I thank the editor of this Journal, Sudesh Nuujumdar, Deborah Popper, the participants in the Market Structure and Profitability session at the 2002 Eastern Economic Association conference (at which an earlier version of this paper was presented), and two anonymous referees for helpful and insightful comments. All remaining errors are my own.

1. Our relationship between the consumers’ demand parameters is a) corresponds with Slokey’s condition for profitable price discrimination, that “reservation prices at time zero are positively correlated with rates of time preference” (1979, 158). However, the equality of reservation prices at t is ruled out by Slokey, who assumes that “those who value the good more highly at time zero also value it more highly at every other date” (1979, 157).

2. Note that the CD can be sold through both outlets at the same price, since the purchase cost makes no difference to the consumer; I use the terms “retail price” and the “music club price” the same to retain continuity within the expansion.

3. Freidson (1986, 105) interprets hardcover and paperback book publication as an example of second-degree price discrimination; I thank Sudesh Nuujumdar for pointing this out. See Freidson (1986) for an empirical analysis of this phenomenon.

REFERENCES


DID STRATEGIC BEHAVIOR SAVE THE SCHINDLER JEWS?

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The list is an absolute good. The list is life. All around its margins lies the golf. (Ben Kingsley as Zoham Shmuel in Schindler’s List)

I could’ve got more out ... If I’d made more money ... I didn’t do enough. (Liam Neeson as Oskar Schindler in Schindler’s List)

INTRODUCTION

Interpretation of well-known historical episodes often makes for interesting applications of economics. Recent examples include Bethell’s (1998) description of how the Plymouth colonists benefited from land privatization (a property rights lesson). McClure and Van Cott (1994) point out how the U.S. government agents who worked at Indian reservations and were employed by U.S. General George Custer as intelligence sources faced monetary incentives to report falsely high reservation population counts, thus hastening Custer’s demise at the Little Bighorn (a public choice lesson). Mixon (2000) suggests that Salem church ministers successfully employed Puritan religious doctrine regarding witchcraft to increase church membership in 1692. What followed was the now infamous Salem witch trials episode, wherein 20 people were hanged or prosed to death after being condemned as witches. The latter two of these episodes are dramatic given the associated human cost (that is, lives lost).

The present article argues that one aspect of the Nazi Holocaust of the 1930s-1940s offers yet another example of the explanatory power of economic science. As with other studies that portray the usefulness of history and culture in explaining economics principles (Becker and Watts, 1995; 1998; Trautel, 1996; Kish-Goodling, 1998; Tintari and Knudtso, 2000), we develop game theoretical tools to describe the Oscar-winning movie portrayal—Schindler’s List (1994)—of Oskar Schindler’s attempts to save 1,100 Polish Jews from Nazi death camps. Our game-theoretical model matches Oskar Schindler, the movie’s hero, against Amon Goeth, the movie’s villain, as rivals in a sequential game, the outcome of which depends upon important strategic behavioral concepts. Below, we use dialogue and scenarios from the movie, along with a game tree, to discuss game theoretic concepts such as signaling, reputation, credibility.
OSKAR SCHINDLER AS PROFITEER: SETTING THE STAGE

The movie opens with Oskar Schindler (played by Liam Neeson), a German entrepreneur of questionable business acumen and character, building relationships with German SS officers in Poland, shortly after the German conquest of that country in September of 1939. His early attempts at rent seeking prove successful, and soon thereafter Schindler decides to buy a confiscated factory in Krakow to produce matériel for the German army, thus taking advantage of his newly-established popularity with German officers. At this point, he engages Itzhak Stern, a Jewish accountant (played by Ben Kingsley), who, based on the book "Schindler's List," has been sent to the Jewish ghetto in Krakow. Schindler explains to Stern that he needs Jewish financial capital to buy the factory, and that if Stern would run the day-to-day activities of the company, he (Schindler) could "make a fortune." He offers the Jewish investors enamelledware as a return on their financial investment, and proposes to hire skilled and unskilled Jewish workers from the ghetto (at 7 Reich marks and 5 Reich marks per day, respectively), instead of non-Jewish Poles. As Schindler states to Stern (T1, 0:23:30):6

Schindler: Poles cost more... Why should I hire Poles?

This passage, among others, portrays Schindler as viewing the Jews much like profit-enhancing physical capital assets in his quest for fortune, although he does hint to the incidental effect of offering protection to those he would employ. Although his profiteering reputation was not part of any strategic plan by Schindler in the beginning, it would serve him well later.

