ATLANTIC FUTURE SCIENTIFIC PAPER

05

Technology, Trade and Changes in Transport in the Atlantic Space

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ABSTRACT

This paper asks what is required to develop resurgence in trade and economic integration in the Atlantic economy. It does this by examining the factors that have led to growth in the past and examines the current network of transport links; in particular maritime networks. The paper outlines demand and supply based drivers. It finds on the demand side that the growth of national GDP's has led not only to an increase in goods transported but also to a change in the composition of those goods. Growing GDP has also influenced the mode of transport used to carry goods. Other demand side factors that have influenced the growth of trade include lower trade barriers as a result of trade agreements; the entry into the world economy of former centrally planned command economies as well as the emerging BRICS and NICs and the operations of multinational companies. On the supply side the main influence in promoting networks include the decline in transportation costs brought about by technological changes affecting ships and aircraft coupled with the increase in investment in sea ports and airports as well as the associated development of hub and spoke networks. The development and use of the internet connections has also boosted trade in goods. To regenerate the Atlantic economy will require inter governmental cooperation to develop economic and political institutions to facilitate economic integration and growth and improve transport networks in the Atlantic economic space.

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1. Introduction

To meet the rise in economic and political power of Asia and the Pacific - and in particular China - the countries that constitute the Atlantic economic space have two options. They can either acquiesce in this shift or they can engage with it and simultaneously develop closer economic and political links to enhance their own power. Closer economic integration will principally come from promoting trade and financial flows through enhanced forms of economic integration. Aside from developing strong economic and political institutions to underpin this closer relationship the development of efficient and effective transport networks will be essential. That will include both domestic and inward facing and external and outward facing networks. Ports and airports will be essential in promoting commercial links as will ship and airline routes. These networks will not only have to build on the already existing and excellent links between the countries of the North Atlantic but also address the current weaknesses of the transport system between the north and south. In particular the major inadequacies of the south -south links between Latin America and Africa will have to be addressed. A recent study has shown that in order for individuals or cargo to be transported between those two continents requires passage and trans-shipment either via the United States or Europe thereby adding to costs (SELA, 2011) Apart from bulk cargoes container links are also poor and mainly indirect and often require trans-shipment via hubs again adding to time delays and costs.

The existing maritime network has been developing since the nineteenth century. Today's sea and air networks reflect the current pattern of trade and are influenced by geographical as well as economic constraints. Four principal maritime routes can be discerned (Rodrigue, 2010a). The first is the circum equatorial route. With the current improvements to the Panama Canal large container ships with carrying capacities of up to 12,000 (Rodrigue, 2010a) TEU will be able to sail around the globe via the Suez Canal and provide a conveyor belt service. This route is the principal carrier for east-west trade connecting the principal hub ports around the world. it traverses the Atlantic economy via the Mediterranean and the Caribbean.

The circum equatorial route is complemented by the north-south pendulum connecting routes (Rodrigue, 2010a). These are mainly reflective of the existing bulk trades in raw materials such as oil, gas, minerals and grains and principally connect North and South America, Europe and Latin America, Europe and Asia and Asia and Australia. These routes also accommodate container cargo traffic and can be envisaged as the branch lines flowing out from the circum equatorial route. The lack of high volumes prevents the establishment of transoceanic routes so container vessels carry cargoes from transhipment ports to their destinations.

Transoceanic routes or pendulum connectors link a variety of ports that boarder their respective oceans. There are three such routes. The first is the transpacific connector which serves Asia-Europe through the Indian Ocean and the second is the transatlantic connecting the countries of the North Atlantic as well as the North with the South Atlantic. The third is an emerging new transoceanic route linking the growing economies of Brazil, India and China as well as South Africa. This route via the Cape of Good Hope has the potential to grow in the future and act as a significant link between Latin America, southern Africa, India and the Far East (Rodrigue, 2010a, 2010b)

A further set of trade routes can be identified which link regional ports to the transoceanic and circum equatorial routes. These transhipment routes are based on a hub and spoke system and can be found linking ports in the Far East, the Mediterranean and the Caribbean with the transoceanic and circum equatorial routes (Rodrigue, 2010a).



The purpose of this paper is to examine and illustrate the drivers behind the growth of trade in the Atlantic economic space and identify the constraints that exist. While reference will be made to air routes and cargoes it will concentrate on maritime transport as the cargoes between the Atlantic economy countries will be carried mainly by ship at least in volume terms. From that analysis and by gaining an understanding of the commercial and economic relationships between the members' economies we will be able to understand how trade can be enhanced within the Atlantic economy.

