

Greek Economic Development and Shipping Income in the 19th century¹ by

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Ocean-going shipping is an international business whose income is based on freight rates usually contracted beyond national boundaries; shipping income earned from a national merchant fleet in foreign seas is thus difficult to calculate and it is usually classified under “invisible earnings”. Analyses of economic growth essentially focus their interest on the examination of the primary and secondary sectors, tending to neglect the tertiary sector, and particularly shipping activities. This is the result of the great importance that has been given on the process of industrialization in the international bibliography and in the economic history of the second half of the 20th century. The path to economic development, however, did not always stem from the secondary sector, according to the model of the “First Industrial Nation” as it is well known today, and countries have followed “concrete solutions to concrete situations” according to their history and comparative advantages in entrepreneurial know how. We now know that in the case of Greece, for example, the tertiary sector played a leading role to the country’s development in the 19th century.

Greeks, who had become the main Mediterranean grain carriers during the Napoleonic wars, with the formation of the Greek state in the 1830s continued to be so, and consolidated their position as the most important owners of a bulk cargo fleet in the Mediterranean during the period of *pax Britannica*³. Shipping formed thus a main source of capital accumulation and proved, only second to agriculture, the main sector of economic development of the country particularly during the first 80 years of its existence. The fact that Greece was an “agricultural and maritime nation” and that a main source of its wealth has been the sea, was still reported by leading Greek and foreign analysts to the interwar period⁴.

¹This research has partly taken place within the research project “Greek Economic History, 19th-20th centuries”, led by Th. Kalafatis and E. Prontzas in the P.I.O.P. (Cultural Foundation of Piraeus Group), 2005-2006.

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³ Gelina Harlaftis, *A History of Greek-Owned Shipping. The Making of an International Tramp Fleet, 1830 to the present day*, London, Routledge 1996.

⁴ «La Grèce doit rester un pays essentiellement agricole et maritime» και συνεχίζει «passant en revue toutes les ressources économiques de la Grèce, il montre que, malgré que la mer l’ait mieux dotée que la terre, néanmoins elle n’a pas pour richesse rien que sa marine» in E.J. Tsouderos, *Le relèvement économique de la Grèce*, Paris 1919, pp. XIV-XV.

The fact, however, that shipping earnings were generated beyond the borders of the small Greek state, in the international Mediterranean and northern European seas, and were not easily counted, means that they have been highly underestimated in the Greek national account magnitudes throughout the existence of the Greek economy in the 19th and 20th centuries. These were essentially what has been described “invisible earnings” which could neither be traced nor estimated to their full extent. Shipping earnings however, from the very existence of the Greek state provided an impressive and continuous capital influx throughout the period in question.

It is not surprising therefore that, in spite of the obvious importance of shipping, its contribution is usually not discussed at any significant extent in the context of the various analyses of the economic development of Greece in the 19th and early 20th centuries⁵. The combination of this implicit underestimation of the importance of the shipping activity by contemporary analysts with the relative backwardness of quantitative work regarding the economic history of Greece has resulted that up to the present day, no direct estimates of the income originating in the activity have been made. The two estimates of GDP for the period have included only indirect estimates of the magnitude⁶.

The goal of this article then is to fill the existing gap and make a first attempt to estimate the income created by the overseas transport activities of the Greek merchant fleet with a long seafaring tradition in long distance trade. This income will then be compared with the income of the other sectors of the economy in order to make an evaluation of the effects of shipping on the development of the country in the 19th century.

Furthermore, this study presents a methodology for the calculation of shipping income in countries with similar experience based on our long experience in international shipping and archival research; to our knowledge no such attempts have been undertaken up the present day. Ultimately it is a combination of the tools of the historian with the tools of the economist, archival research with econometrics, in order to construct systematic historical

⁵ The first attempt to calculate the impact of shipping in post-WWII Greek economy has been made by Gelina Harlaftis, *Greek Shipowners and Greece, 1945-1975. From Separate Development to Mutual Interdependence*, Athlone Press, London, 1993.

⁶G. Kostelenos, “*Money and Output in Modern Greece: 1858-1938*”, Center of Planning and Economic Research, Athens, 1995; G. Kostelenos, S. Petmezas et al, “Gross Domestic Product 1830-1939”, Center of Planning and Economic Research & Historical Archives of the National Bank of Greece, Athens, (forthcoming).

statistical series at a macro-level in order to calculate a flow of capital so important and so neglected in national economies.

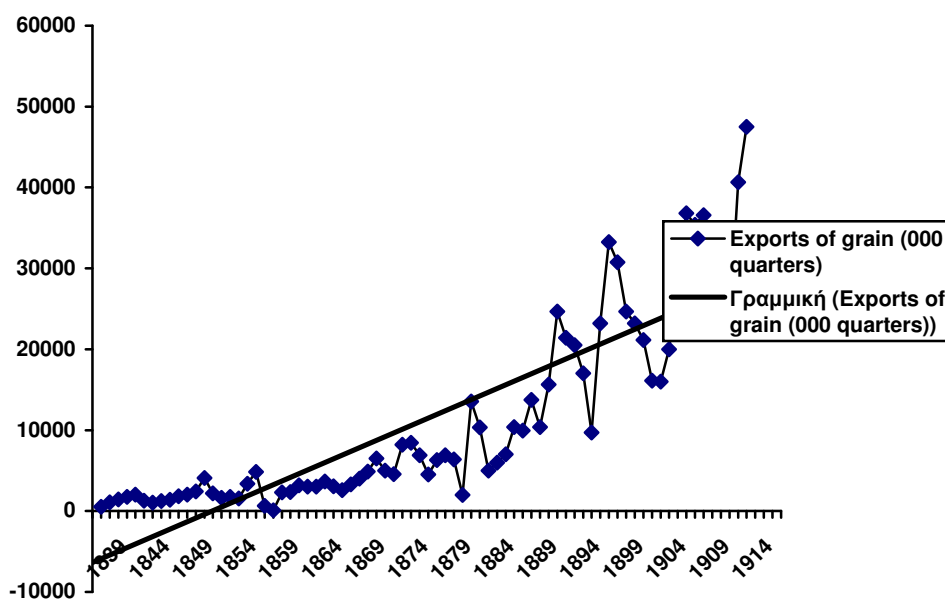
I. THE RISE OF GREEK-OWNED FLEET AS THE MAIN CARRIER OF BULK CARGOES IN THE MEDITERRANEAN

The formation and development of the world economy in the 19th century can be best understood by the unprecedented growth in international sea trade and cheaper freight rates in comparison to the immediate past. This is the era of the industrial revolution, of an increase in world production, of impressive technological achievements, quicker communications and cheaper transportation. The flow of raw materials in the industrializing Western Europe brought about the increase in the volume of so called “bulk” cargoes, i.e. grain, coal, cotton etc., that filled the holds of the ships. As the Black Sea became the granary of Europe in the 19th century, grain exports from the eastern Mediterranean competed with those of western Atlantic coast, while at the same time the transition from sail to steam, the opening of the Suez Canal brought the Mediterranean Sea back to the center stage as a main player of equal importance with the large oceans⁷. This is also the period of major transformations in the Eastern Mediterranean where in 1800 still the Ottoman State reigned. In the 1830s the first nation to gain its independence from the disintegrating Ottoman Empire was Greece to be followed soon by the rest of the Balkan states in the 1870s.

The Greek sailing ship fleet, that became an international carrier between third countries, flourished on 40 islands of the Aegean and Ionian seas and its growth was directly related to the grain trade largely handled by the Greek diaspora merchants who lived at the various Greek commercial communities that spread from the

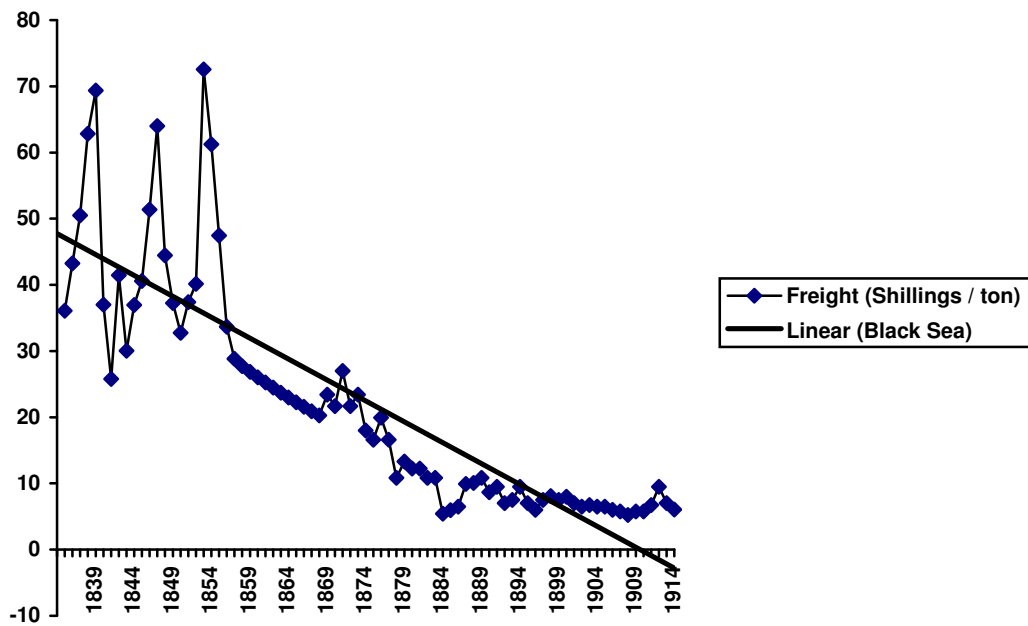
⁷ Gelina Harlaftis and Vassilis Kardasis, «International bulk trade and shipping in the Eastern Mediterranean and the Black Sea», in Jeffrey Williamson and Sevket Pamuk, *The Mediterranean Response to Globalization*, London, Routledge, pp. 233-265.

Figure 1
Total exports of grain from Southern Russia



Source: Gelina Harlaftis, *A History of Greek-Owned Shipping. The Making of an International Tramp Fleet, 1830 to the present day*, Routledge, London 1996, Table 1.2

Figure 2
Freight rates on grain shipped from Odessa to the U.K., (shillings per ton)



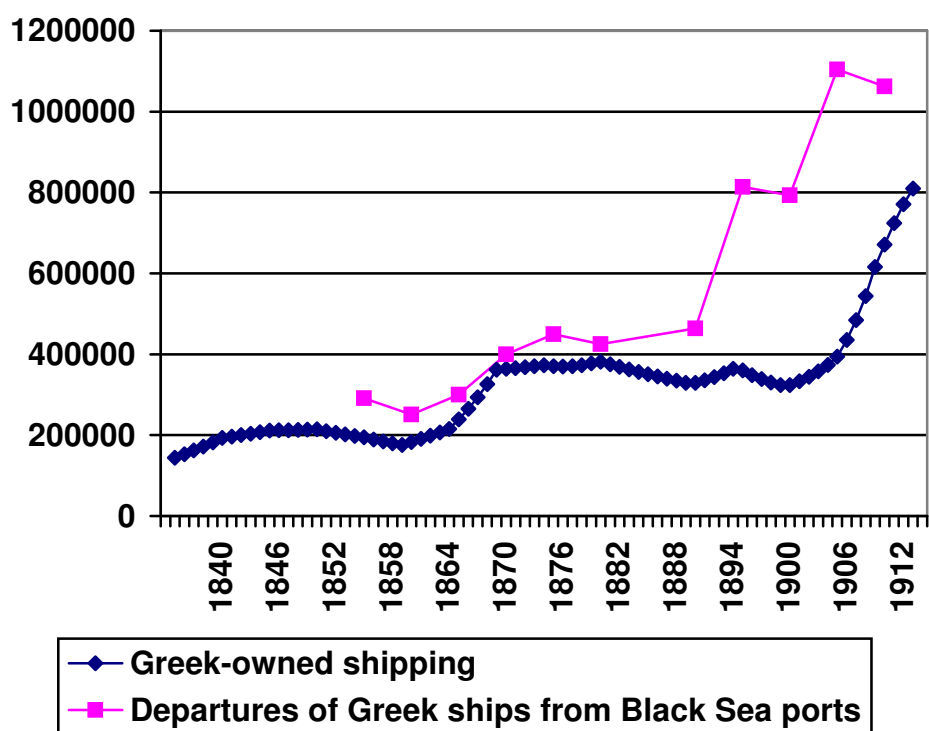
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Source: Appendix 8

Black Sea to the Northern and Baltic Sea⁸. It transported grain, from the ports of the Black Sea to those of the Western Mediterranean and Northern Europe, and coal, on the return route, from the ports of Northern Europe to the Mediterranean Sea. The spectacular growth of Black Sea grain exports as indicated in Figure 1 compensated the decline of freight rates, that were kept at a reasonably high level during the heyday of the sailing ship era up to the 1870s, and gave the great leap forward to the Greek-owned fleet (Figure 3) providing the necessary capital for the transition from sail to steam which was completed at the turn of the 20th century.

