

# Who perished on the *Titanic*? The importance of social norms

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## Abstract

This paper seeks to empirically identify what factors make it more or less likely for people to survive in a life-threatening situation. Three factors relate to *individual attributes* of the persons onboard: physical strength, economic resources, and nationality. Two relate to *social aspects*: social support and social norms. The *Titanic* disaster is a life-or-death situation. Otherwise-disregarded aspects of human nature become apparent in such a dangerous situation. The empirical analysis supports the notion that social norms are a key determinant in extreme situations of life or death.

## Keywords

decision under pressure, disasters, power, quasi-natural experiment, survival, tragic events

## I Situations of life or death

This paper asks the question: what individual and social factors determine survival in a situation of life or death? The basic idea is that otherwise-disregarded aspects of human nature become more readily visible in the most dangerous situations in which some individuals perish and others save

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themselves. The specific situation of life or death we analyze is the disaster of the sinking of the *Titanic*.<sup>1</sup> During her maiden voyage on the night of April 14, 1912, the *Titanic* collided with an iceberg and sank two hours and forty minutes later, resulting in the death of 1,517 people—more than two-thirds of her 2,223 passengers and crew. This is one of the deadliest peacetime maritime disasters in history and by far the most famous. The disaster was a great shock to many as the vessel was equipped with some of the most advanced technology of the time, had an experienced crew, and was thought to be (practically) ‘unsinkable.’<sup>2</sup>

The myths surrounding the *Titanic* disaster were intensified by the many failed attempts to find her wreck. Finally, in 1985, a joint American–French expedition led by Jean-Louis Michel and Dr. Robert Ballard located it and collected approximately 6,000 artifacts, which were later shown in a blockbuster exhibition that toured the world.

We distinguish five determinants of survival. Three are factors relating to *individual attributes* of the persons onboard: physical strength, economic resources, and nationality; two relate to *social aspects*, communal support and moral norms.<sup>3</sup> Individuals with greater physical, material and communicative resources (through a common language reflected by nationality) are hypothesized to have a greater probability of surviving. While these individual attributes are shown to be important for survival, our focus is on the social determinants. We hypothesize that passengers traveling in the company of relatives or friends have a higher chance of survival because they receive more social support in a situation of life or death. Most importantly, we inquire whether the social norm of ‘women and children first’ was followed in the case of the *Titanic* disaster. The empirical analysis suggests that this was indeed the case.

Some of our results are in line with what has long been known in the literature (e.g., Fiske and Berdahl, 2007). Thus, in the case of the *Titanic*, it is not surprising that individuals who were endowed with more financial resources had a better chance of being saved. However, other results do not necessarily meet expectations. Despite their stronger physical power, adult males had a lower chance of being saved, which is the opposite of what we would have expected. One would also expect that British subjects would have had a better chance of being saved because the vessel and the crew were British. However, this was not the case; instead, Americans were better able to survive. In a matter of life or death, one would expect that social support in the form of physical and psychological help by relatives and friends would be an advantage for survival. Our analysis, indeed, reveals that individuals traveling alone had a worse chance of saving their lives than those traveling with family, or friends. In contrast, the social norm that women and children should be saved first was upheld.

Section 2 introduces the data available to us for the *Titanic* disaster. Section 3 discusses the five determinants of survival distinguished, formulates theoretical hypotheses, and subjects them to a (preliminary) empirical test using bivariate correlations. Section 4 presents the simultaneous empirical estimates of the hypotheses. It turns out that the qualitative results of the bivariate estimates are upheld in the simultaneous estimates. Section 5 presents our conclusions.

## 2 The data

The tragic event of the sinking of the *RMS Titanic* can be interpreted as a quasi-natural experiment. Every individual was affected by the shock and was unable to put off making a decision. Even if one chose not to participate in the scramble for lifeboat seats, the outcome was the same as it was for someone who did strive for a seat and failed. The great advantage of the natural field experiment is randomization and realism. The participants did not know that their fate would be looked at as being the result of a (natural) experiment; their behavior was therefore unaffected (List and Reiley, 2008).

