Journal of Economic Behavior & Organization 74 (2010) 1–11

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

# Noblesse oblige? Determinants of survival in a life-and-death situation

Bruno S. Frey[a,b,c], David A. Savage[d], Benno Torgler[b,c,d,*]

[a] Institute for Empirical Research in Economics, University of Zurich, Winterthurerstrasse 30, CH-8006 Zurich, Switzerland
[b] CREMA – Center for Research in Economics, Management and the Arts, Gellertstrasse 18, CH-4052 Basel, Switzerland
[c] CESifo, Poschingerstrasse 5, D-81679 Munich, Germany
[d] The School of Economics and Finance, Queensland University of Technology, GPO Box 2434, Brisbane, QLD 4001, Australia

ARTICLE INFO

*Article history:*
Received 29 September 2008
Received in revised form 1 February 2010
Accepted 10 February 2010
Available online 16 February 2010

*JEL classification:*
D63
D64
D71
D81

*Keywords:*
Decision under pressure
Altruism
Social norms
Interdependent preferences
Excess demand

ABSTRACT

This paper explores what determines the survival of people in a life-and-death situation. The sinking of the Titanic allows us to inquire whether pro-social behavior matters in such extreme situations. This event can be considered a quasi-natural experiment. The empirical results suggest that social norms such as 'women and children first' persevered during such an event. Women of reproductive age and crew members had a higher probability of survival. Passenger class, fitness, group size, and cultural background also mattered.


*How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it.*
The Theory of Moral Sentiments (Smith, 1790).

## 1. Introduction

At the very core of economics lies the question of scarcity, or "how society makes choices concerning the use of limited resources" (Stiglitz, 1988). To achieve utility-maximization from a limited set of resources, traditional economic models assume that individuals actively pursue their material self-interest. The Homo Economicus theory has shown to be useful in many cases. However, substantial evidence has been generated that suggests that other motives such as altruism, fairness, and morality profoundly affect the behavior of many individuals. People may punish others who have harmed them or reward others who have helped them, sacrificing their own wealth (Camerer et al., 2004). People donate blood or organs without being compensated; they donate money to charitable organizations. During wartime many individuals volunteer to join the armed forces and are willing to take high risks as soldiers (Elster, 2007). Citizens vote in elections incurring

* Corresponding author at: The School of Economics and Finance, Queensland University of Technology, GPO Box 2434, 2 George Street, Brisbane, QLD 4001, Australia.
*E-mail address:* benno.torgler@qut.edu.au (B. Torgler).

0167-2681/$ – see front matter 
doi:10.1016/j.jebo.2010.02.005

higher private costs than benefits, and people show greater tax compliance than a traditional economics-of-crime model would predict (Torgler, 2007). Individuals also help others in many situations in the workplace (Drago and Garvey, 1998). In many experiments subjects have shown to care about aspects such as fairness, reciprocity, and distribution. Ultimatum experiments have shown that the modal offer is (50, 50) and that the mean offer is somewhere around (40, 60). This also demonstrates that the smaller the offer, the higher the probability that the offer will be rejected (Ochs and Roth, 1989; Roth, 1995). We also observe helping to be a key element in our work environment: "Within every work group in a factory, within any division in a government bureau, or within any department of a university are countless acts of cooperation without which the system would break down. We take these everyday acts for granted, and few of them are included in the formal role prescriptions for any job" (Katz and Kahn, 1966).

Individuals compare themselves to their environment and care greatly about their relative position, which can influence individual choices. Thus, not only is the absolute level of an individual's situation important (e.g. income), but also the relative position. Researchers have included the concept of interdependent preferences to allow for social comparison (e.g. Becker, 1974; Easterlin, 1974; Scitovsky, 1976; Schelling, 1978; Pollak, 1976; Frank, 1985; Clark et al., 2008; Akerlof and Yellen, 1990). Frank (1999) emphasizes that research provides "compelling evidence that concern about relative position is a deep-rooted and ineradicable element in human nature" (p. 145).

Thus, several approaches try to take into account the deviation of a self-interested model by extending the motivation structure (e.g. Becker, 1974; Rabin, 1993; Andreoni and Miller, 2002; Dufwenberg and Kirchsteiger, 2004; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Sobel, 2005; Frey, 1997). In general, Thaler (2000) stresses that the Homo Economicus will evolve to Homo Sapiens: "As economists become more sophisticated, their ability to incorporate the findings of other disciplines such as psychology improves" (p. 140).

Despite the large number of studies in this area, there is hardly any empirical evidence that demonstrates that interdependent preferences and pro-social behavior matter in extreme situations such as *life-and-death situations*. This paper tries to rectify this shortcoming by exploring this question using data from the sinking of the RMS Titanic, the most recognizable maritime disaster in history. While the unexpected loss of life from this tragedy was indeed sorrowful, the event provides us with data that help us to better understand decision-making processes under extreme pressure. Individuals are forced to make choices that affect their probability of surviving. What makes the event interesting for research is that it is a contained and controlled event, much like a natural field experiment would be designed, wherein the majority of the exogenous factors are controlled and the endogenous factors can be tested and investigated. The environmental or situational conditions were identical for every person on board the Titanic. This allows us to explore behavioral reactions to an external shock, as well as to investigate people's behavior under scarcity. The issue of scarcity or shortage arose, as there existed a severe lack of lifeboats. The Titanic carried only 20 lifeboats adequate for 1178 people (or 53 percent of the passengers on board). The problem was exacerbated further by the panicked deck crew, who began launching lifeboats that had not been loaded to capacity. This meant an *excess demand* situation as people wishing to survive had to compete with others on board for a place on the lifeboats. A failure to secure a seat virtually guaranteed death as the average water temperature of the surrounding ocean was approximately 2 °C (35 °F). Anyone left in the freezing water would quickly succumb to hypothermia and drown. We can expect a certain level of agreement among those already in a lifeboat and those still waiting to board a lifeboat to limit the lifeboat to its maximum safe load to avoid the boat falling into serious danger (Martin, 1978). In addition, we can largely exclude that potential helping behavior could be motivated by *future* reciprocity, a key element in the helping literature (e.g. Gouldner, 1960; Batson et al., 1979). A life-and-death situation can be seen as a "one-shot game". Moreover, previous research has shown that legitimacy affects helping behavior. Legitimate need elicits more help than does illegitimate need (e.g. own laziness) (Schwartz and Fleishman, 1978; Berkowitz, 1969). In our case, people were confronted with an "external shock" which in a substantial manner helps to control legitimacy.

