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Parental Support, Savings, and Student Loan Repayment[†]

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Using unique survey and administrative data from Canada, we document that parental support and personal savings substantially reduce student loan repayment problems. Developing a model of student borrowing and repayment, we show that nonmonetary costs of applying for income-based repayment assistance are critical to understanding our findings. Furthermore, we show that eliminating these costs may be inefficient. Empirically, we show that expanding Canada's Repayment Assistance Plan to automatically cover all borrowers could reduce program revenue by half over early repayment years. Finally, we show how student loan programs can be more efficiently designed. (*JEL* G51, I22, I23, I28)

Increases in government student borrowing, coupled with growing labor market risk, have led to expansions in the availability and use of income-based repayment assistance. As of 2014, roughly 25 percent of Canadian and American student borrowers who had recently entered repayment were making reduced government loan payments through some form of income-driven repayment (IDR) plan, e.g., *Pay-as-You-Earn* (*PAYE*) in the United States or the *Repayment Assistance Plan* (*RAP*) in Canada (US Government Accountability Office 2015; Employment and Social Development Canada 2016).

Despite growing enrollment in IDR plans, many eligible students do not apply.[1] This has led to calls in North America to make it easier to apply for and receive repayment assistance, with several recent policy proposals calling for fully income-based programs (like those of Australia and, recently, the United Kingdom) that would automatically link loan repayments to earnings (Nelson 2013, Baum

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[1] The US Treasury Department estimated that only 20 percent of all Direct Loan borrowers eligible for IDR plans in 2012 were actually enrolled (US Government Accountability Office 2015). Among Canada student loan borrowers eligible for RAP during their first two years of repayment, we find that only about half were actually enrolled.

and Johnson 2016). While offering important "insurance" benefits to many student borrowers, income-based repayment assistance, like the informal insurance implicit in delinquency and default, can be quite costly. For example, the US Department of Education expects to collect only 75–80 percent of any outstanding amounts when borrowers enter either IDR plans or default (Department of Education 2017). Since Canadian and American government student loan programs are meant to be self-financing, shortfalls arising from borrowers who do not fully repay their loans (due to loan forgiveness in IDR or default) are offset by "profits" from those who repay in full. In practice, student loans include an interest premium to cover the risk that many borrowers will not repay in full.

Given the costs associated with repayment assistance and default, it is important to understand whether the insurance provided by current student loan programs is well-designed. Several recent studies consider potential improvements to current repayment plans (Nelson 2013, Baum and Johnson 2016) or the optimal design of student loans under uncertainty and various market frictions (Chatterjee and Ionescu 2012, Gary-Bobo and Trannoy 2015, Lochner and Monge-Naranjo 2016); yet, the empirical relevance of different frictions is largely unknown. Importantly, none of these studies, nor recent policy discussions, consider the role of one potentially crucial aspect of current programs—that a borrower's (and spouse's) earnings is the only financial resource taken into account when considering the ability to repay. However, access to other resources like parental transfers (including in-kind assistance such as the opportunity to live at home) and personal savings are known to provide valuable insurance against adverse labor market outcomes (Kaplan 2012, Edwards 2020, McGarry 2016). Little is known about how these additional resources impact student loan repayment or their implications for the design of student loan programs. This paper theoretically and empirically studies these issues.

Developing a simple model of student borrowing and repayment under existing government student loan programs, we show that (nonmonetary) costs of income verification (or other application/enrollment costs) are critical to understanding the role parental support plays in the decision to enroll in income-based repayment plans. These costs not only reflect potential stigma effects but also the effort associated with learning the details of available repayment options, assembling documentation on income and family structure, and filling out and filing the lengthy application form (US Government Accountability Office 2015).[2] In their evaluation of a recent field experiment conducted by US loan servicer Navient, Mueller and Yannelis (2019) estimate that enrollment in IDR plans more than doubles when borrowers requesting information about repayment options are given assistance in filling out the IDR application. Borrowers must also regularly document their earnings and any changes in family structure to remain enrolled in these plans.

Our model suggests that the presence of these nonmonetary enrollment/verification costs can induce eligible borrowers to forego repayment assistance if they have sufficient parental support, generating a negative relationship between parental transfers and repayment assistance take-up. By contrast, monetary verification

[2] Indeed, the US application form for IDR plans is 12 pages, much longer than the much-maligned Free Application for Federal Student Aid.

costs and problems associated with moral hazard predict no relationship or even a positive relationship between parental support and application for repayment assistance. Thus, the relationship between student loan repayment and parental transfers (or other available resources besides the borrower's earnings) provides valuable information about underlying market frictions central to the design of efficient student loan programs.[3]

Perhaps surprisingly, there is little or no current empirical evidence about this relationship, likely due to a lack of data on these resources.[4] We overcome this challenge by combining administrative data on student loan amounts and repayment outcomes from the Canada Student Loans Program (CSLP) with data from a new survey that we helped design to measure a broad array of available resources, including personal savings and unique information about potential parental support (i.e., the amount of resources parents are willing and able to provide).[5] These data reveal a strong negative relationship between repayment difficulties (including enrollment in repayment assistance as well as delinquency/default) and all types of financial resources available to borrowers. While repayment difficulties are primarily concentrated among borrowers with low post-school earnings, we find that many low-earning borrowers still manage to make their standard payments by taking advantage of parental support and personal savings.[6] For example, only 4 percent of low-earning borrowers with access to (at least) a modest amount of parental support and savings do not make their standard payments, compared to 60 percent of low-earning borrowers with little access to parental support and negligible savings. Taking into account other factors that could be correlated with parental support and savings does not mitigate this stark difference.

One concern often raised in response to low repayment assistance take-up rates among eligible borrowers (roughly 50 percent in our sample of CSLP borrowers) is that students may be unaware of their repayment options. The US-based Navient experiment highlights the limits of this explanation, demonstrating low IDR take-up rates even among eligible borrowers that were pre-qualified by repayment specialists over the phone (Mueller and Yannelis 2019). Furthermore, it is difficult to reconcile a general lack of borrower awareness with the very high repayment assistance take-up rates we document among eligible CSLP borrowers with little parental support or savings. When viewed through the lens of our model, it is more likely that enrollment/verification costs primarily discourage application for repayment

[3] While we do not explicitly model access to other resources like personal savings in our theoretical analysis, they would play a similar role to parental transfers.

[4] While some survey-based datasets contain limited information about parental income when borrowers attended college (usually from financial aid applications), our novel measure of potential parental support is a much stronger predictor of student loan repayment. Parental support depends on parents' ability and willingness to provide it. While parental income is a good proxy for the former, it need not reflect the latter. Park (2019) documents considerable heterogeneity in parental transfers for higher education conditional on parental income.

[5] The CSLP services all provinces and territories in Canada except Quebec. In the 2011–2012 period, the CSLP provided loans to 447,000 full-time students (Employment and Social Development Canada 2016). Canada does not offer loans to parents of students as in the United States; however, parent PLUS loans only account for about 10 percent of undergraduate borrowing in the United States and are typically taken out after other available federal student loans have been exhausted.

[6] Several previous American and Canadian studies document higher rates of nonpayment among low earners (Dynarski 1994, Flint 1997, Lochner and Monge-Naranjo 2015, Schwartz and Finnie 2002). See Gross et al. (2009) for a recent survey.

assistance among eligible borrowers with access to financial resources beyond their own earnings.[7] This has important implications for current policy proposals and for the efficient design of student loan programs.

Motivated by concerns about low take-up rates for RAP, the CSLP has introduced several initiatives to reduce application/verification costs (e.g., introduction of online enrollment). Reducing these costs is also a central feature of US proposals aimed at facilitating enrollment in IDR plans (Government Accountability Office 2016). In principle, these policy changes could raise program revenue by encouraging currently delinquent/defaulting borrowers with low earnings to make reduced income-based payments. Yet, they could also be quite costly if they lead to sizeable payment reductions among borrowers currently choosing to repay their loans in full (with help from parents or personal savings) despite being eligible for repayment assistance. Simulating the effects of moving to automatic enrollment in RAP, we show that the revenue gains would be negligible, while the revenue losses would be sizeable, at least over the first several years of repayment. To the extent that interest rates would need to be raised to cover these losses, we show that eliminating verification costs could be economically inefficient given the current structure of student loan programs. With the focus of current repayment assistance on the borrower's earnings alone, the existence of modest verification costs may be an efficient way to target that assistance to borrowers who need it most.

Given the drawbacks of simply reducing verification costs under the current system, it is natural to consider more general changes that better account for the important role of parental support. We consider the design of a (constrained) efficient student loan program that provides liquidity for school and insurance against post-school earnings risk, subject to concerns about moral hazard and income verification costs. We show that efficient student loan contracts would have similar features to current government student loan programs in Canada and the United States; however, efficient contracts would set interest rates, income-based payment amounts, and eligibility thresholds (for reduced payment) based on the amount borrowed, (reported) parental support, and borrowers' earnings potential. Efficient contracts would also compensate low-income borrowers for any verification costs associated with reduced income-based payments. Importantly, with loan contracts designed to maximize the amount of insurance that can be provided given market frictions, it would always be efficient to reduce verification costs as much as possible.[8] When loan contracts are structured to be actuarially fair for each borrower, there would be no ex ante redistribution across borrowers with different parental support or earnings potential. Under some conditions, this can eliminate incentives

[7] Of course, many borrowers may be initially uninformed about their repayment options, choosing to become informed about repayment assistance only when necessary. Our results are consistent with this possibility, where acquiring the information is simply part of the cost of applying—a cost borrowers with greater parental support are less willing to pay. Our results are inconsistent with the idea that parents who provide more financial support are also more helpful in navigating the IDR application process.

[8] Burdens placed on individuals that provide no direct benefits to others, but may serve to sort individuals into programs as desired, are often referred to as "ordeals" (Zeckhauser 2019). Our analysis shows that it would be efficient to eliminate "ordeal" costs under efficiently designed student loan contracts, while this need not be the case under the current structure of student loan programs.

for students applying for loans to misrepresent the level of parental support they expect to receive after school.

I. Student Loan Contracts with Parental Transfers, Costly Income Verification, and Moral Hazard

In this section, we develop a model of student borrowing and repayment when post-school earnings depend on (unobserved) effort and are uncertain. We consider current government student loan programs, which offer borrowers the option of repaying their loans in full or, if eligible, applying for reduced income-based payments. We abstract from the option of default for now; however, we introduce this possibility in Section IB. Crucially, payment reductions are independent of parental transfers, and eligible borrowers may decide not to apply for income-based payments due to (nonmonetary) verification/enrollment costs.[9] We use the model to examine how parental transfers impact student loan repayment, as well as other choices. Insights from this analysis motivate a new test for the presence of verification costs.

A. *Environment*

We assume that individuals live for two periods. During college (period 1), they make tuition payments costing $T \geq 0$, consume c_1, and borrow d—all coming from their initial resources $w \geq 0$, which includes any early parental support. After college (period 2), they consume c_2 out of their earnings y and post-school transfers from parents $\tau \geq 0$ less loan repayments D. While we refer to τ as parental transfers, it may also reflect other financial resources available to borrowers but not considered by student loan programs in setting income-based payments. To simplify the exposition, most of our analysis assumes that post-school parental transfers are exogenous and anticipated in period 1; however, our main results continue to hold for potential parental support when transfers are endogenously determined by altruistic parents (and may depend on the borrower's post-school income) as discussed in Section IB.

Post-school earnings $y \geq \underline{y} \equiv \min\{y\}$ are uncertain and depend on costly (unobserved) effort $e \geq 0$, which may reflect such activities as studying during college or post-school job search. We assume a well-behaved conditional distribution function $\Phi(y|e)$ and $\phi(y|e) \equiv \partial\Phi(y|e)/\partial y \in (0,\infty)$ for all $(e,y) \in [0,\infty) \times [\underline{y},\infty)$. We also assume that earnings under higher effort first-order stochastically dominate (FOSD) earnings under low effort, so $\partial\Phi(y|e)/\partial e < 0$ for all (e,y).

Preferences for consumption each period are given by the strictly increasing and strictly concave function $u(c)$, while effort has a utility cost $v(e)$ that is strictly increasing and strictly convex. We consider income-contingent loan repayment

[9] Given our focus on student loan repayment behavior, post-college parental support, and the structure of student loan repayment plans, we do not study the enrollment decision itself; however, it is clear that greater parental support and more generous student loan repayment policies would encourage enrollment among students at the margin. See Lochner and Monge-Naranjo (2016) for a detailed analysis of how credit market frictions and student loan repayment policies impact human capital investment decisions.

schemes that may require an enrollment and income verification process for interested borrowers. This process may impose a utility cost of $\psi \geq 0$ during the repayment period. Individuals discount the future at rate $\beta > 0$.

With uncertainty in post-school earnings, borrowers maximize expected lifetime utility given by

$$U = u(c_1) + \beta\Big[\int_{\underline{y}}^{\infty}\big[u\big(c_2(y)\big) - \mathcal{V}(y)\psi\big]\phi(y|e)\,dy - v(e)\Big], \tag{1}$$

where $\mathcal{V}(y)$ is an indicator function equalling one if an individual has his post-school income verified and zero otherwise. Consumption is given by $c_1 = w - T + d$ during school and $c_2(y) = y + \tau - D$ after school.

B. *A Basic Government Student Loan Program*

Consider a government student loan program that requires payments with a fixed gross interest rate of $R > 1$ when earnings are high, but offers reduced earnings-contingent payments $\xi(y) \geq 0$ for those who verify that their earnings are below a fixed eligibility threshold θ.[10] In many cases (e.g., *PAYE* in the United States, *RAP* in Canada), eligibility is also (or only) limited to borrowers whose income-based payment amount $\xi(y)$ does not exceed the debt-based standard payment amount Rd. This implies an endogenous debt-to-income eligibility constraint ($Rd/y \leq \xi(y)/y$); however, this constraint never binds and has no effect on behavior when verification/enrollment costs ψ are nonnegative. Consistent with observed government student loan programs, we assume that income-based payments are non-decreasing in earnings with $0 \leq \xi'(y) < 1$ for all y and that repayments are zero at the lowest earnings level, $\xi(\underline{y}) = 0$.[11] Altogether, loan repayments are given by

$$D(d,y) = \begin{cases} \xi(y) & \text{if } y < \theta \text{ and } \mathcal{V}(y) = 1 \\ Rd & \text{otherwise.} \end{cases} \tag{2}$$

Importantly, borrowers must incur a (nonmonetary) verification cost ψ if they wish to pay the income-based amount. In practice, this cost includes efforts to learn the details of income-based repayment plans, acquiring documentation on recent earnings and family composition, and filling out and submitting a lengthy application form.[12]

[10] Existing IDR plans typically offer the opportunity to (at least partially) delay loan payments (via income-based payment reductions) with the potential for forgiveness of remaining debt at the end of the repayment period (15 years in the case of Canada's RAP). The CSLP also forgives interest payments for most borrowers while they are enrolled in RAP. In 2010–2011, nearly 90 percent of RAP recipients made no monthly payments, so CSLP effectively forgave associated interest payments at an estimated cost of $83 million; another $36 million was budgeted to cover expected future unpaid principal amounts associated with RAP for CSLP loans disbursed in 2010–2011 (Human Resources and Skills Development Canada 2012). Since we consider a single post-college repayment period (abstracting from the dynamics of repayment), $\xi(y)$ incorporates these types of forgiveness.

[11] The assumption $\xi(\underline{y}) = 0$ is convenient but not important. It implies that borrowers with very low earnings always prefer the income-contingent payment to the standard payment in the absence of any verification costs.

