The Political Economy of Forgiving Student Loans*

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Abstract

The rapid growth of U.S. student loan debt has drawn attention from scholars and raised public concerns with presidential candidates proposing "Student Loan Forgiveness" plans as part of their campaigns. I explore the political economy of such proposals by developing a two-period model of schooling and unemployment insurance with search costs. Schooling benefits individuals directly, through increased future earnings and lower search costs in the labor market, and indirectly, through increased aggregate taxable income in the economy which results in an enhanced unemployment insurance. The model suggests that schooled median voter will favor student loan forgiveness policy. This attitude intensifies as the average probability of employment in the economy falls. However, median voter's support for the policy, and for redistribution in general, attenuates as *his* probability of employment increases. By contrast, unschooled median voter will *not* be in favor of the policy, since publicly funding higher education decreases the share of redistribution to unemployment insurance.

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1 Introduction

For years student-loan debt has been a social and political topic, with the rapid growth of the student loans and defaults during the Great Recession leading some political leaders to propose forgiving student loans and making some higher education tuition-free (Minsky, 2019; Friedman, 2020; Mitchell, 2020).[1] For example, proposals by 2020 presidential candidates Senator Elizabeth Warren, Senator Bernie Sanders, and former Vice President Joe Biden suggest debt repayment hinders the U.S. economy by placing a hurdle before individuals whose ex post earnings are below their ex ante expectations, particularly due to macroeconomic shocks. As stated on Joe Biden's website:

> "Almost one in ten Americans in their 40s and 50s still hold student loan debt. But, college debt has especially impacted Millennials who pursued educational opportunities during the height of the Great Recession and now struggle to pay down their student loans instead of buying a house, opening their own business, or setting money aside for retirement."[2]

These proposals raise a question: what circumstances motivate the implementation of student-loan debt forgiveness policy? In particular, the goal of this study is to understand when voters find student loan forgiveness plan appealing and the circumstances that make its implementation more likely. This paper focuses on the federal student loans only. This differentiation is important for the purpose of loan cancellation for two main reasons: (1) the interest rate in the student-loan market is predetermined by the federal government and does *not* vary with the individual, and (2) *how* the burden of debt cancellation is distributed importantly depends on who is the lender. In the student-loan market the interest rate does not vary with the borrower and, therefore, it does *not* reflect the idiosyncratic riskiness of the borrowers. Moreover, the fact that the lender is the federal government implies that

[1] For example, under Joe Biden's plan families with an income below $125,000 would not have to pay tuition at a public college or university. Senator Warren and Senator Sanders also proposed tuition free public colleges and universities, but under different conditions.

[2] Source: "The Biden Plan for Education Beyond High School", www.joebiden.com

debt cancellation has to be financed through some form of tax revenues.[3]

I propose a two-period insurance and schooling model with search costs to investigate this question. The proposed insurance and schooling model with search costs incorporates some features from the Persson and Tabellini (1996) risk sharing model and some from the Ben-Porath (1967) schooling model. The model focuses on the individual's work and schooling behavior that takes place in the first period. Uncertainty and information problems are introduced to the labor market in the second period to study the behavior changes. Given that schooling increases future wage rate, the individuals are faced with a trade-off between expected increased earnings and forgone earnings. It is assumed that individuals borrow to pay for schooling in the first period, therefore, accumulated debt will decrease the expected future earnings.

To analyze the circumstances motivating the implementation of student-loan debt forgiveness, the model adds another layer to the decision-making process, where agents vote for their favorite policy. The voters face trade-offs in the two-dimensional policy space, where they decide on their favorite tax and debt-forgiveness policies.[4] In presence of search costs, debt-forgiveness policy leads to more individuals investing in schooling, thus increasing aggregate income in the economy, which results in a better financial protection against the risk of unemployment for schooled and unschooled (i.e., a higher consumption level in case of unemployment). However, debt forgiveness also leads to higher tax burden on the employed, thus making it less attractive. In the equilibrium, under the assumption of a majority rule voting system, the policy set that is favored by the median voter gets implemented.

The major findings of the model suggest that as median voter's prospect of employment improves he will prefer lower taxes and will not be in favor of the debt-forgiveness policy. This result is hardly surprising since increased probability of employment implies decreasing need for the unemployment insurance (i.e., the unemployment transfer). The model also suggests

[3]In the model I assume that cancellation of debt will result in higher proportional taxes on income.

[4]Although debt cancellation comes in several forms, the model assumes that the entire debt accumulated by the borrower is forgiven.

that, ceteris paribus, the debt-forgiveness policy becomes more appealing as the average probability of employment in the economy decreases. This trend exists irrespective of which policy set is initially preferred by the median voter. Perhaps this finding is particularly interesting, since it resembles the student-loan environment in the U.S. and it corresponds with the rationale of the proposed student loan forgiveness plans. It is documented in the literature that defaults on student loans rose sharply during the Great Recession, while student-loan debt continued increasing unlike other forms of debt (Dynarski, 2015; Lochner and Monge-Naranjo, 2015). This prompted policy responses such as interest rate reduction, some forms of student loan forgiveness, and flexible repayment plans (Dynarski, 2015).

These findings also explain the most recent policies that were implemented in response to an increased uncertainty in the labor market due to COVID-19 pandemic. The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) that was passed in March 2020 includes the student-loan debt relief plan. Under this temporary student-loan relief plan, loan payments were suspended, collections on defaulted loans stopped, and interest rates were set to 0%.[5] Derived implications and predictions of the model about the student loan forgiveness policy are convincing in light of the events that took place during the Great Recession and during the ongoing pandemic.

2 Background

Student-loan debt differs from other forms of debt in two major aspects. First, a student loan is *unsecured*, meaning the borrower provides no collateral. Consequently, student loans are riskier than secured debt, resulting in fewer privately issued student loans. This is one of the justification for governments to lend money to students seeking higher education degrees (Dynarski, 2015).

Second, in 2005 all student-loan debt was made nondischargeable with some exceptions

[5]The U.S. Department of Education, www.studentaid.gov.

(Pottow, 2006), meaning they cannot be eliminated through bankruptcy.[6] The inability to discharge student debt deteriorates borrower's insurance against negative economic shocks, and it may deter individuals from borrowing for schooling. Conversely, dischargeable student debt could lead to problems such as higher risk of default, higher interest rates, and even possible exclusion of future borrowers from the loan market. My model assumes student loans are nondischargeable so all students must repay their debt. The reason of this assumption is twofold. First, it reflects the current environment of student loans. Second, the assumption of nondischargeable student loans implies there is no arbitrage opportunity for students with high levels of student loan debt, low assets and savings, and high expected earnings.[7]

Besides these peculiarities, individuals take out student loans to invest in their human capital to increase expected future earnings. In addition to these private benefits, investments in human capital enhance society's welfare by increasing aggregate taxable income. Higher aggregate income permits enhanced public unemployment insurance. However, uncertainties and information problems in the labor market may restrict these benefits by influencing individuals' schooling-labor decisions in distinctive ways. Therefore, to study the effect of each, the model incorporates labor-market uncertainties and information problems.

