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ABSTRACT

Suicidal Behavior and the Labor Market Productivity of Young Adults*

This paper provides a comprehensive analysis of the link between suicidal behaviors and labor market productivity of young adults in the United States. Using data from the National Survey of Adolescent Health (Add Health), we estimate the effects of suicide thoughts and suicide attempts on the work and schooling activities of young adults as well as on their hourly wage rates. The richness of the data set allows us to implement several strategies to control for unobserved heterogeneity and the potential reverse causality. These include using a large set of control variables that are likely to be correlated with both the suicidal behavior and the outcome measures, an instrumental variables method, and a twin fixed effects analysis from the subsample of twin pairs contained in the data. The longitudinal nature of the data set also allows us to control for past suicide thoughts and attempts of the individuals from their high school years as well as the suicide behaviors of the members of their family. Results from the different identification strategies consistently indicate that both suicide thoughts and suicide attempts decrease the hourly wage rate and the probability that a young adult individual works and/or attends school. The results are found to be robust to various specification tests.

JEL Classification: I1, J24

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I. Introduction

The suicide rate among youths has reached an alarming rate in recent years and is now the third leading cause of death for those aged 15-24 (Anderson and Smith 2003). Since 1950, the suicide rate has tripled among youths (Cutler et al. 2000). Even more striking is the number of suicide attempts by young individuals. For every teen that commits suicide, as many as 150 teens attempt suicide (Chatterji et al. 2004). Concern over the health and well-being of youths has prompted the U.S. Department of Health and Human Services (DHHS) to develop a national strategy for suicide prevention. This comprehensive campaign includes developing public education campaigns, increasing the number of suicide prevention programs in schools, work sites and community services, and incorporating screening at primary health care facilities.

Suicide attempts, regardless of whether or not they are completed, impose real health care and other costs on individuals and society. For example, the direct medical costs associated with both completed and medically treated suicides by youths under 21 amounted to $945 million in 1996, and lost future earnings are estimated at $2.85 billion (Miller et al. 1999). A suicide attempt can have adverse effects on one's current and future labor market productivity due to a bodily injury or permanent disability, lost credibility in the workplace, interruptions at work and school, lost interest in future employment efforts, and continuing psychological problems. Despite this strong link between suicidal behavior and labor market outcomes, our knowledge on the potential effects of suicidal behavior on labor market outcomes is very limited. This relationship is also confounded by the potential effects that poor labor market outcomes have in contributing to suicidal behaviors.

This paper explores in depth the link between suicidal behaviors and human capital formation. Specifically, we focus on labor market and educational outcomes of young adults who are at a stage in life characterized by intense investment in human capital. These adults are in school, participating in job training or are just starting their careers. Disruptions to these

investments can have profound, long-term implications for future earnings and occupational choices. If there is a positive link between the quality of the initial job and future labor market success, the answer to this question will provide important insights into the long-term effects of suicidal behavior and will help structure a better-informed policy debate over the effectiveness of cognitive behavioral therapies and anti-suicide programs such as those implemented at high schools in the United States.

A study by the Center for Disease Control and Prevention (1992) documents that most anti-suicide programs focus on teenagers with little emphasis given to suicide among young adults. This is partly due to the fact that teenagers in high school are easier to reach than young adults and partly due to a failure to appreciate that the suicide rate is generally twice as high among persons 20-24 years of age as among adolescents 15-19 years of age. The study recommends an expansion of the suicide prevention efforts for young adults 20-24 years of age.

The paper is organized as follows. Section II provides a summary of the previous evidence on the subject. Section III discusses the econometric methodology. Section IV introduces the data set and the variables used in the analyses. Section V summarizes the results. Section VI concludes the paper.

II. Background

Researchers believe that almost all individuals who commit suicide have a diagnosable mental disorder (Maris et al. 1992). It has been estimated that two-thirds of people who commit suicide have a depressive illness; 5 percent suffer from schizophrenia; and 10 percent meet the criteria for other mental illnesses including borderline personality disorder. Mental illnesses, such as depression and panic disorders, are also primary risk factors for suicide thoughts and attempts (Alexopoulos et al. 1999, Johnson et al. 1990). The relationship between mental illness and suicidal

behaviors also holds for youth (Fergusson and Woodward 2002). One estimate shows that over 90 percent of children and adolescents who commit suicide have a mental disorder (Shaffer and Craft 1999). The link between suicide and mental illness cannot be denied. Therefore, in this study, we use suicidal behavior as an outcome reflecting an underlying mental illness.

Suicidal behaviors and the underlying mental illness may influence labor market outcomes through direct and indirect channels. The direct mechanism may work through suicidal behavior causing lower productivity due to reduced concentration and cognitive abilities or absenteeism (Greenberg et al. 1990, Conti and Burton 1994). The indirect mechanism may work through mental illness which may, for example, contribute to teenage pregnancy and marital instability, or may lead to low educational attainment, poor labor market productivity and lower wages (Kessler et al. 1997, Overbeek et al. 2003). Whether direct or indirect, suicidal behaviors can affect an individual's productivity which may have consequences for wages and earnings. If a positive link exists between the quality of a job early in adulthood and future labor market success, suicidal behaviors in early adulthood can have long-lasting implications.

The relationship from labor market outcomes to poor mental health also cannot be ignored. Mental health may certainly be affected by wages and income. In the simplest case, more income can allow a person to purchase treatment for mental illness. Higher incomes might also remove stress from financial insecurity and contribute to good health. Hamermesh and Soss (1974) propose that suicide occurs when the total discounted lifetime utility, which is a function of permanent income, reaches zero. Aggregate suicide rates should therefore fluctuate with expectations about future income and the unemployment rate. Indeed, a number of studies on the economic determinants of suicide show that suicide rates fall with rising incomes and rise with the unemployment rate (see Marcotte 2003 for a review). In short, mental health status and labor market outcomes may be intertwined. In this case it is necessary to model the link between suicidal

behavior and labor market outcomes as simultaneous equations in order to obtain unbiased estimates.

To the best of our knowledge, only one previous study, Marcotte (2003), has directly estimated the effects of suicide thoughts and attempts on labor market outcomes. The lack of economic studies on suicidal behavior is largely due to lack of individual level data. The majority of studies on the topic use aggregate data from sources such as vital statistics to look at the correlations between economic outcomes such as income and suicidal behavior. However, to the extent that the underlying behavioral mechanism that leads to suicide decisions and thoughts is based on micro-level utility maximization decisions, aggregate data analysis is unsatisfying (Marcotte 2003). Using data from the National Comorbidity Survey conducted in 1991-1992, Marcotte (2003) finds that past suicide ideation is associated with lower current income. By contrast, past suicide attempts are associated with higher current income, perhaps because of income transfers from family members or the government following the attempt. Also subsequent mental health treatment may improve mental health and labor market outcomes. The sample size in this paper is 5,877 and the target population is all adults between ages 18-54. In contrast, we use a much larger sample in this study from a more recent survey and we explicitly look at the responses of young adult population between ages 18 and 26. Our outcome measures differ in that we examine school and work activities and the hourly wage rate. Finally, the cross-sectional nature of the data set used in Marcotte study and the lack of any potential instruments do not allow the author to rule out the possibility that his findings are due to heterogeneity (Marcotte 2003, p. 640).

Despite the lack of evidence in the literature of the labor market effects of suicidal behaviors, a number of studies have examined the relationship between mental illness and labor market outcomes. Given the close link between suicide and mental illness, this literature can provide insights into the true nature of the relationship. Most of this research shows that poor

mental health is associated with reduced success in the labor market among adults. The first generation of papers focusing on the effects of mental health status on labor market outcomes acknowledges but ignores the potential endogeneity between the outcomes. Studies such as Bartel and Taubman (1979, 1986), Mullahy and Sindelar (1990), and Frank and Gertler (1991) all show that individuals with reported or diagnosed mental disorders have worse labor market outcomes than other individuals. Bartel and Taubman (1979, 1986) find that earnings are lower among individuals with a recent or past mental illness diagnosis. Mullahy and Sindelar (1990) find that people with both self-reported and diagnosed mental illnesses are associated with a lower probability of working. Frank and Gertler (1991) show that having a mental illness reduces earnings. This paper is also important because it shows the bias introduced by using a utilization based measure that disregards mental health status rather than population based measure of mental illness. The bias arises because only a subset of the mentally ill seek treatment.

The second generation of papers explicitly tests for and if necessary, accounts for, the endogeneity of mental illness in the equations for labor market outcomes. The results of these studies are generally consistent with the first generation studies and find worse labor market outcomes among mentally ill individuals. For example, Ettner et al. (1997) use the National Comorbidity Survey to study effects of the presence of specific mental illnesses (such as schizophrenia and major depression) on the probability of being employed, usual hours of work and annual income. The number of psychiatric disorders experienced during childhood and parental history of mental illness serve as instrumental variables. Results show that psychiatric disorders have detrimental effects on all three labor market outcomes. French and Zarkin (1998) examine the relationship between symptoms of emotional and psychological problems and earnings at a large worksite in the U.S. Results of tests for the endogeneity of mental health in the earnings equation leads the authors to treat mental health as exogenous. They find that earnings are lower and

absenteeism is higher among those reporting mental health problems. Hamilton et al. (1997) examine the simultaneous relationship between unemployment and mental health. Using maximum likelihood estimation, the authors find evidence that being employed is associated with improved mental health and that being in poor mental health is associated with a lower probability of employment.

