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The Insurance Implications of Government Student Loan Repayment Schemes

By Martin Gervais, Qian Liu, and Lance Lochner*

A large literature examines the extent to which consumption responds to idiosyncratic earnings shocks.[1] This paper studies whether student loan repayments serve as a source of insurance, much like government tax and transfer programs.[2] Indeed, this insurance mechanism is an explicit aim of formal income-contingent repayment schemes in many countries, where the efficient structure of contingencies depends on such market frictions as moral hazard, adverse selection, and costly income verification (Lochner and Monge-Naranjo, 2016).

We use new administrative data that links detailed information on Canadian student loan recipients with their repayment and income histories from the Canada Student Loans Program (CSLP), income tax filings, and post-secondary schooling records to measure the extent to which student borrowers adjust loan repayments to insure against income variation.[3]

Several mechanisms are available for students to adjust loan repayments in response to income fluctuations: formal, like CSLP's Repayment Assistance Plan (RAP); and informal, such as delinquency or default. Close to 30% of students are enrolled in RAP soon after graduation, although that fraction falls as incomes rise thereafter. Within 5 years of graduation, nearly 10% of borrowers have defaulted on their debt. In addition, borrowers can make larger payments than required should they experience unexpectedly high income: 40% of borrowers have fully repaid their student debt within 5 years of graduation. Indeed, loan payments are shown to increase in income, more so in early years and for individuals with higher initial debt.

More formally, we estimate that on average, an unexpected $1,000 change in year-over-year income is associated with a $30 change in loan payment: from a $50 change the year after graduation, declining to a $20 change 5 years after graduation. Loan repayments are also used to absorb income variation that is more permanent in nature: for borrowers whose income is consistently below or above expected income at graduation, the magnitude of average repayment adjustment is similar to the average yearly response.

I. Student Borrowing and Repayment in Canada

The CSLP provides loans and grants to help Canadian students pay for postsecondary education based on their financial need. As long as students remain in school, Canada student loans accrue no interest and need not be repaid. Six months after leaving school, all loans received during school are combined into a single repayment plan in a process known as consolidation, at which time repayment begins. Consolidation establishes the repayment agreement, which typically entails a constant debt-based payment with an amortization period of 9.5 years. We refer to this amount as the scheduled payment.[4]

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[1] See, e.g., the survey by Meghir and Pistaferri (2011) and references therein.

[2] Brzozowski et al. (2010) show that the tax and transfer system in Canada is very effective at absorbing income movements.

[3] Lochner, Liu and Gervais (2021) document sizable transfers implicit in the CSLP through differences in repayment by expected post-school income.

[4] The scheduled payment can change if, e.g., borrowers receive an extension to their repayment period. How-

Borrowers experiencing periods of financial hardship can apply for reduced payments (for 6 months at a time) through the CSLP's income-based repayment scheme known as RAP. Under RAP, eligible borrowers with income below a specific threshold (roughly $20,000 for singles during our sample period) need not make any payments, while those with higher incomes are expected to contribute an increasing fraction (ranging from 0 to 20 percent) of their incomes above the threshold toward their student loan. Despite the availability of RAP, many student loans still end up in default, having missed 9 consecutive monthly payments.

II. Data: Income, debt, and repayments

We exploit longitudinal administrative data from the Education and Labor Market Longitudinal Platform provided by Statistics Canada. This platform links student loan records from the CSLP, schooling records from the Post-Secondary Information System (PSIS), and tax records from T1 Family Files (T1FF).

Our analysis utilizes data on loan payments and income through 2015 for students who attended Canadian post-secondary institutions and consolidated their student loans in 2010, restricting our sample to borrowers that can be linked across the 3 databases and who did not borrow or attend university after 2010.[5] To ensure that there is potential for loan payments to serve as a source of insurance, we further limit our sample to borrowers who consolidated at least $5,000 in student loans. We consider "traditional" students by restricting our analysis to those who were ages 18–30 in 2010 when they consolidated their loans. Because we are interested in the extent to which payments help insure against income shocks above and beyond any insurance provided by the government tax and transfer system, we focus on income measured net of government taxes and transfers, $Y_{i,t}$ (where i denotes individual and t year).[6]