The paper is structured as follows. The next section will provide a short review of the literature dealing with the impact that trade and transportation has on economic growth and development and in particular the role played by the transport infrastructure. This will be followed by a brief overview of the nature of the cargoes carried across the Atlantic economic space by both ships and aircraft. The principal influences on trade and cargo movements will then be covered before moving on to draw inferences regarding future developments.

2. Literature review

Economic literature recognises the importance of trade in promoting countries economic growth. A motivating factor behind Adam Smith's wealth of Nations was his belief that the removal of trade restrictions would improve a country's economic growth and welfare; using his theory of absolute advantage to prove his point (Smith, 1776). His view was developed further by David Ricardo (Ricardo, 1821). Later economists principally invoking the Harrod-Domar two sector model (Domar, 2009; Harrod, 1939) and Solow's exogenous growth model (Solow, 1956) or the endogenous growth theory of Romer (1986) showed that trade could positively influence growth although there are sceptics (Dollar and Kraay, 2004; Harrison and Rodriguez-Clare, 2009; Rodriguez and Rodrik, 2001; Rybczynski, 1955). Removing trade barriers and integrating partners economies would increase the trade between them through trade creation effects but could harm non partners' trade via trade diversion (Viner, 1950). Essentially the long term benefits of barrier reduction would come through the reallocation of resources and economies of scale effects; both static and dynamic. The international reallocation of resources would also lead to the flow of investment between partners ostensibly to their mutual advantage and spill over into benefits for the rest of the world economy. While there is evidence of positive benefits to countries participating fully and deeply in economic blocs there is some concern that they can have a negative effect on non participants (Limao, 2006).

It has long been recognised that transport links can play a crucial role in enhancing countries economic growth and development. The swift, safe and secure movement of goods from where they are made to where they are sold is an essential factor in promoting commercial activity and hence economic growth and development. The development of good transport links is therefore essential in developing commercial networks and economic integration (Kerr and Perdikis, 2014). However, as Greve, Hansen and Schaumburg-Muller (2007: 10) state "the theoretical and empirical literature on the role of transport in economic development is surprisingly weak. In general, transport is acknowledged to play an important role as a facilitator of economic development; however the role of transport remains ambiguous and to shallow interpretation".

'In theoretical terms the impact that transport can have on economic growth has evolved over time. Originally, (as with trade) economists saw transportation and in particular transport infrastructure as having an exogenous effect on economic growth (Solow, 1956). Work by Ducruet, Rozenblat, & Zaidi, 2010; Hummels, 2007 emphasise the impact of transport cost can have on promoting trade and hence economic growth. Romer's (1986)



work has also led to a reappraisal of the contribution of transport and its infrastructure to economic growth.

Aschauer's (1989) work has had a great influence on the development of empirical research and following his work numerous studies have found a positive relationship between transportation and improvements in factor productivity and hence economic growth. Empirical evidence has shown benefits arising from the agglomeration impact of public transport (Chatman and Noland, 2011), the non-transport benefits from transport (rail) investment (Banister & Thurstain-Goodwin, 2011) and the wider economic benefits of transport infrastructure investment (Bhatta & Drennan, 2003; Lakshmanan, 2011; Vickerman, 2008). Yamaguchi (2007) found that there were positive impacts on regions in Japan as a result of improvements to air transport.

Studies specific to the countries in the Atlantic economic space include, (Alleman et al., 1994) who found a positive relationship between infrastructure and economic development in South Africa: (Fernald, 1999) found a positive causality between road improvements and the productivity of US industries; (van Veen-Groot and Nijkamp, 1999) showed that transportation infrastructure led to economic growth in the Netherlands.

Several writers have however suggested that improvements to infrastructure and in particular infrastructure investment are not the only contributory factors in promoting economic growth. The development of logistics and the capacity to handle consignments is also critical (Lean, et al 2014). Others have suggested that institutional changes also play a significant role in developing capacity and responsiveness to change (Galvão et al., 2013).

Rodrigue (2010b) has identified six factors that "individually and in conjunction" influence transportation systems. These include: economics and finance, demography and society, energy and the environment, technology and policy. Economic factors inter alia encompass economic growth and fluctuations, the structure of economic activity, the level of integration between economies and supply chains, the relative price of transport and the cost of finance to support domestic consumption and international trade as well as investment in transport systems.