Thus, the intention of the paper is to investigate the decisions made under these extreme conditions and see if the survival outcomes fit with the literature on interdependent preferences. The key question is whether we are able to observe social norms, fairness and social preferences in a life or death situation.

## 2. Theoretical background

Previous studies have explored the link between fairness and shortage using survey data. In telephone surveys of randomly selected residents of two Canadian metropolitan areas, Kahneman et al. (1986) have shown that people consider the use of prices to eliminate the excess of demand to be unfair. This is consistent with the observation that firms do not adjust prices and wages as often as traditional economic theory would suggest. Moreover, we also observe formal laws that penalize vendors who take advantage of shortages by increasing prices for water, fuel and other necessities after a natural disaster (Camerer et al., 2004). Frey and Pommerehne (1993) and Savage and Torgler (2010) replicated the study using European samples, and found similar results. In a shortage situation an allocation process in line with tradition (first-come, first-served) is perceived to be fairest, followed by administrative allocation procedures. However, in contrast to these studies, which consider attitudes we explore *behavioral* consequences of excess demand in a *life-and-death* situation.

Our research focus is closely linked to the question in line with the traditional economic approach, whether people behave according to the notion "every man for himself" or whether a "helping hand" effect can be observed. Interestingly, the willingness to help others in such situations is not uncommon. Perlow and Weeks (2002) stress that helping behavior is required within organizations for increased efficiency, flexibility, learning and innovation: "Therefore, it has never been

more important for us to understand why people help each other at work and why they don't" (p. 343). Shotland and Stebbins (1983) refer to two lines of thoughts: firstly an "altruism school" with the premise that people have a need (innate or acquired) to help others in need; secondly a "hedonistic base" that suggests that people weigh the benefits and costs to themselves to reach the decision to help or not (p. 36). The second one is close to a traditional economic approach.

Helping behavior is not only linked to altruism (Piliavin and Charng, 1990), but also to reciprocity or exchange (Oberholzer-Gee, 2007; Fehr et al., 2002; Henrich, 2004). The idea of reciprocity is helping those who have helped us. Exchange focuses not only on direct reciprocity but also on expectations that lead to solidarity and indirect reciprocity in more anonymous settings such as, helping lost tourists (Rabinowitz et al., 1997). However, as discussed in the introduction, in the case of the sinking of the Titanic, we are able to exclude such motivation due to the nature of the event studied.

Altruistic motivation has been defined as the desire or motivation to enhance, as the ultimate goal, the welfare of others even at a net welfare loss to oneself (Batson, 1992; Elster, 1996). An additional definition of an *altruistic act* is "an action for which an altruistic motivation provides a sufficient reason" (Elster, 1996). However, altruistic behavior is often framed described as being somewhat selfish. It is stressed that what appears to be motivated by a concern for others is often ultimately driven by selfish motives (Piliavin and Charng, 1990). The differentiation between motivation and act is useful, as identifying altruistic motivation is problematic. For example, a so-called "warm glow effect" can be observed when people give. *Giving makes people feel good*. Piliavin and Charng (1990) when summarizing the literature refer to a "paradigm shift" that emphasizes the importance of altruistic behavior: "The central point we attempt to make in this review is that the data from sociology, economics, political science, and social psychology are all at least compatible with the position that altruism is part of human nature. People do have "other regarding sentiments", they do contribute to public goods from which they benefit little, and they do sacrifice for their children and even for others to whom they are not related" (p. 29).

When people sacrifice their life or when they increase the fitness or the survival possibility of others in the Titanic disaster, at the expense of their own survival chances, we are *observing* altruistic behavior. Self-sacrifice can be seen as an extreme form of altruism. For example, Krebs (1991) stresses: "On my definition of altruism, behaviors directed toward the enhancement of the welfare of another increase in altruism in proportion to the anticipated costs to self: Risking your life to save a drowning person is more altruistic than throwing him or her a lifesaver" (p. 137). A person could have done better for herself not helping others and therefore ignoring the effects of her choice on others (Margolis, 1982). Such a notion is consistent with the definition of altruism in social biology (Wilson, 1975).

There are various approaches to model altruistic behavior. An altruistic individual $i$ would have the following function:

$$U_i = U_i(s_i,\ s_j), \tag{1}$$

where $s_i$, $s_j$ measure the survival probability of $i$ and other individuals $j$. If $i$ were an egoist the utility function only depends on his own survival. This can be modeled using the following specific utility function:

$$U_i(s) = s_i + \sum_{j \neq i} \lambda_{ij} s_j \tag{2}$$

$\lambda_{ij}$ is a factor that shows how much individual $i$ cares about $j$. If $i$ does not care at all, $i$'s utility only depends on the own survival. A positive $\lambda_{ij}$ reflects altruism. The utility of $i$ increases when individual $j$ survives. On the other hand, a negative $\lambda_{ij}$ reflects spite (Sobel, 2005). The utility of $i$ decreases if individual $j$ has a higher probability of surviving. The degree of $\lambda_{ij}$ depends on the relation (closeness) between $i$ and $j$. Higher positive values are expected for family members and friends.

