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CURRENT TRENDS IN THE GREEK MARINE MANPOWER MARKET: A QUALITATIVE AND QUANTITATIVE APPROACH

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Abstract. In this paper we attempt to analyse the long-established problem of recruitment on board national ships, under both quantitative and qualitative terms, by examining firstly the general framework of the shipping industry. Within this framework are found the parameters that directly affect it. Particularly focusing on the Greek marine manpower market, the supply number of available seafarers, the vessel's flag, the crew's cost, the quality of training and the motives one has for building a career in the maritime sector, are illustrated. From the quantitative perspective, we have reached a high risk period where the seafarer's profession is becoming unpopular. By presenting the available statistical data for a period of 20 years, we approach a critical point where new scientific methods must be adopted in the Greek maritime policies

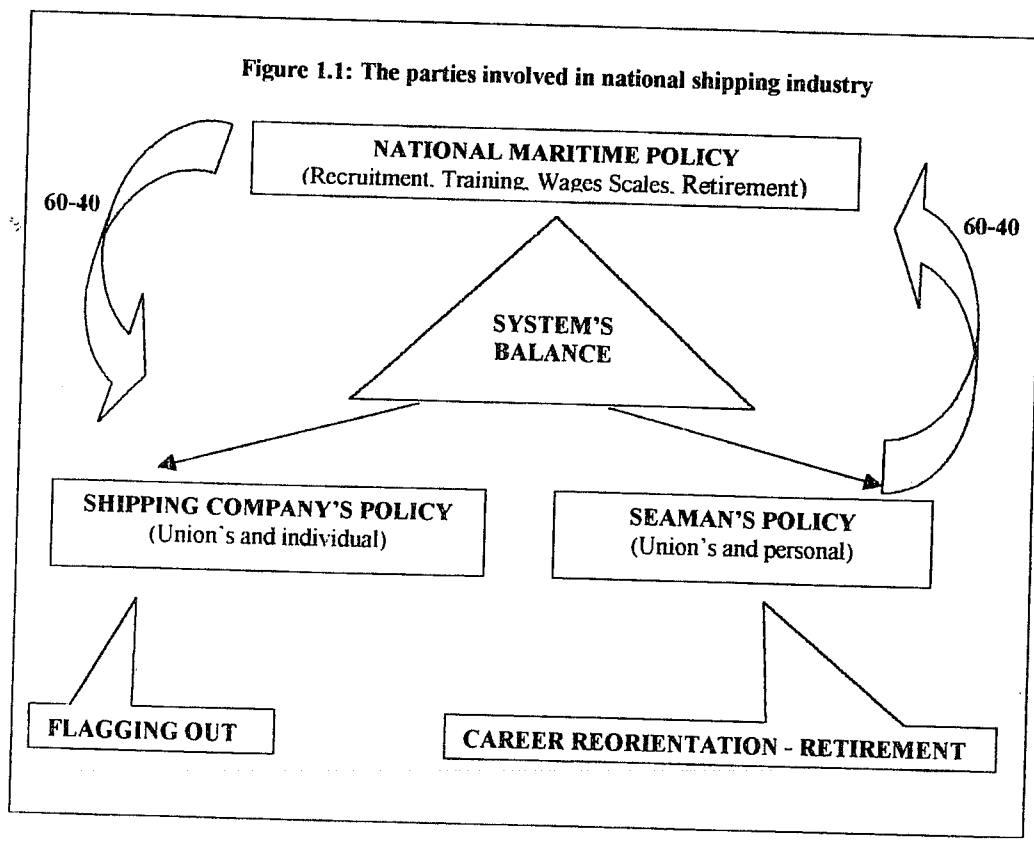
Keywords: availability of seafarers, labour costs, training levels, national policies.

1. INTRODUCTION: DEFINING THE PROBLEM

The dimension of the marine manpower problem of the shipping industry should be seen from three different views, the government's policy, the shipping company's strategy and the seamen's expectations. The government invests on marine education institutes expecting a competitive sector with well qualified seafarers, the shipping company invests on ships and expects maximum profit and the potential seafarer invests on his career and expects earning and welfare.

It is shown from Figure 1.1. that, in most cases the national maritime policy does not coincide with industry's policy-makers. One major drawback is the 'flagging-out' to FOCs for obvious economic advantages, i.e. European shipowners enjoy lower costs in respect of crew salaries. Again, national policies rarely go in parallel with seafarers' unions interests. A major characteristic of this non-conformity is the career re-orientation, i.e. seeking jobs on land, or retiring permanently from the seafaring profession. Until 1998, in Greece the debate between the three involved parties mainly focused on the proportion 60-40 of Greek and foreign seamen onboard Greek ships. Nowadays, by implementing the Circular 71203/07.09.98 in article 8 it is stated that the number of Greek seafarers on board ships depends on the G.R.T. In other words, specific posts must be filled by national seafarers but the above ratio has not changed although it is not officially mentioned anymore.

Figure 1.1: The parties involved in national shipping industry



In this respect, the aim of this paper, is to define the variables which affect the quantity and quality of seafarers, then to present the data which define the current trends of seafaring profession and finally, to propose new methodologies in order to attract new entries in the maritime sector and retain the existing percentage of seamen.

2. CURRENT PROBLEMS OF SEAFARING PROFESSION

The quantity and quality of human capital in the sea transportation system constitutes the second important factor after the investment capital. This factor has its negative and positive influences.

The continuous reduction of ship's operating cost which is often the most effective short-term strategy of a competitive ship-management company, affects in a negative manner the balance of expensive and well qualified European marine manpower, when available. The availability of cheap labour mainly coming from East Asia and East Europe, has reduced the need for the recruitment of ship officers originating from European countries who produce a higher operative cost. These figures are also justified by the fact that Maritime Education and Training Institutes (MET) in European Countries are quite expensive compared to MET in third world countries.