Demography and society have an impact on consumer behaviour with regard to the amount and type of goods demanded and consumed and hence how much and what is traded between nations. Energy and the environment impact via the availability of fuels needed to run transport systems and the need for them to be adhere to international and national environmental standard. These can have an important impact on transportation costs and affect the comparative advantage of different modes of transport. Technology can have a positive role to in this regard by improving fuel efficiency and reducing pollution.

Finally, policy has a leading role to play in harmonizing national policies with regard to transport as well as domestic and international attitudes towards transport and modes of transport infrastructure ownership. In addition to internationally agreed regulations on safety, security and the environment transportation is subject to various forms of regulation and taxation which impact on the costs and the complexity of managing transport across countries. Domestic attitudes to privatisation also affect investment decisions by international shipping companies and terminal operators (Rodrigue, 2010b)

3. Growth in Trade

Globalisation over the last sixty five years, but in particular since 2000, has led to the growth of world trade. It is a fact that world trade has grown faster than world GDP thereby raising its share. As a consequence world transport movements both in terms of seaborne and air



transport have increased significantly. According to the International Chamber of Shipping over ninety percent of world trade is transported by sea (International Chamber of Shipping, 2013). Air transport has also grown over the period and now accounts for 2 percent by weight and 40 percent by value (Bowen & Rodrigue, 2013). A similar picture can be seen in the Atlantic Economic Space where exported cargoes carried by vessels increased from \$ 43.6 billion in 2000 to \$ 124.4 billion in 2011 and air freight from \$ 11 billion in 2000 to \$ 29.4 billion in 2011. Within the Atlantic space seaborne trade accounted for 62 percent of world sea exports in 2000 but decreased to 56 percent of the total by 2011. Likewise, a decrease in air freight within the Atlantic space with respect to total world values was observed; accounting for 68 percent of the total carried in 2000, compared to 64% of total world exports in 2011.

The world economy has experienced three waves of globalization. In each wave world GDP and world trade has grown rapidly and trade has increased as a proportion of GDP. The first wave that can be identified ran from approximately 1870 to 1914. During this period merchandise exports as a proportion of world GDP increased from approximately 10% to over 30% (The World Bank Group, 2002). This period coincided with the opening up of the United States and the economic and political unification of Germany and other European nations such as Italy as well as the development of the Latin American economies and the European "scramble" for Africa.

Perhaps the most profound long term influence on trade in this period was the opening up of the American frontier and the emergence of Germany not just as an economic power but as a major exporter. The symbiotic relationship between the United States and Europe has been well documented and analysed by several authors but notably by Brindley Thomas in his book on the Atlantic Economy (Thomas, 1954). Using the idea of long swings he developed an explanation for the growth of the US and its impact on the European Economy both in terms of exports and emigration from it and the long term impact this had on the developing Atlantic Economy.

There then followed a period of decline which was caused by several factors. Firstly, the disruption to trade brought about by the adverse impact of the First World War (1914-1918). Secondly, the Great Depression (1930-1936) that reduced aggregate demand in the principal trading nations and was exacerbated by the widespread adoption of beggar they neighbour policies of which the Smoot-Hawley Act is an example. Thirdly, the disruption to trade caused by the Second World War which began in 1939 and ended in 1945 but had an adverse impact on trade until the early 1950's as economies tried to readjust to peacetime conditions.

The second wave is associated with the upturn in trade that began in 1950's and continued up until 1980. Between 1950 and 1980 there was a resumption of growth in world GDP and exports as a proportion of world GDP grew from approximately 6 percent to 8 percent (The World Bank Group, 2002).

The third phase or continued upswing in world GDP until today has seen world GDP grow from 2.05 percent per annum in 1980 to 2.34 per annum in 2012; dipping in 2009 to -2.1 as a result of the international financial crisis and the onset of the "great recession" (The World Bank Group, 2014) and world merchandise trade grow from \$5,121,053 in 1995 to \$18,351,468 in 2012 (United Nations Conference on Trade and Development, 2013). World merchandise trade as a proportion of world trade also grew from 8 percent in 1980 to just below 20 percent. Deane (2004) has suggested that the principal determinants of the growth in the world trade/GDP ratio during this third wave of globalisation are the fall in the price of tradable goods, the decline in tariffs, increase in country size, the rise in real incomes and the decline in exchange rate volatility. Each of these contributed 44 per cent, 21 per cent, 13 per cent, 5 per cent and 3 percent respectively.