Personal and societal norms are implicated in altruism (Piliavin and Charng, 1990). Altruistic motivation may be driven by moral norms such as sharing equitably or helping others in distress (Elster, 2006). Norms are the generally accepted conditions under which society functions, guiding how individuals act and behave towards each other. They are adopted and enforced by members of that society and are not always in the best interest of the individual within that society (Elster, 1985). Elster (2007) sees moral norms as unconditional while social norms are conditional and therefore influenced by the presence or the behavior of other people (p. 104). A key norm that we are going to explore is "women and children first". Interestingly, no international maritime law requires that women and children are rescued first. Such a social norm was first documented during the sinking of HMS Birkenhead in 1852. The Birkenhead sank only 25 min after having struck a rock off the South African coast. The 7 women and 13 children onboard were rowed away from the wreck to safety. Captain Seton drew his sword ordering men to "stand an' be still" (Kipling, 1892) to avoid men rushing to the lifeboats putting the life of women and children in danger. Similar norms have been found in other areas where people had to be evacuated. Humanitarian agencies often first evacuate "vulnerable" and "innocent" civilians such as women, children and the elderly. The Geneva Convention provides special protection and evacuation priority for pregnant women and mothers of young children (Carpenter, 2003).

How can we explain that such a social norm may arise? Helping children and women as their caregivers serves to strengthen the chances of their survival and thereby helps to guarantee the survival of future generations. This may explain why it was also considered vital for women to be rescued. Behavioral evidence is consistent with the norm of social responsibility. For example, studies report that motorists are more willing to stop on a busy street for a woman who is pushing a baby carriage than for a woman who is pushing a grocery cart (Harrell, 1994). Helping behavior is also exhibited during common threat situations (Batson et al., 1979). An increased level of helping behavior may be observed during situations of common threat that may generate "we-feelings" and as a consequence a concern for the welfare of others (Worman, 1979).

In other words closeness strongly correlates to helping behavior (Amato, 1990) and being connected during an external and shocking event may induce closeness.

Eagly and Crowley (1986) in their meta-study report that traditional male gender roles may matter and encourage chivalrous and heroic acts. The results show that men may be predisposed to being more helpful than women during situations which women judge to be more dangerous than men do. Moreover, women usually receive more help than men and males believe themselves to be more competent and more comfortable helping than females. This would suggest a higher probability of survival among females.

In addition, sociobiology also stresses the relevance of the "procreation instinct". The survival of a species relies on its progeny; thus a high value must be placed upon females of reproductive age as a valuable resource. Social norms may be created to protect the reproductive and child-rearing role of women. It is an attempt to protect children rather than the desire to help a woman. A potential shortage of women would limit the number of offspring, while a shortage of men would not (Felson, 2000).

In humans the period of peak reproduction is between the age of 15 and 35 (A.S.R.M., 2003). Prior to age 15 females on average are not yet reproductively functional and after the age of 35 the reproductive cycle begins to slow until at about 50 the reproductive function is lost. Others also stress that the emergence of a social norm, which gives preference to women, may be related to an increased physical and structural vulnerability in women (Felson, 2000).

Females may also have a strong incentive to guarantee the survival of their children. In the study of anthropology "*parental investment*" is an important concept. The study argues that females of most species invest more in the survival of their offspring than males do. Females invest a whole range of benefits, over a period of time, on their offspring starting with the gestation period, lactation, predatory protection and education (Geary, 1998) whereas a male's investment is much smaller. Because of this much larger investment the opportunity costs of losing offspring are much higher and the drive to ensure offspring survival is therefore much stronger (Campbell, 1999). It has been shown that the mortality rates of children with a surviving mother are 1.4 times lower than those without (Voland, 1998). The survival rates of offspring can be directly linked to maternal survival (Bjorklund and Shackelford, 1999). Under these conditions it would be expected that females with children would be much more wary of possible danger and would aggressively fight other females to ensure a safe haven (Cashdan, 1997). Moreover, it has been stressed that the sex that puts in greater parental investment to promote the prosperity of offspring, is the more valued resource (Trivers, 1972; Eswaran and Kotwal, 2004).

## 3. Empirical results

Amato (1990) criticizes that a large amount of literature in this area of helping is laboratory-based: "Researchers who value the rigor of the laboratory have been reluctant to extend the study of pro-social behaviour to everyday life, where the possibility of control is minimal" (p. 31). Working with the Titanic data provides an alternative strategy to explore whether "social norms of helping" survive in a real life-and-death situation. We cannot observe the detailed rescue process but we can evaluate the overall outcome, which provides an indication about the level of social norms or altruism among crew and passengers.

We use a probit model of the survival probability for a typical Titanic passenger:

$$\Pr(y = 1|x_1,\ x_2,\ \ldots,\ x_k) = \Phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k). \tag{3}$$

Here $y$ is a dummy variable indicating whether the passenger survived ($y = 1$) or not ($y = 0$); the variables $(x_1, x_2, \ldots, x_k)$ are explanatory variables such as gender, age, etc; $(\alpha, \beta_1, \beta_2, \ldots \beta_k)$ are parameters to estimate; and $\Phi$ is the cumulative standard normal distribution function. The role of $\Phi$, which is increasing in its argument, is to keep the probability $\Pr(y = 1)$ in the zero to one interval. Each passenger contributes one observation on $(y, x_1, x_2, \ldots, x_k)$. From a sample of such observations, assumed independent, the parameters can be estimated by maximum likelihood. This is a standard probit model.

Since the coefficients are difficult to interpret directly, the marginal effect of a continuous explanatory variable $x_j$ will, as usual, be interpreted through the partial derivative

$$\frac{\partial \Pr(y = 1|x_1, x_2, \ldots, x_k)}{\partial x_j} = \beta_j \phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k), \tag{4}$$

evaluated at the means, where $\phi$ is the standard normal density function (not the cumulative density $\Phi$). Since $\phi > 0$, the sign of the marginal effect is the same as the sign of $\beta_j$. For a discrete $x_j$, a difference rather than a derivative will be used in place of (4).

