UNIVERSITY OF OXFORD

Discussion Papers in Economic and Social History

Number 18, Sept. 1997

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NEUTRALITY AND MEDITERRANEAN SHIPPING UNDER THE DANISH FLAG, 1750-1807

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The paper tests the hypothesis that the consistent neutrality of the Danish Monarchy during the great wars of the eighteenth century may have permanently increased the kingdom's shipping in the Mediterranean. It does so by using data derived from Algerian Passport Registers for the years 1750-1807. Modern time-series techniques are applied to analyse the relative importance of neutrality and favourable factor endowments. We show that the data lends qualified support to both hypotheses, with two thirds of the rise in Danish shipping attributable to neutrality and the remainder, by implication, to favourable factor endowments.

War is not just the ultimate arbitrator between states, but also a powerful agent of economic change and social transformation within them.[1] The relationship between the world wars of the twentieth century and economic growth is an obvious example,[2] but the concept can also been applied to earlier centuries. A famous debate concerns whether the American Civil War speeded up or retarded North American industrialisation.[3] For the eighteenth and early nineteenth century war has been used to explain a puzzle - the relatively slow rate of British economic growth during the industrial revolution.[4] The argument is that the Revolutionary and Napoleonic wars raised state borrowings and crowded out private sector investment. On the other side of the English Channel much research has been done on the economic effects of Continental Blockade and Britain's naval stranglehold which on the one hand disrupted economic life, but on the other gave continental industries a breathing space from British competition.[5]

The focus has almost exclusively been on major states like Britain and France. Smaller states have not received the same attention, but from a methodological point of view the experience of smaller states is just

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1 Cf. J.M. Winter: 'The Economic and Social History of War', in: J.M. Winter, ed., *War and Economic Development. Essays in Memory of David Joslin* (Cambridge 1975), p. 1-10.

2 The latest example is D. Greasley and L. Oxley: 'Discontinuities in Competitiveness: The Impact of the First World War on British industry', *Economic History Review* 49 (1996).

3 T. C. Cochran, 'Did the Civil War Retard Industrialization?', *Mississippi Valley Historical Review* 48 (1961).

4 Cf. N.F.R Crafts, 'British Economic Growth, 1700-1850: Some Difficulties of Interpretation', *Explorations in Economic History* 24 (1987); J. R. Williamson, 'Debating the British Industrial Revolution', *Explorations in Economic History* 24 (1987); J. Mokyr, 'Has the Industrial Revolution Been Crowded Out? Some Reflections on Crafts and Williamson', *Explorations in Economic History* 24 (1987), pp 245-325.

5 F. Crouzet, *L'economie Britannique et le Blocus Continental* (Paris 1958) and *The First Industrialists: the Problem of Origins* (Cambridge 1985).

as important. The stakes, however, might well have been higher for smaller states. Our aim here is to test the hypothesis that during the second half of the eighteenth century a small state like Denmark-Norway may have reaped long-term economic benefits from deliberately exploiting its neutrality during the great power conflicts.

DENMARK-NORWAY IN THE EIGHTEENTH CENTURY

In the second half of the eighteenth century, the merchant navies of Denmark-Norway and Sweden-Finland grew rapidly. Contemporaries (and later historians) estimated that, by the end of the century, they could boast the fourth and fifth largest merchant fleets in Europe - fleets that were out of all proportion to the size of their populations. This was all the more remarkable because the eighteenth century was the most Machiavellian of all - small states were attacked, divided, and devoured by powerful neighbours and shipping was restricted by national preferences and Navigation acts.[6]

The case of Denmark-Norway is of special interest because of the kingdom's low level of economic development and lack of imports and exports. There was very little industry or manufacturing, and the main export staples were Norwegian timber and fish. Apart from Denmark proper it consisted of the Kingdom of Norway, and the Duchies of Schleswig and Holstein in Northern Germany. Beyond that there were the Faeroes, Iceland and Greenland in the Atlantic, the Virgin Islands in the Caribbean, the fortresses of Christiansborg in present-day Ghana, Tranquebar in India on the Coromandel coast, and finally a trading post in Canton. Population merely numbered about 2.5 million.[7] The three small sugar producing islands in the Caribbean were linked with the metropolitan country in an English-style mercantile system. Although they were certainly 'jewels in the crown' of the Danish king, the volume of sugar transported to the tables Europe was insufficient to be the basis of a large merchant navy.

Despite these inconspicuous starting conditions, the Danish Monarchy built up over the course of the eighteenth century a merchant navy about 1/3 the size of the British, 1/2 of the French, and on par with the Dutch. Danish tonnage per head of population probably exceeded the British ratio by half. Copenhagen had become a centre of exchange between the Baltic and western Europe and may possibly have been the busiest port in Europe in relation to its size. In the Mediterranean - and elsewhere - this remarkable expansion was driven by acting as a carrier for others.

Danish contemporaries and many later histories ascribed the rise and expansion of Danish shipping to the persistent policy of neutrality which the government pursued with great success throughout the century. From 1720 to 1807 Denmark had peace apart from brief wars or skirmishes with Russia 1762, Sweden 1788 and Britain 1801. It all came to an end in the autumn of 1807 when Britain "copenhagened" the Danish navy and Denmark was forced into the Napoleonic wars on the French side.

There is no reason to doubt the genuine pacifism and abhorrence of war which Danish ministers expressed on many occasions, but they also acted on the assumption that a major European conflagration

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6 H.C. Johansen, 'Scandinavian Shipping in the late Eighteenth Century in a European Perspective', *Economic History Review* 45 (1992). P.W. Schroeder, *The Transformation of European Politics 1763-1848* (Oxford 1994) pp. vii-viii and 46-52.

7 From now on, we shall use the terms Danish and Denmark to describe the whole monarchy.

offered neutral shipping substantial economic benefits of a potentially long term nature. For that reason Danish neutrality was not just a passive declaration of non-involvement. During the wars Denmark put pressure on the belligerent states to secure recognition of neutrals' rights, a narrow definition of contrabands, the right to sail to ports not immediately blockaded by warships etc. Shipping and trading companies were founded to exploit the opportunities created by the war time boom and absence of many competitors. All this points to the conclusion that the aim of the Danish government was not just to earn some fast money during the war, but use it to secure a foundation for future economic growth.[8]

But were the leaders of Danish foreign and commercial policy right? Was neutrality crucial in creating the expansion of Danish shipping, or was it rather due to "normal" economic advantages such as low wages, good crew-tonnage ratios, and favourable geographic location on the important trade route between the Baltic and the Mediterranean. In most years between 1750 and 1800, Danish shipping saw some growth - irrespective of war or peace. What is subject to debate is whether the pace accelerated in wartime due to the benefits of neutrality. Further, if this was the case, we need to ask if this was only a temporary effects - or did it persist after the conclusion of peace? In 1975 Hans Chr. Johansen analysed the Sound toll registers and Danish consular reports and pointed out that shipping rose both in war and peace. Indeed, it seemed that in some cases growth was slower during years of war. However, he explicitly excepted shipping to the West Indies and the Mediterranean where growth was extremely high and there might be a persistence effect.[9]

Before the mid-century very few Danish ships sailed to the Mediterranean due to fear of capture by Barbary corsairs.[10] Between 1747 and 1753, Denmark concluded treaties with the North African states of Algiers, Tunis, Tripoli and Marocco which secured free passage for unarmed Danish ships. Out of a total of approximately 20,000 voyages beyond Cape Finisterre in the period 1747-1807, more than 15,000 went to the Mediterranean.[11]

Examples from two major Mediterranean ports give a first impression of the Danish fleet's increasing market share:

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8 For the Danish government's conception of neutrality see O. Feldbæk, 'Eighteenth Century Danish Neutrality: its Diplomacy, Economics and Law', *Scandinavian Journal of History* 8 (1983), p. 3-21, and O. Tuxen, 'Principles and Priorities. The Danish View of Neutrality during the Colonial War of 1755-63', *Scandinavian Journal of History* 13 (1988). In a number of works Feldbæk has analysed the diplomacy and practice of Danish neutrality. See especially *Dansk neutralitetspolitik under krigen 1778-1783* (Copenhagen 1971) with an English summary and *Denmark and the Armed Neutrality, 1800-1801* (Copenhagen 1980).