To state the obvious the consequence of the increases in world trade has led to an increase in the shipment of cargoes by both sea and air. In the Atlantic region freight exports by sea and air increased sharply as can be seen in the following figures.



Figure 1: Freight Exports by Sea in the Atlantic Region 2000 to 2011

The value of freight carried by ships in the Atlantic space increased rapidly between 2002 and 2004 from \$ 48.9 billion to \$ 95.6 billion and again from 2007 to 2008 from \$ 120 billion to \$ 169 billion. This resulted in an overall rise in export value by sea transport of \$ 126 billion within the Atlantic Basin between 2000 and 2008. A decline in value of approximately \$ 50 billion was observed in 2008 to 2009 which can be attributed to the onset of the global recession. This was followed by a small rise, subsequently stabilising at this lower value, between 2010 and 2011.

The countries which export larger values by sea within the Atlantic Space are Denmark and Germany, contributing values of \$ 21.7 billion and \$ 22 billion over the period 2000 to 2011. Small actors within the Atlantic area include Cape Verde and Slovakia.

With respect to air freight carried we can see similar trends. From 2000 to 2008 a rise in the value of freight transported by air can be observed, increasing from \$ 11 billion to \$ 31.7 billion during this period. A decline in value between 2008 and 2009 of \$ 7.8 billion can be observed similar to that in sea freight and for the same reasons. Despite this, the value of exported goods started to increase again from 2010, from \$ 27 billion to \$ 29 billion.





Figure 2: Freight Air Transports Exports in Atlantic Region 2000-2011

Source: (International Trade Centre, 2013)

Although the figures show a rise in export values by air and a levelling off of sea export values, it is important to note that sea transport accounts for over 4 times the value of export by air within the region.

The main actors with reference to air exports within the Atlantic Space are clearly the USA, with freight export values of \$ 112.6 billion over the period 2000 to 2011, followed by Germany, contributing a value of \$ 33.4 billion over this time period. Small actors are noted as Angola and Guinea.

In terms of tonnages shipped the picture is that same as that seen in terms of values as the two following figures namely 3 and 4 illustrate.



Figure 3: Cargoes Exported by Sea and Air: World



Source: Seaborne cargo: UNCTAD (2013); Air cargo: The World Bank Group (2014).



Figure 4: Air and Sea Cargoes Exported: Atlantic Space

Source: Seaborne cargo: UNCTAD (2013); Air cargo: The World Bank Group (2014).

Looking at the types of cargoes unloaded in the Atlantic region the following figures provide interesting reading. Figure 5 shows the tonnage of crude oil unloaded by economic and geographical area. Developed economies within the Atlantic region, Europe and America, dominate crude, with values of 456 million metric tons and 439 million metric tons unloaded respectively. Developing economies account for less, corresponding to 74 million metric tons for developing America and 40 million metric tons for developing Africa







With reference to dry cargo within the Atlantic economic region, we can see in figure 6 that the developing economies of America and Africa are gradually increasing their share of trade, with developing America showing increases from 263 (2006) million metric tons to 338 (2011) and developing Africa increasing from 269 (2006) to 287 (2011)million metric tons. Developed economies are observed to be decreasing unloaded dry cargo in metric tons. In Europe we see a decrease from 1245 million metric tons in 2006 to 1067 in 2011. Developed America also observed a decrease from 492 million metric tons in 2006 to 336 in 2011.



Source: (United Nations Conference on Trade and Development, 2013)





Source: (United Nations Conference on Trade and Development, 2013)



Figure 7: Petroleum products and gas unloaded by Atlantic economic region

Source: (United Nations Conference on Trade and Development, 2013)



For petroleum products and gas trends suggest relative stability. There is a small decrease in developed economies of America (155 metric tons in millions in 2006 to 113 in 2011) and a slight increase in the developing economies of America (60 million metric tons in 2006 to 79 in 2011).

4. Factors Influencing the Growth in Seaborne and Air Freight

As stated above in section 3 the growth in seaborne trade and air cargo traffic has grown on the back of globalization which is itself the result of a number of drivers. The principal drivers of the growth of seaborne trade and air freight can be categorized as either demand side or supply side drivers.

On the demand side we can list:

- The growth of world GDP and for our purposes the growth of the Atlantic basin's GDP.
- The reduction of trade barriers either via reductions due to multilateral agreements or those generated by bilateral trade agreements.
- The entry of "new" or emerging economies into the world trading system that had previously been excluded
- Increased FDI and multinational activity.