I conjecture that as the prevalence of macroeconomic shocks increase, individuals with high probability of unemployment will favor debt-forgiveness policy irrespective of their schooling status. Uncertainties, such as macroeconomic downturns, in the labor market affect schooling decisions through decreasing future expected earnings. Because schooling decisions are made taking these *exogenous* employment shocks as given, some individuals may forgo schooling as their employment prospects worsen. Debt-forgiveness policy could improve unemployment insurance for unemployed individuals through encouraging more individuals

[6] One exception includes undue hardship, the burden of demonstrating which the student bears (Pottow, 2006).

[7] The ability to discharge the student loan debt becomes very tempting once the degree is attained, because a typical student after graduating has little to no assets and savings meaning that there is "not much to lose". The option to file for a bankruptcy is perhaps even more compelling for a graduate with large debt and large potential earnings. This is because it presents an opportunity for the student to "get rid" of the loan and enjoy the higher earnings without the need to make payments.

invest in schooling, thus increasing aggregate taxable income in the economy. However, labor-market uncertainties alone cannot explain if more individuals would invest in schooling when student loans are forgiven. In particular, an economy with higher unemployment rate will require higher tax rate to pay for unemployment insurance. These higher tax rates may encourage some individuals to forgo schooling.

The model also includes search costs to enrich the set of incentives faced by individuals. The effect of information problems in the labor market on schooling decisions differ from uncertainties in two ways. First, all individuals must engage in search of employment *before* their employment status is known. Therefore, search costs are sunk costs that decrease future earnings of all individuals regardless of their employment and schooling status. Second, individuals *can decrease* their search costs through schooling. For example, Stigler (1962, p.94) explains "If he is an unskilled or a semi-skilled worker, the number of potential employers is strictly in the millions. Even if he has a specialized training, the number of potential employers will be in the thousands..." Therefore, uncertainties and information problems affect schooling-labor decisions through different channels.

Finally, debt-forgiveness policy in the model refers to cancellation of the entire student-loan debt held by individuals and entails provision of publicly funded higher education. Generally, debt cancellation comes in several forms. Cancelling the entire or part of debt as well as stopping or slowing the accumulation of debt are considered to be debt cancellation. Moreover, forgiving student loans necessitates addressing the question of who pays for higher education? This question intimately relates to the way the debt cancellation policy is funded. The model assumes that the debt-forgiveness policy is financed through income tax revenues, therefore it follows that higher education is publicly funded. This setting of the model conforms with the student-loan forgiveness proposals by 2020 presidential candidates.

3 The Model

In this section I present the model. In section 3.1, I set the stage and introduce notation for the economic model to study labor-schooling decisions. Section 3.2 describes the political model, which adds another layer to the decision-making process, taking the economic model as given. This enables the analysis of voter behavior and its determinants. In Section 3.3, I describe the policy equilibrium and discuss findings under alternative debt cancellation policies.

3.1 The Economic Model

Consider a continuum of $\mathcal{N}$ agents living in an economy that lasts for two periods, $t \in \{1, 2\}$. In each period t, each agent allocates 1 unit of time between labor (L_t) and schooling ($1-L_t$). An agent with H_t units of human capital earns $H_t L_t$ that finances current consumption. Schooling increases future human capital, and hence future wages. All agents begin with H_1 units. To simplify the algebra, I assume that $L_1 \in \{\frac{1}{2}, 1\}$. Individuals pay for schooling by accumulating debt d per unit of schooling $(1 - L_1)$. Student loans are offered through government at fixed and predetermined interest rate, that does not vary with the borrower. For added simplicity and without loss of generality, I assume that all students face the same interest rate of 0%.[8] The wage rate earned by individuals at $t = 2$ is $w_2 = H_1 + \alpha H_1^{\gamma}(1 - L_1)$ $\forall L_1 \in \{\frac{1}{2}, 1\}$, where $\alpha, \gamma \in (0, 1)$ and $H_1 > 0$. The parameter α captures the ability effect of the individual and parameter γ captures the effect due to forgone earnings. Individuals face uncertainty in the second period. Specifically, an agent i is employed at $t = 2$ with probability $p^i \in (0, 1)$ and unemployed with probability $1 - p^i$, where $p^i \sim F(\cdot)$ such that $F(\cdot)$ is a left-skewed distribution with mean $\bar{p}$ and median p^m (i.e., $\bar{p} < p^m$). Moreover, the second-period income is taxed at rate $\tau \in [0, 1]$ and each unemployed individual receives a lump-sum transfer T.

[8] As noted earlier, the interest rate in the federal student loan market is predetermined by the federal government and does *not* vary with the individual. Therefore, assumption of 0% is chosen to simplify the analysis, but does not affect its validity.

Moreover, in the second period *all* agents must engage in a search activity for employment *before* employment status of an agent is realized (i.e., before the agent knows if he/she is employed or unemployed). However, agents are still aware of their probability of employment, p^i, as noted earlier. The schooling dependent search cost function is described by

$$\lambda(L_1) = a - b(1 - L_1), \tag{1}$$

where a and b are constants such that $a, b \in (0, 1)$. Notice that $\frac{\partial \lambda(L_1)}{\partial L_1} > 0$ and $\frac{\partial \lambda(L_1)}{\partial (1-L_1)} < 0$, i.e., cost of search decreases with the amount of schooling. This assumption can be interpreted as search cost being lower due to schooling, specialized skill, or ability. Note, because all individuals in engage in search before they know if they will be unemployed, $\lambda(L_1)$ is a fixed (or sunk) cost. Because the focus of this paper is the debt-forgiveness policy, the decision on the amount of search for agents is not considered and it is taken as given instead.[9]

Individuals share the same utility function. Let c_1, c_2 be consumption in $t = 1$ and $t = 2$, respectively. The preferences are given by $U(c_1, c_2)$ such that $U'(\cdot) > 0$ and $U''(\cdot) < 0$ (i.e., individuals are risk-averse). Specifically, I assume that $U(c_1, c_2) = \ln c_1 + \ln c_2$. This functional form of utility assumes that each period utility is additively separable and there is no discounting.

Next, I define individual's budget constraints. Let d be debt borrowed per unit of schooling and f be the price per unit of schooling. Define an indicator function

$$\mathbb{I}(D) = \begin{cases} 1 & \text{if } D = \text{forgive all debt} \\ 0 & \text{if } D = \text{do not forgive.} \end{cases}$$

[9] Stigler (1962, 1961) provides examples and a clear explanation of the search decision process.

Then individual's budget constraints are given by,

$$
\begin{aligned}
c_1 &= w_1 L_1 - (f-d)(1-L_1),\\
c_2^e &= (1-\tau)w_2 L_2 - d(1-L_1)(1-\mathbb{I}(D)) - \lambda(L_1),\\
c_2^u &= T - d(1-L_1)(1-\mathbb{I}(D)) - \lambda(L_1),
\end{aligned}
$$

where c_2^e and c_2^u are the consumption levels at $t=2$ when agent is employed and unemployed, respectively.

