# The Self-Perpetuating Student Loan Debt Crisis

David Jinkins*

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**Abstract**

Student loan debt has grown quickly over the last decade to become the largest category of non-housing debt among American households. Several prominent politicians have advocated cancelling all student loan debt. In this paper I argue that the possibility of debt cancellation has made borrowers hesitant to pay back their debt, further exacerbating the crisis and leading to more political support for debt cancellation. In a simple calibration targeting the growth of student loan debt from 2003-2018, I find that the probability of student loan debt cancellation is 28.5%.
*Keywords:* Student loan debt; Debt forgiveness; Debt cancellation; American politics

American student loan debt has become the largest category of non-mortgage debt among American households in the last decade and a half. Figure 1 shows that outstanding student loan debt has risen from 240 billion USD in 2003 to 1.49 trillion USD in 2019 (New York Fed, 2019b). This represents an increase in share from 12% to 37% of all non-housing related American debt. Moreover, as can be seen in Figure 2, mean debt per borrower has also markedly increased.[1] Women and minorities are more likely to have student loan debt, and conditional on having debt have more of it (Atkinson, 2010; Houle and Addo, 2018).

Political proposals to cancel some or all outstanding student debt have increased over the last decade. The first nationally prominent politician to propose canceling student loan debt was Green Party candidate Jill Stein in the 2016 presidential election (Stein, 2016). In this year's US Democratic primary for the presidential election, three of the front running candidates–Harris, Sanders, and Warren–campaigned on student loan debt cancellation (Market Watch, 2019). There is a non-trivial chance that there will be some form of student loan debt cancellation in the near future.

In this paper, I argue that the presence of student loan debt cancellation as a political topic has made the student loan debt crisis worse. Borrowers with outstanding debt are hesitant to repay it when there is a chance that the debt will be canceled. The less borrowers repay, the more outstanding debt there is, and the more likely some sort of debt cancellation policy is taken up by a politician. I call this spiral the self-perpetuating student loan crisis. Some preliminary evidence for this hypothesis can be seen in Figure 3 (New York Fed,

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[1] Calculations are the author's, based on data from the New York Fed (New York Fed, 2019b,a).

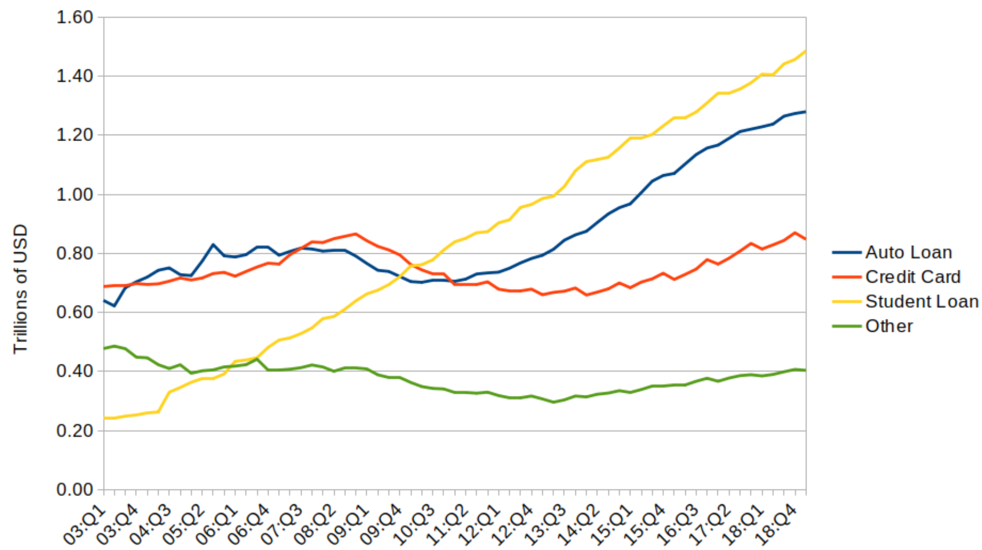


Figure 1: Total American Non-Housing Household Debt by Category

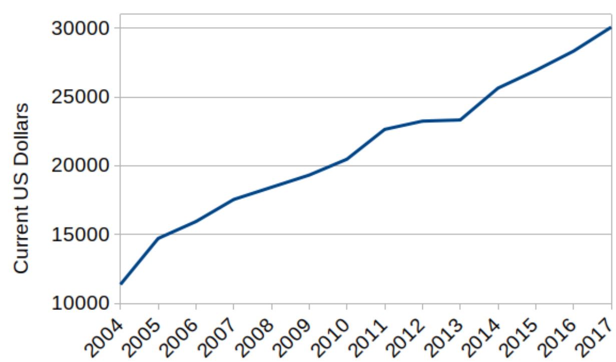


Figure 2: Student Loan Debt Per Borrower, US Dollars

2019b). Delinquency in student loan debt has been the highest among all non-mortgage debt categories since 2013. This statistic is consistent with the expectation among the holders of student loan debt that debt cancellation legislation may be passed in the future.[2]

