
Concession duration > 30 years and GTO (obs: 5)	0.13	$Ln(Port\ Throughput)_{t-1}$ (α_1)	-0.29***
Concession duration > 30 years and SL (obs: 2)	-0.18**		
Concession duration > 30 years neither GTO or SL (obs: 3)	0.13*		
R squared: 0.1697			
n (groups): 212			
n: 2126			

Table 7.6. Driscoll and Kraay Estimator: the effect of concession duration and the participants on port throughput

7.3 Shipping Line and Long-term Concession

Both models show that Shipping Lines have a negative effect on port throughput under certain conditions. This result is remarkable, because Farrell states that the only successful newcomers in the terminal operator industry were Shipping Lines. Our dataset has two observations concerning long concession durations and Shipping Lines. The graphs of port throughput (Appendix K) do not show a constant decline in the port throughput after the concession is commissioned. The boxplots also did not show anything extraordinary. The World Bank reports, media and company websites did not mention anything according the decrease in port throughput. Farrell (2012) gives an explanation for the decrease. She states that this can be due to the fact that Shipping Lines call at the port that offers them the best deal. Other possible scenarios are that Shipping Lines still have to get routine in the terminal operating industry because of a lack of experience and that may cause the decrease in port throughput. Notteboom and Rodrigue (2012) have addressed the fact that Shipping Lines are more eager on locations where the value creations towards the entire supply chain are higher. However, the results of our test show that the port performance of ports operated by Shipping Lines does not improve. This could lead to the notion that a concession commissioned to a Shipping Line can be beneficial in terms of returns for the Shipping Line without this being reflected in a corresponding increase in port throughput.

7.4 Neither a Global Terminal Operator Nor a Shipping Line and Long-term Concession

Both models also show that the port performance rises after a long-term concession is commissioned to neither a Global Terminal Operator Nor Shipping Line. These companies, that are defined as not a Global Terminal Operator or Shipping Line, differ from Stevedores to Financial Institutions, as we can see from the classification from Farrell in Chapter 4. The backgrounds of these companies and experience levels in the terminal operating industry vary and therefore it is difficult to give one clear reason to explain the difference with the base group (no concession granted at all). Stevedores and Regional Terminal Operators for example already have gained experience with loading and unloading container ships, while an Industrial Conglomerate may have no experience at all. Further research is needed on this group in order to get a better insight.

7.5 Other findings

If we look closer at the magnitudes of the dummy variables of both Driscoll and Kraay and Newey and West standard errors, we can conclude that the coefficients have the same magnitudes. However the

Driscoll and Kraay estimator allows for temporal and spatial dependence meaning that the standard errors in this estimator are smaller and therefore estimates of the coefficients become significant.

7.6 Conclusion

The conclusion of the analysis is summed up in the table below. We can see that almost all the formulated hypotheses are rejected. The Driscoll and Kraay estimator shows us that concessions have a positive influence on the port throughput, implying that the first hypothesis is accepted under this estimator. This is as expected from the literature. When focusing on the different characteristics of concessions, we see that only the significant positive effect was measured when a concession was granted with longer durations and to neither a Shipping Line nor a Global Terminal Operator. Both estimators also show a negative influence when concessions are granted to Shipping Lines with longer duration. These outcomes imply that the hypotheses according the concession participants are rejected with both estimators. Furthermore our model shows that when splitting up concessions in long-term and short-term concessions both groups do not show any significant effect on the throughput. These outcomes concerning the dummy variables were not expected from the consulted literature.

Hypotheses	Newey and West standard errors	Driscoll and Kraay standard errors
1. The presence of a concession has a significant positive effect on the port performance.	Rejected	Accepted
2. A concession with the duration under or equal to 30 years show significantly higher port performance compared to concessions with longer durations.	Rejected	Rejected
3. The presence of a Shipping Line in a concession will lead to a better port performance.	Rejected	Rejected
4. The presence of a Global Terminal Operator in a concession will lead to a better port performance.	Rejected	Rejected

Table 7.7 Hypotheses and results

Nonetheless the models with both Newey and West and Driscoll and Kraay estimator show insignificant coefficients with certain dummy coefficients. If we look more closely at the number of observations of the significant dummy coefficients, it stands out that these dummies have relatively few observations. The dummy categories with more observations do not measure any effect. In the discussion we will further discuss these outcomes and highlight some possibilities for this outcome.

8. Discussion

The model in this research has tried to create better understanding in the concession characteristics, which can be useful in developing more innovative contractual arrangements. The Bårdsen ECM model with Driscoll and Kraay standard errors shows us that there is a significant positive effect when concessions are commissioned. Furthermore, the results of the model imply for the governments and port authorities that if their objective is to have better performing ports, they have to grant long-term concessions to participants that are no Global Terminal Operator nor a Shipping Line. Both Bårdsen ECM models with Driscoll and Kraay and Newey and West standard errors show that presence of a Shipping Line in a long-term concession has negative consequences concerning the port performance. In both estimators the sign of the coefficient for long-term concessions is negative, implying that the presence of a Shipping Line may lead to a decrease in port performance. For the government this implies that they should reconsider granting long-term concessions to Shipping Lines and if granting long-term concession, make clear arrangements about throughput guarantees.

However, as stated in previous chapter (chapter 6), the dummy categories with few observations have a significant coefficient while dummy categories with more observations have not. We **cannot** state that if there were more observations in the significant categories, the coefficients of these observations would also be insignificant. The coefficients for dummy categories with more observations are therefore better grounded, and one should be cautious with interpreting the coefficients for dummy categories with few observations.

Notteboom (2007) states that concessions are used as powerful governance tools. Concessions stimulate the private operators to operate as efficiently as possible. And, at the same time the government retains some control on the organization and the structure of the supply side of the port. However, when we look in general to the effect of concessions using the model, we cannot measure an effect in port throughput as expected from the literature. How to explain this outcome? Throughput mainly depends on the location of the port and the distance of the ports to the market. Research on port choice factors (Tongzon, 1995; Tongzon et Heng, 2005; Wiegmans et al, 2007) shows that these two factors are highly important choice factors for the port users. Privatization of a port does not change the location of the port or the market distance of the port. The list of advantages of privatization, provided by the UNSCEP, shows that the privatization changes the way of managing the port and privatization leads to more efficient ports services. Furthermore port privatization leads to the delivering of port service that are adjusted to the competitive environment ports are operating in. In a concession arrangements are also made to rehabilitate the port and its facilities. If we look at the list of factors influencing the port users choice, we can see that the port physical infrastructure is called after the location and distance to the market. The quality of the port services and the port charges is choice factor of less importance (Tongzon, 2005; Wiegmans et al, 2007). Thus an improvement in the quality

of port services has a small influence on the decision of the port users. When granting concessions arrangements are also made regarding investing and rehabilitating the port facilities. These arrangements may influence on the port physical and technical infrastructure. The port physical and technical infrastructure also is a choice factor in the port decision process of the port users and is, according to the port choice factor studies, of more importance compared to the quality of services and port charges (Tongzon, 2005; Wiegmans et al, 2007). However, the influence of port privatization depends on the competition in the market. If the port operates in a highly competitive environment and has a contestable hinterland, the effect of privatization can be noticeable in terms of port throughput. An example is the Le Havre-Hamburg range where different ports compete for the same hinterland or countries where there is inter-port competition. This research however, mainly focuses on ports in developing (and emerging) countries. Niekerk (2005) states that in developing countries inter-port competition is limited because the quality of hinterland connections for ports located in developing countries is relatively low. Furthermore, if the location of the port is remote from the main shipping routes (and this is often the case with developing countries), the scope for becoming a transshipment hub is limited (Niekerk, 2005).

The differences between the government and the private entity should also be taken into account, because they play an important role in observing the effects of concessions. The goal of a government is to maximize the social surplus, while the goal of a private company is to maximize profits. When a concession is granted, the ownership of the port facilities is passed to the private entity. The private entity gets operational freedom and is allowed to operate outside the governmental regulations. The private entity is able operate the port in its interest, but this does not automatically imply that the way of operating is in the interest of the society. For example in determining the port charges, the private entity can determine the port charge that maximizes its profits. The port charge though, can be on such a level that there is a deadweight loss for the society. The possibility for government interference depends on the agreed arrangements. Renegotiating is a possibility to change the made arrangements, but this, again, leads to high transaction costs. Furthermore governments tend to support failing concessions, because it can be politically embarrassing to see the concessions fail (Shaw et al, 1996) and if concession fails the transaction costs associated can be significant. This can lead to a situation in which concessionaires are less motivated to perform efficiently or are less committed to the arrangements made in the agreement. In order to motivate the private entities, the port performance could be monitored systematically on a regular base. Notteboom (2007) states that clear arrangements can be made according the performance of the port, such as throughput guarantees.

Concessions are presented as good governance tools for port authorities, however these arrangements may have downsides for the society as stated above. Additionally, when determining the concession duration, it is essential to keep in mind that the environment in which the ports operate is dynamic. This can lead to situation where the arrangements do not match anymore with the environment when

granting a long-term concessions and lock in the parties into terms that are not desirable. As mentioned above, breaking the arrangement goes together with high transaction costs. The government should be aware of the dynamic environment, when defining the concession duration.

As stated in the introduction, when port authorities want to profit more from the concessions, they have to develop more innovative contractual arrangements. According Farrell (2012) governments have to take more initiative in reforming the arrangements instead of relying on the competition. There is still little research done on the effect of concessions in seaports and therefore more research is needed to take initiatives to reform concessions.

To conclude, the effects captured in the models are mixed. We can measure a positive effect when a concession is granted, however when zooming in on the characteristics no significant effects were identified. We have to address the fact that privatization is vulnerable to downsides that are not explicitly addressed in the different research papers. Governments and port authorities use concessions as important governance tools, but should not overlook the disadvantages of the concessions. Entering into long-term contracts may lock them into terms that are, with a view on the dynamic and ever changing environment in which ports are operating, less than desirable. As we can see from the cases in the analysis, the developing countries often rely on only one port that serves the whole country. Transferring the operational responsibility and ownership to a private party can put the government in an undesirable position. Therefore in order to make the ports more efficient and still allowing the government or port authority to interfere when necessary, other innovative methods of privatization have to be developed.

9. Conclusion

Throughout this thesis we have tried to find an answer to the research question: *What is the effect of the characteristics of container terminal concession on the port performance?* The port performance is measured in port throughput in TEU on the assumption that the objective of a port is to maximize their port throughput. As stated in the introduction, if public authorities want to obtain a larger slide of the benefits of concessions, better understanding in the different characteristics of terminal concessions is needed.

In order to capture the effect of container terminal concession we estimate the Bårdsen ECM model with two different standard errors that correct for serial correlation, namely the Driscoll and Kraay standard errors and the Newey and West standard errors. The difference between the estimators are that the Driscoll and Kraay standard errors allow for cross-sectional correlation and are therefore more robust compared to the Newey and West standard errors. Four hypotheses (table 9.1) are formulated to test with the ECM model. The first hypothesis is formulated to test if the presence of concession leads to a significant positive effect on the port performance. The literature reveals that it is generally assumed that granting concessions will lead to an increase in the port efficiency and therefore in the port throughput. The Newey and West estimator rejects this assumption, but the hypothesis is accepted the Driscoll and Kraay estimator. This means that we can state that there is a positive significant effect on the port performance after a concession is commissioned. Both the estimators reject the second hypothesis meaning that there was no significant effect on short and long-term concessions measured. When zooming in on the concession participants, a positive increase of thirteen percent in port throughput was measured for concessions with duration time longer than 30 years and granted to neither a Global Terminal Operator nor a Shipping Line. A decrease in port throughput of eighteen percent was captured for concessions with a duration time longer than 30 years and granted to a Shipping Line. However these categories had only a few observations, making the outcomes less reliable. Hypothesis three and hypothesis four, both considering the concession participants, are therefore both rejected.

The outcomes of the model were not as expected from the literature. One explanation is that port throughput depends on the location, the distance to the market(s) and macro economic variables of a country. Privatization does not influence these factors but may influences the port services and the port infrastructure; both addressed as less important port choice variables. It is important that governments and port authorities are aware of this. In spite of that, port authorities and governments should not forget the downsides of concessions into account before granting a concession to a private party.

Hypotheses	Newey and West standard errors	Driscoll and Kraay standard errors
1. The presence of a concession has a significant positive effect on the port performance.	Rejected	Accepted
2. A concession with the duration under or equal to 30 years show significantly higher port performance compared to concessions with longer durations.	Rejected	Rejected
3. The presence of a Shipping Line in a concession will lead to a better port performance.	Rejected	Rejected
4. The presence of a Global Terminal Operator in a concession will lead to a better port performance.	Rejected	Rejected

Table 9.1 Hypotheses and results

10. Limitations and Future Research

This thesis has some limitations to be considered before interpreting the results. The first limitation is regarding the sample size. Simkiss et al formulated a simple rule of thumb that the sample should be larger than 104 plus the number of the independent variables. This research makes use of the concessions that were reported in the World Bank PPI database. Including terminal concessions from other type of terminals could solve this problem concerning the sample size; however the measurement of the port performance would not be uniform. As de Langen et al (2007; 2010) state, adding up different commodities to one aggregated throughput does not provide insights in the port performance, because the usage of one tonnage of crude oil or iron is very different from the usage of one tonnages of fruit juice or bananas. Also creating the aggregated throughput can give difficulties because the throughput figures have to be aligned. When doing research on one port, this limitation is of less importance because the port can have certain objectives and the performance is measured by if the goal has reached. However if we want to investigate the effect on more ports, this would become difficult. A question as, *what is the best throughput ratio to assume that the port is performing better than other ports,* may arise.

The second limitation in this research is considering data restrictions and collecting reliable data. Many details of concessions are not known available for third parties. The World Bank states in their database that they made a compilation of the publicly available information on the projects. If these details are compiled, a more extensive analysis about the concession characteristics can be made. For example the other participants in a concession, which have not received much attention in this analysis, can be investigated more closely. Or, the influence of the way of awarding the concession can be investigated. Something that has received little attention in this research is that there is large diversity among ports around the world, particularly in terms of the type of award arrangement and the awarding procedure of the concessions. The diversity is due to the range of different priorities and objectives followed by the respective authorities (Notteboom et al, 2012). This research did not pay much attention on the awarding process of concessions since the details of the process were not given or known. Future research can include the different awarding procedures in the model in order to see how this influences the port performance. Further research may be regarding the Special Purpose Vehicles (SPVs) (Farrell, 2012) by creating dummy for each type of entity involved in the concession and let these dummies interact when more entities are involved in a concession. This can be done in order to give the public authorities and governments more insights in finding the optimal Special Purpose Vehicles. The sample size of this research has restricted us this from including this in the research, therefore to investigate the effect of granting concessions to different SPVs more concessions should be collected in the database. The World Bank states that some projects (especially smaller projects) are not involved in the database because of the scale of these projects; they are usually not

reported by the major news courses, government websites and other sources used by the World Bank database. Adding these concessions in the database can give better insights in the case of the SPVs but also for concessions in general. Also the role of Shipping Lines in concessions should be investigated more closely. Farrell (2012) states that Shipping Lines are the only private entities that have entered the terminal operating industry but writes in the same article that the presence of a Shipping Line in a concession does not guarantee for throughput growth because the Shipping Line calls at the port that offers the best deal. Case studies can provide more insights in the participation of Shipping Lines in a concession.

An additional limitation due to data restrictions is that the port characteristics were not provided over time. To solve this problem, we used fixed effects in this research to capture the different characteristics in the intercept term. However the literature shows us is that the port characteristics have an influence on the port choice, and to capture these effects, in future research the port characteristics should be investigated over time and added in the model. An example is the meters of quay; an expansion of the meters of quay in the port can lead to more capacity and more port throughput. This data limitation makes it hard to carefully capture the effects on the port performance.

Another limitation is considering the port performance indicator. Our port performance indicator is the total container throughput of a port. In the port, especially in the bigger ports (e.g. Shanghai, Rio de Janeiro, Buenos Aires), there can be more terminals operating containers. If only one of these container terminals is granted with a concession, we will assume that this is the container terminal increasing in efficiency and therefore causing the growth in the container throughput of the terminal. The problem we face however is that we are not sure if the growth rate is subjected to the privatized container terminal. For example Terminal 1 and Terminal 2 both operate containers. In Terminal 2 a concession is commissioned: what we expect in this research is that the growth in throughput after the concession is commissioned (after corrected by the other explanatory variables) is due to the privatized terminal. However in the reality, the growth rate is due to the Terminal 1 because to give an example Terminal 1 signed, around the time of commissioning Terminal 2, a deal with a shipping line. For future research, the container throughput should be collected per container terminal instead of per port to avoid this problem. In some ports (Argentina – Buenos Aires; Brazil – Rio de Janeiro; China – Shanghai) there were more concessions granted after each other. Since the port throughput was only available per port and not per terminal, the concessions are converted into one case. This makes it hard to capture the effect of one concession and the characteristics of that concession. Again, having the throughput per container terminal would eliminate this limitation.

