



Journal of Economics and Business
Vol. VI – 2003, No 2 (89 – 122)

The ex-Soviet and Russian Tanker and Cargo Fleet's Magnitude (1975-2001)*

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* *The authors would like to thank Associate Professor Leonidas Maroudas, as well as the two anonymous referees and the Editor of this Journal for their helpful comments. They would also like to thank Panayotis Varzakakos, MSc. Eng of N.T.U.A., for providing them with data that were essential.*

Abstract

The present paper examines the relationship of the ex-Soviet and the Russian fleet of tankers and cargoes, with respect to the world trade of oil and bulk loading. We study the extent to which, the Russian fleet followed the patterns of the world trade and we investigate the determinants of the tanker and cargo fleets' performance. The main conclusion is that the Russian fleet faces problems related to Russia's severe economic situation and is rapidly aging. As a result, the Russian fleet is relatively shrinking and the solutions driving to a positive future seem to be linked to Russia's political and economic development.

KEYWORDS: ex-Soviet; Russia; tanker; cargo; flagged fleet owed fleet

JEL classification: P26 ; N74

Introduction

There are at least three reasons for the study of the ex-Soviet and Russian merchant fleet: First, the ex-Soviet Union and Russia possessed one of the largest fleets in the world (Fondron 2002).¹ Second, the political and economic environment in Russia and the other ex-Soviet states is characterized by political instability and serious volatility (Fondron 2002). Third, the Russian merchant policy is a very important issue that the European Union (E.U.) takes into consideration (European Commission 2000) when planning its own merchant and naval policy in regions where the Russian fleet is active, e.g. the Baltic Sea.

There was the view that the Russian state and merchant policy would be in a state of drift, and until a new national consensus could be formed, no cohesion would be likely in the Soviet policy. Thus, merchant programs and policies would be likely to continue by momentum, checked only by budgetary considerations (Fondron 2002). The present paper provides, at least, a partial answer to this question.

The purpose of the present paper is to identify the factors that had determined the development of the Soviet fleet in the period before the regime's collapse, to study the changes which occurred in the process of transition from the centralized economy to the capitalist economy and to locate the factors determining the

¹ *In the late 80's the ex-Soviet merchant fleet represented 6.3% of the world's merchant fleet, while this percentage fell to about 2%, for the Russian fleet in the late 90's (Lloyd's Register of Shipping 1999, 2000).*

dynamics of Russia's maritime performance ever since², in contrast to the patterns of development of the world's merchant fleet and the factors determining it.³

We start our investigation with the assumption that the world production (and demand) determines *ceteris paribus* the volume of the transportation services, and especially the volume of the merchant fleet. More precisely, the magnitude of the world oil trade⁴ and the bulk loading trade⁵ determine the relevant volume of the sea transportation, i.e. fleets of tankers and cargoes⁶, both at a national and international level.

The present paper attempts, first, to set a plan that would enable the interpretation of the various fleets' behaviors, second, to answer some questions regarding the recent development of the Russian fleets, and third to indicate several other issues that remain open for further investigation in the future.

The paper is organized as follows: The second section relates the magnitude of the tanker and cargo fleets with world trade, the third section investigates the determinants of the Russian fleet's performance, while the fourth section presents some other determining factors of the Russian fleet's development, that may not be easily quantified. Finally, in the fifth section we summarize our concluding remarks.

The Tanker and Cargo Fleets and the World Trade

Based upon our assumption, namely that the volume of the world oil and bulk loading trade determines the volume of sea transportation (i.e. the tonnage of tanker and cargo fleets), both at a national and an international level, we will first examine the ex-Soviet and the Russian fleet's (tankers and cargoes) performance, which belong to the domestic flag: (a) in respect to the volume of trade that is being transported by ships of the relevant type and (b) in respect to the behavior of the world fleet of tankers and cargoes compared to the world trade.

² After the formation of the Russian Federation, there are data available for the tanker and cargo fleets, both under Russian flag and under Russian ownership; we will therefore consider both cases.

³ In 1980, the world's fleet of tankers and cargoes represented 90.1% of the world's merchant fleet. This percentage fell to 70% in 2000 still representing the largest part of the fleet. For the Soviet Union, this percentage fell from 62.5% in 1980 to 50.6% in 1991 and, for the same year, to 56.1% for the Russian fleet (N.S.S.G., I.S.L.).

⁴ With the term "oil trade" we refer to the seaborne trade of crude oil and oil products.

⁵ With the term "bulk loading trade" we refer to the trade of iron ore, coal and grain, the type of goods that (ore/dry) bulk and cargo ships, in general, carry.

⁶ With the term "cargoes" we refer to two kinds of ships: ore/dry bulk carriers and cargo ships in general.

In this section we will investigate whether the ex-Soviet and Russian flag fleets of tankers and cargoes follow the trends of the world oil trade and the trade of bulk loading, and whether the world's fleet of tankers and cargoes have similar behaviors.

The data and the variables

The data is on annual basis and covers the period 1975-2001. Because of the crisis and the final collapse of the Soviet Union in 1992, we separate the time series in two parts. The one starting from year 1975, when the first data is available and ending in 1991, just one year before the collapse, and the second from 1993, one year after the collapse, and ending in 2001 when the last data is available. As can be seen, we omit year 1992 when the final collapse occurred, because it obviously functions as an outlier and worsens dramatically the performance of our models. The data come from various sources (National Statistical Service of Greece, Lloyd's Register of Shipping, Statistical Yearbook of Norway).

Dependent variables:

- (a) In the first period (1975-1991), the dependent variable, magnitude of the ex-Soviet flagged fleet (tankers and cargoes) in year t is measured in thousands of gross tones (grt).
- (b) In the second period (1993-2000), the dependent variable, magnitude of the Russian flagged fleet (tankers and cargoes) in year t , is measured in thousands of gross tones (grt).

Independent variable:

In both periods (1975-1991 and 1993-2000), the magnitude of the world oil trade and the bulk loading trade in year $t - i$, $i \in \mathbb{N}$, is measured in millions of tones, where i expresses the delay in years that mediates.