9 H. C. Johansen, 'Den danske skibsfart i sidste halvdel af det 18. århundrede', *Erhvervshistorisk Årbog* 26 (1975). In recent works Johansen has emphasised the importance of purely economic factors. See 'Danish Shipping services as a link between the Mediterranean and the Baltic, 1750-1850', in: L.R. Fischer and H.W. Nordvik, eds., *Shipping and Trade, 1750-1950',* (Pontefract 1990) and 'Scandinavian Shipping in the late Eighteenth Century in a European Perspective', *Economic History Review* 45 (1992).

10 For convenience's sake we include Portugal and the Atlantic coast of Spain beyond Cap Finisterre in the term Mediterranean.

11 E. Gøbel, 'De Algierske Søpasprotokoller. En kilde til langfarten 1746-1840', *Arkiv* 9 (1982/83). Database of Algerian Passports.

Table 1: Arrivals of Danish and ships of other important shipping nations in Barcelona (B) and Livorno (L); selected years.

	1785		1790		1798		1802	
	B	*L*	*B*	*L*	*B*	*L*	*B*	*L*
Denmark-Norway	68	44	42	49	174	85	171	105
France	125	52	172	94	50	15	64	62
Netherlands	30	9	73	30	NA	NA	20	8
England	81	102	74	116	3	14	129	209
Sweden-Finland	24	29	2	7	34	28	31	13
Genoa	39	6	25	23	46	29	16	11
United States	NA	NA	1	NA	23	10	58	42
Ragusa	5	63	17	53	39	128	45	169
Venice	21	30	4	14	NA	NA	NA	NA
Naples	50	25	17	27	29	90	19	25

Sources: Livorno: Annual shiplists from the Danish consuls. The weekly magazine *Handels- og Industritidende* from 1782. The statistical reports collected by "Kommercekollegiet" from 1796. Jean Pierre Filippini, 'Il Movimento del porto di Livorno durante il primo periodo lorenese (1737-1801)', in C. Zeffiro and L. Rombal, eds., *La Toscane dei Lorena* (Florence 1989) p. 74-75. Barcelona: P. Vilar, *Cataluña en la España Moderna*, vol. 3 (Barcelona 1988), p. 118. It should be pointed out that Vilar's numbers for Danish ships are not always the same as the as the ones from the Danish consul in Barcelona. For reasons of comparison we have used Vilar's numbers.

Lack of data does not allow us to examine all the years that are of interest. Nonetheless, the relationship between war and number of arrivals is striking even in this limited sample. In 1790 Swedish ships had by and large disappeared from the Mediterranean. This is probably best explained by the Russo-Swedish war of 1788-90. Likewise the British nadir in 1798 is due to the fact that Britain only regained naval mastery of the Mediterranean after the battle of Abukir on 1. August 1798. Even more interesting for our purposes is the fact that the mere threat of war influenced shipping markedly. In 1784-85, when war between the Emperor and the Netherlands seemed imminent, Dutch shipping was correspondingly hit.

Sources and Interpretations

We use a database of more than 15,000 voyages between Denmark and the Mediterranean 1747-1807 derived from the 'Algierske Søpasprotokoller' preserved in the National Archive in Copenhagen.[12] These are copybooks of the so-called Algerian or Turkish passports which all Danish ships by royal decree had to buy for voyages beyond Cap Finisterre. This passport system was introduced after the treaty with Algiers 1747 and continued until 1840, when buying a passport was made voluntary. The register for the years 1772-77 has been lost. The information contained in the registers is remarkably similar throughout the century it was in use. Usually the following pieces of information are supplied: 1. passport number, 2. name of ship, 3. name of master, 4. name of one or more of the owners, 5. port in which the ship was registered, 6. tonnage of ship expressed in commercial lasts, 7. date when owners swore an oath that no foreigners had a share in the ship, 8. date when the passport was issued, 9. date when the passport was returned (until 1791), as well as further

[12] Rigsarkivet, Kommercekollegiet, no. 195-202, 1186-90, 1850-54. There is a detailed discussion in Gøbel 1982/83.

information such as payment of a passport fee, refund of fee because voyage did not take place, and unusual events such as loss of passport due to shipwreck.

Obviously we are dealing with a source of potentially high value, but also one requiring careful consideration of possible inaccuracies or systematic biases. After all we are using an eighteenth century source for a purpose for which it was not intended. The authorities in Copenhagen only wanted to keep track of the precious passports, whereas our intention is to reconstruct shipping under Danish flag. A number of limitations need to be mentioned.

In the strictest sense the registers only contain notices about planned voyages, but in the cases where the passport was not used the full fee of 52 rixdollars was refunded and a small note written to that effect in the register. Such passports have not been included in the calculations. Conversely there were extremely few voyages without a passport. Local magistrates in Denmark and Danish consuls in foreign ports controlled that ships under Danish flag were issued with a passport. If the fine of double the price of a passport was not enough to discourage the foolhardy, the risk of capture by Barbary corsairs should have been.[13]

The tonnage of the ships is given in so-called commercial lasts (1 last = 2.6 English tons). However, by a secret royal decree in 1672 all Danish ships had their lasts reduced by 1/6 at the official measurement in Copenhagen.[14] This reduced the various fees the ship had to pay and gave Danish ships a competitive advantage, but presents the historian estimating the size of the Danish merchant marine with a problem. It is not possible merely to add 20% to the lasts because for secrecy reasons the ships were only reduced when they came to Copenhagen and we do not know the ratio of 'reduced' to 'unreduced' ships. Another problem is that the method of measurement was fairly primitive and overestimated the carrying capacity of sharpgoing as opposed to flatgoing ships with an oblong hull. Unfortunately (for our purpose) the proportion of the former increased throughout the century.[15] In reality there is nothing that can be done; using the unadjusted data is the accepted procedure in works on Danish shipping.[16] Introducing corrections at our present level of knowledge only increases the risk of distortions. We should also point out that the possible inaccuracies are not large. They may also at least partly cancel each other out. The load factor of a sharpgoing ship was less than that of a flatgoing one, but on the other hand it probably sailed faster.

Tonnage at sea is obviously a better proxy for shipping output than the number of voyages. We do, however, lack direct information on the time at sea. We have therefore substituted the time between issue and return of passport for each ship. The dates for issue and return are the dates for issue and return in Copenhagen. How much time passed between the issue of passport and the ship setting sail - and, conversely, between return of the ship and the passport? Did this interval vary from one year to the next? There are good reasons to assume that a ship owner would not ask for a passport a long time in advance of the ship's departure. The

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13 E. Gøbel 1982/83 only finds few ships without a passport.

14 A. Monrad Møller, 'Skibsmålingen I Danmark 1632-1867', *Handels- og Søfartsmuseets Arbog*' 1974, with an English summary. Corrected in Møller, *Fra galeoth til galease* (Esbjerg 1981) with an English summary, p. 43-46. Since methods of measurement were rather crude, conversion into tons is not without difficulty.

15 O. Ventegodt, 'Flensburg's 'Flatgoing' and 'Sharpgoing' Ships between 1750 and 1807', *5th International Congress of Maritime Museums, Proceedings 1984* (Hamburg 1985).

16 An example is E. Gøbel,' Volume and Structure of Danish shipping to the Caribbean and Guinea, 1671-1838', *International Journal of Maritime History* 2 (1990), p. 115.

passports were valid for 2 years, renewable upon paying a fee. There was no reason for an owner to waste any of this time by having a passport gathering dust in his office. Indeed ships picking up a cargo in the Baltic often received their passport in Elsinore on the outward journey.[17] More problems arise at the end of the voyage. By decree the captain had to hand in his passport immediately upon returning. Yet local authorities might have saved postage by collecting several passports before sending them to Copenhagen. Indeed we see that in the registers there are sometimes small groups of passports from one port with same return dates. But the return dates are distributed over the year, not clustered around e.g. New Years Eve. Local authorities were continuously sending passports to Copenhagen which is only to be expected. An Algerian passport was a valuable document which the authorities in Copenhagen kept track of - hence the registers - and which you might not want to have in your possession longer than strictly necessary.

This optimistic assessment of the validity of dates for issuing/return of passports for getting time at sea is confirmed by a brief study of the customs registers in Bergen, Norway, 1750-59.[18] Dates of clearances for outgoing and incoming ships are well in tune with dates for issuing and return of Algerian passports. On an average an Algerian passport is issued 19 days before the ship is cleared through customs and it is returned 17 days after the date of customs clearence.