The view expressing that there is a quality advantage of European seafarers, in our case Greek seafarers, is only partly justified. Nowadays, seafarers from third world countries are almost equally qualified as European seafarers (Mazzarino and Maggi, 2000). Moreover, the hard-working conditions onboard ships and the negative image of shipping industry caused by marine accidents and pollutions incidents do not attract new entries in the marine profession.

Demand and supply of seafarers and marine training institutions world-wide have both a quantitative and a qualitative dimension. There are shortcomings in both dimensions. **Quantitative shortcomings** normally do not exist in East Europe and Asia where a number of countries produce more ship officers than required to man ships flying the national flag. However, they exist in most European countries including Greece, and they will continue to exist if the present shortage of cadets cannot be overcome.

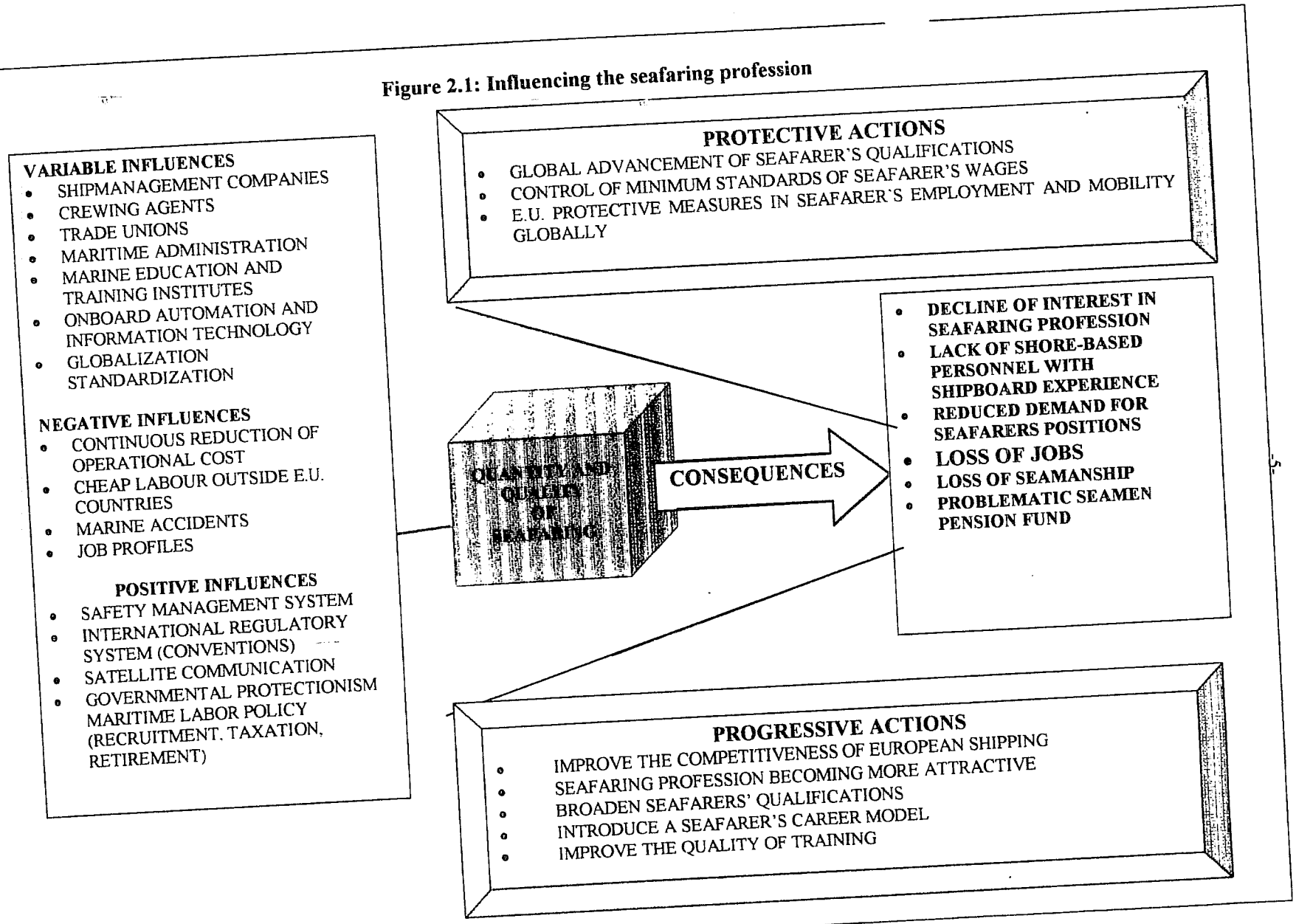
Qualitative shortcomings are addressed by the minimum requirements of the STCW 1995 convention. This has led, and will lead, to improvements of standards in those countries where these requirements are not met yet, but may also lead to reduced standards in countries where the convention's requirements are already exist. The problem is focused on the loss of traditional seamanship, or better on the loss of shipboard management knowledge.

The implementation of the ISM Code and the continuous improvement of the international regulatory system in relation to the evolution of telecommunications technology onboard ships have absolute positive effects on the quality and quantity of

the seafaring profession. If a national labour policy effectively and rapidly corresponds to these changes, the seafaring profession will be protected. The true picture though, is that the public authorities do not have the correct mechanisms or the appropriate forecasting tools to predict the consequences, which possibly are the reduced demand for seafarers supported by a problematic seamen pension fund.

The use of modern technology in the maritime transport chain will continue to progress under the observation of cost benefit criteria. It has led to changes in work conditions and work contents for personnel on board and ashore (operational changes), i.e. reducing captain's autonomy because the ship can be reached by modern means of communication day and night. Many officers see this development as an erosion of shipboard responsibility. However, such modern means of communication can also be used either to the benefit of shipboard personnel by facilitating their communication with their relatives or can be extended to an educational use by making distance learning programmes available on board (Nautilus Project, 2000).

Figure 2.1: Influencing the seafaring profession



Another serious problem stemming from the employment of non-European ship officers on European-flag ships is the lack of provision of executives with shipboard experience for shore based positions in which such experience is essential or at least desirable.

