Honor, Shared Heroism, and Survival: An Evolutionary Approach

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Abstract

This paper develops a theory of honor and shared heroism in the framework of evolutionary game theory. Though heroes will die, their strains may not. Yet, mutual externalities within the population have no e¤ect on the equilbrium heroism and survival of the population but the memetic e¤ects have. The private bene…t from shirking, however, is linked to the externality reducing the heroism in equilibrium. In a two-stage game, the option to cooperate in the future increases heroism in the earlier stage.

JEL classi…cations:

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1 Introduction

On November 30, 1939, Soviet Union attacked without warning Finland. The war, known subsequently as the "winter war" lasted 105 days. The defenders are respected as national heroes, whether they fell or survived. The war also had signi…cant internal social implications among the Finns. The civil war in the Spring 1918 in the country had strongly divided the population between "the reds" and "the whites" and had resulted in mutual terror and …ghting between the two classes. The winter war, however, united the nation and its social classes. There was a common enemy, the communist Soviet Union, which threatened the survival of the nation. At the frontier, "the whites" and "the reds" were …ghting side by side against the attacking enemy. A concept "sisu" has its roots in this war experience pointing to the e¤orts of soldiers to maximize their input while their life was at stake. The principle of …ghting to the last soldier in defending a piece of land or an island was not uncommon.[1] Another concept inherited from this war experience is known as a "Molotov cocktail", a bottle …lled up with gasoline to be used when attacking at a high risk against a tank. Moreover, the principle of "not leaving a wounded soldier" behind to the enemy is still known today as a re‡ection of mutual commitment.[2] The characteristic attitude has subsequently been called *the spirit of the winter war*. After the

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[1] The battle over the island Petäjäsaari in Lake Ladoga is an example of "to the last man" principle. Keeping the island was important to prevent the enemy from being able to encirle the Finnish troops. The attac was known to be shattering but the defenders stayed and fell.

[2] After a break, the war broke again in 1941 lasting until 1944 and being followed by a war in Lapland. During most of the time, the 1941-44 war was regarded as justi…ed though no more quite so unanimously as the winter war.

war, the political arena became, however, deeply divided between the in‡uential communist party, on the one hand and the social democratic and the non-socialist parties on the other hand. The war-time consensus disappeared in the political life (though it continued in the economic life in some form or another).[3] To explain such phenomena among and between groups, one is tempted to suggest that an evolutionary argument could be rather indispensable. Honor and heroism are partly genetic and partly mememic phenomena. They have signi…cance for the survival and hence for the genetic success of a population.[4]

Honor and heroism are also often associated with sports. Such phenomena tend, however, to arise from private motives rather than from social ones though it has social value.[5] Heroism in a war is di¤erent: the personal cost can be high. Why did the defenders in the winter war take a high personal risk of sacri…cing their life? This paper examines this problem. It is greatly inspired by the 2004 book *The Economy and Esteem* where Brennan and Pettit discuss the incentives of people to build self-esteem and honor. We adopt a game-theoretic approach to study the mechanisms behind social honor and the evolutionary pressures towards the demand for honor. Heroism in a war is a matter of life and death. The central principle in the evolutionary biology is that genes are sel…sh and "want to maximize" their own reproductive survival. How can such a strategy be compatible with heroism in a war which appears to minimize the survival chance? Samuelson (1993) claimed that "Heroes who help others will eliminate themselves doing so, and their strains will tend to die out in the population". This is, however, not so if those who have been helped carry the same genes. This is a common feature among many animals. A bee who attacks an enemy will die but its genes continue to live.[6] By shared heroism, we refer to joint e¤orts analogous to joint ventures. The paper uses the winter war as an example where such mechanisms can be identi…ed. It therefore provides an economic analysis of the social commitment and its break-down after the war in the case of Finnish history. Apparently, the experience is not unique but similar observations can be found in many other contexts.

A citation from Wikipedia is illuminating: A *hero (heroine in female) in Greek mythology and folklore was originally a demigod, their cult being one of the most distinctive features of ancient Greek religion. Later, hero (male) and heroine (female) came to refer to characters who, in the face of danger and adversity or from a position of weakness, display courage and the will for self*

[3] In the 1960s, President Kekkonen accepted some communists in the government. This was a re‡ection of internal coordination but more related to the battle for power and keeping the Soviets satis…ed.