GAME-THEORETIC LESSONS FROM SCHINDLER'S LIST

As Dixit and Skeath discuss (1999, 21-22), your opponents in a strategic game are persuasive rational players and know that you are one too. They will recognize your incentive to exaggerate or even lie. Therefore, they will not accept your unsupported declarations; they can be convinced only by objective evidence or by actions that are credible proof of your information. Such actions are called signals, and strategies that use them are called signaling (Dixit and Skeath, 1999, 22). One form of this strategy is that a player "establish and use a reputation" (Dixit and Nalebuff, 1991, 144).

Relatedly, in the strategic management literature (Weigelt and Camerer, 1988), one's character is privately known information, and is known as one's "type." While each player knows his/her own type, players are often uncertain about their rivals' types. Players form beliefs about rivals' probable types from their reputations. In this view, knowledge of one's own type and his/her rival's type allows for the possibility of an asymmetric information advantage (Dixit and Skeath, 1999). This is consistent with our example that follows, wherein Schindler conceals his own type—via signaling—in the presence of knowledge about his rival's type.
Schindler: ... What's a person worth to you?  
Goeth: No, no, no, no. What's one worth to you?

Our game-theoretical model has three players: "Nature," Schindler and Goeth. As the first mover in the game, Nature sets Schindler's type as either "mean" or "nice." As the second mover, Schindler proposes to purchase the Jewish workers from Goeth, who, as the third mover, has the option of accepting ("trade") or refusing ("don't trade") Schindler's proposal. As the (potentially) fourth mover, Schindler has the option to "protect" ("don't protect") the Jewish workers from the death camps. We treat the negotiation between Schindler and Goeth as a sequential game, and employ a game tree, which is presented as Figure 1 (Dixit and Skeath, 1989).

Payoffs regarding various outcomes are highlighted in Figure 1. These depict the potential rewards to both Goeth and Schindler, respectively, from their dealings regarding the 1,100 Jewish workers. Note that payoffs to the Jews are not directly relevant to the game. As Figure 1 illustrates, Goeth's payoff is higher when the Jews are not protected (that is, Goeth is a mean type). Goeth is depicted throughout the movie as being vehemently supportive of the Third Reich's policies regarding the Jews, and the movie's portrayal of his zeal in liquidating the Krakow ghetto suggests that the Reich's policies have a "richer significance" to him than any monetary reward resulting from a trade with Schindler. Therefore, it can be inferred that, in his dealings with Schindler, Goeth prefers that the Jews be exterminated rather than gain freedom; that is, the Nazi extermination policy be carried out irrespective of his own financial concerns. Goeth's ranking of the three possible outcomes regarding his remuneration from a (possible) trade and the fate of the Jews is:

1. (trade Jews, extermination)
2. (don't trade Jews, extermination)
3. (trade Jews, freedom)

Figure 1 payoffs indicate that a mean-type Schindler would have the same preference structure as Goeth (labeled above). The payoffs in Figure 1 illustrate that a nice-type Schindler would most favor protecting the Jews in the event Goeth chooses "trade." However, among the other two possible outcomes—Goeth chooses "trade" and Schindler chooses "don't protect," or Goeth chooses "don't trade"—a nice-type Schindler prefers the latter, given that Schindler would not be responsible for the death of the 1,100 Jewish workers and would, therefore, avoid the psychic costs associated with direct responsibility.

We assume that both mean, ceteris paribus, prefer positive (to zero/negative) payoffs in their business transactions with each other, without regard to the distributional (relative) outcomes in the payoffs (Beil and Beard, 1964). As Figure 1 illustrates, Goeth does not have a dominant strategy. In other words, if he thinks Schindler will choose "don't protect," Goeth will choose "trade." If, however, he believes Schindler will choose "protect," Goeth will choose "don't trade." In this case, knowing what type Schindler represents would assist Goeth in making a utility-maximizing decision. Goeth would correctly reason that a mean-type Schindler would choose "don't protect," and that a nice-type Schindler would choose "protect." One's type is privately known information, and Goeth must, therefore, assign probabilities to two possible outcomes. The probability that Schindler is mean is denoted as \( p \), and \( 1 - p \) represents the likelihood that Schindler is nice. Goeth's decision whether to trade depends on his beliefs about the probability, \( p \), that Schindler is mean. If Goeth's ex ante prior thought is that \( p \) is large (small), he is more (less) likely to trade with Schindler.