Table 1a.
The Ex-Soviet and Russian flag tanker fleet, 1975-2001 (selected years)

Year	Ex-Soviet Tankers Fleet (10 ³ grt)	World's Tankers Fleet (10 ³ grt)	World Oil Trade (10 ⁶ tones)	Year	Russian Tankers Fleet (10 ³ grt)	World's Tankers Fleet (10 ³ grt)	World Oil Trade (10 ⁶ tones)
1975	3713	149957	1496	1993	2823	144580	1714
1980	4728	175004	1596	1995	2306	144790	1808
1985	4346	138448	1159	1997	1646	147894	1929
1990	4167	134836	1526	1999	1429	154092	1958
1991	4069	140828	1573	2001	1430	156068	1997

Source: National Statistical Service of Greece, ISL.

Table 1b
The Ex-Soviet and Russian flag cargo fleet, 1975-2001 (selected years)

Year	Ex-Soviet cargoes Fleet (10 ³ grt)	World's cargoes Fleet (10 ³ grt)	World bulk loading Trade (10 ⁶ tones)	Year	Russian cargoes Fleet (10 ³ grt)	World's cargoes Fleet (10 ³ grt)	World bulk loading Trade (10 ⁶ tones)
1975	7999	159678	556	1993	6446	200417	915
1980	9939	203481	700	1995	6230	209130	1005
1985	11386	228136	774	1997	4937	219341	1093
1990	9792	184600	881	1999	3770	214706	1113
1991	9306	187263	927	2001	3680	219806	1225

Source: National Statistical Service of Greece, ISL

Empirical Results

The relationship is assumed to be linear, and we use a time-series data set for the two periods: 1975-1991 and 1993-2001.⁷ The number of observations is 17 and 9 respectively. Specifically, the basic models for the tanker's fleets are:

$$(1) ST_t = f(WOT_{t-i})$$

$$(2) WT_t = f(WOT_{t-i})^8$$

$$(3) RT_t = f(WOT_{t-i})$$

where:

ST_t = magnitude of the ex-Soviet tanker's flagged fleet in year t,

RT_t = magnitude of the Russian tanker's flagged fleet in year t,

WOT_{t-i} = magnitude of the world oil trade in year t-i, $i \in N$.

WT_t = magnitude of the world's tanker's fleet

Respectively, the basic models for the cargoes fleets are:

$$(4) SC_t = f(WCT_{t-i})$$

$$(5) WC_t = (WOT_{t-i})^9$$

$$(6) RC_t = f(WCT_{t-i})$$

where:

SC_t = magnitude of the ex-Soviet cargoes fleet in year t,

RC_t = magnitude of the Russian cargoes fleet in year t,

WCT_{t-i} = magnitude of the world bulk loading trade in year t-i, $i \in N$.

WC_t = magnitude of the world cargoes fleet

Table 2 presents the regression results for each of the dependent variables of the equations (1)-(3) for a delay of $i = 3$ years for the period 1975-1991 and without delay ($i = 0$) for the period 1993-2001, which gives the most satisfactory and acceptable statistical results. The estimated coefficients are statistically significant

⁷ The variables could have, as well, been expressed in logs.

⁸ We use the same relationship for both periods 1975-1991 and 1993-2000.

⁹ We use the same relationship for both periods 1975-1988 and 1993-2000.

and the regressions explain 0.74 and 0.94 of the variability of the ex-Soviet and Russian flagged tankers fleets respectively and 0.87 and 0.83 of the variability of the world's tankers fleet for 1974-1991 and 1993-2001 respectively. Also a constant term is included because omission of this term might bias the results substantially.

Table 3 presents the regression results for each of the dependent variables of the equations (4)-(6). For the ex-Soviet and the world cargo fleets the most satisfactory results are obtained from the regression without delay for the time-series 1975-1988. For the years 1989-1991 we observe a temporary disturbance since the ex-Soviet and the world's cargoes fleets decrease in magnitude, although the world bulk loading trade follows an increasing trend resulting in an overall regression with non-satisfactory statistical results. However, in this period as well, although the small number of observations does not permit us to estimate a regression line, the ex-Soviet fleet's behavior is analogous to the world fleet's behavior. For the 1993-2001 period, $i = 0$ and the regressions explain 0.86 and 0.78 of the variability of the Russian flag and world's cargo fleets respectively.

From the estimated models it is evident, on the one hand, that the ex-Soviet flagged tankers and cargo fleets seem to be following the world oil and bulk loading trade trends during the 1975-1991 period (that is before the Soviet collapse), which is the case with the world fleets as well (positive relation between the dependent and independent variables).

On the other hand, after the collapse of the Soviet Union and during the 1993-2001 period, the Russian flagged fleets were shrinking, despite the world trade's augmenting performance, although the world's fleets continued to behave the same way with trade (negative relation between the dependent and independent variables).

A matter of great interest, which might throw light to our conclusions, is the change in the magnitude of fleets for a given change of the world trade. Thus, we are interested in the average elasticities. Table 4 presents the average elasticities.

Table 2
Regression Results between the tanker fleets and world oil trade.

	ST_t	WT_t (1975-1991)	RT_t	WT_t (1993-2001)
Constant	2858 (10.437)*	31872 (2.306)*	10759 (12.795)*	74978.9 (5.932)*
WOT _{t-1}	1.105 (5.917)*	81.96 (8.692)*	-4.695 (-10.491)*	39.505 (5.916)*
R ²	0.74	0.86	0.94	0.83
SEE	153.1	7727.4	124.2	2012.5
F-Ratio	351	75.5	110	35
D.W.	1.38	1.95	1.91	1.48

Notes: * Significance at the 1% level

Table 3
Regression Results between the cargo fleets and world bulk loading trade.