3.1.1 Individual's Problem

Combining the information for the economic model, the individual's problem can be described by

$$
\max_{c_1, c_2^e, c_2^u} U(c_1, c_2) = \ln c_1 + p^i \ln c_2^e + (1-p^i)\ln c_2^u \tag{2}
$$

subject to constraints

$$
\begin{aligned}
c_1 &= w_1 L_1 - (f-d)(1-L_1),\\
c_2^e &= (1-\tau)w_2 L_2 - d(1-L_1)(1-\mathbb{I}(D)) - \lambda(L_1),\\
c_2^u &= T - d(1-L_1)(1-\mathbb{I}(D)) - \lambda(L_1).
\end{aligned} \tag{3}
$$

I assume $f = d$ for simplicity. Then, an individual will invest in schooling if $U^{\text{schooling}} \geq U^{\text{no schooling}}$ under both debt-forgiveness policies. Also, notice that in the second period, the agents will dedicate the entire unit of time to labor ($L_2 = 1$) because there is no incentive to invest in schooling.

Then, an agent will invest in schooling in the first period if

$$
\begin{aligned}
\ln(c_1|L_1 = \tfrac{1}{2}) + p^i \ln(c_2^e|L_1 = \tfrac{1}{2}) + (1-p^i)\ln(c_2^u|L_1 = \tfrac{1}{2}) \geq\\
\ln(c_1|L_1 = 1) + p^i \ln(c_2^e|L_1 = 1) + (1-p^i)\ln(c_2^u|L_1 = 1).
\end{aligned} \tag{4}
$$

Solving (4) for p_i yields

$$p^i \geq \ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)-(1-\tau)\alpha H_1^{\gamma}+d(1-\mathbb{I}(D))-b\right]}{[(1-\tau)H_1-a][2(T-a)+b-d(1-\mathbb{I}(D))]}\right). \tag{5}$$

When the debt is forgiven, solving for the optimal labor choice in the first period yields

$$L_1^1 = \begin{cases} \frac{1}{2} & \text{for } \mathbb{I}(D)=1 \text{ and } p^i \geq \phi_1(\tau,T) \\ 1 & \text{for } \mathbb{I}(D)=1 \text{ and } p^i < \phi_1(\tau,T), \end{cases} \tag{6}$$

where $\phi_1(\tau,T) = \ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)-(1-\tau)\alpha H_1^{\gamma}-b\right]}{[(1-\tau)H_1-a][2(T-a)+b]}\right)$. Numerical investigations of ϕ_1 indicate that it tends to be very small and can take negative values. In rare cases it can be positive and large, especially for high tax rates. This implies that when debt is forgiven, it is optimal for individuals to invest in schooling. This result is not surprising given the sunk search costs. Since schooling decreases search costs, debt-forgiveness policy will encourage more individuals to invest in schooling.

Similarly, when debt is not forgiven the optimal labor choice in the first period is

$$L_1^2 = \begin{cases} \frac{1}{2} & \text{for } \mathbb{I}(D)=0 \text{ and } p^i \geq \phi_2(\tau,T) \\ 1 & \text{for } \mathbb{I}(D)=0 \text{ and } p^i < \phi_2(\tau,T) \end{cases} \tag{7}$$

where $\phi_2(\tau,T) = \ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)-(1-\tau)\alpha H_1^{\gamma}+d-b\right]}{[(1-\tau)H_1-a][2(T-a)+b-d]}\right)$. Numerical investigations of ϕ_2 indicate that ϕ_2 will vary considerably more than ϕ_1, and will vary between zero and one. In general, larger taxes were associated with large values of ϕ_2. Thus, when debt is not forgiven and when tax rates are large, the individuals will choose *not* to invest in schooling.

3.2 The Political Model

To study the political decisions in our hypothetical economy, I define the political model taking the economic model as given. In particular, the voters in this model are the same individuals as in the economic model. The voters vote for their favorite policy set that consists of three policies: (1) a proportional tax $\tau \in [0,1]$ on second-period income, (2) a targeted transfer T to unemployed in the second period, and (3) a debt-forgiveness policy $D \in \{\text{forgive all debt}, \text{do not forgive}\}$. The voting takes place in the first period, at which time there is uncertainty about second-period employment. The voter knows his/her individual probability of employment in the second period, p^i, and $F(\cdot)$. Policy set is chosen according to pure democracy rule in a direct democracy setting. I assume that voting is sincere, i.e., an agent i votes for policy a over a' whenever $a \succ a'$. All three policies are chosen at $t = 1$.

In addition, taking individual preferences as given, the voter's preferences are described by an expected utility function

$$V^i(\tau, D) = U(\tau; L_1) + p_i U(\tau; L_1) + (1 - p_i)\widetilde{U}(\tau).$$

Let $\delta_n^{\mathbb{I}(D)}$ be a fraction of unschooled population, $\delta_s^{\mathbb{I}(D)}$ be a fraction of schooled population, $\bar{p}_n^{\mathbb{I}(D)}$ and $\bar{p}_s^{\mathbb{I}(D)}$ be average probability of being employed for unschooled and schooled populations, respectively. Then government budget constraint is given by

$$(1 - \bar{p})T + \delta_s^{\mathbb{I}(D)} \frac{d}{2} \mathbb{I}(D) = \tau \left[\bar{p}_n^{\mathbb{I}(D)} \delta_n^{\mathbb{I}(D)} H_1 + \bar{p}_s^{\mathbb{I}(D)} \delta_s^{\mathbb{I}(D)} \left(H_1 + \frac{\alpha H_1^\gamma}{2} \right) \right] L_2$$

where $\delta_n^{\mathbb{I}(D)} + \delta_s^{\mathbb{I}(D)} = 1$ and $\bar{p} = \bar{p}_n^{\mathbb{I}(D)} \delta_n^{\mathbb{I}(D)} + \bar{p}_s^{\mathbb{I}(D)} \delta_s^{\mathbb{I}(D)}$.

Given the optimal labor choice L_1^* in (6) and (7), voter's problem is to choose optimal policies that maximize voter's utility

$$\begin{aligned} \max_{\tau, D, T} V^i(\tau) = \; & \ln [H_1 L_1^*] + p^i \ln [(1 - \tau)[H_1 + \alpha H_1^\gamma (1 - L_1^*)] L_2 - d(1 - L_1^*)(1 - \mathbb{I}(D)) - (a - b(1 - L_1^*)] \\ & + (1 - p^i) \ln [T - d(1 - L_1^*)(1 - \mathbb{I}(D)) - (a - b(1 - L_1^*))] \end{aligned} \tag{8}$$

subject to government budget constraint

$$(1-\bar{p})T + \delta_s^{\mathbb{I}(D)} \frac{d}{2} \mathbb{I}(D) = \tau \left[\bar{p}_n^{\mathbb{I}(D)} \delta_n^{\mathbb{I}(D)} H_1 + \bar{p}_s^{\mathbb{I}(D)} \delta_s^{\mathbb{I}(D)} \left(H_1 + \frac{\alpha H_1^\gamma}{2} \right) \right] L_2. \tag{9}$$

The voter's problem is solved for the two cases noted earlier: (1) when all debt is forgiven (i.e., $\mathbb{I}(D) = 1$) and (2) when debt is not forgiven (i.e., $\mathbb{I}(D) = 0$).