**Table I.** Percentages of different categories of persons on the *Titanic*

Survived	32	
Died	68	
Female	22	
Male	78	
Age < 16 (children)	5	
Age 16–50	89	
Age > 50	6	
1st-class passengers	15	} 22% TRAVELING ALONE, 38% IN COMPANY
2nd-class passengers	13	
3rd-class passengers	32	
Crew	40	
England	53	
Ireland	5	
Sweden	5	
USA	19	
Other nationalities	18	

Sources: The *Encyclopedia Titanica* (2008) was used as the primary source, and the data were cross-checked against the following resources: Beavis (2002), Bryceson (1997), Committee on Commerce (1912), Eaton and Hass (1994), Geller (1998), Howells (1999), Lord (1955, 1978, 1998), Quinn (1999), Ruffman (2000), U.S. National Archives (2008), Wreck Commissioner's Court (1912).

A detailed dataset can be constructed despite the fact that the event occurred almost 100 years ago, and the records at the time were not very detailed. Our data consist of 2,207 persons confirmed to be onboard the *RMS Titanic*. The data were gathered from the *Encyclopedia Titanica* and cross-checked against other sources.<sup>4</sup> Table 1 presents the basic facts of the disaster. It reveals that 32 percent of the 2,207 persons onboard survived the disaster, while more than two-thirds died. Although there is some anecdotal conjecture that there may have been others onboard (stowaways) who were unlisted on any manifest or report, the list of survivors corresponds to the 'official' passenger list.<sup>5</sup> There were relatively few women on board (22 percent), and most persons (89 percent) were of adult age, that is, between 16 and 50 years of age. Of the 2,207 persons onboard, the age of all but 21 individuals is known. Using age in the regression therefore reduces the number of observations to 2,186 persons. Less than 15 percent of all the people on board traveled in first or second class, respectively. A larger majority (32 percent) traveled in third class. 38 percent of the people on board traveled in the company of family or friends—only 22 percent were traveling alone. Forty percent of the people on board were crewmembers, either occupied on the deck, in the engine room, or directly catering to the passengers.

Passenger groupings have been identified by anecdotal evidence taken from family histories and known travel arrangements, ticket numbers, and cabin allocations.<sup>6</sup> Among the passengers, 43 were servants. More than half of the people on board were English with a much smaller share being American (19 percent) and Irish and Swedish (5 percent each). Only limited information (15.2 percent of the cases) is available with regard to the cabin allocation.<sup>7</sup> The subsequent empirical analysis seeks to explain the share of survivors according to the five determinants. The dependent variable is whether or not someone survived the event.

### 3 Determinants of survival

*Physical strength* may well be considered the most obvious personal attribute helping to survive the sinking of a ship. Needless to say, bodily force has always played a dominant role in history, but has been strongly harnessed by institutions such as governments. In an extreme situation of life or death, it may well be expected that physical strength would once again dominate.

Aboard the *Titanic* lifeboats were a scarce commodity. The vessel only had 20 lifeboats, which could accommodate a maximum of 1,178 persons, or 52 percent of the people aboard.<sup>8</sup> Because the *Titanic* at first did not show any signs of being in imminent danger, passengers were reluctant to leave

the apparent security of the vessel to board small lifeboats. Consequently, in the beginning, most of the lifeboats were launched partially empty, which increased the demand for lifeboat places when the people still on board later realized that the ship was indeed sinking. In such a situation, individuals with more physical strength, that is, adult males, would have an advantage over all others (women, children, and aged persons) when it came to securing a place on a lifeboat. The hypothesis based on physical strength suggests that adult males had a higher survival probability.

Table 2 shows the influence of individual characteristics, namely physical strength, economic resources, and nationality, on survival using a probit estimate. The columns under 'Physical strength' show estimates of the bivariate correlations between adult males onboard and their chance of survival. The estimates for Regressions (1) and (2) clearly suggest that adult males were much *less* likely to survive the sinking of the *Titanic*. Adult males were disadvantaged compared to women and children both in the case of passengers and crew. According to the marginal effect exhibited, the probability of surviving was more than 50 percent smaller for adult males than for the rest of the people on board. This result is clearly inconsistent with a hypothesis suggesting that physical strength is a main determinant of survival. Indeed, the 'weaker' sex had a much higher chance of survival. Our empirical analysis suggests, however, that physical strength may have played a role among adult males: Regression (3) indicates that adult male passengers of 55 years of age or more had a lower survival chance than younger, presumably stronger male passengers.