Last but not least, this thesis is a start in investigating the effect of concessions on the port performance. Of course this thesis still has to deal with some limitations and data restrictions and therefore does not provide answers on all the current issues related to concessions. There is still plenty of room for further

academic research. Therefore it is recommended is to collect more data in the future, this in order to investigate the effect of concessions on port performance more intensively through statistical analysis. Data can be collected on the port characteristics over time and terminal throughputs instead of port throughputs over time. Future research can be done on the motivations of private entities to participate in concessions or on one of the topics mentioned earlier in this chapter.

11. References

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11.2 Reference List Classification Private Companies

Company	Company Type *	Source
525 Participacoes	FI	http://listofcompanies.co.in/525-participacoes-s-a/
ACS Group (Actividades de Construccion y Servicios)	EM	http://www.grupoacs.com/index.php/en/c/aboutacs_history
Andino Investment Holding	FI	http://www.andino.com.pe/en/quienes-ingles/andino-investment-holding-aih/
AP Moller - Maersk Group	SL	http://www.maersk.com/Pages/default.aspx
Asian Terminal, Inc.	RTO	http://www.asianterminals.com.ph/ATIWebsite/ATIWebDev/mission_vision.html
Balguerie	FT	http://www.balguerie.com/

Banco Boreal S.A.	FI	Sheila Farrell (2012)
Banco Bozano Simonsen S.A.	FI	N#A
Banco Fator S.A.	FI	http://www.bancofator.com.br/bem_vindo
Banco Opportunity	FI	http://www.opportunity.com.br/home/index.aspx
Battistella Group	IC	http://www.battistella.com.br/languages/ing/empresa/historia/Paginas/default.aspx
Bollore Group	FT	http://www.bollore.com/
British Mersey Docks and Harbour Company	PA	http://www.merseydocks.co.uk/marine/
Carrix	GTO	http://www.ssamarine.com/company/carrix.html
Caucedo Development Corporation	FT	http://www.luxner.com/cgi-bin/view_article.cgi?articleID=772
Chettinad Group	IC	http://www.chettinad.com/aboutus.htm
China Shipping Group Company	N#A	-
CMA-CGM	SL	http://www.cma-cgm.com/
Companhia Siderurgica Nacional SA	IC	http://www.csn.com.br/irj/portal/anonymous?guest_user=usr_csn_pt
COSCO Group	SL	http://www.cosco.com/en/about/index.jsp
DP World	GTO	http://webapps.dpworld.com/portal/page/portal/DP_WORLD_WEBSITE
Dubai Holding	PD	http://dubaiholding.com/about-dubai-holding/
Empresas Navieras	SL	http://www.empresasnavieras.com/
Evergreen Marine Corp	SL	http://www.italiamarittima.it/
Gestao de Fundos	FI	Sheila Farrell (2012)
Green Siam Co.	FT	http://www.green-siam.com/index.php
Grup Maritim TCB	RTO	http://www.gruptcb.com/html/
Grupo Libra S.A.	SL	http://www.grupolibra.com.br/
Gulftainer	STE	http://www.gulftainer.com/profile.aspx
Hamburg Sud	SL	http://www.hamburgsud.com/group/en/corporatehome/
Hong Kong Xuda International Logistics Company	FT	http://globalnet.com.hk/aboutus.php
Hutchison Whampoa Ltd	GTO	http://www.hutchison-whampoa.com/en/global/home.php
International Container Terminal Services Inc. (ICTSI)	GTO	http://www.ictsi.com/default.php
Inversiones La Estampa	N#A	-
Jahangir Siddiqui and Co. Ltd	IC	http://www.js.com/about-jsgroup.asp
John Keels Holdings Ltd.	IC	http://www.keells.com/our-history.html
Kamigumi Co.	SL	http://www.kamigumi.co.jp/english/index.html
Katoen Natie	RTO	http://www.katoennatie.com/Services/tabid/66/language/en-US/Default.aspx
Kingston Wharfes Ltd	STE	http://www.kingstonwharves.com.jm/
Konsortium Perkapalan Berhad	IC	http://www.klb.my/klb/overview.html
Kuwait and Gulf Link Holding Company (KGL Holding)	FT	http://www.kgl.com/Pages/Default.aspx
Lachmann Group	IC	http://shipping-data.com/business/brazil/rio-de-janeiro/lachmann-group
Laem Chabang International Terminal Co. Ltd.	RTO	http://www.lcit.com/
Mediterranean Shipping Company (MSC)	SL	http://www.mscgva.ch/about_us/about_us.html
Mitsui	SL	http://www.mitsui.com/
Mota Engil SGPS	IC	http://www.mota-engil.pt/
Multiterminais de Alfandegados do Brasil Ltda	RTO	http://www.multiterminais.com.br/
Ngow Hock Group	IC	http://www.scb.co.th/en/about-scb/board-and-management/board-of-director?option=9
Nogar Group	FT	http://www.nogar.es/ingles/presen.html
Northport Corp. Bhd.	RTO	http://www.northport.com.my/main.php
NWS Holdings Limited	PD	http://www.nws.com.hk/html/eng/index.aspx
NYK Line	SL	http://www2.nykline.com/
Ocean Wilson Holdings Limited	SL	http://www.oceanwilsons.bm/about_us
Orissa Stevedores Ltd	STE	http://oslgroup.in/grp/
P&O Ports	GTO	http://www.sec.gov/Archives/edgar/vprr/02/9999999997-02-042241
Paulo Roberto Brandao	IC	http://www.gottwald.com/gottwald/site/gottwald/en/

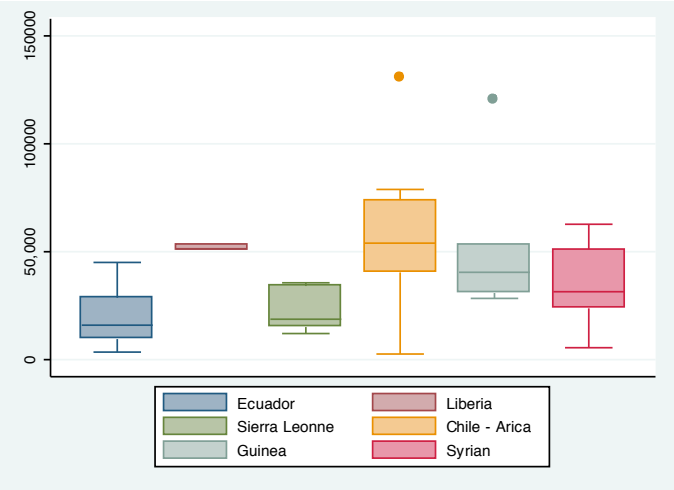
		news/articles/article_2009_03.html
Portek International Limited	EM	http://www.portek.com/
Premier Mercantile Services Ltd.	RTO	http://www.mrgc.com.pk/pms/index.htm
Previ	IC	http://www.previ.com.br/portal/page?_pageid=57,1&_dad=portal&_schema=PORTAL
PSA Corp	GTO	http://www.singaporepsa.com/
RAK Investment Authority	PD	http://www.rak-ia.com/en/home.aspx
Redram Construtora de Obras Ltda	CC	http://www.mercatorintl.com/mercatoramericanshipper2.9.11.pdf
Road Builder (M) Holdings Sdn Bhd	CC	http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=879317
Samudera Indonesia Group	FT	http://www.samudera.com/index.htm
Santos Brasil Participacoes SA	FI	http://www.santosbrasil.com.br/en-us/santos-brasil/the-history
Serveng Civilsan S.A.	CC	http://www.serveng.com.br/_teaser/index_teaser.html
Sistel	IC	http://www.sistel.com.br/
Sociedad Portuaria Regional de Cartagena SA	RTO	http://cisne.puertocartagena.com/
Sociedad Punta de Lobos	IC	http://www.spl.cl/
Socotrans Conglaise De Transports Sarl (Socotrans)	FT	http://www.bizearch.com/company/Socotrans_61633.htm
Soifer Participações Societárias Ltda	SL	http://www.mercatorintl.com/mercatoramericanshipper2.9.11.pdf
Souria Holding	IC	http://www.souriaholding.com/en/main.php
Sudamericana Agencias Aereas y Maritimas (SAAM)	SL	http://www.saam.cl/
Swire Pacific Ltd.	PD	http://www.swirepacific.com/eng/about/marine.php
Terminal de Servicios Portuarios Patagonia Norte SA	FT	http://www.patagonia-norte.com.ar/
Terminal Link Company	SL	http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=47115246
Terminal para Conteineres da Margem Direita (TECONDI)	RTO	http://www.tecondi.com.br/
Trans Dominicana de Desarrollo	N#A	-
Transnet	FT	http://www.transnet.net/Pages/Home.aspx
Triunfo Participacoes e Investimentos	FI	http://ir.triunfo.com/tpi/web/default_en.asp?idioma=1&conta=44
Ultramar Group	SL	http://www.ultramar.cl/
Vertex	FI	http://www.vertex.co.tz/index-2.html
Wilsons, Sons & Co.	SL	http://www.wilsonsons.com.br/en/about-group/our-history

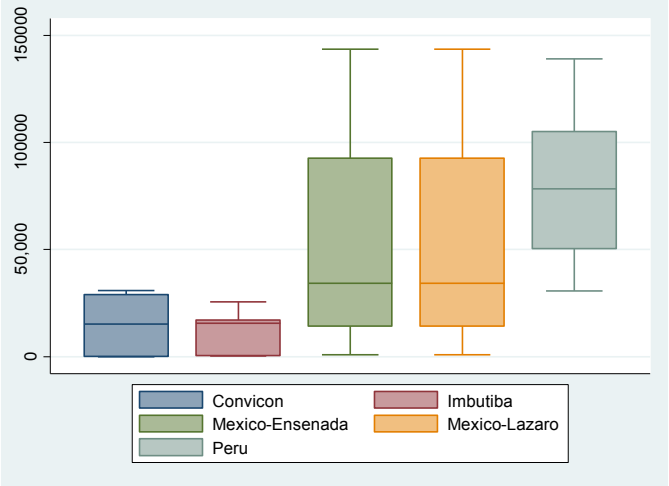
* the meaning of the abbreviations are given in Chapter 4

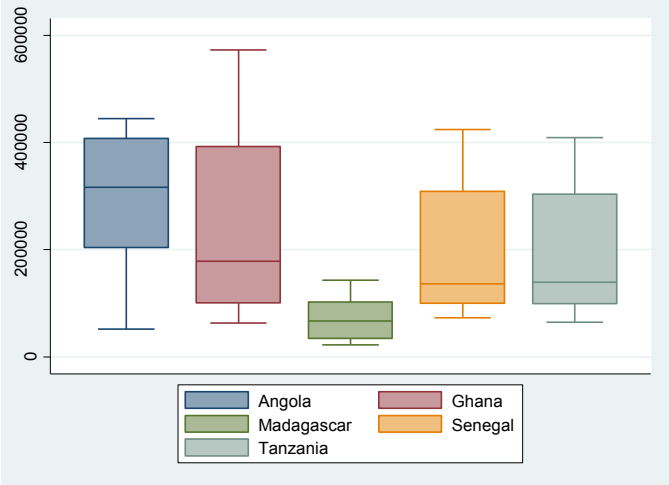
12. Appendices

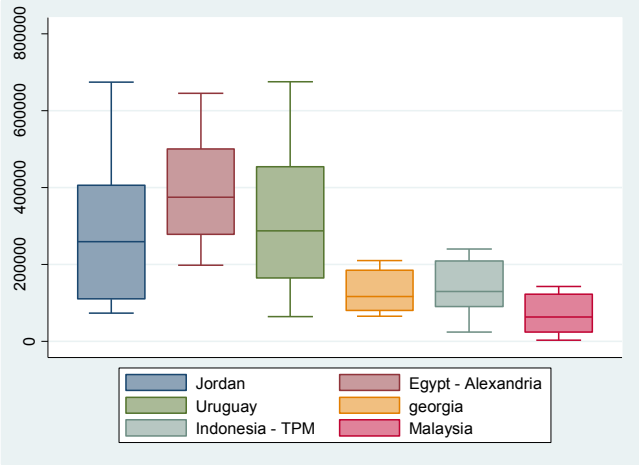
12.1 Appendix A

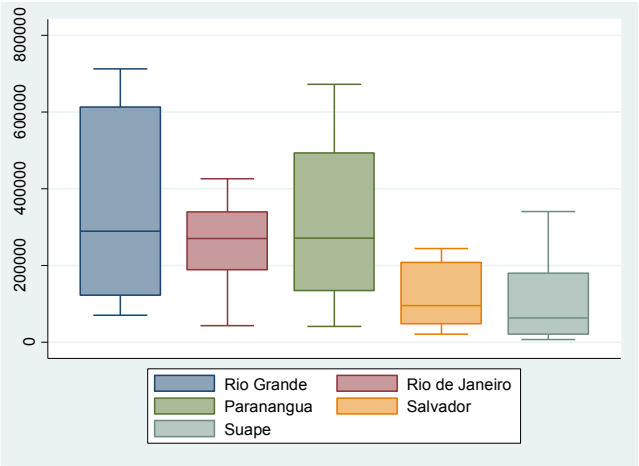
The boxplots of the container throughput of the commissioned concessions (ordered by size)








0
200000
400000
600000
800000
Jordan
Uruguay
Indonesia - TPM
Egypt - Alexandria
georgia
Malaysia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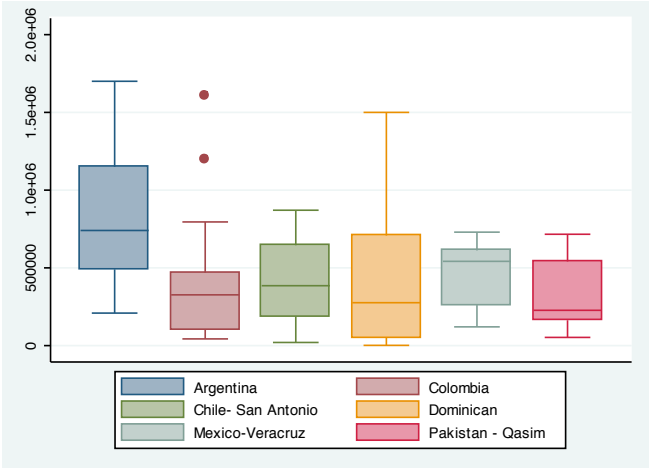
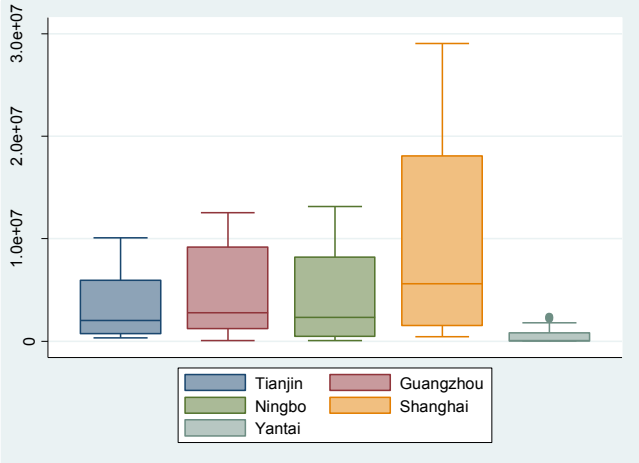
200000
400000
600000
800000
Rio Grande
Paranangua
Suape
Rio de Janeiro
Salvador