A related problem is that time at sea is not necessarily the same as time with a cargo. Could an increase in shipping output simple hide time at sea searching for a cargo? It may be so. However, as running costs were very high compared to initial capital outlay[19] an owner would not let his ship sail around for a very long time without a cargo. Then better pick up an unsatisfactory freight or let the ship be laid up until times changed for the better.

Finally there are changes in productivity. Given among other things better organisation in ports we would expect an increasing rate of capacity utilisation as the century progressed.[20] If there is such a development we would expect it to assert itself slowly and continuously over time. It may even have been reversed during the Revolutionary and Napoleonic wars when blockades, changes in borders and nations, disruption of the post etc., dislocated economic life.[21]

The Algerian Passport registers are a unique source for the history of maritime shipping. They do not contain all the information that would be ideal for estimating shipping output, and where lack of information exists, educated guesses have to be made. Despite these limitations, it is unusual by the standards of eighteenth century sources for its reliability, homogeneity and completeness. With these caveats in mind, we can proceed to constructing a measure of Danish shipping output.

An intuitive measure of the success of Danish shipping is the number of voyages departing each year. We will use this measure in subsequent analysis. There are, however, a number of problems with this approach. First, the length of voyages varies dramatically - Danish ships could return after a few months, or

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17 O. Ventegodt, *Redere, Rejser og Regnskaber* (Flensburg 1989) with a German summary.

18 We are very grateful to Tore L. Nilson, Maritime History Museum in Bergen, for permission to use his database of Bergen ships.

19 An analysis of the accounts published by Ventegodt 1989 p. 190-238 shows that annual running costs were 25 - 75% of initial capital outlay.

20 We thank Avner Offer for this point. About eighteenth century productivity increases see note 22.

21 C. A. Keene, 'American Shipping and Trade, 1798-1820: The Evidence from Leghorn', *Journal of Economic History* 38 (1978), p. 690-691.

plough the waters of the Mediterranean for years. Second, the size of ships was also not constant. While the smallest vessels would be able to carry 25 lasts (1 last = 2.6 tons), the largest ships in the Danish merchant navy operating in the Mediterranean could measure up to 200 lasts.[22] Finally, if ships departing in any one year often only return in the following year or even later, then using the number of voyages as a proxy for shipping output would be seriously flawed.

For these reasons, we constructed an alternative index to compute shipping output:

$$Q^t = \sum_{i=1}^{n^t} D_i^t L_i^t \qquad (1)$$

where Q^t is shipping output in year t, n^t is the number of ships at sea in this year, D_i is the number of days an individual ship is at sea, and L_i is the number of lasts it can carry. Ships were departing at different times of the year, and many voyages lasting longer than one year. To derive the length of time a ship was at sea in any year, we calculated the number of days remaining in the year after the passport had been issued. If this was longer than the time between issue and return of passport, then we used the interval between issue and return of passport as an indicator of the time at sea. In the alternative case of a ship not returning in the same year as the issue of passport, the number of days it was at sea in the second year was calculated. Multiplied with L, the number of lastdays at sea in the second year of voyage is then assigned to t+1. This iterative procedure was applied until the ship returned its passport. For the first period, 1747 to 1771, there was only a small number of missing values. During the later years from 1778 to 1807, the years after 1790 do not contain information on the return of passport.[23] As the average length of voyages did not vary by much, we decided that it was improbable that major discontinuities could have occurred during this period.

The starting years of each series are problematic because, in the calculation of total shipping output, they do not 'receive' lastdays at sea from voyages initiating in preceding years. In the case of 1747-71, this is irrelevant since there was probably very little Danish shipping to the Mediterranean before the conclusion of treaties with the Barbary states. There is no 'shortfall' due to the technique used. At any rate, because of obvious data deficiencies, we excluded the years 1747-50 from our analysis. For the sample from 1778-1807, a different approach was adopted. The vast majority of voyages was completed within five years. We therefore do not expect the years after 1782 to be affected by the lack of observations before 1778. We ran a regression of

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22 Changes in the size of ships are emphasised by D. C. North ('Sources of Productivity Changes in Ocean Shipping, 1600-1850', *Journal of Political Economy* 76 (1968)). The issue of productivity change in ocean shipping is further discussed in J. F. Shephard, G. M. Walton, *Shipping, Maritime Trade, and the Economic Development of Colonial America* (Cambridge 1972); C. A. Keene 1978; R. R. Menard, 'Transport Costs and Long-range Trade, 1300-1800: Was there a European Transport Revolution in the Early Modern Era?', in: J. D. Tracy, ed., *The Political Economy of Merchant Empires* (Cambridge 1991).

23 At times, the date for the issue of passport was missing as well. In these cases, we also assigned the average day of the year when other ships received their passports.

shipping output on the number of voyages departing in each year, and used the estimated relationship between the two to calculate shipping output for the years 1778 to 1782.[24]

Table 2: Alternative definitions of war and peace

	Consensus	*Extreme War*	*Extreme Peace*
Seven Years War	1756-63	1755-63	1756-62
War of American Independence	1778-83	1778-84	1778-82
Revolutionary Wars	1793-1807	1793-1807	1793-1801; 1803-1807

One further point should be made - our analysis depends crucially on designating individual years as a time of peace or war. We have defined a major war as one involving several European countries including Britain. As the latter was the major naval power and shipping nation any war involving her would have serious repercussions on maritime trade. But when did the war start and when did it end? War might break out or end at any time during the calendar year, making it difficult to unequivocally assign the year as a whole to either peace or war. There might be a period of skirmishes before the actual declaration of war. It was also common to sign preliminaries of peace long before the actual peace treaty. When bad communications are added to this, the result is a more fluid state between complete peace and wide-spread hostilities. Our solution has been to use three alternative definitions of war: a 'consensus' set of years, as well as ones derived from the most stringent interpretation of either war or peace (table 2). We then test the sensitivity of our results to any changes in definition

Data Analysis

Two competing hypotheses can be distinguished in the historiography of eighteenth century Danish shipping. Some scholars - Ole Feldbæk most prominently among them - have argued that Denmark's spectacular performance was at least partly due to the diplomatic skill and insight of her policy makers. Adopting a policy of neutrality allowed the Danish fleet to operate in an environment of much greater certainty - the danger of yet another war disturbing merchant shipping had to be less of a preoccupation for the subjects of the Danish crown and the foreign merchants using the services of Danish ships. Further, if hostilities did break out, there was a high chance of windfall profits for ship owners in neutral states. With competitors absent or at least hamstrung, existing capacity could be used to the full and sold at a premium. Significantly, gains in market share carried over into subsequent years of peace. The alternative interpretation rejects the view that Denmark simply acted as a 'scavenger', preying upon the commerce of its rivals in times of duress. Instead, Johansen has emphasised the importance of Denmark's structural advantages. Its factor endowments - cheap timber, low wages, an advantageous geographical position on the Baltic-Mediterranean route, easy access to labour skilled in shipbuilding, and relatively low interest rates - facilitated the rise of the merchant navy. From this point of view, war was not dropping large bills into the pockets of Danish ship owners; at best, it accelerated the rise in

[24] The adjusted R^2 was equal to 0.77, and the t-statistic on the number of voyages was 9.2. An LM-test indicated some serial correlation. Since the purpose of our exercise is to extrapolate the series, we did not correct for this.

output, a development that was largely predetermined by the kingdom's fortunate starting position.[25] Nor was this mechanism stable over time: Johansen even found evidence to suggest that, during some war years, Danish shipping rose at less brisk a pace than in peacetime.[26]

We are trying to test the respective merits of these competing hypotheses. The Mediterranean is an ideal testing ground for a number of reasons. First, economic factors could not assert themselves in many maritime markets during the eighteenth century - in the age of navigation acts and overseas empires, few contracts were awarded by the laws of competition alone. In the Mediterranean, by contrast, there were few significant impediments to the workings of a free market. Second, Denmark was effectively excluded from the Mediterranean until the middle of the eighteenth century because it had not concluded a treaty with the Barbary states. The economic advantages that it possessed could make themselves felt rapidly once the safe passage of Danish ships was ensured. Further, the wars of the eighteenth century did influence the fortunes of Denmark's maritime rivals in the Mediterranean. From the Seven Years War onwards, the Dutch, the French, the British, the Spanish and most other nations were engulfed in the increasingly ferocious wars of the eighteenth century. We are therefore in the unique position to observe the impact of armed conflict and the consequences of benign factor endowments in a 'laboratory setting' - one in which certain doses of hostility are applied, while at the same time leaving ample scope for the workings of the market.