From the above, we can conclude that the qualitative and quantitative "manning" problem of the industry should be specified as a problem of maximizing the personnel's productivity while reducing the total cost of personnel, and harmonizing the required occupational skills of mariners and finally through the setting of appropriate motivation to attract new entries or to preserve the existing positions.

3. THE MAIN FACTORS AFFECTING NATIONAL MARITIME POLICIES

Based on the previous parameters presented we now turn to the analysis of the three main variables that affect the national maritime policy, that is to say, the availability of seafarers, the labor cost related to flag cost and the quality level of marine education and training.

3.1 The availability levels of seafarers

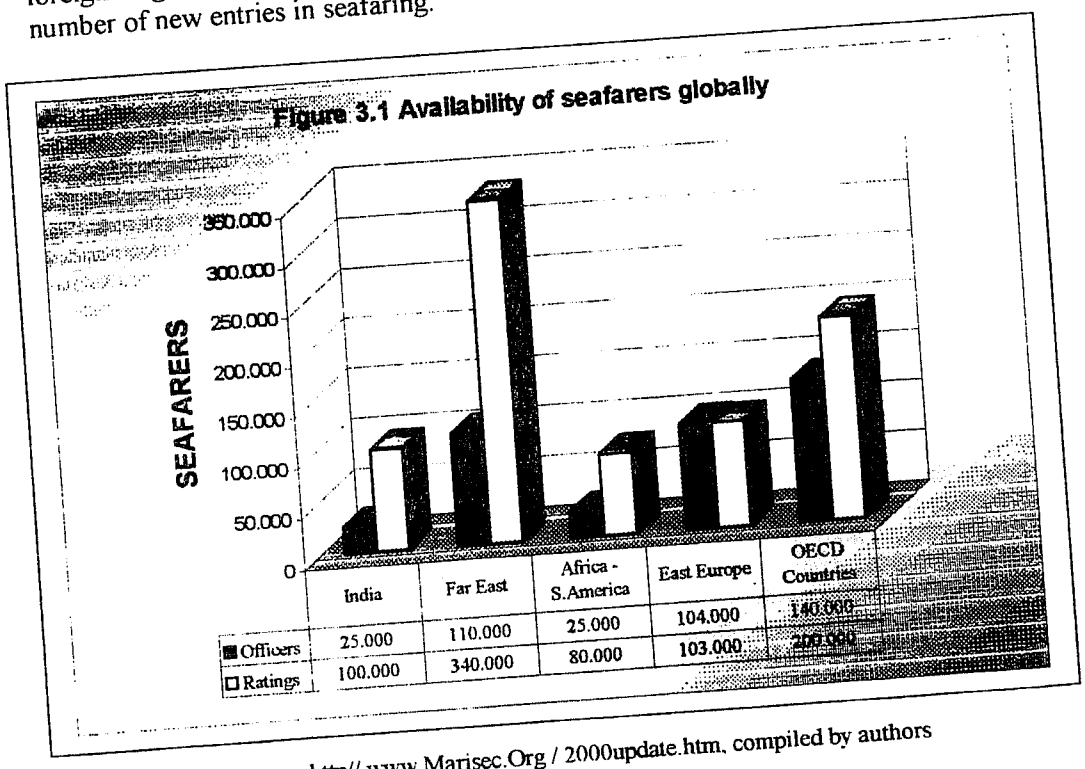
Ship officers are employed in two markets, the international and the national market, and in two sectors, onboard and ashore. It is acknowledged that a global shortage of ship officers and a surplus of ratings already exists (ISF/BIMCO Manpower Study, 2000). The shortage of ship officers is reflected in a surplus of study-places at MET institutions in most European countries, as well as in Greece, during this academic year. The surplus of ratings is for example indicated by the 47 commercially operated private MET institutions in Indonesia and the approximately 120 such institutions in the Philippines.

Despite a reduced demand, one can define a shortage of ship officer supply in many European countries. It is mainly a result of a decline of interest in seafaring as a career, but this picture is not identical in the short sea shipping and especially in the Greek passenger market. The Greek national maritime industry prefers to recruit ship officers who speak the national language and are familiar with national manners and customs. They are employed as pilots, ship and cargo surveyors, managers in ship management companies and manning agencies, in marine insurance and other maritime enterprises, maritime administrations and at MET institutions.

The center of gravity of the marine manpower industry has continued to move away from most of the traditional maritime countries in Europe, Japan and North America towards countries in the Far East, the Indian sub-continent and Eastern Europe (See Figure 3.1). Seafarers from OECD countries currently constitute some 27.5 per cent of the marine global workforce compared to 31.5 per cent in 1995 and there have been particularly substantial reductions in the numbers of junior deck and engine officers

from OECD nations. But while these changes may well have been quite dramatic at the level of an individual company or country, from a global perspective the overall decline of 4 per cent in the proportion of OECD seafarers over a five year period suggests that the changes are evolutionary rather than revolutionary.

Focusing on the Greek marine manpower (Figure 3.2) we can see that the number of available seafarers diminished roughly during the 1980s. In the beginning of the 1990s we have noticed that the pensioners and seamen in practice were almost reaching the same ratio (1:1) and in the mid-1990s the pensioners ratio increased which leads us to a problematic seamen pension fund. Another important element is the increasing number of foreign seamen onboard Greek-flag ships or ships with a foreign flag but contracted with Seamen Pension Fund (NAT) and the decreasing number of new entries in seafaring.



Source: http// www.Marisec.Org / 2000update.htm, compiled by authors

As we can see in Figure 3.3 the Greek fleet continues to rely upon a large number of Greek officers. However, 45 per cent of these officers are over 40 years old, and 15 per cent are aged over 50. Most of these officers are in senior positions. Their retirement will have a severe impact on the industry without having adequate numbers of well trained and experienced replacements. It is highly likely that within the next 10 years most senior officers will originate from Asian or East European countries.