	SC_t	$WC_t(1975 - 1988)$	RC_t	$WC_t(1993 - 2001)$
Constant	1223.26 (1.429)***	69210.6 (3.445)**	16455.98 (9.421)*	148507.4 (10.931)*
WCT	13.131 (10.563)*	195.92 (6.715)*	-10.782 (-6.622)*	60 (4.738)**
R^2	0.93	0.79	0.86	0.78
SEE	418.6	9824.5	490.2	3812.6
F-Ratio	111.6	45.1	43.9	22.4
D.W.	1.32	1.18	1.35	1.28

Notes: * Significance at the 1% level

** Significance at the 5% level

*** Significance at the 10% level

Table 4.
Elasticities

	<i>Coefficient</i>	<i>Formula</i>	<i>Estimate</i>
<i>Tankers</i>	ϵ_{STWOT}	$\frac{\partial ST}{\partial WOT} \frac{WOT}{ST}$	0.37
	ϵ_{WTWOT} (1975-1991)	$\frac{\partial WT}{\partial WOT} \frac{WOT}{SWT}$	0.79
	ϵ_{RTWOT}	$\frac{\partial RT}{\partial WOT} \frac{WOT}{SRT}$	-4.52
	ϵ_{WTWOT} (1993-2001)	$\frac{\partial WT}{\partial WOT} \frac{WOT}{SWT}$	0.50
	ϵ_{SCWCT}	$\frac{\partial SC}{\partial WCT} \frac{WCT}{SC}$	0.87
<i>Cargo</i>	ϵ_{WCWCT} (1975-1988)	$\frac{\partial WC}{\partial WCT} \frac{WCT}{WC}$	0.65
	ϵ_{RCWCT}	$\frac{\partial RC}{\partial WCT} \frac{WCT}{RC}$	-2.33
	ϵ_{WCWCT} (1993-2001)	$\frac{\partial WC}{\partial WCT} \frac{WCT}{WC}$	0.30

The empirical results show a statistically significant *positive relationship* between the ex-Soviet fleets of tankers and cargo and the world oil and bulk loading trade respectively, as well as between the world's fleets of tankers and cargo and the world oil and bulk loading trade respectively for both periods, and a statistically significant *negative relationship* between the Russian fleets of tankers and cargo and the world oil and bulk loading trade respectively after 1992.

For the tankers and for the period 1975-1991, there was a significant delay of three years in the magnitude of the ex-Soviet and the world fleets in respect to the changes of the world's oil trade magnitude, with an average elasticity equal to 0.37 for the ex-Soviet fleet and 0.79 for the world's fleet. The elasticity of the ex-Soviet fleet's magnitude indicates that for a 1% change in the world oil trade, the ex-Soviet fleet would change its magnitude by 0.37% meaning that it is inelastic to such changes. Analogous conclusions can be drawn for the world fleet (0.79% change in magnitude for a 1% change in the world oil trade). The inelastic behavior of the fleets, taking into consideration that the world oil trade during the period that we are investigating does not follow a constant pattern, meaning that the world, as well as the ex-Soviet fleet, present a smaller percentage change for a given percentage change in the world trade. The continuous changes in both directions in the world oil trade during this period – while the two oil crises were in progress (beginning of the 70's and 80's respectively¹⁰ see Thanopoulou 1994) - have created an uncertain environment regarding oil trade and explain the delay in response of the magnitude of the tankers' fleet.

On the other hand, the smaller average elasticity of the ex-Soviet fleet compared to the world fleet, has two possible explanations: (a) a delay in periods of augmenting world trade, but also (b) a smaller percentage decrease of the world fleet in periods of decreasing oil trade. In other words, the ex-Soviet fleet of tankers presented a "better behavior" in the decreasing instead of the increasing period in the world oil trade compared to the world fleet of tankers.

For the cargoes during the 1975-1988 period, the average elasticity is equal to 0.87 for the ex-Soviet fleet and to 0.65 for the world's fleet. The elasticity of the ex-Soviet fleet's magnitude indicates that for a 1% change in the world bulk loading trade, the ex-Soviet fleet would change its magnitude by 0.87%, meaning that it is inelastic to such changes. Analogous conclusions can be drawn for the world fleet. The inelastic behavior of the fleets, during a period of continuous increase in the world bulk loading trade implies a percentage change in the magnitude of the

¹⁰ As can be seen from tables (1a and 1b) the crisis in the world oil trade during the 80's has led to an impressive restructuring of the world's magnitude, which was not in favor of the tankers (Miliotis and Ioakimoglou 1991b: 81).

fleets, which is smaller than the percentage change in the magnitude of the world trade, while the higher elasticity of the ex-Soviet fleet denotes its greater flexibility.

Conclusively, for the period before the collapse we could say that the ex-Soviet fleet seemed to present a more flexible behavior to the changes in international supply and demand, in comparison to the world fleet. It also presented a more conservative increasing trend in the world oil trade increase, but also a “better defense” in the crisis, as well as greater flexibility to the increase of the world bulk loading trade. The explanatory factors are to be found (a) in the strong relation between the (centrally planned) ex-Soviet fleet¹¹ and the import and export oriented trade of the former USSR (Guzhenko 1977: 109); (b) in USSR’s commercial policies of selling CIF and buying FOB (Marine Policy 1981, Scrivener 1983: 118, Smalley 1984: 66, Bergstrand 1990: 118¹²) and (c) in lower freight rates which Soviet merchant marine offered, compared with Western companies, i.e. the lower operational costs, because of, among other things, “the low costs of bunker fuel in Soviet ports, less annual depreciation deductions and the repair of ships mainly in the own bases” (Guzhenko 1977: 102, 109).¹³

On the other hand, for the 1993-2001 period, the negative relations of the Russian tanker and cargo fleets with respect to the trade have, on their own, no deeper economic meaning. The relations do not provide us with an explanatory set of independent variables (i.e. determinants) that could account satisfactorily for the Russian fleet’s decreasing performance. They express empirically the fact that the Russian fleets, after the collapse of the Soviet formation, do not follow the augmenting trends of the world trade, while the world fleets still follow the trend

¹¹ Through the Ministry of Merchant Marine (Morflot).

¹² “A[n] ... area of controversy has been the carriage of cargoes between the Soviet Union and its Western trading partners. As all Soviet international sales and purchases are handled by state-owned agencies they can ensure that Soviet vessels carry all Soviet trade. If foreign goods are bought on ‘free-on-board’ (fob) terms but Soviet exports are sold ‘cost, insurance and freight’ (cif), carriage can always be directed to Soviet shipping companies” (Bergstrand 1990: 118).

