An analysis of Stafford loan repayment burdens

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\begin{abstract}
There is significant unease with the state of college loans in the US, of which Stafford loans are the most common. One of the most important issues relates to the “repayment burden” (RB), the proportion of a debtor's income per period required to repay loans. RBs are fundamental to assessments of student loan systems, and must impact on debtors' consumption experience and loan default probabilities. Surprisingly, there is little evidence of the size of RBs with respect to Stafford loans and our major goal is to rectify this deficiency through the presentation of a large range of plausible calculations, for average graduates and young lawyers working in either the private or public sectors. Importantly, we are able to compare estimates of RBs at the mean of incomes with a much more useful approach using unconditional quantile estimates of incomes. The disaggregation illustrates how critical it is to explore RBs across the income distribution by age and sex, and between employment sectors for lawyers. It is shown that RBs are a potentially important problem for a significant minority of debtors, and could assume major difficulties for some. 
\end{abstract}

1. Introduction

The design of the Stafford student loan scheme is critical to its success, with one of the most important aspects being the extent of loan repayment burdens (RBs) faced by graduates. RBs are the proportion of a debtor's income per period required to repay loans and are fundamental to assessments of student loan systems, because they impact on debtors' consumption hardship and loan default probabilities. Surprisingly, there is little evidence of the potential size of RBs in the US and this is our subject.

Our empirical exercise focuses on Stafford loan arrangement since this is the system commonly used by college students taking out loans: about 88\% of graduates with debts are on different types of Stafford loans (10 year loan, extended repayment, graduated repayment or extended graduated repayment plan \textsuperscript{(Chopra, 2013)}. In our analysis the incomes and thus the RBs of three groups of graduates (by sex) will be examined: a typical graduate, law graduates working in the private sector and law graduates working in the public sector.\textsuperscript{1} The attention given to the latter two groups is motivated by two facts: young lawyers typically incur the highest student loan debts, and the differences in lawyer incomes between the private and public sectors are very large. Both realities will likely impact very significantly on RB calculations and we want to know the extent to which this might matter.

A critical contribution of our exercise involves the use of unconditional quantile estimates of graduate incomes to show how important it is to explore RBs across the income distribution (by both age and sex). A crucial reason that RBs

\textsuperscript{1} The calculations present RBs only for single graduates and thus take no account of the possibility that debtors might be in households with shared incomes, such as would be the case with married couples. This is an acceptable simplification given that the RB issues are much more likely to matter when debtors first graduate and are young.

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matter is the potential for student loan repayment obligations to impact on debtors with respect to consumption hardship and/or default probabilities. Baum and Schwartz (2006) consider this issue at length with a detailed analysis of the so-called “8 percent rule”, the idea that at some ratio of income generally RBs become problematic to a significant proportion of debtors. The point has influenced our empirical method and is considered further below.

The approach provides new information on the potential incidence and extent of RBs for Stafford loans and is undertaken in different ways. To begin the process, a hypothetical, but fairly typical, loan repayment stream is constructed and this provides data reflecting potential annual repayment obligations. Given estimates of the structure of loan repayment requirements the illustration of Stafford RBs takes two different forms.

First, under a range of assumptions, we estimate the probability that young US graduates are likely to experience a repayment difficulty in at least one future year, something which has not been done before for any other country. This is achieved through an examination of the hypothetical loan payment obligation in combination with the presentation of distributions of graduate incomes which are calculated from a cross-section of a large number of individuals from a typical Current Population Survey.

Second, and perhaps our major empirical innovation, is the computation and presentation of RB calculations in a far more sophisticated way with respect to the distribution of income than what is typically undertaken. We begin by showing average and median RBs by sex and age for the three groups for a typical loan, which allows a comparison with what is revealed with a much more disaggregated method exploring the distributions of graduate incomes a long way from the mean. To achieve the latter entails the use of unconditional quantile regression techniques.

2. Motivating analysis of disaggregated repayment burdens

Education economists and others have examined the concept and implications of student loan RBs for more than a quarter of a century. Defined simply in a comparative static context, a loan repayment burden is the proportion of a person’s income that needs to be allocated to service a debt per period, or, formally:

\[
\text{repayment burden in period } t = \frac{\text{loan repayment in period } t}{\text{income in period } t}. \tag{1}
\]

There are several policy design issues usually raised with respect to RBs. The first is motivated by the importance of difficulties faced by debtors in meeting their obligations. The main issue is that it is obviously the case that in a world in which borrowing against expected future earnings is difficult, the higher is a debtor’s RB the less consumption and/or savings are possible at any given income. This is of importance in comparisons of different student loan policies; specifically, for example, Stafford student loans are quite different to income contingent loans in this respect, although we do not explore directly alternative policy approaches.