Figure 3
Greek-owned fleet (sailing ships and steamships) and
departures of Greek-owned ships from Black Sea ports (Southern Russia and Danube)
(in net registered tons)

⁸ Gelina Harlaftis, “Mapping Greek maritime diaspora from the early 18th to the late 20th century”, in Ina Baghdiantz McCabe, Gelina Harlaftis and Ioanna Minoglou (eds), *Diaspora Entrepreneurial Networks. Five Centuries of History*, Berg Publications, Oxford, 2004.



The size of the Greek owned fleet of sailing ships exhibits a continuous increase from the 1830s to the 1870s, an exception being observed during the two periods of international crises 1848-1852 and 1859-1862. The “prolonged recession” of the period 1873-1886 is clearly discernible in the Figure, although the massive purchase of steamships by Greek shipowners after 1880 led to the decline of the fleet of sailing ships which, after the mid-1990s, were rapidly being decommissioned. The increase in steamships rises sharply after 1900.

Table 1 indicates the relative importance of Greek shipping in European shipping. In 1850, just twenty years after the formation of the Greek state, a young and definitely underdeveloped state, it owns a fleet almost equivalent to that of Holland and Norway. In 1880, the Greek fleet is not able to compare with that of Great Britain, Norway, Italy, France, and the German Empire but could easily compare with that of Russia, Sweden and Spain and was larger than that of Denmark, Holland, Austria-Hungary and Portugal. In 1910 Greece is in the ninth place of European shipping, which really meant then, of world shipping. It may be even more important to note that the Greek owned fleet consisted almost exclusively of ocean-going cargo vessels for the transportation of bulk cargoes, the so-called tramp ships

that were international cross-traders, chartered on demand⁹. By comparison the fleets of Russia, Austria-Hungary, Italy, France and Spain mostly consisted of liners running regular routes and owned by large subsidized shipping companies (i.e. the Russian Steamship Co., the Austrian-Hungarian Lloyd Austriaco, the French Messageries Maritimes, Fraissinet, Paquet or Ligne Franco-Belge and the Italian Florio e Rubatino) which essentially carried passengers and industrial or packed products¹⁰.

Table 1

The largest commercial fleets of Europe (sailing ships and steamships in nrt)

| Year Country | 1850 | 1860 | 1870 | 1880 | 1890 | 1900 | 1910 |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Gr.Britain | 3.565.133 | 4.658.687 | 5.690.789 | 6.574.453 | 7.978.538 | 9.304.108 | 11.556.663 |
| German Empire | | | 982.355 | 1.181.525 | 1.433.413 | 1.941.645 | 2.903.570 |
| Norway | 298.315 | 558927 | 1.022.915 | 1.518.658 | 1.705.699 | 1.508.118 | 1.525.727 |
| France | 688.153 | 996.124 | 1.072.048 | 919.298 | 944.013 | 1.028.726 | 1.451.648 |
| Russia | | | | 666.192 | 794.685 | 974.536 | 1.116.356 |
| Italy | | | 1.012.164 | 999.176 | 740.716 | 948.008 | 1.107.192 |
| Spain | | | | 560.133 | 618.182 | 774.579 | 789.457 |
| Sweden | | | | 502.742 | 510.947 | 613.792 | 772.679 |
| Greece | 214.248 | 175.675 | 361.806 | 389.351 | 331.194 | 332.471 | 619.256 |
| Denmark | | | 179.366 | 249.466 | 302.194 | 408.440 | 546.838 |
| Holland | 292.576 | 433.922 | 389.614 | 328.281 | 255.711 | 346.923 | 534.275 |
| Aust/Hungary | | | 329.377 | 322.612 | 236.648 | 299.725 | 509.851 |
| Portugal | | | | | | 116.002 | 114.037 |

⁹ On the division of the shipping market to tramp ships and liner ships see Gelina Harlaftis, *A History of Greek-Owned Shipping. The Making of an International Tramp Fleet, 1830 to the present day*, Routledge, London 1996, Chapter 1.

¹⁰ Gelina Harlaftis, *A History of Greek-Owned Shipping. The Making of an International Tramp Fleet, 1830 to the present day*, Routledge, London 1996, Table 1.10

Source: Adam W. Kirkaldy, *British Shipping. Its History, Organisation and Importance*, London, 1914, Appendix XVII. The data are based on *Progress of Merchant Shipping in the United Kingdom and Principal Maritime Countries*, Cd 6180, 1912. The data for Greece are from Appendix I.

II. CALCULATING THE SHIPPING INCOME OF A NATIONAL FLEET

The procedure used to estimate shipping income by using freight rates is quite simple in theory and complicated and time consuming in practice. In order to estimate gross income from shipping in a particular year one needs to multiply the freight rate by the quantity of the cargoes carried by Greek ships by the number of trips the ship completed at a particular shipping route.

$$\text{Gross Shipping Income} = (\text{freight rate per ton of cargo}) \times (\text{ship capacity}) \times (\text{number of trips per year})$$

In what follows the assumptions and conjectures made in regard to the terms included in the above equation will be presented and analyzed. The estimates made will be based on these assumptions.

A) Freight rates per ton of cargo

To estimate the freight rate per ton of cargo we must choose the rates and cargoes which realistically reflect the activities of Greek owned shipping during the 19th century. Four typical routes have been chosen which were the main routes followed by Greek owned ships during the period. As for the typical cargoes, these were grain and coal. More specifically, the typical routes and cargoes chosen are the following:

1. Odessa - England/Northern Europe with grain
2. Odessa - Marseilles with grain
3. Odessa - Livorno with grain
4. England / N. Europe - Mediterranean with coal

Freight rates differ according to the route taken and the cargo carried. In this context, the classic studies discussing the subject are those of I. Isserlis, D. North and C. Knick

Harley¹¹. Of these, the latter and most recent is the most relevant to the present work. In particular, C. Knick Harley has estimated freight rates for coal, from England to the most important sea routes, for the period 1839-1913.

Harley's figures will be used for route no. 4, *i.e.*, for the transportation of coal from England to the Mediterranean, for the period 1839-1913. In addition, his figures constitute the basis of the freight rates estimated for route 2 (Odessa - Marseilles) for the period 1869-1914. For the other three routes, raw data originating from the reports sent by the U.S. Consul in Odessa to Washington, D.C. are used for the period 1835-1857. Then, for the period 1869-1914, the data used are taken from the well known source for freights of J. C. Gould, Angier & Co. Ltd.

The reliability of the rates reported by the US Consul in Odessa is considered to be beyond question. This is because the Consul was the Greek merchant Zannis Rallis, a partner of the Ralli Bros Co., the most important Greek trading company based in London. The raw data used in this work originates from the regular reports Z. Rallis sent to Washington, D.C. during the period in question¹². The figures provided in these reports have not been used up to the present day and are quite useful as they cover the period 1835-1857 for which there is insufficient information in the relevant literature.

In these reports, Rallis cites the freights for the transportation of grain for three routes: Odessa-England, Odessa-Livorno and Odessa-Marseilles. Typically, he quotes the prices four times a year, *i.e.*, each January, April, July and October, although in some cases he might cite them two or three times a year and on some occasions more often. The unit he uses to quote the freight rate differs according to the destination. Thus, for England it is usually shillings or pound sterling per tallow-ton, for Livorno lire fiorentini per sac and for Marseilles francs per charge¹³ (see Appendix 6).

Rallis often cites both a lower (minimum) and a higher (maximum) freight rate for each route and cargo. It should be noted that in all cases he cites minimum rates; in many of

¹¹Isserlis I., "Tramp Shipping Cargoes and Freights", *Journal of the Royal Statistical Society*, vol. 101, 1938, pp. 53-146; D. North, "Ocean Freight Rates and Economic Development, 1750-1913", *The Journal of Economic History*, vol. XVIII, 1958; C. Knick-Harley, "Coal Exports and British Shipping, 1850-1913", *Explorations in Economic History*, 26, pp. 311-338, 1989.

¹²The National Archives, Washington, "Dispatches from United States Consuls in Odessa", vols. 1-2, May 1831-January 1858. We are indebted to Dr Katerina Vourkatioti for providing the freight rate series included in the Ralli Consular documents.

¹³In some cases the figures for the Livorno and Marseilles routes might be given in sterling or shilling per tallow ton.

these cases he also cites maximum rates. Therefore, whereas the typical case is to have eight observations per year (four minimum and four maximum), in practice, the usual case is to have fewer, as there might be some maximum freights missing. In fact there are occasions when no maximum rates are given altogether¹⁴. On the other hand there are a few instances when more than eight observations are given.

In constructing the time series for the whole period, a general practical problem faced has to do with the differences in the currency and weight unit given by the sources. It goes without saying that the freight rates in the whole series must be expressed in the same unit. The figures given were therefore modified accordingly and, as can be seen in Appendix 6, shillings per imperial ton have been adopted¹⁵.

Moving to more specific problems, the series for route no.1 (Odessa-England/N. Europe with a cargo of grain) was constructed from Rallis' figures, covering the period up to 1857 and the Gould, Angier & Co. Ltd. figures from 1869 to 1914. Starting with the Rallis figures, two annual freights have been derived, the maximum and the minimum. These are the averages of the figures (maximum and minimum) given for each year. When fewer maximum figures are given for a certain year, the corresponding minimum figure has been used¹⁶. This means that in many cases the figure derived for the maximum freight rate might underestimate the true magnitude¹⁷. A second shortcoming is that the averages adopted for

¹⁴It is not clear whether this is due to the fact that there were fewer trips during the years fewer observations are given, or whether Rallis simply did not have all the information.

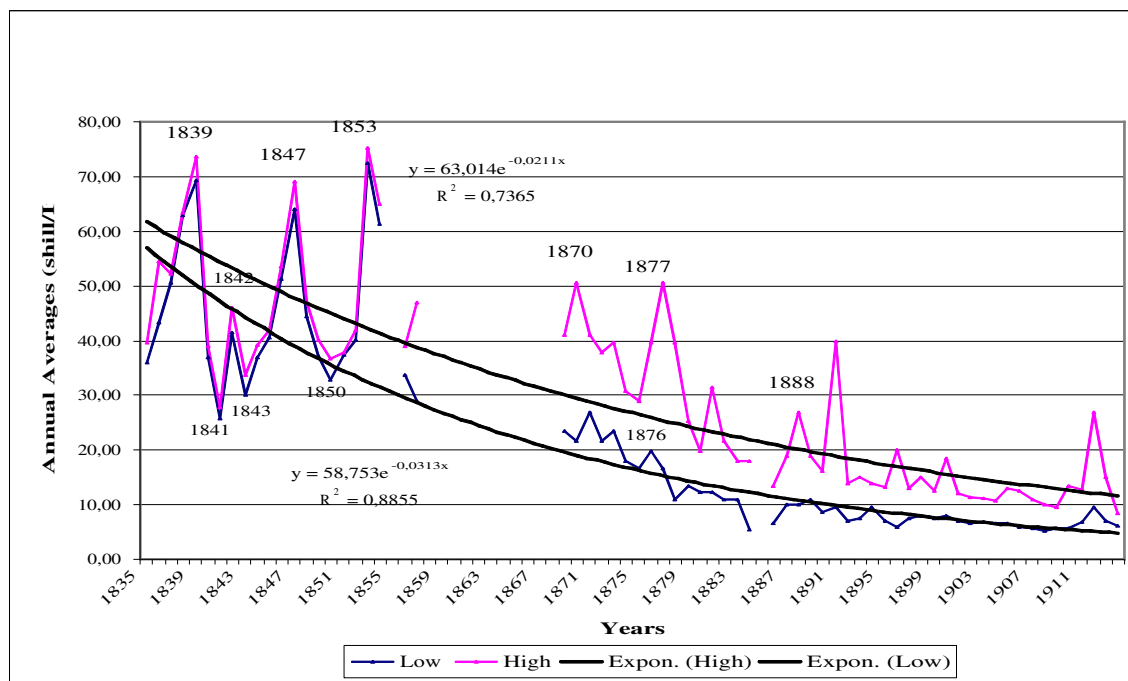
¹⁵Whereas Rallis uses tallow-tons, Gould & Angier use tallow-tons up to 1890 and "unit new charter" i.e., imperial tons, thereafter.

¹⁶The advantage being that the same number of observations is used to estimate both averages.

¹⁷ Rallis apparently reported freight rates according to actual departures of ships from Odessa. If during a certain period there was one departure then the figure cited as a minimum is also a maximum, this implying that there is no error.