¹³ Schematizing the fundamental differences between Morflot and western operators in commercial and financial matters Smalley writes: “1. Capital for building and replacing ships comes from the State Bank, and operators need make no provision for depreciation or replacement. 2. Soviet shipping companies profess to be profit-motivated, but political considerations always prevail and, in any event, any measure of profit starts from a base line wholly incomparable with Western norms. 3. Fuel oil is secured well below world market prices and more cheaply than Soviet oil is sold to the satellites. 4. Port charges and ship-working schedules in home ports favour Soviet vessels. 5. Because of the high social wage inherent in the Soviet system and funded by the state, cash wage paid to Soviet seamen directly by the ship operator is extremely low in hard currency terms [...] 6. Soviet shipping companies do not insure hull and machinery [...] 7. Much training of crews is provided free by the naval authorities and mariners are interchangeable with naval crews (Smalley 1984: 65).

of trade.¹⁴ We may conclude that the global production and demand, and thus the demand for transportation, is the basic factor that determines the magnitude of fleets, while for the case of Russia, the reasons for the inconsistent - in relation to the general situation - behavior should be found in the interior of the specific social formation at the specific historical period.

Consequently, the negative relationship between the Russian fleets and the world trade is a very interesting issue that needs further investigation. Thus, our next step will be to investigate the factors that may be responsible and can account for the Russian fleet's decreasing performance in the specified time period.

The question arising at this point is: *What factors drove the Russian fleet's magnitude to a decrease while the world trade was augmenting?*

The Determinants of the Russian Fleets' Performance

The macroeconomic situation and the aging fleet

The transition of Russia from a centrally planned to a Western type capitalist economy has been marked by a rapid decline in most macroeconomic indices (Milius 1999: 126). The first apparent results of this transition process, which was mainly characterized by the decentralization of enterprise decision-making and accountability, price liberalization and finally enterprise privatization,¹⁵ is a dramatic output decline (the Gross Domestic Product declined in 1990-1995, by more than 50% of its 1989 value) and very high inflation rates (Milius 2001: 66). The decline in industrial output was even greater, while investment practically collapsed (O.E.C.D. 1995: 3). In such an economic environment showing the signs of a "deconstruction crisis", one should expect the Russian fleet to be strongly restricted, in concern with its further development, by the macroeconomic situation of the country, and thus to follow the dramatic worsening of most indices.

¹⁴ We should note that the world fleet's elasticity (tankers and cargoes) in respect to the relevant trade has fallen in the 1993-2001 period (in comparison to the first period) to values ranging from 0.50 to 0.30 respectively, a tendency which at least partially is reflected in the decline of the Russian fleet's magnitude.

¹⁵ The privatization processes had started at the period of the so-called "Perestroika" (see *Naftika Chronika* 1992: 28). However, the possibility of private ownership under the State flag had made its appearance long before "Perestroika": "The 1968 Merchant Shipping Code of the USSR gives the right to sail under the State flag of the USSR only to vessels in the ownership either of the State itself, or Soviet cooperative or social organizations, or citizens of the USSR [Article 22]. [...] The fact is that citizens of the USSR had always been included in the list of subjects who possessed the right to register their vessels under the State flag of the USSR" (Gitsu 1992: 112).

Consequently, at this point we follow the argument that, while under “ordinary” conditions¹⁶ the fundamental macroeconomic indices, and more specifically the G.D.P., may not always constitute explanatory variables of the magnitude of commercial fleets, under crisis conditions, these indices are transformed into crucial explanatory factors: the ultimate economic basis of a merchant fleet is the state and economic structure of the social formation with which it is connected, in the sense that it derives from it its productive resources (reproduction of material capital, of management, of the labor force, etc., see Milios and Ioakimoglou 1991a, Milios and Ioakimoglou 1991b). In other words, we expect a positive relationship between the Russian G.D.P. (as an expression of the overall macroeconomic situation) and the magnitude of Russian tanker and cargo fleets.¹⁷

The Russian fleets of tankers and cargoes face another great obstacle in international competition, i.e. the aging of their ships. Although this factor is related with the country's crucial economic situation and the (consequent) limitation of the amount of funds available, it has an independent significance, as we will see below.¹⁸

Funding problems most directly affect the fleets' ability to keep vessels operational and complete their mission. For example, since 1989, there has been a 40% decrease in the number of operational vessels as well as a 20% decrease in Atlantic Ocean Patrolling (Nielsen, Kudrik and Nikitin 1996). The purchase of the new equipment, and the modernization of facilities translate into major challenges of the Russian fleet (Tatko and Robinson 2002). The 1996 funding level for ship repairs decreased by 10% from the 1990 funding level, and maintenance and repairs are long overdue on a fleet that is already 10 years old (Handler 1997).¹⁹

¹⁶ As opposed to crisis conditions, which are accordingly defined in the specific and historically determined social formation.

¹⁷ This argument shall not be confronted with the literature investigating the factors that contribute to the growth of the world trade (such as the world income growth, tariff-rate reductions, transport-costs declines, etc.) or the impact of the world trade on the level of income (see on these subjects, among other works, Helpman and Krugman 1985, Helpman 1987, World Bank 1987, Bergstrand 1990, Hummels and Levisohn 1995, Ben-David and Papell 1997, O'Rourke and Williamson 1999, Baier and Bergstrand 2001, WTO 2001, Irwin 2002, Irwin and Tervio 2002, Baltagi, Egger and Pfaffermayr 2003); we do not examine here the factors that affect the world trade or income but (given the level of the world trade and income) the factors that under conditions of national crisis emerge as determinants of the supply of transport services (here the merchant fleet) of the country under examination.

¹⁸ “The Russian shipowning scene is characterized by struggle, in-fighting and intrigue as owners battle to keep their companies afloat and adapt their operations to a commercial environment. Funds for investment are scarce and newbuild contracts are largely dependent on access to foreign credits” (Lloyd's Ship Manager 1999: 49).

¹⁹ The cost for maintaining one decommissioned vessel runs up to about four million rubles (approximately \$641,720) per year according to Murmansk Governor Yuri Yevdokimov (Gallant 1998).