Our paper expands the second generation literature by looking at the effects of suicide thoughts and attempts, which are used as indicators of mental illness, on human capital formation. This is the first paper to examine schooling and labor market outcomes for a sample of young adults. The average age in many of the above mentioned studies ranges from 35 to 40. This paper also uses a variety of methods to control for the potential endogeneity of suicidal behaviors, which allows us to asses the validity of our conclusions. Lastly, our measure of mental health is population based rather than treatment based, the latter of which, as Frank and Gertler (1991) point out, can produce biased results.

III. Methods

The goal of this paper is to model the impact of suicidal behavior on schooling and labor market outcomes. Therefore, the basic econometric model can be expressed as:

$$L_i = \beta S_i + X_i\alpha + \varepsilon_i \qquad (1)$$

where L_i is one of the schooling/labor market outcomes for individual i, S_i is a measure of suicidal behavior, X_i is a vector of personal and family characteristics, and ε is the disturbance term.

Estimating unbiased effects of suicidal behaviors on labor market outcomes is a difficult task. Biased estimates can come from two sources of endogeneity. The first, statistical endogeneity, results from unobserved factors in the error term of equation 1 that are correlated with both the schooling/labor market outcomes and the suicidal behaviors. For example, a lack of a

caring home environment might lead to insufficient investment in activities of child development and nutrition. This in turn could result simultaneously in poor labor market outcomes and poor mental health status. Estimates of the impact of suicidal behavior that do not take account of this type of effect would be biased. The second source of endogeneity, structural endogeneity, comes from the potential reverse causality from labor market outcomes to mental illness and suicidal tendencies. As discussed above, unemployment and low wages may contribute to stress and poor mental health outcomes. Not accounting for this relationship would bias the estimates of the suicidal behaviors in equation 1.

We will attempt to address the potential endogeneity problems in a number of ways. First, we will try to control for the statistical endogeneity by specifying a full set of variables designed to minimize the unobserved factors left in the error term. These are variables designed to represent the home and family environment. By comparing models with and without the background variables, we will be able to see the extent to which correlations between suicidal behavior and outcome variables are affected by controls for these observable characteristics. We are also able to control for suicidal behaviors of the respondents and their family members from Wave 1, when these individuals were at high school. These will further help us eliminate the unobserved heterogeneity.[1]

Despite the richness of the data set, there may still exist unobserved factors that may be correlated with both suicide behavior and the schooling/labor market outcomes, causing biased estimates. In order to guard against this possibility, the genetic oversample of the data is exploited. In particular, any observed or unobserved background measures common to both twins will be controlled by estimating a model with twin-fixed effects. To the extent that twin pairs are exposed

[1] Selection bias may be present in our data as it is possible that individuals with severe mental illness in Wave 1 may have dropped out of the sample because of hospitalization or having committed suicide. If this is the case then our sample would represent people with less severe illnesses. The extent of the problem should be very small as only 41 of the original 20,745 adolescents were not re-interviewed because they were physically or mentally incapable. Another 96 adolescents died between Waves 1 and 3. The reason for death is unknown.

to the same unobservables, a fixed-effects approach will further eliminate unobserved heterogeneity. In order to implement this design, we restrict our sample to twin pairs, and estimate models of the form:

$$L_i = \delta S_i + X'_i\lambda + \gamma PairID_i + \eta_i \quad (2)$$

where X' is a vector of fewer control variables then specified in equation 1, and PairID is a unique identifier for each twin pair. Since any observed or unobserved background measures common to both twins will be controlled for by including the PairID, only things that differ between twins, such as gender, marital status, test scores, and drug use will be included in the vector X'. The twin-fixed effects is a powerful way to control for background characteristics that might be correlated with both the suicidal behaviors and the outcome measures. However, to the extent that there is random error in reports of suicidal behavior, fixed effects estimates from twin models may be biased towards zero.

In order to guard against any bias from potential measurement error and also to address a potential reverse causality from our outcome measures toward suicidal behavior, we will next turn to the instrumental variables (IV) method. The IV method can be used to address both forms of endogeneity discussed above. Instrumental variables will yield unbiased estimates of the effects of suicidal behaviors if instruments can be found which 1) predict suicidal behaviors; and 2) do not affect outcomes except through their effects on the probability that an individual is suicidal. Variables describing the suicidal behaviors of friends from Wave 1 and Wave 3 will be used as instruments for identification under the assumption that these variables will predict an individual's own decision on suicide while having no direct impact on his/her labor market outcomes.[2] The IV method requires the estimation of a model for S_i in the following form:

$$S_i = X_i\theta + Z_i\zeta + \upsilon_i, \quad (3)$$

[2] There is evidence in literature that suicidal behavior is imitative, particularly for teenagers and young adults (Gould et al. 1994).

where Z is a vector of instruments. We can use equation (3) to construct the predicted probability of suicidal behavior for each individual, $P(S_i)$. In the second step, we estimate equation (1) with S_i replaced by $P(S_i)$.[3]

IV. Data

The data for this project comes from the National Longitudinal Study of Adolescent Health (Add Health).[4] The Add Health is the largest and most comprehensive nationally representative survey of adolescents ever undertaken. The first Wave of the survey was administered between Sept. 1994 and April 1995 to 20,745 youths in grades 7 through 12. Approximately 200 adolescents were randomly selected from each of 132 schools that are representative of U.S. schools with respect to county, urbanicity, school size, school type, and ethnicity. The adolescents were interviewed again for the second time from April to August 1996 for Wave 2. Of the original Wave 1 respondents, 15,170 were re-interviewed between August 2001 and April 2002 for Wave 3. There are about 5,500 cases excluded from Wave 3 for various reasons including moving out of country, active military duty, incarceration and being institutionalized, death, and failure to locate in repeated attempts. The Wave 3 respondents constitute our main analysis sample since these respondents are between the ages 18-26 and are engaged in productive activities. As described below, we also utilize a number of questions from Wave 1.[5]

[3] Note that the implementation of the IV method in two steps requires one to correct for the standard errors because of the use of predicted explanatory variables. Standard econometric software packages like the one used in this paper, STATA, automatically provide the correct standard errors with a single step implementation.

[4] The Add Health is a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (www.cpc.unc.edu/addhealth/contract.html).

[5] We exclude responses from Wave 2 because a large number of individuals were not interviewed in Wave 2 but are interviewed Waves 1 and 3.

The Add Health is specifically designed to provide information on individual behavior including sensitive topics such as sexual behavior, criminal and substance use/abuse, and suicidal behaviors. Survey administrators took several steps to maximize the accuracy of data. First, respondents were not provided with printed questionnaires. Rather, all data were entered into laptop computers. Second, on sensitive topics, respondents listened to pre-recorded questions through earphones and entered their answers directly into laptop computers. These steps are likely to eliminate or minimize any potential parental or interviewer influence. In any case, the parental influence is less of an issue for this paper because parents were not present in most of the interviews in Wave 3 as the respondents are adults, living separately from their parents.

One interesting feature of Add Health is the genetic oversample, which consists of a large number of twins. As one of our identification strategies, we limit our sample to twins and estimate fixed effect models. There a total of 578 twin pairs identified in our sample. There is also one set of triplets, which results in three twin pairs for our estimation purposes. It is noteworthy that the fractions of twins who report suicide thoughts and suicide attempts are similar to that reported in the full sample.[6]

Dependent Variables

We consider two measures of schooling and labor market outcomes in this paper. The first dependent variable is a dichotomous indicator for whether or not the individual is currently engaged in a productive (or work-related) activity. This indicates whether the individual currently works, attends school, or both. That is, the variable *Work-School* equals 1 if the respondent is either working, in school, or both, and equals 0 otherwise. We define individuals who are at school as engaging in productive activity because many individuals in our sample are still at school age. In fact about 37 percent reported going to school. The second dependent variable is the natural log of

[6] The sample size for our analyses with twins decreases further because of the elimination of missing variables from either of the individuals within the pairs.

the hourly wage rate for those individuals who work. In Add Health, the respondents report the time period for their rate of pay from a list of hourly, daily, weekly, bi-weekly, bi-monthly, monthly, and yearly pay periods. Then they report their job earnings during that period as well as their usual number of hours of work per week. These answers can be combined to calculate an hourly wage rate for each worker. However, the number of hours of work has to be transformed to match the pay period before calculating the wage rate. For instance, for somebody being paid daily, the daily work hours is calculated by dividing weekly hours by five and for another person being paid monthly, monthly hours is calculated by multiplying weekly hours by four. However, this process may introduce considerable measurement error to the wage rate. This is likely to be a more serious problem than what is usually faced in other survey because in most other surveys, the wage rate is calculated simply by dividing annual earnings with annual hours of work.