A second loans design issue is that greater RBs are associated with higher prospects that debtors will default on loan repayments because of low incomes; this is substantiated by the findings for the US of Dynarski (1994) and Gross, Cekic, Hossler, and Hillman (2009). An associated policy mechanism relates to the provision of interest rate subsidies on student loans, argued by Woodhall (1987) to influence governments’ approach to interest rate subsidies. Shen and Ziderman (2009) explore these links, while Chapman, Lounkaew, Polsiri, Sarachitti, and Sitthiponganpanich (2010) and Ziderman and Albrecht (1995) illustrate taxpayer subsidies associated with the Thai Student Loan Fund and many other Asian countries.

Given that RBs are of critical loan design importance, an important critical issue concerns the manner and methods used in their calculation. Until recently the vast majority of empirical research into RBs took two forms:

(i) calculations performed at the mean of the data (such as by using projected incomes smoothed by OLS age–earnings profiles); or
(ii) hypothetically constructed illustrations of ratios for some low income debtors.

In the first category Ziderman (2003) calculates average RBs for the Thai Student Loans Fund and finds them to be around 2.3–3.5%. Ping (2003) reports a similar exercise for Hong Kong and finds that repayment burdens are around 5–11%. For South Korea Kim and Lee (2003) reports RBs of 10–14%. What is critical to note from these exercises is that they arrived at the similar conclusion that RBs do not pose serious problems for graduates in these countries.

The other approach often taken with respect to the illustration of RBs are analyses of hypothetical incomes lower than the means or the OLS projections from age–earnings profiles (which are essentially the means as well) and some examples are as follows. Shireman et al. (2006) examines US loans calculating RBs for a range of 2006 US incomes, including as low as $10,000 per annum. This research shows that RBs for low income graduates can be as high as 22–37% for the lowest income debtors with debt sizes of $15,000–25,000.

A similar method is used by Schwartz and Finnie (2002) in calculations of the impact of earnings differential on Canadian RBs. They found that for graduates earning median income, RBs are around 6%, but for those in the 25th percentile however, RBs can be as high as 13%. Later work by Chapman et al. (2010) on the Thai Student Loans Fund (SLF), using a form of truncated OLS, reports that while RBs of typical graduates are around 3–5% in the earliest years after graduation, RBs of graduates in the bottom income decile are around 9–14%; they also report that the elimination of the considerable interest rate subsidies associated with the SLF will increase RBs to around 25–30% for this group of borrowers.

Our disaggregated approach using unconditional quantile regression methods with respect to the role of US graduate

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3 The issue of credit constraints is critical in understanding repayment burdens and is addressed in Rothstein and Rouse (2011) and Chapman (2006).

4 For recent analyses see Ziderman (2003) and Chapman and Lounkaew (2010).
income distributions follows similar exercises with respect to Thailand reported above (Chapman et al., 2010), and for Germany (Chapman & Sinning, 2014), Indonesia (Chapman & Suryadarma, 2013) and Vietnam (Chapman & Liu, 2013). In all these applications it is clear that RBs calculated at the mean of the data (for example, using an OLS econometric approach) are very different to those estimated for the tails of the distributions, leading to a far less benign interpretation of the effect of traditional loan schemes on the welfare of borrowers in all these countries. This is indeed what is found and reported here for Stafford loans.

The policy consequences of high RBs for those receiving relatively low incomes as graduates are potentially profound, a point highlighted in different ways by Baum and Schwartz (2006). We offer brief commentary in this context in the conclusion, a main point being that loan systems in which repayments are based on time alone will be associated with loan repayment difficulties for a significant minority of borrowers.

3. Understanding Stafford loans

There are many different loan schemes (not-universally) available to US college students. However, by far the largest is the Stafford loan system; in 2010 the proportion of enrolled higher education students with this type of loan was 35% (88% of all student borrowers) and the total stock of debt was around $750 billion in 2010 (National Center of Education Statistics, 2010). Accordingly we have chosen to model RBs on the basis of the Stafford loan system and it is now described in what follows.

3.1. Stafford loan rules

There are two types of Stafford loans: subsidized and unsubsidized.5 A subsidized Stafford loan is available to students with assessed financial needs based on information concerning household family incomes. With subsidized loans the federal government pays the interest (as long as the student is enrolled at least half-time) with repayments beginning after a 6-month repayment grace period following graduation. The second type of loan, unsubsidized Stafford, is available to all full-time students regardless of financial need, with the interest being capitalized during study and with a 6-month repayment grace period after graduation.

There are two principal repayment options for all Stafford loans.6 The first is a mortgage-type standard repayment plan under which the student is required to repay a constant nominal amount per period. The other option is the graduated repayment plan, in which the repayment requirement increases step-wise every 2 years. For a debt of less than $30,000 both plans have a fixed repayment period of 10 years, but if the debt exceeds this amount the student qualifies for an extended repayment plan with a maximum period of 25 years.7

Interest rates and the repayment conditions for 10 year Stafford loans are shown in Table 1.