The two columns in Table 2 under the heading 'Economic resources' exhibit estimates of the correlations between economic class and survival. Individuals commanding *more economic resources* may be expected to have a better chance of surviving disasters. From the beginning, they are in an enhanced position. This also holds true for the passengers aboard the *Titanic*. The 1,316 passengers on the *Titanic* were separated into three different classes. The 325 people in first class clearly had higher incomes and/or more wealth than the 285 persons in second class and the 706 in third class. As a result, the well-to-do first-class passengers had better access to information about the imminent danger and were aware that the lifeboats were situated close to the first-class cabins. In contrast, most third-class passengers likely had no idea where the lifeboats were located (the introduction of safety drills for all passengers came as a response to the *Titanic's* disaster) and probably did not know how to get to the higher decks where the lifeboats were stowed.<sup>9</sup> Moreover, the first-class passengers likely tried to obtain the same preferential treatment with respect to lifeboat access that they generally were used to receiving onboard for all other items. People

with higher incomes and greater wealth are used to giving orders to employees (in this case the crew), are better informed, and are willing to bargain in the extreme, even offering financial rewards to obtain what they want. The first-class passengers were also in closer contact with the leading crewmembers (in particular, the officers commanding the loading of the lifeboats). The hypothesis based on economic resources suggests that the first-class passengers had a higher survival chance than those in second and third class. As can be seen from Regressions (4) and (5), male and female passengers who had the means to travel first class had a much higher survival chance (19.4 percent for male and 40.2 percent for female passengers) than those in third class.<sup>10</sup> The same holds true for second-class female passengers compared to those females traveling third class (second-class males had a 24 percent higher survival chance). This is in line with the hypothesis developed above. For male passengers (Regression (4)) the situation is different in one respect from the female passengers onboard the *Titanic*. There is no statistically significant difference between the survival probabilities of males traveling second and third class. The effect of economic resources on survival turns out to be greatest for first-class passengers and for women and is somewhat muted for male passengers.

A third individual attribute which may increase the odds of survival in the case of the sinking of the *Titanic* refers to *nationality*. This ship was built in Great Britain, operated by British subjects, and manned by a British crew.<sup>11</sup> It could be expected that national sentiments would be activated during the disaster and that the crew would give preference to British subjects, easily identified by their accents. This would mean that passengers of other nationalities, in particular Scandinavians, but also Americans and Irish, and would be at a disadvantage. The hypothesis based on nationality suggests that persons of British nationality had a better chance to survive. Table 2 (the two columns under 'Nationality') exhibits the probit estimates linking survival probability and nationality. In contrast to the hypothesis that the British had a higher probability of saving themselves, Regression (6) indicates that British passengers had an 11 percent *lower* chance than those of other nationalities. Regression (7) also suggests that passengers of American nationality were significantly more likely to save themselves.

The next two determinants of survival relate to *social*, rather than *individual aspects*. Under conditions of life or death, it may be expected that *social* or *communal support* in the form of physical and psychological help by relatives and friends is an advantage for survival. The fourth hypothesis suggests that persons traveling in the company of friends, relatives, or acquaintances would have a higher survival chance than passengers traveling alone. Table 3 (the columns under 'Social support') shows the corresponding

Table 2. Individual attributes of survival

Hypothesis	Physical strength		Economic resources		Nationality		
	Passengers	Crew	Adult male Passengers	Male Passengers	Female Passengers	Passengers	Passengers
Sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regressions							
Independent variables							
Adult males	-1.419*** <b>-18.18</b>	-1.571*** <b>-5.37</b>					
Ages 55–74			-0.541* <b>-1.83</b>				
1st class			-0.105	0.644*** <b>5.39</b>	1.860*** <b>8.58</b>		
2nd class				0.194 -0.112	0.402 1.074***		
England				<b>-0.8</b> -0.028	<b>6.24</b> 0.243		
						-0.309*** <b>-3.68</b>	-0.113

Table 2. (Continued)

Hypothesis	Physical strength		Economic resources		Nationality		
	Passengers	Crew	Adult male Passengers	Male Passengers	Female Passengers	Passengers	Passengers
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ireland							0.169 <b>1.18</b>
Sweden							0.065 -0.094 <b>-0.62</b> -0.035
USA							0.591*** <b>6.06</b>
All others							0.227 0.154 <b>1.55</b> 0.059
N	1300	886	777	840	460	1300	1300
$p > \chi^2$	0.000	0.000	0.006	0.000	0.000	0.000	0.000
Pseudo R <sup>2</sup>	0.206	0.035	0.049	0.043	0.224	0.008	0.029