[4] The long history of confrontation between the Swedish and the Russian empires goes back to the 14th century and military con‡icts have been repetitive. A condition for a meme to develop is satis…ed.

[5] In his well-known book, Edward Wilson notices the words of Paavo Nurmi, the legendary Finnish hero in long distance running: "The national pride has never been in my mind, always my own personal honor." Heroism in sports in a zero-sum game which we do not consider in this paper.

[6] Ridley (1996) describes that with an example of a species …sh which jointly monitor the predator.

sacri…ce – that is, heroism – for some greater good, originally of martial courage or excellence but extended to more general moral excellence. Stories of heroism may serve as moral examples. In classical antiquity, hero cults – veneration of dei…ed heroes such as Heracles, Perseus, and Achilles – played an important role in Ancient Greek religion. Politicians, ancient and modern, have employed hero worship for their own apotheosis (i.e., cult of personality). The literal meaning of the word is "protector" or "defender" and etymologically it is thought to be cognate with the name of the goddess Hera, the guardian of marriage. It is also thought to be a cognate of the Latin verb servo (original meaning: to preserve whole) and of the Avestan verb haurvaiti (to keep vigil over), although the original Proto-Indoeuropean root is unclear. According to the American Heritage Dictionary of the English Language, the Indo-European root is ser meaning "to protect". According to Eric Partridge in Origins, the Greek word Hērōs "is akin to" the Latin seruāre, meaning to safeguard. Partridge concludes, "The basic sense of both Hera and hero would therefore be 'protector'.

Apart from Brennan and Pettit (2004), there is hardly any earlier economic work on honor and heroism. However, the studies of animal behavior protecting their descendants are related. The work on altruism, cooperation and mutual helping is related. Theory on status-seeking is related. Books on the heroes of industrial revolutions (like Edison, Steve Jobs and Bill Gates) are related.

Our paper studies honor and heroism in an evolutionary context. Its approach follows the earlier paper by Hirshcleifer (1999). It is also related to the earlier literature on kinship as a candidate hypothesis for cooperative behavior in evolutionary psychology, …rst developed by Hamilton (1964), cf. also Frank (2004). It focuses on a case where players may cooperate or shirk in a context where commitment to cooperate gives rise to mutual positive externalities. The payo¤s are given in terms of …tness. However, costly action gives rise to shirking incentives and a potential prisoners' dilemma. While Brennan and Pettit (2004) discuss a phenomenon where attracting attention can be absent, our paper studies honor where attracting attention may be excluded. Cooperation is a precondition for shared heroism.

We provide an explanation for why young men from the same village were made to …ght together when military combat units were set up. There are monitoring gains against shirking and free-riding and advantages in terms of reputation. The risk of exclusion helped to build the group e¤ect. Section 2 of the paper introduces the basic model and Section 3 the extension to a two-period variety. Other extensions are dscussed in Section 4 where they are interpreted as memetic or derived from moral sentiments. Multiplicity of equilibrium is also considered. While there is nothing normative in the nature, a planning solution can be thought as pointed out i Section 5. Making the Hamilton's Rule normative is discussed in Section 6 and Section 7 concludes.

2 Heroistic strategies and genetic survival

We consider a population of individuals with non-identical genetic structures. The individuals encounter pair-wise one another in a joint venture, say "keeping the island from an enemy". Each has a choice between two strategies, i.e. provide a risky heroistic e¤ort subject to cost, $c > 0$, or abstain from it. The strategies will be called a hero strategy (s_1) and a chicken strategy (s_2). The payo¤s are provided in terms of increased …tness, valued as e_1, e_2.[7] We introduce the following assumptions:

(i) If neither partner provides the e¤ort, the increase in …tness is zero.

(ii) There is a positive externality, measured by $\phi > 0$: if one of the partners provides the e¤ort but the other does not, also the other bene…ts in terms of increased …tness.[8]

(iii) If both partners provide the e¤ort, there is a joint venture e¤ect in terms of mutual externality.