3.2.1 Voter's Favorite Tax when Student Loans are Forgiven

Under the student loan forgiveness policy (i.e., when $\mathbb{I}(D) = 1$) the optimal labor choice is given by (6) and the government budget constraint can be written as

$$T = \frac{1}{(1-\bar{p})} \tau \left[\bar{p}_n^1 \delta_n^1 H_1 + \bar{p}_s^1 \delta_s^1 \left(H_1 + \frac{\alpha H_1^\gamma}{2} \right) \right] - \frac{1}{(1-\bar{p})} \frac{\delta_s^1}{2} d. \tag{10}$$

Using the budget constraint in (10), the voter's problem can be written as an unconstrained optimization problem given by

$$\begin{aligned} \max_{\tau} V^i(\tau) = & \ln\left[H_1 L_1\right] + p^i \ln\left[(1-\tau)[H_1 + \alpha H_1^\gamma (1 - L_1^*)] - (a - b(1 - L_1^*))\right] \\ & + (1 - p^i) \ln\left[\frac{1}{(1-\bar{p})} \tau \left[\bar{p} H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2} \right] - \frac{1}{(1-\bar{p})} \frac{\delta_s^1}{2} d - (a - b(1 - L_1^*)) \right]. \end{aligned} \tag{11}$$

Solving (11) for optimal tax rate yields

$$\tau_1^* = (1 - p^i) + \frac{p^i \delta_s^1 d}{2\left[\bar{p} H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} + \left[\frac{p^i (1-\bar{p})}{\left[\bar{p} H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)} \right] \lambda(L_1^*), \tag{12}$$

where $w_2(L_1^*) = H_1 + \alpha H_1^\gamma (1 - L_1^*)$ and $\lambda(L_1^*) = a - b(1 - L_1^*)$. Notice, the components of

τ_1^* can be thought of as following

$$\tau_1^* = \underbrace{(1-p^i)}_{\text{insurance}} + \underbrace{\frac{p^i \delta_s^1 d}{2\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]}}_{\text{tax burden due to debt forgiveness}} + \underbrace{\left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right]\lambda(L_1^*),}_{\text{tax burden due to search costs}}$$

where the insurance component is decreasing in p^i, the tax burden due to the debt-forgiveness policy is increasing in p^i, and the tax burden due to search costs is increasing as search costs increase. The intuition of each component is presented below.

Insurance: The unemployment insurance policy component is negatively correlated with the agent's probability of employment. This result is expected, since an agent prefers less insurance as his probability of employment increases. On the other hand, An individual who is more likely to be unemployed, will prefer more unemployment insurance.

Debt Forgiveness: The debt-forgiveness policy is positively correlated with the agent's probability of employment. This component elucidates a trade-off between the debt-forgiveness policy and the unemployment insurance faced by the agents. Specifically, as agent's probability of employment decreases, he prefers to have larger unemployment transfers and less debt-forgiveness. In other words, an agent with greater probability of being unemployed would prefer to have a larger share of the tax to go to the unemployment insurance rather than to the debt-forgiveness policy.

Search Costs: Higher search costs increase the burden of tax, because as search costs increase more agents become unemployed. Consequently, all else equal, as the number of employed individuals in the economy falls, the total taxable income falls as well. As a result, the tax rate must increase to finance the unemployment insurance and the debt-forgiveness policy.

In addition, notice that the optimal tax rate for agent i varies with idiosyncratic probability of employment p_i as well as with schooling. Therefore, schooled agent with the same probability of employment as unschooled agent will have different "favorite" tax rates τ_1^*.

3.2.2 Voter's Favorite Tax when Student Loans are Not Forgiven

The optimal labor choice when the student loan forgiveness policy is not implemented (i.e., when $\mathbb{I}(D) = 0$) is given by (7) and the government budget constraint can be written as

$$T = \frac{1}{(1-\bar{p})}\tau\left[\bar{p}_n^0\delta_n^0 H_1 + \bar{p}_s^0\delta_s^0\left(H_1 + \frac{\alpha H_1^\gamma}{2}\right)\right]. \tag{13}$$

Using the budget constraint in (13), the voter's problem can be written as an unconstrained optimization problem given by

$$\begin{aligned}\max_\tau V^i(\tau) = \; & \ln\left[H_1 L_1\right] + p^i \ln\left[(1-\tau)[H_1 + \alpha H_1^\gamma(1-L_1^*)] - d(1-L_1^*) - (a - b(1-L_1^*))\right] \\ & + (1-p^i)\ln\left[\frac{1}{(1-\bar{p})}\tau\left[\bar{p}H_1 + \bar{p}_s^0\delta_s^0\frac{\alpha H_1^\gamma}{2}\right] - d(1-L_1^*) - (a-b(1-L_1^*))\right].\end{aligned} \tag{14}$$

Solving (14) for optimal tax rate τ under no student loan forgiveness policy yields

$$\tau_2^* = (1-p^i) + \left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right](1-L_1^*)d + \left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right]\lambda(L_1^*),$$

where $w_2(L_1^*) = H_1 + \alpha H_1^\gamma(1-L_1^*)$ and $\lambda(L_1^*) = a - b(1-L_1^*)$. Notice, the components of τ_2^* can be thought of as following

$$\tau_2^* = \underbrace{(1-p^i)}_{\text{insurance}} + \underbrace{\left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right](1-L_1^*)d}_{\text{tax burden due to debt forgiveness}} + \underbrace{\left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right]\lambda(L_1^*)}_{\text{tax burden due to search costs}},$$

where the insurance component is decreasing in p^i because an agent "likes" less insurance as the probability of employment increases, the tax burden due to student loan debt is increasing in the amount of schooling, and the tax burden due to search costs is increasing as search costs increase (or as schooling decreases).[10]

[10] The first and last components of τ_2 remain the same and their interpretation is the same as described earlier.

Debt Forgiveness: Schooled agents with higher probability of being unemployed prefer higher tax rate relative to unschooled agents, all else equal. This result is expected. Schooled individuals with higher probability of unemployment prefer higher taxes because, ceteris paribus, it will lead to more generous unemployment benefits.

Finally, it is worth noting that optimal tax rate (τ_2^*) for agent i will vary more relative to τ_1^*. In other words, the optimal taxes for agents in the population will be more dispersed when debt is not forgiven. The dispersion of the optimal tax rates will stem from (1) idiosyncratic probability of unemployment, (2) debt burden due to schooling, and (3) search costs.

3.3 The Policy Equilibrium

The assumed functional-form for the preferences of individuals in the economy satisfies the single-peakedness assumption. Therefore, individuals can be ordered according to the order of their favorite policy and the unique Condorcet winning policy set among voters exist based on the median voter theorem. However, the outcome of the policy depends on the distribution of the probability p^i.