Notes: Dependent variable: Survival (value 1). z- values in bold, marginal effects in italics. The symbols \*, \*\*, and \*\*\* represent statistical significance at the 5%, 1%, and 0.1% levels, respectively. Adult=Age>15. In the reference group: female (adult and children) and male children (Regressions 1-2), age<55 (Regression 3), male third class (Regression 4), female third class (Regression 5), other nationalities (Regression 6), England (Regression 7).



probit estimates. Regressions (8) to (10) indicate that passengers traveling alone indeed had a lower chance of survival. While the effect is statistically highly significant, its size is quite small. The negative effect is found to hold true for both male and female passengers, although one should note that the coefficient for female passengers is not statistically significant.

Under extreme duress, such as when a ship is sinking, *social norms* may vanish as everyone tries to save his or her own life. According to this argument, morality may be considered relevant under 'ordinary' conditions only. A key social norm under conditions of life or death is that 'women and children are to be saved first'. Similar social norms can be found in other areas where people need to be evacuated. Humanitarian agencies often evacuate 'vulnerable' and 'innocent' civilians such as women, children, and the elderly first. The Geneva Convention provides special protection and evacuation priority for pregnant women and mothers of young children (Carpenter, 2003). The fifth hypothesis tests whether this social norm was acted upon when the *Titanic* sank.

Regressions (11) to (14) in Table 3 show the influence of the social norm 'Women and children first' on the probability to survive (see the columns under 'Social norms'). Female persons on board the *Titanic* had a much greater chance of surviving than males (more than 50 percent). The result holds for both female passengers and female crewmembers (Regressions (11) and (12)). Regression (13) indicates that children 15 years of age and under had a 17 percent higher chance of survival than adults. Those passengers traveling with children also benefited; they had a 37 percent greater probability of surviving than those not having children accompanying them (see Regression (14)). These results suggest that the social norm of first saving women and children was active even under the conditions of life or death on the *Titanic*. This is a remarkable result not necessarily to be expected.

#### 4 Jointly testing the hypotheses

The various theoretical hypotheses were tested using a probit estimation model with bivariate correlations. We did not control for possible confounding factors. The five hypotheses can be valid at the same time. Therefore, a joint test of the five hypotheses is in order to see whether the results so far obtained are accurate even if possible interdependencies are taken into account.

Table 4 lists the joint probit estimates of all five hypotheses. Regression (15) suggests that the results are qualitatively the same and of similar magnitudes compared to when the hypotheses were tested sequentially. Female

**Table 3.** Social aspects

Hypotheses	Social support (traveling alone)			Social norms (women and children)			
	Passengers	Male	Female	Passengers	Crew	All	Passengers
Regressions	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<b>Independent variables:</b>							
Traveling alone	-0.567***	-0.228*	-0.183				
	<b>-7.4</b>	<b>-2.25</b>	<b>-1.16</b>				
	-0.205	-0.06	-0.064				
Female				1.462***	1.858***		
				<b>18.34</b>	<b>5.5</b>		
				0.53	0.64		
Aged 15 or under (children)						0.444***	
						<b>3.62</b>	
						0.167	
Has children							0.783***
							<b>4.86</b>
							0.373
N	1300	840	460	1300	886	2186	1300
$p > \chi^2$	0.000	0.024	0.247	0.000	0.000	0.000	0.000
Pseudo $R^2$	0.0327	0.006	0.002	0.211	0.041	0.005	0.014

Notes: Dependent variable: Survival (value = 1). z-values in bold, marginal effects in italics. The symbols \*, \*\*, and \*\*\* represent statistical significance at the 5%, 1%, and 0.1% levels, respectively. In the reference group: not traveling alone (Regressions 8–10), male (Regressions 11–12), adults (Regression 13), not having children (Regression 14).

passengers and the crew (Regression (17)) had a substantially higher chance of being saved than males on the ship. The marginal probability is about 50 percent higher for women to survive than for men. The hypothesis that physical force determines survival under conditions of life or death is thus rejected.