Figure 4: Freight rates for Odessa-England /N. Europe (route no. 1 / cargo: grain): 1835-1914

Source: Appendix 2



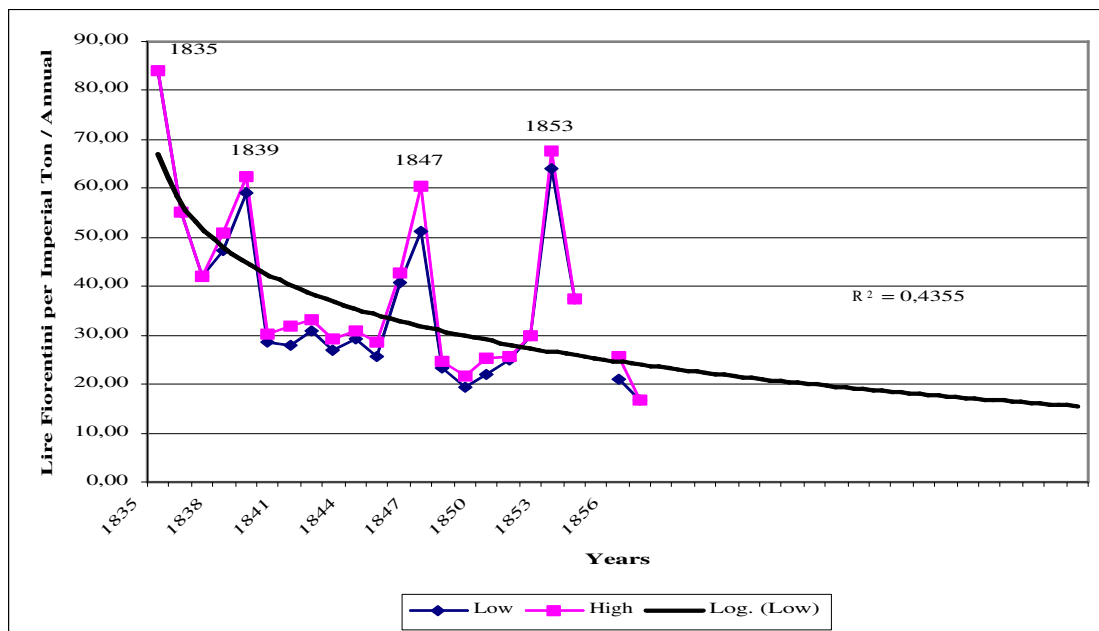
different years have been estimated by using a different number of observations¹⁸. Finally, as Rallis reports no figure for 1855, the average of 1854 and 1856 is used.

As can be seen in Figure 4, the series for freight rates for route 1 appear to be falling from the earlier part of the period (Rallis' figures) to the latter (figures from Gould & Angier). The trend values appear to fit adequately, especially for the minimum freight rates, which permits us to use the trend values for the years in between the two series. The resulting error would seem acceptable for the type of calculations the freight rates are going to be used.

¹⁸For example, if for year x there were 3 minimum values ($x_{1min}=10$, $x_{2min}=15$ and $x_{3min}=32$) the average of the minimum values is $x_{avermin}= 57/3=19$. If for the same year we had two maximum values ($x_{1max}=17$ and $x_{2max}=18$) the average of the maximum values would be $x_{maxaver}=35/2=17,5$ which is smaller than three average of the three minimum values (in the example freights increased in period 3). To alleviate the problem as much as possible we use $x_{3max}=32$ (i.e., the minimum given) this giving us a $x_{maxaver}=67/3=22,3$. This may underestimate the average derived for the maximum freight but eliminates the absurdity of the average of the minima being larger than that of the maxima. If, on the other hand there was only one shipment in period 3, then the freight given is both a maximum and a minimum so the average is correct.

Moving on to route 2, Odessa-Livorno (grain), data is again given by Z. Rallis for the period 1835-1857 (see Figure 5). The same that was said in regard to the data given by this source in the context of route 1 is relevant here (i.e., mostly minimum but also maximum rates are given, typically four times a year etc¹⁹). The difference here is that the freight rates are given in Lire Fiorentini or soldi per sac and we adjust this to use Lire Fiorentini per imperial ton. Again two series were estimated for minimum and maximum rates (Appendix 3). In this case the trend does not have a good fit ($R^2=0,44$ for the minimum rates) although it does reflect the tendency of falling freight rates experienced in the 19th century as is obvious in the case of route 1.

Figure 5: Freight Rates for Odessa-Livorno (route no. 2 / cargo: grain): 1835-1857 (1914)



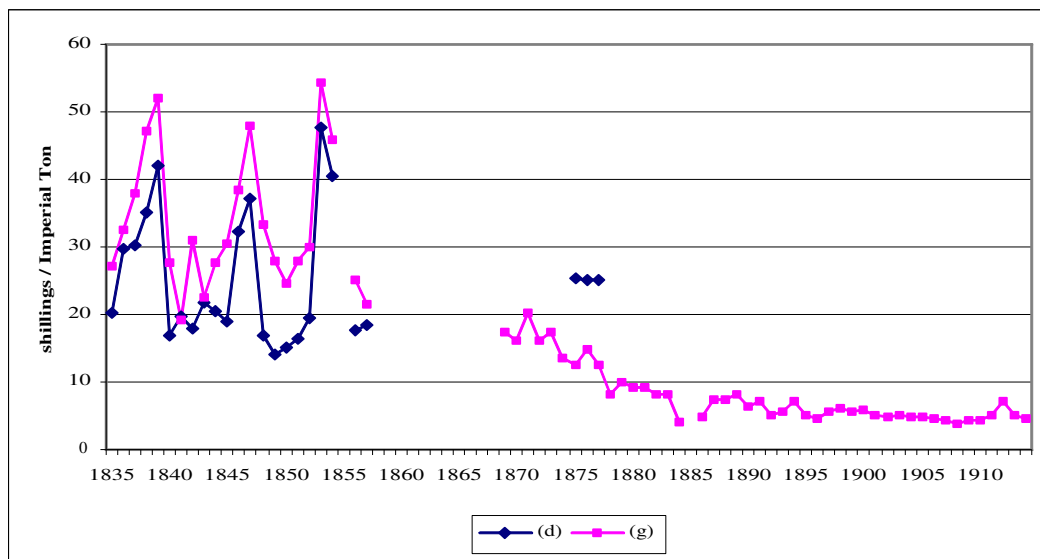
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¹⁹Once again there is no figure for 1855. An estimate is made by taking the average of 1854 and 1856.

Fortunately, in the case of route 2 there is no need to make any forward extrapolations to estimate freight rates. The reason for this is that the Corn Laws, passed in 1847 in the UK, resulted in a decline in the importance of this route for the transportation of grain. Thus, these freights are not used in our estimations after 1857. A limited use of the trend is used to extrapolate freight rates for the period 1858-1879 which are used for steamships.

Figure 6: Freight Rates for Odessa-Marseilles (route no. 3 / cargo: grain): 1835-1857 (1914)

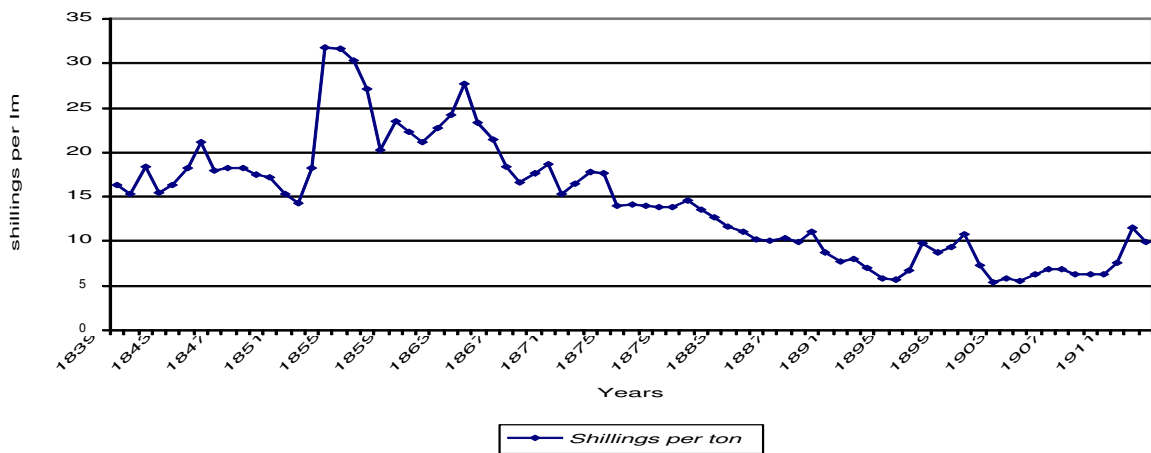


Source: Appendix 4

Moving on to route 3, Odessa-Marseilles (cargo: grain), the figures given by Rallis for 1835-1857 have the same characteristics as the figures he gives for the previous two routes. The freight rates are given mostly in French francs per charge and we transform them into French francs per imperial ton. Once again the trend does not fit adequately well to present a firm ground for forward extrapolations. In this case, however, we make use of the information given by Gould & Angier who state that the freight rates for this route are roughly 75% the corresponding rates for route 1 (Odessa - England). Thus, for the period 1869-1914 the rates used, and reflected in Figure 4, are estimated by use of the route 1 magnitudes given by Gould & Angier multiplied by 0,75. As in the case of route 1, this leaves us with the task of estimating the figures for 1857-1868. Here, these magnitudes were estimated by taking the

figures estimated for route 1 and multiplying them by 0,75²⁰ (Appendix 4). As can be seen in Figure 4, the series determined appears to reflect the overall fall of freights experienced in the 19th century.

Figure 5: Freight Rates for England -Mediterranean (route no. 3 /cargo: coal): 1835-1914



Source: Appendix 5

Finally, route 4 includes freight rates of cargo of coal on the return route from the UK back to the Mediterranean and the Black Sea. As noted earlier on, in this case these are freight rates provided by C. Knick Harley (Figure 5, Appendix 5).

²⁰Alternatively one can make freight forward estimates based on the trend..

B) Weighted coefficient in the use of freight rates according to the importance of routes

Having estimated the necessary freight rates, the next step is to determine a weighted coefficient that will reflect the relative importance of the four typical routes, both for sailing ships and steamships. In this context four distinct sub-periods are discerned:

- ❖ sub-period A1: years 1835-1849
- ❖ sub-period A2: years 1850-1879
- ❖ sub-period A3: years 1880-1899
- ❖ sub-period A4: years 1900-1901

Sub-period A1: 1835-1849

During these years the Greek fleet consists solely of sailing ships. In this regard, we assume that 30% of the trips are from Odessa to Marseilles, 50% from Odessa to Livorno and 20% from Odessa to Northern Europe. The ships are assumed to sail on a full capacity on their outward trip. On the other hand, on their return trip the ships are either assumed to carry various cargoes usually for intermediate destinations (i.e., Marseilles-Barcelona-Marseilles or Marseilles-Civitavecchia) in order to cover some of their costs, or traveling on ballast. For this reason, the receipts for the return trip are estimated as a markup of those realized during the outward trip. The markup adopted for the return trip from N. Europe to Odessa is 25%, from Marseilles to Odessa 30% and from Livorno to Odessa 50%²¹.

Sub-period A2: 1850-1879

In this sub-period sailing ships still dominate although steamships also appear to be owned by Greek shipowners. For sailing ships we use the freights to Marseilles for the outward trips to the Western Mediterranean. The assumption made is that 40% of the trips are to these destinations and the corresponding markup for the return trip is 50%. Of the remaining 60% of the trips, half (30%) are assumed to be made to N. Europe (carrying grain) and the other half (30%) from England to the Mediterranean carrying coal. Obviously there is no markup for the return trip in this case. Steamships are assumed to make two typical trips a

²¹ The percentages, both for number of trips and markups, are obviously conjectures based on a sample of journeys from logbooks of Greek sailing ships and steamships. See Harlaftis, *A History of Greek-owned...*, Chapt. 5.

year to Western Europe. Obviously this is an underestimation of the actual number of trips made each year, but in line with our conservative approach to the subject. The freight rates adopted are those of Odessa-Livorno, estimated on the basis of the trend.

Sub-period A3: 1880-1899

This is a period during which the importance of steamships increases and that of sailing ships declines. Most of the trips of steamships are assumed to be to Northern European ports. In this respect, we assume that 40% of these trips are to Marseilles (grain), the markup for the return trip being 50%. Of the remaining trips, 30% are assumed to be to N. Europe (grain) and 30% from England to the Mediterranean (coal). Sailing ships are assumed to travel only to Mediterranean ports, the typical journey assumed to be to Marseilles (grain). The receipts for the return trip are again estimated by using a markup coefficient (50%).

Sub-period A4: 1900-1914

At this time steamships dominate the fleet. The typical journey is assumed to be from Odessa to N. Europe (grain) and from England to the Mediterranean (coal). Of the total trips steamships made, 45% are assumed to be outwards and 45% inwards. The remaining 10% of the trips are assumed to be to Mediterranean ports. In this case the Odessa-Marseilles trip is adopted as typical and a 50% markup is used to estimate the receipts of the return journey. Finally, the same journey (Odessa-Marseilles) is adopted as typical for the sailing ships still in the fleet (a 50% markup is used to estimate the receipts of the return journey).