[12] Enrollment in IDR plans and the income verification process could also impose monetary costs on borrowers; although, we are unaware of explicit fees associated with current plans. Any financial enrollment/verification costs

Given our interest in the structure of student loan repayment plans and the implications of parental support for repayment decisions, we focus on students whose initial wealth w is sufficiently low that they wish to borrow (i.e., $d > 0$).[13] Finally, we note that government student loans may be restricted by an upper loan limit:

$$d \leq d_{\max}. \tag{3}$$

Repayment Decisions.—Borrowers with sufficiently high earnings, $y \geq \theta$, must make the standard repayment Rd, while those with lower earnings are eligible for an income-based payment. In the absence of verification costs ($\psi = 0$), eligible borrowers would simply choose the repayment plan with the lowest payment amount (Rd versus $\xi(y)$), while the presence of verification costs ($\psi > 0$) means that borrowers would need a sufficient reduction in the payment amount before they would be willing to apply for income-based payments.

In general, eligible borrowers must decide whether the gains from a potentially lower income-based payment, $G(y,d;\tau) \equiv u(y+\tau-\xi(y)) - u(y+\tau-Rd)$, outweigh the verification costs ψ. Because the standard payment is increasing in debt while the income-based payment is not, the gains $G(y,d;\tau)$ from choosing the latter are increasing in debt d. The gains are decreasing in both earnings and parental transfers wherever the gains are nonnegative (by concavity of $u(\cdot)$). It is straightforward to show that the gains from applying for income-contingent repayments are positive and, therefore, decreasing in earnings at the low end of the income distribution.[14] These properties imply a unique earnings threshold $\hat{y}(d;\tau,\psi)$ at which borrowers are indifferent between repaying the standard and income-based amounts; this threshold solves

$$G\big(\hat{y}(d;\tau,\psi),d;\tau\big) = \psi. \tag{4}$$

Using the implicit function theorem, one can show that $\hat{y}$ is always decreasing in verification costs ψ and increasing in debt d, while it is decreasing in transfers τ if and only if $\psi > 0$. When $\psi = 0$, $\hat{y} = \xi^{-1}(Rd)$ does not depend on transfers τ, since borrowers simply choose the lower payment amount.

Taking into account the eligibility requirement, borrowers choose to have their income verified ($\mathcal{V} = 1$) and pay a reduced income-based payment if and only if

$$y < \tilde{y}(d;\tau,\theta,\psi) \equiv \max\Big\{\underline{y}, \min\big\{\hat{y}(d;\tau,\psi),\theta\big\}\Big\}, \tag{5}$$

where the verification threshold $\tilde{y}$ does not depend on effort and depends on debt and parental transfers (transfers only if $\psi > 0$) only in the intermediate range between $\underline{y}$

are likely to be quite modest and can simply be embedded in $\xi(y)$ without affecting our analysis. A key distinction between monetary and nonmonetary verification costs is that the former directly increase the marginal utility of consumption while the latter do not. We are more interested in and focus on nonmonetary verification costs ψ, because they have important implications for the role of parental transfers in repayment decisions.

[13] Small changes in student loan policies will not impact inframarginal savers; however, major policy changes that make student borrowing more attractive could cause some students to borrow rather than save.

[14] The gains may turn negative (and remain negative) as earnings rise if $\xi(y)$ becomes sufficiently high. See online Appendix E.1 for these derivatives and other technical details.

and θ.[15] The probability of applying for a reduced income-based payment conditional on $(d, e; \tau, \theta, \psi)$ is $\Phi(\tilde{y}(d; \tau, \theta, \psi)|e)$, which only depends on effort through the post-school earnings distribution. Conditional on debt and realized earnings, effort does not affect repayment behavior.

For $\psi > 0$, there are three distinct repayment cases for borrowers eligible for income-contingent payments. First, borrowers with sufficiently low debt or high parental transfers (satisfying $G(\underline{y}, d; \tau) \leq \psi$) always make the standard loan payment regardless of their earnings, since verification costs always exceed the benefits from income-contingent repayment. Second, borrowers with sufficiently high levels of debt (such that $G(\theta, d; \tau) \geq \psi$) always choose the income-based payment when they are eligible, since the benefits from reduced payments exceed the verification costs for all eligible income levels.[16] Third, borrowers with moderate levels of debt and parental transfers (satisfying $G(\theta, d; \tau) < \psi < G(\underline{y}, d; \tau)$) will only apply for income-based repayment when their earnings are less than $\hat{y}(d; \tau, \psi) \in (\underline{y}, \theta)$. The ex ante probability that they apply for a reduced income-based payment given student debt d, transfers τ, and effort e is decreasing in parental transfers but increasing in debt.[17]

Borrowing and Effort Choices.—Students choose borrowing d and effort e to maximize expected utility U (equation (1)) subject to the borrowing constraint (equation (3)) and repayment decision rule (equation (5)). As shown in online Appendix E.1, the first-order condition for student debt d can be written as

$$u'(c_1) = R\beta\big(1 - \Phi(\tilde{y}|e)\big)E\big[u'(c_2)|y \geq \tilde{y}, e\big] + \lambda, \tag{6}$$

where $\lambda \geq 0$ is the Lagrange multiplier on the borrowing constraint (equation (3)). If borrowing is unconstrained, then $\lambda = 0$ and $u'(c_1) \leq R\beta E[u'(c_2)|e]$, so the expected marginal utility of consumption increases after school when $R\beta = 1$. The potential for partial loan forgiveness associated with income-contingent repayments generates a tendency for "over-borrowing."

Optimal effort must satisfy the following interior first-order condition:

$$v'(e) = \frac{\partial E\big[u\big(c_2(y)\big)|e\big]}{\partial e} - \psi \frac{\partial \Phi(\tilde{y}|e)}{\partial e}, \tag{7}$$

equating the direct marginal utility costs of effort with the marginal gains from higher post-school earnings/consumption and reductions in expected verification costs.

[15] Notice that $\tilde{y} = \underline{y}$ if and only if $G(\underline{y}, d; \tau) \leq \psi$, and $\tilde{y} = \theta$ if and only if $G(\theta, d; \tau) \geq \psi$.

[16] Borrowers with very little parental support are likely to behave in this way; however, it is possible that $G(\theta, d; 0) < \psi$ if debt is low enough or the eligibility threshold is high enough.

[17] With heterogeneity in verification costs, for any given level of debt and parental transfers, those with $\psi \geq G(\underline{y}, d; \tau)$ would always repay in full, those with $\psi \leq G(\theta, d; \tau)$ would always apply for reduced income-based payments whenever eligible, and those with intermediate verification costs would only apply when their earnings fall below $\hat{y}(d; \tau, \psi)$.

Effects of Parental Transfers on Behavior.—We now use our model to study the effects of (anticipated) parental transfers τ on borrower behavior.[18]

We begin by discussing the effects of parental transfers on effort. Because income-based payments implicitly "tax" earnings while standard payments do not, the effects of transfers on effort depend, in part, on how the verification threshold adjusts. As discussed above, if verification costs are sufficiently high ($\psi > G(\underline{y}, d; \tau)$) or sufficiently low ($\psi < G(\theta, d; \tau)$), the verification threshold is set at $\underline{y}$ or θ, respectively, and is unaffected by (marginal) changes in parental transfers or student debt. In these cases, parental transfers only impact effort through an income effect. With high verification costs, borrowers always repay in full, so consumption is monotonically increasing in earnings and effort. As a result, the income effect on effort is unambiguously negative: parental transfers reduce the marginal value of income, which reduces incentives to exert effort. When verification costs are low, consumption discontinuously drops when earnings rise above the eligibility threshold θ as borrowers switch from income-based to standard payments. As a result, an increase in effort could lead to a reduction in consumption for a range of earnings realizations. As long as effort still lowers the expected marginal utility of post-school consumption, the income effect will continue to be negative, and parental transfers will reduce effort.[19] Letting d^*, e^*, and c_2^* reflect optimal borrowing, effort, and post-school consumption, we summarize these results in the following lemma. (Proofs for all results can be found in online Appendix E. All appendices are available online.)

LEMMA 1: *If* (i) $\psi > G(\underline{y}, d^*; \tau)$ *or* (ii) $\psi < G(\theta, d^*; \tau)$ *and* $\partial E[u'(c_2^*)|e^*]/\partial e < 0$, *then the repayment verification threshold does not respond to marginal changes in debt or parental transfers* $(\partial \tilde{y}/\partial d = \partial \tilde{y}/\partial \tau = 0)$ *and effort is strictly decreasing in parental transfers* $(de^*/d\tau < 0)$.

When verification costs are moderate ($G(\theta, d^*; \tau) < \psi < G(\underline{y}, d^*; \tau)$), borrowers lower their verification threshold in response to an increase in parental transfers. Because this reduces the likelihood that borrowers apply for income-based payments, which implicitly "tax" earnings, it encourages effort. If this effect dominates the opposing income effect, effort is increasing in parental transfers.

Next, consider the effects of parental transfers on borrowing. On one hand, the availability of additional post-school resources encourages borrowing, as students wish to shift some of those resources to the schooling period. On the other hand, reductions in the verification threshold (and potentially effort) discourage borrowing. Unfortunately, it is not easy to determine which force will dominate, so the total effects of transfers on borrowing are generally ambiguous.

[18] Any unexpected transfer amount would have no effect on borrowing or effort, since these choices predate transfer receipt. Unanticipated transfer amounts would only affect repayment behavior through the direct effects of transfers on the verification threshold. Because $\partial \tilde{y}/\partial \tau \leq 0$, unanticipated transfers (weakly) reduce the probability of enrollment in income-based repayment when $\psi > 0$.

[19] Online Appendix E.1 shows that if the Monotone Likelihood Ratio Property (MLRP) is satisfied for $\Phi(y|e)$ and the eligibility threshold θ is not too near the point where effort goes from reducing to increasing the likelihood of earnings (i.e., where $\partial \phi(y|e)/\partial e = 0$), then the expected marginal utility of post-school consumption is declining in effort.

Finally, consider the effects of parental transfers on the probability of making a reduced income-based payment:

$$\frac{\partial \Phi\left(\tilde{y}(d,\tau)|e\right)}{\partial \tau} = \underbrace{\frac{\partial \Phi\left(\tilde{y}|e\right)}{\partial e}\frac{\partial e}{\partial \tau}}_{\text{effort effect}} + \underbrace{\phi(\tilde{y}|e)\left[\frac{\partial \tilde{y}}{\partial d}\frac{\partial d}{\partial \tau} + \frac{\partial \tilde{y}}{\partial \tau}\right]}_{\text{threshold effect}}. \tag{8}$$

The first term reflects the fact that, by influencing effort, parental transfers will change the likelihood that a borrower's earnings are below a particular verification threshold $\tilde{y}$, while the second term reflects the fact that parental transfers lead to an adjustment in the verification threshold itself.

When $\psi > G(\underline{y}, d^*; \tau)$, borrowers always repay in full, so both the "effort" and "threshold" effects are zero and marginal changes in parental transfers do not affect repayment behavior. There are also no "threshold" effects when $\psi < G(\theta, d^*; \tau)$. However, the "effort" effect is positive (assuming effort reduces the expected marginal utility of post-school consumption), since effort is strictly decreasing in transfers (Lemma 1) and $\Phi(y|e)$ is strictly decreasing in e (due to FOSD). In this case, the probability of making a reduced loan payment is strictly increasing in parental transfers. These results are summarized in the following proposition.

PROPOSITION 2: *If $\psi > G(\underline{y}, d^*; \tau)$, then the probability of making a reduced loan payment is zero and unaffected by a marginal change in parental transfers. If $\psi < G(\theta, d^*; \tau)$ and $\partial E[u'(c_2^*)|e^*]/\partial e < 0$, then the probability of making a reduced loan payment is strictly increasing in parental transfers.*

With moderate verification costs satisfying $G(\theta, d^*; \tau) < \psi < G(\underline{y}, d^*; \tau)$, parental transfers may raise or lower the likelihood of making reduced payments, since borrowers will adjust the verification threshold and the "effort" effect is ambiguous. If additional parental transfers lead to large increases in the verification threshold, then effort may increase and the probability of making a reduced income-based payment may fall.

A Test for the Presence of Verification Costs.—The previous subsection shows how verification costs affect the relationship between parental transfers and student loan repayment. These insights motivate a test for the presence of these costs.

When $\psi = 0$, the repayment decision (for those eligible for reduced payments) depends only on a comparison of $\xi(y)$ and Rd, so the verification threshold $\tilde{y}$ does not directly depend on parental transfers. Absent changes in effort, parental transfers would not affect repayment conditional on debt.[20] With population heterogeneity in initial wealth w and parental transfers τ, borrowers anticipating different transfer amounts may still borrow the same amount.[21] The following proposition shows that

[20] This result generalizes to multiple post-school periods of loan repayment. If $\psi = 0$, borrowers would choose to make the lowest payment in each period (assuming they cannot borrow at lower interest rates elsewhere), so effects of transfers on repayment behavior (conditional on debt) would be driven by changes in effort.

[21] This implicitly assumes that all individuals have the same earnings potential, or ability. Alternatively, these results would apply conditional on ability. Unobserved differences in ability are discussed in Section IIB.

among borrowers with the same debt, those receiving higher parental transfers will put forth less effort (due to the income effects discussed earlier) and will be more likely to make reduced loan payments.[22]

PROPOSITION 3: *Suppose* $\psi = 0$. *If* $\partial E[u'(c_2^*)|e^*]/\partial e < 0$ *for all* (e^*, c_2^*), *then among borrowers with the same level of debt, those with higher levels of parental transfers exert less effort and have a greater probability of making reduced income-based payments.*

Online Appendix E.2 shows that when $\psi = 0$, the condition $\partial E[u'(c_2)|e^*]/\partial e < 0$ is satisfied for all borrowers with low levels of debt $d^* \leq R^{-1}\xi(\theta)$. It is also satisfied for borrowers with higher levels of debt under fairly general conditions.[23] Important for our purposes, it is always satisfied when there is no exogenous eligibility limit θ on earnings alone. This is consistent with current US and Canadian student loan programs, which generally allow borrowers for whom the income-based payment is lower than the standard debt-based payment to apply for reduced payments.

Proposition 3 implies an empirically testable prediction for the presence of verification costs based on our cross-sectional data from Canada: if borrowers with higher levels of parental transfers (but the same debt) *do not* have a greater probability of making reduced income-based payments, then verification costs ψ must not be zero.[24] This test is easy to implement, since it only depends on the cross-sectional relationship between parental transfers and repayment choices.

One potential concern is that our test would be uninformative if borrowers with higher transfers always had a greater probability of applying for reduced payments, even when $\psi > 0$. Fortunately, this is not the case. In the presence of nonmonetary verification costs, the verification threshold will be lower for those with higher parental transfers. This can easily offset any incentives of higher parental transfers to reduce effort, resulting in a negative relationship between parental transfers and income-based payments. Our empirical results in Section III suggest that this is the case in our context, implying that verification costs are positive.

Heterogeneity in Ability.—The distribution of earnings may differ across individuals due to factors other than effort. Thus far, we have abstracted from such differences, or implicitly assumed that these factors (e.g., ability) can be observed and conditioned upon. Fortunately, it is straightforward to generalize our "test" for $\psi = 0$ to account for unobserved heterogeneity in ability by simply conditioning on post-school earnings as well as debt when examining the relationship between parental transfers and repayment behavior. To see why, notice that when $\psi = 0$, repayment choices

[22] Note that this proposition considers a comparison across borrowers with different levels of parental transfers who chose to borrow the same amount, while Lemma 1 and Proposition 2 report standard comparative statics results holding initial wealth constant.

[23] See footnote 19 or online Appendix E.