Passengers endowed with greater economic resources, that is, traveling first class, have a much higher chance of being saved than passengers traveling in second and third class. The marginal probability is slightly lower than 40 percent for first-class passengers and somewhat less than 20 percent for second-class passengers when compared to persons traveling in third class. This is consistent with the hypothesis that persons of higher social means are more likely to survive a disaster.

**Table 4.** Testing hypotheses jointly

Sample Regressions	Passengers (15)	Passengers (16)	All (17)
<b>Independent variables:</b>			
Female	1.444*** <b>16.58</b>	1.444*** <b>16.39</b>	1.474*** <b>17.36</b>
	<i>0.523</i>	<i>0.523</i>	<i>0.536</i>
Aged 15 or under (children)	0.336* <b>2.39</b>	0.347* <b>2.44</b>	0.334* <b>2.37</b>
	<i>0.129</i>	<i>0.134</i>	<i>0.124</i>
Has children	0.445* <b>2.28</b>	0.437* <b>2.23</b>	0.444* <b>2.26</b>
	<i>0.173</i>	<i>0.170</i>	<i>0.167</i>
1st class	1.022*** <b>10.01</b>	0.983*** <b>8.47</b>	0.989*** <b>8.60</b>
	<i>0.388</i>	<i>0.373</i>	<i>0.374</i>
2nd class	0.455*** <b>4.11</b>	0.431*** <b>3.77</b>	0.416*** <b>3.67</b>
	<i>0.174</i>	<i>0.165</i>	<i>0.154</i>
England	-0.249* <b>-2.40</b> <i>-0.090</i>		
Ireland		0.247 <b>1.43</b> <i>0.094</i>	0.191 <b>1.17</b> <i>0.069</i>
Sweden		0.088 <b>0.51</b> <i>0.033</i>	0.054 <b>0.32</b> <i>0.019</i>
USA		0.287* <b>2.32</b> <i>0.108</i>	0.241* <b>2.23</b> <i>0.087</i>
All others		0.258* <b>2.16</b> <i>0.097</i>	0.217* <b>2.01</b> <i>0.078</i>
Traveling alone	-0.048 <b>-0.52</b> <i>-0.018</i>	-0.057 <b>-0.61</b> <i>-0.021</i>	-0.049 <b>-0.52</b> <i>-0.017</i>
Crew			0.666*** <b>5.63</b> <i>0.235</i>
N	1300	1300	2186
$p > \chi^2$	0.000	0.000	0.000
Pseudo $R^2$	0.287	0.288	0.211

Notes: Dependent variable: Survival (value = 1). z- values in bold, marginal effects in italics. The symbols \*, \*\*, and \*\*\* represent statistical significance at the 5%, 1%, and 0.1% levels, respectively. In the reference group: Regression (15): male, adult, not having children, 3rd class, not from England, not traveling alone. Regressions (16) and (17): male, adult, not having children, 3rd class, England, not traveling alone.

Passengers of British nationality had about a 10 percent lower chance of surviving than those of other nationalities as shown in the joint estimate of Regression (15). In contrast, Americans had about a 10 percent higher chance of being saved than those of other nationalities (Regressions (16) and (17)). The hypothesis that British passengers garnered sentimental advantages by a likewise British crew can be rejected. Rather, the estimates are consistent with the notion that the British behaved according to the rules of ‘gentlemen.’

Passengers traveling in the company of friends, relatives, and acquaintances benefited from this social support and had a higher survival chance than those traveling alone, but the effect is not statistically significant, and also small. The hypothesis that social support is a decisive factor for survival is not supported by the data in the case of the *Titanic* disaster.

The estimates also allow us to reject the hypothesis that social norms vanish under conditions of extreme duress. The results indicate that women and children indeed had a much higher chance of survival. According to Regressions (15)–(17), children and passengers with a child had a 13 and 17 percent higher chance, respectively, of being saved than adults. These results correspond with previous estimates reported in Table 3. They suggest that the norm of ‘save the women and children first’ was indeed followed when the *Titanic* sank.