On the supply side one can identify the following:

- The decline in transport costs as a result of technological improvements to ships and aircraft
- Improvements in port infrastructure and logistics
- Improvement in the marketing of products via the use of new media such as the internet

4.1 Demand Side Drivers

4.1.1 The Growth of World and Atlantic Basin GDP and Trade

The growth of GDP over our period has been the result of many factors. In the very early period certainly from the 1950's to the early 1960's one can attribute it to the positive impact the reconstruction and recovery phase after the Second World War had on investment and hence GDP. This was particularly so in Europe which benefited greatly in its reconstruction from the US Marshall plan.

One can also attribute it to the more Keynesian policy stance taken by governments which ensured that economic growth took precedence in economic policy formulation and execution. One can also attribute it to the Bretton Woods institutions which contributed by their existence and actions to financial stability (IMF) and economic growth and development (The World Bank Group, 2002).

In the 1960's and 1970's the growth of GDP was fuelled by the rapidly growing Western European economies although there were several interruptions as a result of the oil price shocks and currency fluctuations in the 1970's. In latter part of the period under discussion



GDP growth was enhanced by the "take off" of the BRIC economies and the income growth seen in the former eastern European economies and China particularly after undertaking its domestic economic reforms and its entry into the WTO.

The relationship between the growth of GDP and trade and cargoes carried is clear to see from figures 8 and 9 with the latter providing the picture for the Atlantic.



Figure 8: World Air and Sea Exports with Reference to GDP

Source: (International Trade Centre, 2013) Sea and air exports (The World Bank Group, 2014) GDP world.





Source: (International Trade Centre, 2013)Sea and air exports, (The World Bank Group, 2014) GDP Atlantic Space



The growth in the GDP of the Atlantic region economies has positively fuelled the growth in trade but this has not been its only impact on transport. As countries have become richer they have demanded more high value consumer goods. This has been one of the drivers behind the growth of containerized cargoes compared to bulk cargoes and also the increase in air freight seen over the period. Although more expensive than sea transport air transport becomes affordable as the value of a good rises since the cost of transportation falls as a proportion of final cost. Expensive luxury good and high value electrical components fall into this category (Hummels, 2007).

While the interrelationship between GDP and seaborne cargoes and airfreight is clear to see the sharper decline in seaborne trade than GDP between 2007 and 2008 needs some explanation. The down turn in economic activity associated with the world financial crisis played a significant role in reducing demand for all traded products. Manufactures both components and final goods were particularly hit in this way. Raw materials and other commodities were also adversely affected. As Houthakker and Magee (1969) have suggested international trade flows are between two and three times more volatile than GDP and so are more likely to be hit when there are changes in GDP. Irwin (2002) has indicated that this volatility has been rising over time. This was in contrast to standard theory which suggested an elasticity of one or a one to one relationship. Freund (2009) has also suggested that the responsiveness of trade flows in relation to changes in demand seems to increase further during recessions. In other words a decline in GDP can have a disproportionate effect on trade when a severe recession takes hold.

Using the World Input-Output Database and examining global value chains, Saito, Ruta and Turunen (2013) suggest a number of factors may contribute to the sharp decline seen in seaborne cargoes and airfreight. These include the running down of inventories and the impact of protectionist policies pursued by national governments. An example of this might be the buy American campaign in the US and other associated policies designed to substitute domestic products for imports. Trade in goods also declines more than services and since the latter makes up the bulk of GDP so GDP holds up better relative to trade. They also suggest that there was a breakdown of international value chains as producers opted for local suppliers in preference to international suppliers in addition to consumers switching away from foreign suppliers towards local suppliers.

Examining these factors in turn and drawing on the existing literature Saito, Ruta and Turunen (2013) conclude, however, that the running down of inventories and the breakdown of international value chains had a limited influence on the sharp decline in cargoes transported by sea and air. Evidence from Bems, Johnson and Yi (2011) suggests that the existence of extensive international value chains prevented trade from falling further. The work of Asmundson et al., (2011) suggests that difficulties associated in raising trade finance could have had a major effect. A later study by Ahn, Amiti and Weinstein (2011) confirms this view and shows that the cost of exporting and importing was particularly dependent on trade finance which became scarce as a result of the crisis.

4.1.2 Declining trade barriers

The decline in trade barriers over the period has also had a major and positive influence on trade movements. This has worked either by lowering the price of goods by reducing tariffs (import taxes) and/or enabling greater access to markets by simplifying rules and regulations and/or by removing quotas or physical restrictions (quotas). These have been achieved via multilateral trade rounds organized by the GATT of which the most recent of these to have an impact being the Uruguay round. Figures 10 and 11 illustrate this pattern (The World Bank Group, 2014).