C) Ship Tonnage

Long-term research has resulted in the construction of systematic series of historical shipping statistics for the period 1830-1914 including data for all Greek owned sailing ships and steamships. Complete data regarding the capacity of the Greek owned fleet per 5-year intervals are available²². As noted, these data, originating from archival research are given per

²²A research project regarding the shipping companies of the 19th and 20th centuries, that was conducted between 1998 and 2004, resulted in the construction of two large data bases containing data on Greek owned shipping. The project, whose leader was Prof. G. Harlaftis, was conducted under the auspices of the Greek Historical and Literay Archive (ELIA) and was funded by the Stavros Niarchos foundation. The name of the Nereid *Pontoporeia*, protectress of seafarers on long voyages, was chosen for a database of 20,000 vessels, sailing ships and steamships, of the Greek-owned fleet, from the founding of the Greek State to the Second World War. This is the first systematic series of shipping statistics. The data were drawn from twelve sources in Greece and

5-year intervals. In Appendix 1 annual capacity has been estimated by assuming a compound rate of change between the benchmark figures. The results are depicted in Figure 1.

Given the tonnage of the Greek owned fleet, the next step is to calculate its transport capacity. This depends on the capacity of the ship's holds and is calculated with the following formula:

$$\text{Hold Capacity} = \text{Weight of Cargo} \times \text{Capacity Coefficient}$$

The internal space of the ship in gross registered tonnage (grt) or net registered tonnage (nrt) is expressed either in units of 100 cubic feet or in the weight carried by a ship in tons of 2240 lbs²³.

A ton of a ship is, therefore, expressed in units of volume and not of weight, as the matter of importance is the space of the hold that must be filled. However, different cargoes have different weights. A ship carrying iron is half empty in comparison to a ship carrying grain. The volume, in ft³ of a ton (2240 lbs) of a cargo is the so-called capacity coefficient.

abroad: from ship registries, customs archives, mercantile shipping Press, etc., in a project lasting six years. This invaluable database now provides us with detailed data on the fleet of each island and port in the Aegean and the Ionian Sea, the capacity and the kind of ships, the owners, the captains, the place of building and registering and was published in Gelina Harlaftis and Nikos Vlassopoulos, *Pontoporeia, Historical Register of Sailing Ships and Steamships, 1830-1939*, E.L.I.A., Athens 2002 (in Greek). *Pontoporeia* "gave birth" to the second volume in the history of Greek shipping enterprises, *Ploto*: see Gelina Harlaftis, Manos Charitatos, Helen Beneki, *Ploto. Greek shipowners from the late 18th century to the eve of World War II*, E.L.I.A., Athens 2002. On the basis of the statistics provided by *Pontoporeia* and *Ploto*, the largest shipping families by island were selected in the six maritime regions of the Ionian and the Aegean. The trilogy of the history of shipping enterprises was completed by *Eupompe*, the third Nereid who protected voyagers on the high seas. This volume presents the 150 most enduring shipping businesses in the second half of the twentieth century; see Ioannis Theotokas and Gelina Harlaftis, *Eupompe. Greek Shipping Companies 1945-2000*, E.L.I.A., Athens, 2004, (in Greek). *Eupompe* is drawn from a third database of 25,000 ships - unpublished research, Greek Historical and Literary Archive (E.L.I.A) – *Pontoporeia 1947-2000*, which contains detailed information on all the Greek-owned ships, by five-year period, from 1947 until 2000.

²³Source: E. Kostalas, "The loading and stowage of cargoes in ships", Stryidakis Publishers, Piraeus, undated, pp. 107-108. The units of capacity of ships are expressed in net registered tonnage, gross registered tonnage and deadweight tonnage (dwt).

< Gross Registered Tonnage (grt) is a unit used to measure the closed spaces of the ship. The grt corresponds to 100 ft³ or 2,83 m³.

< Net Registered Tonnage (nrt) is a unit used to measure the closed spaces of the ship when the spaces not appropriate for commercial use are subtracted. Such spaces are the crew's eating hall, the space where supplies are kept, the engine room, the fuel and water tanks.

< Deadweight Tonnage (dwt) is a unit used to measure the weight the ship can carry, i.e., its transport capacity. Dwt measures the total transport capacity of the ship when it is loaded up to its loading line. In practice, dwt capacity is the difference between the full-load displacement, i.e., the weight of the ship and the cargo, minus the no-load displacement, i.e., the weight of the ship when it has no cargo whatsoever.

$$\text{Capacity coefficient} = (2240 \text{ lbs/specific weight}) = \text{ft}^3/\text{English ton}$$

As a rule, the capacity coefficient of a ship is larger than its stowage factor because during stowage there is usually a loss of space. This becomes obvious when the cargo loaded is wood. Thus, a cargo of wood of 165 ft³ (wood mass) when loaded on a ship occupies a space of 225 ft³. As a result, in order to ascertain the number of tons we can load in a hold, we must know the stowage or load factor. Stowage factors were determined on the basis of experience. They take into account the usual loss of stowage space and are published in professional manuals. In the table that follows, the stowage factors referring to the cargoes that interest us are included.

Table 3: Stowage factors of various cargoes

| Cargo | Type of Packaging or unpacked | Load factor (ft ³ /ton) |
|-------|-------------------------------|------------------------------------|
| Coal | bulk | 42-48 |
| Grain | bulk | 47 |

Source: E.Kostas, *The loading and stowage of cargoes in ships*, Stavridakis

Publishers, Piraeus, undated.

As can be seen, wheat has a load factor of 47. This means that in 47 ft³ of space one can stow a ton (in weight) of wheat. Similarly, one ton (in weight) of coal can be stowed in 42-48 ft³. Thus, in a ship of 200 nrt = 20.000 ft³ one can stow:

- < 425 tons of grain (20000/47)
- < 476 tons of coal (20000/42, i.e., adopted a load factor of 42)

D) Number of Trips per year

To estimate the number of trips per year we define “a trip” to be the journey of a sailing ship or steamship carrying a cargo from port A to port B. This is consistent with the definition given by Alcibiades Embirikos, a contemporary powerful shipowner: “every voyage will start on the day of departure from the port of unloading and will finish the day

before [the day of departure from the port of unloading]”²⁴. Each journey between the Black Sea / Eastern Mediterranean and the Western Mediterranean / Northern Europe is defined as a trip. In accordance to the above, we have estimated the typical number of trips of a Greek owned sailing ship or steamship. The estimates based on archival data from a sample of 15 logbooks of sailing ships and steamships appear in tables 4 and 5.

Table 4: Typical Number of Annual Trips of Overseas Faring Sailing ships (estimate)

| Years | Annual No.of Trips |
|-----------|--------------------|
| 1835-1838 | 1,25 |
| 1840-1845 | 1 |
| 1846-47 | 2 |
| 1848-52 | 1 |
| 1853 | 2 |
| 1854 | 2,5 |
| 1855 | 2 |
| 1856-57 | 1,5 |
| 1858 | 1,25 |
| 1859-69 | 1 |
| 1870-78 | 2 |
| 1879 | 1 |
| 1880-89 | 2 |
| 1890-99 | 1 |
| 1900-1914 | 1,5 |

Table 5: Typical Number of Annual Trips deep-sea going steamships (estimate)

| Years | Annual No. Of Trips |
|-----------|---------------------|
| 1860-1879 | 2 |
| 1880-1899 | 4 |
| 1900-1914 | 6 |

E) Shipping income

Taking into account all the assumptions, conjectures and estimates presented above, the next task is the estimate of the income of the Greek-owned merchant shipping fleet for the period in question. Gross income (receipts) is estimated by multiplying the minimum, in each case, freight rate per ton of cargo²⁵ by weighted coefficients in all four typical routes by the annual number of trips adopted²⁶. Net income is then estimated by subtracting the estimates of costs incurred during the journeys. These are calculated on the basis of archival information found in ships’ accounts. Such information appears indicatively in Appendix 7.

²⁴G. Harlaftis, *The History of the Greek Owned ...*, p. 166.

²⁵From this point of view then, the estimates result in a very conservative total income figure

²⁶Opting to be conservative, the number of trips adopted for the estimates is also a minimum one.

Finally, all values are expressed in the same currency (Latin Monetary Union drachmae). The results of the procedures described²⁷ appear in Table 6, the end result appearing in columns (m) (values in current drachmae) and (n) (values in LMU drachmae).

²⁷The procedures described can be seen in detail in tables 8-11 in the Appendix.

Table 6: Total Net income of Greek Owned Shipping (1835-1914)

| Year | Itinerary (1): Black Sea (Odessa) - North Europe (England) | | Itinerary (2): Black Sea (Odessa) - Livorno | | Itinerary (3): Black Sea (Odessa) - Marseilles | | | | Itinerary (4): North Europe / England - Mediterranean | | Total | Exchange Rate | Total | |
|------|--|---------------------|---|---------------------|---|----------------------|------------------------|---------------------------|---|---------------------|----------------|------------------|------------------|------------|
| | (1) shillings | (1') £ (a/20) | (2) Lire Fiorentini | (2') (g/30) £ | (3) ff | (3'): £ (c/25) | (3 Alter) shillings | (3' Alter) (e/20) £ | (4) shillings | (4') (i/20) £ | (b+d+h+j) £ | 1£ = drs | drs (current) | drs (LMU) |
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) | (l) | (m) | (n) |
| | | | | | | | | | | | | | | |
| 1835 | 2.247.109 | 112.355 | 15.694.555 | 523.152 | 2.456.919 | 98.277 | 1.965.535 | 98.277 | 0 | 0 | 733.784 | 28,50 | 20.912.845 | 18.612.432 |
| 1836 | 2.855.274 | 142.764 | 10.906.934 | 363.564 | 3.834.497 | 153.380 | 3.067.598 | 153.380 | 0 | 0 | 659.708 | 28,50 | 18.801.678 | 16.733.494 |
| 1837 | 3.534.249 | 176.712 | 8.818.756 | 293.959 | 4.141.622 | 165.665 | 3.313.298 | 165.665 | 0 | 0 | 636.336 | 28,50 | 18.135.573 | 16.140.660 |
| 1838 | 4.661.654 | 233.083 | 10.517.294 | 350.576 | 5.091.768 | 203.671 | 4.073.414 | 203.671 | 0 | 0 | 787.330 | 28,50 | 22.438.902 | 19.970.623 |
| 1839 | 5.455.193 | 272.760 | 13.948.114 | 464.937 | 6.464.371 | 258.575 | 5.171.497 | 258.575 | 0 | 0 | 996.272 | 28,50 | 28.393.743 | 25.270.431 |
| 1840 | 2.469.303 | 123.465 | 5.696.619 | 189.887 | 2.192.908 | 87.716 | 1.754.327 | 87.716 | 0 | 0 | 401.069 | 28,50 | 11.430.460 | 10.173.110 |
| 1841 | 1.750.410 | 87.521 | 5.705.868 | 190.196 | 2.623.865 | 104.955 | 2.099.092 | 104.955 | 0 | 0 | 382.671 | 28,50 | 10.906.115 | 9.706.442 |
| 1842 | 2.867.520 | 143.376 | 6.391.423 | 213.047 | 2.416.104 | 96.644 | 1.932.883 | 96.644 | 0 | 0 | 453.068 | 28,50 | 12.912.426 | 11.492.059 |
| 1843 | 2.116.910 | 105.846 | 5.719.588 | 190.653 | 3.010.324 | 120.413 | 2.408.259 | 120.413 | 0 | 0 | 416.911 | 28,50 | 11.881.975 | 10.574.958 |
| 1844 | 2.650.777 | 132.539 | 6.276.246 | 209.208 | 2.859.136 | 114.365 | 2.287.309 | 114.365 | 0 | 0 | 456.112 | 28,50 | 12.999.206 | 11.569.293 |
| 1845 | 2.964.092 | 148.205 | 5.624.265 | 187.475 | 2.701.399 | 108.056 | 2.161.119 | 108.056 | 0 | 0 | 443.736 | 28,50 | 12.646.478 | 11.255.365 |
| 1846 | 7.525.779 | 376.289 | 17.843.414 | 594.780 | 9.210.714 | 368.429 | 7.368.571 | 368.429 | 0 | 0 | 1.339.498 | 27,69 | 37.090.700 | 33.010.723 |
| 1847 | 9.398.616 | 469.931 | 22.624.399 | 754.147 | 10.625.275 | 425.011 | 8.500.220 | 425.011 | 0 | 0 | 1.649.088 | 28,50 | 46.999.020 | 41.829.127 |
| 1848 | 3.274.106 | 163.705 | 5.156.441 | 171.881 | 2.421.660 | 96.866 | 1.937.328 | 96.866 | 0 | 0 | 432.453 | 28,50 | 12.324.912 | 10.969.172 |
| 1849 | 2.751.521 | 137.576 | 4.309.178 | 143.639 | 2.023.753 | 80.950 | 1.619.003 | 80.950 | 0 | 0 | 362.165 | 28,36 | 10.271.013 | 9.141.201 |
| 1850 | 2.911.152 | 145.558 | 0 | 0 | 3.372.047 | 134.882 | 2.697.638 | 134.882 | 1.184.485 | 59.224 | 339.664 | 28,37 | 9.636.260 | 8.576.271 |
| 1851 | 3.260.056 | 163.003 | 0 | 0 | 3.582.647 | 143.306 | 2.866.118 | 143.306 | 1.033.335 | 51.667 | 357.975 | 28,30 | 10.130.704 | 9.016.327 |
| 1852 | 3.430.561 | 171.528 | 0 | 0 | 4.144.246 | 165.770 | 3.315.397 | 165.770 | 947.183 | 47.359 | 384.657 | 28,30 | 10.885.795 | 9.688.357 |
| 1853 | 12.165.108 | 608.255 | 0 | 0 | 19.968.455 | 798.738 | 15.974.764 | 798.738 | 2.377.537 | 118.877 | 1.525.870 | 28,37 | 43.288.944 | 38.527.160 |
| 1854 | 12.591.945 | 629.597 | 0 | 0 | 20.796.754 | 831.870 | 16.637.403 | 831.870 | 5.064.792 | 253.240 | 1.714.707 | 28,62 | 49.074.915 | 43.676.675 |
| 1855 | 7.654.385 | 382.719 | 0 | 0 | 11.727.669 | 469.107 | 9.058.413 | 452.921 | 3.948.752 | 197.438 | 1.033.077 | 28,45 | 29.391.054 | 26.158.038 |
| 1856 | 3.968.342 | 198.417 | 0 | 0 | 5.217.622 | 208.705 | 4.174.098 | 208.705 | 2.767.427 | 138.371 | 545.493 | 28,45 | 15.519.285 | 13.812.164 |
| 1857 | 3.312.685 | 165.634 | 0 | 0 | 5.326.912 | 213.076 | 4.261.529 | 213.076 | 2.412.139 | 120.607 | 499.318 | 28,62 | 14.290.471 | 12.718.519 |
| 1858 | 2.586.375 | 129.319 | 0 | 0 | 4.860.615 | 194.425 | 3.888.492 | 194.425 | 1.467.396 | 73.370 | 397.113 | 28,40 | 11.278.014 | 10.037.432 |