While using the calculated hourly wage will be problematic, one feature of Add Health actually enables us to obtain the hourly wage rate of one group of workers, those whose pay period is hourly. For these workers, the issue of measurement error will be minimal because the hours of work is not involved in the calculation in any way. These individuals report their hourly wage since they are paid hourly and to the extent that they remember their hourly wage correctly, this will be the cleanest measure. In our data, nearly 74 percent of workers are paid hourly. This will be our main group of analysis in the wage models. For this reason, our results are representative of workers who are paid on an hourly basis. It is noteworthy that when we also estimated our wage models for the entire sample of workers, the qualitative nature of the results remained the same, but the standard errors were larger. This is expected because measurement error is a more serious problem for the entire group of workers than it is for those who are paid hourly.

Suicide Variables

The Add Health contains a series of questions about suicidal behaviors of the respondents, their friends, and family members in each wave. The self-suicidal behavior questions include whether the respondent seriously thought about committing suicide in the past 12 months (termed suicide thoughts) and whether she/he attempted suicide in the past 12 months (termed suicide attempt). The two questions on suicide from Wave 3 constitute our primary measures of suicidal behavior. To the extent that suicide attempts are reflective of a more serious mental health problem than having just suicide thoughts, these two measures provide an opportunity to assess the differential effect of the degree of suicidal behavior on our outcome measures.

Table 1 presents the descriptive statistics of the variables used in the analyses as well as their definitions. The first column displays the means for the full sample. The next two columns display the means for the sub-sample of individuals who report that they had suicide thoughts in the past 12 months and those who do not report having such thoughts. As shown in Table 1, 6 percent of the sample seriously thought about committing suicide during the past 12 months and 1.6 percent reported attempting suicide during the past 12 months. The same figures from Wave 1 are 13.5 percent and 4.1 percent, respectively. Note that among individuals with suicide thoughts, about 27 percent actually attempted suicide. These statistics correspond well with figures from other surveys. For example, the rates of suicide thoughts and attempts from the 1991-1992 National Comorbidity Survey are 5.2 percent and 1.4 percent, respectively, for youths ages 15-24.

In Wave 3, 6.7 percent of our sample reported having friends who tried to kill themselves during the past 12 months, and about 3 percent reported having family members who tried to kill themselves during the same period. These numbers are down from 17.5 percent for friends and from 4.4 percent for family members in Wave 1. The decline in the individual's behavior and the friends' behaviors are consistent with the general decline in suicidal behavior between adolescence

and adulthood. The decline in the suicidal behavior of family members between Wave 1 and Wave 3 is also consistent with the general decline in suicides that started in 1992 (Lubell et al. 2004).

As illustrated in Table 1, 83.1 percent of our sample is engaged in a work or schooling activity.[7] The engagement in productive activity is less common (79 percent versus 83.4 percent) among those with suicide thoughts than those with none. The average hourly wage rate is about $9.50 and individuals with suicide thoughts earn 57 cents less per hour than non-suicidal individuals.

Other Control Variables

The richness of the Add Health allows us to control for a large set of background variables in our analyses. There are 34 variables in this set and their definitions and descriptive statistics are reported in Table 1. The set includes indicators for age, gender, race, ethnicity, U.S. resident status, marital status, mother's educational attainment, non-wage income, and standard Picture Peabody Vocabulary Test scores from Wave 1.[8] In expanded models, we also include religion, health status, cocaine and drug use from Wave 1, indicators of whether the person experienced any type of abuse during childhood, whether she/he spent time in foster care, and whether the father had ever been in jail.

It is important to include this extensive set of variables in the analysis to obtain consistent estimates because they will help reduce the amount of unobserved factors in the error term that are correlated with both suicidal behavior and productive activity. For example, negative experiences early in life could predispose individuals to risky, self-destructive or aggressive behaviors by impairing their self-esteem and damaging their ability to form relationships with others (Veltman

[7] Those who work constitute 70 percent of our sample. Thirty seven and a half percent of our sample is at school. The proportion of those who are engaged in both work and schooling is about 24 percent.

[8] The Add Health Picture Vocabulary Test (AHPVT) is a computerized, abridged version of the Peabody Picture Vocabulary Test-Revised (PPVT-R). The AHPVT is a test of hearing vocabulary, designed for persons aged 2 1/2 to 40 years old who can see and hear reasonably well and who understand standard English to some degree.

and Browne 2001, Felitti 1998, and Dube et al. 2003). However, many of these variables may be endogenous themselves, therefore models are estimated with and without these potentially endogenous variables so that we can gauge the effects of the inclusion or exclusion of these variables on the coefficients of interest.

In order to conserve a sample as large and representative as possible, we constructed a dummy variable for "missing category" for the variables for which at least one observation was missing due to any reason.[9] This method allows us to utilize a sample size of 14,779, which is larger than those usually employed in most other studies. Age in our sample only ranges from 18 to 26. We use dummy variables for age in order to capture any non-linear association between age and the outcomes variables. Certain variables from Wave 1 are used to avoid the potential bias from any reverse causality. For example, we use the standard test scores and illicit drug use from Wave 1 because the current values may be endogenous to the current productive activity. Furthermore, we do not include the individual's own years of schooling into the models because (1) this variable may be endogenous; and (2) 37 percent of our sample is still in school. Instead, we adopt a quasi-reduced form approach by substituting in the determinants of human capital accumulation, such as mother's education, physical health, and non-wage income. However, we experimented with models that include the number of years of schooling, models that include the standard test scores from Wave 3, and models that are only estimated for the non-school sample (the outcome is "work" in that case). Results are all similar to those presented in this paper and are available upon request.

V. Results

We begin by discussing the determinants of suicide thoughts and attempts. The results in Table 2 display the effects of the suicidal behaviors of friends and family as well as personal

[9] We include missing dummy categories for friends' suicidal behavior, family members' suicidal behavior, abuse, foster care, jailed father, drug use, standard test scores, mother's education, and non-wage income.

characteristics on the probability of suicide thought or attempts among Add Health respondents. These results will later be used as the first stage results in the labor market equations. Linear probability models are shown with robust standard errors to adjust for heteroskedasticity in the error term.[10]

The most striking result from Table 2 is that peer and family behaviors have a strong, positive relationship with the suicidal behaviors of respondents. For example, having a friend who attempted suicide in Wave 3 increases the probability of suicide thoughts by 12 percentage points and suicide attempts by more than 3 percentage points. Similarly, having a family member who had attempted suicide in the past 12 months increases suicide thoughts by 9 percentage points and suicide attempts by 3 percentage points. A past suicide attempt is highly associated with current suicidal behavior, increasing suicide thoughts and suicide attempts by 11 and 4 percentage points, respectively. This result suggests that mental health problems during adolescence may have persistent effects on the mental health of individuals even after they enter adulthood. The past suicidal experiences of the friends and family members have effects in the expected direction (positive), but the magnitudes of the coefficients are small and are not estimated with much precision. For practical purposes, these effects are not distinguishable from zero.

A few other variables are worth mentioning for their efficacy in predicting suicide thoughts and attempts. Having a standardized test score in one of the top three percentile categories actually increases the probability of having suicide thoughts over those individuals having scores in the lowest 25th percentile. It is interesting to note that the effect monotonically increases as one moves

[10] We specify linear equations for ease of estimation and interpretation. Instrumental Variable estimation is much simpler with a linear model than with a nonlinear model such as a probit. Least squares estimates of coefficients in linear probability models are consistent estimates of average probability derivatives, but standard error estimates are biased as a result of heteroskedasticity (Angrist and Krueger 1999). We report standard error estimates that are robust to any form of heteroskedasticity.

in the direction of higher test scores.[11] However, the differences disappear when suicidal attempts are considered. Having suffered any type of abuse as a child is positively related to current suicide thoughts (4.3 percentage points) and attempts (1.4 percentage points). A similar pattern is observed for the effect of having a father who was ever jailed, although the effect is only statistically significant for suicide thoughts. Being married and being in good physical health are negatively related to both suicide thoughts and attempts.

Tables 3A and 3B present OLS results for the effects of suicide thoughts and attempts on the probability of being in a productive activity as measured by working and/or being at school (columns 1 and 2) and on the log wage rate of hourly workers (columns 3 and 4). Tables 3A and 3B differ by the set of control variables, with the parsimonious specification in Table 3A and the expanded set of variables in Table 3B. Including the larger set of variables does not affect the sign or the statistical significance of the suicide coefficients in the work-school models, although the magnitude of the effects fall slightly when the larger set of variables is included. The results from Tables 3A and 3B indicate that having suicide thoughts decrease the probability of being in a productive activity by a range of 4 to 6 percentage points. Attempting suicide decreases the probability of being in a productive activity by a range of 10 to 14 percentage points. Using a specification with a rich set of control variables does not have much effect on the overall fit of the model as indicated by the R-squared values. The fact that controlling for a large set of background characteristics and past suicidal behavior reduces the effect of current suicide thoughts and attempts only slightly suggests that unobserved heterogeneity accounts for only a small percentage of the effect of suicidal behavior on productive activity and the wage rate. For example, having a jailed

[11] The reason for including the test scores as dummies rather than as a continuous percentile is because the test scores are either missing for or not taken by about 5 percent of the respondents. In order to avoid dropping these individuals, we use dummy categories for test scores and include a dummy category for missing test scores. However, dropping observations with missing test scores and using a continuous test score variable produced results very similar to those presented in the paper.

father or having suffered some type of abuse as a child may cause negative labor market outcomes by increasing suicidal tendencies. If that is the case, the effect on suicidal behavior would actually represent the indirect effects of these adverse life experiences, not the effect of having a mental health problem that manifests itself through suicidal behavior. However, our results suggest that even after controlling for these negative life experiences, suicidal behavior has direct effects on current productive activity.