We proceed in two steps. The first point of disagreement between the two competing schools of thought in Danish historiography concerns the effect of war. We therefore examine the exact timing of discontinuities in shipping output and test whether these are significantly associated with the major conflicts that beset the eighteenth century. The main finding is that a major shock to the fortunes of the Danish fleet is evident from our data. The second part of this section is devoted to the persistence of wartime shocks. We find that there is no conclusive evidence of shipping output following a stationary path.

There was a large increase in Danish shipping to the Mediterranean between the 1750s and the first decade of the nineteenth century. Figure 1 plots the number of voyages as well as total shipping output per year. While Danish ships sailed for 2.4 million lastdays on Mediterranean routes in 1750, this figure had risen more than fivefold by 1807, to 15.8 million. The peak year of 1797, however, registered an even higher level - 28.8 million lastdays. As figure 1 demonstrates, these changes are closely correlated with the number of voyages, which rose from a mere 98 in 1750 to a high of 778 in 1794.[27]

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25 This is not to say that the 'neutrality argument' puts exclusive emphasis on the demand side, and discards the influence of supply conditions. Note that, for example, the differential between Danish and British seamen's wages was largest during wartime. Danish shipowners did not have to compete with the Royal Navy's vast manpower requirements (nor, indeed, its press gangs). Cf. Ventegodt 1989 and S. P. Ville, *English Shipowning during the Industrial Revolution* (Manchester 1987). The lower volatility in factor costs (and profitability) should have encouraged investment: cf. A. Dixit, R. Pindyck, *Investment under Uncertainty* (Princeton 1994).

26 Johansen 1975, p. 63.

27 Note also that Danish shipping to the Caribbean shows the same pattern. This implies that we do not simply observe a transfer of ships from other routes. Cf. Gøbel 1990, p. 108-9.

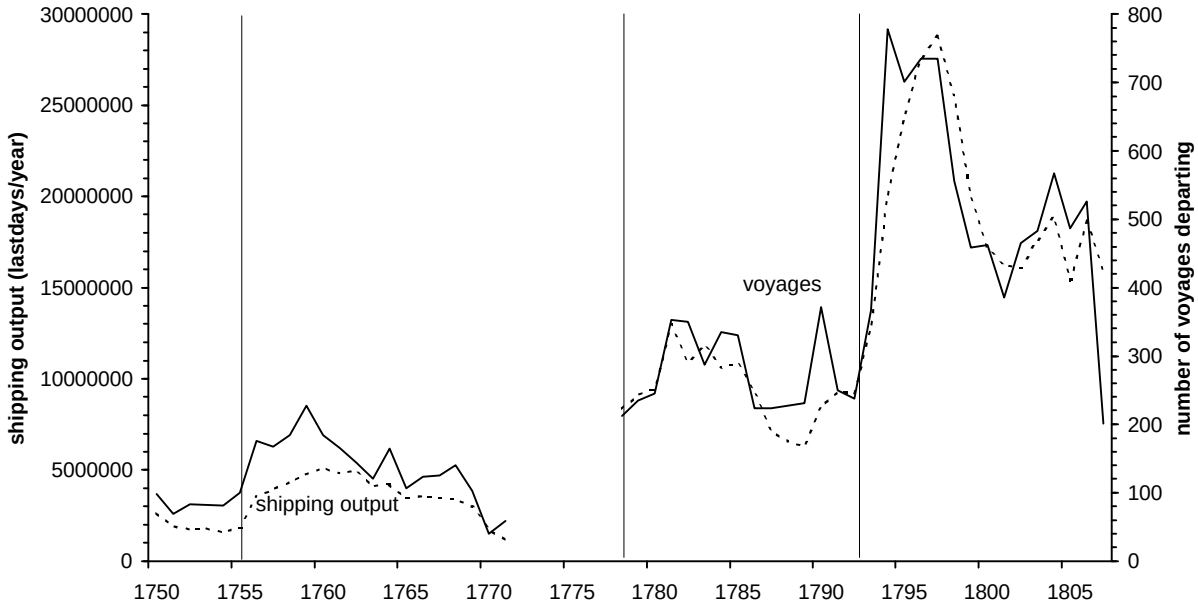

Figure 1

In Figure 1, the vertical lines indicate the outbreaks of the three major wars according to the 'consensus view'. The first few years of conflict all see increases in both shipping output and the number of voyages. The peak in 1791 is probably a result of the Ogarchov Crisis. It should also mentioned that the relative advantages of neutrality declined sharply after 1797, when France began to seize ships suspected of carrying British goods indiscrimately. Also, Denmark found itself at war with the Barbary states in 1796-97. These occasional complications notwithstanding, shipping output drops back to its pre-war level (and even lower) in two cases out of three. For the number of voyages, there is a return to earlier activity levels after all three wars. A first, cursory glance at the figures therefore suggests that the Danish merchant fleet probably did profit from neutrality, but that the effect did not last much beyond the cessation of hostilities.

So far, we have relied on *a priori* knowledge of the timing of major European wars. Clearly, our findings would be reinforced if the data itself would indicate endogenously determined breakpoints that coincide with the outbreak of hostilities. To test this hypothesis rigorously, we regressed shipping output (and, as a test, the number of ships departing in one year) on a time trend, and then calculated the Chow-test for each year:[28]

$$h = \frac{(RSS_{T+H} - RSS_T)/H}{RSS_T/(T-k)} \qquad (2)$$

(RSS = residual sum of squares, T = number of observations, H = forecast horizon, k = number of regressors)

Figures 2 and 3 give plots of the test statistic h. It is readily apparent that the beginning of the Seven Years' War (1756) and the Revolutionary Wars (1793) coincides with a statistically significant break in the relationship between shipping output and the time trend.

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28 We used the 1-step Chow-test (cf. J. Doornik and D. Hendry, *PC-Give 8.0. An Interactive Econometric Modelling Package* (London 1995), p. 328f), which is approximately distributed as an F-test.

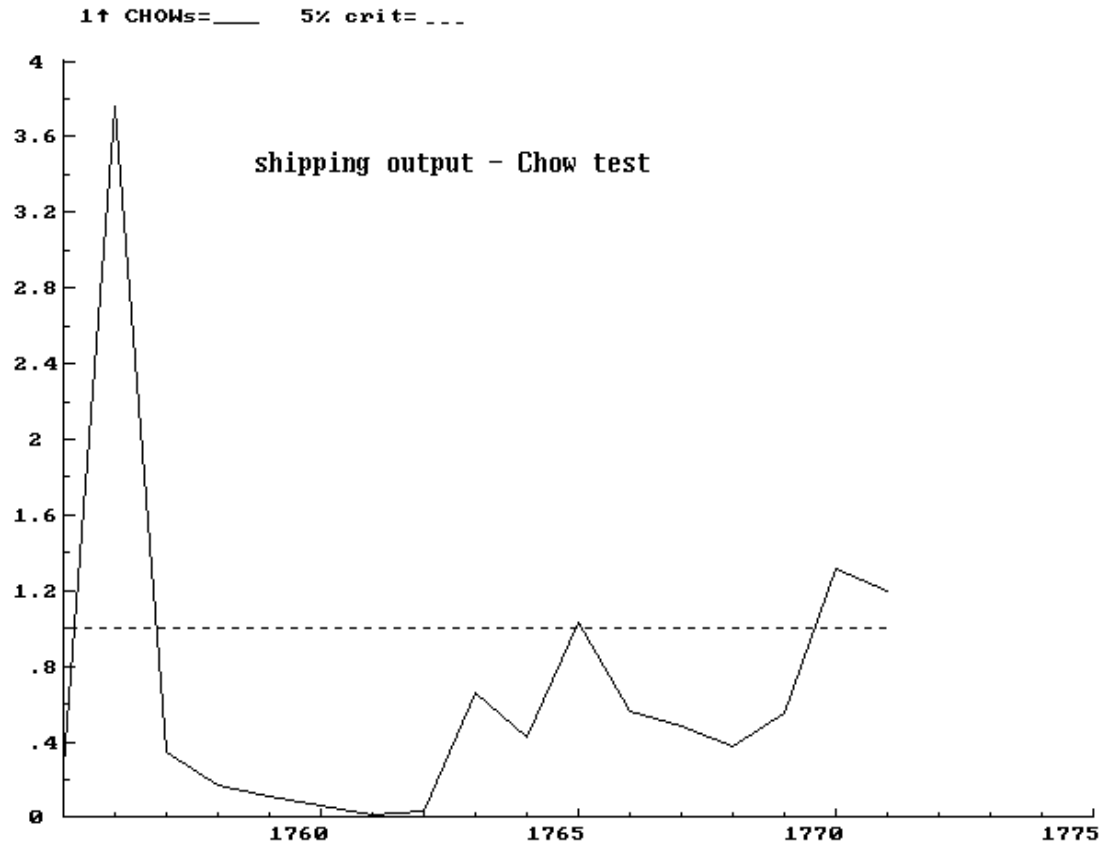
1↑ CHOWs=___ 5% crit= ___
shipping output - Chow test
4
3.6
3.2
2.8
2.4
2
1.6
1.2
.8
.4
0
1760
1765
1770
1775

Figure 2

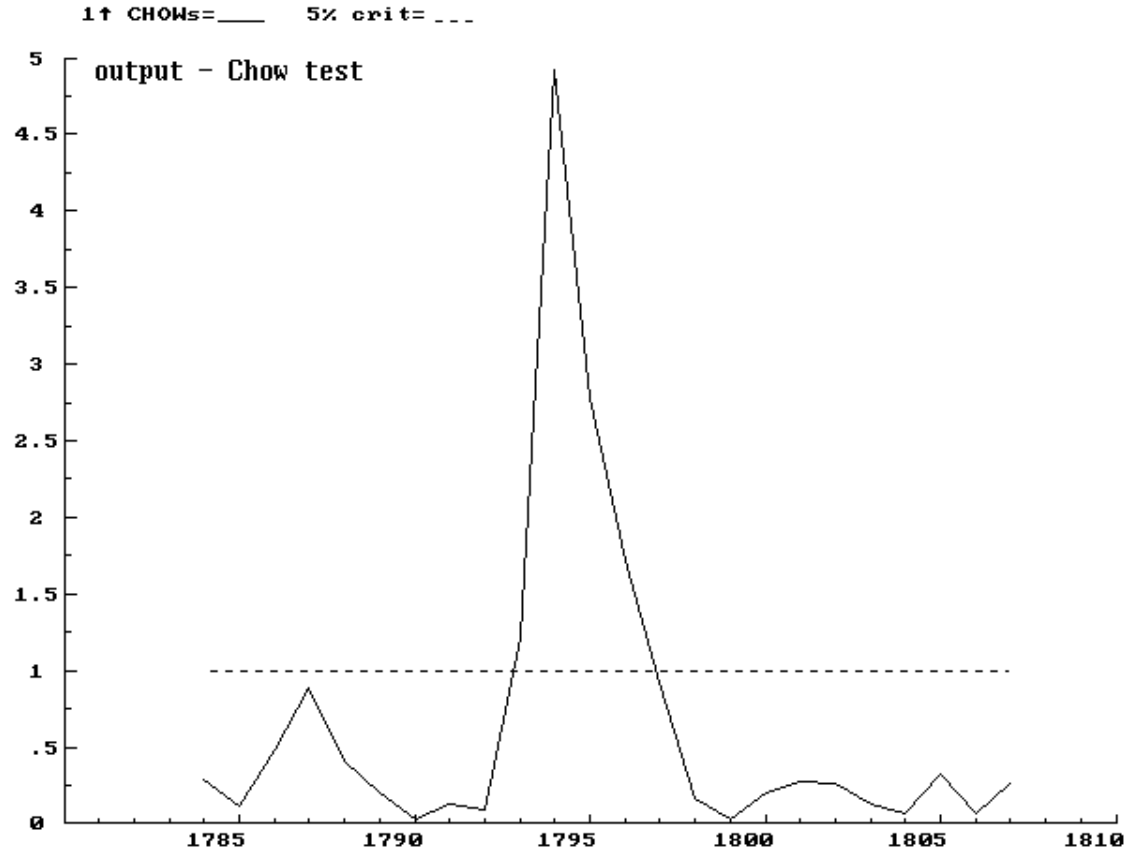
1↑ CHOWs=___ 5% crit= ___
output - Chow test
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
0
1785
1790
1795
1800
1805
1810

Figure 3

The break in 1756 demonstrated by figure 2 is particularly remarkable because it occurs immediately after the initialisation period of 5 observations required by the program.[29] The significant Chow-test value for 1770 is possibly driven by war with the Barbary state of Algiers (1769-72); although the statistic only marginally surpasses the 5% critical level.[30] In the second period, only one major discontinuity stands out - the outbreak of the Revolutionary Wars. With the start of hostilities in 1793, the Chow-statistic rises above its critical level; the shock is so large that it affects the relationship between the time-trend and shipping output for a number of subsequent years.[31]

These results strongly suggest that Danish neutrality conferred sizeable benefits in wartime during the great conflicts of the eighteenth century. Independent of the measure of output we use - lastdays at sea or number of ships departing - there is clear evidence of the Danish merchant navy receiving an additional boost at precisely those times when other European powers went to war. We demonstrated this finding by both using endogenously determined breakpoints in our data series, and without any *a priori* knowledge of armed conflict in eighteenth century Europe. The crucial question now concerns the persistence of the positive wartime shocks identified above. We examine this problem by analysing the time-series properties of the data.[32] A stochastic process is said to be stationary (in the weak sense) if three conditions are met:[33]

$$E(X_t)=\text{constant}=\mu \quad (3)$$

$$\text{Var}(X_t)=\text{constant}=\sigma^2 \quad (4)$$

$$\text{Cov}(X_t X_{t+j})=\sigma_j \quad (5)$$

Variances and means do not change over time, and the covariance simply depends on the interval between the two periods. The time at which the covariance is calculated is irrelevant. The hypothesis most commonly tested in the context of macroeconomic time series is that of a stochastic trend versus the alternative of a deterministic trend.[34] In applied work, Dickey-Fuller and Augmented Dickey-Fuller tests are particularly popular:

$$\Delta y_t = y^{*} y_{t-1} + \sum_{i=1}^{p-1} y_i^{*} \Delta y_{t-i} + m + gt + u_t \quad (6)$$

29 Estimation was carried out using PC-Give 8.0 (cf. Doornik and Hendry 1995).

30 We examined the effect of war with the Barbary states along the lines of the approach adopted in table 3; we were, however, unable to find a significant coefficient.

31 The war from 1778-83 does not leave a trace because the first five years are needed for initialisation. Very similar results emerge when the number of voyages is used as a dependent variable. Cf. figures 4 and 5 in appendix 1.

32 C. Nelson, C. Plosser, 'Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications', *Journal of Monetary Economics* 10 (1982). For an excellent overview of subsequent work, cf. B. Rao, 'Editor's Introduction', in: B. Rao (ed.), *Cointegration for the Applied Economist* (1994) and R. Pindyck and D. Rubinfeld, *Econometric Models and Economic Forecasts* (New York 1991).

33 Cf. A. Spanos, *Statistical Foundations of Econometric Modelling* (Cambridge 1986), p. 137ff; W. Charemza, D. Deadman, *New Directions in Econometric Practice* (Aldershot 1992), p. 118.

34 J. Campbell, P. Perron, 'Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots', *NBER Macroeconomics Annual* (1991), p. 142ff.

where y is the time series in question, t is time trend, u is the disturbance term, and $\psi^*=(\psi_1+\psi_2+\psi_3+...+\psi_p)-1$. In the case of the simple Dickey-Fuller test, equation (6) is estimated without the augmentation term [$\sum_{i=1}^{p-1} y_i^* \Delta y_{t-i}$]. Adding the augmentation term is necessary for whitening the residuals if the error term (u_t) exhibits autocorrelation.[35]

If we can demonstrate that Danish shipping output is stationary, then shocks to not persist infinitely. In the alternative case, the benefits of wartime will make themselves felt in all subsequent years. Before we begin, a few basic observations need to be made. First, the two sample periods we examine are relatively short. Second, since we already found some evidence of structural breaks in a previous part of this paper, the Perron critique is particularly relevant - in the presence of structural breaks, it may be impossible to reject the hypothesis of non-stationarity using DF and ADF tests.[36] Third, the shipping output series by construction contains a large autoregressive component - ships departing this year very often only return in one of the subsequent years, producing a 'knock-on effect' on shipping output. The first objection is potentially serious. As Monte-Carlo simulations regularly show, the power of unit root tests depends significantly on the number of years covered.[37] Increases in the number of observations are relatively less important, leading only to marginal increases in power. In their survey of the relevant literature, Campbell and Perron conclude that '[i]n most applications of interest, a data set containing fewer annual data over a long time period will lead to tests having higher power than if use was made of a data set containing more observations over a short time period.'[38] Our data set spans a minimum period of just above 20 years, which is not unusually short for unit root testing.[39] The sample size is regularly covered in standard tables of critical values.[40] The second and third caveat will be dealt with in later parts of this section.

As a first step, we use Dickey-Fuller and Augmented Dickey-Fuller tests. In table 4, we have added an augmentation term if an LM test indicated serial correlation in the error term at the 90 percent level of confidence. In addition to specification (5), we also ran DF and ADF tests under the assumption of that the data generating process did not contain a mean and/or a time trend.[41] Table 4 gives an overview of the results for both the number of voyages and shipping output:

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35 The use of critical values from DF distributions is unwarranted if the error term is autocorrelated. Cf. D. Dickey and W. Fuller, 'Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root', *Econometrica* 49 (1981), p. 1057ff.

36 P. Perron, 'The Great Crash, the Oil Price Shock and the Unit Root Hypothesis', *Econometrica* 57 (1989).

37 R. Shiller, P. Perron, 'Testing the Random Walk Hypothesis', *Economic Letters* 18 (1985).

38 Campbell and Perron 1991, p. 153. Cf. however the recent results of I. Choi and Bh. Chung ('Sampling Frequency and the Power of Tests for a Unit Root: A Simulation Study', *Economics Letters* 49 (1995)), who find that high sampling frequency can significantly improve the finite sample powers of augmented Dickey-Fuller tests.

39 R. Harris, *Cointegration Analysis in Econometric Modelling* (London 1995), p. 22.

40 Cf. Charemza and Deadman 1992, p. 320ff.

41 Critical values differ when a constant and/or a time trend is included. The critical values underlying table 4 are derived from MacKinnon's response surfaces (J. MacKinnon, 'Critical Values for Cointegration Tests', in: R. Engle, C. Granger (eds.), *Long-Run Economic Relationships* (Oxford 1991)) as implemented by Doornik and Hendry 1995, p. 308f.

Table 4: DF and ADF tests, voyages and shipping output, 1750-71 and 1778-1807

	constant + trend	constant	trend	no constant, no trend
1750-1771				
Voy	-1.59	-1.57	-1.59	-0.57
	-1.13	-1.43	-1.12	-0.52
ΔVoy	-5.2**	-4.612**	-5.2	-4.729**
	-3.6	-2.95	-3.6	-3.03**
Q	0.04	-0.75	0.04	-0.6
	-0.36	-1.7§	-0.36	-0.56
ΔQ	-4.016*	-4.46**	-4.016*	-2.9**
	-2.6	-1.7§	-2.6	-1.6
1778-1807				
Voy	-1.39	-1.9	-1.6	-0.75
	-0.81+	-2.1§	-1.66	-0.29+
ΔVoy	-4.02*	-4.4**	-4.5**	-4.14**
	-2.03	-2.6§	-3.1	-2.1*+
Q	-1.17	-1.2	-1.1	-0.08
	-2.83§	-2.17§	-2.8§	-0.66
ΔQ	-3.22	-3.29*	-3.17	-3.51**
	-2.78§	-2.99	-2.69	-2.99**

Note: Voy denotes the time series on the number of voyages, and Q refers to our series on shipping output. The first line for each variable gives the DF-statistic, the second one the ADF-statistic. If the residuals of the DF regression showed no autocorrelation, an ADF(1) test was performed. § indicates that an ADF(2) test was necessary; + shows that an ADF(5) test was conducted. *, ** indicate significance at the 10% and 5% levels, respectively.

When examined in levels form, neither our time series of shipping output nor of the number of voyages allows us to reject the null hypothesis of a unit root. This is independent of any assumption we make about a constant or time trend being included in the underlying data generating process. After differencing, we can reject non-stationarity in a number of cases. For the years 1750-71, we only fail to reject the null using the DF test when we include a trend but no constant. The ADF-tests regularly do not reject the null. This should not concern us unduly since the LM-test of the error term from the DF regression indicated no serial correlation.[42]

During the second period, the residuals were more likely to exhibit autocorrelation. Neither DF nor ADF tests reject the null for the series in undifferenced form. For the number of voyages, first differencing transforms the series into a stationary one according to the strongly significant DF statistic. The shipping output series fails to reject the hypothesis of a unit root even in difference form when a trend (or a constant and trend) are included in the regression.

[42] The only exception is shipping output series when the data generation process is assumed only to contain a constant. In this case, the ADF(2) test was necessary to 'whiten' the residuals.

That we are unable to reject the null hypothesis of a unit root for output series in levels form can be interpreted in two ways - either these time series are non-stationary, or the power of the DF and ADF tests is too low to reject the null. We therefore report the results of three other tests that have become standard in the literature - the Phillips-Perron test, which deals with the problem of serial correlation by estimating a non-parametric statistic, as well as two test statistics introduced by Leybourne that have better power characteristics than the DF/ADF class of tests.[43] Table 5 summarises the results:

Table 5: Further Unit Root Tests

	1750-71		**1778-1807**	
	Voyages	Lastdays at Sea	Voyages	Lastdays at Sea
Phillips-Perron Z	-4.13	-0.26	-8.68	-5.34
ADF_{tmax}	-1.13	-0.36	-0.81	-2.9
$\hat{c}_T$	0.16	0.16	0.081*	0.081*

Note: * indicates significance at the 10% level.

The ADF_{tmax}-statistic, which uses the maximum ADF value found from using forward and reverse Dickey-Fuller regressions, confirms the results presented in table 4.[44] Since the test value is always below the 10 percent critical value of -2.89, we are again unable to reject that hypothesis that the series for shipping output or the number of voyages are non-stationary.[45] The Phillips-Perron test also leaves open the possibility that the two series are I(1), during both periods. The $\hat{c}_T$-statistic based on the number of lags at which the autocorrelation function of the residuals - from a regression of the time series on a linear trend - is strictly positive is unable to reject the null for the earlier sample. For the period 1778-1807, however, the test value is just marginally above the critical value of 0.08 at the 3.8 percent level. Because of the discrete nature of the test statistic, the sampling distribution of $\hat{c}_T$ does not approach a continuous function for small sample sizes, and the next possible critical value is 0.12 for a nominal test size of 0.16. At this level, we can clearly reject the null hypothesis; if a continuous function for $\hat{c}_T$ existed, this could possibly also be the case at the 5 percent critical level.

Most nonstationarity tests are notoriously ineffective in discriminating between trend and difference stationarity when the data generation process contains a large autoregressive component, or if structural breaks

43 P. Phillips and P. Perron, 'Testing for a Unit Root in Time Series Regression', *Biometrika* 75 (1988); S. Leybourne, 'Testing for Unit Roots: A Simple Alternative to Dickey-Fuller', *Applied Economics* 26 (1994); S. Leybourne, 'Testing for Unit Roots Using Forward and Reverse Dickey-Fuller Regressions', *Oxford Bulletin of Economics and Statistics* 57 (1995).

44 The use of DF_{tmax} seemed most appropriate since the sensible alternative, in terms of the historical problem, is stationarity around a trend.

45 We used table 2 from Leybourne 1995, p. 565. On the use of ADF tests with these critical values, cf. Leybourne 1995, p. 570f. Incidentally, the maximum values were all obtained from the forward regressions.

are present.[46] Since we already found some evidence of breaks in our series, we compute the recursive and rolling test statistics developed by Banerjee, Lumsdaine and Stock. These take into account the possibility that there might be structural shifts of the time trend and/or the intercept in the data generating process.[47] Also, these tests have the advantage that the date of the trend break does not have to be known *a priori* - an important objection to Perron's earlier work.[48]

Table 6: DF tests from rolling and recursive regressions

	1750-71		**1778-1807**	
	Voyages	Lastdays at Sea	Voyages	Lastdays at Sea
Recursive $\hat{t}_{DF}^{\max}$	-0.55	-0.22	-0.34	-0.38
Recursive $\hat{t}_{DF}^{\min}$	-2.41	-0.97	-1.1	-1.2
Rolling $\hat{t}_{DF}^{\max}$	-0.4	-0.36	-0.5	-0.5
Rolling $\hat{t}_{DF}^{\min}$	-1.25	-0.12	-1.23	-1.3

As table 6 shows, none of the test statistics even approaches customary rejection levels. Therefore, even when we allow for the possibility of the time series being stationary around a broken trend, we cannot reject the unit root hypothesis conclusively.

The second possible reason for low power of non-stationarity tests is a large autoregressive component. It is therefore possible that our inability to reject the null hypothesis is simply the result of shocks persisting for long periods, but not *ad infinitum* as required by the unit root assumption. Table 7 provides estimates of the autoregressive component for five different regression specifications (with or without a trend term).

Table 7: Estimates of autoregressive component

46 G. Schwert, 'Tests for Unit Roots: A Monte Carlo Investigation', *Journal of Business and Economic Statistics* 7 (1989); Campbell and Perron 1992, p. 160ff. On structural breaks, cf. Perron 1989; A. Banerjee, R. Lumsdaine and J. Stock, 'Recursive and Sequential Tests of the Unit Root and Trend Break Hypothesis', *Journal of Business and Economic Statistics* 10 (1992); E. Zivot and D. Andrews, 'Further Evidence on the Great Crash, the Oil Price Shock and the Unit Root Hypothesis', *Journal of Business and Economic Statistics* 10 (1992). For a recent application in economic history, cf. Greasley and Oxley 1996.

47 Cf. Banerjee et al. 1992; we here use the Shazam procedure developed by Harris 1995, p. 48f. Such tests have now become standard: cf. N.F.R. Crafts, 'Endogenous Growth: Lessons from and for Economic History', *CEPR Working Paper* 1333 (1996), and Greasley and Oxley 1996.

48 L. Christiano, 'Searching for a Break in GNP', *Federal Reserve Bank of Minneapolis Working Paper* 416 (1988).

	constant	constant+trend
1750-1771		
Voy	0.77	0.78
Q	0.94	1.01
1778-1807		
Voy	0.74	0.72
Q	0.89	0.86

In each case, the AR(1) component of the time series is large.[49] In the case of shipping output measured in lastdays at sea, it is always close to unity. For the number of voyages, the value consistently exceeds 0.7. With values such as these, it may be impossible to reject the hypothesis of a unit root even if the data generating process is stationary.[50]

At this stage, it is convenient to remind us of the historical question at hand. We are asking for how long the advantages so clearly conferred by neutrality continued to benefit Danish shipping once hostilities had ceased. The two periods we are examining are not short by the standards of recent macroeconomic work, but the number of observations is clearly limited. As Blough has demonstrated, unit root tests in finite samples are either very likely to reject the null of non-stationarity falsely if the underlying process is nearly stationary or have low power against the alternative hypothesis.[51] This is because, with a limited number of observations, the sample distribution of any statistic under a trend-stationary process is very close to the distribution for a difference-stationary process that approximates the trend-stationary case. As Campbell and Perron argue, in limited samples, '...any trend-stationary process can be approximated arbitrarily well by a unit root process (in the sense that the autocovariance structures will be arbitrarily close)'.[52] Perhaps even more importantly, they have shown that the 'false answers' given by conventional unit root tests[53] may be more useful in a practical sense than the correct answers would have been. In the case of near-integrated stationary processes, for example, forecasting performance was better on the basis of an integrated model.[54] As a practical rule, Campbell and Perron suggest that data generating processes with an AR component greater than or equal to 0.9 should best be approximated by a unit root model. From table 7, this would suggest that shipping output is best described as non-stationary (even if the true underlying process were to be stationary). For the number of voyages, the size of the AR component favours a stationary model.[55]

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49 Using the Schwarz and Akaike criteria when estimating a set of ARMA (p,q) models with p, q <= 2, we can demonstrate that the series are best modelled as an AR(1) series. Cf. Appendix 2.

50 Cf. Schwert 1989.

51 S. Blough, 'The Relationship between Power and Level for Generic Unit Root Tests in Finite Samples', *Journal of Applied Econometrics* 7 (1992).

52 Campbell and Perron 1991, p. 157.

53 They compute Said-Dickey and Phillips-Perron statistics: Cf. Campbell and Perron 1991, table 1, p. 161.

54 Campbell and Perron 1991, p. 162.

55 This difference is probably due to the fact that the shipping output series was derived from a procedure with 'overlapping generations'.

Table 8: Maximum and minimum effect attributable to war

	Voy		**Q**	
	I(0)	I(1)	I(0)	I(1)
Seven Years War	1.60%	68.50%	16.17%	40.90%
War of American Independence	13.20%	25.80%	13.48%	43.23%

The first conclusion that emerges from the examination of the time-series properties of the data is that persistence is high - the after-effects of sudden increases in shipping output lingered on for long periods of time. Second, even the highest probable degree of persistence is insufficient to tell the full story of Denmark's maritime success. To infer the maximum and the minimum size of the 'war effect', consider the following: if both time series contain a unit root, then the size of the average wartime shock is still too small to explain all of the rise in output. To demonstrate this numerically, we calculated both the number of voyages and shipping output as implied by a simple time trend (table 8). We then tried to explain the difference between the extrapolated and the observed value in the year the next war broke out (as defined by the 'consensus view').[56] If the time series are I(1), then the full impact of the last war should still make itself felt. Even under the interpretation of the test statistics, we are unable to account for more than 68.5% of the increase in Danish shipping through the effects of war. If, alternatively, the coefficients calculated in table 7 are correct, then the positive wartime boost did persist, but only with diminishing strength. After a period of, say, 10 years, no more than 54 percent of the initial shock could still be observed in the series.[57] In the historical cases examined in table 8, the maximum persistence effect of war that we can identify explains 16% of increase in Danish shipping over and above trend. Since even full persistence was insufficient to explain all of the spectacular rise of the kingdom's shipping to the Mediterranean, these estimates reinforce the conclusion that factor endowments and other factors captured by the time trend had a role left to play.

Table 9: Shares in total number of ships departing

	1747-71	1778-93	1794-1807
Schleswig-Holstein	56.72%	47.59%	39.92%
Denmark proper	16.64%	20.13%	19.46%
Norway	26.64%	32.28%	40.62%

At this stage, we need to reconsider the logical structure of our argument. We examined the impact of war, and derived estimates of the maximum effect it had on Danish shipping output. The 'residual' we then assigned to the benefits of factor endowments etc. This is the alternative hypothesis proposed in the literature. It should be noted, however, that argument provides no proof that economic factors were directly responsible for the gains that cannot be attributed to the benefits of neutrality. The composition of the Danish fleet, however, provides

56 Since we have no observations on the years of peace after the end of the Napoleonic wars, we can only presents results for the Seven Years War and the War of American Independence.

57 In the case of voyages (particularly for the years 1778-1807) the effect would be very much smaller - approximately 7-8 percent.

some further clues. If only neutrality mattered, then all provinces of the Danish kingdom should have benefited equally - ships from the Danish mainland were no more neutral than those from Norway. Yet factor endowments even within the different territories under the Danish crown were differed considerably. In Norway, timber for shipbuilding was still abundant and wages were probably lower than in the more developed economy of the Duchies. A pronounced increase in the share of the relatively more favoured provinces would provide indirect evidence that we should indeed attribute part of the 'growth residual' in table 8 to factor endowments. Table 9 gives the percentage share of all voyages originating in the three principalities of the Danish kingdom. As predicted by the factor endowment argument, Norway gained market share at the expense of Holstein, while the Danish mainland more or less maintained its share.[58]

Conclusion

The main conclusion emerging from this paper is that the two competing hypotheses about the factors underlying the rise of Denmark's merchant navy are both correct. We demonstrated that wars caused large and positive shocks to Danish shipping output in the Mediterranean. Statistically significant increases above and beyond trend are clearly associated with the beginning of major wars. Further, the benign consequences of neutrality only waned slowly after the cessation of hostilities. We cannot be assured that the time series for either shipping output or the number of voyages contain a unit root. Yet the autoregressive component in each case (and for both periods) was always large - we calculate that as much as one third of the initial boost given to Danish shipping might have persisted after a period of ten years. In this sense, 'Lady Bracknell's principle' may be the proper verdict on the ill fortunes of Denmark's competitors.[59] To lose market share once because of the storms of war can be regarded as more or less inevitable during the eighteenth century; to do so repeatedly must be put down to the belligerent attitude of governments that simply viewed armed conflict as a natural continuation of politics.