In order to get a better understanding from the presented statistical data we have made a factor analysis with the software application "MINI TAB". We inserted all the variables and the results are presented in Table 1, 2 (See Appendix). From this analysis we understand that the most important factors are C3, C4, C5, C6, C7, C8, C15 and C16 which represent: Official register seaman books, Official signing contracts onboard, Pensioners, Enumerated seamen (start sea carrier), Enlisted

(G.E.N.E. permission), Greek seaman positions onboard Greek ships, C' Engineers diplomas awarded, Total Diplomas Awarded.

Based on these results we have prepared a regression analysis of the collected data. The most important findings are presented in Table 3 (See Appendix). The study of these findings shows that variable C2 (Official register seaman books) has an unquestionably strong relation with variable C3 (Official signings onboard) and variable C16 (Total Diplomas awarded). The causes are the unwillingness of young people to start a career at sea and the inability of Greek ship managers to hire Greek seamen due to gradually higher wages.

Figure 3.2: Greek Marine Manpower trends (1980-1998)

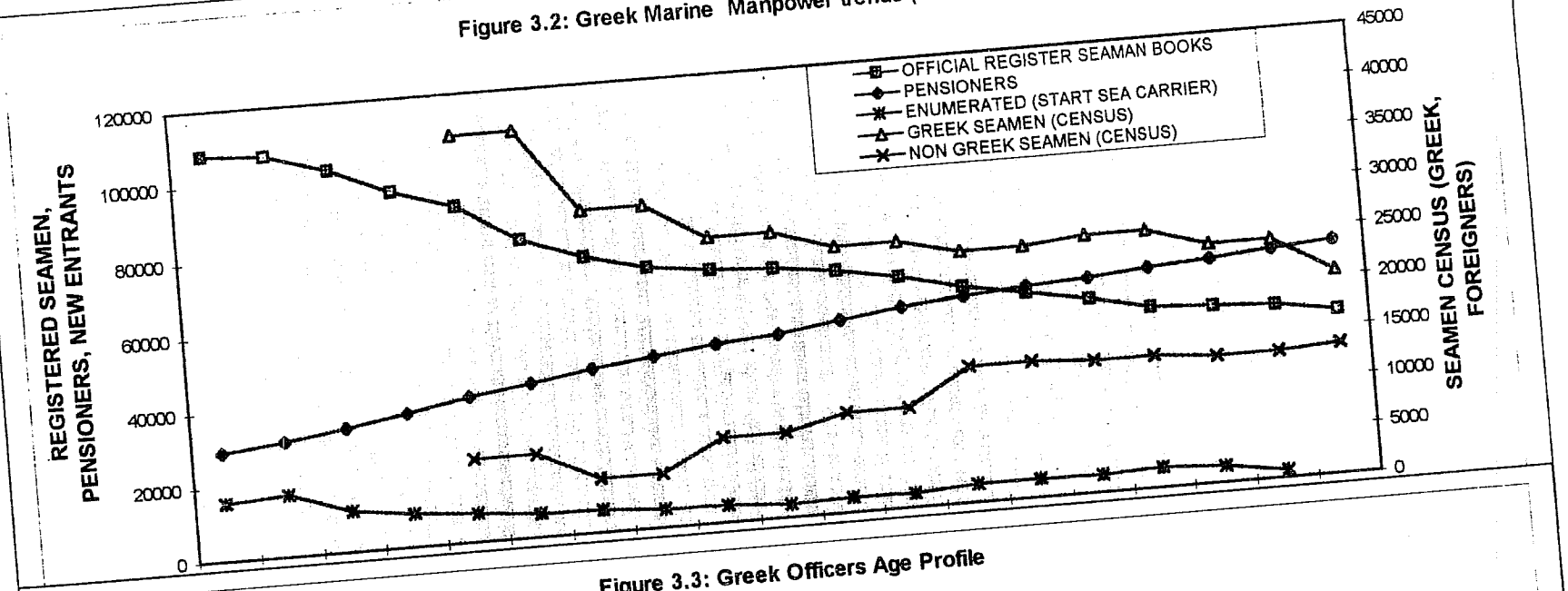
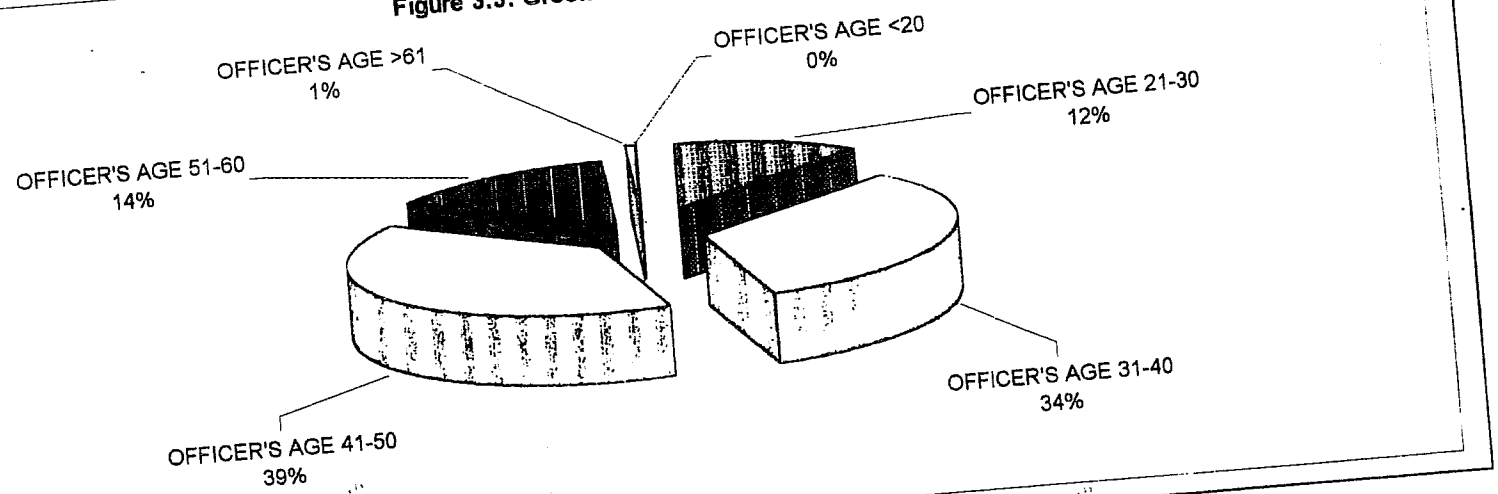


Figure 3.3: Greek Officers Age Profile



Then, we have attempted to predict the future trends of the basic curve C2 and the evolution is very pessimistic. Using as a starting point the year 1980, it will reach zero [0] exactly after 10 years. But, under more careful observation, measuring from the year 1995 the curve is becoming almost parallel to the axe (stable number of available seafarers) and as a result it will reach zero after 30 years.