0
500000
1.0e+06
1.5e+06
2.0e+06
Argentina
Chile- San Antonio
Mexico-Veracruz
Colombia
Dominican
Pakistan - Qasim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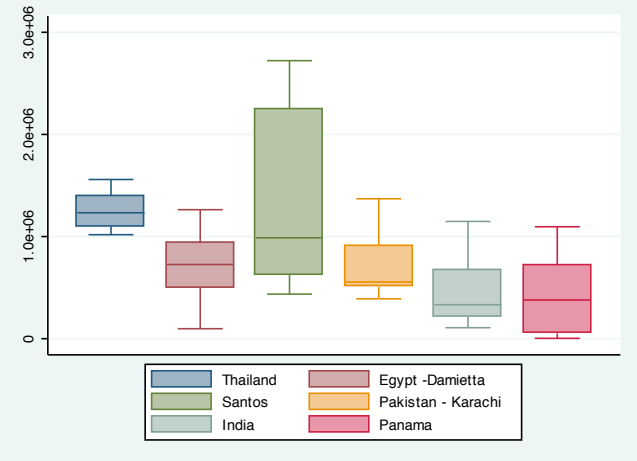
2.0e+07
1.0e+07
0
Tianjin
Guangzhou
Ningbo
Shanghai
Yantai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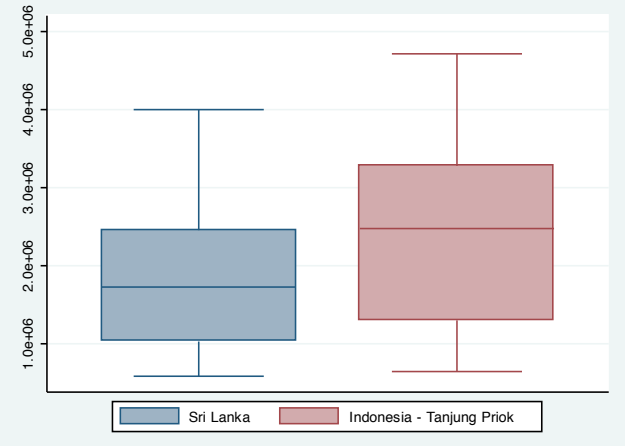
Thailand
Egypt -Damietta
Santos
Pakistan - Karachi
India
Panama


5.0e+06
4.0e+06
3.0e+06
2.0e+06
1.0e+06
Sri Lanka
Indonesia - Tanjung Priok

List of ports and their country (ordering as in the World Bank Database)

Ports	**Country**	**Project Name according World Bank**
Luanda	Angola	Luanda Container Terminal
Tema	Ghana	Tema Container Terminal
Conakry	Guinea	Port of Conarky
Monrovia	Liberia	Port of Monrovia
Toamasina	Madagascar	Port of Toamasina
Dakar	Senegal	Dakar Port
Freetown	Sierra Leone	Port of Freetown Container Terminal
Dar-Es-Salaam	Tanzania	Dar-Es-Salaam Container Terminal
Tianjin	China	Tianjin Port
Guangzhou	China	Guangzhou Container Terminal
Ningbo	China	Ningo Beilun Port Phase II
Shanghai	China	Shanghai Pudong International Container Terminals Ltd ; Shanghai East Container Terminal
Yantai	China	Yantai Rising Dragon International Container Terminals Ltd
Tanjung Priok	Indonesia	Tanjung Priok Koja Container Terminal; PT Jakarta International Container
Makassar	Indonesia	Terminal Petikemas Makassar (TPM)
Kuantan	Malaysia	Kuantan Port
Laem Chabang	Thailand	Laem Chabang Terminal
Batumi	Georgia	Batumi International Container Port Terminal
Buenos Aires	Argentina	Buenos Aires Puerto Nuevo Terminal 1,2;3;5
Santos	Brazil	Santos Terminal 37; Santos Terminal de Conteineres
Rio Grande	Brazil	Rio Grande Terminal de Conteineres
Rio de Janeiro	Brazil	Rio de Janeiro – Terminal de Conteineres (Tecont 1, Tecont 2)
Paranangua	Brazil	Paranagua Port – Container Terminal (TCP)
Salvador	Brazil	Salvador Port Containers Terminal (Tecon Salvador)
Suape	Brazil	Port of Suape Container Terminal
Convicon	Brazil	Convicon Container Terminal
Imbituba	Brazil	Tecon Imbituba
San Antonio	Chile	San Antonio Port Northern Terminal
Arica	Chile	Consorcio Puerto Arica (CPA)
Cartagena	Colombia	Cartagena Port
Manzanillo	Dominican Republic	Manzanillo Port
Manta	Ecuador	Manta Port Concession
Veracruz	Mexico	Veracruz Container Terminal
Ensenada	Mexico	Ensenada Container Terminal
Lazaro	Mexico	Lazaro Cardenas Container Terminal
Colon	Panama	Colon Container Terminal

Paita	Peru	Paita Port
Montevideo	Uruguay	Terminal Cuenca del Plata
Alexandria	Egypt	Alexandria International Container Terminals
Damietta	Egypt	Damietta Port
Aqaba	Jordan	Aqaba Container Terminal
Tartous	Syrian	Tartous International Container Terminal
Chennai	India	Chennai Container Terminal Pvt Ltd
Qasim	Pakistan	Qasim International Container Terminal
Karachi	Pakistan	Karachi – International Container Terminal
Colombo	Sri Lanka	Colombo Port

12.2 Appendix B

Throughput – Source List and Extrapolated Throughput Variables

Port	Year	Source	Extrapolating
Angola - Luanda	2000; 2007; 2008	http://www.temsb.com/assets/ghana08/SteveWray.pdf; http://pdf.usaid.gov/pdf_docs/PNADU390.pdf http://www.transportes.gv.ao/documents/18/125704/RelatórioDeGestãoDoSectorDosTransportes.pdf?version=1.0&t=1323189133743	-
Guinea - Conakry	2010	http://www.bollore-africa-logistics.com/pages-savoir-faire/metiers.aspx?id_metier=1	-
Madagascar - Toamasina	1992	Royal HaskoningDHV	-
Senegal - Dakar	1993	Royal HaskoningDHV	-
Sierra Leone - Freetown	2000-2006	http://www.temsb.com/assets/ghana08/SteveWray.pdf	-
Syrian - Tartous	2006	Royal HaskoningDHV	-
China - Yantai	2008	-	1182552 TEU (Jan-Jun) * 2 = 2365102 TEU (Jan-Dec)
Malaysia - Kuantan	2008	-	100722 TEU (Jan-Sep) * (4/3) = 134296 TEU (Jan-Dec)

12.3 Appendix C

Variance Inflation Factor

```
. vif
```

Variable	VIF	1/VIF
lngdp	12.05	0.082983
lnindus	8.13	0.123074
lntrade	7.60	0.131498
lnvalden	1.01	0.985756
Mean VIF	7.20	

12.4 Appendix D

Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC)

```
. reg thr trade
```

Source	SS	df	MS	
Model	1.7762e+15	1	1.7762e+15	Number of obs = 2705
Residual	4.9257e+15	2703	1.8223e+12	F(1, 2703) = 974.67
				Prob > F = 0.0000
				R-squared = 0.2650
				Adj R-squared = 0.2648
Total	6.7019e+15	2704	2.4785e+12	Root MSE = 1.3e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
trade	2.27e-06	7.29e-08	31.22	0.000	2.13e-06	2.42e-06
_cons	64248.46	28733.25	2.24	0.025	7907.091	120589.8

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2705	-42436.29	-42019.83	2	84043.67	84055.47

Note: N=Obs used in calculating BIC; see [R] BIC note

```
. reg thr trade ltrade
```

Source	SS	df	MS	
Model	1.7764e+15	2	8.8818e+14	Number of obs = 2604
Residual	4.9102e+15	2601	1.8878e+12	F(2, 2601) = 470.48
				Prob > F = 0.0000
				R-squared = 0.2657
				Adj R-squared = 0.2651
Total	6.6865e+15	2603	2.5688e+12	Root MSE = 1.4e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
trade	5.00e-07	7.02e-07	0.71	0.476	-8.76e-07	1.88e-06
ltrade	2.03e-06	7.99e-07	2.54	0.011	4.65e-07	3.60e-06
_cons	58657.05	30039.88	1.95	0.051	-247.4458	117561.6

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2604	-40898.35	-40496.31	3	80998.62	81016.22

Note: N=Obs used in calculating BIC; see [R] BIC note

```
. reg thr trade ltrade l2trade
```

Source	SS	df	MS	
Model	1.7840e+15	3	5.9468e+14	Number of obs = 2521
Residual	4.8893e+15	2517	1.9425e+12	F(3, 2517) = 306.14
				Prob > F = 0.0000
				R-squared = 0.2673
				Adj R-squared = 0.2665
Total	6.6734e+15	2520	2.6482e+12	Root MSE = 1.4e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
trade	5.77e-07	7.12e-07	0.81	0.418	-8.20e-07	1.97e-06
ltrade	-3.59e-07	1.14e-06	-0.31	0.753	-2.59e-06	1.88e-06
l2trade	2.58e-06	8.63e-07	2.99	0.003	8.86e-07	4.27e-06
_cons	54631.16	31086.02	1.76	0.079	-6325.634	115588

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2521	-39633.1	-39240.99	4	78489.99	78513.32

Note: N=Obs used in calculating BIC; see [R] BIC note

```
. reg thr gdp
```

Source	SS	df	MS	Number of obs =	2901
				F(1, 2899) =	804.08
Model	1.4611e+15	1	1.4611e+15	Prob > F =	0.0000
Residual	5.2676e+15	2899	1.8171e+12	R-squared =	0.2171
				Adj R-squared =	0.2169
Total	6.7287e+15	2900	2.3202e+12	Root MSE =	1.3e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	1.45e-06	5.12e-08	28.36	0.000	1.35e-06	1.55e-06
_cons	17667.05	28850.73	0.61	0.540	-38902.96	74237.06

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2901	-45415.48	-45060.4	2	90124.79	90136.74

Note: N=Obs used in calculating BIC; see [R] BIC note

```
. reg thr gdp l.gdp
```

Source	SS	df	MS	Number of obs =	2800
				F(2, 2797) =	433.91
Model	1.5900e+15	2	7.9502e+14	Prob > F =	0.0000
Residual	5.1248e+15	2797	1.8322e+12	R-squared =	0.2368
				Adj R-squared =	0.2363
Total	6.7148e+15	2799	2.3990e+12	Root MSE =	1.4e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp						
--.	.0000131	1.37e-06	9.57	0.000	.0000104	.0000158
L1.	-.0000128	1.50e-06	-8.51	0.000	-.0000157	-9.84e-06
_cons	119257.7	31730.24	3.76	0.000	57040.66	181474.7

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2800	-43881.03	-43502.71	3	87011.42	87029.23

Note: N=Obs used in calculating BIC; see [R] BIC note

```
. reg thr gdp l.gdp l2gdp
```

Source	SS	df	MS	Number of obs =	2706
				F(3, 2702) =	292.18
Model	1.6414e+15	3	5.4713e+14	Prob > F =	0.0000
Residual	5.0597e+15	2702	1.8726e+12	R-squared =	0.2449
				Adj R-squared =	0.2441
Total	6.7011e+15	2705	2.4773e+12	Root MSE =	1.4e+06

thr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp						
--.	5.40e-06	1.95e-06	2.77	0.006	1.57e-06	9.23e-06
L1.	6.33e-06	3.74e-06	1.69	0.091	-1.01e-06	.0000137
l2gdp	-.0000117	2.10e-06	-5.58	0.000	-.0000158	-7.59e-06
_cons	148095.2	33022.61	4.48	0.000	83343.09	212847.4

```
. estat ic
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	2706	-42451.32	-42071.18	4	84150.36	84173.98

Note: N=Obs used in calculating BIC; see [R] BIC note

12.5 Appendix E

Maddala and Wu Unit Root Test

```
. xtfisher gdp, lag(2) trend

Fisher Test for panel unit root using an augmented Dickey-Fuller test (2 lags)

Ho: unit root

         chi2(474)    =  225.7873
         Prob > chi2  =    1.0000
```

```
. xtfisher valden, lag(2) trend

Fisher Test for panel unit root using an augmented Dickey-Fuller test (2 lags)

Ho: unit root

         chi2(472)    =  156.1008
         Prob > chi2  =    1.0000
```

```
. xtfisher trade, trend lag(2)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (2 lags)

Ho: unit root

         chi2(440)    =  336.0932
         Prob > chi2  =    0.9999
```

```
. xtfisher indus, trend lag(2)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (2 lags)

Ho: unit root

         chi2(468)    =  509.6806
         Prob > chi2  =    0.0892
```

12.6 Appendix F

Serial Correlation Test

```
. xtserial dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade llnvalden ///
> gto_condur1 sl_condur1 nogtosl_condur1 gto_condur2 sl_condur2 nogtosl_condur2 _Iy*

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     186) =     64.329
           Prob > F =      0.0000
```

12.7 Appendix G

Hausman test

```
. xtreg lnthr lngdp lnopen lntrade lnvalden depth rail gto_condur1 sl_condur1 nogtosl_condur1 gto_condur2 sl_condur2 nogtosl_condur2, fe
note: lngdp omitted because of collinearity
note: depth omitted because of collinearity
note: rail omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       675
Group variable: port                            Number of groups   =        46

R-sq:  within  = 0.5575                         Obs per group: min =         1
       between = 0.0917                                        avg =      14.7
       overall = 0.0918                                        max =        21

                                                F(9,620)           =     86.78
corr(u_i, Xb)  = -0.8635                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      lnthr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
      lngdp |  (omitted)
     lnopen |  -.8689889   .3545454    -2.45   0.015    -1.565244   -.1727336
    lntrade |   2.036689   .1922156    10.60   0.000     1.659217    2.414162
   lnvalden |  -.2564854   .1601206    -1.60   0.110    -.5709299     .057959
      depth |  (omitted)
       rail |  (omitted)
gto_condur1 |  -.0435654   .1146316    -0.38   0.704    -.2686787    .181548
 sl_condur1 |   .0850241   .2261571     0.38   0.707    -.3591027   .5291508
nogtosl_co~1 |   .1760275   .1286023     1.37   0.172    -.0765214   .4285763
gto_condur2 |  -.2566683   .4312281    -0.60   0.552    -1.103513   .5901764
 sl_condur2 |  -.2876608   .5226192    -0.55   0.582    -1.313979   .7386575
nogtosl_co~2 |    .663429   .2244653     2.96   0.003     .2226247   1.104233
       _cons |  -39.01006    4.9908    -7.82   0.000    -48.81098   -29.20914
------------+----------------------------------------------------------------
     sigma_u |  3.854647
     sigma_e |  .73758153
         rho |  .96467895   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(45, 620) =    48.00                 Prob > F = 0.0000

. estimates store fe


. xtreg lnthr lngdp lnopen lntrade lnvalden depth rail gto_condur1 sl_condur1 nogtosl_condur1 gto_condur2 sl_condur2 nogtosl_condur2, re
note: lntrade omitted because of collinearity

Random-effects GLS regression                   Number of obs      =       675
Group variable: port                            Number of groups   =        46

R-sq:  within  = 0.5296                         Obs per group: min =         1
       between = 0.1946                                        avg =      14.7
       overall = 0.2064                                        max =        21

Random effects u_i ~ Gaussian                   Wald chi2(11)      =    646.87
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      lnthr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+----------------------------------------------------------------
      lngdp |   .8276905   .0874261     9.47   0.000     .6563384    .9990426
     lnopen |   1.758893   .1569663    11.21   0.000     1.451245    2.066541
    lntrade |  (omitted)
   lnvalden |   .0748656   .1637643     0.46   0.648    -.2461065    .3958376
      depth |  -.3258806   .0962626    -3.39   0.001    -.5145519   -.1372093
       rail |   .8205719   .3796344     2.16   0.031     .0765022    1.564642
gto_condur1 |   .2218598   .1174853     1.89   0.059    -.0084072    .4521267
 sl_condur1 |   .5564774   .2263331     2.46   0.014     .1128727    1.000082
nogtosl_co~1 |   .4147561    .133151     3.11   0.002      .153785    .6757273
gto_condur2 |   .4211822     .41481     1.02   0.310    -.3918304    1.234195
 sl_condur2 |  -.1060244   .4988569    -0.21   0.832    -1.083766    .8717172
nogtosl_co~2 |   .8401182   .2330445     3.60   0.000     .3833593    1.296877
       _cons |  -4.148461   2.100704    -1.97   0.048    -8.265764   -.0311571
------------+----------------------------------------------------------------
     sigma_u |  1.130339
     sigma_e |  .73758147
         rho |  .70136214   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimates store re


. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re          Difference          S.E.
-------------+----------------------------------------------------------------
      lnopen |  -.8689889     1.758893      -2.627882        .3179057
    lnvalden |  -.2564854    .0748656       -.331351               .
 gto_condur1 |  -.0435654    .2218598      -.2654252               .
  sl_condur1 |   .0850241    .5564774      -.4714534               .
nogtosl_co~1 |   .1760275    .4147561      -.2387287               .
 gto_condur2 |  -.2566683    .4211822      -.6778505        .1178573
  sl_condur2 |  -.2876608   -.1060244      -.1816364        .1557967
nogtosl_co~2 |    .663429    .8401182      -.1766892               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       60.51
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