As a result of the non satisfactory maintenance of currently operating vessels and the lack of on-time replacements, Russia's fleet is rapidly aging, which in turn prevents many vessels from being operational and decreases the Russian fleet's quality and competitiveness along with increases in the ship's variable operation/transportation costs (see Chacholiades 1990: 434). The cost increases as poorly maintained ships, high are often prevented from being operational, since they face serious difficulties in reaching certain ports and destinations, due to the increasing strictness of controls and security regulations, followed by the United States of America (USA) and the European Union (EU) (e.g. see Fetsis 2002: 39-69, Gibson 1997, A.B.S., Papagiannidis 2002: 25, *Eleftherotypia* 20-11-2002, *Eleftherotypia* 21-11-2002, *To Vima* 20-11-2002, *To Vima* 24-11-2002). Consequently, we would expect the average age of the Russian tanker and cargo fleet to be negatively related to its magnitude.

The data and the variables

The significance of the factors, which presumably influence the magnitude of the fleets, is tested using data collected from various sources (National Statistical Service of Greece, Lloyd's Register of Shipping, Statistical Yearbook of Norway). The data is on annual basis and covers the period 1993-2001. The data covers separately the case of the fleet under Russian flag, as well as the fleet under Russian ownership.

With the exception of the tanker's fleet²⁰ under Russian ownership, it is obvious that the Russian fleets of tankers and cargoes were shrinking despite the world trade's performance. At the same time, the Russian G.D.P. (expressed in US Dollars at 1995 constant prices) was also decreasing. Meanwhile, this decrease was followed by a considerable increase in the fleet's average age as well.

²⁰ This is due to the increase in the tankers under foreign flag; russian-owned tankers under foreign flag increase their overall tonnage with an average annual rate equal to 25%, while their participation in the Russian owned fleet has risen from 33% in 1993 to 70% in 2001. During the same period, the fleet of cargoes under foreign flag shows an average annual increasing rate of 0.5%, while its participation in the Russian-owned fleet of cargoes rose from 22% in 1993 to 32% in 2001, as a result of the decrease in the participation of the domestic flag (ISL).

Table 5a
Russian flagged tanker and cargo fleets, age and G.D.P. (const. 1995 prices), 1993-2001 (selected years)

Year	Russian G.D.P. (10 ⁶ \$)	Russian flagged tankers fleet		Russian flagged cargoes fleet	
		(10 ³ dwt)	av. age (years)	(10 ³ dwt)	av. age (years)
1993	403.2	3376	15.7	10151	16.8
1995	337.9	3376	17.7	9011	17.9
1997	329.4	2765	18.0	7271	18.5
1999	323.2	1927	20.6	5141	19.4
2001	376.0	1875	21.2	4779	21.2

Source: I.S.L., Lloyd's, I.M.F.

Table 5b
 Russian owned tanker and cargo fleets, age of fleets, 1993-2001 (selected years)

Year	Russian owned tankers fleet		Russian owned cargoes fleet	
	(10 ³ dwt)	av. age (years)	(10 ³ dwt)	av. age (years)
1993	4524	15.5	12805	14.9
1995	5118	15.0	12027	15.8
1997	4416	14.3	9891	16.7
1999	5484	12.5	7806	17.6
2001	6263	13.1	7123	19.2

Source: I.S.L., Lloyd's

Dependent variable:

The dependent variable, magnitude of Russian flagged and Russian owned fleets of tankers and cargoes respectively, is measured in 10^3 dwt.

Independent variables:

(a) The Gross Domestic Product of Russia, at constant prices (1995 prices), is measured in millions of US Dollars.

(b) The average age of the fleets is measured in years.

Empirical Results

The analysis tests for the significance of the factors, which presumably influence the magnitude of the Russian tanker and cargo, owned and flagged, fleets. The relationship is assumed to be linear, and we use a time-series data set for the time period 1993-2001.²¹ The number of observations is 9. The results of the regression analysis demonstrated no evidence of serious multicollinearity among the independent variables, so in the basic specification we use all of them simultaneously.

Specifically, the basic models for estimating the Russian flagged fleets' magnitude are:

$$(7) \text{ FLAGTANK}_t = f(Y_t, \text{AGETANK}_t)$$

$$(8) \text{ FLAGCARGO}_t = f(Y_t, \text{AGECARGO}_t)$$

where

FLAGTANK_t = Magnitude of the Russian flagged tanker fleet in year t

FLAGCARGO_t = Magnitude of the Russian flagged cargo fleet in year t

Y_t = Gross Domestic Product of Russia in year t ,

AGEFLAGTANK_t = Average age of the Russian flagged tanker fleet in year t

AGEFLAGCARG_t = Average age of the Russian flagged cargo fleet in year t

And the basic models for estimating the Russian owned fleets' magnitude are²²:

²¹ The variables could have, as well, been expressed in logs.

²² The regression between the ownership and the world trade did not yield statistically acceptable results.

$$(9) \text{ OWNTANK}_t = f(Y_t, \text{AGEOWNTANK}_t)$$

$$(10) \text{ OWNCARGO}_t = f(Y_t, \text{AGEOWNCARG}_t)$$

where

OWNTANK_t = Magnitude of the Russian owned tanker fleet in year t

OWNCARGO_t = Magnitude of the Russian owned cargo fleet in year t

Y_t = Gross Domestic Product of Russia in year t ,

AGEOWNTANK_t = Average age of the Russian owned tanker fleet in year t

AGEOWNCARG_t = Average age of the Russian owned cargo fleet in year t .

Tables 6 and 7 present the regression results for each of the dependent variables of equations (7) to (10). The signs of the estimated coefficients are consistent with the stated hypotheses (i.e. positive relationship between the Russian G.D.P. and the magnitude of Russian tanker and cargo fleets and negative relationship between the average age of the Russian tanker and cargo fleets and its magnitude), and 11 out of 12 estimates, are statistically significant. The regressions' explanatory power ranges from 0.82 to 0.94. The constant term is included because omission of this term might bias the results substantially. Finally, the results of the regression analysis demonstrated no evidence of serious multicollinearity among the independent variables.

Conclusively, the empirical results show a statistically significant *positive relationship* between the Russian fleets' magnitude (tanker and cargo) and the Russian G.D.P., as well as a statistically significant *negative relationship* between the Russian fleets' magnitude (tanker and cargo) and the Russian fleets' average age for both cases, i.e. under Russian ownership, as well as under Russian flag.²³ It is thus reasonable to say that the magnitude of the Russian fleets decreases and its average age increases with the overall decline of economic activity. However, this not the only case, as we will see below.