In the rest of this short paper, I develop a simple economic model to explore this mechanism. In a rough calibration, I find that growth of debt levels from the early 2003 to 2018 is consistent with a current 28.5% probability of student loan debt being canceled. This paper contributes to a large literature on student loan policy and student loan debt. Among other topics, there has been work on the interplay between subsidized student loans and rising

[2]There is a surge in student loan debt delinquency in 2012. In a personal conversation, someone working at a Federal Reserve told me that this is a statistical artifact having to do with the NY Fed changing the way it treated debt from for-profit universities. I cannot, however, find any other sources supporting this claim. A blog post from the St Louis Fed in 2013 simply notes that student loan delinquencies were surging, without mentioning anything about statistical artifacts (Dai, 2013). Either way, the correlation which my argument relies on is between the level of delinquency on student loan debt and political proposals for debt cancellation.

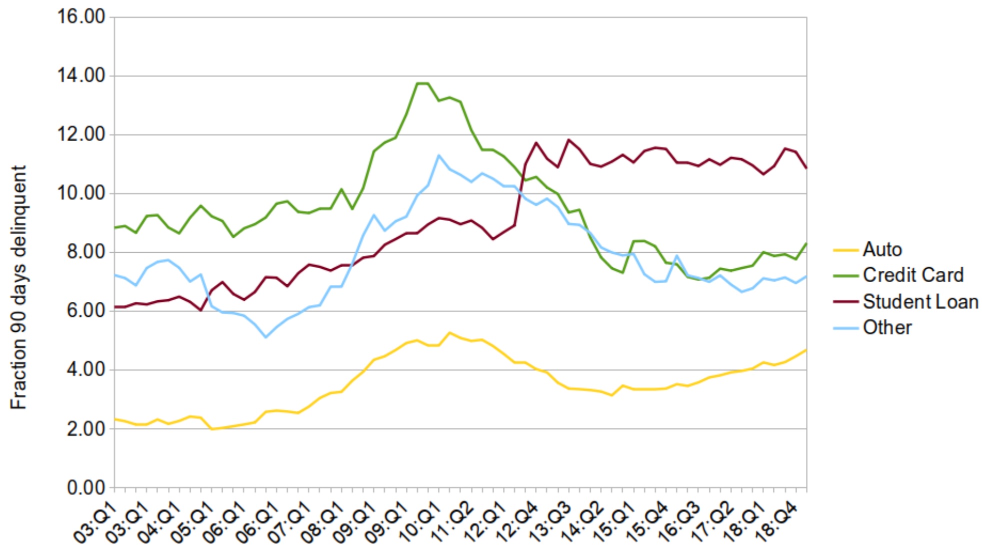


Figure 3: American 90+ Day Delinquency by Debt Category

cost of education (Howard, 2010), on the implications of the non-dischargability of student loan debt in bankruptcy (Roots, 1999; Austin, 2013), on student loan debt and individual outcomes (Minicozzi, 2005; Rothstein and Rouse, 2011; Gicheva, 2016), and on student loans as risky lotteries (Avery and Turner, 2012). This paper adds to this literature by analyzing some political and economic ramifications of proposals for student loan debt forgiveness.