12.8 Appendix H

Newey and West Approach

Model 1: Newey and West Standard Errors

```
. newey dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade  llnvalden ///
> con _Iy* _Ip*, lag(2) force
note: _Iyear_2010 omitted because of collinearity
note: _Iport_5 omitted because of collinearity
note: _Iport_14 omitted because of collinearity
note: _Iport_70 omitted because of collinearity
note: _Iport_135 omitted because of collinearity
note: _Iport_174 omitted because of collinearity
note: _Iport_187 omitted because of collinearity
note: _Iport_194 omitted because of collinearity
note: _Iport_282 omitted because of collinearity
note: _Iport_283 omitted because of collinearity
note: _Iport_285 omitted because of collinearity
note: _Iport_286 omitted because of collinearity
note: _Iport_290 omitted because of collinearity
note: _Iport_293 omitted because of collinearity
note: _Iport_294 omitted because of collinearity
note: _Iport_296 omitted because of collinearity
note: _Iport_297 omitted because of collinearity
note: _Iport_298 omitted because of collinearity
note: _Iport_299 omitted because of collinearity
note: _Iport_300 omitted because of collinearity
note: _Iport_303 omitted because of collinearity
note: _Iport_308 omitted because of collinearity
note: _Iport_319 omitted because of collinearity
note: _Iport_320 omitted because of collinearity
note: _Iport_321 omitted because of collinearity
note: _Iport_322 omitted because of collinearity
note: _Iport_323 omitted because of collinearity

Regression with Newey-West standard errors          Number of obs  =      2126
maximum lag: 2                                      F(230, 1887)   =    329.31
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |               Newey-West
      dlnthr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlngdp |   1.423459   .505565     2.82   0.005     .4319342    2.414985
    dlntrade |   .3046825   .1669352    1.83   0.068    -.0227144    .6320794
   dlnvalden |   .2889309   .1852859    1.56   0.119    -.0744558    .6523176
      llnthr |  -.2905681   .0476283   -6.10   0.000    -.3839777   -.1971585
      llngdp |    .246272   .2333334    1.06   0.291    -.2113465    .7038905
    llntrade |   .2304881   .1247756    1.85   0.065    -.0142246    .4752008
   llnvalden |   .0434606   .0782557    0.56   0.579    -.1100161    .1969373
         con |   .0676515   .0536283    1.26   0.207    -.0375254    .1728284
  _Iyear_1991 |  -.0912597   .1428446   -0.64   0.523    -.3714098    .1888903
  _Iyear_1992 |  -.0409102   .1392714   -0.29   0.769    -.3140523    .2322318
  _Iyear_1993 |  -.0590737   .1382429   -0.43   0.669    -.3301987    .2120512
  _Iyear_1994 |  -.1006365   .1304077   -0.77   0.440    -.3563949    .1551219
  _Iyear_1995 |  -.1421546   .1302776   -1.09   0.275     -.397658    .1133487
  _Iyear_1996 |  -.1126852   .1238769   -0.91   0.363    -.3556353    .1302648
  _Iyear_1997 |  -.0815329   .1292746   -0.63   0.528    -.3350691    .1720034
  _Iyear_1998 |  -.2103456   .1486307   -1.42   0.157    -.5018433     .081152
  _Iyear_1999 |  -.0882673   .1389593   -0.64   0.525    -.3607973    .1842628
  _Iyear_2000 |  -.0746355   .1178388   -0.63   0.527    -.3057435    .1564725
  _Iyear_2001 |  -.0112557   .1177529   -0.10   0.924    -.2421953    .2196839
  _Iyear_2002 |   .0075902   .1126597    0.07   0.946    -.2133605     .228541
  _Iyear_2003 |  -.0372361   .1083206   -0.34   0.731    -.2496769    .1752047
  _Iyear_2004 |  -.0750987   .1033965   -0.73   0.468    -.2778821    .1276847
  _Iyear_2005 |  -.1373109   .0971954   -1.41   0.158    -.3279326    .0533109
  _Iyear_2006 |  -.0844177   .0942911   -0.90   0.371    -.2693436    .1005081
  _Iyear_2007 |  -.1601543   .0919579   -1.74   0.082    -.3405042    .0201956
  _Iyear_2008 |  -.3845093    .135597   -2.84   0.005     -.650445   -.1185736
  _Iyear_2009 |  -.1877575   .1635148   -1.15   0.251    -.5084464    .1329314
  _Iyear_2010 |  (omitted)
    _Iport_5 |  (omitted)
    _Iport_6 |    1.89617   .6648217    2.85   0.004     .5923069    3.200033
    _Iport_7 |   2.239114   .8392365    2.67   0.008     .5931848    3.885043
    _Iport_8 |   1.872753   .6154707    3.04   0.002     .6656783    3.079828
   _Iport_13 |   2.023836    .608873    3.32   0.001     .8297004    3.217971
   _Iport_14 |  (omitted)
   _Iport_15 |   1.676994   .4580721    3.66   0.000     .7786132    2.575375
   _Iport_26 |    .07359   .2689343    0.27   0.784    -.4538498    .6010297
   _Iport_29 |   .0887957   .2702709    0.33   0.743    -.4412655    .6188569
   _Iport_31 |   .0820589   .2703175    0.30   0.761    -.4480937    .6122115
   _Iport_33 |   .4275171   .2731116    1.57   0.118    -.1081154    .9631496
   _Iport_49 |  -.4446127   .2956666   -1.50   0.133    -1.024481    .1352552
   _Iport_50 |   1.118437    .32501    3.44   0.001     .4810198    1.755853
   _Iport_51 |   .9545903   .2110075    4.52   0.000     .5407578    1.368423
   _Iport_52 |   .6955713   .1792873    3.88   0.000     .3439491    1.047194
   _Iport_54 |   .2708197   .1112081    2.44   0.015     .0527158    .4889235
   _Iport_58 |   .0199589   .2372951    0.08   0.933    -.4454295    .4853474
   _Iport_63 |   .7875065   .2344691    3.36   0.001     .3276606    1.247352
   _Iport_70 |  (omitted)
   _Iport_73 |   .7129619   .2472056    2.88   0.004     .2281369    1.197787
   _Iport_77 |   .4423704   .2863942    1.54   0.123    -.1193122    1.004053
   _Iport_79 |    .058025    .277309    0.21   0.834    -.4858396    .6018896
   _Iport_80 |  -.0505331   .2727785   -0.19   0.853    -.5855122    .4844461
   _Iport_81 |   .0110778   .2710429    0.04   0.967    -.5204976    .5426531
   _Iport_86 |  -.2759641   .2764647   -1.00   0.318    -.8181727    .2662446
   _Iport_88 |  -.3190858    .281937   -1.13   0.258    -.8720269    .2338552
   _Iport_89 |  -1.508911   .738708   -2.04   0.041    -2.957681   -.0601406
   _Iport_91 |  -1.220665   .409623   -2.98   0.003    -2.024026   -.4173031
   _Iport_92 |   .9304511   .2388584    3.90   0.000     .4619968    1.398905
   _Iport_93 |   .2084622   .2837198    0.73   0.463    -.3479753    .7648997
   _Iport_95 |    .850206   .2314646    3.67   0.000     .3962526    1.304159
   _Iport_97 |   1.304003   .5762763    2.26   0.024     .1737974    2.434209
   _Iport_99 |   .5220062   .4018688    1.30   0.194    -.2661476     1.31016
  _Iport_101 |   .0304346   .1652941    0.18   0.854    -.2937439    .3546131
```

_Iport_102	-.688547	.2443935	-2.82	0.005	-1.167857	-.2092372
_Iport_103	-.6595535	.2300982	-2.87	0.004	-1.110827	-.2082798
_Iport_105	1.686701	.5398207	3.12	0.002	.6279928	2.745409
_Iport_107	.6395894	.2032569	3.15	0.002	.2409575	1.038221
_Iport_108	1.563854	.379931	4.12	0.000	.8187251	2.308983
_Iport_113	.8446975	.2277684	3.71	0.000	.3979931	1.291402
_Iport_114	1.06596	.2412578	4.42	0.000	.5927998	1.53912
_Iport_116	1.623942	.5520434	2.94	0.003	.5412621	2.706621
_Iport_119	.6660933	.3690425	1.80	0.071	-.0576809	1.389868
_Iport_123	.2334344	.220975	1.06	0.291	-.1999465	.6668154
_Iport_129	1.039913	.2439666	4.26	0.000	.5614404	1.518386
_Iport_130	1.203935	.2674929	4.50	0.000	.6793226	1.728548
_Iport_133	2.029158	.5101042	3.98	0.000	1.02873	3.029585
_Iport_134	.5144593	.22333	2.30	0.021	.0764597	.952459
_Iport_135	(omitted)					
_Iport_136	-.7506287	.795507	-0.94	0.346	-2.310794	.809537
_Iport_137	-.4869639	.1920552	-2.54	0.011	-.8636267	-.1103011
_Iport_138	-.386642	.1935972	-2.00	0.046	-.766329	-.0069549
_Iport_139	-.1600901	.1920266	-0.83	0.405	-.5366969	.2165167
_Iport_140	.3369968	.1992678	1.69	0.091	-.0538116	.7278052
_Iport_141	-.4723738	.2699234	-1.75	0.080	-1.001754	.0570059
_Iport_142	2.238404	.6812301	3.29	0.001	.9023608	3.574448
_Iport_143	-.444986	.2749242	-1.62	0.106	-.9841734	.0942013
_Iport_144	-1.211243	.4023003	-3.01	0.003	-2.000243	-.4222426
_Iport_145	-.638198	.4645259	-1.37	0.170	-1.549236	.2728403
_Iport_146	-.8706377	.3846625	-2.26	0.024	-1.625046	-.1162291
_Iport_147	-.8639465	.2944429	-2.93	0.003	-1.441414	-.2864786
_Iport_148	-1.483922	.7519757	-1.97	0.049	-2.958714	-.0091309
_Iport_149	-.1491964	.255642	-0.58	0.560	-.6505672	.3521743
_Iport_150	1.965448	.5507997	3.57	0.000	.8852075	3.045688
_Iport_151	.7056383	.4352176	1.62	0.105	-.1479201	1.559197
_Iport_152	1.082445	.4598159	2.35	0.019	.1806439	1.984246
_Iport_153	1.722847	.6495175	2.65	0.008	.448999	2.996695
_Iport_154	-.2937636	.1778959	-1.65	0.099	-.6426569	.0551298
_Iport_155	-.1705063	.22029	-0.77	0.439	-.602544	.2615313
_Iport_156	-.4881331	.5895637	-0.83	0.408	-1.644398	.6681322
_Iport_157	.5403021	.1937348	2.79	0.005	.1603452	.920259
_Iport_158	.387256	.2791264	1.39	0.165	-.1601728	.9346849
_Iport_159	-.3825065	.2664214	-1.44	0.151	-.9050181	.140005
_Iport_160	.6725431	.2258416	2.98	0.003	.2296175	1.115469
_Iport_161	-.4088683	.2525863	-1.62	0.106	-.9042461	.0865096
_Iport_162	.9274098	.2436293	3.81	0.000	.4495986	1.405221
_Iport_163	1.70536	.484064	3.52	0.000	.756003	2.654717
_Iport_164	1.270441	.3190584	3.98	0.000	.6446966	1.896185
_Iport_165	.2873225	.3311736	0.87	0.386	-.3621825	.9368275
_Iport_166	.6113511	.3281384	1.86	0.063	-.0322011	1.254903
_Iport_167	1.223323	.3857943	3.17	0.002	.4666944	1.979951
_Iport_168	.5330969	.3475175	1.53	0.125	-.1484621	1.214656
_Iport_169	-1.468547	.2571777	-5.71	0.000	-1.97293	-.9641646
_Iport_170	1.109478	.2353296	4.71	0.000	.647944	1.571011
_Iport_171	1.109272	.4307992	2.57	0.010	.2643794	1.954165
_Iport_172	2.497519	.8729361	2.86	0.004	.7854979	4.209541
_Iport_173	2.399172	.8231017	2.91	0.004	.7848872	4.013458
_Iport_174	(omitted)					
_Iport_175	1.425894	.3953194	3.61	0.000	.6505848	2.201203
_Iport_176	1.377473	.3792739	3.63	0.000	.6336327	2.121313
_Iport_177	1.504503	.3968304	3.79	0.000	.7262309	2.282776
_Iport_178	1.31384	.5662963	2.32	0.020	.2032077	2.424473
_Iport_179	1.86682	.5997068	3.11	0.002	.6906616	3.042978
_Iport_180	.4427342	.5161337	0.86	0.391	-.5695185	1.454987
_Iport_181	-.0858773	.2134064	-0.40	0.687	-.5044146	.3326601
_Iport_182	.027815	.2099635	0.13	0.895	-.38397	.4395999
_Iport_183	-1.161046	.3837218	-3.03	0.003	-1.91361	-.4084827
_Iport_184	-.4400437	.2317147	-1.90	0.058	-.8944877	.0144004
_Iport_185	.4343589	.1351641	3.21	0.001	.169272	.6994457
_Iport_186	.2196262	.1835885	1.20	0.232	-.1404316	.579684
_Iport_187	(omitted)					
_Iport_188	.0911918	.2558018	0.36	0.722	-.4104922	.5928759
_Iport_189	.1735969	.2819262	0.62	0.538	-.3793229	.7265167
_Iport_190	.1770578	.2564034	0.69	0.490	-.3258062	.6799218
_Iport_191	.6904463	.2836146	2.43	0.015	.1342152	1.246677
_Iport_192	.6861231	.2878219	2.38	0.017	.1216404	1.250606
_Iport_193	-.0864641	.2424683	-0.36	0.721	-.5619983	.3890701
_Iport_194	(omitted)					
_Iport_195	-.9270918	.2144017	-4.32	0.000	-1.347581	-.5066024
_Iport_196	-.5898503	.1678029	-3.52	0.000	-.9189491	-.2607516
_Iport_197	-1.196727	.2235583	-5.35	0.000	-1.635174	-.7582794
_Iport_198	-1.095321	.2813843	-3.89	0.000	-1.647178	-.5434643
_Iport_199	-.792794	.2486346	-3.19	0.001	-1.280422	-.3051664
_Iport_200	1.531518	.5608656	2.73	0.006	.4315357	2.6315
_Iport_201	1.597909	.6164379	2.59	0.010	.3889371	2.80688
_Iport_202	1.564088	.5970016	2.62	0.009	.3932354	2.734941
_Iport_203	.6100757	.4567857	1.34	0.182	-.2857824	1.505934
_Iport_204	1.40662	.5525483	2.55	0.011	.3229502	2.49029
_Iport_205	.3608851	.5259864	0.69	0.493	-.670691	1.392461
_Iport_206	1.433885	.5492933	2.61	0.009	.3565992	2.511171
_Iport_207	.2999558	.8475063	0.35	0.723	-1.362192	1.962104
_Iport_208	-.333259	.2565382	-1.30	0.194	-.8363874	.1698694
_Iport_209	-.7696802	.9128146	-0.84	0.399	-2.559912	1.020552
_Iport_210	-.1720167	.2223778	-0.77	0.439	-.6081489	.2641155
_Iport_211	-.3209064	.4046642	-0.79	0.428	-1.114543	.4727298
_Iport_212	.4403898	.2190923	2.01	0.045	.0107012	.8700784
_Iport_213	.7365287	.25366	2.90	0.004	.2390453	1.234012
_Iport_214	.5212271	.215733	2.42	0.016	.0981269	.9443274
_Iport_215	-.1666526	.1928493	-0.86	0.388	-.5448728	.2115676
_Iport_216	.2542572	.2101005	1.21	0.226	-.1577964	.6663109
_Iport_217	-.1600074	.1858545	-0.86	0.389	-.5245093	.2044945
_Iport_218	.23927	.2164228	1.11	0.269	-.1851831	.663723
_Iport_219	-.5855549	.2009758	-2.91	0.004	-.9797131	-.1913968
_Iport_220	-.0831408	.1856481	-0.45	0.654	-.447238	.2809563
_Iport_221	-.6386202	.1879349	-3.40	0.001	-1.007202	-.2700381
_Iport_222	-.0857298	.182263	-0.47	0.638	-.4431881	.2717284
_Iport_223	-.2437727	.1837786	-1.33	0.185	-.6042032	.1166579
_Iport_224	.1963209	.203819	0.96	0.336	-.2034134	.5960553
_Iport_225	.1580389	.2668971	0.59	0.554	-.3654056	.6814833
_Iport_226	-.5944086	.197499	-3.01	0.003	-.981748	-.2070691
_Iport_227	-.4216153	.2138195	-1.97	0.049	-.8409628	-.0022679
_Iport_228	-.2912536	.186297	-1.56	0.118	-.6566234	.0741163
_Iport_229	.0958384	.1981728	0.48	0.629	-.2928225	.4844993
_Iport_230	-.5228964	.3242109	-1.61	0.107	-1.158746	.1129531
_Iport_231	-.3292622	.2644392	-1.25	0.213	-.8478862	.1893618
_Iport_232	-.2856648	.2905224	-0.98	0.326	-.8554438	.2841142
_Iport_233	-.4322944	.2608691	-1.66	0.098	-.9439166	.0793277
_Iport_234	-.7371841	.2957714	-2.49	0.013	-1.317257	-.1571107
_Iport_235	-1.238509	.341529	-3.63	0.000	-1.908323	-.5686951
_Iport_236	-.2547493	.4743565	-0.54	0.591	-1.185068	.6755691
_Iport_237	-.6568497	.3521234	-1.87	0.062	-1.347442	.0337425
_Iport_238	-.1938761	.2841295	-0.68	0.495	-.7511171	.3633648
_Iport_239	-.0034643	.2556232	-0.01	0.989	-.5047982	.4978696
_Iport_240	-.8710748	.3028068	-2.88	0.004	-1.464946	-.2772035
_Iport_241	-.1947015	.2773031	-0.70	0.483	-.7385544	.3491515
_Iport_242	-.5621943	.2764356	-2.03	0.042	-1.104346	-.0200428
_Iport_243	-.6992481	.3013914	-2.32	0.020	-1.290344	-.1081527
_Iport_244	-.3848067	.2587579	-1.49	0.137	-.8922883	.1226749
_Iport_245	1.193866	.3618216	3.30	0.001	.484253	1.903478
_Iport_246	.7438004	.1699168	4.38	0.000	.4105559	1.077045
_Iport_247	1.070992	.2162156	4.95	0.000	.6469448	1.495039
_Iport_248	.0076486	.1141888	0.07	0.947	-.2163009	.2315982
_Iport_249	.521561	.1462088	3.57	0.000	.2348131	.8083089
_Iport_250	-.7028308	.1563575	-4.50	0.000	-1.009483	-.396179
_Iport_251	1.61593	.4259236	3.79	0.000	.7805992	2.45126
_Iport_252	.5093029	.4107215	1.24	0.215	-.2962131	1.314819
_Iport_253	.7715009	.3959499	1.95	0.052	-.0050448	1.548047
_Iport_254	2.495006	.8688746	2.87	0.004	.7909501	4.199062
_Iport_255	1.265285	.4058938	3.12	0.002	.4692377	2.061333
_Iport_256	.7513715	.1667045	4.51	0.000	.4244269	1.078316
_Iport_257	-.2808728	.1541759	-1.82	0.069	-.5832461	.0215004
_Iport_258	.5224538	.1850259	2.82	0.005	.1595769	.8853306
_Iport_259	-1.369772	.3531924	-3.88	0.000	-2.062461	-.6770838
_Iport_260	.0346163	.2160052	0.16	0.873	-.3890178	.4582505
_Iport_261	-.905326	.3236299	-2.80	0.005	-1.540036	-.2706159
_Iport_262	.0473348	.2248644	0.21	0.833	-.3936741	.4883437
_Iport_263	.2717678	.1678089	1.62	0.106	-.0573426	.6008783
_Iport_264	.3195011	.1536028	2.08	0.038	.018252	.6207503
_Iport_265	-1.56856	.3476611	-4.51	0.000	-2.2504	-.886719
_Iport_266	.4942333	.1531791	3.23	0.001	.1938151	.7946515
_Iport_267	.5282793	.2422203	2.18	0.029	.0532315	1.003327
_Iport_268	.3840135	.1378231	2.79	0.005	.1137118	.6543151
_Iport_269	-1.005096	.197651	-5.09	0.000	-1.392733	-.6174583
_Iport_270	-.483714	.1241319	-3.90	0.000	-.7271641	-.2402638
_Iport_271	.9036828	.3611522	2.50	0.012	.1953831	1.611982
_Iport_272	.0053543	.116126	0.05	0.963	-.2223946	.2331032
_Iport_273	.6434862	.1685152	3.82	0.000	.3129904	.9739819
_Iport_274	-.213333	.1219333	-1.75	0.080	-.4524712	.0258052
_Iport_275	.8793872	.191509	4.59	0.000	.5037956	1.254979
_Iport_276	.2841899	.3233073	0.88	0.380	-.3498875	.9182673
_Iport_277	1.071288	.3777457	2.84	0.005	.3304448	1.812131
_Iport_278	-.3208959	.3257776	-0.99	0.325	-.9598181	.3180263
_Iport_279	.312285	.3265154	0.96	0.339	-.3280842	.9526543
_Iport_280	1.623415	.5030211	3.23	0.001	.6368791	2.609951
_Iport_281	.6093935	.1846887	3.30	0.001	.2471779	.9716091
_Iport_282	(omitted)					
_Iport_283	(omitted)					
_Iport_284	-.9095908	.4119423	-2.21	0.027	-1.717501	-.1016806
_Iport_285	(omitted)					
_Iport_286	(omitted)					
_Iport_287	1.018153	.5019657	2.03	0.043	.0336864	2.002619
_Iport_288	2.164052	.5860189	3.69	0.000	1.014738	3.313365
_Iport_289	-.1450027	.1396803	-1.04	0.299	-.4189468	.1289413
_Iport_290	(omitted)					
_Iport_291	-1.371099	.7134231	-1.92	0.055	-2.77028	.0280818
_Iport_292	.822902	.6169286	1.33	0.182	-.387032	2.032836
_Iport_293	(omitted)					
_Iport_294	(omitted)					
_Iport_295	1.52262	.6984335	2.18	0.029	.1528368	2.892403
_Iport_296	(omitted)					
_Iport_297	(omitted)					
_Iport_298	(omitted)					
_Iport_299	(omitted)					
_Iport_300	(omitted)					
_Iport_301	-1.245462	.337625	-3.69	0.000	-1.907619	-.5833042
_Iport_302	-.8727373	.2793293	-3.12	0.002	-1.420564	-.3249105
_Iport_303	(omitted)					
_Iport_304	-.7150273	.4279375	-1.67	0.095	-1.554308	.1242531
_Iport_305	-3.156674	.3882834	-8.13	0.000	-3.918184	-2.395165
_Iport_306	-1.241865	.2660921	-4.67	0.000	-1.76373	-.7199988
_Iport_307	1.370981	.4814943	2.85	0.004	.4266636	2.315298
_Iport_308	(omitted)					
_Iport_309	1.217899	.3199583	3.81	0.000	.59039	1.845409
_Iport_310	.3549731	.2520663	1.41	0.159	-.1393848	.8493309
_Iport_311	-.3645688	.0965277	-3.78	0.000	-.5538811	-.1752564
_Iport_312	-.1699527	.1294956	-1.31	0.190	-.4239224	.0840169
_Iport_313	-1.001153	.1293761	-7.74	0.000	-1.254888	-.747418
_Iport_314	.0936441	.0942238	0.99	0.320	-.0911497	.2784379
_Iport_315	.4807819	.1257752	3.82	0.000	.2341089	.727455
_Iport_316	.0574896	.0862312	0.67	0.505	-.1116289	.2266082
_Iport_317	2.580976	1.004857	2.57	0.010	.6102278	4.551724
_Iport_318	2.265092	.9233211	2.45	0.014	.4542543	4.07593
_Iport_319	(omitted)					
_Iport_320	(omitted)					
_Iport_321	(omitted)					
_Iport_322	(omitted)					
_Iport_323	(omitted)					
_cons	-8.951377	3.645102	-2.46	0.014	-16.10023	-1.802523