In other words, during a period of 30 years the available percentages of seafarers will not vanish but they will be equal in numbers with those originating from other European states. The critical question is what can be done to reverse or minimize those trends. Simply, we have to move from firefighting decisions into the field of strategic planning.

3.2 The ship's operating cost based on flag and labour cost

Since the 1980s the E.U. merchant fleet has suffered a dramatic decline with detrimental effects on employment on account of three prime reasons: (Kiriazidis & Tzanidakis, 1995)

(a) Reduced demand for shipping services. In other words, people avoid becoming seafarers,
(b) Intense competition mainly from far-east countries that enforce protection policies. This shows the low figure in availability numbers of European seafarers,
(c) Operation of FOCs offering economic advantages to foreign shipowners. This obviously reduces substantially the operating cost of a vessel.

Consequently, EU states faced significant problems in preserving a national flag fleet. The reaction of some states in an attempt to maintain a national flag fleet concentrated on related supportive measures in the form of:

(a) Subsidies and fiscal incentives. This was partially effective in some states (Greece) or completely failed in other states (Spain, Portugal).
(b) Establishing second registers, either offshore or international, e.g. Isle of Man, Kerguelen, DIR, GIS, proving to be the only economic alternative to 'flagging out'. However, those measures led to a distortion of competition between member states because some states do not operate an offshore registry (Greece, Belgium), others (Denmark) follow policies in a specific manner: the national shipowner can employ a non-national crew save the master.

Additionally, labour cost is a major influence in considering European and international manning. On a straight line comparison, the cost of manning a vessel fully-employed with Europeans will obviously be higher than manning her with an all far Eastern complement (See Appendix table 4). On the other hand, table 5 (see Appendix) shows the individual typical monthly rank costs of employing different nationality seafarers, doing the same job, in the international trading market. This typical cost includes wage, consolidated overtime and vacation. As we can see the difference between European monthly cost and non European monthly cost is almost double (MASSOP, 2000).

The criteria for determining the manning scales vary from country to country although they are based on IMO requirements for all countries. The following criteria for the determination of safe manning scales have been mentioned: tonnage, type of ship, power of main engine, competence of crew, proper and qualified lookout, all types of emergencies can be properly handled, required repair works can be done, maintenance work can be carried out, crew is given the required rest hours (fatigue issues), enough people are onboard to carry out mooring activities, onboard technology.

Nevertheless, there are a number of issues to confront, apart from straight costs. An owner, in giving consideration to a manning style of his vessel, will be influenced by a number of features, which will broadly fall into the following categories: (Fournarakis, 2000)
(a) Manpower skills and availability (Experience, skills training, knowledge of English or other onboard language, supply of crew)
(b) Other aspects (Vessel trading area, union situation, legislation, preference for labour choice, political status)

Based on the foresaid, it is obvious that in all cases European seafarers are (and will be) more expensive than their Far Eastern counterparts, the reason being that market rates are invariably based on country of domicile. This will even be the case when "discounting" the European costs through government training subsidies, alleviation of social security payment or other measures.

So far we can conclude that, if a shipowner wishes to be competitive, his most important decisions are to choose a flag and a crew. The question that arises is whether the whole Greek shipping industry is examined as one national enterprise or every ship-manager has to solve the problem on his own. The answer is that the state's maritime policy must adopt appropriate measures, i.e. establish a second registry, in order to offer comparative advantages to the whole shipping industry.

3.3 The training system

The marine training system in Europe varies from country to country not only in a quantitative but also in a qualitative manner.

At METs in seven European Countries, courses are leading to unlimited certificates of competency and academic degrees. These countries are Belgium, France, Germany, Netherlands, Norway, Portugal and Spain. In Netherlands, Norway and Germany an unlimited certificate of competency can also be obtained without an academic degree. The entry requirements in general education are lower to these MET institutes than the ones where academic degrees are also awarded. In most countries, general education requirements for certificate plus degree studies at an MET institute are equivalent to university entry requirements in general education. Five of the seven countries offer a degree equivalent to a BSc. France offers a degree equivalent to an MSc (Baccalauréat + five years of study). Only in Spain, and in Greece now, after the BSc, an MSc or even a PhD may be obtained.

The value of a BSc from MET institutes for pursuing a postgraduate degree is in most countries rather limited because of the lack of study opportunities for an MSc degree

in nautical or marine engineering science. For obtaining an MSc degree, students with a BSc from an MET institute in these countries will have to choose postgraduate studies in another maritime subject (such as naval architecture) or in a field (economics, management or law) where only a limited relation to maritime studies exists, although such postgraduate qualification may become of increased value because of the additional maritime qualification. The time spent on obtaining a BSc at an MET institution and the degree itself are therefore often hardly taken into account in terms of time and credits for postgraduate studies.

The question is whether a marine cadet can acquire the motives of building a recognized career with long-term plans in an educational system of high standards. If he chooses to become a ship officer, then he should know each and every step of his career orientation.

