Southern Economic Journal 2003, 69(3), 628–643

The Economics of Suicide, Revisited

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Only a small fraction of suicide attempts are fatal. Nonfatal attempts might elicit resources and care from others, enhancing economic prospects for those who survive. I expand the standard utility-maximizing model of suicide to include a nontrivial probability of survival and the possibility that the utility function may be affected by the suicide attempt. This expanded model predicts that suicide attempts are more likely when future income may be positively affected by the attempt, conditional on survival. Data from the National Comorbidity Survey show that *ex post,* individuals who made a suicide attempt had higher incomes than peers who seriously considered suicide but who never made a suicide attempt. Moreover, those who reported making the most serious attempts experienced the largest subsequent effects on income.

1. Introduction

Economists have contributed important insights into the motivations underlying suicidal behavior. In particular, economists have formalized the notion that utility maximization plays a role in shaping suicidal behavior and have found empirical evidence suggesting that suicide rates respond to economic factors in ways predicted by economic theory. At the very least, economists have established that suicide is not an act arising purely from social isolation or mental illness. Rather, even for this most drastic of behavioral choices, at some level individuals respond to the same types of incentives that govern other aspects of their economic and social lives.

The economics of suicide, however, remains very understudied. In this paper, I attempt to advance economic understanding of suicidal behavior in two ways. First, I focus on suicide attempts rather than on completed suicides. Completed suicides have been the focus of all previous economic work on the subject, although only a small fraction of suicide attempts are successful. One advantage of the current focus is that it broadens economic analysis to a much wider scope of behavior.

Second, I carry out the first examination of the economic determinants of suicidal behavior using individual-level data. In doing so, I employ information from a national probability sample of Americans aged 18–54 in 1991–1992. The focus of previous research on completed suicides is largely the consequence of data limitations. Since information about suicidal behavior for individuals is hard to come by, researchers have exclusively focused on the economic correlates of aggregate suicide rates. This approach is somewhat unsatisfying, since underlying the economic conceptualization of suicidal behavior are microlevel utility maximization decisions. Focusing on individuals' behavior can provide more direct tests of economic models of suicidal behavior.

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For Margot: September 12, 1969–February 3, 2002.

While many people provided helpful comments, I am especially thankful to Tim Brennan, Robert Margo, two anonymous referees, and seminar participants at Johns Hopkins University. Bernadette Hanlon provided valuable research assistance. I am grateful for support from the National Institute of Mental Health (grant R01-MH56463-01), which enabled my initial research related to this topic.

Received October 2001; accepted April 2002.

2. Background

Suicide is the eighth leading cause of death in the United States, with 30,535 deaths being ruled suicides in 1997, for a rate of 1.14 suicides per 10,000 people (CDC 1999). Petronis et al. (1990) estimate the rate of suicide attempts to be 22 per 10,000 each year in the United States. The difference in these reported annual incidence rates suggests that suicide attempts occur about 20 times as often as completed suicides. The CDC (2001) estimate that every day, 17 suicide attempts occur for each completed suicide. Moscicki et al. (1988) estimate that 2.9% of the U.S. population have attempted suicide.

For obvious reasons, suicidal behavior is the subject of much research in public health and psychiatry. Much suicidal behavior is due to psychiatric illness, for which an individual's reasoning and behavior is not tractable within the context of economic theory, which requires rationality. However, economic analysis can still illuminate suicidal behavior.[1]

The social scientific view of suicide has been dominated by the work of the sociologist Emile Durkheim. Durkheim (1951) proposed two dimensions along which suicide could be categorized. The first dimension pertained to integration into social groups and institutions, and the second was defined by imbalance between means and needs. In an important respect, this sounds like an economic conceptualization, and although Durkheim meant something broader, he believed that deficits between economic means and needs precipitated suicide.

These concepts have dominated sociological work on suicide and have variously been incorporated or extended. For example, demographers have noted the importance of cohort size in shaping prospects, including suicide propensity, throughout the life course. Demographers have suggested that persons born in large cohorts are more likely to be frustrated in their attempts to obtain means to satisfy their needs.[2]

Clearly, these theories imply an economic component to the motives behind suicidal behavior and fit well in the framework of relative supply and demand shifts. Recognizing the importance of economic motivations, economists have developed models of suicidal behavior. Most notably, Hamermesh and Soss (1974) formalized a model of the utility maximization decision faced by those contemplating suicide. Hamermesh and Soss's paper and subsequent work by economists developed the notion that suicide occurs when the discounted stream of expected utility over a person's lifetime is sufficiently low, perhaps negative.[3] Within this framework, suicide rates are expected to rise as lifetime income falls. Suicide rates are also predicted to increase with age under certain conditions.

Hamermesh and Soss (1974) examined empirical data and found evidence in support of these predictions. In general, subsequent work has supported these predictions as well. Chuang and Huang (1997) found that per capita income served as the best predictor of regional suicide rates in Taiwan. Kimenyi and Shughart (1986) also found that suicide rates fall with real income. Hamermesh (1974), however, found that the suicide rate among Blacks in the United States during the late 1960s and early 1970s was less responsive to variations in income. Yang (1992) and others have also found that suicide rates rise with the unemployment rate.

Without exception, previous work on the economics of suicide has relied on aggregate data derived from vital statistics on the number of completed suicides. Researchers have then exploited

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[1] Suicide attempts (rather than completed suicides) may be particularly amenable to economic analysis. Those who attempt suicide and fail are much less likely to suffer from mental illness than are those who complete suicide (Clayton 1985).