| | | | | | | | | | | | | | | |
|------|-----------|---------|-----------|--------|------------|-----------|------------|---------|-----------|---------|-----------|-------|------------|------------|
| 1859 | 1.954.283 | 97.714 | 0 | 0 | 3.755.537 | 150.221 | 3.004.430 | 150.221 | 1.324.368 | 66.218 | 314.154 | 28,50 | 8.953.390 | 7.968.517 |
| 1860 | 1.845.838 | 92.292 | 297.279 | 9.909 | 3.627.128 | 145.085 | 2.901.702 | 145.085 | 1.224.743 | 61.237 | 308.523 | 28,40 | 8.762.067 | 7.798.240 |
| 1861 | 1.864.971 | 93.249 | 296.140 | 9.871 | 3.747.366 | 149.895 | 2.997.893 | 149.895 | 1.208.076 | 60.404 | 313.418 | 29,00 | 9.089.131 | 8.089.327 |
| 1862 | 1.884.302 | 94.215 | 295.100 | 9.837 | 3.871.589 | 154.864 | 3.097.271 | 154.864 | 1.354.907 | 67.745 | 326.661 | 29,00 | 9.473.160 | 8.431.112 |
| 1863 | 1.903.833 | 95.192 | 294.150 | 9.805 | 3.999.930 | 159.997 | 3.199.944 | 159.997 | 1.505.813 | 75.291 | 340.284 | 28,37 | 9.653.871 | 8.591.945 |
| 1864 | 1.923.567 | 96.178 | 293.282 | 9.776 | 4.132.526 | 165.301 | 3.306.021 | 165.301 | 1.796.831 | 89.842 | 361.097 | 28,40 | 10.255.154 | 9.127.087 |
| 1865 | 1.943.505 | 97.175 | 292.489 | 9.750 | 4.269.517 | 170.781 | 3.415.614 | 170.781 | 1.582.396 | 79.120 | 356.825 | 28,50 | 10.169.522 | 9.050.875 |
| 1866 | 2.094.251 | 104.713 | 275.284 | 9.176 | 4.704.425 | 188.177 | 3.763.540 | 188.177 | 1.616.494 | 80.825 | 382.890 | 28,60 | 10.950.665 | 9.746.092 |
| 1867 | 2.256.689 | 112.834 | 259.144 | 8.638 | 5.183.635 | 207.345 | 4.146.908 | 207.345 | 1.538.119 | 76.906 | 405.724 | 28,50 | 11.563.132 | 10.291.188 |
| 1868 | 2.431.727 | 121.586 | 243.997 | 8.133 | 5.711.658 | 228.466 | 4.569.326 | 228.466 | 1.542.825 | 77.141 | 435.327 | 28,70 | 12.493.889 | 11.119.561 |
| 1869 | 3.123.363 | 156.168 | 229.773 | 7.659 | 6.293.468 | 251.739 | 4.685.044 | 234.252 | 1.829.020 | 91.451 | 489.530 | 29,40 | 14.392.195 | 12.809.054 |
| 1870 | 6.426.225 | 321.311 | 216.413 | 7.214 | 13.869.085 | 554.763 | 9.639.338 | 481.967 | 4.296.879 | 214.844 | 1.025.336 | 29,40 | 30.144.874 | 26.828.938 |
| 1871 | 8.051.696 | 402.585 | 226.984 | 7.566 | 13.819.711 | 552.788 | 12.077.545 | 603.877 | 3.534.783 | 176.739 | 1.190.767 | 28,50 | 33.936.870 | 30.203.814 |
| 1872 | 6.496.442 | 324.822 | 238.103 | 7.937 | 13.770.513 | 550.821 | 9.744.662 | 487.233 | 3.832.791 | 191.640 | 1.011.631 | 28,80 | 29.134.987 | 25.930.138 |
| 1873 | 7.059.408 | 352.970 | 249.793 | 8.326 | 13.721.490 | 548.860 | 10.589.113 | 529.456 | 4.157.296 | 207.865 | 1.098.617 | 29,00 | 31.859.902 | 28.355.313 |
| 1874 | 5.456.015 | 272.801 | 262.084 | 8.736 | 13.672.642 | 546.906 | 8.184.022 | 409.201 | 4.156.464 | 207.823 | 898.561 | 29,12 | 26.166.103 | 23.287.831 |
| 1875 | 5.053.993 | 252.700 | 275.004 | 9.167 | 13.623.967 | 544.959 | 7.580.990 | 379.050 | 3.305.511 | 165.276 | 806.192 | 29,25 | 23.581.103 | 20.987.181 |
| 1876 | 6.017.269 | 300.863 | 386.951 | 12.898 | 13.384.892 | 535.396 | 9.025.904 | 451.295 | 3.300.271 | 165.014 | 930.071 | 28,96 | 26.934.844 | 23.972.011 |
| 1877 | 4.966.776 | 248.339 | 544.504 | 18.150 | 13.150.012 | 526.000 | 7.450.164 | 372.508 | 3.248.467 | 162.423 | 801.420 | 28,83 | 23.104.952 | 20.563.407 |
| 1878 | 3.216.509 | 160.825 | 766.250 | 25.542 | 12.919.254 | 516.770 | 4.824.764 | 241.238 | 3.174.311 | 158.716 | 586.321 | 30,99 | 18.170.083 | 16.171.374 |
| 1879 | 1.962.237 | 98.112 | 1.078.349 | 35.945 | 6.346.273 | 253.851 | 2.943.355 | 147.168 | 1.573.401 | 78.670 | 359.895 | 29,33 | 10.555.708 | 9.394.580 |
| 1880 | 766.697 | 38.335 | 0 | 0 | 33.849.302 | 1.353.972 | 14.553.907 | 727.695 | 1.022.561 | 51.128 | 817.158 | 28,71 | 23.460.613 | 20.879.946 |
| 1881 | 790.330 | 39.516 | 0 | 0 | 32.932.979 | 1.317.319 | 14.287.937 | 714.397 | 981.883 | 49.094 | 803.008 | 29,33 | 23.552.210 | 23.552.210 |
| 1882 | 720.475 | 36.024 | 0 | 0 | 32.048.338 | 1.281.934 | 12.407.340 | 620.367 | 945.168 | 47.258 | 703.649 | 30,21 | 21.257.241 | 21.257.241 |
| 1883 | 742.683 | 37.134 | 0 | 0 | 31.194.454 | 1.247.778 | 12.185.945 | 609.297 | 897.585 | 44.879 | 691.311 | 28,54 | 19.730.006 | 19.730.006 |
| 1884 | 382.788 | 19.139 | 0 | 0 | 30.370.434 | 1.214.817 | 5.985.652 | 299.283 | 877.803 | 43.890 | 362.312 | 26,19 | 9.488.956 | 9.488.956 |
| 1885 | 434.045 | 21.702 | 0 | 0 | 29.575.414 | 1.183.017 | 6.370.291 | 318.515 | 831.494 | 41.575 | 381.792 | 26,45 | 10.098.385 | 10.098.385 |
| 1886 | 488.099 | 24.405 | 0 | 0 | 28.808.558 | 1.152.342 | 6.937.142 | 346.857 | 840.317 | 42.016 | 413.278 | 30,81 | 12.733.092 | 12.733.092 |
| 1887 | 767.618 | 38.381 | 0 | 0 | 28.069.057 | 1.122.762 | 10.405.139 | 520.257 | 900.868 | 45.043 | 603.681 | 31,58 | 19.064.252 | 19.064.252 |
| 1888 | 804.577 | 40.229 | 0 | 0 | 27.356.131 | 1.094.245 | 10.404.513 | 520.226 | 883.990 | 44.200 | 604.654 | 31,83 | 19.246.138 | 19.246.138 |
| 1889 | 891.067 | 44.553 | 0 | 0 | 26.669.022 | 1.066.761 | 10.996.154 | 549.808 | 1.021.691 | 51.085 | 645.446 | 30,74 | 19.840.999 | 19.840.999 |
| 1890 | 734.826 | 36.741 | 0 | 0 | 14.659.323 | 586.373 | 4.879.174 | 243.959 | 834.957 | 41.748 | 322.448 | 30,87 | 9.953.965 | 9.953.965 |
| 1891 | 704.481 | 35.224 | 0 | 0 | 14.032.229 | 561.289 | 5.165.819 | 258.291 | 647.275 | 32.364 | 325.879 | 32,46 | 10.578.025 | 10.578.025 |