²³ As mentioned earlier, there is only one exception, in the case of the cargo fleet under Russian flag, where the G.D.P. coefficient is slightly not statistically significant at the 10% level.

Table 6
Regression Results on the Determinants of the Russian flag fleet, 1993-2001

	<i>FLAGTANK</i>	<i>FLAGCARGO</i>
<i>Constant</i>	8300.95 (5.569)*	29639.88 (4.76)**
Y_t	6.791 (2.138)***	9,610 (1.12)
<i>AGEFLAGTANK_t</i>	-429.92 (-8.438)*	-
<i>AGEFLAGCARG</i>	-	-1382 (-5.695)*
R^2	0.93	0.85
<i>S.E.E.</i>	257	875.9
<i>F-ratio</i>	39.6	17.6
<i>D.W.</i>	1.15	1.60

Notes: * Significance at the 1% level
 **Significance at the 5% level
 ***Significance at the 10% level

Table 7
Regression Results on the Determinants of the Russian owned fleet, 1993-2001

<i>Independent Variables</i>	<i>OWNTANK</i>	<i>OWNCARGO</i>
<i>Constant</i>	9549.63 (3.509)**	30581.3 (7.795)
Y_t	10.165 (2.45)***	11.105 (2.303)***
<i>AGEOWNTANK</i>	-561.229 (-4.627)*	-
<i>AGEOWNCARG</i>	-	-1464.858 (-9.136)*
R^2	0.82	0.94
<i>S.E.E.</i>	448.7	586.7
<i>F-ratio</i>	13.6	45.8
<i>D.W.</i>	1.37	1.19

Notes: * Significance at the 1% level
 **Significance at the 5% level
 ***Significance at the 10% level

At this point then, we will examine more closely the case of the tanker's fleet, under Russian ownership. In this case, as we have already noticed, we have an increase in the fleet's magnitude. This "exceptional" increase, should be explained as the result of a "balancing" process, which is exercised by the (also "by exception") falling average age of the tanker's fleet under Russian ownership, given the higher effect that the average age has – compared to the G.D.P. – over the magnitude of the fleets as can be seen through the average elasticities that follow.

So, a matter of great interest, that may further clarify our conclusions, is the change in the fleets' magnitude as a result of the change in one of the independent variables, while the other variable remains constant. Thus, we are interested in the average elasticities presented in Tables 8 and 9.

The elasticities of the magnitudes with respect to the output and the average age of the fleet show that, in all cases, elasticities with respect to the age are higher (in absolute values) than the elasticities with respect to output. This result indicates the stronger influence of independent variable "age", compared to the independent variable "output", on the fleet's magnitude. In all cases, elasticities with respect to "age" are smaller than -1, meaning that the magnitude is elastic with respect to the average age of the fleet, and thus, for a 1% *increase* in the average fleet's age, the fleet's magnitude always *decreases by more* than 1%. In all cases the magnitude of the fleet with respect to output, as expressed through G.D.P., is inelastic since the respective elasticities are less than unity.

When comparing the respective elasticities for flag and ownership, we observe that the elasticities concerning the flag are (in absolute values) always higher than the ones that concern the ownership. This means that the independent variables have higher implications to the dependent variable when referring to the Russian flag than the Russian ownership. A possible explanation for this behavior could be found in the "balancing" advantages of the cost reduction that the Russian owned fleet (except for the Russian flagged part of it) can be offered by certain non-Russian "flags of convenience": (a) reduction in taxation, (b) reduction in labor expenses because the renting of low-waged workers is more frequent, (c) reduction in expenses which result from the legalization of international agreements concerning industrial relations, the crew and the safety regulations (Milios and Ioakimoglou 1991a: 105-7, 99).

Table 8.
Elasticities, Russian flag

<i>Coefficient</i>	<i>Formula</i>	<i>Estimate</i>
$\varepsilon_{FLAGTANK,Y}$	$\frac{\partial FLAGTANK}{\partial Y} \cdot Y$	0.84
$\varepsilon_{FLAGTANK,FLAGAGETANK}$	$\frac{\partial FLAGTANK}{\partial AGEFLAGTANK} \cdot \frac{AGEFLAGTANK}{FLAGTANK}$	-2.83
$\varepsilon_{FLAGCARGO,Y}$	$\frac{\partial FLAGCARGO}{\partial Y} \cdot Y$	0.46
$\varepsilon_{FLAGCARGO,FLAGAGECARGO}$	$\frac{\partial FLAGCARGO}{\partial AGEFLAGCARGO} \cdot \frac{AGEFLAGCARGO}{FLAGCARGO}$	-3.51

Table 9
Elasticities, Russian ownership

<i>Coefficient</i>	<i>Formula</i>	<i>Estimate</i>
$\epsilon_{OWNTANK,Y}$	$\frac{\partial OWNTANK}{\partial Y} Y$	0.70
$\epsilon_{OWNTANK,OWNAGETANK}$	$\frac{\partial OWNTANK}{\partial AGEOWNTANK} \frac{AGEOWNTANK}{OWNTANK}$	-1.58
$\epsilon_{OWNCARGO,Y}$	$\frac{\partial OWNCARGO}{\partial Y} Y$	0.39
$\epsilon_{OWNCARGO,OWNAGECARGO}$	$\frac{\partial OWNCARGO}{\partial AGEOWNCARGO} \frac{AGEOWNCARGO}{OWNCARGO}$	-2.47

The geography of Russia and other factors influencing the fleets' performance

Except for the factors that may be easily quantified (i.e. the general macroeconomic situation and the aging fleet) and were analyzed earlier, there seem to be some other significant factors that may account for the Russian fleet's performance, which cannot be easily measured and quantified in appropriate manners.

The first factor concerns the reorientation of Russia's foreign trade patterns after the collapse. During the first period, trade with major allies of the Soviet Union, including COMECON members, provided employment for a substantial part of the fleet. Although the USSR's national trade across the ocean was limited,²⁴ almost 10% of the shipping tonnage was involved in exchange with Cuba and some vessels were engaged in trade with Vietnam, Angola and Mozambique and various other – considered as quasi-satellite – states, in need of arms or economic support at particular times (Bergstrand 1990: 114, Viewpoint 1981: 70). During the 1993-2001 period, the commercial trade with Cuba was stopped, and the major trade partners of the Russian Federation are the European countries, and especially the countries belonging to the E.U. (ITC 2001).