[24] The reverse need not be true: if borrowers with higher transfers have a greater probability of making reduced payments, ψ need not be zero. We also highlight that Proposition 3 applies regardless of any potential financial costs associated with income verification or enrollment in IDR plans, which can be incorporated in $\xi(y)$. Thus, a negative relationship between parental transfers and enrollment in IDR plans indicates the existence of nonmonetary verification costs but is silent on financial costs.

should be independent of parental transfers conditional on both debt and post-school earnings, since the repayment decision depends only on a comparison of $\xi(y)$ and Rd (among the eligible).[25] When $\psi > 0$, the probability that someone applies for reduced payments should be weakly decreasing in transfers (conditional on both debt and earnings), since the verification threshold is weakly decreasing in transfers.[26] This is what we observe in our data.

Incorporating Default.—Suppose individuals also have the option to stop paying their loans altogether (i.e., default), which entails monetary costs $\xi_D(y) \geq 0$ and nonmonetary costs $\psi_D \geq 0$, where we assume $0 \leq \xi_D'(y) < 1$. Monetary costs may reflect legal or collection fees, wage garnishments, etc., while nonmonetary costs may reflect stigma or other costs associated with a poor credit record (e.g., difficulty renting an apartment or obtaining a credit card). In this case, borrowers choose between repaying in full, applying for a reduced income-based payment, and default.

When the nonmonetary costs associated with both income-based payments and default are similar, the choice between them simplifies to the lesser of $\xi(y)$ and $\xi_D(y)$. There may be some earnings levels for which default is preferred and others for which the income-based payment is preferred.[27] As discussed further in online Appendix E.3, the choice between making the standard repayment versus making a reduced payment (i.e., default or reduced income-based payment) is quite similar to the problem without default, replacing $\xi(y)$ with the preferred reduced payment, $\min\{\xi(y), \xi_D(y)\}$. Under reasonable assumptions regarding the costs of default, effort continues to be declining in parental transfers when nonmonetary costs are high or low. Furthermore, among borrowers with the same debt, those with greater parental transfers should be more likely to make a reduced payment (either default or income-based payments) in the absence of nonmonetary costs of verification and default (i.e., $\psi_D = \psi = 0$).

Even with positive nonmonetary costs of default, if verification costs are zero (so $\psi_D > \psi = 0$), reduced payments should be more common among those with greater parental transfers as long as default is only preferred at low earnings levels (see online Appendix Table A1 for support of this condition).[28] Section III shows that the failure to make standard loan payments (due to default or income-based payments) is strongly declining in parental transfers. While this relationship is

[25] This result generalizes to multiple repayment periods as long as borrowers cannot borrow elsewhere at lower interest rates, the relevant case for our empirical context where interest rates are effectively zero for the vast majority of borrowers eligible for Canada's IDR plan, RAP. This result is also robust to unobserved heterogeneity across borrowers in terms of preferences for consumption and earnings dynamics, since borrowers always choose the lowest payment amount when $\psi = 0$.

[26] In the absence of measurement error, the probability of applying for a repayment reduction is one for earnings below $\tilde{y}$ and zero above, where $\tilde{y}$ is independent of τ when $\psi = 0$ and weakly decreasing in τ when $\psi > 0$. With classical measurement error in earnings (i.e., error independent of true earnings and debt), the probability of a repayment reduction conditional on debt and measured earnings will typically be between 0 and 1, but it will continue to be independent of τ when $\psi = 0$ and weakly decreasing in τ when $\psi > 0$.

[27] Instead, assuming $\xi(y) = \xi_D(y)$ and $\psi \neq \psi_D$, individuals would always prefer the option with the lesser nonmonetary cost. This yields the same reduced payment decision (default or income-based payments) for all earnings outcomes.

[28] Of course, if ψ_D is so high that nobody ever wants to default, then Propositions 2 and 3 apply directly.

partially explained by declines in delinquency/default with parental support (see online Appendix A), most of the decline is driven by reductions in income-based RAP enrollment. Altogether, the data suggest that income verification costs ψ are important.

Altruistic Parents and Endogenous Transfers.—Parental transfers are likely to be endogenous to their children's earnings. When parental wealth and altruism vary across families, parental transfers and *access to parental support* (defined as the value of transfers when own earnings equal $\underline{y}$) reflect a combination of both the means and willingness of parents to provide support. Online Appendix E.4 shows that when parents are altruistic toward their children, all previous qualitative results with respect to parental transfers apply directly to parental income. Because transfers are increasing in parental income for any given level of altruism, qualitative results with respect to exogenous parental transfers continue to apply to the level of *access to parental support* even when the transfers are endogenous. Our empirical analysis focuses on this relationship.

II. Data

To empirically study the relationship between financial resources available to borrowers and repayment decisions, we exploit both survey data and administrative data from the CSLP (Canada Student Loans Program 2010–2011).

The CSLP's Client Satisfaction Survey (CSS) is an annual telephone survey of roughly 2,700 borrowers of all ages (in-study and in-repayment).[29] This survey is traditionally used to gauge borrowers' general satisfaction with the CSLP program. However, for the years 2011 and 2012, we added new questions to the survey in an effort to understand why some people experience repayment problems for their student loan obligations while others do not. Most importantly, the survey collected unique information about available financial resources—not only borrowers' post-school earnings, but also their access to parental support and savings—in addition to standard background characteristics (e.g., gender, indigenous status, province of residence, educational attainment) and a novel measure informative about the perceived consequences of not repaying student loans. We merge data from the CSS with administrative records from the CSLP, which provide information on borrowers' loan balances and repayment outcomes (i.e., loan status) throughout the entire time they were clients. Administrative records also contain information about dependency status and parental income levels (for dependent students) at the time of student aid application.

[29] Survey response rates were 50 percent and 52 percent, respectively, in 2011 and 2012. The survey administrator conducted an analysis of nonresponse to see whether responders and nonresponders differed in the following dimensions relevant to our analysis: loan amount, repayment status (current, in arrears, on Interest Relief), institution type (private versus public), province, and age. Nearly all of these differences were statistically insignificant at the 5 percent level in both survey years; however, responders were 3–4 percentage points less likely to be in arrears in both surveys, suggesting that students having repayment problems are slightly underrepresented. See Phoenix Strategic Perspectives Inc. (2010–2011).

CSLP borrowers are not required to begin making payments on their loans until six months after leaving school. After this grace period, all CSLP loans are consolidated and repayment begins. While most borrowers enter loan repayment after a single period of schooling, some leave and return to school and may have multiple distinct repayment periods. We focus on repayment outcomes during the last repayment period observed in our data (as of two months after the CSS). Since repayment begins six months after borrowers leave school, our sample respondents have been out of school for at least eight consecutive months. To mitigate CSS sampling concerns associated with borrowers who have been out of school for many years, we limit our sample to borrowers who entered their most recent loan repayment period no more than two years prior to answering the CSS.[30] Thus, we analyze repayment behavior during the first two years after repayment begins. These borrowers are of particular interest, because most repayment problems surface relatively quickly. For example, 27 percent of recent CSLP borrowers entered RAP during their first two years of repayment, compared to only 1.5 percent first entering RAP over the next two years (Office of the Chief Actuary 2014). While borrowers can exit (and re-enter) RAP and delinquency/default, these states (and borrower income, as discussed below) are quite persistent from year to year. Finally, we restrict our sample to borrowers under age 30 to ensure a more homogeneous group of respondents.

Except where noted, we restrict our sample to the 689 borrowers who had administrative loan records, nonmissing responses to our main financial resource variables of interest, and other "baseline" variables likely to influence repayment. Sample weights are used for all calculations to account for stratified sampling by province, loan type, and repayment status (within the CSS sampling frame).

Based on administrative records, CSLP borrowers in our sample owed nearly $14,000, on average, at the beginning of their repayment period. This implies an average standard loan payment of about $1,850 per year given the 5.5 percent interest rate faced by most of these borrowers. Figure 1 shows that about 45 percent of borrowers owed less than $10,000, while nearly 25 percent owed $20,000 or more. Our main analysis uses an indicator for whether an individual currently has a CSLP loan repayment problem at the time of the CSS.[31] This variable takes a value of one if the administrative data indicates that the borrower is (i) delinquent/in default or (ii) receiving income-based repayment assistance through RAP.[32] Overall, 26 percent of borrowers experienced a repayment problem based on this definition.

[30] Unfortunately, the CSS does not survey borrowers who had fully repaid their loans nor those who were already in default (those in delinquency were surveyed). As discussed in online Appendix B, our sample of respondents in the first two years of repayment excludes less than 5 percent of the population who was already in default and about 10 percent who had already fully repaid their loans. These exclusions primarily reflect individuals who never made a payment or repaid immediately. Restricting the sample to respondents in the first year of repayment eliminates concerns about exclusion due to early default and reduces any sample selection due to early repayment in full. This restricted sample, while much smaller, yields very similar results to those presented in the paper (e.g., see online Appendix Table B1).

[31] The 2011 and 2012 CSS surveys took place in January and February of both years. We examine repayment status as of February 2011 and 2012.

[32] RAP reduces CSLP loan payments for eligible borrowers to "affordable" amounts no greater than 20 percent of gross family income. We discuss RAP further in Section IV and online Appendix D. In a few cases, respondents received very similar repayment assistance delivered through earlier programs referred to as Interest Relief (IR) and Debt Reduction in Repayment (DRR). We observe a very small number of defaults in our sample, since the sampling frame (which generally excluded borrowers in default) was determined a couple months before the CSS

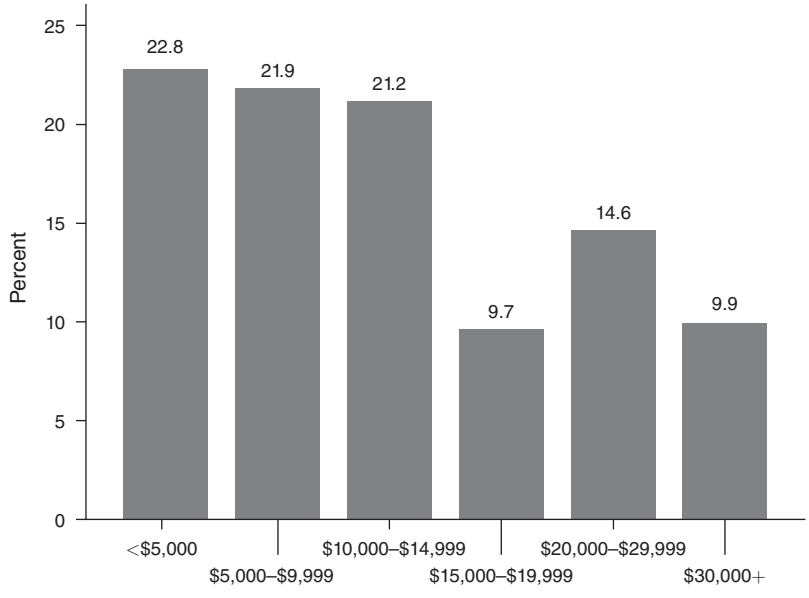

Figure 1. Distribution of Student Debt

This comprehensive measure of repayment problems is consistent with our conceptual framework, which emphasizes the choice between making the standard debt-based loan payment versus a reduced income-based amount with associated nonmonetary costs. Borrowers in delinquency or default (i.e., 9 or more months delinquent) are often subjected to wage garnishments, income tax offsets, and other financial penalties that are generally low but increasing in their earnings, much like income-based payments associated with RAP. Furthermore, delinquency/default may carry stigma or other nonmonetary penalties (e.g., contact with collection agencies, difficulties in renting due to a poor credit rating) analogous to the nonmonetary verification or application costs of repayment assistance. As discussed in Section IB, borrowers compare their utility under standard payment against the better of repayment assistance and delinquency/default. While we focus on this comprehensive measure of repayment problems, online Appendix A replicates our empirical analysis separately for (i) an indicator that includes only delinquency and default (experienced by 10 percent of our sample), and (ii) an indicator for those on RAP (experienced by 15 percent of our sample). The general conclusions associated with both of these outcomes are the same as those reported for our comprehensive measure.[33]

A borrower's own (and spouse's) earnings are the only financial resources taken into account by CSLP when determining the ability to repay student debt under

was administered. Our repayment problem indicator also includes less common nonpayment statuses like claim submitted, consumer proposal, and return-to-government.

[33] Although borrowers in RAP are considered in good standing by CSLP, evidence from the United States suggests that borrowers entering default versus IDR plans are expected to repay a similar share of their remaining debt over the rest of their lives (Department of Education 2017). Thus, from a program revenue point of view, there is likely little distinction between default and RAP enrollment.

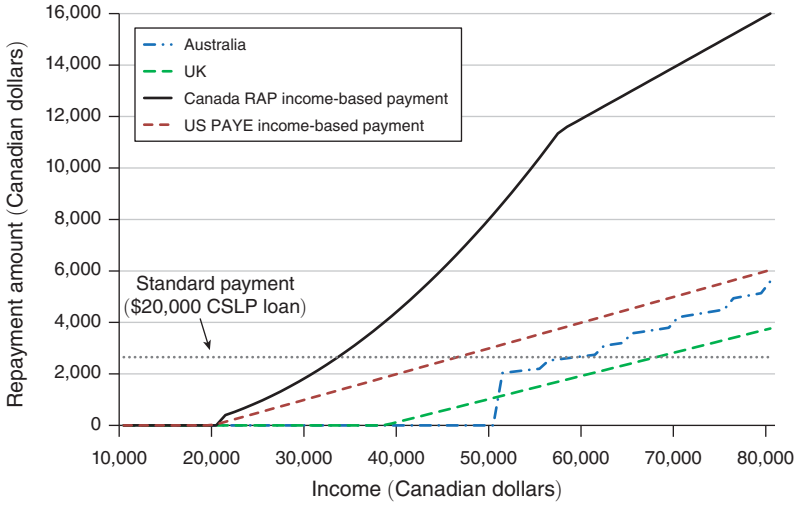

FIGURE 2. RAP AND OTHER COUNTRIES' INCOME-DRIVEN LOAN REPAYMENT FUNCTIONS

Notes: All currencies translated to Canadian dollars using September 2014 exchange rates. Repayments for Canada and the United States are for single childless persons and only reflect the income-contingent repayment amount, which may exceed the debt-based payment.

RAP. For example, enrollment in RAP would reduce loan payments to zero for borrowers earning less than $20,000. Income-based payment amounts under RAP (for single, childless borrowers) increase to about $1,900 annually ($150 monthly) for those earning $30,000. Figure 2 shows the RAP income-based payment schedule for single, childless borrowers, along with income-based repayment schedules in the United States, United Kingdom, and Australia.[34] Income-based payment amounts are highest under RAP (for borrowers earning over $20,000).

Figure 3 reports the distribution of current earnings in all available categories recorded by the CSS. Nearly half of our sample of recent school-leavers earned less than $20,000 annually, and about 85 percent earned less than $40,000. Many borrowers would have difficulty making their standard loan payments if their earnings were the only source of funds available to them.

Other financial resources may also play a crucial role in repayment decisions. Figure 4 reports the distributions for expected parental transfers and own savings, respectively, for all the categories used by the CSS. When asked how much parents or other family would be willing to give them if they needed money over the next six months, 30 percent reported that they could obtain at least $2,500.[35] Roughly half of the borrowers in our sample report at least $1,000 in savings. Combining

[34] Required payments under RAP are the lesser of the income-based amounts shown in Figure 2 and the standard debt-based amount. Section IVB and online Appendix D provide additional details on RAP and Figure 2.