Tables 1 and 2 present the results. For each coefficient of each probit, we report the maximum likelihood estimates of the coefficient (first value), the $z$-statistic (ratio of coefficient to its standard deviation, in italics), and the marginal effect (in bold). At the bottom of the table, for each probit, we also report the sample sizes and the pseudo-$R^2$s. The pseudo-$R^2$ is $1 - L_1/L_0$, where $L_0$ is the log-likelihood value for the null model excluding all explanatory variables and $L_1$ is the log-likelihood value for the fitted model.

Our gender variable (female = 1) will be a key factor that we will explore. We predict that the coefficient is statistically significant with a positive sign. In addition, we will observe whether children and women with children have a higher probability to survive. To measure the age range of a child we use the United Nations provisional guidelines of standard international age classifications (United Nations, 1982). The guidelines classify children as up to the age of 15. Moreover, to

develop further age dummies we rely on an age notion that the British Royal Commission used in 1870–1874 and which appeared in a subsequent Act in 1875 in regard to age benefits. The transition into "old age" was defined to begin at 50 (e.g. Arias, 2004; Boyer, 1988; Eysenck, 2004; Gorsky, 1998). We will also explore whether females in their reproductive age are more likely to survive compared to other women. Moreover, we will examine (check) whether individuals or females with a larger potential pool of helpers (family members) have a higher probability of surviving.

In addition to controls for gender, age and family or travel group size,[1] we also explore the following independent variables: passenger class, crew member, and nationality. The data was generated from numerous sources, in particular the *Encyclopaedia Titanica*. Passengers were separated into three different classes, namely: first class, second class and third class. It can be expected that first class passengers tried to obtain preferential treatment. A higher level of (bargaining) power, better access to information about imminent danger, persons of power and decision makers such as leading crew members may facilitate (lead to a better) access to lifeboats and therefore raise the probability of survival. Moreover, first class cabins were closest to the boat deck. We control for nationality as previous studies on helping behavior did report cultural differences (Perlow and Weeks, 2002). Moreover, it is worthwhile to explore differences between the crew and the passengers. Crew members are better prepared for a catastrophic event and are also in the position of obtaining the information earlier than the passengers. They could use this information advantage to generate a higher survival rate. They have also better access to important resources such as lifeboats. On the other hand, they are restrained by the expectation to be among the very last to leave the sinking ship.

Table 1 presents the empirical results for the first set of estimations. We begin by first examining if we can find the expected gender effect. In the first four specifications we only include the coefficient FEMALE in the specification, focusing on all the individuals on board the Titanic (see specification (1)), only passengers (2), crew members (3), and couples (4). The results indicate that a strong gender effect exists. Being female rather than male increases the probability of surviving between 23.7 percent (specification (3)) and 53.9 percent (specification (4)). This is a quite substantial quantitative effect. Interestingly, females have a lower probability to survive among crew member than among passengers. Moreover, we observe that the survival rate of females increases when focusing only on couples. In sum, the gender effect is robust in all the 11 regression that we present in Table 1. The effect even increases after controlling for further factors (specifications (5)–(11)).

In a next step we explore whether children also have a higher probability of surviving. In specification (5) we focus only on passengers, controlling for passenger class using the age dummies AGE Sub 15 (age 15 and below), AGE 16–50 and AGE 51+ (which is the reference group) to explore the age–survival relationship. The results support the notion that children have a higher probability of survival than other age groups reporting the largest marginal effects. Being a child rather than a person AGE 51+ (reference group) increases the probability of survival by 32 percent. Moreover, the coefficient AGE 16–50 is also statistically significant. Thus, we find a negative relationship between age and survival probability.

Specification (5) and the following ones in Table 1 also show that first and second class passengers have a higher probability of survival. Being a first class passenger as opposed to a third class passenger (which is the reference group) increases the probability of survival by about 40 percent. Thus, more (bargaining) power, better access to information and lifeboats increases the probability of survival quite substantially.

In specification (6) we work with the entire data set using a CREW dummy variable. The results show that crew members had a higher probability of survival which may indicate their taking advantage of their increased opportunities (better possibilities) to acquire resources and to be informed which promoted their survival rate. Thus, such a result is more in line with a self-interested approach.

In a next step specification (7) and in the following ones we explore whether having a child increases the survival rate of an individual. This is indeed the case. Having a child increases the probability of survival by 20 percent. This effect in part explains not only the social norm of "children first", but also the parental investment norm. Having children motivates parents (especially mothers – women being the main caregivers at that time) to fight harder for their child's survival. Helping children increases the possibility of guaranteeing the survival of future generations.

In specification (8) we again focus on couples only. We find that passenger class and having children also mattered. In this specification we observe the strongest gender effect. A possible explanation could be that husbands and fathers fought to secure a place on a lifeboat for their wives and children but perished as they did not attain a seat for themselves. Specifications (9) to (11) allow us to explore whether being active within a small or large group increases the probability of survival. Joint efforts may lead to a higher probability of survival, but they may also lead to a lower level of flexibility during critical situations. The results indicate that both coefficients, the one for small groups (couples) and large groups (families), are negative. Thus, people acting alone have a higher probability of survival. There is even a statistically significant difference for the smaller group.

Finally, in the last two specifications in Table 1 we control for nationality. First we include a dummy for the single largest group on board: people from England. We find that English people had a lower probability of survival. To deal with the heterogeneous structure of the reference group in specification (10) we use people from England as the reference group in specification (11) and compare them with other nationalities such as the US Americans, Irish, Swedes

[1] Singles, singles with children, singles with servants, couples, couples with children, couples with servants, families/friends, families/friends with children and families/friends with servants. The families/friends groups include extended family groups and groups of friends travelling together as a party.