Among borrowers with at least $5,000 in student debt as of early-2011, average net income rose by nearly 40% from $33,200 to $46,100 between 2011 and 2015, while the standard deviation of annual income increased from $18,400 to $26,300 over this period.[7]

There is considerable variation in student debt within Canada, with many borrowers consolidating over $35,000. Among borrowers consolidating at least $5,000 in student loans, consolidation amounts averaged $18,800 (with standard deviation $10,200). For borrowers with at least $5,000 in student debt at the start of 2011, annual loan payments, $P_{i,t}$, averaged $2,400 over 2011–2015.[8] Average loan payments over this period, $\bar{P}_i$, had a standard deviation of $1,700.[9]

As discussed below, we condition parts of our analysis on a detailed set of borrower characteristics, $X_{i,t}$, which includes demographic characteristics (gender, age, marital status, citizenship, whether a borrower lives with parents, number of family members in the household, and province of residence) and educational indicators related to highest type of post-secondary enrolment (i.e., two-year college, baccalaureate, or post-graduate), highest degree obtained, course of study, and Maclean's institutional ranking.[10]

Figure 1 documents the evolution of several basic repayment status measures over

ever, such changes are not very common.

[5]See the Online Appendix for additional data details.

[6]This measure excludes capital gains but includes income from employment, self-employment, interest income, and government transfers, while netting out income taxes paid.

[7]As required by Statistics Canada, all dollar values are rounded to 100 if greater than 1,000.

[8]We do not observe anything about loans after they enter default. We impute payments on defaulted loans based on average collection and rehabilitation amounts conditional on the balance owed at the time of default and years since consolidation. See the Online Appendix.

[9]Payments average roughly 10 percent of the standard deviation of income, suggesting a limited though potentially significant role for payments to act as an insurance mechanism.

[10]Note that $X_{i,t}$ also includes interactions of age with several characteristics. Despite the t subscript on $X_{i,t}$, many characteristics are fixed over time. See the Online Appendix for additional details.

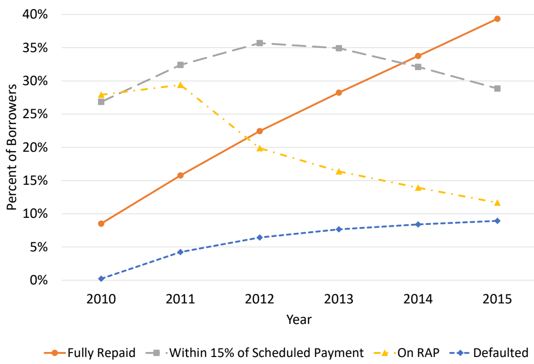

Figure 1. : Repayments Status

Note: Borrowers are considered "Fully Repaid" if they have fully repaid their loans by the end of the year. Borrowers' payments are "Within 15% of Scheduled Payment" if the payment that year is within 15% of the scheduled payment amount, and they have neither fully repaid nor defaulted by the end of the year. Borrowers are considered "On RAP" if they were ever on RAP during the year. Borrowers "Defaulted" if they have ever defaulted by the end of the year.

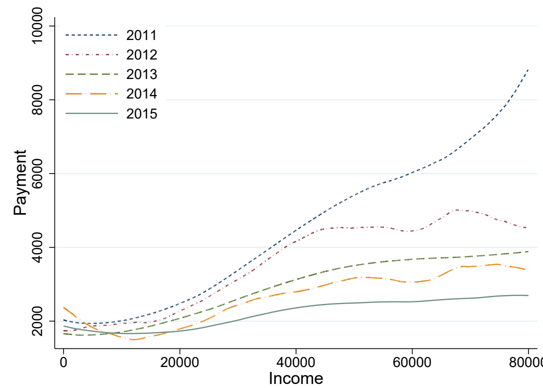

Figure 2. : Payment as a Function of Income by Year

Note: This figure reports predicted values from LLR of payments on income separately for each year for borrowers with 2011 debt of $20,000–$24,999. The Epanechnikov kernel is used with a bandwidth chosen to minimize the integrated mean squared prediction error.