Suicidal behaviors appear to have much less of an impact in reducing the wage rate. The coefficients on suicide thoughts and attempts are all negative in the log wage equations in Tables 3A and 3B, but they are small in magnitude and only one of the coefficients is statistically different from zero and this is only at the 10 percent level.

Given the large set of control variables used in Table 3B, this is our preferred specification. An interesting result that arises in Table 3B is that the current suicidal behaviors affect the decision to go to work or school holding constant past suicide attempts, and holding constant current and past suicide attempts of a family member. In fact, none of these other suicide measures are statistically significant predictors of the work-school decision, although the coefficients are negative as one would expect. In other words, it appears that the only way these factors affect the labor market and school decisions of individuals is through their influence on the current suicidal behaviors of individuals, as shown in Table 2.

The results in Table 3B are informative in that they contradict the hypothesis put forth by Marcotte (2003) that individuals attempt suicide in order to elicit resources or care from others to improve their economic prospects. The coefficients on past suicide attempts on current wage rate and schooling and work outcomes are small in magnitude and are not statistically significant.

The other control variables in Table 3B are usually consistent with our expectations and the results from the relevant literature. High standard test scores at high school are associated with

increases in working and schooling as well as the wage rate. Being in good physical health is a strong predictor of both productive activities and the wage rate. Mother's education increases the probability that someone is working or at school while having no significant effect on the wage rate. Having spent time in foster care, having used illicit drugs at high school, and having a father who was jailed in the past have negative effects on working/schooling, while having no significant effect on the wages.

Table 4 shows the results of two-stage least squares (TSLS) estimation of suicidal behaviors on the two outcomes. Here, only the results from our preferred specification (the full specification) are reported since the inclusion of the potentially endogenous variables does not have a large effect on the coefficients on the suicide variables. The TSLS results are qualitatively similar to those in Table 3B, but the magnitudes are much larger. Having suicide thoughts or a suicide attempt decreases the probabilities of being in a productive activity by 17 percentage points and 60 percentage points, respectively. Suicide thoughts and attempts may also decrease the log wage rate by 19 percent and 39 percent, respectively. However, the effect of the suicide attempt is not significant at conventional levels. The validity of our instrumental variables analyses hinges on the assumption that friends' suicidal behaviors are associated with the individuals' own suicidal behaviors, while having no direct association with the outcome measures that we examine. Our confidence on the reliability of the TSLS estimates are validated by the various test statistics reported at the bottom of Table 4. Taken together, the two instruments, a friend's attempt in the first wave and a friend's attempt in the third wave, are strong predictors of current suicidal behaviors as indicated by the F-statistics. The Durbin-Wu-Hausman test results indicate that OLS estimate is inconsistent at less than 10 percent level in all the models with the exception of the wage equation for the suicide attempt model. Note that the suicide attempt coefficient in the wage column was not estimated with much precision in both the OLS and the TSLS models. Finally, the

results from the over-identification tests suggest that the instruments can be appropriately excluded from the second stage equations. Thus, we believe that we have supportive evidence in favor of TSLS over the OLS estimates.

The results from the twin sample which includes the twin fixed effects are show in Table 5. We believe the results of these specifications are particularly reliable since the fixed effects can control for a host of unmeasured, time invariant characteristics that might be correlated with the suicidal behaviors and the outcome measures. Obviously, the number of control variables in the twin models is much lower than the others as many of the background variables exhibit no variation between sibling pairs. The results are largely consistent with those of the previous tables. Due to the reduced sample size and variation in variables across twins, most of the coefficients are not estimated with much precision. However, three of the four coefficients on the suicidal behaviors are statistically significant at conventional levels. Columns 1 and 2 show that the suicidal behaviors are negatively and statistically significantly related to the probability of being in a productive activity. Column 3 shows that suicide thoughts are associated with decreased wages, but there is no statistically significant effect of suicide attempts on wages in column 4.

The fact that all of the three strategies that we employ to tease out both the unobserved heterogeneity and reverse causality points to a negative link between the suicidal behavior and our outcome measures provides further evidence that these effects are in fact causal.

Specification Checks

One can argue that the family members' suicide attempts may be endogenous to the individuals' own suicidal behavior. For example, a respondent may attempt suicide and a parent may follow in response. If this is the case, our results from the OLS and twin-fixed effects could be biased. However, the coefficients on the family members' suicide attempts are not statistically

significant in any of our models. In fact, our results basically remained the same when we excluded these variables from our models.

Our instrumental variables method would account for the potential reverse causality from labor market and schooling outcomes through suicidal behavior. A useful exercise would be to estimate models that only includes the past suicidal behavior since these models are not subject to any reverse causality problem to begin with. Also having both the current and past suicidal behavior in the same models might be problematic due to multicollinearity. Therefore, we estimated our models excluding the current suicidal behavior variables. In these models, past suicidal attempts have negative coefficients for both the work-school and log(wage) models, but neither of them are statistically significant at conventional levels. This is consistent with the results in Tables 3B and 4, where the effect of past suicide attempt, although negative in seven out of eight models, is never estimated with much precision. These results suggest that suicidal behavior during high school do not have direct effects on the labor market and school outcomes of individuals at early adulthood. However, it certainly has effects for the current suicidal behavior of individuals as illustrated in Table 2.

In order to see if suicidal behaviors have a differential impact on the decisions to go to work, school, or both, we estimate a multinomial logit model. In doing this, we have separated the dichotomous indicator of being in a productive activity into its possible components. The decisions modeled in this table are 1) school, 2) work, 3) school and work together, or 4) no work and no school, which is the omitted reference category. Note that estimating a fixed effects multinomial logit model in our context may be problematic because it has been shown by Monte Carlo simulations that the fixed effects estimator produce a large finite sample bias in discrete choice models when the number of observations in each group is very small (Green 2002). In our case, there are two individuals in each twin pair by definition. Therefore, the fixed effects model in this

context will be unreliable so we rely on the expanded set of variables to help control for omitted variables.

The estimates from the multinomial logit model are presented in Table A1. The coefficients in the first two rows indicate that suicidal behaviors as measured by suicide thoughts and suicide attempts decrease the probability that an individual is engaged in work, school, or both of these activities in comparison to the omitted category of not working and not going to school. In terms of marginal effects, having suicide thoughts reduces the probability of schooling activity with no work by 1.2 percentage points, the probability of work with no schooling activity by 1.3 percentage points, and the probability of working and schooling at the same time by 1.4 percentage points. Therefore, the overall effect of suicide thoughts on productive activity is 3.9 percentage points. These results suggest that suicide thoughts are equally detrimental for the work and schooling activities. The marginal effects on the last three columns indicate that suicide attempts have a negative effect of 10 percentage points on productive activity. This 10 percentage effect is almost equally shared between work with no schooling activity (4.5 percentage points) and work with schooling activity (5.5 percentage points), with no effect on the schooling with no work activity.

Finally, there may exist some state level variables that can influence both the suicidal behavior and labor market outcomes. For example, a high unemployment rate in a state may depress labor market opportunities for individuals. At the same time, a high unemployment rate may also cause mental health problems and may in turn increase suicidal tendencies. Because of the concerns about confidentiality, state identifiers have not been made available to the researchers. Therefore, it is not possible to control for any state level characteristics from Wave 3, such as unemployment rate. However, the pseudo-identifiers for states are available, which allows for estimation of models with state fixed effects. These models would control for any type of state level unobservables that would be correlated with both the suicidal behavior and the outcome

variables. We repeated our analyses including the state fixed effects in the models. None of the implications discussed in this paper has changed as a result of this exercise. Given the negligible effects of these dummies on the coefficients of suicide variables, we present the more parsimonious models in this paper.

VI. Conclusion

This paper expand our understanding of the link between mental health and labor market outcomes by providing insights into the effects of suicidal behavior on the outcomes of productive activity of young adults. The suicidal behaviors are measured as suicide thoughts and suicide attempts, and productive activities are measured as engaging in work and/or schooling activities and the hourly wage rate. Obtaining a reliable effect of suicidal behavior on productivity outcomes can be problematic because of the presence of unobserved heterogeneity and a potential reverse causality. In this paper, we employ three strategies to eliminate these problems. First, we control for a very large set of background variables that are likely to be correlated with both suicidal behavior and our outcome measures. Second, we use the instrumental variables method to control for both unobserved heterogeneity and reverse causality. Finally, we estimate models with twin fixed effects to sweep out any unobservables that are common to both twins.

The results from all three approaches suggest that suicide thoughts and attempts have negative effects on the work and schooling decisions of young adults. Having thought about committing suicide in the past 12 months also has a negative effect on hourly wage rates. The wage effect of suicide attempts also tends to be negative, but is not statistically significant in any model. Nevertheless, all of the effects are found to be robust to different sets of control variables and various specification tests.