**Table 1**
Survival probability and pro-social behavior.

| Probit | All (1) | Passenger (2) | Crew (3) | Couple (4) | Passenger (5) | All (6) | All (7) | Couples (8) | All (9) | All (10) | All (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FEMALE | 1.413*** | 1.462*** | 1.858*** | 1.477*** | 1.469*** | 1.493*** | 1.488*** | 1.702*** | 1.517*** | 1.509*** | 1.512*** |
| | *20.22* | *18.34* | *5.50* | *10.29* | *17.39* | *18.29* | *18.16* | *9.8* | *18.11* | *17.98* | *17.84* |
| | **0.517** | **0.529** | **0.237** | **0.539** | **0.530** | **0.542** | **0.541** | **0.605** | **0.550** | **0.547** | **0.548** |
| AGE Sub 15 | | | | | 0.832*** | 0.764*** | 0.758*** | | 0.745*** | 0.745*** | 0.753*** |
| | | | | | *4.12* | *3.94* | *3.89* | | *3.76* | *3.75* | *3.77* |
| | | | | | **0.322** | **0.293** | **0.291** | | **0.286** | **0.285** | **0.289** |
| AGE 16–50 | | | | | 0.474*** | 0.416*** | 0.445*** | | 0.463*** | 0.462*** | 0.469*** |
| | | | | | *3.01* | *2.84* | *3.01* | | *3.11* | *3.10* | *3.14* |
| | | | | | **0.162** | **0.131** | **0.139** | | **0.143** | **0.143** | **0.145** |
| CREW | | | | | | 0.536*** | 0.546*** | | 0.493*** | 0.649*** | 0.631*** |
| | | | | | | *6.51* | *6.61* | | *5.42* | *5.62* | 5.37 |
| | | | | | | **0.189** | **0.193** | | **0.174** | **0.229** | **0.223** |
| 1st class | | | | | 1.149*** | 1.140*** | 1.122*** | 0.833*** | 1.194*** | 1.173*** | 1.136*** |
| | | | | | *10.95* | *10.92* | *10.68* | *3.85* | *10.91* | *10.67* | *9.36* |
| | | | | | **0.432** | **0.429** | **0.422** | **0.320** | **0.448** | **0.440** | **0.427** |
| 2nd class | | | | | 0.409*** | 0.407*** | 0.390*** | 1.577*** | 0.412*** | 0.481 | 0.454*** |
| | | | | | *3.93* | *3.9* | *3.72* | *7.9* | *3.89* | *4.34* | *3.97* |
| | | | | | **0.156** | **0.150** | **0.144** | **0.569** | **0.153** | **0.179** | **0.169** |
| Has child/children | | | | | | | 0.523*** | 0.596*** | 0.713*** | 0.688 | 0.682*** |
| | | | | | | | *2.69* | *2.77* | *3.39* | *3.26* | *3.22* |
| | | | | | | | **0.199** | **0.234** | **0.274** | **0.264** | **0.261** |
| Small groups (couples) | | | | | | | | | −0.274** | −0.254 | −0.252*** |
| | | | | | | | | | *−2.47* | *−2.28* | *−2.25* |
| | | | | | | | | | **−0.090** | **−0.084** | **−0.084** |
| Large groups (families) | | | | | | | | | −0.479 | −0.033 | −0.023 |
| | | | | | | | | | *−0.47* | *−0.33* | *−0.22* |
| | | | | | | | | | **−0.017** | **−0.012** | **−0.008** |
| England (1143) | | | | | | | | | | −0.201*** | |
| | | | | | | | | | | *−2.20* | |
| | | | | | | | | | | **−0.070** | |
| Ireland (114) | | | | | | | | | | | 0.140 |
| | | | | | | | | | | | *0.85* |
| | | | | | | | | | | | **0.050** |
| Sweden (106) | | | | | | | | | | | 0.068 |
| | | | | | | | | | | | *0.40* |
| | | | | | | | | | | | **0.024** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| USA (424) | | | | | | | | | | | 0.236** |
| | | | | | | | | | | | *2.18* |
| | | | | | | | | | | | **0.085** |
| All others (399) | | | | | | | | | | | 0.206* |
| | | | | | | | | | | | *1.89* |
| | | | | | | | | | | | **0.040** |
| Obs. | 2186 | 1300 | 886 | 376 | 1300 | 2186 | 2186 | 376 | 2186 | 2186 | 2186 |
| Pseudo-$R^2$ | 0.161 | 0.211 | 0.041 | 0.221 | 0.286 | 0.209 | 0.212 | 0.389 | 0.214 | 0.216 | 0.216 |

*Note*: *z*-values in italics, marginal effects in bold.

* Statistical significance at the 10 percent level.

** Statistical significance at the 5 percent level.

*** Statistical significance at the 1 percent level.

and the remaining countries. Interestingly, the results show that Americans had ceteris paribus the highest probability of surviving.

Next we investigate the survival factors among females. This allows us to test, for example, if indeed a higher priority is placed upon females in their prime reproductive age. We therefore construct three dummy variables, namely age 16–35, age below 16 and age 36+. Table 2 presents the results. The findings indeed indicate that women in their prime reproductive age were more likely to survive. Compared to the reference group (age 36+) their probability increases by more than 16 percent (see specification 12). This result remains robust after including further factors (see other specifications).