The second factor concerns the geography of Russia, since overcoming distance and geographical barriers has always been an important issue. International trade economists seem to have long ignored distance until recently (see Leamer 1993, Boisso and Ferrantino 1997, Eichengreen and Irwin 1997, and Frankel 1997) as Krugman wrote:

“[T]he analysis of international trade makes virtually no use of insights from economic geography or location theory. We normally model countries as dimensionless points within which factors of production can be instantly and costlessly moved from one activity to another, and even trade among countries is usually given a sort of spaceless representation in which transport costs are zero for all goods that can be traded” (cited in Wang, Coyle, Gehlhar and Vollrath 2000:71).

The new geographical formation - that the Russian fleet has to face after the collapse of the U.S.S.R. - left the country with very limited westward access to open waterways, while “the existent waterways – the Black Sea and the Baltic Sea

²⁴ According to an analysis, in 1986 about one third of the Soviet vessels that were monitored, did not venture beyond Europe, the Baltic Sea or the Mediterranean (Bergstrand 1990:113)

– both suffer from already high levels of marine transit congestion” (Lloyd’s Ship Manager 2002: 18).

Moreover, the northern location of the country has faced severe problems with ice and bad weather. As a northern country, its fleet locations are distant from world shipping lanes, subject to icing and are vulnerable to choke points and blockades. And it is this situation that caused Russia to have increased requirements for equipment, stores and ship repair facilities.

On the other hand, the country has relatively few ports, and only the port of Murmansk has great strategic importance and both, interior communications and direct access to the open ocean.²⁵ In addition to the Murmansk port, the northern region also includes another important port, Arkhangelsk, which is, however, partly unusable.²⁶ It is icebound much of the year, while icebreakers are needed in order to maintain shipping traffic, which Russia has problems in providing after the collapse of the Soviet Union (Nielsen, Kudrik and Nikitin 1996).²⁷

The Murmansk Shipping Company (MSC) operates Russia’s icebreaker fleet²⁸, while the Atomflot facility, located just north of the city of Murmansk, serves as the base for nuclear powered icebreakers, and repairs are completed at dry docks in

²⁵ More precisely, the Murmansk Port located on the Kola Peninsula, 124 miles north of the Arctic Circle – whose construction began in 1895 and was completed in 1899 for use by the Russian merchant fleet – links Murmansk to the rest of Russia through a railway network, which was completed by 1917. The Murmansk port is a very important one, since it is ice free year-round, due to the warming influence of the Gulf Stream, and it, thus, has great strategic importance, especially when coupled with its geographical proximity to the Atlantic Ocean (Nielsen, Kudrik and Nikitin 1996). The remainder of the Arctic coastline becomes icebound and virtually impassible each winter. This portion of Russia is subjected to long and cold winter nights and in the Murmansk area the sun does not rise from mid-November to mid-January.

²⁶ The city of Arkhangelsk, a shipbuilding center, is located on the White Sea at the delta of the Northern Dvina, and was founded by Ivan the Terrible and established as Russia’s first seaport by Peter the Great. It is also a major provincial capital, and the largest city of the Russian Arctic Coast. Also, located about 30 miles across the delta of the city of Arkhangelsk, is Severodvinsk, home to the world’s largest shipyard, which makes the fleet independent of the Baltic shipyards and serves as the principal Russian shipyard. Also, a construction shipyard with dismantlement capabilities and a repair and refueling shipyard with dismantlement capabilities are located in Severodvinsk, which was founded in 1936 by Stalin.

²⁷ However, Russia has set a partnership with Norway and Sweden, which addresses the question of protection against shortage (and related problems) of vessels and icebreakers (Tatko and Robinson 2002).

²⁸ The typical mission of Russia’s icebreaker fleet is to ensure navigation in the eastern part of the Severnyy Morskoy Put (the Northern Sea Way), the sea line connecting Murmansk with other Russian Arctic Ports (Cochran, Norris and Bukharin 1995). During the winter, one icebreaker can clear a passage for two to three ships, and up to fifteen ships in the summer (Russia Today 1997).

the bay adjacent to the center of the city of Murmansk.²⁹ MSC is operating its icebreaker fleet at a loss, and is not able to afford repairs for the icebreaker fleet (Nilsen 2000).³⁰ Also, the Atomflot facilities have serious problems with cut offs of the supply of electricity because of its debts to the Kola Peninsula regional electricity provider.³¹

In the past, the Russian Fleet of the northern seas played a greater strategic role (Handler 1997). However, since 1989, that a 40% decrease in the operational vessels occurred (Nielsen, Kudrik and Nikitin 1996), the consolidated fleet made up a smaller fleet than in Soviet times, and consequently bases in the Northern region continued to close (Handler 1997).

Experts believe that although the fleet decreased in size and also maintained a smaller supporting infrastructure, it did not achieve greater efficiency and strength (Tatko and Robinson 2002), while problems will most likely persist in terms of manufacturing, repair and modernization (Handler 1997). Apparently the widely separated ocean fronts, require fragmented fleets with varying composition, which Russia fails to provide (Fondron 2002).

Another explanatory factor is the deterioration of the educational (and cultural) level of the Russian maritime personnel, which made them less effective, relative to the western fleets and possibly to the world's fleets (Fondron 2002). It is said that a large part, approximately 50% of some fleets' sailors, have not even completed secondary school and some 20% of them possibly spot previous criminal convictions or have been arrested by the militia (see Russian Fleets); advancement opportunities are essentially closed and advanced training is almost non-existent, especially given the loss of some naval schools; and electricians, radar operators, and ship physicians are among the scarcest of all specialists (Russian Fleets). Also, the training of crews and service personnel for nuclear reactors used by the icebreaker fleet, takes place at Dzerzhinsky Naval College in St. Petersburg, which has a rather limited capacity, and this has contributed to an

²⁹ *The fleet consists of three diesel-powered icebreakers, seven nuclear-powered, and a nuclear-powered transport ship, for a total of fifteen nuclear reactors (Nilsen and Bohmer 1994).*

³⁰ *In light of an expected increase in the flow of goods along the arctic Sea route, the aging of the icebreaker fleet, and given the country's severe economic problems, the responsible ministries believe that the icebreakers, which are due to expire in three to seven years (Vaganov 2000), should serve up to ten years more than originally planned (Vsya Rossiya 2000). However, experts have expressed conflicting opinions as to whether it is a safe move, because it an issue directly connected to the ship's nuclear reactors (Severo-Zapadnoye veshchaniye 2001).*

³¹ *The operational problems that the icebreaker fleet faces are connected to Atomflot's debt of \$59,000 to Kolenergo, as of June 2001 (Rosbalt 2001).*

overall reduction in the competence of Russian nuclear crews (Nilsen, Kudrik and Nikitin 1997).