4. A NEW APPROACH

In order to answer to the above thoughts, we have to examine the number of availability of seafarers not as a total figure but rather as different entities which compose the human capital of the shipping industry. The total number of available seafarers stems from the following algebraic equation:

$$\Sigma_{av} = \Sigma(N_{pos} + N_{car} + N_{stby}) - \Sigma N_{ret} +/- N_{occ}$$

Σ_{av} = Number of available seafarers
N_{pos} = Number of existing positions according to the maritime manpower policy (professions onboard ships multiplied by ships flying the national flag)
N_{car} = Number of new entrants in maritime career (including graduates from marine academies)
N_{stby} = Number of stand-by seamen and seamen in international shipping industry (including foreign flag ships owned by Greek and Foreign shipping companies)
N_{ret} = Number of seamen who have either retired (pensioners) or died or left the industry to work onshore or to occupy themselves in other sectors
N_{occ} = Number of occasionally available seamen

Suggesting that the availability number of Greek seafarers will prove almost impossible to increase under the present conditions (many job opportunities ashore and the number of pensioners is substantially higher than the one of new entries on a yearly basis), then the problem of maintaining the current status will depend on the criteria below:

(a) treatment of a gradual student-leakage from the marine academies,
(b) the re-employment of Greek seafarers (recruited in foreign vessels) to ships flying the Greek flag,
(c) upgrading the percentage ratio of Greek-foreign seafarers on board Greek ships,
(d) attracting vessels to fly the Greek flag under beneficiary terms (labour cost) for the shipowners

The manpower problem in the Greek Shipping industry is not only the decreasing number of available seafarers but also the long-term loss of Greek ship management 'know-how' which is the national competitive advantage. In order to adopt a different approach and offer solutions in the future by providing an effective tool to decision/policy-makers, we have to take under consideration not only the appropriate measures but also to estimate the impacts of these measures in a simulation way.

By using the systems dynamics methodology, a simulation model could be created encompassing the Greek Shipping Industry's System as well as the Greek Marine Manpower Subsystem in order to redesign or improve the problematic dimensions. This methodology (Obando et al, 1999) combines the qualitative and quantitative approach with a more accurate way, using control theory techniques, statistical techniques and computer simulation techniques. Once a valid model has been achieved, it then becomes a valuable tool for analyzing systems behavior and as a test-bed for possible redesign strategies.

Until quite recently, there are no sufficient data in Greece in order to create this model. Instead we present some empirical elements based partly on our own previous experience and partly on interviews with national authorities.

5. PROPOSALS THROUGH PROGRESSIVE ACTIONS

From Figure 2.1 we have shown that there are some progressive actions which must be implemented in order to avoid the negative influences of quality and quantity standards of seafarers, such as improving the quality of training, improving the competitiveness of European and national shipping and introducing a seafarer's career model.

5.1 Improving the quality of training

There are some measures by which the competitiveness of METs in European countries could be improved qualitatively, as for example: (a) the concentration of resources, which would also result in the improvement and harmonization of METs facilities, (b) the improvement and extension of syllabi, (c) a quicker adaptation to changing industry requirements as the updating of maritime lecturers, including the training in a more effective use of modern technology.

This approach provide a better cost-benefit of METs by the concentration of national METs resources which can be expected to lead to higher standards and can be strengthened by the integration of independent METs institutions as departments belonging to higher education foundations (i.e. universities).

Such integration will be particularly advantageous for METs at the end of which an academic degree will be awarded in addition to a certificate of competency. It would facilitate access to expertise in science, English and other subjects (i.e. economics and law) from lecturers of other departments. The other benefit from an integration lies in

the mind-broadening effect for lecturers who have before taught at a MET institution which was physically, organizationally and financially separated from other institutions of higher education. Communication and cooperation with lecturers in other departments normally lead to mutual recognition and appreciation and an opening of the sometimes "solitary confinement" of METs teaching staff in their "maritime world".

Whilst concentration and integration are cost-saving and quality-raising, it may be difficult to calculate to which exact savings they will lead, although it can be taken for granted that there will be savings in addition to gains in quality and potential.

5.2 Improving the competitiveness of national shipping industry

The Greek flag never flew with 100% of tonnage controlled/owned by Greek owners. Flagging out took place during 1981-1990 and again in 1995-1997. The Greek shipping industry instead of forming a second register after 1980, went for a portfolio of flags consisting of old and new open registers (e.g. Liberia, Panama, Cyprus, Malta, St Vincent, Vanuatu, Marshall islands) and second registers (e.g. Kerguelen, NIS). This indicates the inability of the Greek state to provide financial solutions, i.e. subsidies (Gulielmos,1998). Anyway, second registers retain the advantages of FOCs and at the same time retain the link between beneficiary ownership and national flag, particularly in matters of safety. The existence of second registers may help in halting the decline of national fleets and the loss of employment admitting that FOCs could not vanish. (Ready, 1999)

Greece did not produce a second register because a 'quasi second register' (QSRG) had already existed since 1955 (Law 3170/1955). According to this legislation, ships under foreign flag were allowed to employ and insured as many Greeks as were actually working on board of a ship contracted to the Greek Seamen Pension Fund (GSPF). This offered the owner the opportunity to employ as many Greeks as he desired but the main advantage was that Greek crew could be insured in the state-managed GSPF and their service could be counted for promotion.

In other words, Greek seamen were allowed to serve in foreign vessels but insurance to GSPF was denied unless the vessel was contracted to it and also sea service outside QSRG did not count for promotion. These restrictions were removed by Law 1376/1983 and the QSRG fleet declined substantially. The new law gave the possibility for Greek seamen to serve on board Greek Ships (not only under the QSRG) under foreign flags and to count this service for insurance purposes if they wished, paying the required contributions. This decline from QSRG equally removed positions for cadets.

Obviously this is the right time to reconsider this approach by establishing a second Greek registry.