(iv) There is potential for the Prisoners' Dilemma: by shirking one can eliminate one's e¤ort cost but bene…t from the externality of the partner providing the e¤ort. The bene…t has a bonus return or private return $\epsilon > 0$, making the shirking an attractive option.

The payo¤ matrix then takes the form

$$\begin{array}{cc} e_1 + \phi e_2 - c, \phi e_1 + e_2 - c & e_1 - c, \phi e_1 + \epsilon \\ \phi e_2 + \epsilon, e_2 - c & 0, 0 \end{array} \quad (1)$$

In principle, the cost of e¤ort c depends on the forcefulness of the threat. The share of those playing the hero strategies is p while the share of those playing the chicken strategy is $1 - p$. Therefore, the expected return of those strategies in terms of an increase in …tness is provided (for Player 1) by

$$E(s_1) = p(e_1 + \phi e_2 - c) + (1 - p)(e_1 - c) \quad (2)$$

$$E(s_2) = p(\phi e_2 + \epsilon). \quad (3)$$

If

$$E(s_1) - E(s_2) = p(e_1 + \phi e_2 - c) + (1 - p)(e_1 - c) - p(\phi e_2 + \epsilon) > 0, \quad (4)$$

heroism is increasing in the population. But this is just one of many cases. There are others. The potential equilibria hinge upon the return to heroism, the strength of the externality, the bonus return and the e¤ort cost. By equilibria, we refer to the ESS, evolutionary stable strategies introduced by Maynard Smith.

[7] These do not refer to the players themselves but instead are viewed as the survival chances of the family at home.

[8] Intuitively, a heroism raises the survival chance not only of the own family but also the that of the neighbor's family.

Heroes surrounded by chicken Heroism is increasing in the population, $dp/dt > 0$ if

$$e_1 - c - p\epsilon > 0, \tag{5}$$

i.e. if the "initial" share of heroists is small,

$$p < \frac{e_1 - c}{\epsilon}.$$

If the initial share of heroism is large, it holds that $dp/dt < 0$. The replicator dynamics is then given by a downward sloping curve (Figure 1). It crosses the p-axis at point

$$p^{¤} = \frac{e_1 - c}{\epsilon}. \tag{6}$$

This intersection represents an ESS (we take that the numerator is positive). We can see that

$$\partial p^{¤}/\partial e_1 > 0. \tag{7}$$

In other words, the greater is the impact of heroism on the …tness of the own family, the greater is the equilibrium amount of heroes. This is not surprising in the light of the Hamilton's Rule on inclusive …tness. The e¤ort cost reduces the heroism.[9] The bonus return on shirking, ϵ, is part of the externality when shirking and it reduces the equilibrium heroism. Not surpirisingly, the externality plays no role in the private choice between strategies and heroism in the ESS is independent of the externality. We summarize

Proposition 1. *A su¢cient and necessary condition for the evolutionary stable strategies for producing a well-de…ned amount of heroism in a given population is that the private return exceeds the e¤ort cost. The externalities within the population have no impact on the equilibrium heroism. The private bene…t from shirking, however, is linked to the externality and reduces the heroism in equilibrium.*

They were all heroes: The Finnish equilibrium in the winter war The ESS equilibrium

$$p^{¤} = 1 \tag{8}$$

is obtained when

$$\frac{e_1 - c}{\epsilon} \gg 1. \tag{9}$$

For the attacking bee, this condition is satis…ed.

[9] Notice that publicity, discussed by Brennan and Pettit (2004) is not needed for heroism in this model.

No heroes: The Italian equilibrium (Prisoners' Dilemma) Commitment to heroism is not evolutionary stable when

$$\frac{e_1 - c}{\epsilon} < 1. \tag{10}$$

Once this condition is satis…ed, we have the Prisoners' Dilemma. Given the reputation of the Italian army in the Second World War, we call it "an Italian Equilibrium". The replicator dynamics is towards the origin. In this equilibrium, there are no heroes and no mutant hero can successfully invade the population.