our sample period: (i) percent fully repaid by the end of the year, (ii) percent paying within 15 percent of the scheduled payment amount (excluding those who have fully repaid or defaulted by the end of the year), (iii) percent ever enrolled in RAP during the year, and (iv) percent having ever defaulted by the end of the year.[11]

This figure shows that, in each year, about one-third of borrowers made annual repayments within 15 percent of the scheduled payment as determined by their student debt. Many paid more than the scheduled amount, with nearly 40 percent fully repaying their student debt within 5 years of consolidation. At the same time, many students made reduced payments under RAP, especially during the first 2 years after leaving school. The fraction of borrowers enrolled in RAP fell steadily after 2011, from just under 30 percent to slightly over 10 percent as incomes generally rose. Despite the availability of RAP, nearly 10 percent of borrowers had defaulted by 2015. Five years after consolidation, only half of borrowers were still repaying their debt: the other half had either fully repaid or had defaulted. Of those who were still making payments, most repaid within 15% of their scheduled amount, although about one-in-five were enrolled in RAP.

For 2011–2015, Figure 2 shows annual loan payments as a function of annual income for borrowers with student debt ranging from $20,000 to $24,999 in January, 2011. (Similar patterns are observed for other debt levels.) Each line reports estimates of $E(P_{i,t}|Y_{i,t})$ from a local linear regression (LLR) for the reported year. Not surprisingly, payments tend to increase with income, except at very low income levels where there are few borrowers. Perhaps more surprising, payments decline over time at any given level of income above $20,000, with the gap widening substantially as income rises. This implies a much weaker relationship between income and repayments over time. For example, payments in 2011 increase by roughly $5,000 for borrowers with income of $80,000 relative to those with $20,000 in income. Four years later, payments were only about $1,000 higher for those with high relative to low incomes. For context, the scheduled yearly payment for this level of debt is about $3,000. Evidently, many high-income individuals make outsized payments, especially early on.

[11] Note that these measures are neither comprehensive nor mutually exclusive.

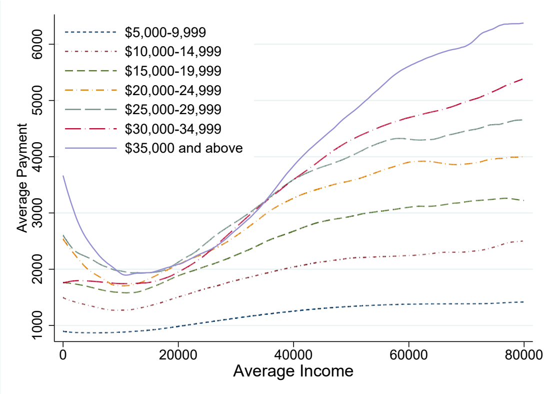

Figure 3. : Average Payment as a Function of Average Income by Student Debt

Note: This figure reports predicted values from LLR of average payment (2011–2015) on average income (2011–2015) separately by debt level in 2011. The Epanechnikov kernel is used with a bandwidth chosen to minimize the integrated mean squared prediction error.

Figure 3 displays average annual payments over the period 2011–2015, $\bar{P}_i$, as a function of average annual income over the same period, $\bar{Y}_i$. Each line is obtained from a separate LLR for borrowers with different debt levels at the start of 2011. Average payments increase in income above $10,000 with much stronger increases evident for those with higher student debt levels.[12] For example, among borrowers owing at least $35,000, average annual payments were about $4,000 higher for those with incomes of $80,000 relative to those with $20,000 in income. By comparison, this difference was a mere $500 among borrowers with only $5,000–9,999 in student debt.[13]

The link between income and loan repayment documented in Figures 2 and 3 suggests that the CSLP may provide modest insurance against income fluctuations, where that insurance is likely to be greater for those with higher debt levels and in earlier years of repayment. We turn to a more formal analysis of this next.