5.3 Introducing a seafarer's career model

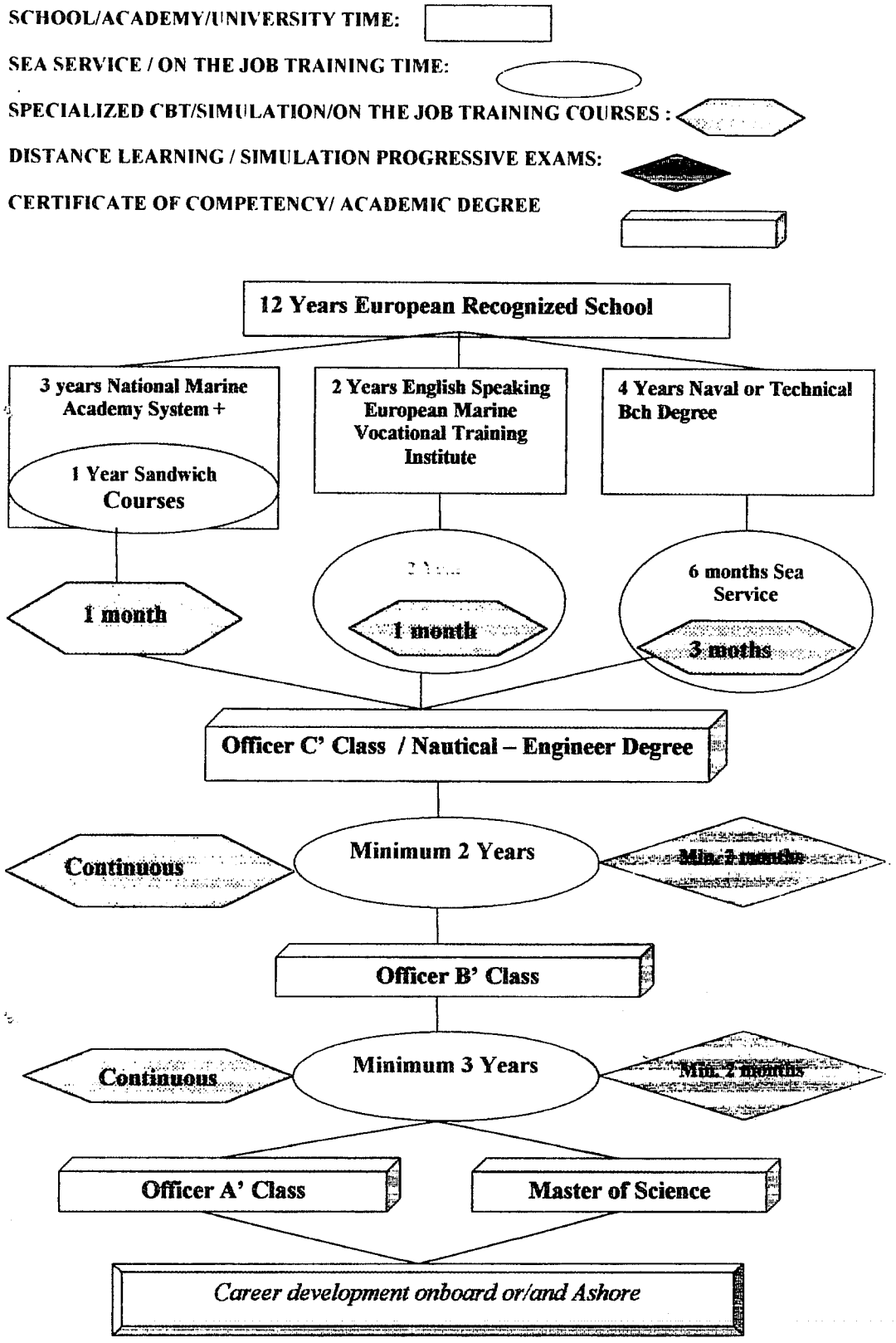
Shipping industry relies on traditional "school models" for most of her training needs even though workplace learning is fundamentally different from traditional school

learning. Empirical studies of professional practice show that while the focus is primarily on getting the job done, learning is inextricably intertwined with working. In order to do their job, professionals must continually learn to apply existing knowledge to routine (or innovative or emergency situations), and to construct new knowledge in response to changing workplace situations. Thus, learning is fundamentally embedded in ongoing work activities and these work activities, in turn give rise to the problems driving the learning must take place.

In the traditional model of on the job training, to promote the new practices, workers would typically receive a pre-prepared course in the new regulations, procedures or processes – often at a different location from their place of work – and be expected to apply this abstracted knowledge later in their workplaces (sometimes with disappointed results). The goal of our model is to use information and communication technology and the advances in workplace learning theories with an innovative and combined way in order to (a) move from one single passive training course to continuous learning processes and (b) compose the various individual training courses within an incorporate work group learning.

Acknowledging the current educational system and the facilities offered by the information and communication technologies (ICT), we propose a new seafarer's Career Development Model. This model aims at combining years spent on board and following a career on land using as an umbrella a continuous training system supported by state and the industry. This career model will plan for a minimum of 15 years, covering education and sea-service time and it will sought to attract new entries into the marine profession.

Figure 5.1: Seafarer Career Development Model



6. CONCLUSIONS

This paper reviews some problems of the current situation in the Greek marine manpower market and concludes that firstly, the numbers of recruitment need to increase in the future and secondly, there is a need to reduce the number of seafarers who leave the industry. Nevertheless, by observing the rates of students leaving the marine academies before graduating, we focus on the improvement of quality of training methods and on the introduction of a career model.

The verification of the above results was extracted from the factor and regression analysis which have led us to a highly pessimistic trend. The use of a system dynamic methodology will provide the suitable decision-making tool in order to implement a new maritime policy.