The lack of sufficient funds to keep the fleet operational has led to officers receiving far less training than was the case a few years ago. Furthermore, the deteriorating social conditions and low wages of the fleet result in fewer and fewer of them electing to renew their contracts, and the heavy turnover of officers reduces the overall level of competence even further (Morskoy sbornik 1994). With the severe cuts in the fleet's budget, special privileges and welfare benefits for personnel and shipyard workers have also been sharply reduced (Morskoy Sbornik 1993, 1994). The shipyards, which once worked under state directives, now operate as independent tax-paying entities and, as a result, some of the ship repair crews have not been paid for several months (Na Strazhe Zapolyarya 1995).

Due to a lack of financing, much of the former activity has come to a standstill and, consequently, the yard infrastructure is slowly falling apart (Polyarnaya Pravda 1995) Subsequently, safety levels in the maintenance of both operational as well as inactive ships are being compromised.

Conclusively, this deterioration of the educational (and cultural) level of the Russian maritime personnel, which seems to be the product of the extensive economic crisis after the regime's collapse, is probably another explanatory factor of the dramatic decrease of ship numbers and tonnage under the Russian flag, in the sense that the advantage resulting from the decrease in the labor cost that an alternative flag (a "flag of convenience") offers is not restricted by a drastic decrease of labor productivity.³²

Concluding remarks

The purpose of the present paper was to examine the relationship between, first, the ex-Soviet, and, second, the Russian fleets, with respect to the world trade, and, subsequently, to identify factors explaining the changes in the Russian fleets' magnitude.

Using data for the ex-Soviet Union in the time span 1975-1991 and for Russia in the time span 1992-2001, it was confirmed that the Russian fleet does not follow the augmenting trends of the world trade. Two major factors have been identified and investigated in an effort to explain Russian fleets' performance, namely the

³² We refer to the low productivity of the low-cost labor (crew), usually originating mainly from third world countries (see Milios and Ioakimoglou 1991a).

general macroeconomic situation (as expressed through the G.D.P.) and the aging of the fleet (as expressed through the average age of the fleets).

The results showed that both of these factors had some empirical validity for Russia. The signs of the estimated coefficients were consistent with the stated hypotheses and 11 out of 12 estimated coefficients were statistically significant at the 10% level or better. Also, the regressions' explanatory power was very satisfactory, ranging from 0.82 to 0.94.

To sum up, output, expressing the general macroeconomic situation of the Russian economy, played a statistically significant role in the determination of the fleets' magnitude, and the influence of the fleets' average age on the fleets' magnitude was statistically significant as well.

With the collapse of the Soviet Union and the end of the Cold War, Russia's transition from a centrally planned economy to a free market system has had great and severe implications for the Russian state (Milios 1999: 126) and fleet (Russian Fleets), and one must recognize that this analysis may be somewhat sterile, given such exceptional circumstances in Russia during the last decade. On the national level, electoral uncertainties seemed to indicate a period of rough sailing ahead. Accelerating inflation and an overall decline by some 40-60% in gross national product had seriously eroded necessities of life (Russian Fleets). Electric power, fuel, food, clothing, spare parts, etc., have been all in short supply. This is particularly acute for the armed services and has produced significant and rapid drawdowns of naval forces, ship scrapping, personnel and manning problems and repair and maintenance shortfalls. While Russia is attempting to operate a viable merchant fleet, the economic and political problems present serious obstacles to such efforts (Russian Fleets).

However, there are some other factors as well, that could account for the Russian fleets' decreasing trends. The first factor concerns the reorientation of the Russia's foreign trade patterns after the collapse. During the first period, trade with major allies of the Soviet Union, including COMECON members and Cuba, provided employment for a substantial part of the fleet. During the 1993-2001 period, the commercial trade with Cuba was stopped, and the major trade partners of the Russian Federation have changed (ITC 2001). Another explanatory factor is the deterioration of the educational level of the Russian maritime personnel, which made them less effective, relative to the western fleets and possibly to the world's fleets (Fondron 2002). Also, the lack of sufficient funds has led to officers receiving far less training than was the case a few years ago. Furthermore, the deteriorating social conditions and low wages of the fleet result in fewer of them

electing to renew their contracts, and the heavy turnover of officers reduces the overall level of competence even further. Finally, due to a lack of financing, much of the former activity has come to a standstill and, consequently, the yard infrastructure is slowly falling apart (Polyarnaya Pravda 1995).

As for the second factor, it is apparent that geography places Russia at a distinct maritime disadvantage compared to most ex-Soviet Union countries and other nations. Russians must deal with inhospitable climates, restricted access to the world's oceans, and isolation from major sea-lanes and strategically important regions. Its fleets are separated by thousands of miles long, sinuous and vulnerable supply routes. Moreover, its somewhat limited access to foreign bases further impedes its merchant strategies (Russian Fleets).

Conclusively, the Russian fleets, if abstracting from the severe geographical problems that cannot be easily quantified and overcome, face a number of problems related mainly to Russia's severe economic problems (G.D.P. decreases), aging of ships and the low educational level of the personnel. As a result, Russian fleet's magnitude does not follow the patterns of the world trade and is shrinking. The solutions driving to a positive future for the Russians seem to be closely linked to the political, social and economic development of Russia (Nielsen, Kudrik and Nikitin 1996, Handler 1997).

However, if a previous conclusion is still in force, "the transition process is going to be hard [...] whereas competitive market structures and enterprise restructuring will entail a long lasting process of economic and social rearrangements" (Milios 2001: 65), the Russian fleet's future does not seem to be very optimistic, at least in the close future and under the current conglomeration of social forces.

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