[2] Easterlin (1987) makes the case that gaps between attainment and expectations, shaped by cohort size, affect group levels of suicide. See Ahlburg and Shapiro (1984) and Pampel (1996) for similar analyses of suicide rates by cohort.

[3] As will be made clear below, the threshold value of expected utility that induces suicide need not be zero.

variation across space and/or time in aggregate suicide rates and aggregate income or the age or gender composition of the population to identify the effects of economic factors on suicidal behavior.

Reliance on such data for testing hypotheses derived from economic theories of suicidal behavior is less than ideal. Such data do not permit direct observation of the behavior that economic models attempt to explain. Rather, these data provide information on one consequence of such behavior: death by suicide. Since the vast majority of suicide attempts do not result in death, these data provide no information about the bulk of the behavior economic models attempt to explain. Furthermore, in the absence of data on suicide attempts, previous researchers have been unable to consider a more complete range of motivations behind suicidal behavior. In particular, individuals may well recognize that suicide attempts are not always (or even often) fatal. This information may play a role in their decisions.[4]

In this paper, I attempt to develop a more complete assessment of suicidal behavior that focuses at once on the behavior of individuals and on suicide attempts, rather than on deaths resulting from suicide attempts. In doing so, I attempt to extend the utility maximization framework to account for the fact that individuals engage in suicide attempts, some of which result in death, some of which do not.

3. Model

As a first approach to understanding suicidal behavior, consider the model first laid out by Hamermesh and Soss (1974). Here, individuals decide to commit suicide if they determine that the expected stream of lifetime utility falls below some threshold. Let $Z(a, I)$ represent the discounted present value of an individual's expected lifetime utility at age a. Then,

$$Z(a,I) = \int_a^d e^{-r(m-a)} U[C(m,I) - K(m)]P(m)\, dm, \tag{1}$$

where $U[\cdot]$ and $C(\cdot)$ represent utility and consumption functions, m is age, I is income that could be devoted to consumption, K describes the costs of maintaining oneself alive in each year, d is the maximum life expectancy, $P(m)$ is the probability of living to age m given living to age a, and r is the discount rate. An individual kills himself or herself when the discounted stream of utility falls below some critical threshold.[5]

This basic model underlies all empirical work on the economics of suicide to date. First, the model predicts that suicide propensity falls with income, since $\partial Z/\partial I > 0$. This is the principal hypothesis tested in all previous economic work on suicide. The model does not generate a clear prediction about how the propensity to kill oneself changes as the age of contemplation increases, although empirically, suicide rates increase with age.

By modeling the valuation of the discounted stream of the benefits and costs of living, this framework captures the essential element of an individual's decision calculus as that individual contemplates suicide. However, this formulation omits important aspects of suicidal behavior. First, it is not the case that individuals choose between life and death. Instead, the decision faced is between whether or not to *attempt* suicide. Second, suicide attempts may affect future utility, through either

[4] Rosenthal (1993) developed a game-theoretic model of suicide attempts in which individuals recognize that death is not certain but may attempt suicide as a means of signaling credibly in order to influence the behavior of others. Rosenthal does not, however, examine empirical evidence.

[5] Whether this threshold is zero depends on whether the suicide attempt itself has some utility content.

consumption or maintenance costs, if they are survived. Below, I extend the basic model to accommodate these aspects of suicidal behavior in turn.

The basic model can be easily expanded to take into account that suicide attempts do not result in death with certainty. Most directly, engaging in a life-threatening suicide attempt affects the probability of survival. Introducing suicide as a choice variable that influences the discounted stream of lifetime utility by limiting survival probability, we obtain

$$Z(a,I,s) = \int_a^d e^{-r(m-a)}U[C(m,I) - K(m)]P(m,s)\,dm, \tag{2}$$

where the probability of surviving additional years is now affected by whether or not suicide is attempted, and s is a binary variable (1 if an attempt is made; 0 otherwise).[6] When it is recognized that a suicide attempt does not result in certain death, the individual's decision is guided by a comparison of two different states, one in which suicide is not attempted, and one in which it is. The individual assesses his or her expected utility in the absence of a suicide attempt as

$$Z(a,I \mid s=0) = \int_a^d e^{-r(m-a)}U[C(m,I) - K(m)]P(m \mid s=0)\,dm, \tag{3}$$

and this individual assesses his or her expected utility if a suicide attempt is made as

$$Z(a,I \mid s=1) = \int_a^d e^{-r(m-a)}U[C(m,I) - K(m)]P(m \mid s=1)\,dm. \tag{4}$$

A suicide attempt is undertaken when the discounted stream of expected utility in the state in which an attempt is made exceeds the stream of expected utility absent the attempt by at least an amount sufficient to compensate for the attempter's distaste for the act itself.

This extension of the basic model recognizes that a suicide attempt does not result in one's simply foregoing all remaining expected utility. Rather, it affects the likelihood that future periods are realized. Assume that an individual contemplating suicide is risk neutral. Since the effect of attempting suicide on survival probability is surely negative, suicide attempts may be optimal for those whose expected utility in future periods is negative, by limiting the probability that such periods will be endured. Whether or not a suicide attempt ensues depends on whether the associated enhancement of expected lifetime utility is sufficient to offset the individual's distaste for the attempt itself. For those whose discounted present value of utility is positive, the suicide attempt is optimal only if the individual has a taste for the suicide attempt.

This extension of the basic model provides no new insights into the behavior of individuals contemplating suicide. It predicts that individuals are more likely to attempt suicide when the discounted stream of expected utility is negative and less likely to attempt suicide when the discounted stream of expected utility is positive. Hence, the propensity to commit suicide will be inversely related to permanent income and directly related to the costs of maintaining oneself alive.

While this extension does recognize and directly model the feature that a suicide attempt does not ensure death, it ignores any direct effects suicide may have on utility in future periods if the attempter survives. A suicide attempt in any period can affect utility in future periods in two ways. First, because of the possibility of bodily injury and permanent disability, future health and maintenance costs may be higher if suicide is attempted.

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[6] I ignore, temporarily, the fact that the attempter chooses from a variety of means of suicide with various lethality levels.

Second, suicide attempts may even affect consumption in future periods. Indeed, there is reason to believe that many individuals engage in suicide attempts precisely as a means to improve future prospects. Rather than serving as an all-out attempt to end an unhappy life, suicide attempts may instead serve as a "cry for help," intended to elicit attention and care and improve the future.

Rosenthal (1993) develops a model in which a suicide attempt is used as a mechanism to evoke a sympathetic response from another actor, such as a family member. In Rosenthal's formulation, the sympathetic response may be in the form of a change in behavior that the family member would otherwise prefer not to make. However, the suicide attempt serves as a signal to the recipient about whether the sender is of the depressed type or not. If the sender is of the depressed type, the recipient perceives some real threat that the sender will make another, perhaps successful, suicide attempt—an outcome abhorrent to the recipient. Although the recipient prefers not to make a behavioral change, he or she might do so in an attempt to prevent a future suicide if the sender is perceived to be of the depressed type.

Suicide attempts might also evoke responses beyond sympathy and behavioral changes in others. Because it creates a crisis for both families and the health care system, a suicide attempt is likely to elicit attention, help, and substantial resources from many sources. Such intensive attention may be desired by attempters and may even be anticipated as a means to improve future economic standing should the attempt be survived.[7] This may occur, for example, if attempters expect that counseling, treatment, family support, or other resources could improve the quality of their life by aiding them in dealing with difficulties or stress in life.[8]

The formulation in Equation 2 can be modified to model the direct effects of a current suicide attempt on future utility:

$$Z(a,I,s) = \int_a^d e^{-r(m-a)} U[C(m,I(s)) - K(m,s)]P(m,s)\,dm. \tag{5}$$

Here, suicide attempts directly affect future utility via health costs and income, either because the attempt elicits direct income transfers or because it results in care that enables the attempter to improve his or her own life, productivity, and earnings. One's decision rule about whether to attempt suicide is still guided by a comparison of the expected utility in the states with and without a suicide attempt. Suicide is attempted as long as the expected utility associated with the attempt exceeds the expected utility absent the attempt by an amount sufficient to compensate for the distaste of the attempter for the act itself.

Here, however, the expected utility associated with each state differs not only in probability weights, but also in subsequent utility streams:

$$Z(a,I \mid s) = \int_a^d e^{-r(m-a)} U(\cdot \mid s)P(m \mid s)\,dm. \tag{6}$$

Any difference in expected utility streams between the state in which suicide is attempted and the state in which it is not is then

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[7] Indeed, Van Tol (1978) found that persons surviving suicide attempts experienced subsequent improvements in their relationships with their partners.

[8] This raises the question of why a suicide attempt is necessary to evoke such attention. One explanation is that the resources and attention of family members, counselors, and physicians, which might improve an individual's prospects, are not costless. Yet, such resources may be provided at little or no direct cost to those in dire need. A suicide attempt may serve as a mechanism to signal such need.

$$\Delta Z = \int_a^d e^{-r(m-a)}[U(\cdot \mid s=1)P(m \mid s=1) - U(\cdot \mid s=0)P(m \mid s=0)]\,dm. \tag{7}$$

Since $P(m|s=1) < P(m|s=0)\ \forall\ m$, whether this difference is positive depends on the difference in utility streams, conditional on whether or not an attempt is made. In general, in any period the effect of an attempt on utility depends on the ability of the attempt to elicit income or support from others and the effects of the attempt on future health maintenance costs:

$$\Delta U = \frac{\Delta U}{\Delta I}\frac{\Delta I}{\Delta s} - \frac{\Delta U}{\Delta k}\frac{\Delta k}{\Delta s}. \tag{8}$$

An individual's decision to attempt suicide then is shaped by a comparison of the expected gains and risks associated with the attempt. The gains arise from modifications to the utility function due to the attempt. The risk is due to a shift in the probability of realizing future consumption. Suicide is attempted if the subsequent expected effect on utility exceeds the attempter's distaste for the attempt itself and the associated risk. More formally, an individual attempts suicide if

$$Z(a,I \mid s=1) > b + Z(a,I \mid s=0), \tag{9}$$

where b is a measure of the attempter's distaste for the suicide attempt. The left-hand side of the inequality captures the potential benefit of a suicide attempt, realized as an altered stream of expected utility. The right-hand side of the inequality describes the costs of an attempt. Costs are in the form of the distaste for the attempt itself and the opportunity cost of the foregone utility stream.

This extension of the basic utility maximization model generates several predictions about suicidal behavior. First, it predicts that the propensity to attempt suicide is negatively related to permanent income. *Ceteris paribus*, those with higher levels of anticipated income are less likely to satisfy the inequality in Equation 9. Such persons put more at risk and thus have a higher standard to satisfy before a suicide attempt is optimal. This is the principal prediction of the standard utility maximization model underlying all previous work on the economics of suicide.

The current model also has novel implications. Most importantly, it predicts that the propensity to attempt suicide increases as ΔU increases. That is, if it is anticipated that the utility function can be positively affected by the act of attempting suicide, an attempt is more likely. A suicide attempt could affect utility through the two principal arguments in the utility function; consumption and health maintenance costs. An attempt may positively influence future consumption if it evokes sympathy or resources from others. It may also increase maintenance costs if it results in disability.

The first hypothesis is not new and has substantial empirical support. The second hypothesis is novel and is testable in principle. In practice, it is difficult to collect information on income effects anticipated from a suicide attempt *ex ante*. However, it is possible to use retrospective information to compare the incomes of those who have attempted suicide but survived with those of others who contemplated suicide but never made an attempt. If suicide attempts serve as a mechanism to enhance future utility via consumption, then individuals who attempt suicide and survive should fare better than comparable peers who never attempted suicide. In particular, we should observe higher incomes subsequent to the suicide attempt. Increased income subsequent to the attempt would be consistent with the possibility of direct transfers to the attempter and/or care and counseling that improved the attempter's own productivity and income.

In the remainder of this paper, I make use of data from a cross-sectional sample representative of the U.S. population to test whether, *ex post*, suicide attempters experience higher incomes. I do so by comparing attempters with those who contemplate suicide but never attempt it. I also explore the relationship between the severity of the suicide attempt and subsequent income effects.

Heretofore, I have ignored the fact that suicide attempts are heterogeneous, with some attempts being more lethal than others. The decision rule in Equation 9 suggests that it is impossible to know *a priori* whether individuals undertaking attempts involving higher risks of death are likely to anticipate higher subsequent utility effects if the attempt is survived. For those with a positive discounted present value of utility conditional on no attempt, attempts that have extensive effects on survival probability require greater anticipated utility effects as compensation for the risk. In this case, we anticipate a positive relationship between the lethality of the attempt and income gains subsequent to the attempt. However, for individuals whose discounted present value of utility conditional on no attempt is negative, lethal attempts are more likely, even if there is no effect on subsequent utility. For such persons, a benefit of the lethal attempt is that it limits the possibility of enduring the future.

4. Data and Empirical Tests

To study the relationship between suicidal behavior and subsequent income effects, I make use of data from the National Comorbidity Survey (NCS). Conducted in 1991 and 1992, the NCS is a nationally representative survey funded by the National Institute of Mental Health (NIMH) and administered by the Survey Research Center at the University of Michigan. It was designed to study the prevalence, causes, and consequences of comorbidity of various psychiatric disorders (Kessler et al. 1994). The data consist of a stratified, multistage area probability sample of persons 15–54 years old in the 48 coterminous states, and these data provide information about mental illness and suicidal behavior for a sample of 5877 Americans. I restrict my analysis to the members of the sample aged 18–54.

NCS respondents were asked a variety of standard questions about their demographic, social, and economic characteristics. In addition, they were asked several questions about suicidal behavior, including questions about whether they had contemplated or attempted suicide and whether their natural mother or father ever attempted suicide. They were also asked detailed questions about the nature of any attempts. Importantly, they were asked to describe a suicide attempt as a "cry for help" or as a serious attempt that was survived only through luck.

Respondents were also asked a series of questions designed to elicit information necessary to make diagnoses of mental illnesses. This feature of the survey, a diagnostic interview survey (DIS), was the result of a substantial effort by the NIMH to design and validate interview questions that could be used to diagnose mental illnesses. The resulting interview instruments are now widely used and recognized as a useful mechanism for collecting diagnostic information outside the clinical setting.[9]

I use the NCS data to estimate a series of models to identify the income effects of a suicide attempt. I estimate a model of the general form

$$\ln(Y_i) = X_i\beta + S_i\gamma + C_i\delta + R_i\lambda + \upsilon_i, \tag{10}$$

where $\ln(Y_i)$ is the log of individual i's annual income during the survey year, and X_i is a vector of characteristics known to affect income, including demographic characteristics, marital status, region of residence, age, etc.

To identify income effects of suicide attempts, I include a dichotomous measure, S_i, (1 if the person attempted suicide; 0 otherwise). I also include a separate dummy variable measuring whether

[9] See Robins et al. (1981) and Helzer et al. (1985) for descriptions of the development of this instrument and discussions of its validity.

an individual was ever in a suicidal state. This measure, C_i, equals 1 if an individual ever seriously considered suicide or devised a plan to attempt suicide, and it equals 0 otherwise.[10] Including this measure of suicide contemplation is important in constructing a good control group with which to identify the income effects of a suicide attempt. The use of all nonattempters as a control group would require a belief that an attempter is comparable to all observationally similar peers except with regard to the suicide attempt. However, the suicide attempt itself suggests that the attempter is not similar to others. Rather, he or she was in a state of social, economic, or psychological distress. The appropriate reference is to observationally similar individuals who were in comparable states of distress but opted against suicide attempts, foregoing both the inherent risks and any care and resources emergent subsequent to a suicide attempt.

I also include a measure of the recency of the suicide attempt, R_i, to determine whether any productivity effects compound or decay over time. Finally, I control for the effects of mental illness and substance abuse by including indicators of whether the respondent met the DIS criteria for a major mental illness or substance abuse problem during his or her lifetime, as well as measures of whether a respondent's natural mother or father ever attempted suicide. I include these to control for the possibility that there may be certain persons with histories of mental illness and substance abuse who are prone to suicide and who exhibit tenuous ties to economic and social institutions.

I anticipate first that $\delta < 0$ if suicide is an option mainly for those whose permanent incomes are fundamentally lower than those of observationally similar peers. γ provides a test of the implications of the expanded model of suicidal behavior developed here. The theoretical model predicts that suicide attempts are positively related to *ex ante* assessments of the consumption effects of an attempt. If so, I expect that *ex post*, income is higher subsequent to suicide attempts; hence, $\gamma > 0$. Finally, *a priori*, λ cannot be signed. I also estimate a model that distinguishes between suicide attempts of different severities. I do this to establish the empirical relationship between the severity of a suicide attempt and income effects.

There is an inherent truncation problem associated with the use of a sample of the living to study suicidal behavior. This truncation would cause no estimation problems if survival of the suicide attempt was entirely a matter of chance, so that survivors and completers would differ only with regard to their luck. While chance surely plays an important role in surviving a suicide attempt, there may be important differences between survivors and completers. Unfortunately, there is no satisfactory way to compare completers and attempters on dimensions relevant to the model developed here. The only data available on those who complete suicides are derived from death certificates. These data provide little information that would be useful for comparing the economic attributes of people who die as a result of suicide with those of people who attempt suicide but survive. For example, there is seldom information on income and its correlates reported in these data. As a result, even though completed suicides comprise a small subset of all attempted suicides, it is difficult to assess the impact of this truncation problem on the results presented below.

Beyond the fact that completed suicides constitute a very small portion of all attempted suicides, there is an additional reason to believe that this truncation may not be so problematic for estimating economic models of suicidal behavior. Clayton (1985) reports that those who complete suicide are much more likely to suffer from psychiatric illnesses than are those who merely attempt it. Consequently, those who complete suicide are more likely motivated by mental illness rather than economic incentives.

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[10] $C_i = 1$ for all suicide attempters. See Appendix A for further discussion of the determination of whether or not an individual was ever in a suicidal state.

5. Results

In Table 1, I present basic descriptive statistics for the NCS sample. The demographic characteristics and educational attainment statistics for the sample are unremarkable. What is unique about this sample is the information about health and suicidal behavior. While 90.7% of the respondents reported that their physical health was good or better, at some point in their lives 36.8% had satisfied DIS criteria for a diagnosis of mental illness. Moreover, 7.4% of the respondents met the criteria for alcohol abuse or dependence in the year preceding the survey, and 2.4% could be diagnosed as currently abusing or dependent on controlled substances.[11]

The sample exhibits interesting patterns of suicidal behavior. Fully 13.5% of the respondents reported thinking seriously about suicide at some point, while 4.7% reported attempting suicide. Suicide attempts are divided into two types. First, 2.8% of the respondents reported that they made a "soft" suicide attempt—one that they characterized as a "cry for help"—and that they did not want to die or that they knew their method was not foolproof. Moreover, 1.8% of the respondents reported making a "hard" suicide attempt—one that they characterized as a serious attempt to kill themselves—that was survived only by luck. The average number of years elapsed since an attempt was 10.18.

In Table 2, I present estimates of the basic model of the effects of suicide attempts on income described in Equation 10. I estimate the model for all adults with their own positive income (i.e., income attributable to only themselves, not spouses or others in the family). Model 1 is the model in which I include a dummy variable measuring whether or not an individual ever attempted suicide, along with a measure of the number of years since the attempt. Model 2 is the model in which I distinguish between two mutually exclusive types of suicide attempts: "soft" and "hard" attempts.[12] I also include measures of recency for each of these types of suicide attempts.

For both specifications, an individual's having seriously considered or planned a suicide attempt is associated with substantially lower income. For example, the results for the first model suggest that those who reported having seriously considered suicide earned 21% less than comparable peers who had never seriously contemplated suicide. This finding is consistent with the notion that suicide is seriously contemplated mainly by those whose permanent incomes are low.

For the first specification, there is weak evidence consistent with the prediction that those who actually carry out a suicide attempt may fare better later on than those in similar circumstances who do not. People who attempted suicide are estimated to have incomes that are 23% higher than those of people who merely thought about or planned suicide but did not make a suicide attempt. The statistical significance of this finding is fairly weak, however. The effect of a suicide attempt on income appears to decline with time since the attempt. Specifically, with each year that passes, the effect on income associated with a suicide attempt declines by about 1.5%.

The results presented for model 2 suggest that there may be differences in the effects of a suicide attempt on income, depending on the severity of the attempt.[13] Respondents who reported having made a hard suicide attempt experienced large and significant income increases in subsequent years. These subsequent effects appear to decay over time. I estimate that a hard suicide attempt is associated with an initial increase in income of approximately 44%. However, this earnings effect declines about 2.9% with each year that passes after the suicide attempt. The effect of soft suicide attempts on subsequent earnings is smaller and is not significant at the 5% level.

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[11] These prevalence estimates are comparable to those obtained elsewhere (e.g., Kessler et al. 1994).

[12] Six attempters refused or were unable to characterize their suicide attempts and were treated as missing for this analysis.

[13] Again, the effects of suicide attempts on income discussed here are conditional on one's contemplating suicide.

Table 1. Descriptive Statistics of NCS Sample

Variable	Description	Weighted Mean[a]
Female	Respondent is female (0/1)	0.500
		(0.007)
White	Respondent is white (0/1)	0.807
		(0.005)
Age	Age, in years	34.673
		(9.823)
Married	Respondent is married (0/1)	0.587
		(0.007)
High school dropout	Respondent is high school dropout (0/1)	0.150
		(0.005)
Some college	Respondent attended some college (0/1)	0.252
		(0.006)
College	Respondent attended 4 years of college (0/1)	0.220
		(0.006)
Good physical health	Respondent reports good physical health (0/1)	0.907
		(0.004)
Alcohol abuse	Respondent abuses alcohol (0/1)	0.074
		(0.004)
Substance abuse	Respondent abuses controlled subs. (0/1)	0.024
		(0.002)
Mental illness (lifetime)	Respondent has had mental illness (0/1)	0.368
		(0.007)
Suicide attempt	Respondent reports making suicide attempt (0/1)	0.047
		(0.003)
"Soft" suicide attempt	Respondent reports "cry for help" suicide attempt (0/1)	0.028
		(0.002)
"Hard" suicide attempt	Respondent reports "serious" suicide attempt (0/1)	0.018
		(0.002)
Suicidal ideation	Respondent seriously considered suicide attempt (0/1)	0.135
		(0.005)
Years since suicide attempt	Years since last suicide attempt	0.483
		(0.007)

Unweighted final sample size was 5395.

[a] Standard errors are in parentheses.

These results imply that a survived suicide attempt has a sizeable effect on income in the years following the attempt. The baseline effect of any suicide attempt on income (about 23%) is comparable in magnitude to the effect of a two-year postsecondary degree. However, the effect of a suicide attempt on income deteriorates such that by 14 years after the attempt, there is no remaining income advantage attributable to the attempt. The effects of hard suicide attempts on income are even more substantial. Again, the effect erodes after about 12 years. The large initial effect on income is interesting. It may arise because of sizeable transfers from family members elicited by the attempt, or it may be due to subsequent disability payments from the government or private insurance. It is also possible that counseling and treatment following a suicide attempt improve functioning and thereby increase labor market earnings. The finding that the income advantage erodes is consistent with either the withdrawal of these forms of support or the possibility that nonattempters are eventually able to "catch up," perhaps by seeking help or overcoming their problems more gradually.

Table 2. Estimates of Income Effects of Suicide Attempts

Explanatory Variable	Model 1	Model 2
Intercept	4.941**	4.942**
	(0.204)	(0.204)
Female	−0.696**	−0.697**
	(0.029)	(0.029)
White	0.109**	0.110**
	(0.037)	(0.031)
Married	−0.006	−0.007
	(0.032)	(0.032)
Good health	0.141**	0.143**
	(0.053)	(0.053)
Alcohol abuse	0.025	0.023
	(0.059)	(0.059)
Substance abuse	−0.182*	−0.193*
	(0.101)	(0.102)
Physical disability	−0.612**	−0.619**
	(0.127)	(0.127)
Mental illness (lifetime)	−0.082**	−0.082**
	(0.031)	(0.031)
Mother attempted suicide	−0.041	−0.042
	(0.083)	(0.083)
Father attempted suicide	−0.417**	−0.425**
	(0.124)	(0.124)
High school dropout	−0.435**	−0.437**
	(0.046)	(0.046)
Some college	0.195**	0.194**
	(0.036)	(0.036)
College	0.512**	0.512**
	(0.038)	(0.038)
Age	0.236**	0.236**
	(0.011)	(0.011)
Age^2	−0.003**	−0.003**
	(0.000)	(0.000)
Past suicidal behavior		
Suicidal ideation	−0.230**	−0.246**
	(0.051)	(0.051)
Suicide attempt	0.206*	—
	(0.117)	
Years since attempt	−0.015*	—
	(0.008)	
"Soft" suicide attempt	—	0.242*
		(0.149)
Years since "soft" attempt	—	−0.010
		(0.010)
"Hard" suicide attempt	—	0.363**
		(0.173)
Years since "hard" attempt	—	−0.029**
		(0.012)
R^2	0.356	0.357

Standard errors are in parentheses.
* Significant at the 10% level.
** Significant at the 5% level.

It is also possible that the observed erosion of the income gain following a suicide attempt over time may be an artifact of differences in suicidal behavior and its consequences by age group. Since these are cross-sectional data and older sample members on average have had more time pass since a suicide attempt, the observed pattern may arise if younger attempters experience larger-than-average income effects. Indeed, the effect of suicide on income may vary substantially by other demographic covariates. I explored this possibility by estimating a series of models of the form reported in Table 2 conditioning on age, gender, and race.[14] The results of this analysis are revealing.[15] The income advantage following a suicide attempt is substantially larger for younger sample members, for men, and for Whites and is always higher among those making hard attempts. However, even among these groups, the effect of suicide on income declines as time passes.[16]

The relatively large effect of suicide attempts on subsequent income for young people, males, and Whites suggests interesting differences between groups with regard to the ability of a suicide attempt to improve economic outcomes. This might be due to differences in the quality of the signal sent by an attempt or to the ability and willingness of others to respond to that signal. For example, it may be that families and friends are particularly alarmed by suicide attempts by young people and respond with more substantial transfers and support. Young people are more likely to have living parents, who might be especially likely to provide aid to an attempter. The relatively large effect for males may be due to the fact that males have traditionally made the most severe attempts. Thus, even within the categories of severity used here, attempts by males may be the most threatening.

The persistent finding that more severe suicide attempts have the most substantial effects on income is interesting. Recall that the model developed here offered no prediction about the relationship between the severity of a suicide attempt and its subsequent effects on income. The findings presented in Table 2 are consistent with the notion that suicide attempts differ in their information content and ability to elicit resources and support from others. In order to elicit a substantive response from families, clinicians, or others, it may be the case that the suicide attempt must be seen as credible. The severity of the suicide attempt may provide this credibility. This finding is consistent with Rosenthal's game-theoretic model of suicidal behavior, in which family members and professionals prefer to change behavior or provide resources only for persons truly in need. The suicide attempt signals such need, and resources are provided to prevent what is perceived as a potential catastrophic event: the future death of the attempter by another, successful suicide attempt. If soft suicide attempts are perceived by family members and professionals as less-than-credible threats, these people may be unwilling to provide significant resources or treatment to the attempter.

To better assess whether observed income differences between attempters and contemplators are an artifact of heterogeneity, I engaged in several additional analyses. First, I assessed the robustness of the findings by modifying the specification of the basic models reported in Table 2. Alternately, I omitted various controls relevant to suicidal behavior. These controls include disability, mental illness, whether or not a respondent's mother or father had attempted suicide, and whether or not a respondent had a history of alcohol or drug abuse. The main results of these analyses are reported in Appendix B. In no case did the income effect of suicide attempts disappear. In each case, some aspect of suicidal behavior was associated with significant income increases, with hard suicide attempts being associated with the most extensive effects.

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[14] To condition on age, I divided the sample into two age groups: those no older than the median age and those older than the median age.

[15] To conserve space, the results of this analysis are not presented here. They are available from me on request.

[16] Of course this effect might disappear altogether if the sample were large enough to divide into smaller age groups.

In a second attempt to assess the importance of heterogeneity, I employed an instrumental-variables (IV) estimator of the effects of suicide attempts on income. At the time of the survey, overall suicide rates in the United States had been rising for at least 50 years, and patterns differed for men and women. I used this variation in national suicide rates during adulthood to instrument for suicidal behavior. Because the NCS is cross-sectional, different cohorts within the sample were exposed to different levels of suicide during adulthood, which is likely to affect a respondent's propensity to attempt suicide.[17] However, a Hausman test rejected the IV estimates as an improvement over the ordinary estimates, largely because of the large standard errors associated with the IV estimator. While the IV estimator is suggestive that the effects in Table 2 reflect a real effect of suicide attempts on subsequent income, it does not rule out the possibility that this result is due to heterogeneity. Further tests of this hypothesis might be accomplished with better instruments or panel data.

Finally, to assess whether suicide attempts were associated with access to resources, I compared access to medical care and counseling for attempters with that for contemplators. The NCS asked respondents about their past access to medical care and counseling during periods of emotional or mental crisis. Table 3 presents estimates of the rates of access to medical and counseling services reported by those who had contemplated suicide and by those who had made suicide attempts (distinguished by severity). Clearly, those attempting suicide are more likely to have been hospitalized during periods of crisis; are more likely to have seen a physician, especially a psychiatrist; and are more likely to have obtained counseling. In general, respondents reporting hard suicide attempts were the most likely to have access to such care. Since both groups seriously considered suicide, each was in a state of emotional distress, and both were likely to benefit from professional care. These patterns are consistent with the notion that suicide attempts create a crisis for the health care system and elicit care for attempters.

6. Conclusions

In this paper, I have attempted to extend the research on the economics of suicide in two principal ways. First, I focus on attempted, rather than completed, suicide. I have done this both because the study of suicide attempts provides a more direct analysis of suicidal behavior and because attempts comprise the overwhelming bulk of suicidal behavior. Second, I have employed data collected at the individual level, rather than the aggregate level.

I have expanded on the traditional utility maximization model to capture a wider range of economic motives that might underlie suicidal behavior. The expanded model recognizes that suicide attempts are not always fatal and that a suicide attempt might affect utility in future periods, either by eliciting resources or care from others that might improve economic prospects or by increasing health maintenance costs. The model developed here predicts that suicide attempts are less likely as real income rises and more likely if attempters anticipate a positive subsequent income effect.

Using a unique, nationally representative data set, I next examined the empirical relationship between suicide attempts and subsequent income. The results of this investigation are consistent with the prediction of the model developed here. I find that those attempting suicide and surviving subsequently report higher incomes than their peers who seriously contemplated but never attempted suicide. However, it appears that the economic improvements subsequent to a suicide attempt occur

[17] While average national suicide rates during adulthood are expected to affect an individual's propensity to attempt suicide, they are unlikely to bear on individual attributes pertinent to determining the outcome of interest here.