Figure 10: Tariff Rate, applied, weighted mean, all products.

Source: (The World Bank Group, 2014)





Source: (The World Bank Group, 2014)



4.1.3 Bilateral Agreements and Bloc formation in the Atlantic Region.

Bilateral agreements have largely taken an integrative form with the creation of numerous free trade areas that characterize trade relations in the Americas and Africa (NAFTA, MERCOSUR, ECOWAS, SADC etc) or in Europe with the creation of the European Union. While there is a debate in the literature regarding the impact that these agreements have on non member's trade, the so called trade diversionary effects (Viner, 1956) the general consensus is that they have had a positive effect on those implementing full agreements with inter union transfers (Limao, 2008).

These bilateral trading agreements have been recently enhanced further by the development of bilateral agreements (i.e. the European Union's partnership agreements) and more recently inter bloc trade for example the proposed EU-Mercosur trade agreement and the TTIP between the European Union and the USA. What multilateral and bilateral agreements achieve is market access and a more competitive environment for business. Their positive impact on "openness can be seen from the following figures where trade as a share of GDP has tended to rise within the blocs formed in the Atlantic region.





Source: United Nations Conference on Trade and Development (2013)





Figure 13: Trade Openness within Agreements.

Source: United Nations Conference on Trade and Development (2013)

4.1.4 New Entrants into the World Economy and Atlantic Economic Space

Two occurrences stand out. The first is the change in political ideology that played its part in changing the economic system from a non market centrally planned economic system to a market orientated capitalist system in Eastern Europe. Not only did this change have an impact on the way these economies were managed it also influenced attitudes in the rest of the world by making market orientated policies more acceptable. Although this change in policy outlook and application was controversial in some quarters it led to the adoption of more liberal trade policies throughout the world. The impact this had on both China and India cannot be underestimated. In adopting more liberal economic trade policies and welcoming foreign direct investment they now became significant importers of raw materials and goods in their own right and thereby contributed to the growth of GDP in a number of countries within the Atlantic space.

The rise of the BRIC economies in conjunction with the emerging economies of Turkey and Indonesia but also Latin American economies is the second factor to stand out. These economies growing in terms of GDP and also adopting more liberal trade policies began to engage more with the trading system and added to the flow of traded goods.



4.1.5 The Influence of Multinational Companies and FDI

The decline in trade barriers and the associated political and economic risks of carrying out foreign direct investment allowed multinationals to take advantage of this new environment. Their strategies could now be based on producing or outsourcing production to low cost countries and shipping final or intermediate goods to be sold in the richest markets. This internationalisation of supply chains gave a further boost to the quantity and value of cargoes shipped by both sea and air (UNCTAD,2013). Their activities have certainly integrated the Atlantic economy and in particular the North Atlantic.



Figure 14: FDI and Trade within the Atlantic Space

Source: United Nations Conference on Trade and Development (2013) Foreign Direct Investment, International Trade Centre (2013) export sea and air.

4.2. Supply Side Drivers

In addition to the demand side factors supply side factors have also influenced trade and trade patterns and the cargoes that were carried. Hummels (2007) has suggested that direct transport costs as influenced by fuel costs and innovations in technology are an important determinant of trade and the types of cargoes carried by ship and airplane. Others have suggested that port and airport facilities also have an important influence as they affect the costs of shipment. These cost range from port pricing, handling cost, turnaround times and service quality to the maritime and land network linkages that they provide (Weigend, 1958; Vigare, 1968; Nottboom, 2004; Ducruet et al., 2012; Rodrigue, 2010; Sanchez and Wilsmeier, 2009).

4.2.1 Direct Transport Costs

The importance of transport cost can be seen in three ways. These are first, their size relative to the value of the goods being transported often referred to as the ad valorem



measure; second value relative to other costs such as tariffs and finally the extent to which they change relative to prices.