3 Life Thereafter: A Second Sub-Game

Heroism is a one-and-for-all phenomenon. Providing heroism in the …rst game, however, leads to an option to participate in the second sub-game.[10] With no heroism, the population goes extinct. But it has implications for the life thereafter for those populations who survive. In this section, we consider an extended game where the players of their descendants are expected to meet again after the …rst sub-game. In the second game, heroism has no value. The second game is subject to the commitment problem but also provides room for cooperative strategies. During the …rst sub-game, the players only know probabilistically what game they will be playing in the second stage.

Assume that the payo¤ in the second game is known probabilistically. This uncertainty arises because the players do not know what strategy the partners will be playing in the second sub-game. With probability q, the players participate in a joint venture providing a payo¤ a while with the probability $1 - q$ they play the Prisoners' Dilemma with payo¤ zero. The expected payo¤ thus is qa. Such a payo¤ is, however, only available if there was mutual heroism in the …rst period. The sub-game perfect equilibrium necessitates that the future return is taken into account in the choice of the …rst sub-game.[11]

We now adjust the payo¤ matrix from above to incorporate the outcome of the second sub-game (assuming zero discount rate) as

$$\begin{array}{cc} e_1 + \phi e_2 + qa - c, \phi e_1 + e_2 + qa - c & e_1 - c, \phi e_1 + \epsilon \\ \phi e_2 + \epsilon, e_2 - c & 0, 0 \end{array} \tag{11}$$

The heroism in the …rst sub-game is now given by

$$p^{\ast} = \frac{e_1 - c}{\epsilon - qa}. \tag{12}$$

Thus,

$$\partial p^{\ast} / \partial (qa) > 0. \tag{13}$$

[10] In terms of our example in the introduction, the second game could be represented by the possibility to participate in a political cartel.

[11] Notice that we have not introduced mixed strategies for players, only to the Nature.

Indeed, the greater is the probability of playing a joint venture in the second game, the greater is the heroism in the …rst game.

4 Extensions

4.1 Meme E¤ects: guilt, punishment, pressure, conscience, following the lead, heterogeneity, mixed strategies under imperfect trust

Our model has the feature that social behavior interacts with genetic …tness. The model could be extended to introduce memetic e¤ects and moral sentiments like feeling guilt when avoiding heroistic actions, feeling guilt from punishment and group pressure, conscience e¤ect, and following a lead.[12] One only needs a reinterpretation of the basic model above. One could make the sensitivity of individuals to heroism individual-sensitive, like discussed by Spichtig and Traxler (2007) on social norms and evolution of cooperation.[13] Such memetic e¤ects in the spirit of Blackmore (1999) could be analyzed by the reinterpretation of our model as they are analogous to a reduction in the private cost of e¤ort, c (Figure 2). Moreover, playing mixed strategies is analogous to the imperfection of trust and commitment. The expected payo¤s would have to be adjusted for the degree of trust.

4.1.1 Monitoring gains

One can study two cases of heroism (i) game with monitoring gains (ii) game without monitoring gains. With monitoring gains, the cost c would - again - be lower. This would result in increased heroism in the equilibrium. We suggest that such an e¤ect helps to explain why combat troups were built of young men from the same village. Positive reputational e¤ects helped to make monitoring more e¤ective.

4.2 Multiple equilibria

How many soldiers are needed in the bee nest to safeguard? Similarly, how many heroes are needed in human population to defend successfully. The answer

[12] The memetic phenomenon of following the lead is analogous to the heard e¤ect, studied in economics though the mechanism is not based on information rejection and adoption. It can be a rather weak mechanism, however, and is accompanied by orders to be obeyed and to be implemented. Such orders are not needed in the case of social insects with identical genetic inheritance.