The following definition of the policy equilibrium is largely borrowed from Persson and Tabellini (1996). Let a feasible policy be a nonnegative vector $a \equiv [\tau, T, D]$ that satisfies the government budget constraint in (9). Then, a political equilibrium under direct democracy is a feasible policy that cannot be beaten by any other policy proposal a' under majority rule. Moreover, Persson and Tabellini (1996) show that the equilibrium policy a maximizes the expected utility of the voter with the p^m, the median probability of being employed.[11]

To determine the conditions under which certain policy set gets implemented, I compare utility of a median voter when debt is forgiven to when it is not forgiven (i.e., determine whether $U(c_1, c_2^e, c_2^u|\tau_1, T_1, \mathbb{I}(D) = 1) - U(c_1, c_2^e, c_2^u|\tau_2, T_2, \mathbb{I}(D) = 0) \gtrless 0$). Note, the investigations of ϕ_1 implied mostly negative values for ϕ_1 under debt-forgiveness policy. This

[11]Proof for a Condorcet winner in the multi-dimensional policy space is forthcoming.

simplifies the analysis of the policy equilibrium to two cases described below, such that the tax policy is determined by the median voter.[12]

I investigate the changes in $U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D) = 1) - U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D) = 0)$ numerically by assuming some values for the parameters and variables in the model. Specifically, I let $\alpha = 0.65$, $\gamma = 1$, $H_1 = 0.68$, $d = 1$[13], $\bar{p}_s^1 = 0.97$, $\delta_s^1 = 0.67$, $\bar{p}_s^0 = 0.975$, and $\delta_s^0 = 0.5$[14]. Moreover, the changes in $U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D) = 1) - U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D) = 0)$ due changes in p^m and $\bar{p}$, were examined for $\bar{p} = 0.98, 0.96, 0.94$, and 0.90.

3.3.1 The median voter is schooled under both debt-forgiveness policies

Given some probability p^m such that $p^m \in [\phi_2, 1)$, the median voter is schooled under both debt-forgiveness policies. Thus the median voter's favorite tax policies are given by

$$\tau_1^m = (1 - p^m) + \frac{p^m \delta_s^1 d}{2\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right] \lambda(L_1^*),$$

when debt is forgiven and by

$$\tau_2^m = (1-p^m) + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right](1-L_1^*)d + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right] \lambda(L_1^*),$$

when debt is not forgiven. To determine whether τ_1^m or τ_2^m gets implemented, I compare utilities obtained under each policy, i.e., compare $U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D) = 1)$ versus $U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D) = 0)$. τ_1^m is implemented if

$$U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D) = 1) \geq U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D) = 0), \tag{15}$$

[12]The median voter is an agent with a probability of employment p^m.

[13]According to Berman and Zehngebot (2017), a student working part-time at a minimum-wage salary would be able to cover 68.2% of the cost for University of Central Florida in 2016. Using this information, it means that if $d = 1$ then $w_1 = H_1 = 0.68$.

[14]Torpey (2018) reported an unemployment rate among bachelors degree graduates at about 2.5% in 2017 in the U.S. Moreover, according to April 2020 BLS Economic News Release, about 66.2% of high-school graduates enrolled in College in 2019.

and τ_2^m is implemented if condition in (15) is not satisfied.

Using the assumed values above, I investigate the condition in (15) graphically. The results are presented in Figure 1 in the Figures section. According to Figure 1, the median voter's unambiguously prefers τ_1^m, T_1^m, and to forgive student loans. All else equal, the policy set becomes less attractive as the median voter's probability of employment increases, although the effect weak.

In addition, all else equal, as the average probability of employment in the economy decreases, the model suggests that debt-forgiveness policy becomes more attractive. This result is especially interesting since in some ways it resembles the current atmosphere in the U.S. First, according to the 2015 Census Report, majority of the adult population in the U.S. completed some college or more (Ryan and Bauman, 2016). In addition, research indicates that during the Great Recession defaults on student loans rose sharply while student loan debt continued increasing unlike other debt (Dynarski, 2015; Lochner and Monge-Naranjo, 2015). At the time, there were policy responses that included interest rate reduction, some forms of forgiveness of student debt, and flexible repayment plans (Dynarski, 2015). Lechner and Monge-Naranjo (2015) suggest that the Great Recession was the onset of an increased concern about the levels of student loan debt which was exacerbated by an increased uncertainty in the labor market.

Most recently, the increased uncertainty in the labor market due to COVID-19 pandemic lead to CARES Act which includes the student debt loan relief plan (Friedman, 2020). In addition, it has been announced that the New York Representative Carolyn Maloney will be introducing legislation to forgive student loan debt for COVID-19 frontline health care workers (Friedman, 2020). The proposed model therefore is able to predict these observations and, more importantly, provides an explanation to the questions (1) when do voters find student loan debt forgiveness policy appealing? and (2) under which circumstances is the implementation of the student loan debt-forgiveness policy more likely?

3.3.2 Schooled versus unschooled median voter under each debt-forgiveness policies

Given some probability p^m such that $p^m \in (0, \phi_2,)$, the median voter is schooled when debt is forgiven and unschooled when debt is not forgiven. Thus the median voter's favorite tax policy when debt is forgiven is given by

$$\tau_1^m = (1-p^m) + \frac{p^m \delta_s^1 d}{2\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right] \lambda(L_1^*),$$

when debt is forgiven and by

$$\tau_2^m = (1-p^m) + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right](1-L_1^*)d + \left[\frac{p^m(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1 \delta_s^1 \frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^m)}{w_2(L_1^*)}\right] \lambda(L_1^*),$$

when debt is not forgiven. To determine whether τ_1^m or τ_2^m will be implemented, we need to compare utilities obtained under each policy, i.e., compare $U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D)=1)$ versus $U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D)=0)$. τ_1^m is implemented if

$$U(\cdot|\tau_1^m, T_1^m, \mathbb{I}(D)=1) \geq U(\cdot|\tau_2^m, T_2^m, \mathbb{I}(D)=0), \tag{16}$$

and τ_2^m is implemented if condition in (16) is not satisfied.

As before, the difference in the utilities was investigated numerically. The results are presented in Figure 2 in the Figures section. The figure suggests that for the given parameter values, the median voter prefers τ_2^m, and T_2^m, and no debt forgiveness policy set. All else equal, the policy set becomes less attractive as the median voter's probability of employment decreases.

4 Conclusion

This paper introduces a two-period insurance and schooling model to explain what circumstances motivate the implementation of student loan debt-forgiveness policies. One of the primary implications of the model is that the average probability of employment in the economy is an important determinant of voters' attitude toward debt-forgiveness policy. Particularly, all else equal, debt-forgiveness policy becomes more attractive as the average probability of employment in the economy falls. This effect due to uncertainty conforms to the conjectures that the Great Recession is the origin of concerns about the levels of student-loan debt. Indeed, these concerns resulted in programs such as Income-Based Repayment plan under which a portion of debt is forgiven.[15] This implication also proposes an explanation to a heightened interest in the student-loan debt and higher education topics on the social media.