Table 3. Access to Professional Care during Period of Emotional/Mental Distress by Suicidal Behavior

Person/Place Providing Care	% Receiving Care		
	Contemplated but Did Not Attempt Suicide	Made "Soft" Attempt	Made "Hard" Attempt
Hospital emergency room	5.2	15.3**	16.2**
Psychiatric outpatient clinic	10.9	21.9**	21.6**
Family doctor	20.1	22.6	27.4*
Psychiatrist	17.6	24.8**	37.2**
Psychologist	21.0	22.3	24.5
Social worker	7.0	11.2*	15.3**
Counselor	21.3	29.2**	28.6
Nurse, or other health professional	3.0	6.3*	4.9
Received care from any source listed above	58.6	72.1**	73.6**

* Significantly different from nonattempters, $p < 0.10$.
** Significantly different from nonattempters, $p < 0.05$.

mainly for those making the most severe forms of suicide attempts. This finding suggests that any attention, care, and resources invested in suicidal individuals are reserved for those whose threat is most credible.

Both the apparent effect of suicide attempts on income and the finding that this effect is larger for those who attempt the most severe forms of suicide are robust to several specification checks. Even so, the identification of the effect of suicide attempts on subsequent income may be hampered by heterogeneity between attempters and the control group, and additional tests with better data are important to verify the current results. One possibility will be to make use of data from the yet-to-be-released follow-up survey of the NCS sample. Subsequent interviews of the baseline cohort were conducted in 2001, and data from this survey will likely be available in a few years. These data, along with data from the original interview, will provide a panel with which researchers can carry out additional tests on the effect of suicide attempts on subsequent income.

For now, the regularity and magnitude of the pattern of income advantage subsequent to a suicide attempt across specifications and demographic groups suggest that suicide attempts have an effect on economic prospects. Initially, this effect is equivalent to that of two years of postsecondary education, though it declines quickly. The large and immediate effect is consistent with the notion that suicide attempts evoke a substantial response. This is not surprising, since suicide attempts are likely to shock and frighten family and friends. Following a suicide attempt, having just been faced with the prospect of the death of a loved one, family and friends are likely to be quite willing to aid the attempter by providing or ensuring income transfers, care, or treatment.

Appendix A: Measuring Suicide Contemplation in the National Comorbidity Survey

NCS respondents were asked many questions about suicide. During the interview, respondents were handed a card listing several important life events that may or may not have happened to them. In a series, they were asked, "Did [the event] ever happen to you?" I considered people to have been in a suicidal state if they answered that either of the following events had happened to them: (i) "You seriously thought about committing suicide." (ii) "You made a plan for committing suicide."

The NCS provided evidence suggesting that responding affirmatively to either of these questions indicates serious contemplation of suicide. In a different series of questions, respondents were asked, "Have you ever felt so low you thought about committing suicide?" About a third (467) of those who answered yes to this question answered no to the question about having "seriously" thought about committing suicide.

Appendix B
Estimates of Effects of Suicide Attempts on Income: Robustness Checks

Explanatory Variable	Alternate Specification 1		Alternate Specification 2		Alternate Specification 3		Alternate Specification 4	
Alcohol abuse	—	—	0.032	0.030	0.012	0.010	0.021	0.019
			(0.059)	(0.059)	(0.059)	(0.059)	(0.059)	(0.059)
Substance abuse	—	—	−0.215**	−0.224**	−0.198**	−0.208**	−0.178**	−0.188*
			(0.101)	(0.102)	(0.101)	(0.102)	(0.102)	(0.102)
Disabled	−0.627**	−0.634**	—	—	−0.615**	−0.622**	−0.600**	−0.607**
	(0.127)	(0.127)			(0.127)	(0.127)	(0.127)	(0.127)
Mental illness (lifetime)	−0.086**	−0.086**	−0.084**	−0.083**	—	—	−0.085**	−0.085**
	(0.031)	(0.031)	(0.031)	(0.031)			(0.031)	(0.031)
Mother attempted suicide	−0.045	−0.045	−0.039	−0.039	−0.054	−0.054	—	—
	(0.083)	(0.083)	(0.084)	(0.084)	(0.083)	(0.083)		
Father attempted suicide	−0.414**	−0.421**	−0.401**	−0.409**	−0.422**	−0.430**	—	—
	(0.124)	(0.124)	(0.125)	(0.125)	(0.124)	(0.124)		
Past suicidal behavior								
Suicidal ideation	−0.232**	−0.248**	−0.236**	−0.252**	−0.253**	−0.269**	−0.232**	−0.248**
	(0.051)	(0.051)	(0.052)	(0.051)	(0.051)	(0.050)	(0.051)	(0.051)
Suicide attempt	0.201*	—	0.196*	—	0.197*	—	0.175	—
	(0.117)		(0.117)		(0.117)		(0.117)	
Years since attempt	−0.015*	—	−0.016**	—	−0.014*	—	−0.014*	—
	(0.008)		(0.008)		(0.008)		(0.008)	
"Soft" suicide attempt	—	0.250*	—	0.250*	—	0.234	—	0.213
		(0.149)		(0.149)		(0.149)		(0.149)
Years since "soft" attempt	—	−0.012	—	−0.013	—	−0.010	—	−0.009
		(0.010)		(0.010)		(0.010)		(0.010)
"Hard" suicide attempt	—	0.337**	—	0.331**	—	0.355**	—	0.326**
		(0.172)		(0.173)		(0.173)		(0.172)
Years since "hard" attempt	—	−0.028**	—	−0.029**	—	−0.029**	—	−0.028**
		(0.011)		(0.012)		(0.012)		(0.012)
R^2	0.356	0.357	0.353	0.354	0.357	0.356	0.355	0.356

Standard errors are in parentheses. All specifications include controls for age, gender, race, education, marital status, and self-reported physical health.
* Significant at the 10% level.
** Significant at the 5% level.

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