

Changing Tides

Countdown to 2004: Greek coastal shipping prepares for deregulation and colossal changes

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Shipping within the Greek coastal system has been an important activity throughout the course of history. Evidence exists that boats sailed the Aegean as early as the Stone Ages (about 13,000 BC). The Minoan civilization of Crete (1,600 BC) was the first European civilization that seriously practiced trade with the islands and the mainland. Ships were crucial in the Athenians' defeat of the Persian Empire (480 BC) and in the establishment of their own empire. Coastal shipping also played important roles in the Macedonian, Roman and Byzantine civilizations.

In more recent times, the Greek commercial fleet has established itself as a world leader, being involved in "deep sea" cargo trades all over the world. Even though based on completely different principles, coastal domestic shipping has developed along a parallel track. It has been critical in promoting the development of the Greek islands and in sustaining the economic and social cohesion of modern Greece as a whole.

Yet, for all its long history and steady evolution across the centuries, Greek coastal shipping is about to experience unprecedented changes within the next decade or so. This article spotlights these changes and gives a sample of the pertinent analysis that can be made to investigate their impact. The analysis itself has been carried out by the author and his colleagues in 1993 in the context of a project sponsored by the Hellenic Industrial Development Bank.

Busy Ports

Greek coastal shipping ranks among the largest such operations in Europe. It involves the movement of passengers and cargo within a system of mainland-to-island, island-to-island, and mainland-to-mainland connections. The actual number of islands is close to 10,000, but only about 115 are inhabited. Of these, 69 are considered important from an economic perspective. The ports that are considered important number 138, of which 42 are on the mainland and the rest (96) are located on the islands. Crete is Greece's largest island, with eight ports.

With few exceptions (short periods of temporary decline), coastal passenger traffic has steadily grown every year over the last 30 years, from approximately three million passenger movements in 1964, to about five million in 1970, eight million in 1980 and 12 million in 1990. The heaviest traffic is generated within the short-distance routes of the Argosaronikos Bay near Piraeus, where passenger movements are more than double that of the long-haul Piraeus-Crete lines. Vehicle traffic has also grown, often more steeply than passenger traffic. The Piraeus-Crete line is the leader for both cars and trucks, with car movements experiencing a 48 percent growth between 1981 and 1990 (more than double the equivalent passenger growth rate).

The introduction of large passenger/car ferries, which managed to displace the traditional passenger-only steamers of the post World War II era, has been the main reason for the generation of such a demand. Indeed, the evolution from traditional passenger-only ships to passenger/car ferries is an important change of the nature of coastal shipping in Greece in

recent years. This change has gradually developed over the course of the last 30 years and has been spurred to a significant extent by rapid island economic growth and by significant infrastructure improvements in island ports in the late 1960s and early '70s. This permitted, for the first time, ferry service to these islands. In 1993 the fleet consisted of 104 large ferries (above 1,000 gross registered tons), 149 small and medium ferries (up to 1,000 grt), 69 conventional passenger ships, 52 hydrofoils and three catamarans.

An alternative to passengers who travel without a vehicle (car, bus or motorcycle) is air transport, provided by Olympic Airways, and by its commuter subsidiary, Olympic Aviation. Some private airlines have also recently entered the market (this is a direct result of European air transport deregulation). Olympic's domestic network consists of 34 airports, of which nine are on the mainland and 25 are located on 23 islands (Crete has three airports). A few of these destinations are also served directly by foreign airlines (charter or regular flights).

Real Revolution

If the transformation of the system thus far has been a natural evolution, a real revolution is about to happen within the next decade. One of the main reasons is Regulation No. 3577/92 (referred to from now on as "the Regulation") passed on Dec. 7, 1992, by the Council of Ministers of the European Union (EU). The Regulation is concerned with the freedom of service in maritime cabotage trades. So far under Greek law, only ships flying the Greek flag have "cabotage privileges" in Greece, that is, are allowed to carry passengers and freight between Greek ports. Several other EU countries also have similar cabotage laws, which are very similar to, but perhaps not as restrictive as, the "Jones Act" in the United States.

All such national cabotage legislation is incompatible with the Regulation and therefore has to be changed. Indeed, Article 1 of the Regulation gives freedom to provide maritime transportation services within the entire EU to all ships flying the flag of any EU member state, effective Jan. 1, 1993 (the official starting date of implementation of a borderless European market). However, Article 6 grants exemptions (or, as they are officially called, "derogations") from an immediate implementation of the provisions of the Regulation for certain EU countries, Greece included. For Greece, such derogations stipulate, among other things, that its coastal shipping market will be deregulated in a phased period, so that it becomes fully open to all EU shipping no later than Jan. 1, 2004. The 11-year waiting period (already reduced to less than eight years) was intended to provide Greece with the necessary time to prepare for the opening of the market to competition.