| | | | | | | | | | | | | | | |
|------|------------|-----------|---|---|------------|---------|-----------|---------|------------|-----------|-----------|-------|------------|------------|
| 1892 | 605.335 | 30.267 | 0 | 0 | 14.296.298 | 571.852 | 3.913.084 | 195.654 | 774.170 | 38.708 | 264.629 | 35,91 | 9.502.843 | 9.502.843 |
| 1893 | 756.329 | 37.816 | 0 | 0 | 14.632.945 | 585.318 | 4.330.113 | 216.506 | 789.943 | 39.497 | 293.819 | 39,96 | 11.741.017 | 11.741.017 |
| 1894 | 1.117.184 | 55.859 | 0 | 0 | 15.052.953 | 602.118 | 5.693.249 | 284.662 | 763.269 | 38.163 | 378.685 | 43,73 | 16.559.900 | 16.559.900 |
| 1895 | 959.955 | 47.998 | 0 | 0 | 15.568.795 | 622.752 | 4.378.008 | 218.900 | 874.735 | 43.737 | 310.635 | 45,06 | 13.997.208 | 13.997.208 |
| 1896 | 873.780 | 43.689 | 0 | 0 | 14.977.383 | 599.095 | 3.642.666 | 182.133 | 1.091.879 | 54.594 | 280.416 | 43,43 | 12.178.478 | 12.178.478 |
| 1897 | 1.546.497 | 77.325 | 0 | 0 | 16.361.310 | 654.452 | 5.019.034 | 250.952 | 2.261.322 | 113.066 | 441.343 | 42,75 | 18.867.400 | 18.867.400 |
| 1898 | 1.770.013 | 88.501 | 0 | 0 | 16.033.578 | 641.343 | 5.348.973 | 267.449 | 2.131.836 | 106.592 | 462.541 | 36,85 | 17.044.639 | 17.044.639 |
| 1899 | 1.743.995 | 87.200 | 0 | 0 | 15.786.219 | 631.449 | 4.930.575 | 246.529 | 2.420.001 | 121.000 | 454.729 | 39,12 | 17.788.981 | 17.788.981 |
| 1900 | 2.963.217 | 148.161 | 0 | 0 | 23.423.129 | 936.925 | 7.874.114 | 393.706 | 4.476.574 | 223.829 | 765.695 | 41,08 | 31.454.759 | 31.454.759 |
| 1901 | 4.327.030 | 216.351 | 0 | 0 | 13.295.791 | 531.832 | 3.946.278 | 197.314 | 5.049.673 | 252.484 | 666.149 | 41,45 | 27.611.877 | 27.611.877 |
| 1902 | 4.470.255 | 223.513 | 0 | 0 | 13.149.417 | 525.977 | 3.656.823 | 182.841 | 4.155.864 | 207.793 | 614.147 | 40,68 | 24.983.505 | 24.983.505 |
| 1903 | 5.164.757 | 258.238 | 0 | 0 | 13.069.463 | 522.779 | 3.808.503 | 190.425 | 5.051.807 | 252.590 | 701.253 | 39,24 | 27.517.180 | 27.517.180 |
| 1904 | 5.533.331 | 276.667 | 0 | 0 | 13.058.352 | 522.334 | 3.697.457 | 184.873 | 5.334.698 | 266.735 | 728.274 | 33,80 | 24.615.672 | 24.615.672 |
| 1905 | 6.156.215 | 307.811 | 0 | 0 | 13.118.994 | 524.760 | 3.748.210 | 187.411 | 6.571.140 | 328.557 | 823.778 | 27,38 | 22.555.048 | 22.555.048 |
| 1906 | 6.710.332 | 335.517 | 0 | 0 | 13.695.829 | 547.833 | 3.644.670 | 182.234 | 8.510.405 | 425.520 | 943.270 | 27,45 | 25.892.772 | 25.892.772 |
| 1907 | 7.593.691 | 379.685 | 0 | 0 | 14.443.805 | 577.752 | 3.716.865 | 185.843 | 10.197.243 | 509.862 | 1.075.390 | 27,19 | 29.239.853 | 29.239.853 |
| 1908 | 8.187.225 | 409.361 | 0 | 0 | 15.388.853 | 615.554 | 3.648.392 | 182.420 | 10.819.761 | 540.988 | 1.132.769 | 27,08 | 30.675.382 | 30.675.382 |
| 1909 | 10.588.577 | 529.429 | 0 | 0 | 16.561.456 | 662.458 | 4.339.213 | 216.961 | 12.982.516 | 649.126 | 1.395.515 | 25,79 | 35.990.340 | 35.990.340 |
| 1910 | 11.859.206 | 592.960 | 0 | 0 | 17.422.603 | 696.904 | 4.606.109 | 230.305 | 14.540.418 | 727.021 | 1.550.287 | 24,98 | 38.726.160 | 38.726.160 |
| 1911 | 15.313.844 | 765.692 | 0 | 0 | 18.224.076 | 728.963 | 5.707.044 | 285.352 | 19.294.904 | 964.745 | 2.015.790 | 25,00 | 50.394.740 | 50.394.740 |
| 1912 | 23.277.043 | 1.163.852 | 0 | 0 | 18.911.153 | 756.446 | 8.410.314 | 420.516 | 31.531.935 | 1.576.597 | 3.160.965 | 25,00 | 79.024.115 | 79.024.115 |
| 1913 | 18.180.596 | 909.030 | 0 | 0 | 19.433.173 | 777.327 | 6.425.708 | 321.285 | 28.773.576 | 1.438.679 | 2.668.994 | 25,00 | 66.724.850 | 66.724.850 |
| 1914 | 16.589.794 | 829.490 | 0 | 0 | 19.883.828 | 795.353 | 5.765.401 | 288.270 | 30.517.429 | 1.525.871 | 2.643.631 | 25,16 | 66.513.761 | 66.513.761 |

Table 7: Shipping Income vs National Account Aggregates (1835-1914)

| Year | Shipping Income | GDP (current prices) | Primary Production | M&Q | Secondary Production | Tertiary production | shipping/ GDP | shipping Primary | shipping/ M&Q | shipping/ Sec |
|------|-----------------|----------------------|--------------------|-----------|----------------------|---------------------|---------------|------------------|---------------|---------------|
| | drs (LMU) | drs (LMU) | drs (LMU) | drs (LMU) | drs (LMU) | drs (LMU) | % | % | % | % |
| 1835 | 18.612.432 | 76.038.359 | 64.492.859 | 413.000 | 0 | 11.545.500 | 24,48% | 28,86% | 4506,64% | |
| 1836 | 16.733.494 | 64.873.632 | 52.694.632 | 539.000 | 0 | 12.179.000 | 25,79% | 31,76% | 3104,54% | |
| 1837 | 16.140.660 | 71.130.900 | 58.683.400 | 513.000 | 0 | 12.447.500 | 22,69% | 27,50% | 3146,33% | |
| 1838 | 19.970.623 | 76.561.464 | 62.856.714 | 557.500 | 1.253.000 | 12.451.750 | 26,08% | 31,77% | 3582,17% | 159 |
| 1839 | 25.270.431 | 82.158.944 | 68.249.194 | 562.500 | 1.432.000 | 12.477.750 | 30,76% | 37,03% | 4492,52% | 176 |
| 1840 | 10.173.110 | 90.511.374 | 76.587.224 | 592.500 | 1.431.900 | 12.492.250 | 11,24% | 13,28% | 1716,98% | 71 |
| 1841 | 9.706.442 | 81.524.303 | 66.958.803 | 600.000 | 1.779.000 | 12.786.500 | 11,91% | 14,50% | 1617,74% | 54 |
| 1842 | 11.492.059 | 72.050.835 | 57.022.835 | 658.500 | 1.786.000 | 13.242.000 | 15,95% | 20,15% | 1745,19% | 64 |
| 1843 | 10.574.958 | 70.304.740 | 55.118.490 | 653.000 | 1.883.500 | 13.302.750 | 15,04% | 19,19% | 1619,44% | 56 |
| 1844 | 11.569.293 | 72.286.510 | 57.222.010 | 665.000 | 1.945.000 | 13.119.500 | 16,00% | 20,22% | 1739,74% | 59 |
| 1845 | 11.255.365 | 72.555.290 | 56.130.540 | 607.000 | 2.008.000 | 14.416.750 | 15,51% | 20,05% | 1854,26% | 56 |
| 1846 | 33.010.723 | 77.310.985 | 60.677.735 | 686.000 | 2.606.000 | 14.027.250 | 42,70% | 54,40% | 4812,06% | 126 |
| 1847 | 41.829.127 | 70.202.232 | 52.523.482 | 666.000 | 2.676.750 | 15.002.000 | 59,58% | 79,64% | 6280,65% | 156 |
| 1848 | 10.969.172 | 78.740.260 | 57.827.010 | 716.500 | 2.695.500 | 18.217.750 | 13,93% | 18,97% | 1530,94% | 40 |
| 1849 | 9.141.201 | 81.072.203 | 60.279.703 | 694.000 | 2.827.750 | 17.964.750 | 11,28% | 15,16% | 1317,18% | 32 |
| 1850 | 8.576.271 | 89.725.822 | 68.002.072 | 752.000 | 2.971.250 | 18.752.500 | 9,56% | 12,61% | 1140,46% | 28 |
| 1851 | 9.016.327 | 93.491.567 | 70.386.817 | 567.000 | 3.351.750 | 19.753.000 | 9,64% | 12,81% | 1590,18% | 26 |
| 1852 | 9.688.357 | 111.072.033 | 86.434.533 | 1.009.000 | 4.752.250 | 19.885.250 | 8,72% | 11,21% | 960,19% | 20 |
| 1853 | 38.527.160 | 102.915.915 | 77.666.915 | 1.046.500 | 5.516.750 | 19.732.250 | 37,44% | 49,61% | 3681,53% | 69 |
| 1854 | 43.676.675 | 118.870.213 | 92.941.713 | 919.500 | 5.304.750 | 20.623.750 | 36,74% | 46,99% | 4750,05% | 82 |
| 1855 | 26.158.038 | 109.909.135 | 81.190.135 | 759.500 | 5.810.000 | 22.909.000 | 23,80% | 32,22% | 3444,11% | 45 |
| 1856 | 13.812.164 | 151.598.737 | 120.030.237 | 723.000 | 6.705.000 | 24.863.500 | 9,11% | 11,51% | 1910,40% | 20 |
| 1857 | 12.718.519 | 145.799.997 | 114.082.247 | 936.500 | 6.101.500 | 25.616.250 | 8,72% | 11,15% | 1358,09% | 20 |
| 1858 | 10.037.432 | 136.394.946 | 101.698.946 | 948.500 | 6.807.250 | 27.888.750 | 7,36% | 9,87% | 1058,24% | 14 |
| 1859 | 7.968.517 | 166.176.291 | 127.959.291 | 1.293.500 | 7.469.250 | 30.747.750 | 4,80% | 6,23% | 616,04% | 10 |
| 1860 | 7.798.240 | 152.205.786 | 110.809.536 | 1.363.000 | 7.833.250 | 33.563.000 | 5,12% | 7,04% | 572,14% | 9 |
| 1861 | 8.089.327 | 150.281.238 | 106.252.488 | 1.116.000 | 8.417.250 | 35.611.500 | 5,38% | 7,61% | 724,85% | 9 |
| 1862 | 8.431.112 | 154.490.247 | 109.642.997 | 1.221.000 | 10.281.750 | 34.565.500 | 5,46% | 7,69% | 690,51% | 8 |
| 1863 | 8.591.945 | 160.133.781 | 120.007.531 | 1.740.000 | 11.873.000 | 28.253.250 | 5,37% | 7,16% | 493,79% | 7 |
| 1864 | 9.127.087 | 187.269.130 | 143.128.130 | 1.372.500 | 11.614.250 | 32.526.750 | 4,87% | 6,38% | 665,00% | 7 |
| 1865 | 9.050.875 | 182.285.007 | 130.436.757 | 1.655.000 | 11.913.750 | 39.934.500 | 4,97% | 6,94% | 546,88% | 7 |
| 1866 | 9.746.092 | 194.257.887 | 139.531.887 | 3.736.000 | 12.835.000 | 41.891.000 | 5,02% | 6,98% | 260,87% | 7 |
| 1867 | 10.291.188 | 227.097.909 | 171.949.909 | 5.238.500 | 12.680.500 | 42.467.500 | 4,53% | 5,98% | 196,45% | 8 |
| 1868 | 11.119.561 | 217.616.329 | 158.705.329 | 6.091.000 | 13.457.250 | 45.453.750 | 5,11% | 7,01% | 182,56% | 8 |
| 1869 | 12.809.054 | 193.019.153 | 133.820.403 | 4.859.000 | 14.590.750 | 44.608.000 | 6,64% | 9,57% | 263,62% | 8 |
| 1870 | 26.828.938 | 230.486.438 | 167.804.938 | 6.368.000 | 16.428.250 | 46.253.250 | 11,64% | 15,99% | 421,31% | 16 |
| 1871 | 30.203.814 | 263.454.291 | 200.756.541 | 5.505.000 | 17.052.250 | 45.645.500 | 11,46% | 15,04% | 548,66% | 17 |
| 1872 | 25.930.138 | 221.459.580 | 158.017.330 | 8.445.500 | 17.147.750 | 46.294.500 | 11,71% | 16,41% | 307,03% | 15 |
| 1873 | 28.355.313 | 239.559.808 | 173.312.558 | 7.921.500 | 18.203.500 | 48.043.750 | 11,84% | 16,36% | 357,95% | 15 |
| 1874 | 23.287.831 | 256.489.074 | 183.090.574 | 7.121.500 | 18.740.000 | 54.658.500 | 9,08% | 12,72% | 327,01% | 12 |
| 1875 | 20.987.181 | 256.007.212 | 180.344.712 | 7.544.000 | 21.027.750 | 54.634.750 | 8,20% | 11,64% | 278,20% | 9 |
| 1876 | 23.972.011 | 246.853.109 | 172.084.359 | 6.467.500 | 20.455.000 | 54.313.750 | 9,71% | 13,93% | 370,65% | 11 |
| 1877 | 20.563.407 | 280.196.087 | 206.518.337 | 7.785.500 | 18.976.750 | 54.701.000 | 7,34% | 9,96% | 264,12% | 10 |