We again observe a passenger class effect. Table 2 shows that the class coefficients report the largest marginal effects. Being a first class passenger increased the probability of surviving among women by around 40 percent. Interestingly, there exists no statistically significant difference between children and the reference group. One reason could be that several women above the reproductive age may be active as caregivers. Specifications (14)–(18) show that having a child increases, ceteris paribus, the probability of surviving among women. Interestingly, we observe that female crew members also had a

**Table 2**
Survival of women.

| Probit | Passenger (12) | All (13) | All (14) | Couples (15) | All (16) | All (17) | All (18) |
|---|---|---|---|---|---|---|---|
| AGE Sub 15 | 0.147 | 0.060 | 0.086 | 0.993 | −0.011 | −0.012 | 0.054 |
| | *0.61* | *0.25* | *0.35* | *1.15* | *−0.04* | *−0.05* | *0.21* |
| | **0.044** | **0.017** | **0.023** | **0.089** | **−0.003** | **−0.003** | **0.015** |
| AGE 16–35 | 0.528*** | 0.421** | 0.457** | 0.272 | 0.473*** | 0.472*** | 0.425** |
| | 2.85 | *2.39* | *2.55* | *0.83* | *2.62* | *2.60* | *2.29* |
| | **0.169** | **0.125** | **0.132** | **0.048** | **0.135** | **0.135** | **0.121** |
| CREW dummy | | 1.177*** | 1.22*** | | 1.007*** | 1.014*** | 1.031*** |
| | | *3.41* | *3.54* | | *2.81* | *2.64* | *2.66* |
| | | **0.200** | **0.194** | | **0.174** | **0.175** | **0.177** |
| 1st class | 1.964*** | 2.001*** | 1.99*** | 2.899*** | 2.170*** | 2.168*** | 2.138*** |
| | 7.96 | *8.45* | *8.21* | *6.04* | *8.74* | *8.69* | *7.89* |
| | **0.415** | **0.403** | **0.389** | **0.527** | **0.408** | **0.407** | **0.403** |
| 2nd class | 1.131*** | 1.118*** | 1.111*** | 1.168*** | 1.202*** | 1.205*** | 1.188*** |
| | 6.40 | *6.37* | *6.25* | *3.77* | *6.43* | *6.11* | *5.80* |
| | **0.274** | **0.241** | **0.231** | **0.136** | **0.240** | **0.241** | **0.238** |
| Has child/children | | | 1.024** | 1.45*** | 1.457*** | 1.456*** | 1.536*** |
| | | | *2.37* | *2.98* | *3.18* | *3.17* | *3.16* |
| | | | **0.186** | **0.154** | **0.215** | **0.215** | **0.220** |
| Small groups (couples) | | | | | −0.661*** | −0.660*** | −0.623*** |
| | | | | | *−3.43* | *−3.40* | *−3.18* |
| | | | | | **−0.197** | **−0.196** | **−0.185** |
| Large groups (families) | | | | | −0.167 | −0.166 | −0.154 |
| | | | | | −0.95 | *−0.94* | *−0.86* |
| | | | | | **−0.047** | **−0.047** | **−0.044** |
| England dummy | | | | | | −0.009 | |
| | | | | | | *−0.05* | |
| | | | | | | **−0.003** | |
| Ireland | | | | | | | 0.203 |
| | | | | | | | *0.76* |
| | | | | | | | **0.052** |
| Sweden | | | | | | | −0.413 |
| | | | | | | | *−1.40* |
| | | | | | | | **−0.130** |
| USA | | | | | | | 0.016 |
| | | | | | | | *0.07* |
| | | | | | | | **0.0040** |
| All other nations | | | | | | | 0.045 |
| | | | | | | | *0.21* |
| | | | | | | | **0.012** |
| Obs. | 433 | 482 | 482 | 169 | 482 | 482 | 482 |
| Pseudo-$R^2$ | 0.2198 | 0.2338 | 0.2466 | 0.4505 | 0.2683 | 0.2683 | 0.2761 |

*Note*: *z*-values in italics, marginal effects in bold.
*Statistical significance at the 10 percent level.
** Statistical significance at the 5 percent level.
*** Statistical significance at the 1 percent level.

higher probability of survival. The quantitative difference is quite substantial (close to 20 percent). On the other hand, being in a small group (with only a partner) reduces the probability of survival while being part of a larger group (family) does not lead to a statistically significant difference in relation to women who are travelling alone. Finally, Table 2 shows that nationality does not matter. Thus, the advantage of being a US citizen disappears when the focus lies on women only.

## 4. Conclusions

There has been little evidence available that illuminates whether interdependent preferences or pro-social behaviors matter in extreme situations such as *life-and-death events*. This paper tries to address this shortcoming by exploring these questions using data from the sinking of the Titanic. This data set not only allows us to explore the behavioral consequences of an extraordinary event, but also provides evidence of an individual's reaction in a situation where there exists an *excess of demand* due to the shortage of lifeboats. Moreover, the analyzed event can be considered a quasi-natural experiment. The environmental or situational conditions were identical for every person on board the Titanic. The event can be seen as an external shock that affected everyone on board in the same manner. In addition, we can largely exclude that potential helping behavior could have been driven by *future* reciprocity. Such a life-and-death situation can be seen as a "one-shot game".

The results offer strong support for the assumption that social norms and altruism matter. The adherence to the norm "women and children first" is apparent in such a life-and-death situation. Being female rather than male increases the probability of survival between 23.7 percent and 53.9 percent, depending on the specification used. This is a large quantitative effect. Interestingly, females had a lower probability to survive among crew members than among passengers. However, the effect is still quite substantial (23.7 percent). Moreover, the survival rate of females increases when focusing only on couples. Similarly, being a child rather than a person of AGE 51+ (reference group) increases the probability of survival by about 30 percent. Having a child and being of reproductive age strongly raises the survival probability. Having a child also increases the probability of survival when males are considered also. Such results are in line with socio-biological theories (e.g. procreation instincts or parental investment) that were discussed in the theoretical part. The findings are also consistent with previous results that report that males are more willing to help in critical situations (e.g. chivalrous and heroic behavior).

Social class has a strong effect. Passengers of the first and second class had a higher probability of survival. Preferential treatment, a higher level of (bargaining) power, better access to information about imminent danger, persons of power and decision makers such as leading crew members tend to raise the probability of survival as they allow for better access to lifeboats. Moreover, these passengers were closer to the boat deck.[2] Similarly, it seems that crew members used their information advantage and their superior access to resources (e.g. lifeboats) to generate a higher probability of survival.