The results shown in this paper highlight the costs to individuals and to society resulting from suicidal behaviors, and more generally, the underlying mental illnesses they represent. The fact that all of the three strategies that we employ to tease out both the unobserved heterogeneity and reverse causality points to a negative link between the suicidal behaviors and the outcome measures makes us believe that the detrimental effects are consistent with a causal explanation. Furthermore, the small and statistically insignificant coefficients on past suicide attempts arising from models that both include and exclude current suicidal behaviors suggest that there is no long term effect of past attempts (i.e. attempts during high school) on future human capital formation. This result should be interpreted with caution, however, as teenagers who attempt suicide may receive mental health treatment that prevents future deleterious effects.

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Table 1
Definitions and Descriptive Statistics

Variable	Definition	Full Sample	Suicide thoughts=1	Suicide thoughts=0
Work-school	Dummy variable =1 if working and/or attending school, =0 otherwise	0.831	0.790***	0.834
		(0.374)	(0.407)	(0.372)
Wage	Hourly wage rate in dollars	9.471	8.936***	9.506
		(3.835)	(3.250)	(3.868)
Suicide thoughts	Dummy variable =1 if ever thought seriously about committing suicide during the past 12 months, =0 otherwise	0.060	1.000	0.000
		(0.238)	(0.000)	(0.000)
Suicide attempt	Dummy variable =1 if actually attempted suicide during the past 12 months, =0 otherwise	0.016	0.265***	0.000
		(0.125)	(0.442)	(0.000)
Suicidal friend	Dummy variable =1 if any friends tried to kill themselves, =0 otherwise	0.067	0.221***	0.057
		(0.250)	(0.415)	(0.232)
Suicidal family	Dummy variable =1 if any family members tried to kill themselves, =0 otherwise	0.029	0.094***	0.025
		(0.167)	(0.292)	(0.155)
Suicidal_w1	Dummy variable =1 if ever thought seriously about committing suicide during the past 12 months (reported at Wave 1), =0 otherwise	0.135	0.309***	0.123
		(0.341)	(0.016)	(0.329)
Suicide attempt_w1	Dummy variable =1 if actually attempted suicide during the past 12 months (reported at Wave 1), =0 otherwise	0.041	0.134***	0.036
		(0.199)	(0.341)	(0.187)
Suicidal friend_w1	Dummy variable =1 if any friends tried to kill themselves (reported at Wave 1), =0 otherwise	0.175	0.249***	0.170
		(0.380)	(0.433)	(0.376)
Suicidal family_w1	Dummy variable =1 if any family members tried to kill themselves (reported at Wave 1), =0 otherwise	0.044	0.068***	0.042
		(0.205)	(0.253)	(0.202)
Catholic	Dummy variable =1 if Catholic, =0 otherwise	0.255	0.227*	0.257
		(0.436)	(0.419)	(0.437)
Protestant	Dummy variable =1 if Protestant, =0 otherwise	0.405	0.345***	0.409
		(0.491)	(0.476)	(0.492)
No religion	Dummy variable =1 if no religion or agnostic, =0 otherwise	0.205	0.280***	0.200
		(0.403)	(0.449)	(0.400)
Other religion [a]	Dummy variable =1 if other religion, =0 otherwise	0.136	0.148	0.135
		(0.342)	(0.355)	(0.342)
Healthy	Dummy variable =1 if in good health, =0 otherwise	0.954	0.888***	0.958
		(0.210)	(0.315)	(0.200)

Any abuse	Dummy variable =1 if experienced sexual abuse, physical abuse, or neglect from parents or other adult caregivers by the start of 6th grade, =0 otherwise	0.246 (0.431)	0.426*** (0.495)	0.234 (0.424)
Foster	Dummy variable =1 if ever spent time in foster care, =0 otherwise	0.024 (0.152)	0.042*** (0.200)	0.022 (0.148)
Jailed father	Dummy variable =1 if father ever spent time in prison, =0 otherwise	0.147 (0.355)	0.236*** (0.425)	0.142 (0.349)
Cocaine_w1	Dummy variable =1 if ever used cocaine (reported at Wave 1), =0 otherwise	0.032 (0.176)	0.053*** (0.225)	0.031 (0.172)
Marijuana_w1	Dummy variable =1 if ever used marijuana(reported at Wave 1), =0 otherwise	0.278 (0.448)	0.332*** (0.471)	0.275 (0.447)
Age	Age in years	21.957 (1.776)	21.641*** (1.835)	21.977 (1.770)
Age18 [a]	Dummy variable =1 if 18 years of age, =0 otherwise	0.010 (0.099)	0.014 (0.116)	0.010 (0.097)
Age19	Dummy variable =1 if 19 years of age, =0 otherwise	0.095 (0.293)	0.139*** (0.346)	0.092 (0.289)
Age20	Dummy variable =1 if 20 years of age, =0 otherwise	0.132 (0.339)	0.157** (0.364)	0.131 (0.337)
Age21	Dummy variable =1 if 21 years of age, =0 otherwise	0.161 (0.368)	0.167 (0.373)	0.161 (0.367)
Age22	Dummy variable =1 if 22 years of age, =0 otherwise	0.189 (0.392)	0.191 (0.393)	0.189 (0.392)
Age23	Dummy variable =1 if 23 years of age, =0 otherwise	0.190 (0.393)	0.134*** (0.341)	0.194 (0.395)
Age24	Dummy variable =1 if 24 years of age, =0 otherwise	0.162 (0.369)	0.144 (0.352)	0.163 (0.370)
Age25	Dummy variable =1 if 25 years of age, =0 otherwise	0.052 (0.221)	0.052 (0.222)	0.052 (0.221)
Age26+	Dummy variable =1 if 26 years of age, =0 otherwise	0.009 (0.093)	0.003* (0.058)	0.009 (0.094)
Male	Dummy variable =1 if male, =0 otherwise	0.469 (0.499)	0.444 (0.497)	0.471 (0.499)
White	Dummy variable =1 if white, =0 otherwise	0.660 (0.474)	0.705*** (0.456)	0.657 (0.475)

Black	Dummy variable =1 if black, =0 otherwise	0.228	0.182***	0.231
		(0.420)	(0.386)	(0.422)
Other race [a]	Dummy variable =1 if other race, =0 otherwise	0.112	0.113	0.112
		(0.315)	(0.317)	(0.315)
Hispanic	Dummy variable =1 if Hispanic ethnicity, =0 otherwise	0.163	0.148	0.164
		(0.369)	(0.355)	(0.370)
U.S. born	Dummy variable =1 if born in the U.S., =0 otherwise	0.919	0.922	0.919
		(0.273)	(0.268)	(0.273)
PVT_w1A [a]	Standard Peabody test score ranking from Wave 1 in the lowest 25 percentile	0.255	0.177***	0.259
		(0.436)	(0.382)	(0.438)
PVT_w1B	Standard Peabody test score ranking from Wave 1 in the 25-50 percentile	0.256	0.257	0.256
		(0.436)	(0.437)	(0.436)
PVT_w1C	Standard Peabody test score ranking from Wave 1 in the 50-75 percentile	0.232	0.253	0.231
		(0.422)	(0.435)	(0.421)
PVT_w1D	Standard Peabody test score ranking from Wave 1 in the highest 25 percentile	0.258	0.313***	0.254
		(0.437)	(0.464)	(0.435)
Married	Dummy variable =1 if married, =0 otherwise	0.170	0.098***	0.175
		(0.376)	(0.298)	(0.380)
Mother high school- [a]	Dummy variable =1 if mother has less than a high school degree reported at Wave 1, =0 otherwise	0.159	0.138*	0.161
		(0.366)	(0.345)	(0.367)
Mother high school	Dummy variable =1 if mother has a high school degree reported at Wave 1, =0 otherwise	0.352	0.352	0.352
		(0.478)	(0.478)	(0.478)
Mother high school+	Dummy variable =1 if mother has more than a high school degree at Wave 1, =0 otherwise	0.489	0.510	0.487
		(0.500)	(0.500)	(0.500)
Non-wage	Non-wage income in the past year in dollars	1900.3	1656.2	1916.0
		(14367.1)	(7631.4)	(14693.5)
Non-wage1[a]	Dummy variable =1 if non-wage income is < 0, =0 otherwise	0.031	0.039	0.031
		(0.174)	(0.195)	(0.172)
Non-wage2	Dummy variable =1 if non-wage income is =0, =0 otherwise	0.537	0.506*	0.539
		(0.499)	(0.500)	(0.498)
Non-wage3	Dummy variable =1 if 0<non-wage income<=1000, =0 otherwise	0.157	0.160	0.157
		(0.364)	(0.367)	(0.364)
Non-wage4	Dummy variable =1 if 1000<non-wage income<=2000, =0 otherwise	0.066	0.073	0.066
		(0.249)	(0.260)	(0.248)

Non-wage5	Dummy variable =1 if 2000<non-wage income<=5000, =0 otherwise	0.098	0.107	0.97
		(0.297)	(0.310)	(0.296)
Non-wage6	Dummy variable =1 if 5000<non-wage income<=10000, =0 otherwise	0.054	0.068*	0.054
		(0.227)	(0.252)	(0.225)
Non-wage7	Dummy variable =1 if 10000<non-wage income, =0 otherwise	0.056	0.047	0.057
		(0.230)	(0.211)	(0.232)
Number of observations		14,779	887	13,892

Note: Standard deviations are in parentheses.