# 1 Model

In this section I write down a partial equilibrium model of student loans. People live for three periods, and there are overlapping generations. There is no population growth, so the size of each generation is the same. There is a constant exogenous interest rate $r$. The lifetime utility of a person is:

$$U(C) = \ln(c_1^i) + \beta \ln(c_2^i) + \beta^2 \ln(c_3^i) \tag{1}$$

Period income is given by $w^i = h^i l^i$, where $h^i = 1$ if person $i$ has not been to college, and $h^i = h$ if the person is a college graduate. College is costly, both in terms of both time and money. A student does not have time to work in period 1, and must pay tuition of $T$.[3] The period budget constraint is:

$$c_t^i + T_t^i + (1+r)b_t^i = h_t^i l_t^i + b_{t+1}^i \tag{2}$$

I force loans to be paid off at the end of the third and final period ($b_4^i = 0$). Since the agent is representative, I drop the superscript $i$. In all that follows, I will assume that $\beta(1+r) = 1$. This assumption is not critical to any of the results, but it makes the derivations more

[3]If people go to college, they will choose to do so in period 1 so as to get as much benefit from the increase in $h^i$ as possible.

intuitive. I consider only the case in which college is chosen, since otherwise there is no student loan debt.[4] Under these assumptions, maximizing (1) with respect to (2) shows that people will consume the same amount $\bar{c}$ in each period:

$$\bar{c} = \frac{\left(\frac{1}{1+r} + \frac{1}{(1+r)^2}\right) h - T}{1 + \frac{1}{1+r} + \frac{1}{(1+r)^2}} > 1$$

Intuitively, the numerator is discounted lifetime income, which is split among the three periods by the denominator. I know this level of consumption must be greater than one, because otherwise people would not go to college and consume one unit each period. This level of consumption induces optimal borrowing as follows:

$$b_2^* = \frac{\frac{1}{1+r} + \frac{1}{(1+r)^2}}{1 + \frac{1}{1+r} + \frac{1}{(1+r)^2}} (h + T) \tag{3}$$

$$b_3^* = \frac{\frac{1}{1+r}}{1 + \frac{1}{1+r} + \frac{1}{(1+r)^2}} (h + T) \tag{4}$$

## 1.1 Student loan forgiveness

Suppose that due to high levels of debt the government publicly considers a (surprise) policy of canceling all outstanding student loan debt. The more debt there is carried forward, the worse the crisis and the more likely that the debt cancellation legislation is passed. Suppose that the probability of debt cancellation $p(\bar{b})$ is increasing in the average amount of end of period debt $\bar{b} = \frac{1}{2}b_2 + \frac{1}{2}b_3$. Individuals take $p$ as given. If the policy is considered when an individual is in period 1, then the individual's problem becomes:

$$\max_{b_2, b_3} \ln(b_2 - T) + (1-p)\left[\beta \ln\left(h - (1+r)\, b_2 + b_3\right) + \beta^2 \ln\left(h - (1+r)\, b_3\right)\right] + p\left(\beta + \beta^2\right) \ln(h)$$

If an individual is in period 2, then the problem becomes:

$$\max_{b_3} \ln(h - (1+r)b_2^* + b_3) + \beta(1-p)\ln(h - (1+r)b_3) + p\ln(h)$$

Optimal levels of borrowing in these two situations are:

$$b_2^*(p) = b_2^* + \frac{p\left(\frac{1}{1+r} + \frac{1}{(1+r)^2}\right)}{1 + \frac{1}{(1+r)} + \frac{1}{(1+r)^2} - p\left(\frac{1}{1+r} + \frac{1}{(1+r)^2}\right)}\bar{c} \tag{5}$$

$$b_3^*(p) = b_3^* + \frac{\frac{p}{(1+r)^2}}{\frac{1}{(1+r)} + \frac{1}{(1+r)^2} - \frac{p}{(1+r)^2}}\bar{c} \tag{6}$$

[4] This choice will be taken if the discounted lifetime income of college graduates is higher than non-college graduates. Formally, I consider only parameters such that $\frac{h}{1+r} + \frac{h}{(1+r)^2} - T > 1 + \frac{1}{1+r} + \frac{1}{(1+r)^2}$.

Here $b_2^*$ and $b_3^*$ are taken from (3) and (4). They are the optimal borrowing levels when there is no possibility of debt cancellation. Both (5) and (6) are a strictly increasing functions bounded below by $b_2^*$ and $b_3^*$ respectively. Any probability of debt relief raises debt above its original level. Intuitively, as the probability of debt cancellation $p$ approaches one, households borrow the discounted value of all future consumption. They do not borrow more because the slope of utility approaches infinity as consumption approaches zero, and even with a $p$ close to one there is a small probability of no debt relief.

Finally, assume that $p$ is a logistic function which is conveniently bounded between zero and one:

$$p(\bar{b}) = \frac{1}{1 + e^{-k_2(\bar{b}-k_1)}} \tag{7}$$

Any equilibrium value of $p^*$ will satisfy the fixed point condition $p(\bar{b}^*(p^*)) = p^*$.