[35] Specifically, the CSS asks: "If you needed money during the next six months, how much would parents or other family be willing and able to give you?" We focus on whether the borrower reports that he/she could expect to receive $2,500 or more from parents/family—a modest sum but enough to cover up to a year of typical monthly loan payments. In online Appendix C, we consider a broader measure of parental assistance that includes the ability of students to move back in with their parents. Based on this broader measure of parental assistance, approximately 85 percent of all borrowers can count on financial transfers of at least $2,500, can

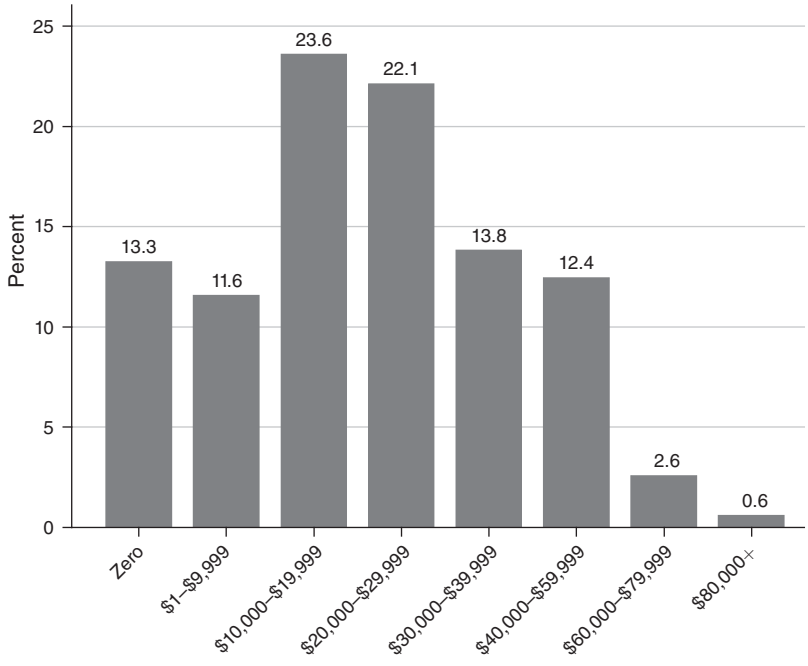

FIGURE 3. DISTRIBUTION OF BORROWER'S CURRENT ANNUAL EARNINGS

these additional sources of support, 63 percent of respondents have access to at least $2,500 in parental transfers or $1,000 in savings, while only 19 percent have access to both.

Since other data sources do not contain direct measures of student borrowers' parental support and savings, previous studies have sometimes considered the roles of dependency status and parental income at the time students applied for aid (Lochner and Monge-Naranjo 2015). About 40 percent of our sample attended school as a dependent student. Among these students, average annual parental income was about $46,000 with 30 percent having income below $25,000.

Descriptive statistics for other variables used in our analysis, referred to as "baseline determinants," are reported in Table 1. In terms of background characteristics, our sample contains more women than men, has an average age of 24, and contains 8 percent indigenous persons. Roughly 40 percent of borrowers had earned at least a university degree (from four-year institutions), with only 14 percent of our sample having attended a private for-profit institution (typically a vocational/technical school). The CSS contains a unique survey question eliciting beliefs about the importance of repaying student loans. Specifically, the survey asks borrowers which type of loan (e.g., CSLP, credit cards, home mortgage) they would stop repaying first if financial difficulties prevented them from repaying them all. Table 1 shows that roughly 40 percent of all respondents say they would stop paying their CSLP loans first.

move back in with their parents, or already live with them. Results using this alternative measure are qualitatively consistent with those discussed in the paper.

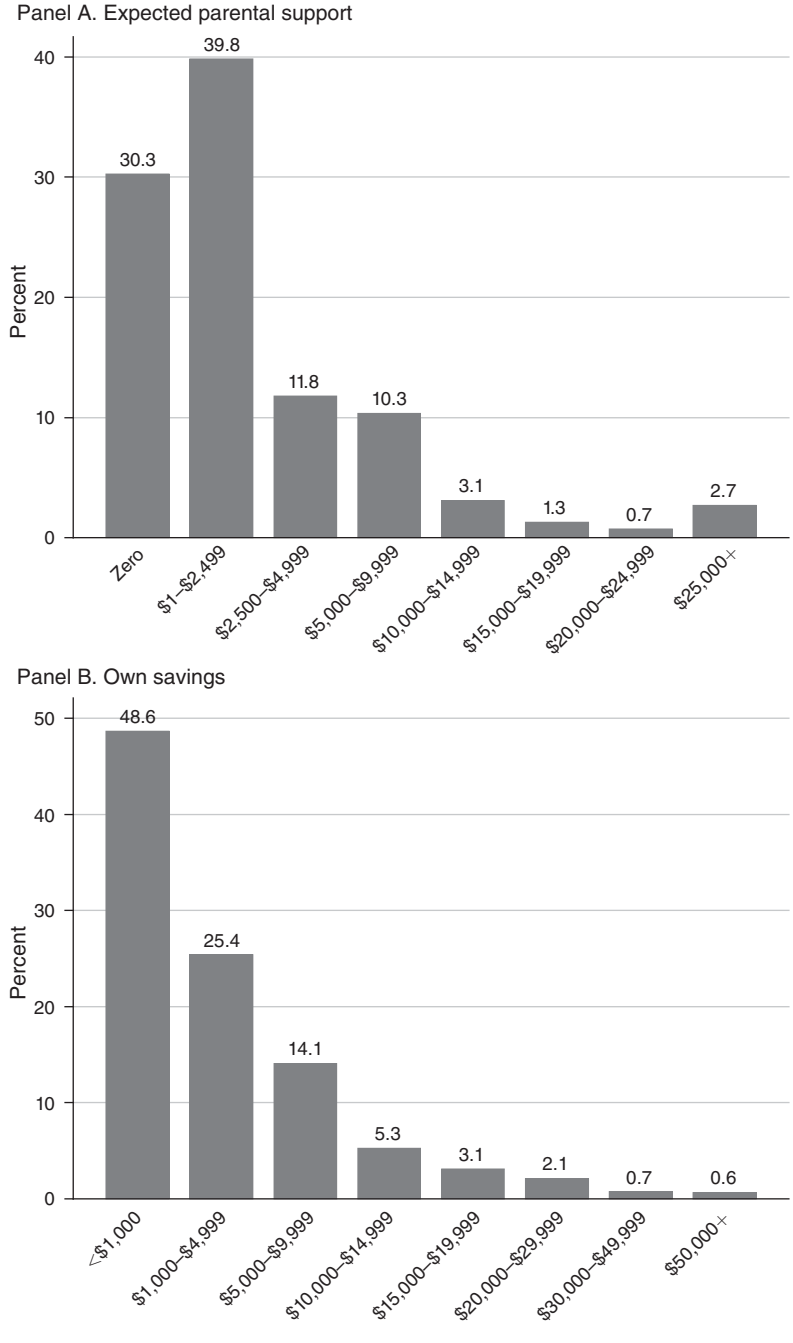

FIGURE 4. DISTRIBUTION OF EXPECTED PARENTAL TRANSFERS AND OWN SAVINGS

III. Empirical Importance of Financial Resources for Student Loan Repayment

This section examines the empirical importance of financial resources for student loan repayment, emphasizing the roles of expected parental transfers and personal

Table 1—Descriptive Statistics for Baseline Determinants of Repayment

Variables	Mean	Standard error
Vocational/technical school graduate or more	0.793	0.028
4-year university graduate or post-graduate degree	0.416	0.033
Would stop paying CSLP loan first if unable to repay all loans	0.418	0.033
Male	0.421	0.033
Age	23.720	0.193
Indigenous	0.083	0.018
Private for-profit postsecondary institution (CSS loan type)	0.139	0.014

Notes: Based on main sample of 689 individuals with nonmissing responses to baseline determinants, current earnings, expected parental support, and savings. Sample weights used in calculating all statistics.

savings. The relationship between these financial resources and repayment (for individuals with the same level of debt) provides new evidence about the types of informal insurance individuals may have against poor labor market outcomes after leaving school. As detailed in Proposition 3, this relationship is also informative about the presence of nonmonetary costs of applying for and enrolling in repayment assistance. We consider the implications of these costs for student loan policy in Section IV.

A. *Parental Transfers and Savings*

Table 2 documents the probability that borrowers experience repayment problems by student debt and our three measures of available resources: post-school earnings, expected parental transfers, and personal savings. For all debt levels (and overall), repayment problems are decreasing in available resources. Overall, repayment problems for borrowers earning less than $20,000 (41.0 percent) are almost three times more likely than those earning $20,000–$40,000 (15.3 percent) and 17 times more likely than those earning more than $40,000 (2.4 percent). Borrowers who have expected parental transfers of less than $2,500 are three times as likely to experience a repayment problem as those who can expect at least $2,500 in help if they need it (32.2 percent versus 10.5 percent). Finally, borrowers with little or no savings (less than $1,000) are five times as likely to experience a repayment problem as those with at least $1,000 in savings (43.7 percent versus 8.7 percent). Not surprisingly, repayment problems are particularly severe for borrowers with few available resources and high student debt levels.

Recognizing that these different types of resources may be correlated with each other, as well as other factors that determine loan repayment, we estimate a linear probability model in which repayment problems are allowed to depend on our resource measures as well as student debt, educational attainment, reported beliefs about the importance of repaying student loans, whether the borrower had attended a private postsecondary institution, province indicators, and demographic variables. The "baseline determinants" may affect repayment behavior conditional on debt and financial resources due to individual differences in expected costs associated with delinquency, default, or enrolling in repayment assistance.

Table 2—Repayment Problems at CSS by Earnings, Expected Parental Transfers, and Savings

	CSLP debt at consolidation			
	<$10,000	$10,000–19,999	$20,000+	All
Panel A. By current earnings				
Earnings < $20,000	0.309	0.374	0.790	0.410
	(0.054)	(0.077)	(0.093)	(0.043)
$20,000 ≤ earnings < $40,000	0.076	0.264	0.165	0.153
	(0.024)	(0.093)	(0.051)	(0.033)
Earnings ≥ $40,000	0.037	0.003	0.029	0.024
	(0.037)	(0.004)	(0.019)	(0.016)
Panel B. By expected parental support				
Expected parental transfer < $2,500	0.294	0.299	0.395	0.322
	(0.047)	(0.058)	(0.067)	(0.032)
Expected parental transfer ≥ $2,500	0.036	0.223	0.167	0.105
	(0.017)	(0.107)	(0.070)	(0.032)
Panel C. By savings				
Savings < $1,000	0.340	0.439	0.669	0.437
	(0.056)	(0.077)	(0.086)	(0.042)
Savings ≥ $1,000	0.045	0.094	0.142	0.087
	(0.018)	(0.041)	(0.040)	(0.018)
Sample size	289	198	202	689

Notes: Based on main sample of individuals with nonmissing responses to baseline determinants, current earnings, expected parental support, and savings. Sample weights used in calculating all statistics.

Table 3 reports least squares estimates of the linear probability model for several different specifications.[36] In column 1, we exclude all forms of available resources to see how student debt and our "baseline determinants" influence repayment. Column 2 also includes indicators for all available categories of the borrower's current earnings. Consistent with the model of Section I and previous research (Gross et al. 2009, Lochner and Monge-Naranjo 2015), the probability of a repayment problem is significantly increasing in student debt.[37] The estimated effect of graduating university with a four-year degree (or more) is moderate when not accounting for earnings, but it becomes small and statistically insignificant once we condition on post-school earnings in column 2. This is not surprising, since one would expect that educational attainment largely affects repayment through earnings and accumulated debt. Repayment problems are more likely among borrowers who attended a private for-profit postsecondary institution even after conditioning on post-school earnings. Other "baseline determinants," including reported beliefs about the importance of student loan repayment, have only modest and statistically insignificant effects on repayment problems.

We are mainly interested in the role of financial resources. Column 2 of Table 3 shows that even after conditioning on student debt, schooling, and many other factors, we estimate strong effects of the borrower's own earnings on student loan repayment

[36] Average marginal effects from analogous Probit models are similar.

[37] Specifications that control for indicators for all student debt categories shown in Figure 1 instead of debt and debt-squared yield very similar estimates for all other coefficients and suggest that borrowers with at least $30,000 in debt are about 20 percentage points more likely to experience repayment problems than borrowers with less than $5,000 in debt.

Table 3—Estimates for Probability of a Repayment Problem

Variables	(1)	(2)	(3)	(4)	(5)
Constant	0.145	−0.514	0.450	−0.116	−0.118
	(0.239)	(0.237)	(0.233)	(0.244)	(0.244)
CSLP loan amount outstanding at consolidation (in $10,000)	0.143	0.127	0.108	0.097	0.097
	(0.051)	(0.045)	(0.045)	(0.043)	(0.043)
CSLP loan amount (in $10,000) squared	−0.013	−0.010	−0.010	−0.008	−0.008
	(0.010)	(0.008)	(0.009)	(0.008)	(0.008)
Vocational/technical school graduate or more	−0.010	−0.004	0.008	0.015	0.019
	(0.075)	(0.072)	(0.069)	(0.067)	(0.066)
4-year university graduate or post-graduate degree	−0.128	−0.051	−0.036	−0.002	−0.003
	(0.063)	(0.064)	(0.059)	(0.059)	(0.058)
Would stop paying CSLP loan first if unable to repay all loans	0.063	0.067	0.059	0.062	0.061
	(0.052)	(0.049)	(0.046)	(0.044)	(0.043)
Male	−0.027	0.015	0.037	0.054	0.059
	(0.050)	(0.049)	(0.047)	(0.047)	(0.047)
Age	−0.004	0.014	−0.006	0.008	0.010
	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Indigenous	0.061	0.066	−0.008	0.002	−0.010
	(0.105)	(0.104)	(0.088)	(0.095)	(0.093)
Private for profit postsecondary institution (CSS loan type)	0.116	0.092	0.064	0.055	0.051
	(0.056)	(0.054)	(0.056)	(0.054)	(0.054)
Current earnings: none		0.549		0.449	0.440
		(0.092)		(0.085)	(0.086)
Current earnings: $1 to less than $10,000/year		0.438		0.324	0.290
		(0.086)		(0.082)	(0.086)
Current earnings: $10,000/year to less than $20,000/year		0.365		0.259	0.241
		(0.067)		(0.062)	(0.062)
Current earnings: $20,000/year to less than $30,000/year		0.143		0.095	0.093
		(0.051)		(0.054)	(0.052)
Current earnings: $30,000/year to less than $40,000/year		0.090		0.097	0.085
		(0.058)		(0.058)	(0.056)
Expected parental transfer ≥ $2,500			−0.144	−0.139	−0.253
			(0.044)	(0.043)	(0.082)
Savings ≥ $1,000			−0.323	−0.251	−0.311
			(0.050)	(0.048)	(0.061)
Has both savings ≥ $1,000 and parental transfer ≥ $2,500					0.195
					(0.094)
R^2	0.088	0.227	0.233	0.312	0.321

Notes: Linear probability model estimated using OLS. Specifications also include indicators for CSS cohort and province. Based on main sample of 689 individuals with nonmissing responses to baseline variables, current earnings, expected parental support, and savings. Sampling weights are used. Robust standard errors in parentheses.

problems, with a sizeable jump occurring around $20,000. Borrowers with no earnings, borrowers with yearly earnings between $1 and $10,000, and borrowers with yearly earnings between $10,000 and $20,000 are 55 percentage points, 44 percentage points, and 37 percentage points, respectively, more likely to experience a repayment problem than borrowers earning more than $40,000 (the omitted category).[38]

[38] Using very similar data from the CSLP's Defaulter Survey, we have previously shown that defaulters are significantly more likely to return to good standing if they experience increases in earnings relative to when they entered default (Lochner, Stinebrickner, and Suleymanoglu 2013).

Despite the importance of post-school earnings for student loan repayment, nearly 60 percent of borrowers with annual earnings below $20,000 still manage to make timely CSLP payments (see Table 2). Our theoretical analysis in Section IB suggests that other resources not taken into account by the CSLP (in determining income-based payments) may explain why. The next few columns of Table 3 demonstrate that additional resources in the form of parental support and personal savings also play critical roles in enabling repayment.

Column 3 includes measures of access to parental support (at least $2,500) and personal savings (at least $1,000), in addition to the baseline determinants (without controlling for own post-school earnings). Both access to parental support and savings substantially reduce the likelihood of repayment problems.[39] Highlighting the importance of these additional resources, the R^2 statistics at the bottom of the table reveal that accounting for savings and parental support explains a similar share of the variation in repayment problems, as does accounting for the borrower's own earnings (i.e., compare columns 2 and 3). In column 4, we simultaneously control for post-school earnings, parental support, and savings. Access to parental support reduces the likelihood of a repayment problem by 14 percentage points, while access to savings reduces the likelihood by 25 percentage points. The estimates in column 5 suggest that the added benefit from having access to both parental support and savings (versus just one of these) is modest. Relative to having access to neither savings nor parental support, having access to only parental support reduces the likelihood of a repayment problem by 25 percentage points, having access to only savings reduces the likelihood of a repayment problem by 31 percentage points, and having access to both reduces the likelihood of a repayment problem by 37 $(= 25.3 + 31.1 - 19.5)$ percentage points.

Consistent with our theoretical framework, Figure 5 shows that parental support and savings are particularly important for borrowers with low post-school earnings. Only 4 percent of low-earning borrowers (i.e., borrowers earning less than $20,000) with access to both parental assistance and savings experience repayment problems. However, the rate of repayment problems is much higher, 26 percent, for low-earning borrowers with access to only one form of additional financial resources (i.e., parental assistance or savings, but not both), and nearly 60 percent of low-earning borrowers with access to neither parental support nor savings experience a repayment problem.

Among borrowers earning at least $20,000, Figure 5 shows that only 5 percent with access to both parental assistance and savings and 7 percent of those with access to only one of these additional resources experience repayment problems. Among these higher-earning borrowers with neither parental support nor savings, repayment problems are more common at 31 percent, but still much less common than among their low-earning counterparts. While these results suggest a role for parental assistance and savings in reducing repayment problems even among those

[39] It is possible that some borrowers may have avoided repayment problems up until the CSS survey date due to prior parental support and/or savings but may have since exhausted those resources. This would cause us to underestimate the importance of these resources; however, any attenuation is likely to be small, since we estimate very similar effects for borrowers in their first year of repayment (see online Appendix Table B1).

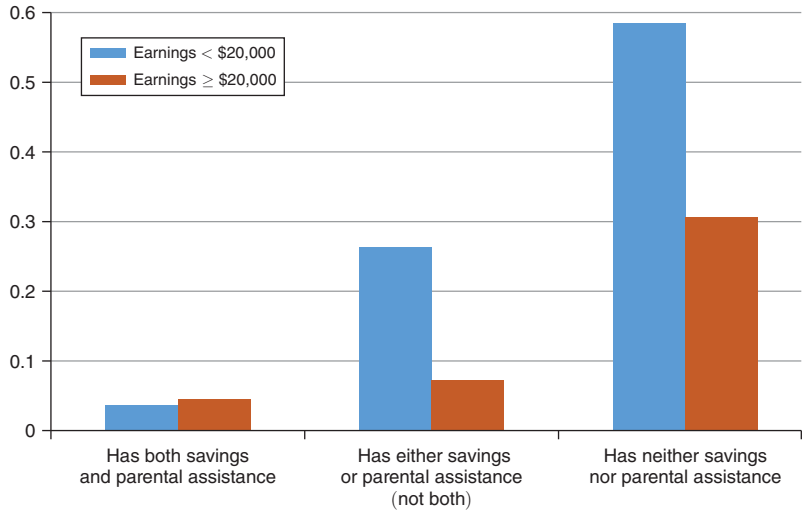

FIGURE 5. PROBABILITY OF REPAYMENT PROBLEMS AT CSS BY EARNINGS AND OTHER FINANCIAL RESOURCES

Notes: "Savings" implies savings of at least $1,000. "Parental Assistance" implies expected parental transfers of at least $2,500. Sampling weights are used.

with moderate to high earnings, that role is considerably muted relative to that observed for those with lower earnings. In particular, the added benefit from access to a second form of additional resources (i.e., both savings and parental support versus just one) is negligible for higher earners.

In Table 4, we estimate the importance of parental assistance and savings for low-earning borrowers (less than $20,000/year) accounting for other possible determinants of repayment problems (as studied previously in Table 3). Consistent with Table 3 and Figure 5, we estimate that both parental transfers and savings substantially reduce the likelihood of repayment problems. Based on the estimates in column 2, relative to having access to neither parental support nor savings, having access to only parental support decreases the likelihood of a repayment problem by 22 percentage points, having access to only savings decreases the likelihood of a repayment problem by 41 percentage points, and having access to both decreases the likelihood of a repayment problem by 49 percentage points.

Altogether, these results suggest that parental assistance and savings serve as critical sources of "insurance" for many borrowers in the event that they experience periods of low earnings or unemployment after leaving school. Borrowers with low earnings and no access to other resources (from savings or parents) are more likely than not to experience some form of repayment problem. However, low earners with modest savings and parental support are very unlikely to experience repayment problems. In light of Proposition 3, these results suggest that nonmonetary verification/application costs are an important factor in repayment decisions.[40] We explore the policy implications of these costs in Section IV.

[40]The strong relationship between savings and repayment problems could also indicate heterogeneity in verification/application costs, since borrowers with high costs of nonpayment will tend to save more to ensure that

Table 4—Estimates for Probability of a Repayment Problem: Low-Earnings Borrowers

Variables	(1)	(2)
Constant	0.469	0.449
	(0.427)	(0.426)
CSLP loan amount outstanding at consolidation (in $10,000)	0.241	0.247
	(0.078)	(0.077)
CSLP loan amount (in $10,000) squared	−0.022	−0.023
	(0.013)	(0.012)
Vocational/technical school graduate or more	−0.020	−0.022
	(0.092)	(0.092)
4-year university graduate or post-graduate degree	0.155	0.166
	(0.093)	(0.092)
Would stop paying CSLP loan first if unable to repay all loans	0.070	0.072
	(0.073)	(0.071)
Male	−0.008	−0.008
	(0.077)	(0.076)
Age	−0.003	−0.001
	(0.019)	(0.019)
Indigenous	0.029	0.021
	(0.141)	(0.142)
Private for profit postsecondary institution (CSS loan type)	0.083	0.082
	(0.077)	(0.077)
Current earnings $<$ $10,000/year	0.143	0.140
	(0.072)	(0.071)
Expected parental transfer $\geq$ $2,500	−0.150	−0.224
	(0.082)	(0.129)
Savings $\geq$ $1,000	−0.376	−0.413
	(0.072)	(0.082)
Has both savings $\geq$ $1,000 and parental transfer $\geq$ $2,500		0.146
		(0.155)
Observations	356	356
R^2	0.374	0.377

Notes: Linear probability models estimated using OLS. Specifications also include indicators for CSS cohort and province. Sample includes respondents with earnings less than $20,000 per year and is restricted to those with nonmissing responses to baseline variables, current earnings, expected parental support, and savings. Sampling weights are used. Robust standard errors in parentheses. Columns 1 and 2 correspond to columns 4 and 5, respectively, of Table 3.

B. *Parental Income and Repayment Problems*

Sections I and IIIA, respectively, describe the conceptual and empirical importance of our novel measure of parental transfers. Given that parental income is often observed in administrative data, it is natural to examine whether it can serve as an effective proxy for parental transfers.

they can continue to repay in full if they experience low earnings. Any correlation between unobserved verification costs and observed characteristics would lead to spurious correlation between these characteristics and repayment problems; however, the insignificant effects of most baseline determinants (especially the likelihood of not repaying CSLP loans if unable to repay all loans, which we might expect to be correlated with any verification/application costs) suggests that heterogeneity in verification costs is likely to be quite modest. Regardless, heterogeneity in these costs would indicate that they are important for at least some borrowers.

TABLE 5—ESTIMATED EFFECTS OF PARENTAL INCOME ON REPAYMENT PROBLEMS

Variables	Full sample	Subsample with expected parental transfers = 0	Subsample with expected parental transfers ≥ 0
Constant	−0.544	−1.469	−0.192
	(0.232)	(0.414)	(0.264)
CSLP loan amount outstanding at consolidation (in $10,000)	0.157	0.231	0.122
	(0.046)	(0.082)	(0.057)
CSLP loan amount (in $10,000) squared	−0.013	−0.028	−0.006
	(0.008)	(0.014)	(0.010)
Vocational/technical school graduate or more	0.010	−0.084	−0.001
	(0.072)	(0.109)	(0.093)
4-year university graduate or post-graduate degree	−0.046	−0.174	0.014
	(0.064)	(0.123)	(0.076)
Would stop paying CSLP loan first if unable to repay all loans	0.068	0.162	0.054
	(0.048)	(0.086)	(0.059)
Male	0.031	0.025	0.051
	(0.048)	(0.085)	(0.062)
Age	0.015	0.049	0.001
	(0.010)	(0.016)	(0.013)
Indigenous	0.044	−0.173	0.208
	(0.098)	(0.146)	(0.130)
Private for profit postsecondary institution (CSS loan type)	0.080	0.070	0.074
	(0.054)	(0.111)	(0.062)
Current earnings: none	0.553	0.670	0.528
	(0.089)	(0.182)	(0.105)
Current earnings: $1 to less than $10,000/year	0.432	0.622	0.402
	(0.086)	(0.160)	(0.107)
Current earnings: $10,000/year to less than $20,000/year	0.366	0.589	0.326
	(0.067)	(0.143)	(0.079)
Current earnings: $20,000/year to less than $30,000/year	0.145	0.214	0.138
	(0.051)	(0.108)	(0.063)
Current earnings: $30,000/year to less than $40,000/year	0.100	0.189	0.053
	(0.058)	(0.125)	(0.065)
Dependent student with parental income < $25,000	−0.089	−0.028	−0.083
	(0.077)	(0.121)	(0.094)
Dependent student with parental income ≥ $25,000	−0.133	0.002	−0.142
	(0.064)	(0.134)	(0.079)
R^2	0.239	0.373	0.233
Sample size	689	207	482

Notes: Linear probability models for repayment problems estimated using OLS. Specifications also include indicators for CSS cohort and province. Based on main sample of individuals with nonmissing responses to baseline variables, current earnings, expected parental support, and savings. Sampling weights are used. Robust standard errors in parentheses.

Table 5 reports estimates from regressions of repayment problems analogous to those of columns 4 and 5 of Table 3, replacing measures of expected parental transfers and savings with measures of parental income at the time students applied for aid. The omitted parental income category is the group of independent students for whom no parental income information is available. Thus, the estimated effects of income for dependent students are relative to all independent students. Column 1 of Table 5 reports estimates from the full sample and reveals that differences in

repayment problems by parental income are modest. Compared to independent students, dependent students with annual parental income of at least $25,000 (at the time they applied for aid) are about 13 percentage points less likely to experience a repayment problem. The difference in repayment problems among dependent students from lower versus higher parental income backgrounds is much smaller (about 4 percentage points). Comparing the R^2 for this specification (0.239) with that reported in column 2 of Table 3 (0.227) suggests that accounting for parental income explains relatively little of the variation in repayment across borrowers with similar backgrounds, debt, and earnings.[41] This contrasts sharply with the specifications in columns 4 and 5 of Table 3, which account for differences in expected parental transfers and savings and show substantially greater R^2 statistics (0.312 and 0.321, respectively).

Why is parental income so much less predictive of repayment problems than expected transfers and savings? In addition to the fact that parental incomes may change between the time students apply for aid and the first few years of loan repayment, post-school parental support need not be tightly linked to parental income. Parental transfers are not only based on parents' ability to help their children, which would tend to be reflected in parental income, but they also depend on parents' willingness to help, which would not necessarily be reflected in parental income. Indeed, column 2 of Table 5 shows that parental income is irrelevant for repayment among the subset of borrowers who do not expect any support from their parents, while column 3 shows that parental income reduces repayment problems among those borrowers who report that they could receive at least some support from their parents if they needed it. Altogether, this evidence suggests that parental income (at least when students first apply for aid) is, at best, a weak proxy for actual post-school parental support.

IV. Implications for Canada's Repayment Assistance

The importance of parental support and savings for student loan repayment has direct implications for the design of government student loan programs. Most notably, it suggests that the costs of earnings verification (or repayment assistance take-up more generally) are likely to be sizeable. Concerns about these costs have led some to call for streamlining the IDR application process or abolishing it altogether (as in Australia and the United Kingdom) through automatic enrollment (Dynarski and Kreisman 2013, Government Accountability Office 2015).

We begin this section by using the economic model developed earlier to analyze the implications of reducing or eliminating verification/application costs. We then use our administrative and CSS data on student borrowing, repayment, and earnings, as well as longitudinal data on student debt and earnings from Canada's Survey of Labour and Income Dynamics (SLID) to empirically study the implications of

[41] Controlling for additional parental income categories does not change this conclusion. For example, the R^2 statistic is unchanged (to the third decimal place) when adding another indicator for parental income of at least $50,000.

making enrollment in the CSLP's RAP automatic. We refer to this potential program as "Universal RAP."

A. *The Economics of Lowering or Eliminating Verification Costs*

Using the model of government student loan programs developed in Section IB, we first study the effects of reducing verification costs ψ on repayment behavior. We then discuss the effects of eliminating verification costs on economic welfare.

Effects on Repayment.—The effects of verification costs on the probability of applying for income-based payments are given by the following:

$$(9) \qquad \frac{\partial \Phi\big(\tilde{y}(d;\tau,\theta,\psi)|e\big)}{\partial \psi} = \phi\big(\tilde{y}|e\big)\frac{\partial \tilde{y}}{\partial \psi} + \phi\big(\tilde{y}|e\big)\frac{\partial \tilde{y}}{\partial d}\frac{\partial d}{\partial \psi} + \frac{\partial \Phi\big(\tilde{y}|e\big)}{\partial e}\frac{\partial e}{\partial \psi}.$$

Consider, first, the short-term impacts of lowering verification costs ψ on borrowers who have already entered the labor market. Their debt and effort choices have already been made. Only the first (direct) effect of ψ on the threshold $\tilde{y}$ in equation (9) applies to these borrowers, so $d\Phi/d\psi \leq 0$ since an increase in ψ reduces $\tilde{y}$ whenever $G(\theta,d;\tau) < \psi < G(\underline{y},d;\tau)$.

In the long term, new borrowers will be affected by a reduction in ψ, adjusting their borrowing and effort choices. The following proposition shows that if the Monotone Likelihood Ratio Property (MLRP) holds and the density at the earning threshold amount $\tilde{y}$ is increasing in effort (i.e., $\tilde{y}$ is not too low), then debt is decreasing and effort is increasing in verification costs.[42] Effort is also increasing in verification costs for eligible borrowers that always apply for reduced income-based payments.

PROPOSITION 4: *Suppose the MLRP holds for* $\Phi(y|e)$ *and* $\partial\phi(\tilde{y}|e)/\partial e \geq 0$. *Then, borrowing is strictly decreasing in verification costs* $(\partial d/\partial\psi < 0)$ *if* $d < d_{\max}$, *and effort is strictly increasing in verification costs* $(\partial e/\partial\psi > 0)$.