III. Measuring insurance

We begin by analyzing the short-run insurance implicit in student loan repayments, building on the extensive literature aimed at measuring insurance and consumption-smoothing more generally. Specifically, we estimate the extent to which changes in income, $\Delta Y_{i,t} \equiv Y_{i,t} - Y_{i,t-1}$, lead to changes in student loan payments, $\Delta P_{i,t} \equiv P_{i,t} - P_{i,t-1}$, conditional on borrower characteristics $(X_{i,t-1}, X_{i,t})$ using the following linear regression:[14]

$$(1) \qquad \Delta P_{i,t} = \beta \Delta Y_{i,t} + X'_{i,t-1}\gamma + X'_{i,t}\delta.$$

This specification eliminates the role of predictable changes in income (or consumption demands) associated with the rich set of demographic, schooling, and other characteristics included in $(X_{i,t-1}, X_{i,t})$. Estimates of β, therefore, measure the responsiveness of loan payments to unpredictable year-to-year changes in income (after taxes and transfers)—a measure of short-term insurance.[15]

Table 1 reports estimates of β, first for all years stacked together and then separately for each yearly difference. On average, a $1,000 idiosyncratic increase in income is associated with a $32 rise in loan repayment. Consistent with Figure 2, the extent of insurance is declining with time since consolidation from nearly $51 for 2011–2012 income changes to $20 for 2014–2015 changes.

We next explore the extent of short-run insurance separately for different subgroups of borrowers in Table 2.[16] Consistent with the importance of student debt for repayment functions documented in Figure 2, Panel A shows that repayments adjust much more strongly in response to income innovations for borrowers with high

[12] Very few borrowers have average income below $10,000. The negative relationship between average payments and average income among these very low income borrowers with high debt is primarily driven by unmarried borrowers who live with their parents.

[13] For perspective, the scheduled payment for borrowers owing $35,000 is about $4,000 more than those owning $5,000–$9,999.

[14] As noted earlier, $X_{i,t-1}$ and $X_{i,t}$ contain several time-invariant characteristics, which we include only once in these regressions.

[15] This specification assumes a symmetric response to positive and negative income changes. More general specifications are consistent with this symmetry.

[16] Differences by gender are quite modest with men (women) increasing their loan payment by $30 ($34) for every $1,000 increase in income.

Table 1—: Effects of $1,000 Change in Income on Change in Payments

	Estimate	Std. Error
All Years	32.0	1.3
2011 to 2012	50.7	2.9
2012 to 2013	30.2	2.6
2013 to 2014	24.5	2.3
2014 to 2015	20.4	2.2

Note: Table reports estimates of β and its standard error from equation (1) for the full sample and separately by year. Outliers with $|\Delta Y_{i,t}| > \$500{,}000$ are excluded.

initial debt levels. For example, borrowers with at least $25,000 in student debt (in year $t-1$) change their loan payments by $41 for every $1,000 change in income, while those with less than $15,000 in debt adjust their payments by only $22.

Figure 2 suggests that payments may be most responsive to income changes at moderate income levels. Panel B of Table 2 shows that this is indeed the case. For borrowers with incomes of $25,000–$49,999 in both periods $t-1$ and t, an additional $1,000 in income raises payments by about $42. Payment adjustments are significantly weaker for borrowers whose income remains less than $25,000 in both periods or exceeds $50,000 in both periods.

Next, we see that borrowers who obtain their baccalaureate degree take greater advantage of student loan repayments to insure against yearly income fluctuations: those with a BA or higher degree adjust their payments by $35 for every $1,000 change in income, compared to only $19 for those without a BA.[17]

Table 2 further shows that single borrowers adjust their payments at twice the rate observed by married borrowers. This suggests that borrowers with less access to insurance from a spouse are more likely to take advantage of the insurance provided by the CSLP. The opposite appears to be true for borrowers living with their parents, who adjust their payments by about 61% more than borrowers living separately from their parents.

[17] Additionally, borrowers who last attended four-year universities adjust their payments by $33 per $1,000 change in income, while those last attending a two-year college only adjust their payments by $23.