Model 2. Newey and West Approach

```
. newey dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade  llnvalden ///
> condur1 condur2 _Iy* _Ip*, lag(2) force
note: _Iyear_2010 omitted because of collinearity
note: _Iport_5 omitted because of collinearity
note: _Iport_14 omitted because of collinearity
note: _Iport_70 omitted because of collinearity
note: _Iport_135 omitted because of collinearity
note: _Iport_174 omitted because of collinearity
note: _Iport_187 omitted because of collinearity
note: _Iport_194 omitted because of collinearity
note: _Iport_282 omitted because of collinearity
note: _Iport_283 omitted because of collinearity
note: _Iport_285 omitted because of collinearity
note: _Iport_286 omitted because of collinearity
note: _Iport_290 omitted because of collinearity
note: _Iport_293 omitted because of collinearity
note: _Iport_294 omitted because of collinearity
note: _Iport_296 omitted because of collinearity
note: _Iport_297 omitted because of collinearity
note: _Iport_298 omitted because of collinearity
note: _Iport_299 omitted because of collinearity
note: _Iport_300 omitted because of collinearity
note: _Iport_303 omitted because of collinearity
note: _Iport_308 omitted because of collinearity
note: _Iport_319 omitted because of collinearity
note: _Iport_320 omitted because of collinearity
note: _Iport_321 omitted because of collinearity
note: _Iport_322 omitted because of collinearity
note: _Iport_323 omitted because of collinearity

Regression with Newey-West standard errors                Number of obs   =      2126
maximum lag: 2                                            F(230, 1887)    =    155.21
                                                          Prob > F        =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
      dlnthr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlngdp |   1.518844   .5367556     2.83   0.005     .4661468    2.57154
    dlntrade |    .2465499  .1723543     1.43   0.153    -.0914751    .584575
   dlnvalden |    .141375   .1938507     0.73   0.466    -.2388092    .5215593
      llngdp |  -.0614527   .2301626    -0.27   0.790    -.5128526    .3899471
    llntrade |    .0962285  .1243755     0.77   0.439    -.1476993    .3401564
   llnvalden |  -.0819342   .0892862    -0.92   0.359    -.2570443    .0931759
     condur1 |  -.0101873   .0558892    -0.18   0.855    -.1197984    .0994238
     condur2 |  -.1182565   .0446122    -2.65   0.008    -.2057509   -.0307621
  _Iyear_1991 |  -.0342959   .1404336    -0.24   0.807    -.3097174    .2411255
  _Iyear_1992 |  -.0014678      .1429    -0.01   0.992    -.2817265    .2787909
  _Iyear_1993 |  -.0367963   .1461225    -0.25   0.801     -.323375    .2497824
  _Iyear_1994 |  -.0917167   .1391147    -0.66   0.510    -.3645515    .181118
  _Iyear_1995 |  -.1006722   .1372909    -0.73   0.463    -.3699301    .1685856
  _Iyear_1996 |  -.0925815   .1310524    -0.71   0.480    -.3496043    .1644414
  _Iyear_1997 |  -.0529115    .141759    -0.37   0.709    -.3309324    .2251094
  _Iyear_1998 |  -.1469057   .1503091    -0.98   0.329    -.4416952    .1478839
  _Iyear_1999 |  -.0523712   .1425026    -0.37   0.713    -.3318504    .2271081
  _Iyear_2000 |  -.1025712   .1342194    -0.76   0.445    -.3658053    .1606628
  _Iyear_2001 |  -.0676476   .1342816    -0.50   0.614    -.3310036    .1957085
  _Iyear_2002 |  -.0743282   .1329539    -0.56   0.576    -.3350804    .186424
  _Iyear_2003 |  -.1269952   .1301873    -0.98   0.329    -.3823215    .1283311
  _Iyear_2004 |  -.1578845   .1255243    -1.26   0.209    -.4040656    .0882966
  _Iyear_2005 |  -.2201611   .1186492    -1.86   0.064    -.4528584    .0125362
  _Iyear_2006 |  -.1561061   .1147812    -1.36   0.174    -.3812176    .0690054
  _Iyear_2007 |  -.2226079   .1122384    -1.98   0.047    -.4427323   -.0024836
  _Iyear_2008 |   -.404629   .1526323    -2.65   0.008     -.703975   -.1052831
  _Iyear_2009 |     -.1848   .1919053    -0.96   0.336    -.5611689    .1915689
  _Iyear_2010 |  (omitted)
     _Iport_5 |  (omitted)
     _Iport_6 |  -.0117224   .5672649    -0.02   0.984    -1.124255    1.10081
     _Iport_7 |  -.1467264   .7117405    -0.21   0.837    -1.542607    1.249155
     _Iport_8 |   .0635292   .5179972     0.12   0.902    -.9523782    1.079437
    _Iport_13 |   .0112498   .4889562     0.02   0.982    -.9477017    .9702014
    _Iport_14 |  (omitted)
    _Iport_15 |    -.01155   .329385     -0.04   0.972    -.6575471    .6344471
    _Iport_26 |   -.189442   .274722     -0.69   0.491    -.7282329    .3493488
    _Iport_29 |  -.0564613   .2530167    -0.22   0.823    -.5526832    .4397606
    _Iport_31 |    .002319   .253295      0.01   0.993    -.4944487    .4990866
    _Iport_33 |  -.1268172   .2496544    -0.51   0.612    -.6164448    .3628104
    _Iport_49 |  -.0523158   .2706781    -0.19   0.847    -.5831756    .4785439
    _Iport_50 |  -.1912012   .2164954    -0.88   0.377    -.6157968    .2333943
    _Iport_51 |  -.1480409   .078624     -1.88   0.060      -.30224    .0061582
    _Iport_52 |  -.1757254   .0755916    -2.32   0.020    -.3239774   -.0274734
    _Iport_54 |  -.0805212   .0862487    -0.93   0.351     -.249674    .0886317
    _Iport_58 |  -.0575209   .2427255    -0.24   0.813    -.5335595    .4185177
    _Iport_63 |  -.2603345   .1299985    -2.00   0.045    -.5152905   -.0053786
    _Iport_70 |  (omitted)
    _Iport_73 |  -.0338477   .2112335    -0.16   0.873    -.4481235    .3804282
    _Iport_77 |  -.0577428   .282914     -0.20   0.838    -.6125999    .4971144
    _Iport_79 |   .0222292   .2663174     0.08   0.933    -.5000783    .5445367
    _Iport_80 |  -.0754489   .2826207    -0.27   0.790    -.6297308    .478833
    _Iport_81 |  -.0312058   .2775839    -0.11   0.911    -.5756095    .5131979
    _Iport_86 |  -.0629107   .278691     -0.23   0.821    -.6094857    .4836642
    _Iport_88 |   .0708988   .2730645     0.26   0.795    -.4646413    .6064389
    _Iport_89 |  -.2112627   .3658109    -0.58   0.564    -.9286991    .5061737
    _Iport_91 |  -.1513283   .2738898    -0.55   0.581     -.688487    .3858305
    _Iport_92 |  -.0162842   .1576879    -0.10   0.918    -.3255452    .2929768
    _Iport_93 |  -.0945845   .288507     -0.33   0.743    -.6604108    .4712418
    _Iport_95 |   .1347403   .1663704     0.81   0.418     -.191549    .4610296
    _Iport_97 |  -.0019938   .5839167    -0.00   0.997    -1.147184    1.143196
    _Iport_99 |  -.2021403   .3642297    -0.55   0.579    -.9164757    .512195
   _Iport_101 |  -.1382272   .1645823    -0.84   0.401    -.4610097    .1845553
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_Iport_102	-.6341727	.2525311	-2.51	0.012	-1.129442	-.138903
_Iport_103	-.6248403	.2350463	-2.66	0.008	-1.085818	-.1638622
_Iport_105	1.694711	.5386768	3.15	0.002	.638246	2.751176
_Iport_107	.6327462	.2014909	3.14	0.002	.2375777	1.027915
_Iport_108	1.564581	.3763239	4.16	0.000	.8265256	2.302636
_Iport_113	.8480771	.2237927	3.79	0.000	.4091698	1.286984
_Iport_114	1.060126	.2394049	4.43	0.000	.5905998	1.529653
_Iport_116	1.604728	.5537556	2.90	0.004	.5186904	2.690766
_Iport_119	.6481367	.3695586	1.75	0.080	-.0766499	1.372923
_Iport_123	.2686204	.2224297	1.21	0.227	-.1676137	.7048545
_Iport_129	1.075976	.2378495	4.52	0.000	.6095004	1.542452
_Iport_130	1.226359	.2616848	4.69	0.000	.713137	1.739581
_Iport_133	2.027862	.5073142	4.00	0.000	1.032906	3.022818
_Iport_134	.5096233	.2238188	2.28	0.023	.0706648	.9485818
_Iport_135	(omitted)					
_Iport_136	-.7311153	.7982024	-0.92	0.360	-2.296568	.8343373
_Iport_137	-.4836747	.1926477	-2.51	0.012	-.8614998	-.1058497
_Iport_138	-.381866	.1941681	-1.97	0.049	-.7626728	-.0010591
_Iport_139	-.1551471	.1915	-0.81	0.418	-.5307212	.2204269
_Iport_140	.3243284	.2006299	1.62	0.106	-.0691515	.7178084
_Iport_141	-.4538591	.271451	-1.67	0.095	-.9862349	.0785167
_Iport_142	2.193721	.6854322	3.20	0.001	.8494356	3.538006
_Iport_143	-.425432	.2766275	-1.54	0.124	-.9679602	.1170962
_Iport_144	-1.185562	.405492	-2.92	0.003	-1.980822	-.3903018
_Iport_145	-.6229742	.4660545	-1.34	0.181	-1.537011	.2910625
_Iport_146	-.8520166	.3864372	-2.20	0.028	-1.609906	-.0941272
_Iport_147	-.8461696	.2960687	-2.86	0.004	-1.426826	-.2655129
_Iport_148	-1.466122	.7504268	-1.95	0.051	-2.937876	.0056316
_Iport_149	-.1354616	.2564949	-0.53	0.597	-.6385051	.367582
_Iport_150	1.927253	.5568131	3.46	0.001	.835219	3.019288
_Iport_151	.6737394	.4410432	1.53	0.127	-.1912445	1.538723
_Iport_152	1.050146	.4643491	2.26	0.024	.1394544	1.960838
_Iport_153	1.678214	.654473	2.56	0.010	.3946468	2.961781
_Iport_154	-.30087	.1819811	-1.65	0.098	-.6577754	.0560355
_Iport_155	-.1753836	.2242859	-0.78	0.434	-.6152582	.264491
_Iport_156	-.4970023	.589163	-0.84	0.399	-1.652482	.6584774
_Iport_157	.5305719	.1940858	2.73	0.006	.1499264	.9112173
_Iport_158	.3750587	.2810777	1.33	0.182	-.1761972	.9263147
_Iport_159	-.3902752	.2690281	-1.45	0.147	-.9178993	.1373489
_Iport_160	.6606501	.2263007	2.92	0.004	.2168241	1.104476
_Iport_161	-.4189121	.2547793	-1.64	0.100	-.9185911	.0807669
_Iport_162	.9191274	.2426166	3.79	0.000	.4433022	1.394953
_Iport_163	1.679041	.4855647	3.46	0.001	.726741	2.631342
_Iport_164	1.24904	.3183742	3.92	0.000	.6246369	1.873442
_Iport_165	.2646345	.3351232	0.79	0.430	-.3926166	.9218856
_Iport_166	.5879147	.3313161	1.77	0.076	-.06187	1.237699
_Iport_167	1.199412	.3871112	3.10	0.002	.4402006	1.958623
_Iport_168	.5107335	.3512199	1.45	0.146	-.1780869	1.199554
_Iport_169	-1.475693	.2582903	-5.71	0.000	-1.982258	-.9691281
_Iport_170	1.103454	.2325529	4.74	0.000	.6473655	1.559542
_Iport_171	1.0844	.4338136	2.50	0.013	.2335954	1.935205
_Iport_172	2.442928	.8801313	2.78	0.006	.7167945	4.169061
_Iport_173	2.344574	.8298615	2.83	0.005	.7170307	3.972117
_Iport_174	(omitted)					
_Iport_175	1.400877	.3964519	3.53	0.000	.6233468	2.178408
_Iport_176	1.352693	.3805804	3.55	0.000	.6062905	2.099096
_Iport_177	1.478659	.3977307	3.72	0.000	.6986209	2.258698
_Iport_178	1.2793	.5707824	2.24	0.025	.1598685	2.398731
_Iport_179	1.831147	.6030878	3.04	0.002	.6483576	3.013937
_Iport_180	.4103891	.5238141	0.78	0.433	-.6169269	1.437705
_Iport_181	-.0719818	.2142664	-0.34	0.737	-.4922059	.3482423
_Iport_182	.0426422	.2106283	0.20	0.840	-.3704467	.4557312
_Iport_183	-1.143325	.3847296	-2.97	0.003	-1.897865	-.3887845
_Iport_184	-.4284482	.2323282	-1.84	0.065	-.8840956	.0271991
_Iport_185	.4357277	.1337163	3.26	0.001	.1734802	.6979752
_Iport_186	.2139632	.1841574	1.16	0.245	-.1472104	.5751368
_Iport_187	(omitted)					
_Iport_188	.0851019	.256202	0.33	0.740	-.4173673	.587571
_Iport_189	.1696405	.2823546	0.60	0.548	-.3841197	.7234007
_Iport_190	.1710046	.2573349	0.66	0.506	-.3336866	.6756957
_Iport_191	.6833603	.2842813	2.40	0.016	.1258215	1.240899
_Iport_192	.6774371	.2886546	2.35	0.019	.1113212	1.243553
_Iport_193	-.0916721	.2437074	-0.38	0.707	-.5696365	.3862922
_Iport_194	(omitted)					
_Iport_195	-.9102921	.21573	-4.22	0.000	-1.333387	-.4871975
_Iport_196	-.575489	.1688277	-3.41	0.001	-.9065977	-.2443803
_Iport_197	-1.181001	.2251068	-5.25	0.000	-1.622486	-.7395168
_Iport_198	-1.074568	.2838997	-3.79	0.000	-1.631359	-.5177777
_Iport_199	-.7757598	.2507767	-3.09	0.002	-1.267589	-.2839308
_Iport_200	1.496267	.5655217	2.65	0.008	.3871527	2.605381
_Iport_201	1.557642	.6217824	2.51	0.012	.3381886	2.777096
_Iport_202	1.520902	.6033591	2.52	0.012	.3375805	2.704224
_Iport_203	.5800479	.4628181	1.25	0.210	-.3276413	1.487737
_Iport_204	1.377979	.5552732	2.48	0.013	.2889647	2.466993
_Iport_205	.3321545	.5322857	0.62	0.533	-.7117762	1.376085
_Iport_206	1.406707	.5521718	2.55	0.011	.3237748	2.489639
_Iport_207	.2764543	.8502539	0.33	0.745	-1.391083	1.943992
_Iport_208	-.3473789	.2605912	-1.33	0.183	-.8584563	.1636985
_Iport_209	-.7764011	.9197332	-0.84	0.399	-2.580203	1.027401
_Iport_210	-.1844373	.225626	-0.82	0.414	-.6269402	.2580656
_Iport_211	-.3307237	.4088311	-0.81	0.419	-1.132533	.4710851
_Iport_212	.4304966	.21981	1.96	0.050	-.0005997	.8615929
_Iport_213	.728946	.2536799	2.87	0.004	.2314233	1.226469
_Iport_214	.5128604	.2160552	2.37	0.018	.089128	.9365928
_Iport_215	-.1746042	.1951467	-0.89	0.371	-.5573303	.2081219
_Iport_216	.2445988	.2109712	1.16	0.246	-.1691627	.6583603
_Iport_217	-.1680081	.1880924	-0.89	0.372	-.5368991	.2008829
_Iport_218	.2309789	.217491	1.06	0.288	-.1955694	.6575272
_Iport_219	-.5917436	.2052028	-2.88	0.004	-.9941919	-.1892953
_Iport_220	-.0915038	.187451	-0.49	0.626	-.459137	.2761294
_Iport_221	-.6469609	.1912111	-3.38	0.001	-1.021968	-.2719533
_Iport_222	-.0940625	.184106	-0.51	0.609	-.4551354	.2670103
_Iport_223	-.251604	.1862225	-1.35	0.177	-.6168278	.1136198
_Iport_224	.1870936	.2045603	0.91	0.361	-.2140947	.5882819
_Iport_225	.15101	.2693172	0.56	0.575	-.3771809	.679201
_Iport_226	-.6010068	.2012449	-2.99	0.003	-.9956928	-.2063207
_Iport_227	-.4293918	.2159647	-1.99	0.047	-.8529466	-.005837
_Iport_228	-.2989354	.1888995	-1.58	0.114	-.6694094	.0715386
_Iport_229	.0880213	.1993709	0.44	0.659	-.3029894	.4790321
_Iport_230	-.4962546	.3276415	-1.51	0.130	-1.138833	.1463234
_Iport_231	-.3033639	.268116	-1.13	0.258	-.829199	.2224713
_Iport_232	-.2610416	.2932512	-0.89	0.373	-.8361724	.3140893
_Iport_233	-.4071642	.2647872	-1.54	0.124	-.9264709	.1121424
_Iport_234	-.7140203	.2995045	-2.38	0.017	-1.301415	-.1266252
_Iport_235	-1.210564	.3428943	-3.53	0.000	-1.883056	-.5380716
_Iport_236	-.2322506	.4773185	-0.49	0.627	-1.168378	.7038773
_Iport_237	-.6323989	.3548859	-1.78	0.075	-1.328409	.0636113
_Iport_238	-.1718576	.2883195	-0.60	0.551	-.7373162	.3936011
_Iport_239	.0183315	.2606151	0.07	0.944	-.4927927	.5294557
_Iport_240	-.8477398	.3055557	-2.77	0.006	-1.447003	-.248477
_Iport_241	-.1734225	.282202	-0.61	0.539	-.7268835	.3800385
_Iport_242	-.539024	.2806571	-1.92	0.055	-1.089455	.0114071
_Iport_243	-.6715897	.3043575	-2.21	0.027	-1.268502	-.0746769
_Iport_244	-.3634788	.2627906	-1.38	0.167	-.8788698	.1519121
_Iport_245	1.172515	.3629007	3.23	0.001	.4607859	1.884244
_Iport_246	.7409747	.1681444	4.41	0.000	.4112061	1.070743
_Iport_247	1.067079	.2145701	4.97	0.000	.6462593	1.487899
_Iport_248	.0065733	.1147572	0.06	0.954	-.2184911	.2316378
_Iport_249	.5189213	.1445665	3.59	0.000	.2353942	.8024484
_Iport_250	-.706504	.1595699	-4.43	0.000	-1.019456	-.3935519
_Iport_251	1.584865	.4273883	3.71	0.000	.7466617	2.423069
_Iport_252	.4787984	.416523	1.15	0.250	-.338096	1.295693
_Iport_253	.7419562	.4011847	1.85	0.065	-.0448562	1.528769
_Iport_254	2.433779	.8769434	2.78	0.006	.7138981	4.15366
_Iport_255	1.242949	.4075322	3.05	0.002	.4436873	2.04221
_Iport_256	.750027	.1654462	4.53	0.000	.4255502	1.074504
_Iport_257	-.2771708	.1543446	-1.80	0.073	-.5798749	.0255332
_Iport_258	.5271148	.1834435	2.87	0.004	.1673414	.8868882
_Iport_259	-1.353324	.3558277	-3.80	0.000	-2.051182	-.6554671
_Iport_260	.0390759	.2159425	0.18	0.856	-.3844354	.4625872
_Iport_261	-.8918348	.3253122	-2.74	0.006	-1.529844	-.2538253
_Iport_262	.0483963	.2236558	0.22	0.829	-.3902426	.4870351
_Iport_263	.2791554	.1693636	1.65	0.099	-.0530044	.6113152
_Iport_264	.3261323	.1531217	2.13	0.033	.0258265	.6264381
_Iport_265	-1.552324	.3504295	-4.43	0.000	-2.239594	-.8650534
_Iport_266	.4992862	.1522574	3.28	0.001	.2006755	.7978968
_Iport_267	.5340668	.2431124	2.20	0.028	.0572693	1.010864
_Iport_268	.3906072	.136169	2.87	0.004	.1235496	.6576648
_Iport_269	-.9909859	.200353	-4.95	0.000	-1.383923	-.5980491
_Iport_270	-.4779162	.1241396	-3.85	0.000	-.7213817	-.2344508
_Iport_271	.8805029	.3633913	2.42	0.015	.1678117	1.593194
_Iport_272	-.0014461	.1167705	-0.01	0.990	-.230459	.2275668
_Iport_273	.6360104	.1670123	3.81	0.000	.3084622	.9635586
_Iport_274	-.2192929	.1227375	-1.79	0.074	-.4600085	.0214226
_Iport_275	.8758259	.1894331	4.62	0.000	.5043055	1.247346
_Iport_276	.2641181	.3269552	0.81	0.419	-.3771138	.90535
_Iport_277	1.048754	.3797935	2.76	0.006	.3038939	1.793613
_Iport_278	-.3393592	.3311892	-1.02	0.306	-.988895	.3101766
_Iport_279	.2922528	.3300496	0.89	0.376	-.355048	.9395535
_Iport_280	1.585491	.5071005	3.13	0.002	.5909537	2.580028
_Iport_281	.5969298	.184488	3.24	0.001	.2351078	.9587518
_Iport_282	(omitted)					
_Iport_283	(omitted)					
_Iport_284	-.9079633	.4181854	-2.17	0.030	-1.728118	-.0878087
_Iport_285	(omitted)					
_Iport_286	(omitted)					
_Iport_287	.9820941	.5096148	1.93	0.054	-.0173739	1.981562
_Iport_288	2.130062	.5868997	3.63	0.000	.979021	3.281103
_Iport_289	-.1484518	.1437162	-1.03	0.302	-.4303111	.1334076
_Iport_290	(omitted)					
_Iport_291	-1.346827	.715852	-1.88	0.060	-2.750772	.0571185
_Iport_292	.779204	.6259134	1.24	0.213	-.4483516	2.00676
_Iport_293	(omitted)					
_Iport_294	(omitted)					
_Iport_295	1.475355	.7045439	2.09	0.036	.0935873	2.857122
_Iport_296	(omitted)					
_Iport_297	(omitted)					
_Iport_298	(omitted)					
_Iport_299	(omitted)					
_Iport_300	(omitted)					
_Iport_301	-1.220406	.3408694	-3.58	0.000	-1.888927	-.5518852
_Iport_302	-.8430995	.2822418	-2.99	0.003	-1.396638	-.2895605
_Iport_303	(omitted)					
_Iport_304	-.6806612	.4319595	-1.58	0.115	-1.52783	.1665075
_Iport_305	-3.141826	.3909728	-8.04	0.000	-3.90861	-2.375041
_Iport_306	-1.261814	.2731927	-4.62	0.000	-1.797605	-.7260221
_Iport_307	1.3375	.4853514	2.76	0.006	.3856179	2.289382
_Iport_308	(omitted)					
_Iport_309	1.202507	.3198491	3.76	0.000	.5752119	1.829802
_Iport_310	.3369926	.2546344	1.32	0.186	-.1624021	.8363874
_Iport_311	-.3628964	.0958605	-3.79	0.000	-.5509002	-.1748927
_Iport_312	-.1666241	.1285454	-1.30	0.195	-.4187303	.0854822
_Iport_313	-.9964601	.1301569	-7.66	0.000	-1.251727	-.7411935