An equilibrium must exist, but it is not necessarily unique. A simple argument is as follows: The logistic function $p(x)$ is in $(0,1)$ for all finite $x$. $\bar{b}^*(0) = \bar{b}^* > 0$, so $p(\bar{b}^*(0)) > 0$. Since $\lim_{p\to 1} \bar{b}^*(p) = h < \infty$, there is an $\bar{\epsilon} > 0$ such that for all $\epsilon \in [0, \bar{\epsilon}]$, $p(\bar{b}_3^*(1-\epsilon)) < 1-\epsilon$.[5] Since $p(\bar{b}^*())$ is continuous on $[0, 1)$, by the intermediate value theorem a fixed point must exist.

# 2 Calibration

To roughly calibrate the model with data, we need to be explicit about the time frame for each period. Since the first period is meant to reflect time in college, I set each period to four years. The college wage premium is set to 1.85, which is the quarterly weekly wages of US workers with at least a bachelors degree divided by the weekly wages of US workers with a high school degree in the third quarter of 2019 (FRED, Federal Reserve Bank of St. Louis, 2018). The average annual student loan interest rate was 5.8% in 2017, as calculated by a New America policy report based on data from the Federal Reserve Board Survey of Consumer Finances (Dancy and Holt, 2017). Compounded annually, this corresponds to an interest rate of 25.3% over four years. The tuition is the fraction of annual earnings of non-college workers paid as a fee to universities. The College Board reports that in 2019 the average net annual tuition at a four-year public university was 3,870 USD (CollegeBoard, 2019a). The median earnings of a high school graduate in 2017, the most recent year available, was 31,742 USD in 2019 dollars(US Census Bureau, 2017).[6]. I therefore set tuition to 0.12. In 2003, the College Board reports that the average borrower graduating from a non-profit four year institution had 25,084 USD of debt in 2019 dollars. In 2018, the debt level had grown to 30,060 USD per borrower on graduation (CollegeBoard, 2019b).

I simulate the model with two different parameterizations. The parameterizations are identical except for the two parameters in the function giving the probability of debt cancellation $p$. In the first parameterization, I set the logistic function such that there is almost no chance of debt relief, which is meant to loosely correspond to the political situation in the

[5] There is a discontinuity when $p = 1$, as then debt will not need to be paid back for certain. Borrowing at $p = 1$ is unbounded.

[6] All deflations in this paper were performed using the BLS CPI inflation calculator (US Bureau of Labor and Statistics, 2019)

early 2000's. In the second parameterization, I choose parameters so that the average debt is close to the 20% growth of debt per student between 2003 and 2018. Both the parameters and the results are presented in Table 1.

Table 1: Simulation parameters and results

| | | No cancel | Targeted |
|---|---|---|---|
| College wage prem. | $h$ | 1.85 | 1.85 |
| Tuition | $T$ | 0.12 | 0.12 |
| Interest rate | $r$ | 0.253 | 0.253 |
| Cancel midpoint | $k_1$ | 10 | 1.345 |
| Cancel curve | $k_2$ | 1 | 3.5 |
| Pre policy cancel prob | | 0.0% | 17.5% |
| Post policy cancel prob | | 0.0% | 28.5% |
| Pre policy debt | | 0.90 | 0.90 |
| Post policy debt | | 0.90 | 1.08 |
| Debt growth | | 20% | |

In the model, students take out much more debt than in the real world. The value of 0.9 in the first parameterization implies that students borrow 90% of the wages they would have earned over four years if they had not gone to college. Since my model abstracts from important features of reality such parental contributions and students working during their studies, it would be difficult to match the level of borrowing. The model is, however, able to replicate the growth of debt from 2003 to 2018 by positing that a policy of debt cancellation became possible. At the calibrated parameters, the probability that debt is canceled after the policy announcement is 28.5%, which is a high but plausible number for the probability of some sort of debt relief after the 2020 US presidential election.

To provide further intuition about the way the model works, I plot the induced probability of debt cancellation $p(\bar{b}^*())$ for the targeted parameterization above in Figure 4. Since a fixed point of this function is an equilibrium, I also plot the identity function as a dashed line. An equilibrium is where these two lines intersect.[7]

# 3 Conclusion

The possibility of debt forgiveness for student loans makes students less likely to repay their loans. The resulting increase in debt burden makes debt forgiveness policy more likely to be taken up by politicians. This mechanism may partially explain the rapid ramp up in outstanding student loan debt in the United States over the last few years.