How big a change will this be? "Quite monumental" might be an understatement. For starters, the current system is completely regulated by the Greek Ministry of Merchant Marine (MMM), which controls practically all aspects of the operation, from network design to fare pricing, from granting of route licenses to crew composition, and from development of timetables to support of thin (low traffic) lines. Some of the existing legislation dates back as far as 1926 and goes into such details as how many cooks and stewards should be employed on a ship as a function of ship size, what the prices of meals should be, and what fare discounts can be granted to a heterogeneous array of special interest groups (including, among others, members of the parliament, journalists, students, actors, members of the military, boy scouts, members of large families, and even prison security personnel).

Although it is recognized that thus far the system has worked reasonably well, it is fair to say that in many respects the institutional framework is complex, rigid, outdated and cumbersome. No rational criteria exist for fare estimation and route licensing, and the discretionary power granted to the Minister of Merchant Marine on many important matters is immense. What is worse, some central components of the law are directly incompatible with the Regulation.

Some other developments are also expected to lead to sweeping overhaul of the system. For instance, Greek law mandates a withdrawal age of 35 years for ferries. As the average age of the fleet is close to 25, more than half of the existing ships in the fleet will have to be replaced by 2004. Perhaps more important, as a result of the sinking of the ESTONIA ferry in the Baltic in 1994 (900 lives lost), the International Maritime Organization (IMO) has mandated new

rules for the internal subdivision of ferries, both new and existing. For a variety of reasons, these rules will be more stringent for ferries operating in the Baltic and in the North Sea than for ferries in the Mediterranean. Their effect will be twofold: (a) they will force many of the existing Greek ferries out of commission, as a retrofit to make them compatible with the new rules would be too costly, and (b) they will induce many northern European ferry operators to move to the Mediterranean sun, as it would be cheaper to convert their ferries to the looser "southern" specifications (actually, some of these ships are already compatible to them).

Last but not least, there is the expected impact of High Speed Craft (HSC) on the system. In the summer of 1993, the Italian company Tirrenia (which is state-owned) introduced a fast monohull on the line between Civitavecchia (mainland Italy) and Olbia (island of Sardinia). This is a state-of-the-art fast ship, capable of carrying 450 passengers and 126 cars at speeds up to 43 knots. The trip (124 nautical miles) is traveled in 3.5 hours, of which 3 hours are at the maximum speed. Two daily trips were planned for the summer high season, dropping to one at lower traffic seasons. This HSC is scheduled to operate only 11 weeks per year (July-October), and charges for cars a fare only 15 percent over the equivalent conventional fare. In view of the Regulation and the other developments that are expected to occur soon, the appearance of such HSCs in Greece is considered only a matter of time.

Note that today in Greece there are no HSCs that can also carry vehicles, and conventional passenger-car ferries have a real monopoly on those passengers who travel with their cars (captive demand). The rest of the HSCs operating today in Greece are hydrofoils and catamarans, neither of which can carry cars. And although hydrofoils have carved their own special niche in the Greek market, catamarans have been less successful. Their meager presence is mostly attributed to the existing system of route licensing by the MMM, which, in one case, granted a license to a catamaran on the condition that it serve a 10-port route. However, after 2004 such MMM policies would be illegal, and HSCs that can also carry cars are expected to be active players within the system.

OR/MS Viewpoint

Given all these developments, a simple question to ask is, What does the future hold for the Greek coastal shipping system? From an OR/MS analyst's point of view, this question can be both a dream and a nightmare.

It can be a dream because the range of problems that can be addressed in the context of the monumental changes that are about to occur is extremely rich in OR/MS content, and very challenging at the same time. Furthermore, one would think that the magnitude of the change that is bound to occur is likely to maximize the chances of implementation of a "clean slate" solution in many areas, with maximum benefits to the players involved. Here is just a sample of problems with a significant OR/MS content:

- In the light of deregulation, how should an individual shipping company design its network of operations?
- How should the MMM design the process of licensing routes to carriers, especially for thin lines to underdeveloped regions?
- What will be the modal split among the various modes competing for passengers and vehicles (including air transport)?

However, there are also valid reasons the OR/MS analyst's job may run into some obstacles. For instance:

- Greek shipping companies typically operate in an ad hoc fashion, with the need for sophisticated OR/MS analysis usually not transparent.
- 004 may still seem far away to governmental agencies and politicians, particularly since at least two general elections will take place between now and then.

- Collecting reliable data for the analysis may be a formidable task.