The analysis of individual's labor-schooling decisions in section 3.1.1 imply that sunk search costs will induce more individuals to pursue higher-education degrees under debt-forgiveness policy. When search costs are unavoidable and could be reduced through schooling, all else equal, more individuals' will find it optimal to invest in schooling if student loans are forgiven, all else equal. This suggests student loan forgiveness accompanied with publicly funded higher education will result in more individuals pursuing higher education.

The model also suggest that debt-forgiveness policy is less attractive in economies whose decisive voters are unschooled. Moreover, as described in section 3.3.2, voter's probability of employment is negatively correlated with the attractiveness of debt-forgiveness policy. The model elucidates the reasons for this relationship. Although unschooled individuals do not benefit directly through debt-forgiveness policy, they may support it as their employment prospect deteriorates due to indirect benefits. Specifically, forgiving student loans will lead to more individuals pursuing higher education, consequently leading to higher aggregate

[15] Specifically, under this plan after 25 years of "qualifying payments" the remainder of debt is forgiven. The Department of Education provides a detailed definition of a "qualifying payment" on their website: www.studentaid.gov.

taxable income in the economy. Increased taxable income in the economy implies enhanced unemployment insurance. Therefore, as the probability of employment decreases, enhanced debt-forgiveness policy could become more attractive, to unschooled voters inclusively.

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Figures

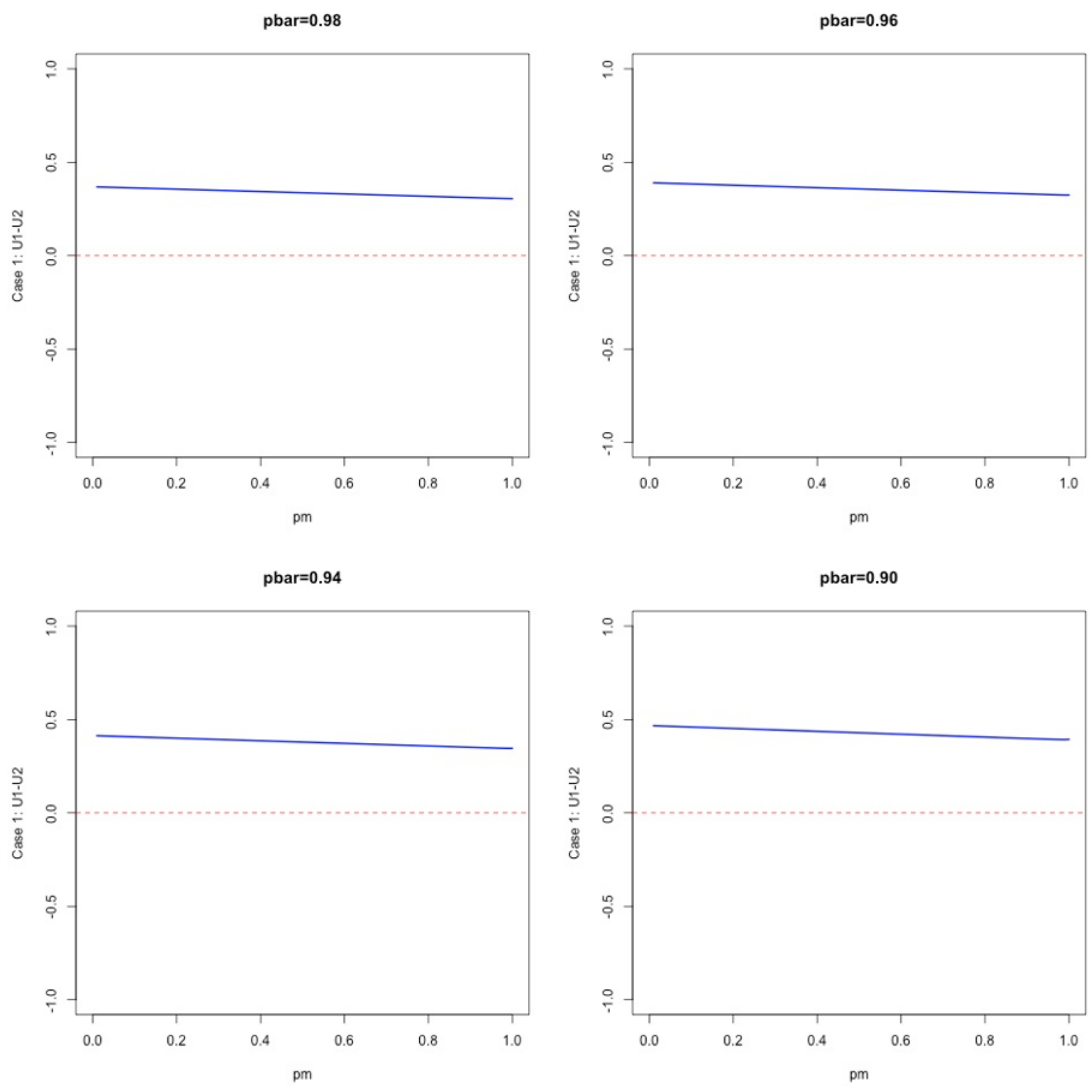

Figure 1: Case I: The median voter is schooled under both debt-forgiveness policies