[a] Omitted category

*, **, and *** indicate that the mean is statistically different between the sample with suicide thoughts and those without at the 10%, 5%, and 1% levels, respectively.

Table 2
Determinants of Suicide Thoughts and Attempts

Variable	Suicide thoughts	Robust Standard Error	Suicide attempt	Robust Standard Error
Suicidal friend	0.118***	(0.012)	0.034***	(0.007)
Suicidal family	0.091***	(0.018)	0.031***	(0.011)
Suicide attempt_w1	0.107***	(0.016)	0.039***	(0.010)
Suicidal friend_w1	0.003	(0.006)	0.003	(0.003)
Suicidal family_w1	0.000	(0.011)	0.013*	(0.008)
Catholic	-0.006	(0.007)	-0.003	(0.004)
Protestant	-0.006	(0.006)	-0.005	(0.003)
No religion	0.012*	(0.007)	0.002	(0.004)
Healthy	-0.068***	(0.013)	-0.027***	(0.008)
Any abuse	0.043***	(0.006)	0.014***	(0.003)
Foster	0.009	(0.016)	0.012	(0.010)
Jailed father	0.027***	(0.007)	0.005	(0.004)
Cocaine_w1	0.007	(0.014)	0.001	(0.008)
Marijuana_w1	0.000	(0.005)	-0.001	(0.003)
Age19	-0.000	(0.023)	0.016	(0.011)
Age20	-0.018	(0.023)	0.004	(0.010)
Age21	-0.022	(0.023)	0.004	(0.010)
Age22	-0.022	(0.022)	0.002	(0.010)
Age23	-0.037*	(0.022)	-0.000	(0.010)
Age24	-0.021	(0.023)	0.000	(0.010)
Age25	-0.013	(0.024)	-0.002	(0.010)
Age26+	-0.044*	(0.026)	-0.004	(0.013)
Male	-0.002	(0.004)	-0.003	(0.002)
White	0.005	(0.007)	-0.004	(0.004)
Black	-0.005	(0.008)	-0.003	(0.005)
Hispanic	-0.001	(0.006)	-0.001	(0.003)
U.S. born	-0.015*	(0.008)	-0.003	(0.004)
Married	-0.026***	(0.005)	-0.007***	(0.002)
PVT_w1B	0.013**	(0.005)	0.004	(0.003)
PVT_w1C	0.017***	(0.006)	0.004	(0.003)
PVT_w1D	0.029***	(0.006)	0.003	(0.003)
Mother high school	0.005	(0.006)	-0.006	(0.004)
Mother high school+	0.005	(0.006)	-0.006*	(0.004)
Nonwage2	-0.013	(0.012)	-0.008	(0.008)
Nonwage3	-0.012	(0.013)	-0.006	(0.008)
Nonwage4	-0.011	(0.015)	-0.006	(0.009)
Nonwage5	-0.010	(0.014)	-0.007	(0.008)
Nonwage6	-0.003	(0.015)	-0.006	(0.009)
Nonwage7	-0.020	(0.014)	-0.012	(0.008)
Constant	0.121***	(0.030)	0.050***	(0.017)
Observations	14,779		14,779	
R-squared	0.07		0.03	

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Models also include missing dummy categories for friends' suicidal behavior, family members' suicidal behavior, abuse, foster care, jailed father, drug use, standard test scores, mother's education, and non-wage income.

Table 3A
OLS Estimates for Work-School and Wage Models for Basic Specification

Variable	Work-School	Work-School	Log(Wage)	Log(Wage)
Suicide thoughts	-0.061***		-0.030*	
	(0.014)		(0.018)	
Suicide attempt		-0.135***		-0.029
		(0.030)		(0.035)
Age19	0.004	0.006	0.057	0.057
	(0.032)	(0.033)	(0.046)	(0.046)
Age20	-0.004	-0.003	0.100**	0.100**
	(0.032)	(0.032)	(0.046)	(0.046)
Age21	-0.012	-0.010	0.176***	0.176***
	(0.032)	(0.032)	(0.046)	(0.046)
Age22	-0.015	-0.014	0.211***	0.212***
	(0.032)	(0.032)	(0.046)	(0.046)
Age23	-0.005	-0.002	0.277***	0.278***
	(0.032)	(0.032)	(0.046)	(0.046)
Age24	0.006	0.008	0.352***	0.352***
	(0.032)	(0.032)	(0.046)	(0.046)
Age25	-0.006	-0.006	0.322***	0.322***
	(0.034)	(0.034)	(0.049)	(0.049)
Age26+	-0.044	-0.041	0.234***	0.234***
	(0.048)	(0.048)	(0.058)	(0.058)
Male	0.019***	0.019***	0.100***	0.101***
	(0.006)	(0.006)	(0.009)	(0.009)
White	0.036***	0.035***	-0.106***	-0.106***
	(0.011)	(0.011)	(0.013)	(0.013)
Black	-0.027**	-0.027**	-0.129***	-0.129***
	(0.013)	(0.013)	(0.015)	(0.015)
Hispanic	0.011	0.012	0.057***	0.057***
	(0.009)	(0.009)	(0.012)	(0.012)
U.S. born	-0.081***	-0.080***	-0.004	-0.003
	(0.012)	(0.012)	(0.015)	(0.015)
Married	-0.050***	-0.049***	0.066***	0.066***
	(0.009)	(0.009)	(0.012)	(0.012)
PVT_w1B	0.079***	0.078***	0.032***	0.032***
	(0.010)	(0.010)	(0.012)	(0.012)
PVT_w1C	0.109***	0.108***	0.063***	0.062***
	(0.010)	(0.010)	(0.013)	(0.013)
PVT_w1D	0.140***	0.139***	0.036***	0.035**
	(0.010)	(0.010)	(0.014)	(0.014)
Mother high school	0.041***	0.040***	0.006	0.006
	(0.011)	(0.011)	(0.013)	(0.013)
Mother high school+	0.087***	0.086***	0.008	0.008
	(0.011)	(0.011)	(0.013)	(0.013)
Non-wage2	0.016	0.016		
	(0.019)	(0.019)		
Non-wage3	-0.004	-0.004		
	(0.020)	(0.020)		
Non-wage4	0.014	0.014		

	(0.022)	(0.022)		
Non-wage5	-0.032	-0.033		
	(0.021)	(0.021)		
Non-wage6	-0.028	-0.029		
	(0.023)	(0.023)		
Non-wage7	-0.001	-0.002		
	(0.022)	(0.022)		
Constant	0.764***	0.763***	1.956***	1.954***
	(0.039)	(0.039)	(0.048)	(0.048)
Observations	14,779	14,779	7,262	7,262
R-squared	0.06	0.06	0.11	0.11

Robust standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Models also include missing dummy categories for standard test scores, mother's education, and non-wage income.

Table 3B
OLS Estimates for Work-School and Wage Models for Expanded Specification

Variable	Work-School	Work-School	Log(Wage)	Log(Wage)
Suicide thoughts	-0.038***		-0.024	
	(0.014)		(0.018)	
Suicide attempt		-0.103***		-0.022
		(0.029)		(0.035)
Suicide attempt_w1	-0.014	-0.014	-0.023	-0.024
	(0.018)	(0.018)	(0.024)	(0.024)
Suicidal family	-0.018	-0.018	-0.033	-0.035
	(0.019)	(0.019)	(0.028)	(0.028)
Suicidal family_w1	-0.020	-0.019	0.001	0.001
	(0.016)	(0.016)	(0.022)	(0.022)
Catholic	0.005	0.005	0.051***	0.051***
	(0.010)	(0.010)	(0.016)	(0.016)
Protestant	-0.003	-0.003	0.007	0.007
	(0.009)	(0.009)	(0.014)	(0.014)
No religion	-0.037***	-0.038***	0.012	0.012
	(0.011)	(0.011)	(0.016)	(0.016)
Healthy	0.101***	0.101***	0.048**	0.049**
	(0.017)	(0.017)	(0.020)	(0.020)
Any abuse	-0.008	-0.008	0.010	0.009
	(0.008)	(0.008)	(0.011)	(0.011)
Foster	-0.097***	-0.096***	-0.029	-0.029
	(0.025)	(0.025)	(0.031)	(0.031)
Jailed father	-0.036***	-0.036***	-0.011	-0.012
	(0.010)	(0.010)	(0.013)	(0.013)
Cocaine_w1	-0.063***	-0.063***	0.011	0.010
	(0.021)	(0.021)	(0.027)	(0.027)
Marijuana_w1	-0.021***	-0.021***	0.013	0.013
	(0.008)	(0.008)	(0.011)	(0.011)
Age19	0.007	0.009	0.055	0.055
	(0.033)	(0.033)	(0.045)	(0.045)
Age20	0.000	0.001	0.096**	0.097**
	(0.032)	(0.032)	(0.045)	(0.045)
Age21	-0.004	-0.002	0.172***	0.172***
	(0.032)	(0.032)	(0.045)	(0.045)
Age22	-0.006	-0.005	0.207***	0.208***
	(0.032)	(0.032)	(0.045)	(0.045)
Age23	0.006	0.007	0.271***	0.272***
	(0.032)	(0.032)	(0.045)	(0.045)
Age24	0.016	0.017	0.345***	0.346***
	(0.032)	(0.032)	(0.045)	(0.045)
Age25	0.004	0.005	0.315***	0.315***
	(0.035)	(0.035)	(0.049)	(0.049)
Age26+	-0.031	-0.030	0.228***	0.228***
	(0.048)	(0.048)	(0.057)	(0.057)
Male	0.019***	0.019***	0.097***	0.097***
	(0.006)	(0.006)	(0.009)	(0.009)
White	0.034***	0.033***	-0.104***	-0.104***

	(0.011)	(0.011)	(0.013)	(0.013)
Black	-0.026**	-0.026**	-0.116***	-0.116***
	(0.013)	(0.013)	(0.015)	(0.015)
Hispanic	0.010	0.010	0.042***	0.042***
	(0.009)	(0.009)	(0.013)	(0.013)
U.S. born	-0.069***	-0.069***	0.001	0.001
	(0.012)	(0.012)	(0.015)	(0.015)
Married	-0.050***	-0.050***	0.069***	0.070***
	(0.009)	(0.009)	(0.012)	(0.012)
PVT_w1B	0.080***	0.080***	0.033***	0.032***
	(0.010)	(0.010)	(0.012)	(0.012)
PVT_w1C	0.108***	0.108***	0.064***	0.064***
	(0.010)	(0.010)	(0.013)	(0.013)
PVT_w1D	0.136***	0.135***	0.038***	0.037***
	(0.010)	(0.010)	(0.014)	(0.014)
Mother high school	0.037***	0.036***	0.003	0.003
	(0.011)	(0.011)	(0.013)	(0.013)
Mother high school+	0.078***	0.077***	0.006	0.006
	(0.011)	(0.011)	(0.013)	(0.013)
Non-wage2	0.012	0.012		
	(0.019)	(0.019)		
Non-wage3	-0.010	-0.010		
	(0.020)	(0.020)		
Non-wage4	0.008	0.008		
	(0.021)	(0.021)		
Non-wage5	-0.035*	-0.035*		
	(0.021)	(0.021)		
Non-wage6	-0.031	-0.031		
	(0.023)	(0.023)		
Non-wage7	-0.005	-0.005		
	(0.022)	(0.022)		
Constant	0.688***	0.688***	1.893***	1.891***
	(0.043)	(0.043)	(0.053)	(0.052)
Observations	14,779	14,779	7,262	7,262
R-squared	0.07	0.07	0.11	0.11

Robust standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Models also include missing dummy categories for family members' suicidal behavior, abuse, foster care, jailed father, drug use, standard test scores, mother's education, and non-wage income.

Table 4
TSLS Estimates for Work-School and Wage Models

Variable	Work-School	Work-School	Log(Wage)	Log(Wage)
Suicide thoughts	-0.169*		-0.193*	
	(0.101)		(0.121)	
Suicide attempt		-0.601*		-0.387
		(0.363)		(0.425)
Suicidal family	-0.001	0.001	-0.009	-0.024
	(0.023)	(0.024)	(0.032)	(0.030)
Suicide attempt_w1	-0.0001	0.005	-0.006	-0.009
	(0.021)	(0.024)	(0.027)	(0.030)
Suicidal family_w1	-0.020	-0.012	0.000	0.002
	(0.016)	(0.017)	(0.022)	(0.022)
Catholic	0.004	0.003	0.052***	0.052***
	(0.010)	(0.010)	(0.016)	(0.016)
Protestant	-0.004	-0.005	0.006	0.007
	(0.009)	(0.010)	(0.014)	(0.014)
No religion	-0.036***	-0.038***	0.013	0.014
	(0.011)	(0.011)	(0.016)	(0.016)
Healthy	0.092***	0.088***	0.035	0.037
	(0.019)	(0.021)	(0.022)	(0.025)
Any abuse	-0.002	-0.001	0.019	0.016
	(0.009)	(0.009)	(0.013)	(0.013)
Foster	-0.096***	-0.095***	-0.039	-0.030
	(0.025)	(0.025)	(0.031)	(0.031)
Jailed father	-0.032***	-0.030***	-0.005	-0.012
	(0.010)	(0.010)	(0.013)	(0.013)
Cocaine_w1	-0.062***	-0.063***	0.012	0.008
	(0.021)	(0.021)	(0.027)	(0.027)
Marijuana_w1	-0.021***	-0.022***	0.013	0.015
	(0.008)	(0.008)	(0.011)	(0.011)
Age19	0.007	0.017	0.054	0.053
	(0.033)	(0.034)	(0.046)	(0.046)
Age20	-0.002	0.003	0.092**	0.090*
	(0.033)	(0.033)	(0.046)	(0.046)
Age21	-0.007	-0.001	0.165***	0.167***
	(0.032)	(0.033)	(0.046)	(0.046)
Age22	-0.009	-0.005	0.200***	0.201***
	(0.032)	(0.033)	(0.046)	(0.046)
Age23	0.001	0.007	0.262***	0.263***
	(0.033)	(0.033)	(0.046)	(0.047)
Age24	0.013	0.016	0.339***	0.337***
	(0.033)	(0.033)	(0.046)	(0.047)
Age25	0.002	0.003	0.310***	0.307***
	(0.035)	(0.035)	(0.049)	(0.050)
Age26+	-0.037	-0.032	0.222***	0.222***
	(0.049)	(0.049)	(0.057)	(0.058)
Male	0.019***	0.017***	0.095***	0.096***
	(0.006)	(0.006)	(0.009)	(0.009)
White	0.035***	0.031***	-0.103***	-0.104***

	(0.011)	(0.011)	(0.013)	(0.013)
Black	-0.027**	-0.030**	-0.118***	-0.114***
	(0.013)	(0.013)	(0.015)	(0.016)
Hispanic	0.010	0.009	0.040***	0.042***
	(0.010)	(0.010)	(0.013)	(0.013)
U.S. born	-0.071***	-0.071***	-0.004	-0.002
	(0.012)	(0.012)	(0.015)	(0.016)
Married	-0.054***	-0.054***	0.065***	0.068***
	(0.009)	(0.009)	(0.013)	(0.012)
PVT_w1B	0.081***	0.082***	0.035***	0.035***
	(0.010)	(0.010)	(0.012)	(0.013)
PVT_w1C	0.111***	0.110***	0.066***	0.066***
	(0.010)	(0.010)	(0.013)	(0.014)
PVT_w1D	0.140***	0.137***	0.043***	0.039***
	(0.010)	(0.010)	(0.014)	(0.014)
Mother high school	0.038***	0.034***	0.004	0.001
	(0.011)	(0.011)	(0.014)	(0.014)
Mother high school+	0.079***	0.075***	0.006	0.004
	(0.011)	(0.011)	(0.013)	(0.014)
Non-wage2	0.010	0.008		
	(0.019)	(0.019)		
Non-wage3	-0.011	-0.013		
	(0.020)	(0.020)		
Non-wage4	0.006	0.005		
	(0.021)	(0.022)		
Non-wage5	-0.036*	-0.039*		
	(0.021)	(0.021)		
Non-wage6	-0.031	-0.034		
	(0.023)	(0.023)		
Non-wage7	-0.008	-0.011		
	(0.022)	(0.023)		
Constant	0.705***	0.713***	1.917***	1.913***
	(0.046)	(0.049)	(0.056)	(0.059)
F-test on instruments	25.47	6.50	25.47	6.50
(test stat. and p-value)	(0.00)	(0.00)	(0.00)	(0.00)
Hausman Test	3.82	2.98	2.87	1.97
(test stat. and p-value)	(0.051)	(0.084)	(0.090)	(0.161)
Overidentification test	1.46	1.47	1.68	1.79
(test stat. and p-value)	(0.227)	(0.227)	(0.195)	(0.181)
Observations	14,779	14,779	7,262	7,262
R-squared	0.06	0.04	0.10	0.10

Robust standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Models also include missing dummy categories for family members' suicidal behavior, abuse, foster care, jailed father, drug use, standard test scores, mother's education, and non-wage income.

Table 5
Fixed Effects Estimates from the Twin Sample

Variable	Work-School	Work-School	Log(Wage)	Log(Wage)
Suicide thoughts	-0.183**		-0.460**	
	(0.088)		(0.184)	
Suicide attempt		-0.300*		0.049
		(0.169)		(0.394)
Suicidal_w1	-0.117	-0.140	0.140	0.118
	(0.147)	(0.148)	(0.168)	(0.171)
Any abuse	0.030	0.028	0.241*	0.228*
	(0.053)	(0.053)	(0.132)	(0.134)
Cocaine_w1	-0.124	-0.124	0.003	-0.065
	(0.156)	(0.157)	(0.242)	(0.243)
Marijuana_w1	-0.013	-0.019	-0.128	-0.086
	(0.067)	(0.067)	(0.144)	(0.147)
Male	0.007	0.001	0.152	0.185
	(0.058)	(0.057)	(0.149)	(0.150)
Healthy	0.324**	0.280**	-0.218	-0.218
	(0.128)	(0.131)	(0.531)	(0.535)
Married	-0.140**	-0.125*	0.235	0.256
	(0.066)	(0.066)	(0.154)	(0.156)
PVT_w1B	0.027	0.025	0.059	0.076
	(0.066)	(0.065)	(0.160)	(0.157)
PVT_w1C	0.052	0.046	-0.084	-0.010
	(0.076)	(0.076)	(0.168)	(0.166)
PVT_w1D	0.061	0.061	0.014	0.068
	(0.090)	(0.090)	(0.205)	(0.205)
Non-wage2	0.131	0.066		
	(0.114)	(0.113)		
Non-wage3	0.081	0.033		
	(0.123)	(0.121)		
Non-wage4	0.178	0.124		
	(0.145)	(0.144)		
Non-wage5	0.070	0.014		
	(0.128)	(0.127)		
Non-wage6	0.186	0.091		
	(0.145)	(0.140)		
Non-wage7	0.185	0.117		
	(0.150)	(0.146)		
Constant	0.075***	0.067**	-0.017	-0.032
	(0.028)	(0.028)	(0.063)	(0.063)
Number of Twin Pairs	318	326	154	158
R-squared	0.06	0.05	0.10	0.06

Robust standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A1
Multinomial Logit Coefficients for the Work-School Model [a]

Variable	School, No Work	No School, Work	School Work	School, No Work	No School, Work	School, Work
Suicide thoughts	-0.337**	-0.257**	-0.306***			
	(0.135)	(0.101)	(0.116)			
Suicide attempt				-0.504**	-0.605***	-0.790***
				(0.229)	(0.172)	(0.209)
Suicidal family	-0.130	-0.062	-0.181	-0.150	-0.069	-0.190
	(0.192)	(0.135)	(0.164)	(0.191)	(0.133)	(0.163)
Suicide attempt_w1	-0.101	-0.010	-0.273*	-0.113	-0.011	-0.271*
	(0.177)	(0.120)	(0.148)	(0.176)	(0.120)	(0.148)
Suicidal family_w1	-0.191	-0.096	-0.162	-0.182	-0.085	-0.149
	(0.162)	(0.110)	(0.133)	(0.162)	(0.110)	(0.133)
Catholic	-0.033	0.037	0.139	-0.033	0.038	0.139
	(0.112)	(0.088)	(0.099)	(0.112)	(0.088)	(0.099)
Protestant	-0.034	-0.009	-0.044	-0.035	-0.011	-0.047
	(0.099)	(0.079)	(0.088)	(0.099)	(0.079)	(0.088)
No religion	-0.494***	-0.165*	-0.417***	-0.499***	-0.167*	-0.420***
	(0.112)	(0.086)	(0.098)	(0.112)	(0.086)	(0.098)
Healthy	0.583***	0.480***	0.833***	0.592***	0.482***	0.833***
	(0.151)	(0.098)	(0.131)	(0.151)	(0.098)	(0.130)
Any abuse	-0.217***	-0.015	-0.102	-0.223***	-0.016	-0.102
	(0.082)	(0.059)	(0.069)	(0.081)	(0.059)	(0.069)
Foster	-0.739***	-0.450***	-0.679***	-0.736***	-0.446***	-0.672***
	(0.235)	(0.136)	(0.187)	(0.235)	(0.136)	(0.187)
Jailed father	-0.502***	-0.141**	-0.333***	-0.509***	-0.145**	-0.338***
	(0.101)	(0.067)	(0.081)	(0.101)	(0.067)	(0.081)
Cocaine_w1	-0.915***	-0.362***	-0.299*	-0.919***	-0.363***	-0.302*
	(0.263)	(0.124)	(0.164)	(0.263)	(0.124)	(0.164)
Marijuana_w1	-0.400***	-0.039	-0.355***	-0.402***	-0.041	-0.356***
	(0.084)	(0.058)	(0.070)	(0.083)	(0.058)	(0.070)
Age19	-0.208	0.450	-0.003	-0.197	0.462	0.013
	(0.285)	(0.305)	(0.274)	(0.285)	(0.306)	(0.275)
Age20	-0.478*	0.678**	-0.146	-0.469*	0.685**	-0.136
	(0.282)	(0.299)	(0.270)	(0.282)	(0.301)	(0.271)
Age21	-0.639**	0.744**	-0.213	-0.627**	0.753**	-0.200
	(0.281)	(0.298)	(0.269)	(0.281)	(0.299)	(0.270)
Age22	-1.134***	0.968***	-0.443*	-1.126***	0.974***	-0.434
	(0.282)	(0.297)	(0.269)	(0.282)	(0.298)	(0.270)
Age23	-1.382***	1.166***	-0.522*	-1.368***	1.174***	-0.510*
	(0.285)	(0.297)	(0.270)	(0.285)	(0.298)	(0.271)
Age24	-1.483***	1.319***	-0.693**	-1.475***	1.325***	-0.685**
	(0.290)	(0.298)	(0.274)	(0.289)	(0.299)	(0.275)
Age25	-1.493***	1.205***	-0.820***	-1.488***	1.207***	-0.817***
	(0.327)	(0.308)	(0.296)	(0.327)	(0.309)	(0.297)
Age26+	-1.526***	0.995***	-1.038**	-1.511***	1.004***	-1.025**
	(0.496)	(0.357)	(0.412)	(0.496)	(0.358)	(0.413)
Male	-0.082	0.316***	-0.150***	-0.083	0.315***	-0.153***

	(0.065)	(0.049)	(0.057)	(0.065)	(0.049)	(0.057)
White	-0.225**	0.353***	0.282***	-0.229**	0.349***	0.277***
	(0.108)	(0.085)	(0.098)	(0.108)	(0.085)	(0.098)
Black	-0.251**	-0.207**	0.013	-0.249**	-0.207**	0.013
	(0.120)	(0.095)	(0.110)	(0.120)	(0.095)	(0.110)
Hispanic	-0.097	-0.031	0.290***	-0.098	-0.032	0.289***
	(0.109)	(0.075)	(0.086)	(0.109)	(0.075)	(0.086)
U.S. born	-0.644***	-0.281***	-0.967***	-0.644***	-0.282***	-0.967***
	(0.139)	(0.106)	(0.118)	(0.139)	(0.106)	(0.118)
Married	-0.844***	-0.143**	-0.887***	-0.839***	-0.141**	-0.885***
	(0.104)	(0.062)	(0.083)	(0.104)	(0.062)	(0.083)
PVT_w1B	0.428***	0.436***	0.581***	0.425***	0.436***	0.580***
	(0.095)	(0.066)	(0.081)	(0.095)	(0.066)	(0.081)
PVT_w1C	0.803***	0.538***	1.075***	0.800***	0.537***	1.074***
	(0.102)	(0.075)	(0.088)	(0.102)	(0.075)	(0.088)
PVT_w1D	1.386***	0.728***	1.496***	1.377***	0.721***	1.488***
	(0.105)	(0.082)	(0.093)	(0.105)	(0.082)	(0.093)
Mother high school	0.470***	0.150**	0.354***	0.466***	0.144**	0.348***
	(0.118)	(0.074)	(0.090)	(0.118)	(0.074)	(0.090)
Mother high school+	1.254***	0.264***	0.875***	1.250***	0.259***	0.868***
	(0.115)	(0.076)	(0.090)	(0.115)	(0.076)	(0.090)
Non-wage2	0.001	0.140	-0.023	0.000	0.138	-0.027
	(0.198)	(0.141)	(0.164)	(0.198)	(0.142)	(0.165)
Non-wage3	0.139	-0.197	0.041	0.140	-0.198	0.040
	(0.208)	(0.152)	(0.174)	(0.208)	(0.153)	(0.174)
Non-wage4	0.471**	-0.132	0.199	0.472**	-0.134	0.197
	(0.229)	(0.174)	(0.195)	(0.229)	(0.174)	(0.195)
Non-wage5	0.172	-0.379**	-0.248	0.172	-0.381**	-0.251
	(0.213)	(0.158)	(0.181)	(0.213)	(0.158)	(0.182)
Non-wage6	0.295	-0.415**	-0.164	0.292	-0.421**	-0.169
	(0.230)	(0.172)	(0.196)	(0.230)	(0.173)	(0.196)
nonwage7	0.469**	-0.163	-0.080	0.469**	-0.167	-0.085
	(0.232)	(0.176)	(0.201)	(0.232)	(0.176)	(0.201)
Constant	0.115	-0.753**	-0.018	0.101	-0.751**	-0.015
	(0.405)	(0.361)	(0.364)	(0.404)	(0.362)	
Log-Likelihood	-16895.8			-16891.8		
Number of observations	14,770			14,770		

[a] Omitted category in the multinomial logit model is No-school/No-work.
Robust standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.