War made a difference to the fortunes of the Danish merchant fleet - both while it was conducted, and for a considerable period thereafter. The Johansen hypothesis should, however, not be discarded. The size of wartime shocks, combined with the persistence effects estimated in the data analysis section, implies that no more than two thirds of the rise in Danish shipping output can be attributed to the benefits of neutrality. The remaining share is probably best attributed to the factor endowments with which the Danish king's territories had been graced.

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58 Ships from Schleswig-Holstein also were more likely to act as carriers for goods from other countries. This made them more vulnerable to seizure during wartime because captain and owner had less control of their cargo's origin - unwittingly, they might have carried goods for enemy account. It could therefore be argued that table 9 at least partly reflects differences in the size of the 'neutrality windfall'.

59 'To lose one parent may be regarded as a misfortune; to lose two is a sign of carelessness'. Oscar Wilde, *The Importance of Being Earnest*. The increasing intensity of armed conflict - and the growing intransigence of the great powers - during the eighteenth century is emphasised by P. Schroeder, *The Transformation of European Politics 1763-1848* (Oxford 1994).

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APPENDIX 1

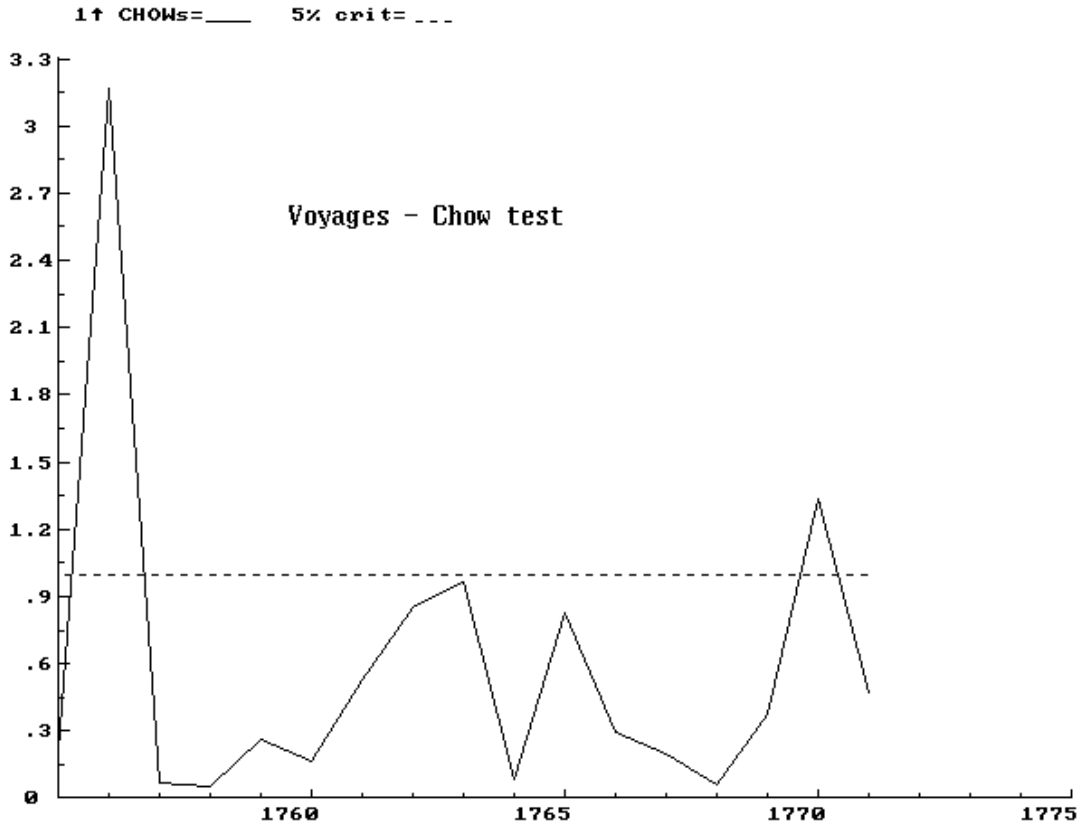

figure 4

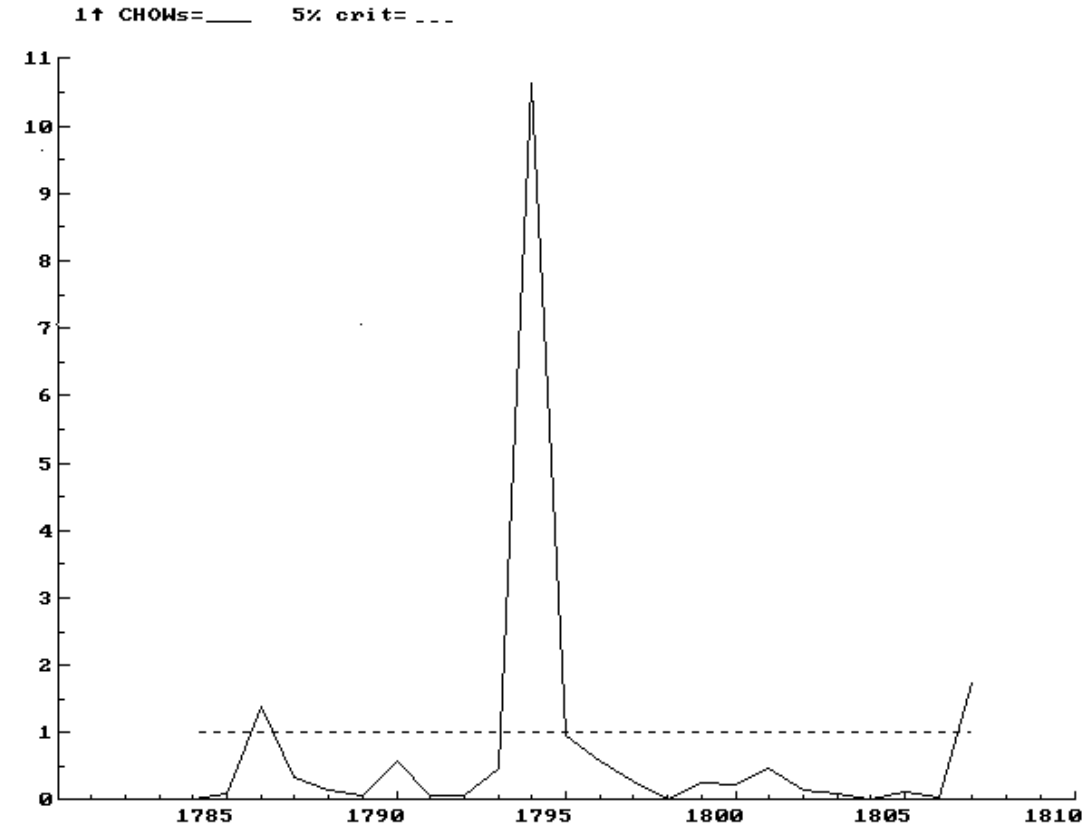

figure 5

APPENDIX 2

Table A1: Q for 1750-1771

	MA(0)	MA(1)	MA(2)
AR(0)		522.4	511.95
		524.9	515.61
AR(1)	510.1	512.2	513.4
	512.6	515.8	518.3
AR(2)	512.2	515.5	514.5
	515.8	519.9	520.6

Note: The statistic reported on the first line for each model is the Akaike criterion (AIC), the second is the Schwarz criterion (SBC).

Table A2: Q for 1778-1807

	MA(0)	MA(1)	MA(2)
AR(0)		542.2	541.9
		541.1	546.1
AR(1)	534.4	536.2	538.2
	536.7	539.9	542.8
AR(2)	536.1	534.7	537.0
	540.1	538.1	543.1