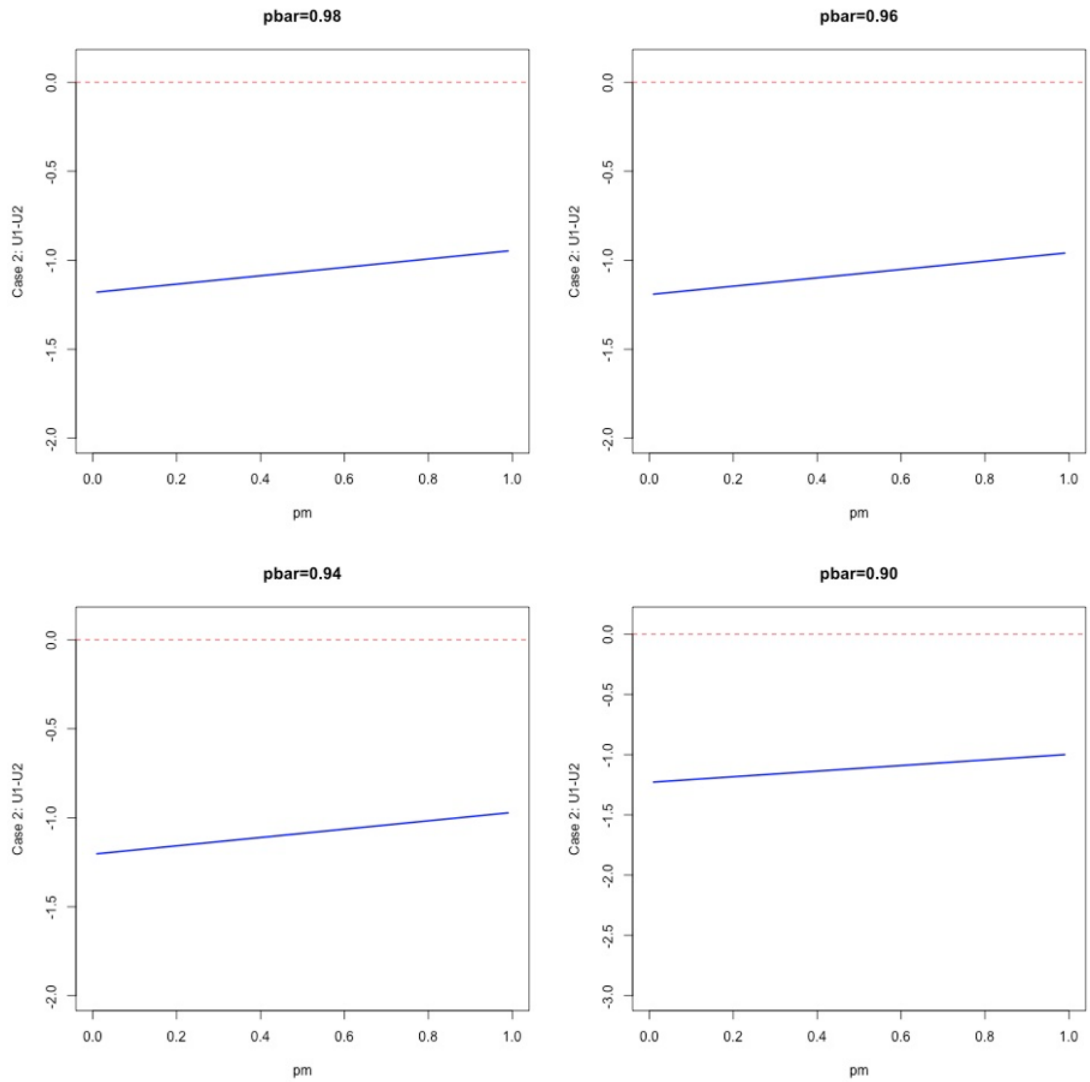

Figure 2: Case II: Schooled median voter when $\mathbb{I}(D) = 1$ versus unschooled median when $\mathbb{I}(D) = 0$

A Solutions for the Debt-Forgiveness Model with Search Costs

A.1 Individual's Problem with Search Costs

Given the additional information about search costs, the individual's problem can be described by

$$\max_{c_1, c_2^e, c_2^u} U(c_1, c_2) = \ln c_1 + p^i \ln c_2^e + (1 - p^i) \ln c_2^u \tag{A.1}$$

subject to constraints

$$c_1 = w_1 L_1 - (f - d)(1 - L_1), \tag{A.2}$$

$$c_2^e = (1 - \tau) w_2 L_2 - d(1 - L_1)(1 - \mathbb{I}(D)) - \lambda(L_1), \tag{A.3}$$

$$c_2^u = T - d(1 - L_1)(1 - \mathbb{I}(D)) - \lambda(L_1). \tag{A.4}$$

As before, I assume $f = d$ for simplicity. Then, an individual will invest in schooling if $U^{\text{schooling}} \geq U^{\text{no schooling}}$ under both debt-forgiveness policies.

Then, an agent will invest in schooling in the first period if

$$\begin{aligned} &\ln(c_1 | L_1 = \frac{1}{2}) + p^i \ln(c_2^e | L_1 = \frac{1}{2}) + (1 - p^i) \ln(c_2^u | L_1 = \frac{1}{2}) \geq \\ &\ln(c_1 | L_1 = 1) + p^i \ln(c_2^e | L_1 = 1) + (1 - p^i) \ln(c_2^u | L_1 = 1), \end{aligned} \tag{A.5}$$

or equivalently if

$$\begin{aligned} \ln\left(\frac{H_1}{2}\right) + p^i \ln\left((1 - \tau)\left[H_1 + \frac{\alpha H_1^\gamma}{2}\right] - \frac{d}{2}(1 - \mathbb{I}(D)) - \left[a - \frac{b}{2}\right]\right) \\ + (1 - p^i) \ln\left(T - \frac{d}{2}(1 - \mathbb{I}(D)) - \left[a - \frac{b}{2}\right]\right) \\ \geq \ln(H_1) + p^i \ln((1 - \tau) H_1 - a) + (1 - p^i) \ln(T - a). \end{aligned} \tag{A.6}$$

The inequality in A.6 simplifies to

$$\begin{aligned} p^i \ln\left[\frac{(T - a)\left[2((1 - \tau)H_1 - a) + (1 - \tau)\alpha H_1^\gamma - d(1 - \mathbb{I}(D)) + b\right]}{[(1 - \tau)H_1 - a][2(T - a) + b - d(1 - \mathbb{I}(D))]}\right] \\ + \ln\left[\frac{2(T - a) + b - d(1 - \mathbb{I}(D))}{4(T - a)}\right] \geq 0, \end{aligned} \tag{A.7}$$

which leads to

$$p^i \geq \frac{\left[\ln\left(\frac{4(T-a)}{2(T-a)+b-d(1-\mathbb{I}(D))}\right)\right]}{\left[\ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)+(1-\tau)\alpha H_1^{\gamma}-d(1-\mathbb{I}(D))+b\right]}{[(1-\tau)H_1-a][2(T-a)+b-d(1-\mathbb{I}(D))]}\right)\right]}. \tag{A.8}$$

Then, solving for the optimal labor choice in the first period when the debt yields

$$L_1^1 = \begin{cases} \frac{1}{2} & \text{for } \mathbb{I}(D) = 1 \text{ and } p^i \geq \phi_1(\tau, T) \\ 1 & \text{for } \mathbb{I}(D) = 1 \text{ and } p^i < \phi_1(\tau, T), \end{cases} \tag{A.9}$$

where $\phi_1(\tau, T) = \frac{\left[\ln\left(\frac{4(T-a)}{2(T-a)+b}\right)\right]}{\left[\ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)+(1-\tau)\alpha H_1^{\gamma}+b\right]}{[(1-\tau)H_1-a][2(T-a)+b]}\right)\right]}$.

Similarly, the optimal labor choice in the first period when debt is not forgiven is

$$L_1^2 = \begin{cases} \frac{1}{2} & \text{for } \mathbb{I}(D) = 0 \text{ and } p^i \geq \phi_2(\tau, T) \\ 1 & \text{for } \mathbb{I}(D) = 0 \text{ and } p^i < \phi_2(\tau, T) \end{cases} \tag{A.10}$$

where $\phi_2(\tau, T) = \frac{\left[\ln\left(\frac{4(T-a)}{2(T-a)+b-d}\right)\right]}{\left[\ln\left(\frac{(T-a)\left[2((1-\tau)H_1-a)+(1-\tau)\alpha H_1^{\gamma}-d+b\right]}{[(1-\tau)H_1-a][2(T-a)+b-d]}\right)\right]}$.