_Iport_314	.0958716	.0932732	1.03	0.304	-.087058	.2788011
_Iport_315	.4808496	.1255924	3.83	0.000	.2345349	.7271642
_Iport_316	.0596835	.0857281	0.70	0.486	-.1084484	.2278155
_Iport_317	2.507001	1.015515	2.47	0.014	.5153499	4.498652
_Iport_318	2.202983	.9327856	2.36	0.018	.3735833	4.032384
_Iport_319	(omitted)					
_Iport_320	(omitted)					
_Iport_321	(omitted)					
_Iport_322	(omitted)					
_Iport_323	(omitted)					
_cons	-8.659519	3.692417	-2.35	0.019	-15.90117	-1.417866

Model 3: Newey and West Standard Errors

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. newey dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade  llnvalden ///
> gto_condur1 sl_condur1 nogtosl_condur1 gto_condur2 sl_condur2 nogtosl_condur2 _Iy* _Ip*, lag(2) force
note: _Iyear_2010 omitted because of collinearity
note: _Iport_5 omitted because of collinearity
note: _Iport_14 omitted because of collinearity
note: _Iport_70 omitted because of collinearity
note: _Iport_135 omitted because of collinearity
note: _Iport_174 omitted because of collinearity
note: _Iport_187 omitted because of collinearity
note: _Iport_194 omitted because of collinearity
note: _Iport_282 omitted because of collinearity
note: _Iport_283 omitted because of collinearity
note: _Iport_285 omitted because of collinearity
note: _Iport_286 omitted because of collinearity
note: _Iport_290 omitted because of collinearity
note: _Iport_293 omitted because of collinearity
note: _Iport_294 omitted because of collinearity
note: _Iport_296 omitted because of collinearity
note: _Iport_297 omitted because of collinearity
note: _Iport_298 omitted because of collinearity
note: _Iport_299 omitted because of collinearity
note: _Iport_300 omitted because of collinearity
note: _Iport_303 omitted because of collinearity
note: _Iport_308 omitted because of collinearity
note: _Iport_319 omitted because of collinearity
note: _Iport_320 omitted because of collinearity
note: _Iport_321 omitted because of collinearity
note: _Iport_322 omitted because of collinearity
note: _Iport_323 omitted because of collinearity
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Regression with Newey-West standard errors
maximum lag: 2

Number of obs	2126
F(235, 1882)	335.51
Prob > F	0.0000

dlnthr	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
dlngdp	1.400767	.5177192	2.71	0.007	.3854026	2.416131
dlntrade	.3151266	.1696542	1.86	0.063	-.0176035	.6478568
dlnvalden	.3050219	.1852833	1.65	0.100	-.0583604	.6684041
llnthr	-.2905139	.0483469	-6.01	0.000	-.3853331	-.1956948
llngdp	.2407494	.2565638	0.94	0.348	-.26243	.7439289
llntrade	.2374963	.1298676	1.83	0.068	-.0172033	.4921958
llnvalden	.0532965	.0783859	0.68	0.497	-.1004359	.2070288
gto_condur1	-.0006681	.0614241	-0.01	0.991	-.1211347	.1197984
sl_condur1	.0162881	.1202312	0.14	0.892	-.2195124	.2520886
nogtosl_co~1	.0306734	.1191245	0.26	0.797	-.2029567	.2643034
gto_condur2	.1264505	.0952827	1.33	0.185	-.0604204	.3133214
sl_condur2	-.1836012	.0958856	-1.91	0.056	-.3716546	.0044521
nogtosl_co~2	.1290073	.0729257	1.77	0.077	-.0140163	.272031
_Iyear_1991	-.1016783	.1533048	-0.66	0.507	-.4023435	.1989869
_Iyear_1992	-.0538383	.1491351	-0.36	0.718	-.3463258	.2386492
_Iyear_1993	-.0726775	.1465506	-0.50	0.620	-.3600963	.2147413
_Iyear_1994	-.1125069	.1386481	-0.81	0.417	-.3844271	.1594132
_Iyear_1995	-.1542271	.1367956	-1.13	0.260	-.422514	.1140598
_Iyear_1996	-.1247532	.1304124	-0.96	0.339	-.3805213	.131015
_Iyear_1997	-.0924599	.1341851	-0.69	0.491	-.3556272	.1707074
_Iyear_1998	-.2197009	.1527933	-1.44	0.151	-.5193629	.0799611
_Iyear_1999	-.0948843	.1420646	-0.67	0.504	-.3735049	.1837364
_Iyear_2000	-.0807176	.1209473	-0.67	0.505	-.3179226	.1564873
_Iyear_2001	-.0147124	.1201377	-0.12	0.903	-.2503294	.2209047
_Iyear_2002	.0041831	.1149616	0.04	0.971	-.2212826	.2296487
_Iyear_2003	-.0394821	.1103947	-0.36	0.721	-.2559911	.1770268
_Iyear_2004	-.0788498	.1054244	-0.75	0.455	-.2856109	.1279112
_Iyear_2005	-.141201	.0988809	-1.43	0.153	-.3351287	.0527266
_Iyear_2006	-.0886966	.0956329	-0.93	0.354	-.2762544	.0988611
_Iyear_2007	-.1647293	.0929818	-1.77	0.077	-.3470876	.0176289
_Iyear_2008	-.3895054	.1381821	-2.82	0.005	-.6605117	-.1184991
_Iyear_2009	-.1877029	.1636003	-1.15	0.251	-.5085599	.1331541
_Iyear_2010	(omitted)					
_Iport_5	(omitted)					
_Iport_6	1.9171	.7367628	2.60	0.009	.4721422	3.362058
_Iport_7	2.274165	.9597602	2.37	0.018	.3918589	4.156471
_Iport_8	1.907422	.6872501	2.78	0.006	.5595695	3.255274
_Iport_13	2.044135	.6729637	3.04	0.002	.724302	3.363969
_Iport_14	(omitted)					
_Iport_15	1.737431	.505671	3.44	0.001	.7456964	2.729166
_Iport_26	.1346312	.2923522	0.46	0.645	-.4387373	.7079996
_Iport_29	.0505738	.284023	0.18	0.859	-.5064593	.6076068
_Iport_31	.0522591	.2869389	0.18	0.856	-.5104927	.615011
_Iport_33	.4893552	.2954853	1.66	0.098	-.090158	1.068868
_Iport_49	-.4175383	.3174218	-1.32	0.189	-1.040074	.2049974
_Iport_50	1.16028	.313757	3.70	0.000	.5449315	1.775628
_Iport_51	1.01921	.2205296	4.62	0.000	.5867018	1.451718
_Iport_52	.7452094	.1892828	3.94	0.000	.3739832	1.116436
_Iport_54	.2990249	.114407	2.61	0.009	.0746471	.5234027
_Iport_58	-.0179052	.265005	-0.07	0.946	-.5376397	.5018292
_Iport_63	.8253355	.2319535	3.56	0.000	.3704224	1.280249
_Iport_70	(omitted)					
_Iport_73	.7883822	.2463116	3.20	0.001	.3053097	1.271455
_Iport_77	.4884037	.3586081	1.36	0.173	-.2149075	1.191715
_Iport_79	.0347875	.2929764	0.12	0.905	-.5398051	.6093801
_Iport_80	-.0015913	.3539627	-0.00	0.996	-.6957918	.6926092
_Iport_81	.0542214	.3419509	0.16	0.874	-.6164215	.7248642
_Iport_86	-.2384619	.3325473	-0.72	0.473	-.890662	.4137382
_Iport_88	-.2724055	.2969188	-0.92	0.359	-.8547301	.3099192
_Iport_89	-1.450522	.7434117	-1.95	0.051	-2.90852	.0074756
_Iport_91	-1.199225	.435789	-2.75	0.006	-2.053905	-.3445445
_Iport_92	.9650947	.2385181	4.05	0.000	.497307	1.432882
_Iport_93	.2449984	.2711791	0.90	0.366	-.2868449	.7768417
_Iport_95	.8118572	.1991078	4.08	0.000	.421362	1.202352
_Iport_97	1.337437	.5959724	2.24	0.025	.1686005	2.506273
_Iport_99	.5573425	.4478875	1.24	0.214	-.3210658	1.435751
_Iport_101	.0987057	.1696265	0.58	0.561	-.23397	.4313814

_Iport_102	-.6199908	.2555473	-2.43	0.015	-1.121177	-.1188049
_Iport_103	-.6202771	.2383692	-2.60	0.009	-1.087773	-.1527814
_Iport_105	1.739687	.6313054	2.76	0.006	.5015546	2.977819
_Iport_107	.6573678	.2158366	3.05	0.002	.2340636	1.080672
_Iport_108	1.600769	.3930173	4.07	0.000	.8299733	2.371564
_Iport_113	.8728133	.2336223	3.74	0.000	.4146273	1.330999
_Iport_114	1.09496	.2507142	4.37	0.000	.6032531	1.586667
_Iport_116	1.650795	.6231988	2.65	0.008	.4285619	2.873028
_Iport_119	.6874502	.4099302	1.68	0.094	-.1165152	1.491416
_Iport_123	.2822183	.2278973	1.24	0.216	-.1647397	.7291762
_Iport_129	1.124135	.2549854	4.41	0.000	.6240512	1.624219
_Iport_130	1.267389	.2767726	4.58	0.000	.7245758	1.810202
_Iport_133	2.073192	.5738424	3.61	0.000	.9477579	3.198627
_Iport_134	.5329102	.2477023	2.15	0.032	.0471102	1.01871
_Iport_135	(omitted)					
_Iport_136	-.7286997	.7997231	-0.91	0.362	-2.297137	.8397374
_Iport_137	-.4775197	.2007813	-2.38	0.017	-.8712972	-.0837422
_Iport_138	-.3751068	.2014447	-1.86	0.063	-.7701853	.0199716
_Iport_139	-.1483831	.1991311	-0.75	0.456	-.538924	.2421579
_Iport_140	.352891	.2217016	1.59	0.112	-.0819158	.7876978
_Iport_141	-.4552811	.2897299	-1.57	0.116	-1.023507	.1129446
_Iport_142	2.261236	.756869	2.99	0.003	.7768452	3.745627
_Iport_143	-.4269576	.2954319	-1.45	0.149	-1.006366	.1524509
_Iport_144	-1.188905	.4203297	-2.83	0.005	-2.013266	-.3645436
_Iport_145	-.6243177	.4772669	-1.31	0.191	-1.560346	.3117103
_Iport_146	-.85355	.3994456	-2.14	0.033	-1.636953	-.0701472
_Iport_147	-.8476927	.3118884	-2.72	0.007	-1.459376	-.2360093
_Iport_148	-1.470634	.7578619	-1.94	0.052	-2.956972	.0157037
_Iport_149	-.1364178	.2741035	-0.50	0.619	-.6739965	.4011609
_Iport_150	1.976732	.6209127	3.18	0.001	.758982	3.194482
_Iport_151	.7089292	.4910906	1.44	0.149	-.2542102	1.672069
_Iport_152	1.087302	.513464	2.12	0.034	.0802833	2.094321
_Iport_153	1.731233	.7204699	2.40	0.016	.3182292	3.144237
_Iport_154	-.2827207	.1993267	-1.42	0.156	-.6736452	.1082038
_Iport_155	-.1562873	.2386868	-0.65	0.513	-.6244059	.3118314
_Iport_156	-.4808518	.5933644	-0.81	0.418	-1.644573	.6828695
_Iport_157	.5511149	.2123875	2.59	0.010	.1345752	.9676546
_Iport_158	.3923446	.2932865	1.34	0.181	-.1828564	.9675455
_Iport_159	-.3708267	.2827987	-1.31	0.190	-.9254587	.1838053
_Iport_160	.6808387	.242572	2.81	0.005	.2051002	1.156577
_Iport_161	-.4014323	.2674634	-1.50	0.134	-.9259882	.1231237
_Iport_162	.9415031	.2583168	3.64	0.000	.4348855	1.448121
_Iport_163	1.72025	.5279836	3.26	0.001	.6847557	2.755745
_Iport_164	1.284927	.3423109	3.75	0.000	.6135782	1.956276
_Iport_165	.2977651	.3715482	0.80	0.423	-.4309246	1.026455
_Iport_166	.6217525	.3686134	1.69	0.092	-.1011814	1.344686
_Iport_167	1.235414	.4220406	2.93	0.003	.4076977	2.063131
_Iport_168	.5442921	.3888707	1.40	0.162	-.218371	1.306955
_Iport_169	-1.458601	.2628616	-5.55	0.000	-1.974132	-.9430703
_Iport_170	1.122835	.2415828	4.65	0.000	.6490367	1.596633
_Iport_171	1.128219	.4798451	2.35	0.019	.1871345	2.069303
_Iport_172	2.51959	.9743231	2.59	0.010	.6087225	4.430457
_Iport_173	2.422738	.9201755	2.63	0.009	.6180662	4.227409
_Iport_174	(omitted)					
_Iport_175	1.442348	.4329254	3.33	0.001	.5932842	2.291413
_Iport_176	1.393612	.418016	3.33	0.001	.5737887	2.213436
_Iport_177	1.519957	.4340446	3.50	0.000	.6686974	2.371216
_Iport_178	1.326466	.6303916	2.10	0.035	.0901256	2.562806
_Iport_179	1.880025	.6615416	2.84	0.005	.5825932	3.177458
_Iport_180	.4559036	.5881909	0.78	0.438	-.6976713	1.609479
_Iport_181	-.0702175	.2273946	-0.31	0.758	-.5161896	.3757546
_Iport_182	.0453657	.2237643	0.20	0.839	-.3934864	.4842178
_Iport_183	-1.14546	.3919359	-2.92	0.004	-1.914135	-.3767855
_Iport_184	-.4318776	.2436705	-1.77	0.076	-.9097704	.0460151
_Iport_185	.4457395	.1383822	3.22	0.001	.1743409	.7171382
_Iport_186	.2298082	.1901005	1.21	0.227	-.1430217	.6026382
_Iport_187	(omitted)					
_Iport_188	.096304	.2789632	0.35	0.730	-.4508055	.6434136
_Iport_189	.1821099	.3042177	0.60	0.550	-.4145296	.7787495
_Iport_190	.1831143	.2802535	0.65	0.514	-.3665259	.7327546
_Iport_191	.6969154	.3056522	2.28	0.023	.0974625	1.296368
_Iport_192	.6910684	.3099381	2.23	0.026	.0832101	1.298927
_Iport_193	-.080361	.2674707	-0.30	0.764	-.6049313	.4442092
_Iport_194	(omitted)					
_Iport_195	-.9155368	.2229794	-4.11	0.000	-1.35285	-.4782239
_Iport_196	-.5798919	.1771481	-3.27	0.001	-.9273192	-.2324646
_Iport_197	-1.187289	.2316696	-5.12	0.000	-1.641645	-.7329328
_Iport_198	-1.07913	.2919217	-3.70	0.000	-1.651655	-.5066062
_Iport_199	-.7800696	.2584069	-3.02	0.003	-1.286864	-.2732754
_Iport_200	1.555731	.6303514	2.47	0.014	.3194701	2.791992
_Iport_201	1.612953	.6894215	2.34	0.019	.2608417	2.965063
_Iport_202	1.577413	.6712002	2.35	0.019	.2610381	2.893788
_Iport_203	.6180875	.5176146	1.19	0.233	-.3970714	1.633246
_Iport_204	1.418128	.6061323	2.34	0.019	.2293663	2.60689
_Iport_205	.3696068	.5815505	0.64	0.525	-.7709449	1.510158
_Iport_206	1.446884	.6056231	2.39	0.017	.2591206	2.634647
_Iport_207	.3155749	.8876876	0.36	0.722	-1.425381	2.05653
_Iport_208	-.3264534	.2718583	-1.20	0.230	-.8596289	.2067221
_Iport_209	-.7580846	.9230732	-0.82	0.412	-2.568439	1.05227
_Iport_210	-.1601042	.2419202	-0.66	0.508	-.6345643	.3143558
_Iport_211	-.3086772	.4169054	-0.74	0.459	-1.126323	.5089682
_Iport_212	.4492711	.2401025	1.87	0.061	-.021624	.9201663
_Iport_213	.7482993	.2710955	2.76	0.006	.2166199	1.279979
_Iport_214	.5314931	.2360662	2.25	0.024	.0685142	.9944721
_Iport_215	-.1578536	.2155839	-0.73	0.464	-.5806622	.264955
_Iport_216	.2629622	.231045	1.14	0.255	-.1901692	.7160936
_Iport_217	-.1512111	.209251	-0.72	0.470	-.5615995	.2591773
_Iport_218	.24897	.2367254	1.05	0.293	-.2153018	.7132418
_Iport_219	-.5770228	.2221726	-2.60	0.009	-1.012753	-.1412923
_Iport_220	-.0743645	.2088852	-0.36	0.722	-.4840354	.3353064
_Iport_221	-.6310946	.2088751	-3.02	0.003	-1.040746	-.2214435
_Iport_222	-.0769518	.2058726	-0.37	0.709	-.4807143	.3268107
_Iport_223	-.2349671	.2074742	-1.13	0.258	-.6418707	.1719365
_Iport_224	.2048827	.224124	0.91	0.361	-.2346749	.6444404
_Iport_225	.1683035	.284663	0.59	0.554	-.3899847	.7265917
_Iport_226	-.585535	.2204461	-2.66	0.008	-1.01788	-.1531906
_Iport_227	-.4128067	.2346628	-1.76	0.079	-.8730333	.0474199
_Iport_228	-.2824397	.2098034	-1.35	0.178	-.6939115	.129032
_Iport_229	.1055645	.2196973	0.48	0.631	-.3253114	.5364405
_Iport_230	-.5021811	.3456828	-1.45	0.146	-1.180143	.1757808
_Iport_231	-.3104776	.2906305	-1.07	0.286	-.8804694	.2595143
_Iport_232	-.2748616	.3151915	-0.87	0.383	-.8930231	.3432999
_Iport_233	-.4192522	.2885943	-1.45	0.146	-.9852507	.1467462
_Iport_234	-.7331742	.3268081	-2.24	0.025	-1.374118	-.0922299
_Iport_235	-1.22238	.3582305	-3.41	0.001	-1.92495	-.5198091
_Iport_236	-.253581	.4971017	-0.51	0.610	-1.228509	.7213474
_Iport_237	-.6483995	.374786	-1.73	0.084	-1.383439	.0866402
_Iport_238	-.1913059	.3164286	-0.60	0.546	-.8118937	.4292818
_Iport_239	.0053891	.2869408	0.02	0.985	-.5573664	.5681445
_Iport_240	-.8687432	.332709	-2.61	0.009	-1.52126	-.216226
_Iport_241	-.192631	.3112555	-0.62	0.536	-.8030732	.4178113
_Iport_242	-.5568107	.3085123	-1.80	0.071	-1.161873	.0482514
_Iport_243	-.6813147	.3253666	-2.09	0.036	-1.319432	-.0431976
_Iport_244	-.377997	.2889116	-1.31	0.191	-.9446177	.1886237
_Iport_245	1.200051	.3891033	3.08	0.002	.4369314	1.96317
_Iport_246	.7559146	.1737542	4.35	0.000	.4151435	1.096686
_Iport_247	1.083046	.2197133	4.93	0.000	.6521388	1.513953
_Iport_248	.0193455	.1209529	0.16	0.873	-.2178704	.2565615
_Iport_249	.5328164	.1500606	3.55	0.000	.2385138	.827119
_Iport_250	-.6963395	.1630548	-4.27	0.000	-1.016127	-.3765523
_Iport_251	1.630406	.4670924	3.49	0.000	.714333	2.54648
_Iport_252	.5218882	.458562	1.14	0.255	-.3774552	1.421232
_Iport_253	.7872818	.4468798	1.76	0.078	-.0891501	1.663714
_Iport_254	2.500803	.967707	2.58	0.010	.602912	4.398695
_Iport_255	1.278894	.4462697	2.87	0.004	.4036584	2.154129
_Iport_256	.7568123	.167407	4.52	0.000	.4284895	1.085135
_Iport_257	-.2734193	.1552288	-1.76	0.078	-.577858	.0310194
_Iport_258	.5345854	.184714	2.89	0.004	.1723195	.8968512
_Iport_259	-1.348914	.3571498	-3.78	0.000	-2.049365	-.6484627
_Iport_260	.0445187	.216796	0.21	0.837	-.3806671	.4697044
_Iport_261	-.8860429	.3266702	-2.71	0.007	-1.526717	-.2453691
_Iport_262	.0522134	.2249402	0.23	0.816	-.388945	.4933717
_Iport_263	.285156	.171032	1.67	0.096	-.0502761	.6205882
_Iport_264	.3339315	.1561208	2.14	0.033	.0277433	.6401196
_Iport_265	-1.549125	.3510467	-4.41	0.000	-2.237607	-.8606436
_Iport_266	.5075561	.1552034	3.27	0.001	.2031673	.8119449
_Iport_267	.5421811	.2444862	2.22	0.027	.0626886	1.021674
_Iport_268	.3984417	.1392745	2.86	0.004	.1252932	.6715903
_Iport_269	-.9857787	.2018312	-4.88	0.000	-1.381615	-.5899423
_Iport_270	-.4715198	.1250381	-3.77	0.000	-.7167477	-.2262918
_Iport_271	.9068358	.3911825	2.32	0.021	.1396387	1.674033
_Iport_272	.0140628	.1251654	0.11	0.911	-.2314147	.2595403
_Iport_273	.6538375	.1747909	3.74	0.000	.3110332	.9966418
_Iport_274	-.2033638	.1312251	-1.55	0.121	-.4607258	.0539982
_Iport_275	.8944911	.1960942	4.56	0.000	.5099062	1.279076
_Iport_276	.2881263	.3633045	0.79	0.428	-.4243957	1.000648
_Iport_277	1.075089	.4127429	2.60	0.009	.265607	1.88457
_Iport_278	-.318227	.3656969	-0.87	0.384	-1.035441	.398987
_Iport_279	.3162236	.3658365	0.86	0.387	-.4012641	1.033711
_Iport_280	1.63037	.5559241	2.93	0.003	.540078	2.720663
_Iport_281	.6132251	.1945476	3.15	0.002	.2316735	.9947768
_Iport_282	(omitted)					
_Iport_283	(omitted)					
_Iport_284	-.8925332	.4249537	-2.10	0.036	-1.725963	-.0591032
_Iport_285	(omitted)					
_Iport_286	(omitted)					
_Iport_287	1.043109	.5747694	1.81	0.070	-.0841428	2.170362
_Iport_288	2.195176	.641083	3.42	0.001	.9378679	3.452484
_Iport_289	-.1332967	.1505375	-0.89	0.376	-.4285345	.1619412
_Iport_290	(omitted)					
_Iport_291	-1.357074	.7190378	-1.89	0.059	-2.767269	.0531212
_Iport_292	.8336208	.7024442	1.19	0.235	-.5440306	2.211272
_Iport_293	(omitted)					
_Iport_294	(omitted)					
_Iport_295	1.532122	.775395	1.98	0.048	.0113977	3.052846
_Iport_296	(omitted)					
_Iport_297	(omitted)					
_Iport_298	(omitted)					
_Iport_299	(omitted)					
_Iport_300	(omitted)					
_Iport_301	-1.242197	.3697119	-3.36	0.001	-1.967285	-.5171087
_Iport_302	-.8516268	.3023281	-2.82	0.005	-1.44456	-.2586933
_Iport_303	(omitted)					
_Iport_304	-.6939222	.4475826	-1.55	0.121	-1.571733	.1838882
_Iport_305	-3.152309	.3957025	-7.97	0.000	-3.928371	-2.376247
_Iport_306	-1.231166	.3056347	-4.03	0.000	-1.830584	-.6317473
_Iport_307	1.376551	.534207	2.58	0.010	.3288506	2.424251
_Iport_308	(omitted)					
_Iport_309	1.233486	.346032	3.56	0.000	.5548389	1.912132
_Iport_310	.3641585	.2837539	1.28	0.200	-.1923469	.9206639
_Iport_311	-.3645046	.0969772	-3.76	0.000	-.5546987	-.1743104
_Iport_312	-.1657515	.1281243	-1.29	0.196	-.4170322	.0855292
_Iport_313	-.9975096	.1301502	-7.66	0.000	-1.252763	-.7422556
_Iport_314	.0964298	.0932534	1.03	0.301	-.0864612	.2793207
_Iport_315	.4840652	.1259738	3.84	0.000	.2370021	.7311282
_Iport_316	.0615907	.086068	0.72	0.474	-.1072081	.2303894
_Iport_317	2.596379	1.128391	2.30	0.022	.3833506	4.809408
_Iport_318	2.28011	1.035276	2.20	0.028	.2497	4.31052
_Iport_319	(omitted)					
_Iport_320	(omitted)					
_Iport_321	(omitted)					
_Iport_322	(omitted)					
_Iport_323	(omitted)					
_cons	-8.992835	4.123138	-2.18	0.029	-17.07924	-.9064332

12.9 Appendix I

Driscoll and Kraay Standard Errors

Model 1:

```
.
. xtscc dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade llnvalden con _Iy*, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =      2126
Method: Fixed-effects regression                 Number of groups  =       212
Group variable (i): port                         F( 28,   211)     =  63711.33
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.1698

------------------------------------------------------------------------------
             |               Drisc/Kraay
      dlnthr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlngdp |   1.423459   .3432096     4.15   0.000     .7469004    2.100018
    dlntrade |   .3046825    .090966     3.35   0.001     .1253639    .4840011
   dlnvalden |   .2889309   .1349216     2.14   0.033     .0229639    .5548979
     llnthr |  -.2905681   .0551185    -5.27   0.000    -.3992216   -.1819147
     llngdp |    .246272     .23153     1.06   0.289    -.2101364    .7026804
    llntrade |   .2304881   .1183407     1.95   0.053    -.0027935    .4637697
   llnvalden |   .0434606   .0504104     0.86   0.390     -.055912    .1428332
         con |   .0676515    .040006     1.69   0.092    -.0112112    .1465143
   _Iyear_1991 |  -8.626853   3.377662    -2.55   0.011    -15.28514   -1.968567
   _Iyear_1992 |  -8.576503   3.381741    -2.54   0.012    -15.24283   -1.910176
   _Iyear_1993 |  -8.594667   3.385557    -2.54   0.012    -15.26851   -1.920818
   _Iyear_1994 |  -8.636229   3.380294    -2.55   0.011     -15.2997   -1.972755
   _Iyear_1995 |  -8.677747   3.383341    -2.56   0.011    -15.34723   -2.008267
   _Iyear_1996 |  -8.648278   3.385423    -2.55   0.011    -15.32186   -1.974693
   _Iyear_1997 |  -8.617126   3.389941    -2.54   0.012    -15.29962   -1.934635
   _Iyear_1998 |  -8.745938    3.39672    -2.57   0.011    -15.44179   -2.050084
   _Iyear_1999 |   -8.62386   3.394769    -2.54   0.012    -15.31587   -1.931852
   _Iyear_2000 |  -8.610228    3.38608    -2.54   0.012    -15.28511   -1.935349
   _Iyear_2001 |  -8.546849   3.382605    -2.53   0.012    -15.21488   -1.878819
   _Iyear_2002 |  -8.528003   3.383083    -2.52   0.012    -15.19697   -1.859031
   _Iyear_2003 |  -8.572829   3.387425    -2.53   0.012    -15.25036   -1.895298
   _Iyear_2004 |  -8.610692   3.394877    -2.54   0.012    -15.30291   -1.918469
   _Iyear_2005 |  -8.672904   3.400053    -2.55   0.011    -15.37533   -1.970479
   _Iyear_2006 |  -8.620011   3.407307    -2.53   0.012    -15.33674   -1.903286
   _Iyear_2007 |  -8.695747    3.41231    -2.55   0.012    -15.42233   -1.969161
   _Iyear_2008 |  -8.920102   3.414321    -2.61   0.010    -15.65065   -2.189552
   _Iyear_2009 |   -8.72335   3.413959    -2.56   0.011    -15.45319   -1.993514
   _Iyear_2010 |  -8.535593   3.431107    -2.49   0.014    -15.29923   -1.771953
         _cons |  (omitted)
------------------------------------------------------------------------------
```

Model 2:

```
. xtscc dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade llnvalden condur1 condur2 _Iy*, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =      2126
Method: Fixed-effects regression                 Number of groups  =       212
Group variable (i): port                         F( 29,   211)     =  29805.93
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.1693

------------------------------------------------------------------------------
             |               Drisc/Kraay
      dlnthr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlngdp |   1.394564   .3484433     4.00   0.000     .7076878    2.08144
    dlntrade |   .3118308   .0920607     3.39   0.001     .1303542    .4933074
   dlnvalden |   .2976712   .1340151     2.22   0.027     .0334913    .5618512
     llnthr |  -.2895842   .0557585    -5.19   0.000    -.3994993   -.1796692
     llngdp |   .2335061   .2341035     1.00   0.320    -.2279754    .6949875
    llntrade |   .2319046   .1192418     1.94   0.053    -.0031533    .4669626
   llnvalden |   .0472249   .0508736     0.93   0.354    -.0530607    .1475105
     condur1 |   .0217757   .0455189     0.48   0.633    -.0679543    .1115057
     condur2 |   .0700274   .0472109     1.48   0.139    -.0230381    .1630928
   _Iyear_1991 |  -8.355309    3.35939    -2.49   0.014    -14.97758   -1.733042
   _Iyear_1992 |  -8.305232   3.363274    -2.47   0.014    -14.93515   -1.675309
   _Iyear_1993 |  -8.322155   3.367549    -2.47   0.014    -14.96051   -1.683803
   _Iyear_1994 |  -8.362346   3.362647    -2.49   0.014    -14.99103   -1.733659
   _Iyear_1995 |   -8.40263    3.36593    -2.50   0.013    -15.03779   -1.767472
   _Iyear_1996 |  -8.372151   3.367705    -2.49   0.014    -15.01081   -1.733494
   _Iyear_1997 |  -8.338237   3.373143    -2.47   0.014    -14.98761   -1.688859
   _Iyear_1998 |  -8.465437   3.379879    -2.50   0.013    -15.12809    -1.80278
   _Iyear_1999 |  -8.341734     3.3781    -2.47   0.014    -15.00088   -1.682586
   _Iyear_2000 |  -8.327013    3.36982    -2.47   0.014    -14.96984   -1.684186
   _Iyear_2001 |  -8.261098   3.366731    -2.45   0.015    -14.89784   -1.624361
   _Iyear_2002 |  -8.241736   3.367662    -2.45   0.015    -14.88031   -1.603162
   _Iyear_2003 |  -8.285667   3.372392    -2.46   0.015    -14.93356    -1.63777
   _Iyear_2004 |  -8.323651    3.37973    -2.46   0.015    -14.98601   -1.661289
   _Iyear_2005 |  -8.384779   3.384815    -2.48   0.014    -15.05717   -1.712392
   _Iyear_2006 |  -8.330975   3.391944    -2.46   0.015    -15.01741   -1.644535
   _Iyear_2007 |  -8.405867    3.39685    -2.47   0.014    -15.10198   -1.709757
   _Iyear_2008 |   -8.62964   3.399351    -2.54   0.012    -15.33068   -1.928599
   _Iyear_2009 |  -8.428497   3.400031    -2.48   0.014    -15.13088   -1.726115
   _Iyear_2010 |  -8.242394   3.417552    -2.41   0.017    -14.97931   -1.505474
         _cons |  (omitted)
------------------------------------------------------------------------------
```

Model 3:

```
. xtscc dlnthr dlngdp dlntrade dlnvalden llnthr llngdp llntrade llnvalden ///
> gto_condur1 sl_condur1 nogtosl_condur1 gto_condur2 sl_condur2 nogtosl_condur2 _Iy*, fe

Regression with Driscoll-Kraay standard errors  Number of obs     =      2126
Method: Fixed-effects regression                Number of groups  =       212
Group variable (i): port                        F(  33,   211)    =   1952.47
maximum lag: 2                                  Prob > F          =    0.0000
                                                within R-squared  =    0.1697
```

dlnthr	Coef.	Drisc/Kraay Std. Err.	t	P>|t|	[95% Conf.	Interval]
dlngdp	1.400767	.3543154	3.95	0.000	.702315	2.099218
dlntrade	.3151266	.0952098	3.31	0.001	.1274424	.5028108
dlnvalden	.3050219	.1286786	2.37	0.019	.0513616	.5586822
llnthr	-.2905139	.0563985	-5.15	0.000	-.4016907	-.1793372
llngdp	.2407494	.2504718	0.96	0.338	-.2529983	.7344971
llntrade	.2374963	.1243451	1.91	0.057	-.0076215	.4826141
llnvalden	.0532965	.0539474	0.99	0.324	-.0530485	.1596414
gto_condur1	-.0006681	.0555677	-0.01	0.990	-.1102072	.1088709
sl_condur1	.0162881	.0956259	0.17	0.865	-.1722165	.2047927
nogtosl_co~1	.0306734	.1091496	0.28	0.779	-.18449	.2458368
gto_condur2	.1264505	.0948102	1.33	0.184	-.060446	.313347
sl_condur2	-.1836012	.0918679	-2.00	0.047	-.3646977	-.0025048
nogtosl_co~2	.1290073	.0761039	1.70	0.092	-.0210141	.2790288
_Iyear_1991	-8.659844	3.635623	-2.38	0.018	-15.82664	-1.493047
_Iyear_1992	-8.612004	3.640435	-2.37	0.019	-15.78829	-1.435721
_Iyear_1993	-8.630843	3.646757	-2.37	0.019	-15.81959	-1.442097
_Iyear_1994	-8.670672	3.641749	-2.38	0.018	-15.84955	-1.491799
_Iyear_1995	-8.712393	3.645446	-2.39	0.018	-15.89855	-1.526231
_Iyear_1996	-8.682919	3.647662	-2.38	0.018	-15.87345	-1.492389
_Iyear_1997	-8.650625	3.653863	-2.37	0.019	-15.85338	-1.447873
_Iyear_1998	-8.777866	3.661617	-2.40	0.017	-15.9959	-1.559829
_Iyear_1999	-8.65305	3.660829	-2.36	0.019	-15.86953	-1.436566
_Iyear_2000	-8.638883	3.653041	-2.36	0.019	-15.84002	-1.437751
_Iyear_2001	-8.572878	3.651802	-2.35	0.020	-15.77157	-1.374189
_Iyear_2002	-8.553982	3.65288	-2.34	0.020	-15.7548	-1.353167
_Iyear_2003	-8.597648	3.656436	-2.35	0.020	-15.80547	-1.389822
_Iyear_2004	-8.637015	3.663442	-2.36	0.019	-15.85865	-1.41538
_Iyear_2005	-8.699367	3.668437	-2.37	0.019	-15.93085	-1.467885
_Iyear_2006	-8.646862	3.675757	-2.35	0.020	-15.89277	-1.400951
_Iyear_2007	-8.722895	3.681946	-2.37	0.019	-15.98101	-1.464783
_Iyear_2008	-8.947671	3.686112	-2.43	0.016	-16.214	-1.681346
_Iyear_2009	-8.745868	3.692873	-2.37	0.019	-16.02552	-1.466216
_Iyear_2010	-8.558166	3.707331	-2.31	0.022	-15.86632	-1.250013
_cons	(omitted)					

12.10 Appendix J

```
. nlcom _b[llngdp] /(-_b[llnthr])

       _nl_1:  _b[llngdp] /(-_b[llnthr])
```

dlnthr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_nl_1	.8063493	.7895745	1.02	0.308	-.7501157	2.362814

```
. nlcom _b[llnvalden] /(-_b[llnthr])

       _nl_1:  _b[llnvalden] /(-_b[llnthr])
```

dlnthr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_nl_1	.1630784	.1794155	0.91	0.364	-.190598	.5167548

```
. nlcom _b[llntrade] /(-_b[llnthr])

       _nl_1:  _b[llntrade] /(-_b[llnthr])
```

dlnthr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_nl_1	.8008192	.4255497	1.88	0.061	-.0380545	1.639693

12.11 Appendix K

Port throughput figures Shanghai & Damietta