Intuitively, an increase in verification costs encourages effort, since exerting higher effort reduces the likelihood that earnings are low and verification is needed (holding constant the verification threshold). Borrowers also reduce their verification threshold when $G(\theta,d;\tau) < \psi < G(\underline{y},d;\tau)$. As long as increases in borrowing do not strongly encourage effort, the reduction in $\tilde{y}$ further encourages effort and discourages borrowing. The stated conditions ensure that this is the case.

It is now straightforward to see from equation (9) how changes in verification costs affect the probability of a repayment reduction in the long term when borrowing and effort respond. Among borrowers with $\psi < G(\theta,d;\tau)$, $\tilde{y} = \theta$ is fixed and increases in verification costs reduce the likelihood of a repayment reduction through an increase in effort: $d\Phi(\tilde{y}|e)/d\psi = (\partial\Phi(\tilde{y}|e)/\partial e)(\partial e/\partial\psi) < 0$. Among

[42] Intuitively, the MLRP implies that higher effort is more likely to have been exerted when observing higher earnings values. Formally, it requires $(\partial/\partial y)[(\partial\phi(y|e)/\partial e)/\phi(y|e)] > 0$.

borrowers with $G(\theta, d; \tau) < \psi < G(\underline{y}, d; \tau)$, if the MLRP holds and $\phi(\tilde{y}|e)$ is increasing in effort, then an increase in verification costs will cause them to lower their verification threshold (directly due to the increase in ψ and indirectly due to reductions in borrowing). This, along with an increase in effort, reduces the likelihood that they apply for a payment reduction.

Except for borrowers with $G(\underline{y}, d; \tau) < \psi$ who always repay the standard amount, a decline in nonmonetary verification costs will typically lead to an increase in the use of income-based payments. The long-term effects of such a change are likely to be greater than the short-term effects, since new borrowers will respond by increasing the amount they borrow and reducing their effort during school or in the labor market. Both of these effects further increase the use of income-based payments.

Welfare Effects.—The implied reductions in repayment amounts present an important challenge for initiatives that reduce verification costs within the existing student loan system.[43] If student loan programs are to remain revenue neutral, the losses must be made up elsewhere. We assume that revenue losses would be compensated for by raising the interest rate.[44]

In this case, there are several efficiency considerations associated with eliminating verification (and other IDR application) costs. Lowering verification costs would directly benefit all borrowers who would sometimes choose lower income-based payments. This benefit must be weighed against the costs associated with higher interest rates imposed on those who repay in full. With heterogeneity in earnings potential, borrowers with high expected earnings would face a higher expected repayment. For some borrowers, this additional cost may outweigh the benefits of reduced verification costs in low-earnings states. Even with all borrowers ex ante identical, it is possible that a poorly structured loan program with easy eligibility criteria and modest income-based payments would result in few borrowers repaying in full at very high interest rates. Even ignoring any overborrowing in such an environment, it is possible that imposing modest nonmonetary verification costs would encourage enough borrowers to repay their loans in full, allowing for significant reductions in interest rates. Indeed, the following proposition shows that $\psi > 0$ can be efficient under a student loan program that offers pure forgiveness when earnings are low (i.e., $\xi(y) = 0$ for all $y < \theta$).

PROPOSITION 5: *Assume ex ante identical agents, quadratic preferences, and no moral hazard. Under a break-even student loan program with pure forgiveness and a low-eligibility threshold* $\theta > \underline{y}$, *it is efficient to impose strictly positive verification costs if optimal debt* (*when* $\overline{\psi} = 0$) *exceeds* $2\beta E[y - \underline{y}]$.

[43] For simplicity, this discussion abstracts from the option of default. If verification costs were eliminated, some borrowers currently in default might make reduced income-based payments instead. As shown below, the potential revenue implications of this are likely to be quite small in Canada, since most borrowers in default have low earnings and face very low (or zero) income-based payments.

[44] Alternatively, other changes in the structure of repayments (e.g., eligibility threshold or income-based repayment amounts) could be made to collect more revenue. We discuss this further below.

Online Appendix E.6 provides a proof of this result, as well as additional details on the tradeoffs relevant to the optimal choice of ψ in the general case.

The potential welfare value of $\psi > 0$ derives from two key shortcomings of the current system.[45] First, the failure to account for parental transfers means that it may be welfare-improving to exclude youth from rich families from income-based payments, since they gain little from the implied insurance. Imposing nonmonetary verification costs is one way to do this.[46] Second, even if transfers were zero for everyone, the structure of loan contracts could be inefficient with "too many" borrowers eligible for and taking up the reduced income-based payments. Verification costs can be used to reduce the set of borrowers who choose to apply.[47]

Of course, imposing nonmonetary verification costs (e.g., lengthy and complicated application forms, waiting periods) is a socially wasteful means to exclude some borrowers from payment reductions. Adjustments in repayment functions $\xi(y)$ and/or the eligibility threshold θ are likely to be more efficient; however, by themselves, such changes cannot easily address the issue of targeting assistance primarily to borrowers without external support. In Section V, we discuss the design of loan contracts that address the shortcomings of current student loan programs by efficiently setting loan limits, standard payments, payment reductions, and the eligibility/verification threshold based on all available information.

B. *Effects of Moving to a "Universal RAP" on Loan Repayments*

Since the efficiency implications of eliminating verification and other RAP enrollment costs are likely to depend heavily on how such a policy would impact CSLP revenue, we empirically examine how payments (based on earnings and debt levels) would change if all borrowers were automatically enrolled in RAP.[48] We refer to this as "Universal RAP."

Two groups of borrowers would be most directly affected by such a move. First, many low-earning borrowers may see their payments reduced. Under the current system, many of these borrowers make their standard payments even though they are eligible for much lower (or zero) payments under RAP. This may reflect high costs associated with RAP enrollment or a lack of information about the program coupled with access to other resources like parental support or savings that make lower payments unnecessary. Second, some low-earning borrowers that are currently

[45] This discussion assumes that lenders could eliminate verification costs for borrowers without incurring any new expenses. Of course, some costs are likely inherent to the verification process or might not be freely eliminated. In this respect, it is notable that government student loan programs in both Canada and the United States do not take advantage of information about borrower's earnings already collected by the government in other contexts (e.g., for purposes of taxation, social security, unemployment insurance). By contrast, loan collections in Australia are done in concert with the tax system.

[46] See Nichols and Zeckhauser (1982) for a related discussion of targeting transfers for redistribution purposes.

[47] See Diamond (1984) for a related point on the potential value of imposing nonpecuniary penalties (not captured by lenders) as an efficient way to improve loan contracts. Unlike the current setting, he considers the efficient design of contracts constrained by non-negative consumption for borrowers.

[48] Note that automatic enrollment would not only alleviate enrollment costs associated with applying for and participating in RAP, but it would also alleviate concerns that some eligible borrowers are unaware of the option. This can be viewed as an extension of several recent CSLP initiatives meant to streamline application for and to facilitate use of RAP.

delinquent or in default may instead choose to make lower income-based payments. The main revenue implications of moving to a "Universal RAP" program, therefore, depend on the balance of reduced payments from low-earning borrowers currently making standard payments against the potential increased revenue from encouraging current delinquents/defaulters to make some (potentially small) payments. We consider a best-case fiscal scenario for "Universal RAP" by assuming that all borrowers would always make their calculated RAP payments under this regime, regardless of their current repayment status.

We use two data sources to explore the potential CSLP revenue effects of moving to a "Universal RAP." We begin by using our 2011 and 2012 CSS sample. These data allow us to determine current loan payments (using administrative records on loan amounts and repayment status) as well as counterfactual payments under "Universal RAP" (using survey reports of earnings and administrative loan amounts). The main limitation of these data is that they only provide a snapshot of earnings during the first two years of repayment; yet, earnings may be unusually low during these early years due to the transition from school to work. We, therefore, exploit data from Canada's SLID to study potential repayment and revenue effects of a "Universal RAP" over the first five years of borrowers' post-school labor market experience. These longitudinal data contain information on the amount borrowed for school and annual post-school earnings; however, they do not contain information on actual payments. With these data, we compare potential payments under a "Universal RAP" with standard debt-based payment amounts.

CSLP's Repayment Assistance Plan.—Before simulating the effects of moving to automatic enrollment in Canada's RAP, we briefly describe key features of the program and student loan repayment in Canada.[49]

Canadians borrowing from the CSLP can choose to apply for repayment assistance if they are currently in good standing on their loan and have sufficiently low earnings. Under Canada's RAP, eligible borrowers are expected to pay a fraction of their current earnings above a threshold—from 0 to 20 percent based on their earnings—toward their student loan. As shown in Figure 2 (also see online Appendix D), these income-based payment amounts are greater than under the analogous American PAYE income-driven repayment scheme and in other countries with universal income-contingent loan programs like Australia and the United Kingdom.[50] Notably, the income-based amount is zero for single, childless borrowers with monthly earnings below $1,685 (annual earnings of roughly $20,000). In 2010–2011, nearly 90 percent of the 165,000 RAP recipients faced a zero monthly payment (Office of the Chief Actuary 2010). If the income-based payment amount exceeds the standard debt-based amount, RAP recipients are only responsible for the lower standard amount. During the early portion of the repayment period (Stage 1 of RAP), if the calculated RAP payment is less than the interest accumulating on

[49] In late 2016, RAP shifted the required repayment schedule, so that childless, single borrowers do not need to make any payments if their annual earnings fall below $25,000 (up from around $20,000). We discuss and study the program structure prior to that change, which we refer to as "current" RAP since that structure covered the period we study.

[50] The American PAYE plan links payments to earnings for 20 years, forgiving any remaining debt.

their debt that period, the federal government pays the remaining interest amount, so the principal does not grow. After five years of reduced payments, borrowers move to Stage 2 of RAP, and the government effectively forgives the full difference between any reduced RAP payment and the expected standard repayment amount. Participating borrowers are debt-free after 15 years. See online Appendix D for further details.

Figure 6 shows the distributions of debt and annual earnings for single, childless borrowers enrolled in RAP (based on our CSS sample).[51] Roughly 84 percent of all RAP recipients were earning less than $20,000 (in annual terms), qualifying them for zero payments regardless of their debt. About one-in-four borrowers on RAP had borrowed less than $10,000 in CSLP loans and another third had borrowed between $10,000 and $20,000. Less than 20 percent had borrowed more than $30,000, consistent with modest CSLP loan limits and very low rates of borrowing for graduate studies (Human Resources and Skills Development Canada 2012). Given the nature of RAP and the analysis of Section 2, it is not surprising that the borrowers on RAP have high debt and low earnings relative to the overall population of CSLP borrowers as reported in Figures 1 and 3. Borrowers enrolled in the American PAYE repayment plan report similarly low incomes but noticeably higher debt levels.[52]

"Universal RAP" over the First 2 Years of Repayment (*Using the CSS*).—We use the administrative loan records combined with earnings reported in the CSS to quantify the early revenue effects of moving to a "Universal RAP." In calculating payments under the current regime, we use the following: (i) borrowers' scheduled payment as given by administrative records if they are currently making the standard payment, (ii) imputed RAP amount based on their reported earnings on the CSS if they are currently on RAP, and (iii) zero if they are currently delinquent or in default. Payments under "Universal RAP" are set equal to the lesser of the income-based RAP amount and their actual scheduled payment, regardless of the borrower's current repayment status.

Figure 7 reports the distribution of monthly payments under these two regimes. Our calculations suggest that the fraction of borrowers paying zero would nearly double under a "Universal RAP" regime, since many low-earning borrowers currently making their loan payments would not be expected to make any RAP payments. This highlights the role of additional resources (i.e., savings and parental support) in enabling repayment for many low-earning borrowers. Automatically placing all of these borrowers on RAP would significantly reduce their repayment obligations. Our calculations further suggest that average monthly payments

[51] Throughout this section, we focus our CSS analysis on single borrowers with no children (the majority of our sample), since the threshold earnings level above which RAP payments begin depends on household size. We also include respondents who had missing "baseline variables," since these background variables are not used here. See online Appendix D for further details.

[52] Among American borrowers enrolled in PAYE in September 2014, 83 percent had incomes of less than $20,000 while only 10 percent had incomes greater than $40,000. Only 11 percent had borrowed less than $10,000, while 46 percent had borrowed more than $30,000 and 20 percent more than $50,000. See US Government Accountability Office (2015). These high debt levels are a fairly recent phenomenon and are primarily explained by the rise in Stafford Loan limits in 2008, the rise of high-tuition for-profit schools, and much greater borrowing for graduate school relative to Canada (Looney and Yannelis 2015).

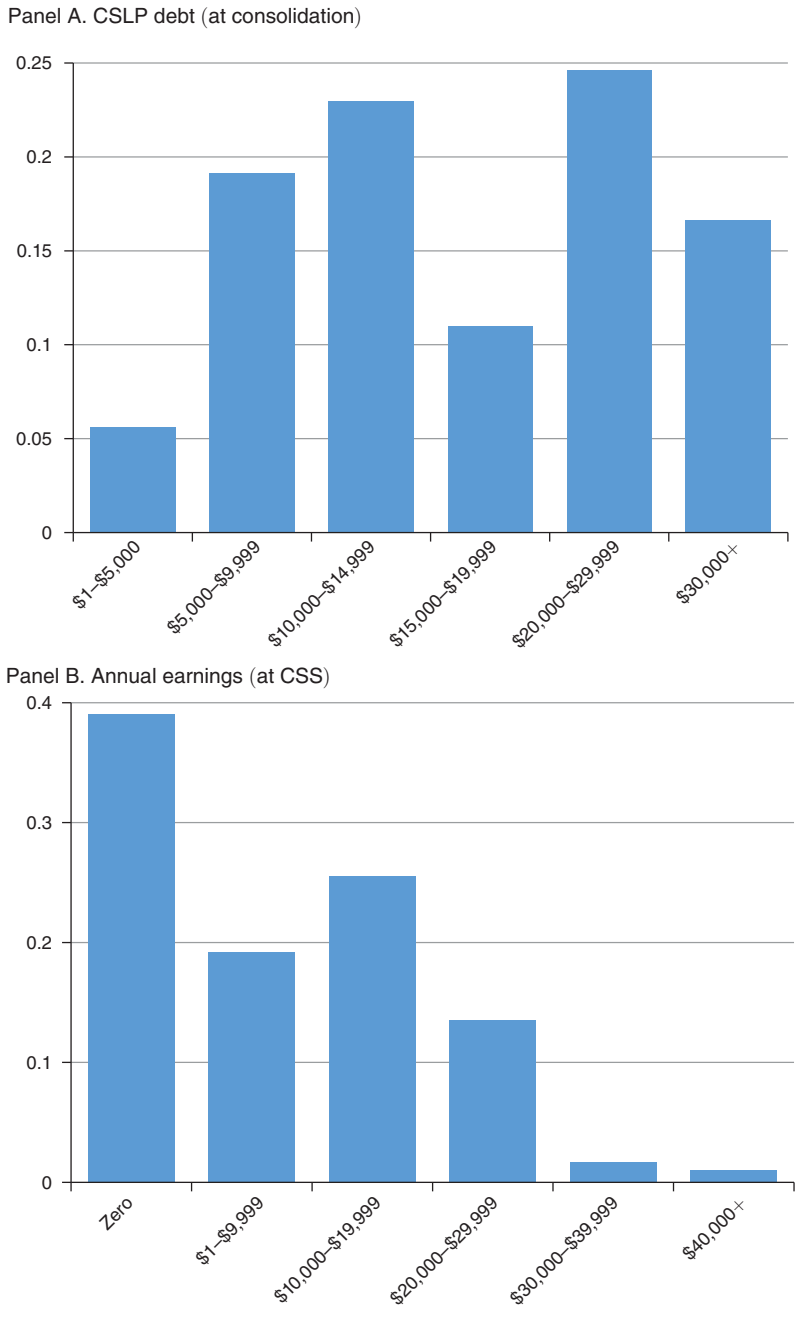

Figure 6. Distribution of Student Debt and Earnings for RAP Recipients (CSS)

(including payments of zero) over the first two years of repayment would decline by nearly half from $130 to $68 for recent school-leavers if RAP were made universal. If persistent, a decline in revenue of this magnitude would likely threaten the viability of CSLP without substantial increases in interest rates or other program changes.