Ad valorem costs are difficult to find and incomplete as few importing countries collect such data. The US and New Zealand have some data which while useful can lead to inconclusive results as these are greatly influenced by the start dates and so on. For example the data from New Zealand quoted in Hummels (2007) which runs from 1963 to 1997shows no clear trend ranging from 7 per cent to 11 per cent. The US data in contrast shows a downward trend from 4 percent in 1974 to 4 percent in 1997 although this might be influenced by the fall in fuel costs after the 1973 OPEC oil price hike. Transportation cost can also be influenced by a wider range of factors such as the proportion of high value good shipped which can show a relative fall in transport costs or the opposite when these may not have changed. An additional factor that can influence matters is the impact that transport service quality can have on the figures. For example shipping cost might rise as a result of improvement in the quality of shipping services such as port provisions, customs clearance etc., and shippers may be willing to pay the extra costs because the reduce uncertainties and risks. If this was the case then transport cost would seem to rise relative to the value of goods shipped (Hummels, 2007).

Taking transport cost as a proportion of tariff rates can also be problematic as indicator. As tariff levels have declined transport cost as a proportion of total trade costs have increased. There is evidence of this for the US and Latin America (Hummels, 2007; Finger & Yeates, 1976 & Waters, 1970).

Examining ad valorem transport costs relative to the price of goods shipped can also lead to inconsistent measures. For example transportation cost vary with distance, the weight ratio of the good transported and the quality of the transport service provided. As a result they can impact in different ways on the relative price of goods and so influence the patterns of trade. Hummels & Skiba (2004) have estimated that a 10 percent increase in a products value reduces ad valorem transport costs by 8.6 percent.

Notwithstanding the above caveats an examination of sea and air freight rates can be useful in shedding light on the development of transport costs over time. Both sea transport and air transport have undergone significant technological changes.

Ships have not only grown in size. There has also been a major change to the way cargoes are carried in particular the carriage of manufactured and semi manufactured goods. The shift from traditional "tween" deck ships to container ships with fast turnaround times, security and speed as the preferred mode of transport is clearly evident. Specialist vessels designed to carry specific cargoes have also made their appearance. Examples include specialist car carriers and gas carriers. The latter has led to the transportation of a product scarcely traded twenty or thirty years ago (Cullinane & Khana, 2000).

Aircraft have also seen similar changes. For example there has been a shift from piston driven aircraft to jet propulsion and their size and carrying capacity has also increased. All these factors have led to a decline in air transport cost and have made more products candidates for air transportation (Gordon, 1990). All these developments taken together have led to the decline in freight rates and hence contribute to the growth of trade.

4.2.2 Infrastructure and its Influence on Transport Costs

The essence of seaports and airports is to link maritime and air networks with land networks (Weigend, 1958, Vigarie, 1968). Technological improvements such as containerization and the integration of port providers and service providers enabled economies of scale to be



achieved. This has impacted on port pricing, service quality, turnaround times and the frequency of deliveries (Notteboom, 2004). The impact that improved access and logistics has on land locked countries has been emphasized by Arvis et al., (2007): witness Rotterdam, Hamburg and Le Havre in Europe. Sarriera et al., (2013) note that Latin American container ports have increased their technical efficiency markedly since 1999, with the greatest improvements found in ports with significant transshipment activities (implying tight linkages to both upstream and downstream activities). The increasing capacity of ships and the technological advances that have taken which have reduced transport costs mentioned above have also had an impact on the development of ports and associated infrastructures. Rodrigue et al., (2013) have shown that these developments have led to not only the development of ports and their associated infrastructures but also the nature of shipping routes. In seaborne trade there has been a decline in point to point trade and a movement towards hub and spoke networks. These changes led to the development of major transhipment areas that serve not just their regions but are also part of a high capacity long distance network. This is evident in the Mediterranean where Algeciras has taken on this role and also Kingston and other ports in the Caribbean (Sanchez and Wilsmeier, 2009)

From the data presented below we can see the expenditure carried out to improve the quality as well as the quantity of port and associated provision. By linking ports via hubs which serve not just countries and regions but act as transhipment centres maritime transport is able to gain significant economies of scale (Rodrigue et al., 2013). In the Atlantic economic space the principal transhipment hubs and transhipment centres can be found in Europe largely based around the ports of Rotterdam, Hamburg, Antwerp, Le Havre and Felixstowe and along the Mediterranean. In the western Atlantic they can be found in the Mexican Gulf ports of the US and the Caribbean and along the North West coast of South America. There are no major hubs in the Southern Atlantic perhaps reflecting the relatively small trade volumes.



Figure 15: Gross Investment in Port Infrastructre: Atlantic Region.

Source: Organisation for Economic Co-operation and Development (2013)

Certainly figures from UNCTAD's liner connectivity index (LSCI) shows increasing connectivity within the Atlantic economic space from the beginning of the series in 2004 to 2013 when the latest figure were published. The LSCI is a proxy for a country's accessibility to global trade.