| | | | | | | | | | | |
|------|------------|---------------|-------------|------------|-------------|-------------|-------|--------|---------|----|
| 1878 | 16.171.374 | 287.893.761 | 212.820.511 | 9.244.000 | 20.903.500 | 54.169.750 | 5,62% | 7,60% | 174,94% | 7 |
| 1879 | 9.394.580 | 284.472.478 | 203.728.728 | 9.574.000 | 19.566.000 | 61.177.750 | 3,30% | 4,61% | 98,13% | 4 |
| 1880 | 20.879.946 | 294.015.339 | 210.015.839 | 9.655.000 | 19.630.500 | 64.369.000 | 7,10% | 9,94% | 216,26% | 10 |
| 1881 | 23.552.210 | 340.537.237 | 229.740.237 | 9.568.500 | 19.605.000 | 91.192.000 | 6,92% | 10,25% | 246,14% | 12 |
| 1882 | 21.257.241 | 378.493.245 | 276.661.495 | 12.508.000 | 24.400.500 | 77.431.250 | 5,62% | 7,68% | 169,95% | 8 |
| 1883 | 19.730.006 | 402.037.420 | 293.398.420 | 12.457.000 | 24.081.750 | 84.557.250 | 4,91% | 6,72% | 158,38% | 8 |
| 1884 | 9.488.956 | 409.597.771 | 299.697.271 | 12.150.000 | 24.290.500 | 85.610.000 | 2,32% | 3,17% | 78,10% | 3 |
| 1885 | 10.098.385 | 404.370.356 | 270.645.856 | 11.605.500 | 24.075.000 | 109.649.500 | 2,50% | 3,73% | 87,01% | 4 |
| 1886 | 12.733.092 | 427.884.977 | 274.553.477 | 15.396.000 | 25.025.750 | 128.305.750 | 2,98% | 4,64% | 82,70% | 5 |
| 1887 | 19.064.252 | 445.552.567 | 317.689.817 | 19.618.000 | 24.737.250 | 103.125.500 | 4,28% | 6,00% | 97,18% | 7 |
| 1888 | 19.246.138 | 457.843.916 | 325.901.916 | 24.549.500 | 27.325.750 | 104.616.250 | 4,20% | 5,91% | 78,40% | 7 |
| 1889 | 19.840.999 | 441.011.848 | 303.465.348 | 20.955.000 | 26.624.500 | 110.922.000 | 4,50% | 6,54% | 94,68% | 7 |
| 1890 | 9.953.965 | 463.711.498 | 319.211.498 | 23.864.000 | 29.999.750 | 114.500.250 | 2,15% | 3,12% | 41,71% | 3 |
| 1891 | 10.578.025 | 506.074.775 | 359.747.775 | 24.977.000 | 30.962.750 | 115.364.250 | 2,09% | 2,94% | 42,35% | 3 |
| 1892 | 9.502.843 | 530.183.043 | 375.679.543 | 29.941.500 | 32.115.500 | 122.388.000 | 1,79% | 2,53% | 31,74% | 2 |
| 1893 | 11.741.017 | 550.345.214 | 398.734.464 | 32.373.000 | 32.160.000 | 119.450.750 | 2,13% | 2,94% | 36,27% | 3 |
| 1894 | 16.559.900 | 497.796.032 | 348.367.782 | 37.252.500 | 33.260.500 | 116.167.750 | 3,33% | 4,75% | 44,45% | 4 |
| 1895 | 13.997.208 | 519.172.168 | 358.630.168 | 39.794.500 | 37.402.250 | 123.139.750 | 2,70% | 3,90% | 35,17% | 3 |
| 1896 | 12.178.478 | 551.490.094 | 396.748.344 | 35.695.000 | 37.087.250 | 117.654.500 | 2,21% | 3,07% | 34,12% | 3 |
| 1897 | 18.867.400 | 512.247.564 | 324.507.814 | 37.595.000 | 40.639.000 | 147.100.750 | 3,68% | 5,81% | 50,19% | 4 |
| 1898 | 17.044.639 | 568.609.039 | 399.315.789 | 36.145.500 | 43.370.000 | 125.923.250 | 3,00% | 4,27% | 47,16% | 3 |
| 1899 | 17.788.981 | 542.817.095 | 355.169.595 | 40.047.500 | 51.678.000 | 135.969.500 | 3,28% | 5,01% | 44,42% | 3 |
| 1900 | 31.454.759 | 585.318.900 | 390.180.900 | 38.918.500 | 51.012.250 | 144.125.750 | 5,37% | 8,06% | 80,82% | 6 |
| 1901 | 27.611.877 | 663.880.009 | 453.656.009 | 43.662.500 | 60.442.250 | 149.781.750 | 4,16% | 6,09% | 63,24% | 4 |
| 1902 | 24.983.505 | 638.047.417 | 413.002.167 | 40.475.000 | 66.085.000 | 158.960.250 | 3,92% | 6,05% | 61,73% | 3 |
| 1903 | 27.517.180 | 623.984.536 | 390.257.536 | 37.826.500 | 72.574.500 | 161.152.500 | 4,41% | 7,05% | 72,75% | 3 |
| 1904 | 24.615.672 | 572.452.526 | 324.138.276 | 27.915.500 | 79.944.500 | 168.369.750 | 4,30% | 7,59% | 88,18% | 3 |
| 1905 | 22.555.048 | 579.591.946 | 341.398.196 | 18.072.500 | 73.574.750 | 164.619.000 | 3,89% | 6,61% | 124,80% | 3 |
| 1906 | 25.892.772 | 604.516.897 | 348.186.647 | 21.940.000 | 82.835.000 | 173.495.250 | 4,28% | 7,44% | 118,02% | 3 |
| 1907 | 29.239.853 | 646.723.396 | 377.420.396 | 22.631.500 | 88.264.750 | 181.038.250 | 4,52% | 7,75% | 129,20% | 3 |
| 1908 | 30.675.382 | 638.396.799 | 365.892.549 | 23.073.000 | 93.496.000 | 179.008.250 | 4,81% | 8,38% | 132,95% | 3 |
| 1909 | 35.990.340 | 689.464.639 | 409.047.639 | 22.965.200 | 99.996.250 | 180.420.750 | 5,22% | 8,80% | 156,72% | 3 |
| 1910 | 38.726.160 | 660.869.107 | 360.019.607 | 26.193.200 | 105.949.750 | 194.899.750 | 5,86% | 10,76% | 147,85% | 3 |
| 1911 | 50.394.740 | 847.536.747 | 530.826.497 | 23.493.400 | 114.826.000 | 201.884.250 | 5,95% | 9,49% | 214,51% | 4 |
| 1912 | 79.024.115 | 823.862.626 | 486.867.876 | 24.104.500 | 129.610.000 | 207.384.750 | 9,59% | 16,23% | 327,84% | 6 |
| 1913 | 66.724.850 | 856.722.066 | 534.159.816 | 28.122.100 | 138.220.000 | 184.342.250 | 7,79% | 12,49% | 237,27% | 4 |
| 1914 | 66.513.761 | 1.235.786.566 | 886.702.816 | 26.173.600 | 124.401.000 | 224.682.750 | 5,38% | 7,50% | 254,13% | 5 |

Source: Appendices 8-11

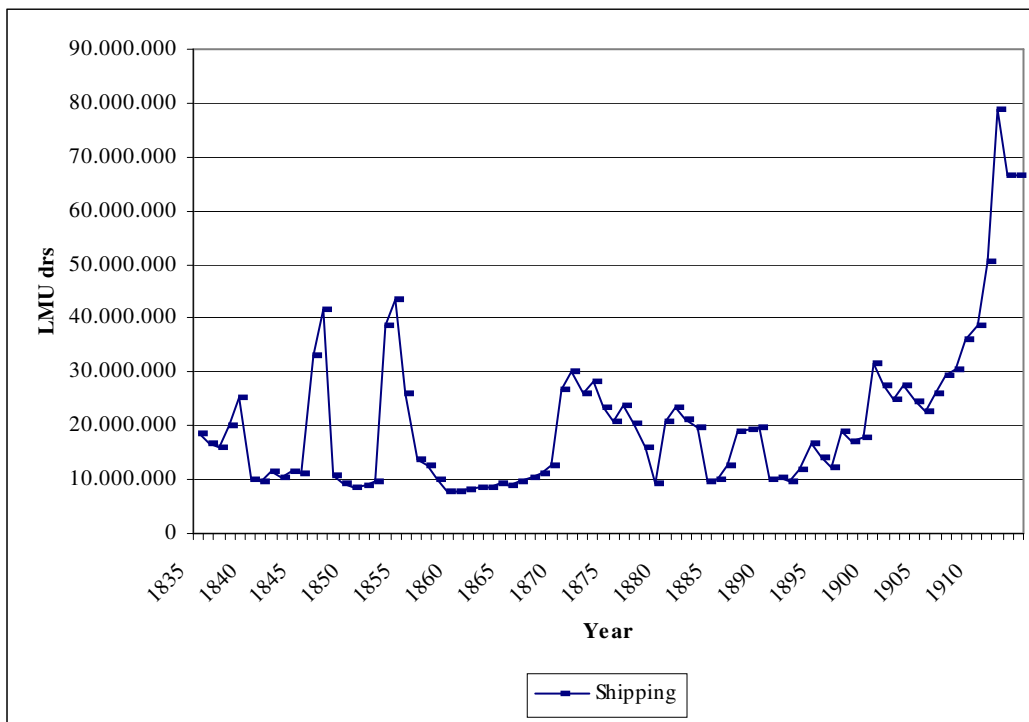
III. THE LEADING TERTIARY SECTOR: SHIPPING INCOME AND GREEK ECONOMIC DEVELOPMENT

Shipping constituted a direct source of income in the economy of the newly established Greek state. A fifty-year period of a rise of the Greek merchant fleet had preceded the War of Independence declared in 1821 and the eventual formation of the Greek state. The Greek island communities of the Aegean and the Ionian seas had flourished on Mediterranean routes and continued to do so during the last two thirds of the 19th century on the routes from the Black Sea and Eastern Mediterranean to the west. Along with shipping, trade and finance had also prospered and it is not surprising therefore that the tertiary sector had an already established comparative advantage. In fact the largest economic centre of the new state became Syros, situated at the middle of the Aegean and becoming the pole of attraction of all entrepreneurship developed around the three above mentioned internationally oriented economic activities.

The income from shipping was a flow of capital originating almost completely from activities beyond the borders of the small Greek state²⁸. This influx of capital consists of the profits of the shipping companies involved and the wages of the seamen. It was essentially funds injected from abroad, invested in the economies of the maritime centers which showed a remarkable shipbuilding activity by building thousands of sailing ships. The transition to steam during the 1880-1914 period on the one hand led to the destruction of this shipbuilding activity, but on the other, resulted on a greater shipping income. As indicated above, this is the first attempt to directly estimate the magnitude of shipping income. It is also the first attempt to appraise the importance of shipping in the context of the economic development of the country during the 19th century. Estimates of shipping income made in this paper, and appearing in Table 6, present us with the opportunity to base this analysis for the first time on firm grounds.

²⁸Additional activities are those of coastal shipping and passenger shipping essentially operating in the Northeastern part of the Mediterranean.

Figure 6: Shipping Income 1835-1914, (in LMU drachmae and current prices)



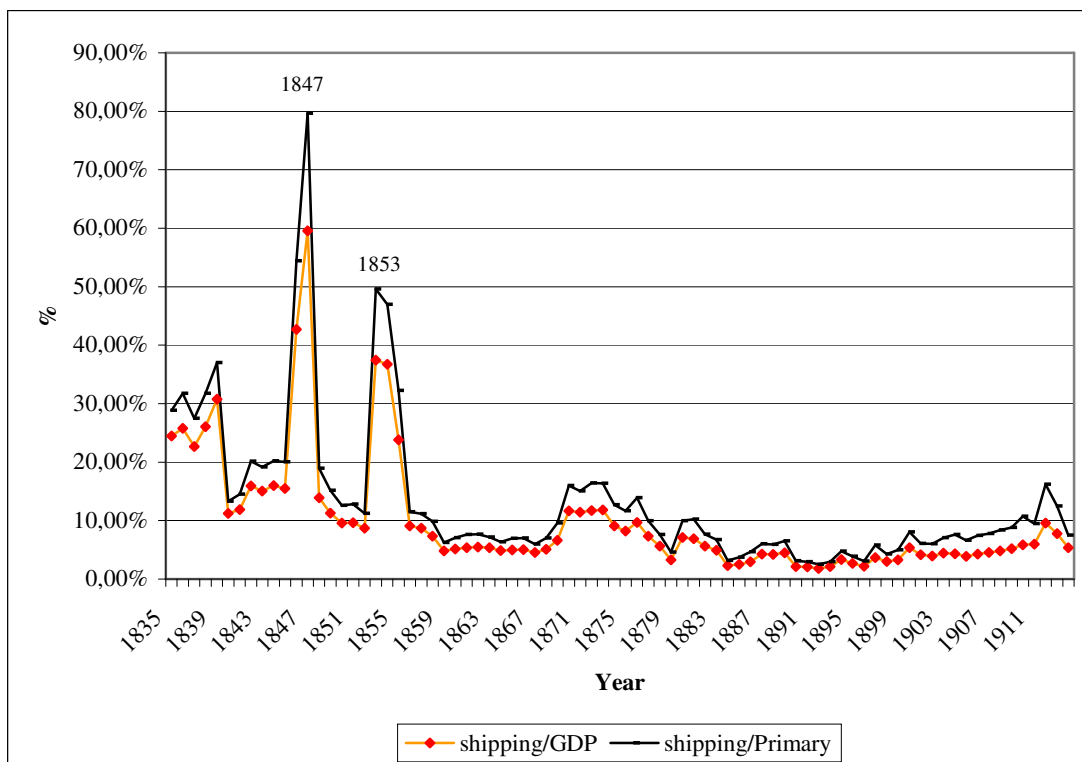
Source: Table 6

Figure 6, based on column (n) of table 6, suggests that from the 1830s to the 1860s the income from shipping varied between ten and forty million Latin Monetary Union (LMU) drachmae. The fluctuations essentially follow the corresponding fluctuations of the freight rates. It is clear that during the high rate years of 1847-1848 and the Crimean war of 1854-1856 shipping income increased threefold and reached two peaks. On the other hand, during the 1860s international freight rates are in a decline and the income of Greek owned shipping fluctuates around ten million LMU drachmae. In the 1870s we have the most stable high income period, i.e., a fluctuation between twenty and thirty million LMU drachmae whereas during the prolonged international crisis of the 1880s relevant income declines and fluctuates between ten and twenty million LMU drachmae. This is the period of the transition from the era of the sailing ship to that of the steamship, a transition which proceeds at a rapid pace and results, after the mid-1890s, in an impressive increase in shipping income. Indeed, the income

from the shipping activities, after the new investments in steamships (see Figure 1), increased dramatically, *i.e.*, up to four times within a decade.