Here is where Schindler's signaling is important. In conjunction with his trading proposal as second mover, a nice-type Schindler has the option of signaling that he is mean, after which Goeth's decision whether to trade arises. In attempting to predict Schindler's final decision to "protect" or "don't protect" should Goeth choose "trade," Goeth relies on past experience and what he believes about Schindler's character from other contexts (Dixit and Skeath, 1991, 31). Schindler's reputation with Goeth and the other Nazi officials is that of a protege, concerned more with his own profit than the welfare of the Jewish population. By first acquiring (non-strategically) and later strategically building his protege reputation with Goeth and the other Nazis (see note 9), Schindler has signaled that he is a mean type and will not protect the Jews. As Dixit and Nalebuff [1999] suggest, the aim of a signal is to alter other players' beliefs about your information, and therefore change their choice of actions in a way favorable to oneself. A signal, however, must be credible. Schindler's signal that he is a mean type and would not protect the Jews is, by movie's end, contrary to his interest as a nice type (that is, he cares for the welfare of his workers). His reputation among Goeth and the SS, however, ensures his credibility with them. That is, the way he employed the Jews as physical assets (for profit motives) gives Goeth a belief that Schindler will choose not to protect them. Although near the beginning of the dialogue above Goeth perhaps has one last brief thought about p and 1−p, his ultimate preoccupation appears to be with his remuneration (and economic surplus), and not with the fate of the 1,100 Jews. This view indicates that Schindler's prior signaling has been successful.

Ultimately, Schindler's plan is successful. He transfers millions of Reich marks (RM) to Goeth in return for 1,100 Jews, whom he immediately transfers to a new munitions plant in Zvitušč-Brnilitz, Czechoslovakia. There, he rejoins his protege.
masquerade by informing SS guards that he wants no interference with production, and that the killing of Jewish workers allows him to prosecute offenders and file damage claims with the Third Reich. In the end, Oskar Schindler's actions saved 1,100 Polish Jews from the Nazi Holocaust.

In 1968, Schindler was pronounced a "righteous person" by the Commissar of Yad Vashem in Jerusalem, and he was invited to plant a tree along the Avenue of the Righteous in Israel. Today, there are 6,000 descendants of the Schindler Jews. As our note points out, at a time when game theorists were formally developing their original models (von Neumann and Morgenstern, 1944), they were already being employed in ways that were, before that time, unimaginable.

CONCLUDING COMMENTS

The use of important historic events, coupled with an easily recognized media dramatization of that event, can provide a compelling tool for explaining economics to the Holocaust, as portrayed in the Oscar-winning movie, Schindler's List. In the context of a model that matches Oskar Schindler (hero) against Amon Goeth (villain) as rivals in a sequential game, we propose that Schindler, by establishing a reputation (that is, signaling) that suggested he would choose an action favored by Goeth, but against his own interest, was able to effect his desired outcome. That is, through strategic behavior he saved 1,100 Polish Jews from extermination in Nazi death camps. The analysis of this aspect of the Holocaust via Schindler's List provides for an insightful pedagogical device for students of economics and strategy.

NOTES

The authors thank two anonymous referees, the editor of this Journal, and Mark Dickens for helpful comments. Any remaining errors are our own.

1. Our game-theoretic analysis of Oskar Schindler's real-world attempt to save 1,100 Jews from the Holocaust is, as noted above, based on the movie adaptation of events. We recognize that the movie's portrayal may be as much "Hollywood" as "history." Students, however, are familiar with this historical example primarily through the 1993 movie adaptation. As we argue below, our game-theoretic approach is consistent with the screenplay.

2. Schindler is depicted as being skillful at using in-kind real-world efforts to gain favor with the German government (Yates, Labin, and Ekelund, 1994). He is shown ordering an associate to treat SS and army officers with gifts (which include fruits from the real "rattines"), German cigarettes, dark chocolate, cognac, champagne, nylon stockings and acetate (the mixture of acetate, 1980-1993). For greater historical detail regarding the Holocaust, see Breton and Wintrobe (1986) and The Editors (1999/Ch. 1001b).

3. As the movie points out, wages were paid by German industrialists to the Reich Economic Office, not to the Jewish workers themselves.

4. The movie comprises a two-part set in VHS format. Our citation of movie quotes uses the counter display of the video cassette player, which displays the hour, the minute and the second (time:minute:second). At the beginning of each tape, the counter was reset to 0:00:00. The two tapes are referred to as T1 and T2. The movie runs approximately three hours and 20 minutes.

5. Early in the movie, viewers sense Schindler's anticipation of the bloody fate of Europe's Jews. When Steen initially offers resistance to Schindler's "business proposal" by stating that Jewish financiers were not likely to be interested, Schindler replies: "They should... tell them they should be... 3/13-3/4." Steen's acceptance of Schindler's offer to run the company shows that he was aware of the perilous

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