In particular, it is the difficulty of data collection that can turn the analyst's job into a nightmare. Such difficulty can be fully understood only when one sets out to do the analysis. It is easy for an OR/MS analyst accustomed to developing algorithms and working on abstract problems to assume that the right data would be readily available to be plugged into the models he or she has developed. Nothing of the sort is the case for Greek coastal shipping.

Indeed, there are a variety of sources for coastal shipping data. But some collect data of interest only to them, while others collect the same or other data, with frequent inconsistencies and gaps in the data. For example, the ship database of the Directorate of Maritime Transport (the MMM agency overseeing routes and schedules) is not exactly the same as the ship database of the Directorate of Merchant Ship Survey (another MMM agency overseeing ship inspection and safety). Origin-destination traffic matrices are not collected, and recent data is frequently missing. The most vivid example in this author's experience was that in 1993 (the year of the study) the most recent published coastal traffic data of the Greek National Statistical Service was dated 1987.

Contrary to our initial expectations, a disproportionate amount of effort was spent (by the 10 people on the research team, by MMM personnel and by others) to collect, cross-reference, update and correct the data. In addition, scores of volumes of relevant legislation were consolidated in about 30 pages. That effort, in and of itself, was perhaps tedious and mundane, but it produced something of value, providing for the first time a broad and concise representation of the status of the system. No analysis of future scenarios and policies could be made without this initial "baseline" knowledge.

One of the "hot topics" in view of 2004 is what portion of demand (passengers and vehicles) will shift to HSCs (including fast ferries) after 2004, when these ships will be free to operate within the system. Given that the passengers will be able to choose among several competing modes (including air), what will be the modal split?

Performing the modal split analysis was by no means an easy task, for a number of reasons. First, the relevant network in Greece is huge (at least 138 ports, 34 airports and thousands of inter-node links). Second, one could only speculate what would actually happen during the few remaining years to 2004 in terms of the fleet, introduction of new technologies, port expansion and development of legislation, to mention just a few of the crucial factors. Third, it was not immediately clear how the Greek traveler values his or her time, which is perhaps the most critical parameter that one needs to know in order to assess how much more the traveler is willing to pay in order to travel faster.

In the face of this complex situation, the approach that was adopted consisted of the following steps:

STEP 1: Choose a workable subset of the entire network for the analysis.

STEP 2: Make aggregate demand projections on this network up to 2004.

STEP 3: Make some assumptions on what kinds of transport modes provide service on this network, and for each estimate the transit times for the relevant links of the network.

STEP 4: Make some assumptions on the fares charged by each mode.

STEP 5: Calculate the monetary value of the time of the passengers using the "revealed preference" method.

STEP 6: Run a "logit" model to determine the modal split on each branch of the network.

STEP 7: Interpret results and perform sensitivity analysis.

Details of the overall approach (which is rather involved) are outside the scope of this article. Here we only highlight some important points and results.

1) In Step 1, we decided to examine a nine-port, six-airport network, distributed in the following six geographical "zones": Athens/Piraeus area (two ports), Mykonos island, Santorini island, Western Crete, Central Crete (two ports) and Eastern Crete (two ports). In terms of size, and even though nine ports are only a small fraction of the 138 ports in the system, in 1990 total passenger traffic among the nine selected ports was 19.2 percent of total Greek coastal traffic. Also in 1990, total traffic among the six selected airports was 27.3 percent of total Greek domestic air traffic. So from this perspective the selected sub-network was certainly non-trivial.

2) In Step 2, and after several regression analyses, it was determined that the best fit to historical data (1964-1989) for the entire system is the one described by the following equation: $TOTAL_PAX = \exp(1.271 + 0.0414 \cdot (Y - 1963))$, where $TOTAL_PAX$ is the total passenger trips by sea in year Y . The R^2 of this equation is 0.95, and the t-statistic on the coefficient of 0.0414 is 21.06, both acceptable. The above equation projects about 16.5 million trips in year 2000, about 19.5 million trips in 2004, and about 25.5 million trips in 2010.

Creating the O-D tables for the sub-network was a rather tricky task. To circumvent this problem, the direct assistance of the MMM was requested, and after a series of estimates on how flows at each port split among different routes, an "expert estimate" of the O-D table of passenger trips by sea in the sub-network for 1990 was finally made. Then O-D tables were created for passengers traveling with their cars and for those traveling by air. Individual regression analyses for each link of the sub-network then projected these flows to 2004.

3) In Step 3, we assumed that a total of five modes of transport would operate in this network in 2004: air transport, conventional ferries, hydrofoils, surface effect ships (passenger only) and HSC ferries. Note that only two of these modes (air transport and conventional ferries) existed on this network in 1990.