[7] Because of the sigmoid shape of the logistic function, it would be easy to find a parameterization with two stable equilibria, one moderate and one extreme. Except for noting that the model can be indeterminate, there is no additional insight from this case so I do not discuss it further.

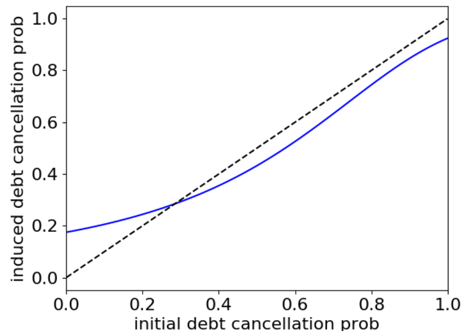


Figure 4: Equilibrium fixed point for the targeted calibration

# References


Atkinson, A. (2010). Race, educational loans & bankruptcy. *Mich. J. Race & L.*, 16:1.

Austin, D. A. (2013). The indentured generation: bankruptcy and student loan debt. *Santa Clara L. Rev.*, 53:329.

Avery, C. and Turner, S. (2012). Student loans: Do college students borrow too much–or not enough? *Journal of Economic Perspectives*, 26(1):165–92.

CollegeBoard (2019a). Trends in college pricing 2019. `https://research.collegeboard.org/trends/college-pricing`. Accessed: 2020-3-10.

CollegeBoard (2019b). Trends in student aid 2019. `https://research.collegeboard.org/trends/student-aid`. Accessed: 2020-3-10.

Dai, E. (2013). Student loan delinquencies surge. `https://www.stlouisfed.org/publications/inside-the-vault/spring-2013/student-loan-delinquencies-surge`. Accessed: 2020-3-10.

Dancy, K. and Holt, A. (2017). In the interest of few. `https://www.newamerica.org/education-policy/policy-papers/interest-of-few/`. Accessed: 2020-3-10.

FRED, Federal Reserve Bank of St. Louis (2018). U.s. bureau of labor statistics, employed full time: Median usual weekly nominal earnings (second quartile): Wage and salary workers: High school graduates, no college: 25 years and over. `https://fred.stlouisfed.org/series/LEU0252917300Q`. Accessed: 2020-3-10.

Gicheva, D. (2016). Student loans or marriage? a look at the highly educated. *Economics of Education Review*, 53:207–216.

Houle, J. N. and Addo, F. R. (2018). Racial disparities in student debt and the reproduction of the fragile black middle class. *Sociology of Race and Ethnicity*, page 2332649218790989.

Howard, W. S. (2010). The student loan crisis and the race to princeton law school. *JL Econ. & Pol'y*, 7:485.

Market Watch (2019). Where the 2020 candidates stand on student debt and college affordability. https://web.archive.org/web/20190731230126/https://www.marketwatch.com/story/where-the-2020-candidates-stand-on-student-debt-and-college-affordability-2019-02-20. Accessed: 2019-08-05.

Minicozzi, A. (2005). The short term effect of educational debt on job decisions. *Economics of Education Review*, 24(4):417–430.

New York Fed (2019a). Center for microeconomic data, student loan data and demographics. https://www.newyorkfed.org/microeconomics/topics/student-debt. Accessed: 2020-3-10.

New York Fed (2019b). Household debt and credit report, 2019 q1.

Roots, R. (1999). The student loan debt crisis: A lesson in unintended consequences. *Sw. UL Rev.*, 29:501.

Rothstein, J. and Rouse, C. E. (2011). Constrained after college: Student loans and early-career occupational choices. *Journal of Public Economics*, 95(1-2):149–163.

Stein, J. (2016). Jill stein 2016 platform. https://www.jill2016.com/platform. Accessed: 2019-08-09.

US Bureau of Labor and Statistics (2019). Trends in college pricing 2019. https://data.bls.gov/cgi-bin/cpicalc.pl. Accessed: 2020-3-10.

US Census Bureau (2017). B20004 - median earnings in the past 12 months (in 2017 inflation-adjusted dollars) by sex by educational attainment for the population 25 years and over. https://factfinder.census.gov/. Accessed: 2020-3-10.