A.2 Voter's Problem with Search Costs

Given the optimal labor choice L_1^* in A.9 and A.10, voter's problem is to choose optimal policies that maximize voter's utility

$$\begin{aligned} \max_{\tau,D,T} V^i(\tau) = &\ \ln\left[H_1 L_1^*\right] + p^i \ln\left[(1-\tau)[H_1 + \alpha H_1^{\gamma}(1-L_1^*)]L_1 - d(1-L_1^*)(1-\mathbb{I}(D)) - (a - b(1-L_1^*)\right] \\ &+ (1-p^i)\ln\left[T - d(1-L_1^*)(1-\mathbb{I}(D)) - (a - b(1-L_1^*)\right] \end{aligned} \tag{A.11}$$

subject to government budget constraint

$$(1-\bar{p})T + \delta_s^{\mathbb{I}(D)}\frac{d}{2}\mathbb{I}(D) = \tau\left[\bar{p}_n^{\mathbb{I}(D)}\delta_n^{\mathbb{I}(D)}H_1 + \bar{p}_s^{\mathbb{I}(D)}\delta_s^{\mathbb{I}(D)}\left(H_1 + \frac{\alpha H_1^{\gamma}}{2}\right)\right]L_2, \tag{A.12}$$

where $\bar{p}_n^{\mathbb{I}(D)}$ is an average probability of being employed among non-schooled population, $\bar{p}_s^{\mathbb{I}(D)}$ is an average probability of being employed among schooled population, $\delta_n^{\mathbb{I}(D)}$ and $\delta_s^{\mathbb{I}(D)}$ are a fraction of unschooled and schooled population respectively. Moreover, $\delta_n^{\mathbb{I}(D)} + \delta_s^{\mathbb{I}(D)} = 1$ and $\bar{p} = \bar{p}_n^{\mathbb{I}(D)}\delta_n^{\mathbb{I}(D)} + \bar{p}_s^{\mathbb{I}(D)}\delta_s^{\mathbb{I}(D)}$.

A.2.1 Voter's Favorite Tax when Student Loans are Forgiven

Under the student loan forgiveness policy (i.e., when $\mathbb{I}(D) = 1$) the optimal labor choice is given by A.9 and the government budget constraint can be written as

$$T = \frac{1}{(1-\bar{p})}\tau\left[\bar{p}_n^1\delta_n^1 H_1 + \bar{p}_s^1\delta_s^1\left(H_1 + \frac{\alpha H_1^\gamma}{2}\right)\right] - \frac{1}{(1-\bar{p})}\frac{\delta_s^1}{2}d. \tag{A.13}$$

Using the budget constraint in A.13, the voter's problem can be written as an unconstrained optimization problem given by

$$\begin{aligned}\max_\tau V^i(\tau) = &\ \ln[H_1 L_1] + p^i \ln[(1-\tau)[H_1 + \alpha H_1^\gamma(1-L_1^*)] - (a - b(1-L_1^*))] \\ &+ (1-p^i)\ln\left[\frac{1}{(1-\bar{p})}\tau\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right] - \frac{1}{(1-\bar{p})}\frac{\delta_s^1}{2}d - (a - b(1-L_1^*))\right].\end{aligned} \tag{A.14}$$

The first order conditions are given by

$$\begin{aligned}\frac{\mathrm{d}V^i(\tau)}{\mathrm{d}\tau} &= p^i\frac{\partial \ln[(1-\tau)(H_1 + \alpha H_1^\gamma(1-L_1^*)) - (a - b(1-L_1^*))]}{\partial\tau} \\ +(1-p^i)&\frac{\partial \ln\left[\frac{1}{(1-\bar{p})}\tau\left(\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right) - \frac{1}{(1-\bar{p})}\frac{\delta_s^1 d}{2} - (a - b(1-L_1^*))\right]}{\partial\tau} = 0,\end{aligned} \tag{A.15}$$

which simplifies to

$$\begin{aligned}&\frac{-p^i[H_1 + \alpha H^\gamma(1-L_1^*)]}{(1-\tau)[H_1 + \alpha H^\gamma(1-L_1^*)] - [a - b(1-L_1^*)]} \\ &+\frac{(1-p^i)\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]}{\tau\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right] - \frac{\delta_s^1 d}{2} - (1-\bar{p})[a - b(1-L_1^*)]} = 0\end{aligned} \tag{A.16}$$

Then, solving A.16 for optimal tax rate yields

$$\tau_1^* = (1-p^i) + \frac{p^i\delta_s^1 d}{2\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} + \left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right]\lambda(L_1^*), \tag{A.17}$$

where $w_2(L_1^*) = H_1 + \alpha H_1^\gamma(1-L_1^*)$ and $\lambda(L_1^*) = a - b(1-L_1^*)$.

A.2.2 Voter's Favorite Tax when Student Loans are Not Forgiven

The optimal labor choice when the student loan forgiveness policy is not implemented (i.e., when $\mathbb{I}(D) = 0$) is given by A.10 and the government budget constraint can be written as

$$T = \frac{1}{(1-\bar{p})}\tau\left[\bar{p}_n^0\delta_n^0 H_1 + \bar{p}_s^0\delta_s^0\left(H_1 + \frac{\alpha H_1^\gamma}{2}\right)\right]. \tag{A.18}$$

Using the budget constraint in A.18, the voter's problem can be written as an unconstrained optimization problem given by

$$\begin{aligned}\max_\tau V^i(\tau) = &\ \ln\left[H_1 L_1\right] + p^i \ln\left[(1-\tau)[H_1 + \alpha H_1^\gamma(1-L_1^*)] - d(1-L_1^*) - (a - b(1-L_1^*))\right] \\ &+ (1-p^i)\ln\left[\frac{1}{(1-\bar{p})}\tau\left[\bar{p}H_1 + \bar{p}_s^0\delta_s^0\frac{\alpha H_1^\gamma}{2}\right] - d(1-L_1^*) - (a - b(1-L_1^*))\right].\end{aligned} \tag{A.19}$$

The first order conditions are given by

$$\begin{aligned}\frac{\mathrm{d}V^i(\tau)}{\mathrm{d}\tau} = &\ p^i\frac{\partial \ln\left[(1-\tau)[H_1 + \alpha H_1^\gamma(1-L_1^*)] - d(1-L_1^*) - (a - b(1-L_1^*))\right]}{\partial\tau} \\ &+ (1-p^i)\frac{\partial \ln\left[\frac{1}{(1-\bar{p})}\tau\left[\bar{p}H_1 + \bar{p}_s^0\delta_s^0\frac{\alpha H_1^\gamma}{2}\right] - d(1-L_1^*) - (a - b(1-L_1^*))\right]}{\partial\tau} = 0.\end{aligned} \tag{A.20}$$

Solving A.20 for optimal tax rate τ under no student loan forgiveness policy yields

$$\tau_2^* = (1-p^i) + \left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right](1-L_1^*)d + \left[\frac{p^i(1-\bar{p})}{\left[\bar{p}H_1 + \bar{p}_s^1\delta_s^1\frac{\alpha H_1^\gamma}{2}\right]} - \frac{(1-p^i)}{w_2(L_1^*)}\right]\lambda(L_1^*),$$

where $w_2(L_1^*) = H_1 + \alpha H_1^\gamma(1-L_1^*)$ and $\lambda(L_1^*) = a - b(1-L_1^*)$.