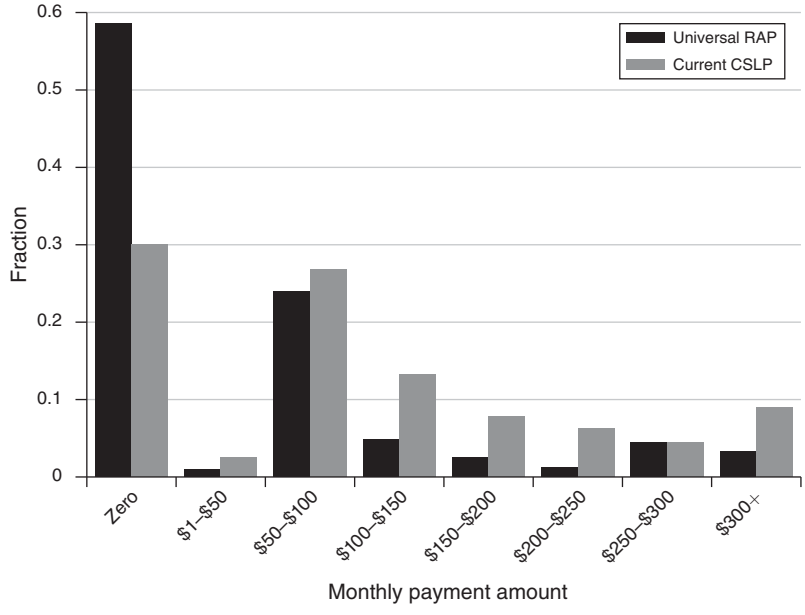

FIGURE 7. DISTRIBUTION OF MONTHLY PAYMENTS UNDER CURRENT AND "UNIVERSAL" RAP

"Universal RAP" over the First 5 Years of Repayment (Using SLID).—We now extend the timeframe of our "Universal RAP" analysis to cover the first five years of borrower's post-school careers using SLID. Panel 5 of SLID contains longitudinal data on earnings, schooling, and the amount borrowed for postsecondary education covering the years 2005–2010. For comparability with our previous analysis, we limit our sample to all individuals in SLID who attended some postsecondary schooling, reported borrowing for school, and left school by age 30. We date observations based on the year individuals are observed leaving school, and we calculate both debt-based payments and "Universal RAP" payments based on their outstanding student loan amount when they left school and their earnings each year after leaving school. We, therefore, observe five post-school earnings measures for those leaving school in 2005, four measures for those leaving in 2006, and so on.

Table 6 reports measures of the earnings distribution by educational attainment and years since leaving postsecondary school for all borrowers in our sample. About 45 percent of borrowers with less than a four-year university degree earned less than $20,000 in their first year out of school compared to only 27 percent of four-year degree recipients. While earnings tend to increase over time, many students still earn less than $20,000 four to five years after leaving school—especially among those with less than a four-year degree. Table 7 calculates the ratio of expected RAP payments to debt-based payments each year after school based on the amount borrowed and post-school earnings.[53] Consistent with our results from the CSS, calculated

[53] The smaller sample sizes in Table 7 relative to Table 6 reflect the fact that some respondents did not report a student loan amount even though they report that they had taken out a student loan. Table 6 includes these individuals while Table 7 does not.

Table 6—Earnings by Postsecondary Education and Years Since Leaving School (SLID)

	Years since leaving postsecondary school:				
	1	2	3	4	5
Panel A. Less than four-year university degree					
Average earnings	24,709	27,170	26,274	31,024	29,077
Fraction earning < $10,000/year	0.214	0.208	0.182	0.150	0.174
Fraction earning < $20,000/year	0.441	0.397	0.385	0.329	0.294
Fraction earning < $30,000/year	0.683	0.611	0.540	0.537	0.486
Fraction earning < $40,000/year	0.825	0.809	0.830	0.683	0.674
Fraction earning < $50,000/year	0.906	0.884	0.916	0.825	0.928
Observations	314	238	145	94	38
Panel B. Received four-year university degree					
Average earnings	38,128	44,245	42,292	47,341	48,301
Fraction earning < $10,000/year	0.159	0.016	0.104	0.051	0.028
Fraction earning < $20,000/year	0.265	0.160	0.222	0.163	0.223
Fraction earning < $30,000/year	0.387	0.296	0.371	0.377	0.247
Fraction earning < $40,000/year	0.564	0.462	0.459	0.474	0.403
Fraction earning < $50,000/year	0.734	0.661	0.596	0.580	0.698
Observations	182	127	86	56	26

Notes: Sample includes individuals reporting some postsecondary borrowing, earnings, and educational attainment from SLID panel 5 (covering 2005–2010). All estimates use sample weights.

Table 7—Calculated RAP Payment Amounts versus Debt-Based Amounts by Postsecondary Education and Years Since Leaving School (SLID)

	Years since leaving postsecondary school:				
	1	2	3	4	5
Panel A. Less than four-year university degree					
Ratio of RAP to debt-based payment	0.495	0.526	0.525	0.609	0.696
Fraction paying zero	0.439	0.419	0.381	0.359	0.280
Observations	244	192	121	82	32
Panel B. Received four-year university degree					
Ratio of RAP to debt-based payment	0.661	0.721	0.720	0.705	0.660
Fraction paying zero	0.296	0.197	0.156	0.196	0.275
Observations	143	103	69	47	23
Panel C. All borrowers					
Ratio of RAP to debt-based payment	0.558	0.592	0.588	0.646	0.680
Fraction paying zero	0.385	0.344	0.309	0.296	0.278
Observations	387	295	190	129	55

Notes: Sample includes individuals reporting some postsecondary borrowing, earnings, and educational attainment from SLID panel 5 (covering 2005–2010). All estimates use sample weights.

RAP payments are substantially lower than debt-based payments, ranging from 56 percent of the debt-based amount in year 1 to 68 percent in year 5. Because earnings levels are higher in this SLID sample than in the CSS sample, the implied RAP payments are also a bit higher here.[54] Table 7 reveals that nearly 40 percent

[54] The higher earnings in SLID relative to the CSS are not surprising given that the Canadian labor market was in much worse shape in 2011–2012 (CSS) than it was in 2006–2008 (SLID) due to the Great Recession.

Table 8—Discounted Present Value of Calculated RAP Payments vs Debt-Based Payments (SLID)

	Years since leaving postsecondary school:		
	Years 1–3	Years 1–4	Years 1–5
Ratio of DPV of RAP payments to debt-based payments	0.550	0.609	0.554
Percent with DPV of RAP payments...			
Less than or equal to 50% of debt-based payments	51	43	42
Greater than 50% but less than 100% of debt-based payments	10	22	32
Equal to 100% of debt-based payments	39	35	26
Observations	190	129	55

Notes: Sample includes individuals reporting postsecondary borrowing amounts, earnings, and educational attainment from SLID Panel 5 (covering 2005–2010). A discount rate of 2.1 percent is used to compute discounted present values over reported post-school years. All estimates use sample weights.

of all borrowers would be asked to pay nothing during their first year out of school under a "Universal RAP"; nearly 30 percent would still not be expected to make any payments five years out of school.

These figures are not necessarily alarming if low-earnings states are highly transitory, since borrowers may only require reduced payment amounts for one or two years. In this case, they may take a few extra years to pay off their loan, but long-term losses (e.g., forgiven interest payments) may be fairly minor. Thus, it is important to know whether the RAP payment reductions observed over years 1–5 in Table 7 represent reductions for different borrowers each year or reductions for the same subset of borrowers year after year. Fortunately, the longitudinal nature of SLID allows us to explore this issue.

In Table 8, we show the discounted present value of RAP payments relative to debt-based payments over the first three, four, and five years after leaving school.[55] The first row shows that borrowers would repay only 55–60 percent of the total debt-based amount under "Universal RAP." Roughly 40 percent of all borrowers would pay less than half the debt-based amount after 5 years, while only one-in-four would pay the full amount. While not shown in the table, 15 percent of all borrowers would make zero payments over the first four years under "Universal RAP."

Unlike with the CSS, we are unable to use SLID to determine actual payments under the current system where some borrowers are delinquent, default, or make reduced payments by signing up for RAP. However, these results indicate that our CSS results do not simply reflect very short-term problems associated with the transition from school to work. Many borrowers experience very low earnings for several years after leaving school.

Unemployment rates for 25–29-year-olds ranged from 5.9–6.3 percent in 2006–2008 but were as high as 8.0 percent in 2011. The measures may also differ somewhat, because the CSS asked respondents about their current (annualized) earnings at the time of the survey, while SLID asks about actual earnings over the previous year.

[55] In calculating present values, we use a discount rate of 2.1 percent, which is the government cost of borrowing for the CSLP (Office of the Chief Actuary 2010). Results are nearly identical for an interest rate of 5.5 percent, which corresponds to the interest rate paid by the vast majority of borrowers who choose the floating rate.

General Discussion and Caveats.—These calculations are only illustrative and come with a few important caveats. First, it is possible that some low-earning borrowers would continue to make higher payments than required by RAP even if their automatic payments were reduced. Second, many currently delinquent borrowers may continue to remain delinquent under a "Universal RAP"; however, the implications of this are likely to be modest since expected RAP payments for many of these borrowers are very low or zero given their incomes. Third, these calculations do not factor in any dynamic long-run effects (beyond the first five years after school) a move to "Universal RAP" might entail. If the program keeps borrowers better connected with CSLP, it could ultimately result in higher lifetime payments among borrowers who temporarily experience poor labor market outcomes after leaving school. Even in this case, however, government interest payments for many RAP recipients who do not make payments for several years can add up. Of much greater concern are the payment reductions that would be granted to the many borrowers who reach Stage 2 of RAP due to persistently low earnings. Under the current system, nearly half of all borrowers who enter RAP shortly after leaving school remain on RAP more or less continuously for at least five years and enter Stage 2 in their sixth year (Office of the Chief Actuary 2014). Our simulations suggest similar patterns for the larger set of borrowers that would participate in RAP if enrollment were made automatic. Unfortunately, a full accounting of the long-run effects of a "Universal RAP" would require better longitudinal data than is currently available and is, therefore, beyond the scope of this paper. Finally, we note that our calculations abstract from potential increases in borrowing and behavioral changes that might affect post-school earnings due to moral hazard or adverse selection. Proposition 4 suggests that these effects would likely increase the long-run costs of moving to a "Universal RAP" system.

It is important to note that our results do not imply that income-based repayment schemes are inherently bad or that they should be scaled back. Instead, they shine a light on important shortcomings in the design of current student loan programs. These problems can be ameliorated by rethinking the overall structure of student loan contracts, an issue we turn to next.

V. A (Constrained) Efficient Student Loan Program

We now consider the design of student loan programs that efficiently set loan amounts and repayment functions to maximize student welfare subject to breaking even in expectation.

Consistent with our analysis and evidence above, we consider (constrained) efficient contracts in the presence of nonmonetary income verification costs $\psi > 0$. We also incorporate unobserved effort (i.e., moral hazard), which is likely to be present. Our analysis focuses mainly on the case in which parental transfers τ are easily observed by the lender; however, we briefly discuss the case of hidden transfers in Section VB. The main points we wish to make apply in both cases; however, details of efficient contracts can certainly depend on the observability of transfers.

For expositional purposes, we assume that the lender's discount factor equals the student's discount factor β. In the absence of any market frictions, the optimal

contract would provide full insurance, equating consumption across time and all post-school earnings realizations. This is not possible in the presence of nonmonetary verification costs and moral hazard, which restrict the extent of consumption smoothing that can be achieved.[56]

A. *Observed Parental Transfers*

We begin by considering the case in which the government lender can observe parental transfers.

For any given borrower, the (constrained) efficient contract can be written such that the lender chooses the loan amount d, post-school repayment $D^v(y)$ contingent on y when earnings are verified, a fixed repayment $\bar{D}$ when earnings are not verified, and a threshold $\bar{y}$ below which earnings are verified to maximize expected utility:

$$u(w - T + d) + \beta\Big[\int_{\underline{y}}^{\bar{y}}\big[u\big(y + \tau - D^v(y)\big) - \psi\big]\phi(y|e)\,dy + \int_{\bar{y}}^{\infty} u\big(y + \tau - \bar{D}\big)\phi(y|e)\,dy - v(e)\Big], \tag{10}$$

subject to the following break-even constraint for the lender:

$$d \;\leq\; \beta\Big[\int_{\underline{y}}^{\bar{y}} D^v(y)\phi(y|e)\,dy + \int_{\bar{y}}^{\infty} \bar{D}\phi(y|e)\,dy\Big]. \tag{11}$$

Unlike with current student loan programs, lenders earn zero expected profits on every borrower, and there is no ex ante redistribution across borrower types.

For simplicity, we consider two effort levels with $e_L < e_H$. When high effort is optimal, it must be induced. The contract is, therefore, constrained by the following incentive compatibility constraint:

$$\int_{\underline{y}}^{\bar{y}}\big[u\big(y + \tau - D^v(y)\big) - \psi\big]\big[\phi(y|e_H) - \phi(y|e_L)\big]\,dy + \int_{\bar{y}}^{\infty} u\big(y + \tau - \bar{D}\big)\big[\phi(y|e_H) - \phi(y|e_L)\big]\,dy \;\geq\; v(e_H) - v(e_L). \tag{12}$$

Finally, borrowers must be indifferent between verifying their earnings to receive a reduced payment and paying the fixed amount $\bar{D}$ at the threshold $\bar{y}$, so

$$u\big(y + \tau - D^v(y)\big) - \psi \;=\; u\big(\bar{y} + \tau - \bar{D}\big). \tag{13}$$

This implicitly defines $\bar{D}$ as a function of $\bar{y}$. Substituting in for $\bar{D}$ into the contracting problem, lenders choose d, $D^v(y)$ for all $y < \bar{y}$, and $\bar{y}$ to maximize equation (10) subject to equations (11) and (12) for $e = e_H$ when high effort is optimal. We focus on this case, briefly commenting on allocations when low effort may be efficient.

[56] See Lochner and Monge-Naranjo (2016) for efficient student loan contracts in the presence of moral hazard, limited commitment, and monetary costs of income verification. They do not consider nonmonetary verification costs or unobservable transfers.

Let $\mu \geq 0$ reflect the (discounted by β) Lagrange multiplier on the incentive compatibility constraint (12), and define the likelihood ratio $\ell(y) \equiv \phi(y|e_L)/\phi(y|e_H)$. The first-order conditions for d and $D^v(z)$ imply that

$$u'(c_1) = u'\big(c_2^v(y)\big)\big[1 + \mu\big(1 - \ell(y)\big)\big], \quad \forall y < \bar{y}.$$

Assuming that the likelihood ratio $\ell(y)$ is decreasing in y (i.e., monotone likelihood ratio property), post-school consumption is strictly increasing in earnings whenever they are verified. Of course, consumption is also increasing (one-for-one) in earnings at higher levels when a fixed repayment is made (i.e., $y \geq \bar{y}$). Thus, moral hazard restricts the amount of insurance that can be provided for low earnings realizations, while verification costs prohibit any insurance across higher earnings levels.[57] Finally, notice that equation (13) implies that consumption must jump discontinuously at the verification threshold due to the verification costs. Borrowers must be offered higher consumption to compensate for the utility costs of verification, which means that loan payments must drop when borrowers apply for reduced payments (i.e., $D^v(\bar{y}) < \bar{D}$). See online Appendix E.7 for the condition determining the optimal verification threshold $\bar{y}$ and other details.