Having discussed the fluctuations of shipping income during the period in question, the next step will be to compare the magnitude with the most important national Accounts Magnitudes, *i.e.* GDP and the corresponding value added in the primary, secondary and tertiary sector of the economy. The figures appear in table 7 and the analysis that follows is based on figures 7,8 and 9.

Figure 7: Shipping Income as a percentage of GDP and the Production of the Primary Sector, 1835-1914



Source: Table 7

In order to analyse the impact of shipping income in the Greek economy, apart from Figures 7, 8 and 9 that include all the period under examination, we will draw information from Table 8. In Table 8 we have divided four twenty-year periods and have calculated the averages of shipping income in the total GDP and in relation to the primary, secondary and

tertiary sector. Before we proceed however, it should be pointed out that the estimates of the National Account Magnitudes refer to the country's borders at each instant, whereas shipping income includes the fleet of the total Greek-owned shipping companies in all Ionian and Aegean islands. The Ionian islands, like Cephalonia and Ithaka, for example, only became part of Greece in 1864, whereas the north-eastern Aegean islands such as Chios became part of Greece in 1912 and those of the south-eastern Aegean such as Kasos in 1946. But we do treat shipping income from all islands of the Ionian and Aegean seas as a whole.

This means that the two magnitudes do not correspond completely and there might be an overestimation of the significance of shipping in comparison to the other sectors of the economy. As much of the income of Greek owned shipping was not created within the country, its comparison with the income of the other sectors is, technically, stretching the limits a bit. Ideally, one should include in the GDP estimates the part of the shipping income created in the islands that were included in the Greek State. This, however, is practically very difficult. Alternatively, one could toy with the idea of adding the total to the other parts of GDP and obtaining a rough equivalent to Gross National Product. This too, however, leads to inconsistencies.

It must, however, be recalled that the estimates are essentially conservative in that minimum freight rates and number of trips have been used. And it should also be noted that there was great mobility, immigration and interrelation with the main Greek centre in Syros, so that it would be much greater discrimination if we do not treat all maritime centers of Greeks as a whole, whether they belong geographically or not to the Greek state. It should also be pointed out that the relevant National Accounts Magnitudes (GDP and Tertiary Production) include an estimate of shipping. This was made indirectly, with the intention to include the income from coastal shipping within the boundaries of the Greek State. So, from this respect the relation of the shipping income we have calculated in relation to the GDP underestimates its importance.

Taking under consideration all the above drawbacks we proceed in Figure 7 where the red line indicates the percentage of shipping income to GDP. During the first period, from 1835 to 1855 shipping income amounted on average 22% of GDP. It must be pointed out that in the boom years, of high freight rates, of 1846-1847 and 1853-1854 this percentage reaches

80%²⁹ and 37% correspondingly, which reveals the impressive potential of shipping income at peak periods of freight rates in the shipping markets. In the next period from 1856 to 1875 shipping income consisted of an average 7% of the country's GDP. This dramatic fall is consequence from two factors: first a long period of low freight rates during the 1860s and second an increase of the country's GDP resulting from the progressive normalization of the country's economic life. In this respect one can not disregard the role of shipping income during the early period of nation-building and the normalization of economic life.

In the 1870s shipping income increases again to 15-16% of the country's GDP despite the continuous increase of the latter. In the last two periods, from 1876 to 1914 shipping income steadily consists 4-5% of GDP. This is the era from the transition from sail to steam, the expansion of Greek boundaries to north and the increase of agricultural produce. It is only after the transition to steam, in the second decade of the 20th century that shipping income becomes a 10% of the country's GDP.

In addition, in Figure 7 the black line shows the percentage of shipping income to that of the primary sector of the economy, which in this case does not include mining & quarrying³⁰. Overall, given the importance of primary production in GDP in the period under consideration, it is not surprising that the fluctuations of the ratio of shipping income to this magnitude are quite similar to its fluctuations *vis a vis* GDP as a whole. In particular, it is high in the earlier decades, *i.e.* 29% in the 1830s and 1840s, it falls to 20% in the 1850s and drops to 7% from the 1860s to the end of the period, excluding the 1870s when it was 12%.

Table 8: Shipping income as an average of National Account magnitudes per decade

| Year | shipping/ GDP (average) | shipping Primary (average) | shipping/ Secondary (average) | shipping/ Tertiary (average) |
|---------|-------------------------------|-------------------------------|----------------------------------|------------------------------------|
| | % | % | % | % |
| 1835-55 | 22,33% | 28,47% | 631,80% | 55,55% |
| 1856-75 | 7,32% | 9,96% | 118,61% | 36,40% |
| 1876-95 | 4,27% | 6,04% | 66,05% | 17,41% |
| 1896-14 | 4,82% | 7,81% | 40,73% | 19,87% |

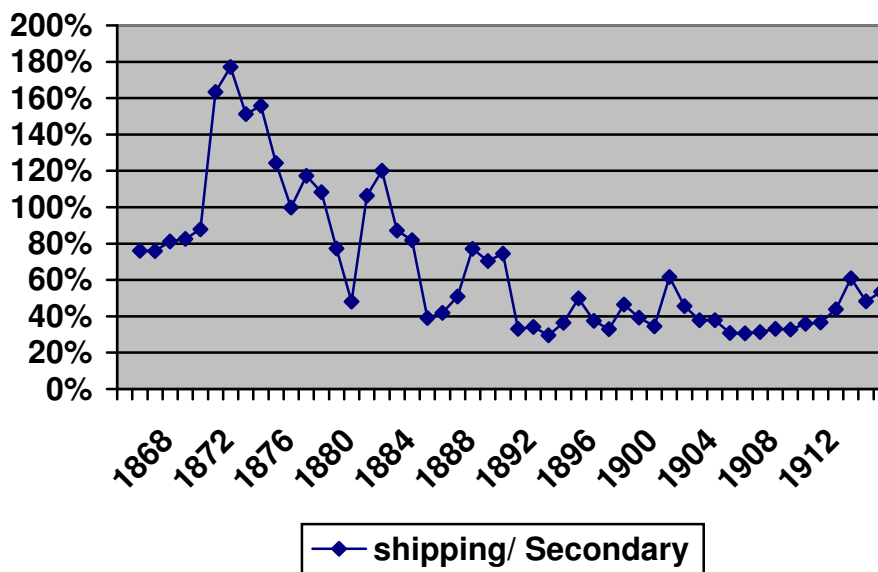
Source: Table 7

²⁹The period 1841-1849 was also a period of a sharp decline in GDP.

³⁰The production of mining and quarrying was estimated separately and can be added on to that of primary production as defined here.

In Figure 8 the percentage of shipping income to the production of the secondary sector (manufacturing) is depicted. During the first three decades of the existence of the Greek State the sector was almost completely nonexistent, a fact depicted clearly on the Figure. Thus, during this period shipping income is about five times that of the secondary sector. Starting in the 1860s and up to the 1880s, in spite of the establishment and modest growth of the secondary sector, shipping income appears still to be greater than value added originating in manufacturing. Only after 1890 and up to 1914 did the secondary sector grow sufficiently so as for its contribution to GDP to surpass shipping income. During this latter part of the period, shipping income appears to be 40% of value added in manufacturing.

Figure 8: Shipping Income as a Percentage of Value Added Originating in the Secondary Sector, 1865-1914

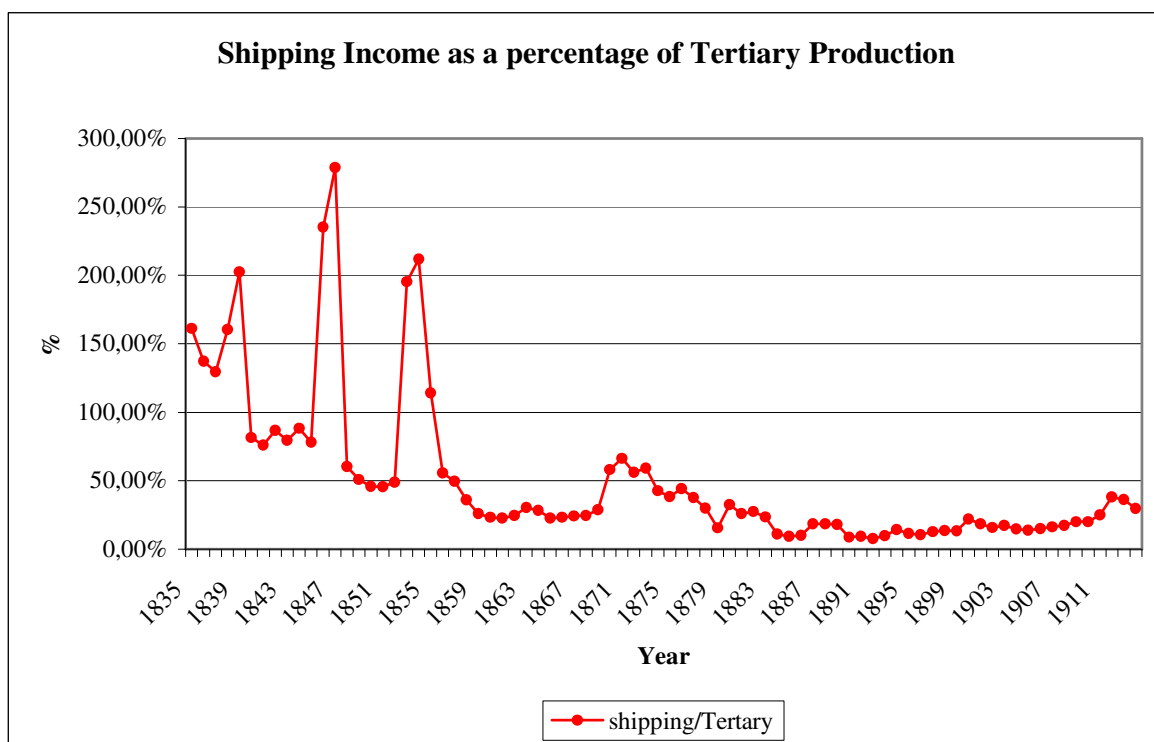


Source: Table 7

Finally, in Figure 9 the percentage of shipping income to the income generated in the tertiary sector as a whole is depicted. This comparison invites more caution than the previous ones as, given that, the tertiary production magnitude includes an indirect estimate of shipping income, albeit this referring to coastal shipping. Tertiary production is defined here to include the public sector, commerce, transportation, communications, banking, insurance,

health, education, construction etc, and, in addition to shipping, certain other activities have also been indirectly estimated. The analysis then can be said that it is on shaky grounds and caution is called for. Having said that, there is no way one can underestimate the importance of the income created by shipping in comparison to the income of the tertiary sector in general. Thus, in the earlier decades and up to the 1860s, income from shipping fluctuates sharply from about 50% (late 1840s) to over 100% (early 1830s, mid-1840s and mid-1850s) of tertiary sector income, while there also appear to be two short periods of stability (early 1840s and early 1850s). Then, after the 1860s it usually fluctuates around 20% of tertiary sector income, increasing to over 50% in the early 1870s.

Figure 9: Shipping Income as a Percentage of Income Originating in the Tertiary (Services) Sector, 1835-1914



Source: Table 7

From what was noted above, and in spite of the reservations one might justifiably have given the nature of the estimates involved, it should be clear that the overseas shipping activity of the fleet owned by Greeks was quite significant in the context of the country's

economy during the period examined. In fact, during the earlier part of this period, i.e. from 1850 to 1880, this income, originating from the activities of the Greek ship owners outside the narrow confines of the Greek State, amounted, on average, to approximately 12% of the country's GDP, to 15% of the income of the narrowly defined primary sector, 300% of manufacturing and to 63% of the income of the tertiary sector. Thereafter, as the country slowly became more stabilized and organized and the denominators of the fractions increased, these percentages fell to more normal, and definitely still quite significant, magnitudes.

Overall, in spite of the limitations of the data and the doubts that may be cast upon the accuracy of these percentages, it appears that the evidence is overwhelming. The importance of Greek-owned shipping in the Greek economy throughout the period under examination cannot be doubted. Shipping income along with agriculture were the main factors of the development of the Greek economy during the first fifty years of the country's existence. In fact, at the outset of World War I one can still safely assert that Greece was largely an agricultural and maritime nation.