Countries' access to world markets depends largely on their transport connectivity, especially as regards regular shipping services for the import and export of manufactured goods. The LSCI aims at capturing a country's level of integration into global liner shipping networks. The higher the index the easier it is to access a high frequency and high capacity global maritime system (Rodrigue, 2013).

The current version of the LSCI is generated from five components: (a) the number of ships; (b) the total container-carrying capacity of those ships; (c) the maximum vessel size; (d) the number of services; and (e) the number of companies that deploy container ships on services from and to a country's ports. The data are derived from *Containerisation International Online* and *Lloyds List Intelligence*.

4.2.3 Internet Usage and Transport Movements



Figure 16: Internet Users per 100 People: Atlantic Space

Source: The World Bank Group (2014)

The internet is having and will continue to have a profound effect on the marketing of goods and services throughout the world. For consumers in particular it brings "shopping" directly into their homes and allows them to purchase goods from anywhere in the world. The use of secure payments systems such as "pay pal" has taken the risk out of paying over internet systems and enabled safe "on-line" purchases. By being able to access businesses anywhere in the world in particular from home has increased consumer choice and competition amongst producers. The ability to ship goods quickly and efficiently by either seaborne containers or aircraft has also reduced the risks involved in international trade and the inconvenience of the traditional delays experienced when purchasing products overseas. The main constraint on this type of purchasing is the ownership of personal computers and individuals access to the internet. We can see from figure 16 that internet usage has increased dramatically over the period and that this growth correlates with the growth of both air freight and seaborne freight movements in the Atlantic space. There is extensive anecdotal evidence to support this.



The internet has also had an effect on the carriage of cargoes and their monitoring while in transit. The impact of the internet on logistics has been to reduce the cost of transportation by bringing together goods that need transporting and those who have the capacity to transport those goods (Rodrigue et al., 2013).

5. Summary and Conclusions

In common with the rest of the world trade has grown in the Atlantic economic space. All aspects of goods ranging from manufactures to bulk cargoes, oil and petroleum products whether they have been transported by air or sea have seen an increase. The growth in cargoes traded has been influenced by a series of both demand and supply side factors.

On the demand side the growth of national GDP's has led not only to the increase in goods transported but also to the composition of goods with manufactures growing rapidly. Growing GDPs has also influenced the mode of transport as higher incomes also lead to an increase in demand for higher valued goods. These goods are able to absorb the higher transport costs associated with air freight without affecting their total costs greatly and hence these goods are often transported by air.

Other demand side factors that have led to the growth of trade include lower trade barriers as a result of both multilateral and bilateral trade agreements and the entry into the world economy of former centrally planned command economies as well as the growth of the BRICS and NICs and the operations of multinational companies.

On the supply side the main influence in reducing transportation costs (which as tariff rates fall contribute proportionately more to a good's final price) have been the range of technological changes affecting ships and aircraft coupled with the increase in investment in sea ports and airports as well as the associated development of hub and spoke networks as opposed to traditional point to point configurations.

To achieve an integrated Atlantic economy that can match the emergent Asian economy based around China will require considerable economic and political effort. Integration will depend on the growth of world and regional GDP. This will require appropriate long term macroeconomic policies and a stable international and regional financial system. The trade relationships between the countries in the Atlantic economic space will have to be negotiated and managed carefully to maximise the benefits to the participants and minimise the costs to non participants less this lead to a damaging trade war. Further development of inter bloc trade agreements based on deepening trade and investment relationships between participating countries, such as the Trans-Atlantic Trade and Investment Partnership need to be extended to include all Atlantic economy countries and accept that some countries can progress towards integration more slowly than others. There also has to be an understanding that countries may have different views regarding the formulation of domestic economic policies and that these may be based on legitimate concerns. Opposition may not be tied to sectional vested interests.

The provision of an efficient and effective transport network will also be essential to enhance the gains through trade of the participants. While principally demand led continued infrastructure investment in sea ports and airports is essential. This is particularly so if the Atlantic economy is to gain fully from the benefits associated with the lower costs associated with the technological improvements to ships, aircraft and port handling. Inter governmental institutions can certainly help in harmonizing and standardising regulations especially when they need to span multiple jurisdictions.



Finally the governments of the nations that make up the Atlantic economy will need to develop an integrated and co-operative approach to policy making if the goal of a resurgent Atlantic economy is to be achieved.



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