In sum, the intention of the paper was to investigate the decisions made under these extreme conditions and to see if the survival outcomes correspond with the literature on interdependent preferences and social norms. Helping behavior is common and altruism or social and moral norms seem to play a central role in such a risky and extreme situation. For example, social norms such as "women and children first" are maintained during such external shocks that create life-and-death situations. Such an effect is only observable when both crew and passengers agree to defer to such norms. Otherwise, it would have been easy for male passengers to revolt against such a norm. Actions are guided by norms and rationality in the sense that society profits when a large number of females and offspring survive. The social norms are strong enough to keep the "public good" problems under control, limiting individual self-interested behavior although people also take advantage of their relative situation as can be seen by the higher survival rate of crew and first and second class passengers. Our findings clearly show the importance of working with Thaler's (2000) notion of a Homo Sapiens able to understand an individual's behavior in a life-and-death situation.

## Acknowledgements

We would like to thank the editor J. Barkley Rosser, Jr., Heather Loveband, and two anonymous referees for very helpful advice and suggestions.

## Appendix A.

Table A1.

[2] Unfortunately, there are only very sketchy data where the cabins of passengers were located on the *Titanic*. We could only collect information on the distance to the lifeboats in meters for 325 persons of which 64 percent survived. As the overall survival rate is 32 percent, this sample is likely to be highly skewed; that is, the information on the distance to the lifeboats comes predominantly from passengers saved. Nevertheless, using this questionable and small sample, the estimates of the determinants discussed are robust: the effects of gender, cabin class, and reproductive age remain statistically significant and of similar magnitude.

**Table A1**
Mean values.

| Variables | Mean |
|---|---|
| Survived | 0.319 |
| FEMALE | 0.220 |
| AGE Sub 15 | 0.052 |
| AGE 16–50 | 0.891 |
| CREW | 0.405 |
| 1st class | 0.146 |
| 2nd class | 0.129 |
| Has kids | 0.031 |
| Small groups (couples) | 0.171 |
| Large groups (families) | 0.167 |
| England | 0.529 |
| Ireland | 0.052 |
| Sweden | 0.048 |
| USA | 0.191 |
| Other nationalities | 0.180 |
| Female age 16–35 | 0.589 |

## References


Akerlof, G.A., Yellen, J.L., 1990. The fair wage-effort hypothesis and unemployment. Quarterly Journal of Economics 105, 255–284.
Amato, P.R., 1990. Personality and social network involvement as predictors of helping behavior in everyday life. Social Psychology Quarterly 53, 31–43.
Andreoni, J., Miller, J., 2002. Giving according to GARP: an experimental test of the consistency of preferences for altruism. Econometrica 70, 737–753.
A.S.R.M., 2003. Reproductive aging in women., http://www.asrm.org/Patients/FactSheets/reproaging.pdf (accessed 13.08.08).
Arias, E., 2004. United States life tables. In: National Centre for Health Statistics (Ed.), National Vital Statistics Reports, vol. 52. U.S. Department of Health and Human Services, pp. 33–34.
Batson, D., 1992. Experimental tests for the existence of altruism. PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association 2, 69–78.
Batson, D., Pate, S., Lawless, H., Sparkman, P., Lambers, S., Worman, B., 1979. Helping under conditions of common threat: increased "we-feeling" or ensuring reciprocity. Social Psychology Quarterly 42, 410–414.
Becker, G.S., 1974. A theory of social interaction. Journal of Political Economy 82, 1063–1093.
Berkowitz, L., 1969. Resistance of improper dependency relationships. Journal of Experimental Social Psychology 5, 283–294.
Bjorklund, D., Shackelford, T., 1999. Differences in parental investment contribute to important differences between men and women. Current Directions in Psychological Science 8, 86–89.
Bolton, G.E., Ockenfels, A., 2000. ERC: theory of equity, reciprocity, and competition. American Economic Review 90, 166–193.
Boyer, G.R., 1988. What did unions do in nineteenth-century Britain? Journal of Economic History 48, 319–332.
Camerer, C.F., Loewenstein, G., Rabin, M., 2004. Advances in Behavioral Economics. Princeton University Press, Princeton.
Campbell, A., 1999. Staying alive: evolution, culture and women's intra-sexual aggression. Behavioral and Brain Sciences 22, 203–252.
Carpenter, C., 2003. "Women and children first": gender, norms, and humanitarian evacuation in the Balkans 1991–95. International Organization 57, 661–694.
Cashdan, E., 1997. Women's mating strategies. Evolutionary Anthropology 5, 134–143.
Clark, A.E., Frijters, P., Shields, M.A., 2008. Relative income, happiness, and utility: an explanation for the Easterlin paradox and other puzzles. Journal of Economic Literature 46, 95–144.
Drago, R, Garvey, G.T., 1998. Incentives for helping on the job: theory and evidence. Journal of Labor Economics 16, 1–25.
Dufwenberg, M., Kirchsteiger, G., 2004. A theory of sequential reciprocity. Games and Economic Behavior 47, 268–298.
Eagly, A.H., Crowley, M., 1986. Gender and helping behavior: a meta-analytic review of the social psychological literature. Psychological Bulletin 100, 283–308.
Easterlin, R., 1974. Does economic growth improve the human lot? Some empirical evidence. In: David, P.A., Reder, M.W. (Eds.), Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz. Academic Press, New York, pp. 89–125.
Elster, J., 1985. Rationality, morality, and collective action. Ethics 96, 136–155.
Elster, J., 1996. Rationality and the emotions. Economic Journal 106, 1386–1397.
Elster, J., 2006. Fairness and norms. Social Research 73, 365–376.
Elster, J., 2007. Explaining Social Behavior: More Nuts and Bolts for the Social Sciences. Cambridge University Press, Cambridge.
Encyclopedia Titanicia, 2008. http://www.encyclopedia-titanica.org/ (accessed 20.03.08).
Eswaran, M., Kotwal, A., 2004. A theory of gender differences in parental altruism. Canadian Journal of Economics 37, 918–950.
Eysenck, M.W., 2004. Adolescence, adulthood and old age. Psychology: An International Perspective, 1–27.
Fehr, E., Schmidt, K.M., 1999. A theory of fairness, competition, and cooperation. Quarterly Journal of Economics 114, 817–868.
Fehr, E., Fischbacher, U., Gaechter, S., 2002. Strong reciprocity, human cooperation and the enforcement of social norms. Human Nature 13, 1–25.
Felson, R.B., 2000. The normative protection of women from violence. Sociological Forum 15, 91–116.
Frank, R.H., 1985. Choosing the Right Pond: Human Behavior and the Quest for Status. Oxford University Press, New York.
Frank, R.H., 1999. Luxury Fever: Why Money Fails to Satisfy in an Era of Excess. The Free Press, New York.
Frey, B.S., 1997. Not Just for the Money: An Economic Theory of Personal Motivation. Edward Elgar, Cheltenham, UK.
Frey, B.S., Pommerehne, W., 1993. On the fairness of pricing—an empirical survey among the general population. Journal of Economic Behavior and Organization 20, 295–307.
Geary, D.C., 1998. Male, Female: The Evolution of Human Sex Differences. American Psychological Association, Washington, DC.
Gorsky, M., 1998. The growth and distribution of English friendly societies in the early nineteenth century. Economic History Review 3, 489–511.
Gouldner, A.W., 1960. The norms of reciprocity: a preliminary statement. American Sociological Review 2, 161–178.
Harrell, W.A., 1994. Effects of blind pedestrians on motorists. Journal of Social Psychology 134, 529–539.
Henrich, J., 2004. Cultural group selection, co-evolutionary processes and large-scale cooperation. Journal of Economic Behavior and Organization 53, 3–35.
Kahneman, D, Knetsch, J.L., Thaler, R., 1986. Fairness as a constraint on profit seeking: entitlements in the market. American Economic Review 76, 728–741.
Katz, D., Kahn, R.L., 1966. The Social Psychology of Organizations. Wiley, New York.
Krebs, D.L., 1991. Altruism and egoism: a false dichotomy? Psychological Inquiry 2, 137–139.
Kipling, R., 1892. Soldier an' Sailor Too. Barrack-Room Ballads.