[13] In their model, there is a continume of individuals and the dynamics is based on the adaptation of social norms but individuals do not behave strategically. There are multiple ESS equilibria characterized by cooperation and free-riding. Charness and Dufwenberg (2006) provide experimental evidence that people strive to live up to others' expectations as as to avoid guilt.

obviously depends on the magnitude of the threat.[14] With a non-trivial threat, one hero typically does not make it: the defending population is driven extinct. The payo¤ to heroism is zero with a small number of heroes.[15] Access to the positive externality e¤ectively requires a great number of heroes to reinforce their mutual impact. The payo¤ matrix is therefore discontinuous. There is a low payo¤ when the number of heroes (measured by p) is small and it is great after a threshold has been exceeded. Thereafter, the payo¤ is subject of diminishing returns. It appears that the heroism has multiple equilibria. The payo¤ matrix can be expressed as

(i) For $p < \overline{p}$,

$$\begin{array}{cc} 0,0 & 0,0 \\ 0,0 & 0,0 \end{array} \quad (14)$$

The replicator dynamics is given by 0 to the left of $\overline{p}$ (with in…nite number of 0-equalibria, all ESS).

(ii) For $p > \overline{p}$, the dynamics is obtained from above to the right of $\overline{p}$ (with one ESS equilibrium).

$$\begin{array}{cc} e_1 + \phi e_2 \text{ ¡ } c, \phi e_1 + e_2 \text{ ¡ } c & e_1 \text{ ¡ } c, \phi e_1 + \epsilon \\ \phi e_2 + \epsilon, e_2 \text{ ¡ } c & 0,0 \end{array} \quad (15)$$

Obviously, the value of $\overline{p}$ depends on the strength of the threat. To obtain the external e¤ects, one needs a su¢cient mass of heroes.

Corollary. *For the hunter-gatherer population to survive, the number of population and heroes had to exceed a given threshold.*

5 Does the planner internalize the externalities?

In nature, there is a "war against and between all". There is nothing normative in the nature. Is the ESS socially optimal appears meaningless. Or does it? Can there be too little or too much heroism from the social point of view? One cannot attach a normative statement to an ESS. On the other hand, unlike social insects, a human population has both common joint interests but is composed of competing gene populations who compete for the option to replicate.[16] Therefore, one might like to ask what a planner would do would the society of non-identical individuals would be able to nominate a planner.

Would the planner allocate the role of heroism to some individuals? Or would he instead only tell how many heroes are needed and leave the choice of

[14] In the begin ning of the winter war, the attacking army had a six times greater manpower than the defending army not to mention the air force.

[15] We abstract from Sven Duva e¤ect. He was during the Swedish governance a historical Finnish soldier who alone defended a bridge against Russian invaders.

[16] In consumer theory, your pleasure is negatively a¤ected by the pleasure of your neighbour (Prisoners' Dilemma).

the role to the individuals? Would he point to an ESS equilibrium as the right target? Does the planner impose the internalization of the externalities?

If the population survives, everyone (apart from the heroes) survives. If the population is driven extinct, everyone is driven. Survival is a collective phenomenon, not a private one. Therefore, the equilibrium satisfying the ESS requirement need not the planning solution!

If the private return on heroism is great, the winner-take-it all model (Frank and Cook (1995)) suggests that there is too much heroism from the social point of view. One can make the following two points. Suppose that the planner chooses to persuade the heroism to reach a stage where the population has a survival chance. It was suggested above that such a level of is given by $p > \overline{p}$. More is not needed if the private valuation of heroism is strong enough to make the heroism adjust towards the ESS along a dowanward-sloping trajectory. If it is upward-sloping, the Planner's choice has no permanent impact and the population is driven extinct.

6 Towards a Normative Hamilton's Rule?

The Hamilton's (1964) rule for kinship e¤ect was developed from an individual's point of view. For the survival of a population, external e¤ects between the members of the population may be important as discussed above. An adjusted rule would accommodate such social e¤ects.

7 Final Remarks

Life has been settled on a battle …eld where competing populations strive to extend their market shares. Under threat, heroistic actions may appear, increasing the survival chance of some sub-populations. External e¤ects bene…t other sub-populations. The resulting aggregate e¤ects strengthen the survival of the total population. With non-identical genetic structures, the external e¤ects are not, however, internalized though the memetic forces like the following the lead may become internalized.

Acknowledgements

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[Figures 1, 2]

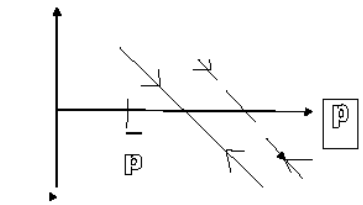

Figure 1: