Postponing the Family? The Relationship between Student Debt and Lifecycle Transitions

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Abstract

This paper uses the Survey of Consumer Finances and an estimation strategy developed by Gicheva (2012) to estimate the relationships between student loans and lifecycle transitions. I use probit models and an instrumental variables strategy to address concerns about endogenous student loan amounts. First, I replicate the primary results of Gicheva (2012) using an updated data set, and find that student loans decrease the probability that both men and women have ever been married. Then, I show that student debt is correlated with a lower probability of having had a child by a particular age for both men and women. When an instrument is used, however, this relationship does not hold; in fact, student loans increase fertility at younger ages. I discuss possible channels for this effect.

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as age, race, and education level. I also employ an instrumental variables strategy that uses the availability of federal student loans as a source of exogenous variation in loan amounts for the respondents in my sample.

Like Gicheva (2012), I find that increases in student loan amounts reduce the probability of ever marrying. My results for men indicate that an additional $10,000 in student loans reduces the probability of marriage by 7.4 percentage points. For women, I find that an additional $10,000 in student loans reduces this probability by 9.3 percentage points. I then turn to estimates of the effect of student loan debt on fertility timing. Using the probit model, I find that student loans are correlated with increasingly negative probabilities of fertility as an individual ages, for both men and women; these results are robust to controlling for whether or not the individual has ever been married. Using the probit model with an instrumental variable, however, nullifies this relationship; I find that student loans cause a statistically significant increase in fertility by ages 25 and 30 for both men and women. When I add a control for whether or not the individual has ever been married, the coefficients increase in magnitude. These results, along with possible explanations, will be discussed in Sections V and VI.

II. Background

a. Student Debt and Family Formation Statistics

The most recent student loan statistics reveal the extent to which American students rely on this form of debt to finance their post-secondary education. Indeed, the total volume of student loans disbursed doubled from $55.7 billion in 2001-02 to $113.4 billion in 2011-12, while the total funds borrowed (including federal and private loans)

The solid lines in Figures 1 and 2, representing the average federal loan per FTE student, have been fundamentally influenced by the piece of legislation that made the current volume of federal loans possible – Lyndon Johnson's Higher Education Act of 1965.[8,9] Title IV of this bill, the Student Assistance Act, stands as the first program to make aid generally available to postsecondary students. It was this legislation that created the modern subsidized federal loan, and removed many of the financial barriers that prevented students from obtaining a college education. Since its initial authorization in 1965, this act has undergone a series of reauthorizations that have expanded the role of the Federal Government in increasing educational accessibility. While a thorough investigation of the terms of all eight reauthorizations is beyond the scope of this paper, the most important, in terms of expanding the amount of aid available to students, occurred in 1976, 1992, and 2008. The immediate impacts that these changes had on the average amount of aid are visible within Figures 1 and 2, in the forms of the increases that take place after each. These acts, created and passed independently of the students they affected, provide the exogenous variation for the instrumental variables strategy that I describe in Section IV.

c. Related Research

A growing body of economic literature has examined the financial conditions that must be in place before individuals initiate lifecycle transitions; many of these studies have focused on how assets or income can be used to predict the probability of marriage or divorce. Ahn and Mira (2001) stands as an early example of such work, and uses data from Spain to show that unemployment can lead to marriage delays. Gibson-Davis

[8] All information for the HEA taken from http://www.finaid.org/educators/reauthorization.phtml and http://www.tgslc.org/pdf/hea_history.pdf.
[9] See Section 3.1 of Gicheva (2012) for additional information on the HEA.

set of data modifications. I then apply this estimation strategy to an evaluation of fertility timing that uses the same data set. This is the first study of the causal effect of student loans on fertility.

III. Data

A. Sample and Key Variables

The data set used in this paper is taken from the Survey of Consumer Finances (SCF), a triennial, cross-sectional survey sponsored by the Board of Governors of the Federal Reserve, in cooperation with the Department of the Treasury. This nationally representative survey is valuable to this study because it contains the respondents' demographic information and detailed information about their six most recent student loans; this data includes loan amount and the year in which each was taken out.

First, I use the methods in Gicheva (2012) to construct a data set that will allow me to closely replicate the marriage results in that paper. The data from the 5 survey waves conducted between 1995 and 2007 are combined to form a pooled cross-section.[11] I drop all individuals born prior to 1954; this ensures that all respondents reach 17 years of age by 1971, the first year for which I have national student loan information. Each SCF data set contains 5 imputations for each respondent in order to account for any missing points; I use the first of these imputations in my analysis. SCF administrators can classify survey takers as either "heads of households" or simply as "respondents." I use survey respondents for two reasons: first, gender is more equally distributed amongst those receiving "respondent" classification than it is amongst those designated "head of

[11] Beginning in 1995, survey information was collected using computer-assisted personal interviewing that brought the available data into its present form.

respondents, are reported.[14] Furthermore, I calculate the age at first birth as the difference between the age of the oldest child and the age of the respondent. For privacy purposes, the 2004-10 sets of the SCF group the ages of children into ranges rather than report the actual ages. In all years of the data, the average age at first birth hovers around 26 regardless of which surveys are evaluated.[15]

My primary independent variable is continuous and aggregates the initial amounts borrowed for up to six loans; I convert these loans to 2010 dollars, based on the year in which each was taken out.[16] Data for my instrument comes from the 2012 installment of a College Board annual report: "Trends in Student Aid."

B. Summary Statistics

Summary statistics are presented in Table 1. My final sample consists of 12,254 individuals, of which 6,007 (49.02%) are male, and 6,247 (50.98%) are female. My sample is 74% white, 13% black, 8% Hispanic, and 5% of another race. Of those who have no student debt, 76.65% report having ever been married; this number falls to 56.45% amongst those with loans. The percentage of the sample that reports having had a child by any particular age is typically higher amongst those without student debt, with the exception of the "Child by 25" category. In general, the percentage of the population with any type of college degree is higher amongst those with student loans. 888 males (7.25% of the entire sample) have at least some student loan debt, while 1,165 females (10.35%) fit this same description. Of those who have student loans, the mean amount

[14] For example, if the respondent has no children, but marries someone with two children, he will appear as having two children.
[15] This is higher than the average age at first birth reported in the CDC's National Vital Statistics Reports (~24) because I have omitted high school dropouts. Mean age at first birth calculated using data from Vol. 51 No. 1 and Vol. 61 No. 1 of the National Vital Statistics Reports.
[16] All monetary values adjusted for inflation using the Bureau of Labor Statistics' CPI for all Urban Consumers.

(or vice versa), results are likely to be biased. There may also be unobserved characteristics that affect both the initial value of student loans borrowed, and marriage or fertility decisions (such as family background characteristics). To account for these issues, I employ an instrumental variables strategy. This instrument appears in the first stage of my IV estimation, in the following model:

$$L_i = Z_i\boldsymbol{\pi} + X_i\Pi + v_i \quad (2)$$

where Z_i represents the instrument and v_i represents the error term. I use the average federal student loan amount as an instrument to predict the loan size (L_i) of individuals within the SCF. This average closely follows changes in the maximum federal loan amount brought about by the various reauthorizations of the Higher Education Act. Furthermore, Figure 2 shows that this average is correlated with the size of an individual's student loans - first stage results confirming this relationship are reported for all IV results within the tables. This average should be exogenous to the error term of the model in Equation (1), because the students who take out federal loans have no role in developing the public policy that influences them. Therefore, the average loan amount can be used as an instrument to obtain consistent estimates of the effect of student loan amounts on marriage and fertility.

V. Results

In Table 2a, I present three two-column groups of results, exclusively for men. The first group (Columns 1 and 2) holds results taken directly from Table 2 of Gicheva (2012), which I include for comparison purposes. The second group (Columns 3 and 4) represents my closest attempt at replicating the results seen within the first group,

2. My final IV results (of Column 6) imply that $10,000 in loans causes a 9.3 percentage point decrease in the probability of having ever been married, for women.

Table 3a presents the fertility results that I find, exclusively for men. The first panel of the table holds the probit results from my estimation, while the second holds IV probit results. Each column represents a model that starts with the dependent variable "Child by X," beginning with "Child by 25" and moving rightwards as age increases, to conclude with "Child by 40." The probit results show that, when controls for education, race, and age are put in place, student loans are negatively correlated with the probability of having had a child by a particular age. The negative correlation is increasingly significant, and increasingly large in magnitude.[19] The IV probit results, however, follow a different pattern. The primary independent variable takes on positive and significant coefficients in the first two columns, while these coefficients lose their significance in the final two. The coefficients on each of the other independent variables included in the table hold the same sign in each panel.

Table 3b follows the same format, but for women. Again, the coefficient on the student loan variable becomes increasingly negative as one moves across the probit results. The only significant coefficient, however, is that of the "Child by 35" model. The IV probit results follow a similar pattern as that seen for men, with positive and significant effects on the probability of having a child by age 25 or 30.
This significant relationship disappears when the probability of having a child by age 35 or 40 is examined.

[19] The largest such coefficient, that of "Child by 40," indicates that an additional $10,000 in loans is correlated with a 2.4 percentage point decrease in the probability of having had a child by age 40.

instrumental variables strategy employed, the results suggest that there is a negative and causal relationship between student loans and that same probability. In other words, an exogenous increase in student loan amounts results in a lower likelihood of having ever been married. There are a number of possible interpretations of these results. The first reflects the marital desirability of someone with debt. When making the decision to marry, an individual must evaluate many aspects of the potential partner, one of which is financial maturity. Considering that the finances of the two engaged parties merge after the marriage takes place, the presence of debt attached to one of those involved may make him or her a less attractive partner. This conjecture seems validated by the coefficients on the other variables within the second, fourth, and sixth columns. For men, all completed degrees are positively and significantly correlated with the probability of having ever been married. Unsurprisingly, the magnitudes of these coefficients rise as the degree becomes more difficult to attain, and the potential career earnings associated with each increase. This is also seen within the female sample, as completing some college (but not a degree) is negatively correlated with marriage probability, while master's and doctorate degrees are positively correlated with marriage and statistically significant. Furthermore, given the traditional role of men as the primary income earners within a household, it is unsurprising that women holding debt are less likely to have ever been married than men.

A second interpretation of the results involves marriage as a means of funding education. The institution of marriage brings a variety of financial benefits, such as the ability to split costs like mortgage payments, utility bills, and food. Some individuals may turn to marriage as a way to help bear the burden of these costs, and save money for

find themselves in the position to bear the expenses that come with having a child. This could also explain why the coefficient is only significant at younger ages. Once someone has passed the age of 30, he would be further removed from the traditional college years (of 18-22) and possibly in a better position to take on child-related expenses. The negative and significant signs on the education variables in the second panel of each table support this idea by indicating that those who spend a large part of their lives accumulating human capital in the form of education are less likely to have had children by ages 25 or 30.

The contents of Tables 4a and 4b show that the probit results remain unaffected by the presence of a control for whether or not the individual has ever been married. For both men and women, student debt is still negatively correlated with the probability of fertility by most ages. Additionally and perhaps unsurprisingly, the coefficient on the "Ever Married" variable is positive and significant in every model. The IV probit results are slightly different from those seen in Tables 3a and 3b. The magnitude of each primary variable coefficient increases with the inclusion of the "Ever Married" control. Also, the significance of the coefficient on student loans extends to include the "Child by 35" column for both men and women. Taken together, these could indicate that student loans provide some students with the financial stability needed to support a child.

VII. Conclusion

The overall volume of student loan debt has increased substantially in recent years. Indeed, in 2012, the total amount of student loans outstanding surpassed $1 trillion for the first time, a figure that has brought attention to the way in which student debt could

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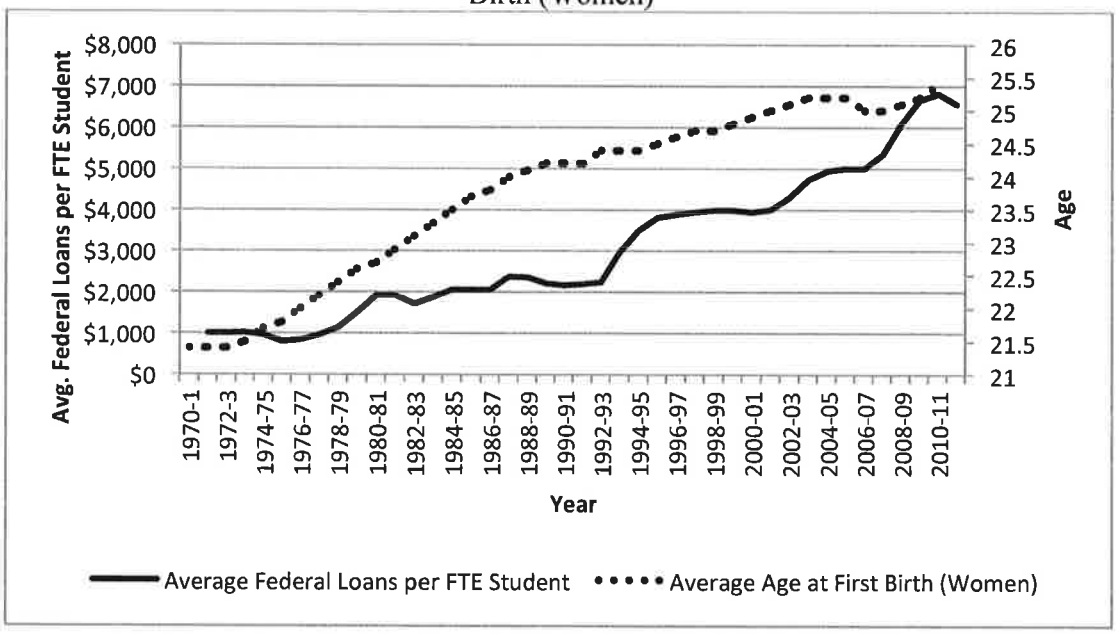
Figures and Tables

Figure 1: Average Federal Loans per Full-Time Equivalent Student, Average Age at First Birth (Women)



Sources: Federal loan information taken from College Board's "Trends in Student Aid" annual report for 2012. Data can be downloaded via the following link (Figure 3): http://trends.collegeboard.org/student-aid/figures-tables/total-aid#Total Aid per Full-Time Equivalent Student
Birth Information taken from the CDC's National Vital Statistics Reports Vol. 51 No.1 and Vol. 61 No. 1.
http://www.cdc.gov/nchs/data/nvsr/nvsr51/nvsr51_01.pdf
http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_01_tables.pdf#I01
All monetary figures presented in 2010 dollars.

Table 1: SCF Summary Statistics (SCF Waves 1995-2010)

	Student Loan=0 Male	Student Loan>0 Male	Student Loan=0 Female	Student Loan>0 Female
White	0.7777	0.7691	0.7338	0.6730
Black	0.0858	0.1194	0.1446	0.2232
Hispanic	0.0764	0.0698	0.0811	0.0755
Age (Mean)	39.73	31.14	38.22	30.94
Ever Been Married	0.7585	0.5811	0.7745	0.5519
Child by 25	0.1610	0.1847	0.3501	0.3785
Child by 30	0.3340	0.2984	0.5397	0.4807
Child by 35	0.4681	0.3660	0.6279	0.5245
Child by 40	0.5212	0.3795	0.6566	0.5322
Completed some College	0.2282	0.2973	0.2745	0.3725
Bachelor's Degree	0.2629	0.3514	0.2155	0.3064
Master's Degree	0.1219	0.1081	0.0760	0.1202
Doctorate (Ph.D., J.D. M.D.)	0.0797	0.0935	0.0264	0.0283
Amount Borrowed/1000		35.45 (41.00)		29.37 (41.00)
N	5119	888	5082	1165
Survey Year				
1995	0.0938	0.1232	0.1216	0.1185
1998	0.1207	0.1366	0.1318	0.1262
2001	0.1451	0.1629	0.1239	0.1296
2004	0.1649	0.1623	0.1419	0.1339
2007	0.177	0.1673	0.1486	0.1579
2010	0.2985	0.2477	0.3322	0.3339

Standard Deviations in Parentheses

Table 2b: SCF Marriage Estimation Results, Women

Variables	Gicheva (2012)	Gicheva (2012)	Replication 1	Replication 1	Replication 2	Replication 2
Amount Borrowed/1000	-0.0004	-0.0142	-0.0004	-0.0148	-0.0003	-0.0093
	-0.0003	(0.0022)**	(0.0003)	(0.0024)***	(0.0002)	(0.0018)***
Some College					-0.0543	-0.0338
					(0.0143)***	(0.0127)***
Bachelor's Degree	-0.0376	0.0518	-0.0379	0.0582	-0.0657	0.0143
	(0.0133)**	(0.0225)**	(0.0139)***	(0.0226)***	(0.0154)***	(0.0215)
Master's Degree	-0.0449	0.1167	-0.0447	0.1291	-0.0651	0.0818
	(0.0189)**	(0.0403)**	(0.0200)**	(0.0420)***	(0.0201)***	(0.0397)**
Doctorate (J.D., M.D., Ph.D.)	-0.0217	0.1374	-0.0242	0.1390	-0.0540	0.1107
	(0.0310)	(0.0424)**	(0.0301)	(0.0350)***	(0.0307)*	(0.04681)**
First Stage		0.0019		0.0022		0.0042
		(0.0003)**		(0.0004)***		(0.0006)***
F-Statistic		47.69		34.98		49.32
N	5,555	5,555	5,466	5,466	6,247	6,247

* $p<0.1$; ** $p<0.05$; *** $p<0.01$. Dependent variable is the probability of having ever been married. All coefficients are marginal effects. All regressions also include a cubic polynomial in age and controls for race (White, Black, Hispanic). Standard errors clustered by year of birth. First stage estimated by linear regression. Result Columns 1 and 2 taken from Table 2 of Gicheva (2012). Columns 3 and 4 represent my closest attempts at replicating Table 2 of Gicheva (2012). Columns 5 and 6 present results from my extension of Table 2 (Gicheva (2012)).

Table 3b: SCF Fertility Estimation Results, Women

Probit	Child by 25	Child by 30	Child by 35	Child by 40
Amount Borrowed/1000	0.0001	-0.0003	-0.0008	-0.0014
	(0.0003)	(0.0004)	(0.0005)*	(0.0010)
Some College	-0.0516	-0.0261	-0.0134	0.0265
	(0.0127)***	(0.0193)	(0.0190)	(0.0184)
Bachelor's Degree	-0.2715	-0.1497	-0.0239	0.0213
	(0.0148)***	(0.0184)***	(0.0229)	(0.0282)
Master's Degree	-0.3156	-0.2129	-0.0113	0.0955
	(0.0286)***	(0.0332)***	(0.0317)	(0.0305)***
Doctorate (J.D., M.D., Ph.D.)	-0.4576	-0.2378	-0.0692	0.1542
	(0.0486)***	(0.0315)***	(0.0328)**	(0.0420)***
N	5,530	4,566	3,476	2,254
IV Probit	**Child by 25**	**Child by 30**	**Child by 35**	**Child by 40**
Amount Borrowed/1000	0.0082	0.0074	0.0022	-0.0020
	(0.0018)***	(0.0023)***	(0.0048)	(0.0097)
Some College	-0.0505	-0.0264	-0.0132	0.0266
	(0.0124)***	(0.0181)	(0.0193)	(0.0186)
Bachelor's Degree	-0.2869	-0.1732	-0.0338	0.0227
	(0.0175)***	(0.0183)***	(0.0284)	(0.0366)
Master's Degree	-0.3894	-0.2812	-0.0376	0.0986
	(0.0320)***	(0.0369)***	(0.0528)	(0.0518)*
Doctorate (J.D., M.D., Ph.D.)	-0.5239	-0.3215	-0.0886	0.1566
	(0.0570)***	(0.0431)***	(0.0436)**	(0.0559)***
First Stage	0.0051	0.0053	0.0035	0.0030)
	(0.0007)***	(0.0007)***	(.00063)***	(0.0004)***
F-Statistic	49.94	54.92	31.06	74.28
N	5,530	4,566	3,476	2,254

* $p<0.1$; ** $p<0.05$; *** $p<0.01$. Dependent variable is the probability of having a child by a particular age (25, 30, 35, or 40). Primary independent variable is the amount of student loans taken out. All coefficients are marginal effects. All regressions also include a cubic polynomial in age and controls for race (White, Black, Hispanic). Standard errors clustered by year of birth. Sample limited to individuals who are at least as old as the age specified by the dependent variable.

Table 4b: SCF Fertility Estimation Results, Women

Probit	Child by 25	Child by 30	Child by 35	Child by 40
Amount Borrowed/1000	0.0002	-0.0002	-0.0007	-0.0015
	(0.0002)	(0.0004)	(0.0004)*	(0.0008)*
Some College	-0.0417	-0.0116	0.0015	0.0431
	(0.0127)***	(0.0186)	(0.0179)	(0.0157)***
Bachelor's Degree	-0.2622	-0.1404	-0.0153	0.0378
	(0.0143)***	(0.0178)***	(0.0240)	(0.0278)
Master's Degree	-0.3074	-0.2032	-0.0012	0.1141
	(0.0288)***	(0.0327)***	(0.0303)	(0.0299)***
Doctorate (J.D., M.D., Ph.D.)	-0.4465	-0.2270	-0.0673	0.1696
	(0.0474)***	(0.0319)***	(0.0289)**	(0.0327)***
Ever Married	0.1942	0.3131	0.3701	0.4052
	(0.0121)***	(0.0170)***	(0.0204)***	(0.0248)***
N	5530	4566	3476	2254
IV Probit	Child by 25	Child by 30	Child by 35	Child by 40
Amount Borrowed/1000	0.0095	0.0097	0.0071	0.0087
	(0.0017)***	(0.0019)***	(0.0039)*	(0.0067)
Some College	-0.0401	-0.0132	0.0019	0.0394
	(0.0120)***	(0.0167)	(0.0182)	(0.0160)**
Bachelor's Degree	-0.2738	-0.1665	-0.0402	0.0124
	(0.0190)***	(0.0184)***	(0.0253)	(0.0318)
Master's Degree	-0.3854	-0.2845	-0.0688	0.0572
	(0.0337)***	(0.0353)***	(0.0467)	(0.0415)
Doctorate (J.D., M.D., Ph.D.)	-0.5118	-0.3265	-0.1146	0.1208
	(0.0576)***	(0.0466)***	(0.0345)***	(0.0571)**
Ever Married	0.1692	0.2688	0.3518	0.3834
	(0.0157)***	(0.0228)***	(0.0321)***	(0.0384)***
First Stage	0.0051	0.0053	0.0035	0.0031
	(0.0007)***	(0.0007)***	(.0006)***	(0.0003)***
F-Statistic	48.39	54.03	30.73	79.24
N	5530	4566	3476	2254

* $p<0.1$; ** $p<0.05$; *** $p<0.01$. Dependent variable is the probability of having a child by a particular age (25, 30, 35, or 40). Primary independent variable is the amount of student loans taken out. All coefficients are marginal effects. All regressions also include a cubic polynomial in age and controls for race (White, Black, Hispanic). Standard errors clustered by year of birth. Sample limited to individuals who are at least as old as the age specified by the dependent variable.