Table 2—: Effects of $1,000 Change in Income on Change in Payments, by Subgroup

	Estimate	Std. Error
A. By $t-1$ student debt		
$5,000–14,999	22.0	1.6
$15,000–24,999	37.0	2.5
$25,000+	41.4	3.0
B. By income in both years $t-1$ and t		
$< \$25{,}000$	19.7	3.7
$25,000–$49,999	41.6	4.1
$\geq \$50{,}000$	26.3	3.4
C. By highest degree		
Less than BA	19.1	1.9
BA or more	35.4	1.6
D. By marital status in $t-1$		
Married	19.6	2.1
Not Married	40.8	1.7
E. By household arrangement in $t-1$		
With parents	44.8	2.7
Not with parents	27.8	1.5

Note: Table reports estimates of β and its standard error from equation (1) separately for reported subgroups. Outliers with $|\Delta Y_{i,t}| > \$500{,}000$ are excluded.

We note that none of the results in Table 2 hinge on differential debt levels across groups.

We end with a brief analysis of long-run insurance implicit in student loan repayment, the notion that deviations from expected income over several years could lead individuals to make smaller or larger repayments than expected. We calculate a measure of long-run insurance by regressing deviations in average payments (from 2011–2015) from their predicted values, $\bar{P}_i - \hat{P}(X_{i,2010}, D_{i,2011})$, on the corresponding average income deviations, $\bar{Y}_i - \hat{Y}(X_{i,2010}, D_{i,2011})$, where predicted average payments and income are based on borrower characteristics in 2010 and the early-2011 debt categories shown in Figure 3.

Using LLR (separately by debt levels in early 2011), Figure 4 shows that borrowers whose post-school income falls short of predicted income make smaller debt payments, whereas the opposite is true for those whose income is unexpectedly high. Notably, the relationship between payment

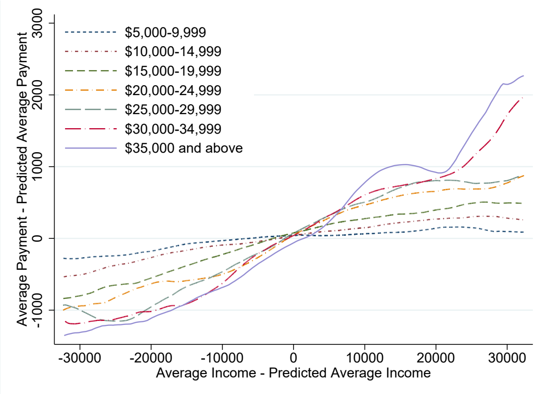

Figure 4. : Long-Run Insurance by Debt

Note: This figure reports predicted values from LLR of average payment less predicted average payment on average income less predicted average income separately by debt level in 2011. The Epanechnikov kernel is used with a bandwidth chosen to minimize the integrated mean squared prediction error.

deviations and income deviations is roughly linear for each student debt level, with a stronger relationship for borrowers who had accumulated more debt. Estimating simple linear regressions analogous to the nonparametric relationships in Figure 4, we find that an additional $1,000 in unpredicted income leads to a roughly $6 increase in payments for those with $5,000–9,999 in student debt and a roughly $53 dollar increase for those with at least $35,000 in debt. Through adjustments in loan payments, student borrowers appear to benefit from modest long-run insurance that is quite similar in magnitude to the short-run insurance measured by year-to-year fluctuations in income and payments. This insurance is substantially greater for those who borrowed more from the CSLP.

IV. Conclusions

Exploiting longitudinal administrative data on the student borrowing, repayment, and income histories of Canadian post-secondary students, we show that the CSLP offers modest insurance against unanticipated income fluctuations, both in the short and long term. On average, borrowers change loan repayments by roughly $30 when their income unexpectedly changes by $1,000 from one year to the next. We observe similar adjustments to income surprises that persist over the first 5 full years of loan repayment. Our results also suggest that both short- and long-run insurance are greater for borrowers who have accumulated more debt.

Given the substantial interest in expanding access to formal insurance through explicit income-based repayment schemes, our results provide some of the first evidence suggesting that there is plenty of room to expand insurance through more flexible repayment options, in Canada at least. Of course, such an expansion must grapple with concerns about information frictions like moral hazard and adverse selection; yet, these forces would need to be quite strong for the current insurance levels to be efficient. We continue to explore these issues in related work.

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