4) In Step 4, we assumed a "default" fast fare surcharge of 15 percent vis-à-vis conventional fares; 30 percent and 50 percent surcharges were also examined in the sensitivity analysis.

5) In Step 5, to calculate the passengers' value of time, we used the "revealed preference" method and a logit model. From the 1990 flows on the sub-network there is clearly revealed preference, that of passengers traveling without a vehicle, split between air transport and conventional ferry.

Performing a regression analysis, an "average" value of time equal to about \$2 per hour was extracted (1990 values). However, the R^2 for this analysis was not that spectacular (0.54), implying that there were probably more factors affecting traveler preference and behavior than those examined by this model (fare and trip time).

6) In Step 6, the value of time was assumed to grow to 2004 as the projected rate of growth of Greek GNP. Then the logit model was run and produced the O-D tables for 2004, per mode, and separately for passengers traveling with a vehicle and for passengers traveling without a vehicle.

7) The results of Step 7 were as follows. In 2004, for those who will travel without a vehicle, 32 percent will take the plane, 40 percent will go by conventional ferry, 3.3 percent will take the hydrofoil, 3.7 percent will use a surface effect ship, and 21 percent will go by HSC ferry. For those who will travel with a vehicle, 60 percent will go by conventional ferry, while 40 percent will go by HSC ferry.

An economic feasibility analysis of HSC ferries was also performed. Interestingly enough, it neutralized, to a significant extent, the promising results of the modal split analysis. It boiled down to the realization that although fast ships can attract a significant share of passenger traffic if the fares they charge are modest (15 to 50 percent over the conventional fares), the economic viability of such vessels is likely to be problematic because they need much higher

fares to break even. As the break-even fares are often close to the level of air transport fares, very few people would accept them, rendering the overall operation problematic. Several factors contribute to this outlook, and to the extent that some or all of these factors change, the outlook itself can change for the better. These are the following: (a) low level of conventional fares, (b) high relative cost of HSCs, (c) low value of time in Greece, and (d) year-round service imposed by the MMM.

Effects of Change

As interesting as these results might be, the pertinent question is whether there has been any real change in the system in preparation for 2004.

Three and a half years after the Regulation was issued, a first-glance assessment of the situation may very well lead to the observation that "little or nothing is moving yet." However, there is more than meets the eye. There have been two main developments in that regard. First, a few Greek ferry operators have become members of the Athens Stock Exchange. Others are planning to do so in the near future. This is a significant departure from past practices, as most of the shipping companies in Greece are family owned. Apparently, the Stock Exchange is, for the first time ever, seriously viewed as a vehicle to raise capital for fleet modernization.

The second significant development has been a related one. Several Greek ship owners have purchased or ordered brand new ferries. This is an important change from the traditional policy of buying cheap secondhand ships (not necessarily passenger ferries) and then making extensive conversions in Greek yards. Trendsetters in that regard have been the twin ferries SUPERFAST I and II, with a service speed of 26 knots. Interestingly enough, all of these new ships have been allocated to the Adriatic corridor, linking Greek ports such as Patras, Igoumenitsa and Corfu to Italian ports such as Brindisi, Bari, Ancona, Venice and Trieste. So far no HSC ferry (monohull or catamaran) operates between Greece and Italy, but there is speculation that this will happen soon.

The Adriatic corridor is very important for the connection of Greece to the rest of the EU, particularly since war broke out in the former Yugoslavia. However, Adriatic services are different from internal Greek cabotage services in many respects. For instance, no Greek flag requirement exists, and in fact many of the Greek-owned ferries in that corridor are foreign-flagged (mostly the Cypriot flag). As such, they are prohibited to carry passengers from one Greek port to another Greek port on the Greece-Italy route (such as from Patras to Corfu). However, by contrast to Greek-flagged ships, these ships are not required to maintain year-round service. Another significant difference regards the fares across the Adriatic, which, in contrast to domestic fares, are not controlled by the MMM.

So one might argue that in many respects the picture that exists in the Adriatic today (which is a much less regulated environment) may be a preamble of what might happen in domestic services after 2004 (or at least in parts of the system). But if this is indeed the case, one set of statistics is revealing: Whereas the total fleets of large ferries of Greece and Italy are comparable in terms of population, out of the 49 large ferries operating in the Adriatic last summer, 48 were Greek-owned and only one was Italian.

Whether or not this is a sign that the much feared "foreign invasion" into Greek waters is grossly exaggerated is only subject to speculation. Whatever happens, one thing is certain. As things will never be the same again after 2004, whoever travels in this part of the world in the next few years will be uniquely privileged to experience first hand the full-scale transformation of Greece's coastal shipping chrysalis.

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