Margolis, H., 1982. Selfishness, Altruism, and Rationality. Cambridge University Press, Cambridge.
Martin, D.J., 1978. Commentary: brotherhood and lifeboat ethics. BioScience 28, 718–721.
Oberholzer-Gee, F., 2007. The helping hand: a brief anatomy. In: Frey, B.S., Stutzer, A. (Eds.), Economics and Psychology: A Promising New Cross-Disciplinary Field. MIT Press, Cambridge, pp. 229–239.
Ochs, J., Roth, A.E., 1989. An experimental study of sequential bargaining. American Economic Review 79, 355–384.
Perlow, L., Weeks, J., 2002. Who's helping whom? Layers of culture and workplace behavior. Journal of Organizational Behavior 23, 345–361.
Piliavin, J.A., Charng, H.-W., 1990. Altruism: a review of recent theory and research. Annual Review of Sociology 16, 27–65.
Pollak, R.A., 1976. Interdependent preferences. American Economic Review 66, 309–320.
Rabin, M., 1993. Incorporating fairness into game theory and economics. American Economic Review 83, 1281–1302.
Rabinowitz, F.E., Sutton, L., Schutter, T., Brown, A., Krizo, C., Larsen, J., Styn, J., Welander, A., Wilson, D., Wright, S., 1997. Helpfulness to lost tourists. Journal of Social Psychology 137, 502–509.
Roth, A.E., 1995. Bargaining experiments. In: Kagel, J.H., Roth, A.E. (Eds.), The Handbook of Experimental Economics. Princeton University Press, Princeton, pp. 253–342.
Savage, D.A., Torgler, B., 2010. Fairness and allocation systems, mimeo. Queensland University of Technology.
Schelling, T.C., 1978. Micromotives and Macrobehavior. W.W. Norton, New York.
Schwartz, S.H., Fleishman, J.A., 1978. Personal norms and the mediation of legitimacy effects on helping. Social Psychology 41, 306–315.
Scitovsky, T., 1976. The Joyless Economy: An Inquiry into Human Satisfaction and Consumer Dissatisfaction. Oxford University Press, Oxford.
Shotland, R.L., Stebbins, C.A., 1983. Emergency and cost as determinants of helping behavior and the slow accumulation of social psychological knowledge. Social Psychology Quarterly 46, 36–46.
Smith, A., 1790. The Theory of Moral Sentiments, 6th edition. A. Millar, London.
Sobel, J., 2005. Interdependent preferences and reciprocity. Journal of Economic Literature XLII, 392–436.
Stiglitz, J.E., 1988. Economics of the Public Sector. W.W. Norton, New York.
Thaler, R.H., 2000. From Homo Economicus to Homo Sapiens. Journal of Economic Perspectives 14, 133–141.
Trivers, R.L., 1972. Parental investment and sexual selection. In: Campbell, B. (Ed.), Sexual Selection and the Descent of Man: 1871–1971. Aldine Transaction, Chicago, pp. 136–179.
Torgler, B., 2007. Tax Compliance and Tax Morale: A Theoretical and Empirical Analysis. Edward Elgar, Cheltenham.
United Nations, 1982. Provisional guidelines on standard international age classifications. In: Department of International Economic, Social Affairs (Eds.), Statistical Papers. United Nations, pp. 1–32.
Voland, E., 1998. Evolutionary ecology of human reproduction. Annual Review of Anthropology 27, 347–374.
Wilson, E.O., 1975. Sociobiology: The New Synthesis. The Belknap Press of Harvard University Press, Cambridge.
Worman, B., 1979. Helping conditions of common threat: increased “we-feeling” or ensuring reciprocity. Social Psychology Quarterly 42, 410–414.