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Appendix I

Table 1: The collection and data entry

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
		Seamen Books	Contracts onboard	Pensioners	Enumerated (start carrier)	Enlisted (GENE permission)	Greek seamen (census)	Non Greek Seamen (sensus)	Master diplomas awarded	Chief Officer diplomas awarded	2nd Officer Diplomas awarded	A' Engineer Diplomas awarded	B' Engineer Diplomas awarded	C' Engineer Diplomas awarded	Total Diplomas awarded	Graduated from public schools	Graduated public/private schools	Students recruited in first academic year
1	1980	108000	65000	29211	15629	73790	46110	2696	602	423	932	404	371	655	5021	1001	1099	2730
2	1981	107000	60000	31022	16697	67553	44763	4138	311	233	749	281	134	658	3780	964	1069	2771
3	1982	102000	52000	33465	11056	45545	43415	5580	242	301	719	295	244	447	3766	979	1040	2811
4	1983	95000	48000	36162	9009	53066	42067	7022	192	245	788	238	138	565	3305	1035	1010	1914
5	1984	90000	50000	39273	7815	65253	40720	8464	183	359	683	210	278	403	3340	936	907	1581
6	1985	80000	47000	41582	6380	54393	36530	6977	20	344	772	237	262	454	2951	725	637	1765
7	1986	74000	42000	44143	6113	42186	32340	5490	162	262	589	149	220	400	2317	242	180	2182
8	1987	70000	40000	46063	4921	34565	30537	7061	105	246	333	123	167	230	1664	442	434	2196
9	1988	68000	38000	48025	4736	34222	28735	8632	89	259	221	142	148	265	1496	367	385	1999
10	1989	67000	37000	49322	3603	30462	27750	9358	163	275	198	172	149	246	1579	325	476	1761
11	1990	65000	36000	51765	4135	29786	26766	10085	360	269	245	184	177	189	1727	466	474	1542
12	1991	62000	34000	53968	3893	26315	26022	11901	154	290	228	160	154	193	1600	487	473	1314
13	1992	58000	32000	55450	4933	24107	25278	13717	168	337	295	183	162	213	1886	154	268	1454
14	1993	55000	31000	56684	4900	22618	25560	13498	182	227	324	140	148	248	1705	247	175	1651
15	1994	52000	30000	57567	4712	22233	25842	13280	187	196	314	144	183	219	1668	290	178	2246
16	1995	48500	28000	58964	5373	21027	24917	13027	220	248	420	201	164	194	1974	382	181	2980
17	1996	47500	27500	60032	4357	17366	23992	12774	235	244	437	175	205	236	1925	497	254	3371
18	1997	46500	27000	61475	1947	16114	22248	12969	210	232	408	162	195	211	1743	575	564	3458
19	1998	44000	25500	62500	1187	14900	20505	13164	210	220	380	150	185	186	1561	551	534	3498

Source: Data borrowed from National Statistical Service of Greece and Ministry of Merchant Marine, compiled by authors

Table 2: Factor Analysis

C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,C16,
Principal Component Factor Analysis of the Correlation Matrix
Unrotated Factor Loadings and Communalities

Variable	Factor1	Factor2	Communality
C3	-0.958	0.241	0.975
C4	-0.973	0.182	0.980
C5	0.946	-0.279	0.973
C6	-0.917	-0.022	0.841
C7	-0.949	0.232	0.954
C8	-0.971	0.179	0.974
C9	0.875	-0.211	0.810
C10	-0.518	-0.577	0.601
C11	-0.621	0.057	0.388
C12	-0.894	-0.173	0.829
C13	-0.900	-0.290	0.895
C14	-0.607	-0.366	0.502
C15	-0.947	0.045	0.899
C16	-0.976	-0.154	0.976
C17	-0.852	-0.171	0.755
C18	-0.877	-0.066	0.774
C19	-0.020	-0.856	0.734
Variance	12.185	1.677	13.861
% Var	0.717	0.099	0.815

Rotated Factor Loadings and Communalities
Varimax Rotation

Variable	Factor1	Factor2	Communality
C3	0.984	0.088	0.975
C4	0.979	0.148	0.980
C5	-0.985	-0.048	0.973
C6	0.859	0.322	0.841
C7	0.973	0.093	0.954
C8	0.976	0.150	0.974
C9	-0.896	-0.089	0.810
C10	0.299	0.715	0.601
C11	0.605	0.151	0.388
C12	0.787	0.458	0.829
C13	0.755	0.570	0.895
C14	0.453	0.546	0.502
C15	0.909	0.269	0.899
C16	0.871	0.466	0.976
C17	0.748	0.442	0.755
C18	0.806	0.351	0.774
C19	-0.263	0.815	0.734
Variance	11.047	2.814	13.861
% Var	0.650	0.166	0.815

Factor Score Coefficients

Variable	Factor1	Factor2
C3	0.121	-0.110
C4	0.111	-0.076
C5	-0.128	0.131
C6	0.067	0.037
C7	0.119	-0.105
C8	0.110	-0.075
C9	-0.109	0.095
C10	-0.073	0.339
C11	0.059	-0.015
C12	0.035	0.122
C13	0.013	0.188
C14	-0.025	0.223
C15	0.082	-0.000
C16	0.045	0.113
C17	0.032	0.119
C18	0.055	0.061
C19	-0.166	0.483

Table 3: Regression Analysis

C4 versus C2, C3

The regression equation is

C4 = 363217 – 180 C2 + 0.489 C3

Predictor	Coef	SE Coef	T	P
Constant	363217	843120	0.43	0.672
C2	-180.1	420.0	-0.43	0.674
C3	0.4892	0.1124	4.35	0.000

S = 2228 R-Sq = 96.7% R-Sq(adj) = 96.2%

Regression Analysis: C4 versus C3

The regression equation is

C4 = 1672 + 0.536 C3

S = 2173 R-Sq = 96.6% R-Sq(adj) = 96.4%

Regression Analysis: C5 versus C3

The regression equation is

C5 = 83848 – 0.505 C3

S = 1262 R-Sq = 98.7% R-Sq(adj) = 98.6%

Regression Analysis: C10 versus C4

The regression equation is

C10 = 29.2 + 0.00459 C4

Predictor	Coef	SE Coef	T	P
Constant	29.22	94.05	0.31	0.760
C4	0.004587	0.002293	2.00	0.062

S = 111.6 R-Sq = 19.1% R-Sq(adj) = 14.3%

Regression Analysis: C10 versus C4

The regression equation is

C3 = 7319882 – 3645 C2

Predictor	Coef	SE Coef	T	P
Constant	7319882	400593	18.27	0.000
C2	-3644.7	201.4	-18.10	0.000

S = 4808 R-Sq = 95.1% R-Sq(adj) = 94.8%