While not emphasized thus far, it is noteworthy that optimal loan contracts $(d, \bar{y}, D^v(y), \bar{D})$ depend on initial wealth and parental transfers (w, τ), as well as any other individual factors like ability that might affect earnings functions or preferences. Clearly, an increase in total wealth due to increases in w or τ would lead to greater consumption c_1 and $c_2^v(y)$ for low earnings realizations. An increase in parental transfers would, therefore, imply a larger loan d and higher verification payment $D^v(y)$; however, it is more difficult to say how it would affect the fixed payment $\bar{D}$ and verification threshold $\bar{y}$.

Comparing Current and Efficient Student Loan Contracts.—While efficiently designed student loan contracts share a similar structure with current student loan contracts, they are much more flexible. Under efficient contracts, the fixed repayment for high earnings realizations $\bar{D}$ is analogous to the "standard payment" Rd under current loan programs; however, the implicit interest rate $\bar{D}/d$ depends on the actual loan amount as well as initial resources, parental transfers, and earnings functions. The efficient contract specifies income-based repayments $D^v(y)$ when earnings are verified. These payments are analogous to $\xi(y)$ under standard loan programs; however, $D^v(y)$ is set efficiently at the individual-level and varies with the loan amount, available resources (w, τ), and earnings functions. Furthermore, there is a discontinuous drop in efficiently determined repayments when earnings are verified (i.e., $D^v(\bar{y}) < \bar{D}$) to compensate borrowers for the nonmonetary costs of verification. This feature is absent in current North American loan programs. Finally, the earnings threshold $\bar{y}$ under efficient loan contracts is analogous to an eligibility threshold θ; however, setting the eligibility threshold optimally (based

[57] In the absence of moral hazard (or if low effort is optimal), $\mu = 0$ and there would be perfect consumption smoothing across the schooling period and all verified post-school earnings outcomes.

on the verification cost, loan amount, available resources, and earnings functions) eliminates the potential discrepancy between eligibility and the desire to apply.

Altogether, efficient loan contracts provide as much consumption smoothing (across time and states) as possible, given inherent market frictions (moral hazard and verification costs). This directly implies that government lenders using efficient contracts would prefer to eliminate all nonmonetary verification costs.[58] Indeed, if verification costs could be freely eliminated, efficient contracts would become fully contingent on earnings and parental transfers, so the only distortion limiting consumption insurance would be due to moral hazard.

Another important feature of the efficient student loan contracts discussed here is that they break-even (in expectation) on an individual basis depending on their available resources (w, τ) as well as any (observable) individual-specific characteristics related to preferences or earnings distributions (e.g., ability, college majors). Current student loan programs do not take these factors into account, leading to ex ante redistribution across borrowers. This can have important implications if parental transfers are not easily observed, as we discuss next.

B. *Unobservable Parental Transfers*

Current government student loan programs effectively ignore parental transfers. If these transfers were easily observed by the government, it would be straightforward to take them into account when computing total earnings measures used in determining income-based payments. Unfortunately, this no longer works if parental transfers are unobservable by the government. In this case, borrowers would have no incentive to report transfers that led to higher payments.

If post-school transfers are known by borrowers at the time they make their borrowing decisions, it may be possible to design efficient loan contracts that induce borrowers to truthfully report those transfers. Indeed, in the absence of moral hazard (i.e., effort is observable), the efficient contracts derived in Section VA would induce students to truthfully reveal their parental support, since those contracts: (i) maximize student welfare conditional on parental transfers and (ii) break-even in expectation for all borrowers.[59] Together, these features imply that students could not improve their welfare by, for example, underreporting the amount of transfers their parents will provide after school. While such a misrepresentation might lead to lower post-school payments, it would also reduce the loan amount offered to the student.

When moral hazard is a concern and parental transfers are unobserved by the lender, borrowers faced with the contracts derived in Section VA (under the assumption of observable transfers) may prefer to misrepresent both their effort and parental transfers. Additional constraints must be placed on the contracting problem to prevent this from happening. We show in online Appendix E.7 that if high effort

[58] Assuming verification costs can be freely eliminated, the marginal welfare cost of ψ is $\Phi(\bar{y}|e) \geq 0$, where $\bar{y}$ and e are the optimal threshold and effort levels in the efficient loan contract above.

[59] This basic point would also apply with endogenous parental transfers in that parents would always choose to reveal their earnings and altruism.

can still be induced (with unobservable transfers), then efficient contracts will be identical to those of Section VA—in this case, the unobservability of transfers does not affect the loan contract. However, it is possible that the unobservability of transfers leads to a break-down of effort-inducing contracts. In this case, loan contracts under unobservable transfers would be written to provide full consumption smoothing across verified post-school earnings realizations and borrowers would exert low effort, whereas contracts under observable transfers would provide only partial consumption smoothing across verified earnings realizations while inducing high effort. Despite contracts offering better consumption smoothing under unobservable transfers, welfare would be lower due to the reduction in effort and, as a consequence, expected earnings and consumption.

When parental transfers are imperfectly known at the time borrowing decisions are made, the efficient contract could simply be written as a function of (reported) expected parental transfers and a modified measure of borrower earnings inclusive of any realized deviation in parental transfers from their expectation.[60] If lenders could verify both earnings and transfer amounts (imposing costs ψ on borrowers), the problem would be qualitatively the same as above.[61]

VI. Conclusions

We show that many borrowers continue to make student loan payments even when they qualify for repayment assistance based on their (low) earnings. Exploiting unique new survey data on a broad set of resources available to student borrowers, we show that access to parental support and personal savings are critical to making standard payments in this situation. As we demonstrate with a simple economic model of student loan repayment, these findings indicate that nonmonetary costs of applying for repayment assistance are nonnegligible and provide an incentive for low earners with access to other resources to continue making standard loan payments even when they are eligible for lower income-based payments.

The roles of parental resources and savings have been largely ignored in policy discussions related to student loans. Our analysis suggests that these resources have important implications for proposals under current discussion to expand the use of IDR plans. In particular, we show that expanding the income-based RAP in Canada to automatically cover all borrowers would reduce revenues by roughly half during the first few years of repayment. This is because a more universal RAP would significantly reduce repayment amounts for many low-earning borrowers who currently make their standard payments (with the aid of parents and/or personal savings). While it is possible that early revenue losses would be made up later, the strong persistence in earnings and structure of RAP suggests that this is unlikely. At the same time, little revenue would be raised from inducing borrowers currently in

[60] Let $E(\tau)$ reflect expected parental transfers and $Y = y + \tau - E(\tau)$ reflect the borrower's earnings plus any deviation from expected transfers. We can then write contracts in terms of $E(\tau)$ and conditional density for Y, $\Phi_Y(Y|e)$, instead of τ and $\Phi(y|e)$.

[61] This raises interesting possibilities where the costs imposed on borrowers when verifying their earnings may differ from those associated with verifying parental transfers. In this case, there may be regions where a subset of total income (earnings or transfers) is verified with contracts contingent only on the verified component.

delinquency/default to make income-based payments, because the vast majority of these borrowers have very low earnings, and, as a result, would be expected to make very low (or zero) payments under RAP. While these competing forces are likely to be important in other countries considering automatic enrollment in IDR plans, the net effects will depend critically on the extent of parental support, earnings mobility among borrowers, and key details of repayment plans (e.g., length of repayment period, repayment schedules).

The revenue losses associated with making RAP enrollment automatic in Canada would likely require substantial increases in student loan interest rates (or other major program changes) to keep CSLP viable. We show theoretically that, taken together, these changes could reduce average welfare among borrowers under the current structure of repayment assistance. Put another way, the costs associated with income verification and program enrollment may serve a useful purpose (under the current system) by targeting assistance to those most in need while collecting fully from borrowers with access to parental support and savings. As such, recent proposals aimed at facilitating enrollment in current repayment assistance plans may not be welfare-improving.

Instead of easing access to current income-based repayment assistance, our analysis suggests that efforts should be made to better design student loan programs, explicitly taking into account inherent verification costs and the importance of parental support and personal savings for many borrowers. We show that an efficiently designed student loan program would look broadly similar to those currently in place in Canada and the United States, with fixed payments above some earnings threshold and income-based payments below. However, repayments would be structured to compensate borrowers for any verification costs incurred and would be better tailored to each borrower's situation. Specifically, interest rates determining "standard payments," income-based payment amounts, and the threshold determining eligibility for reduced income-based payments would depend on the amount borrowed, reported parental transfers, and the distribution of potential post-school earnings. With an efficiently designed system, there would be no benefit from imposing enrollment/verification costs beyond those inherent to the process itself. A well-designed program would also induce borrowers to accurately reveal expected parental support at the time loans are taken out, with loan limits and the structure of repayments contingent on that support.

Finally, our results are not only useful for evaluating changes in student loan policy, but they may also shed light on well-documented but less-understood differences in student loan repayment behavior. In particular, our results may help explain the alarmingly high default rates among African Americans (relative to whites), even when conditioning on student debt and post-school earnings (e.g., see Lochner and Monge-Naranjo 2015). Previous studies document low levels of wealth conditional on earnings for blacks relative to whites (Oliver and Shapiro 1995, Barsky et al. 2002), suggesting that black parents may be less equipped to provide financial support to their children after college. As such, African American students may have less access to the type of post-school parental insurance we find to be critical for student loan repayment in Canada.

REFERENCES

Barsky, Robert, John Bound, Kerwin Kofi Charles, and Joseph P. Lupton. 2002. "Accounting for the Black–White Wealth Gap: A Nonparametric Approach." *Journal of the American Statistical Association 97* (459): 663–73.

Baum, Sandy, and Martha C. Johnson. 2016. *Strengthening Federal Student Aid: An Assessment of Proposals for Reforming Federal Student Loan Repayment and Federal Education Tax Benefits*. Washington, DC: Urban Institute.

Canada Student Loans Program. 2010–2011. "Client Satisfaction Survey [Data]." CSLP Department of Planning, Integrity, and Repayment (accessed January 15, 2012).

Chatterjee, Satyajit, and Felicia Ionescu. 2012. "Insuring Student Loans against the Financial Risk of Failing to Complete College." *Quantitative Economics* 3 (3): 393–420.

Department of Education. 2017. *Student Loans Overview: Fiscal Year 2018 Budget Proposal*. Washington, DC: Department of Education.

Dynarski, Mark. 1994. "Who Defaults on Student Loans? Findings from the National Postsecondary Student Aid Study." *Economics of Education Review* 13 (1): 55–68.

Dynarski, Susan, and Daniel Kreisman. 2013 "Loans for Educational Opportunity: Making Borrowing Work for Today's Students." Hamilton Project Discussion Paper 2013-05.

Edwards, Kathryn A. 2020. "Who Helps the Unemployed? Workers' Receipt of Public and Private Transfers." *IZA Journal of Labor Economics* 9(1) DOI: https://doi.org/10.2478/izajole-2020-0004.

Employment and Social Development Canada. 2016. *Statistical Review: Canada Student Loans Program 2014-2015.* Ottawa, Canada: Employment and Social Development Canada.

Flint, Thomas A. 1997 "Predicting Student Loan Defaults." *Journal of Higher Education* 68 (3): 322–54.

Gary-Bobo, Robert J., and Alain Trannoy. 2015. "Optimal Student Loans and Graduate Tax under Moral Hazard and Adverse Selection." *Rand Journal of Economics* 46 (3): 546–76.

Gross, Jacob P.K., Osman Cekic, Don Hossler, and Nick Hillman. 2009. "What Matters in Student Loan Default: A Review of the Research Literature." *Journal of Student Financial Aid* 39 (1): 19–29.

Human Resources and Skills Development Canada. 2012. *Canada Student Loans Program: Annual Report 2010-2011*. Québec, Canada: Human Resources and Skills Development Canada.

Kaplan, Greg. 2012. "Moving Back Home: Insurance against Labor Market Risk." *Journal of Political Economy* 120 (3): 446–512.

Lochner, Lance J., and Alexander Monge-Naranjo. 2015. "Default and Repayment among Baccalaureate Degree Earners." in *Student Loans and the Dynamics of Debt*, edited by Brad Hershbein and Kevin Hollenbeck, 235–86. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Lochner, L., and A. Monge-Naranjo. 2016. "Student Loans and Repayment: Theory, Evidence, and Policy." In *Handbook of the Economics of Education*, Vol. 5, edited by Eric A. Hanushek, Stephen Machin and Ludger Woessmann, 397–478. Amsterdam: Elsevier Science.

Lochner, Lance, Todd Stinebrickner, and Utku Suleymanoglu. 2013. "The Importance of Financial Resources for Student Loan Repayment." NBER Working Paper 19716.

Lochner, Lance, Todd Stinebrickner, and Utku Suleymanoglu. 2021. "Replication data for: Parental Support, Savings, and Student Loan Repayment." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E115925V1.

Looney, Adam and Constantine Yannelis. 2015. "A Crisis in Student Loans? How Changes in the Characteristics of Borrowers and in the Institutions They Attended Contributed to Rising Loan Defaults." *Brookings Papers on Economic Activity* 75 (2): 1–89.

McGarry, Kathleen. 2016. "Dynamic Aspects of Family Transfers." *Journal of Public Economics* 137: 1–13.

Mueller, Holger M., and Constantine Yannelis. 2019. "Reducing Barriers to Enrollment in Federal Student Loan Repayment Plans: Evidence from the Navient Field Experiment." https://cmepr.gmu.edu/wp-content/uploads/2019/08/MuellerYannelis.pdf.

Nichols, Albert L., and Richard J. Zeckhauser. 1982. "Targeting transfers through Restrictions on Recipients." *American Economic Review* 72(2): 372-77.

Nelson, Libby A. 2013. "Reimagining Financial Aid." Inside Higher Ed. http://www.insidehighered.com/news/2013/03/14/ look-all-15-reimagining-aid-design-and-delivery-reports-gates-foundation.

Office of the Chief Actuary. 2010. *Actuarial Report on the Canada Student Loans Program as at 31 July 2010.* Ottawa, Ontario: Canada.

Office of the Chief Actuary. 2014. *Actuarial Report on the Canada Student Loans Program as at 31 July 2014*. Ottawa, Ontario: Canada.

Oliver, Melvin L., and Thomas Shapiro. 1995. *Black Wealth/White Wealth: A New Perspective on Racial Inequality*. New York: Routledge.

Park, Youngmin. 2019. "Inequality in Parental Transfers, Borrowing Constraints and Optimal Higher Education Subsidies." Bank of Canada Staff Working Paper 2019-7.

Phoenix Strategic Perspectives Inc. 2010–2011. *Canada Students Loans Program (CSLP) Client Satisfaction Survey.*

Schwartz, S., and R. Finnie. 2002. "Student Loans in Canada: An Analysis of Borrowing and Repayment." *Economics of Education Review* 21 (5): 497–512.

US Government Accountability Office. 2015. *Federal Student Loans: Education Could Do More to Help Ensure Borrowers Are Aware of Repayment and Forgiveness Options*. Washington DC: US Government Accountability Office.

US Government Accountability Office. 2016. Federal Student Loans: Education Needs to Improve Its Income-Driven Repayment Plan Budget Estimates. Washington, DC: US Government Accountability Office.

Zeckhauser, Richard J. 2019. "Strategic Sorting: The Role of Ordeals in Health Care." NBER Working Paper 26041.