## 5 Conclusions

The empirical analysis of the *Titanic* disaster allows us to analyze the effects of personal attributes of passengers and crew as well as of social factors under conditions of life or death. The use of individual data produced some results that were expected, while it also gave us some that were rather unexpected. It is not particularly surprising that those with greater economic resources were more likely to survive. In contrast, it is difficult to predict which nationalities were more likely to save themselves. That the British were less likely to survive than the Americans is an empirical result in need of a serious theoretical explanation. Similarly, it is not *a priori* clear whether it is advantageous to travel alone or to travel in the company of family and friends. The result that social support was indeed beneficial in surviving the *Titanic* disaster is therefore of interest.

It is also debatable whether social norms, in particular, the saving of women and children first, are indeed followed under conditions of extreme duress. One could also argue that adult males’ stronger physical power could be a decisive factor under these circumstances, but that did not appear to be the case. In the case of the *Titanic* disaster, the women and children indeed had a much higher chance of being saved than adult males.

The sinking of the *Titanic* is, of course, only one example, although a most prominent one, of the many situations of life or death in which people are compelled to act.<sup>12</sup> It will be interesting to see whether the results obtained for the sinking of the *Titanic* can be replicated for other shipping disasters and other situations of life or death, and for other periods of time.

## Notes

1. For accounts of the event see, for example, Lord (1978, 1998), Eaton and Haas (1994), Quinn (1999), Ruffman (2000), as well as the *Encyclopedia Titanica* ([www.encyclopedia-titanica.org](http://www.encyclopedia-titanica.org)) and the information provided by RMS Titanic, Inc. who was granted 'salvor-in-possession' rights to the wreck by the U.S. Federal Court ([www.titanic-online.com](http://www.titanic-online.com)).
2. In contrast to popular mythology, the *Titanic* was never described as 'unsinkable' without qualification. The notion entered the public consciousness only *after* the sinking (Howells, 1999).
3. A rational choice analysis is, of course, not inconsistent with assuming the existence of social norms. See e.g. Arló-Costa and Perdersen (2010), Bossert and Suzumura (2007), Elster (1989a, 1989b), Hechter and Opp (2001), Horn (2001), and contributions in *Rationality and Society*, such as Heckathorn (1989), Kroneberg *et al.* (2010), and Mehlkop and Graeff (2010).
4. The cross-checked resources include: Beavis, 2002; Bryceson, 1997; Eaton and Haas, 1994; Geller, 1998; Howells, 1999; Kuntz, 1998; Lord, 1955, 1998; NSARM, 2008; Quinn, 1999; Ruffman, 2000; U.S. National Archives, 2008; Wreck Commissioner's Court, 1912.
5. This suggests that any unlisted 'illegal' passengers did not survive and may not have competed with 'official' passengers for lifeboat spaces.
6. Based on an inspection of the literature we assume that for those passengers where the evidence is unclear or unknown, they were travelling alone.
7. The data also indicate that this information has been mainly provided by the survivors and therefore is likely to be biased. Thus, we are not able to control for the cabin locations (e.g., closeness to exits and lifeboats).
8. There were more lifeboats than required by the rules of the British Board of Trade, which were drafted in 1894 and which determined the number of lifeboats by a ship's gross register tonnage, rather than the number of persons aboard.
9. The *Titanic*, like most passenger vessels of the day, employed guards to make sure that the lower classes were kept away from the decks allocated for the higher classes, thus ensuring that third-class passengers were ignorant of the upper decks (the lifeboat deck being the uppermost deck). However, the results of the inquiry testimony indicate that no such guards were restricting access on the evening of the disaster. This is in contrast to the scene shown in the highly popular and award-winning film *Titanic* (1997, produced by James Cameron and featuring Leonardo DiCaprio and Kate Winslet) where the access to the boat deck by third-class passengers was shown to be made impossible by a closed door.

10. First-class cabins were located closer to the lifeboat deck so that first-class passengers found it easier to reach them. Their higher survival probability should, however, not only be attributed to this fact because the same situation applied when the *Lusitania* sank, but in this case the first-class passengers did not have a higher survival chance (Bailey, 1935).
11. However, the Ocean Steam Navigation Company, popularly known as the 'White Star' line because of the white star appearing on the company flag, was under the control of the industrial giant J.P. Morgan. Nevertheless, the *Titanic* was perceived by the public as a British ship.
12. See e.g. Albala-Bertrand (1993), Chamlee-Wright and Storr (2009), Drabek (1986), Howard (1980), Quarantelli (2001), Ripley (2008).

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