3.2. Stafford loan debts: levels and repayments

An essential aspect of the calculation of RBs concerns the numerator of Eq. (1), the amount of money required to service the debt per period, and this will depend on the size of the loan, the interest rates imposed and the length of the repayment period. Our analysis assumes an average loan size in 2010 for a typical university graduate (called “All Graduates”) at to be approximately $20,000 per degree.8 Following Schrag (2007), the debt of law graduates is assumed to be $100,000.9

Fig. 1 illustrates repayment streams in real terms for the standard repayment plan for unsubsidized Stafford loans with the debt levels assumed in this study.10 While the re-

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Table 1: Stafford loan repayment conditions.

<table>
<thead>
<tr>
<th>Loan</th>
<th>Repayment plan</th>
<th>Interest rate(^a) per annum (%)</th>
<th>Grace period after graduation (months)</th>
<th>Repayment period (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidized</td>
<td>Standard</td>
<td>0</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Graduated</td>
<td>0</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Unsubsidized</td>
<td>Standard</td>
<td>6.8</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Graduated</td>
<td>6.8</td>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

\(^a\) The interest rates are in nominal terms.

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5 About 60% of students in receipt of Stafford loans are in the unsubsidized category.

6 There is an additional option that we have not considered, which is known as “deferment”. Deferment is allowed if debtors find themselves in highly adverse financial circumstances, such as a result of prolonged unemployment. However, less than 10% of debtors use this feature of Stafford loans (Chopra, 2013) and it should be noted that the option is not likely to be of great significance to the long-term protection of debtors because the maximum total length of time for which it is available is three years.

7 As well, Stafford loans charge a 1% origination and a 1% guarantee fee. There is also an upfront rebate of 1.5% which means that the net disbursement is 99.5% of the gross loan amount. The borrower must make the first 12 payments on time to retain the rebate.

8 This figure is based on the estimate provided by FinAid (2010). FinAid’s estimate is based on data from the National Postsecondary Student Aid Survey 2007–2008. From the data used in the study, Field (2009) estimates an average loan size to be around $20,000.

9 We chose to consider the impact of very large debts on RBs only for lawyers because it is not uncommon for members of this group to have considerable loan obligations due to law school tuition costs. Very few of the general population of Stafford debtors experience loans much above about $40,000.

10 Subsidized Stafford loan repayments of the same nominal level will be about 5% per annum lower. Since the amount borrowed by law graduates exceeds the maximum limits of Subsidized Stafford, the repayment stream illustration combines both Unsubsidized and Subsidized Stafford.
payment is fixed in nominal terms the real level of repayment declines as a result of CPI inflation, which is assumed to be 3% per annum.11

The important points from the figure are as follows:

(i) Relatively low total debts of around $20,000 in total are associated with annual repayment obligations of about $2000–3500 per annum but these increase to over $12,000 per annum with total debts of $100,000; and

(ii) Annual repayment obligations are ameliorated considerably (to about $4000–9000) with the use of the extended loan repayment system.

4. RB methods

What is now described are the empirical methods employed in this study, which are used in an examination of two separate issues. The first is the probability that borrowers face difficult RBs, defined as being equal to or in excess of 18% (which is justified below). Second, we estimate the extent of RBs for loan conditions defined above and for different assumptions with respect to lifetime income structures. Within this second category we examine age—income profiles and distributions to measure the denominator of Eq. (1).

4.1. Consumption hardship with RBs

In order to understand the likely incidence of problematic RBs, the first part of the exercise involves the calculation of probabilities that a borrower will experience consumption hardship with a particular level of RB. This suggestive benchmark of an excessive repayment burden is discussed in Baum and Schwartz (2006), which refers to the so-called “8 percent rule”, a standard suggesting that “…students should not devote more than 8 percent of their gross income to repayment of student loans.” (p. 2).

Baum and Schwartz are critical of the 8% rule and offer both a range of arguments related to the role of income and considerable consumption data. Table 2 reports selected research on the level of RBs that are likely to trigger important consumption difficulties and/or student loan defaults. Taken together, the evidence implies that a conservative RB of 18% of income is an appropriate and careful indicator of individuals experiencing difficulty with the repayment of student loans rather than the “8 percent rule” used in many contributions from the literature. In our analysis we use this as a cut-off for a maximum level of RB, below which the situation for a debtor can be considered to be benign.

Table 2

<table>
<thead>
<tr>
<th>Author</th>
<th>Maximum repayment burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodhall (1987)</td>
<td>8–10%</td>
</tr>
<tr>
<td>Scherschel (1998)</td>
<td>8%</td>
</tr>
<tr>
<td>Salmi (2003)</td>
<td>15–18%</td>
</tr>
<tr>
<td>Baum and Schwartz(2006)</td>
<td>Less than 10% for low to moderate income graduates; 10–15% for high income graduates</td>
</tr>
<tr>
<td>Harrast (2004)</td>
<td>8%</td>
</tr>
</tbody>
</table>

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11 This is approximately the 15 year average of the US inflation rate (Bureau of Labor Statistics, 2010).
4.2. Probability distributions of income

There are several approaches available in calculations of RBs which capture the role of graduate income distributions, including simple ratios, non-parametric density estimates and parametric density estimates. We have chosen the parametric approach because it is a standard tool for exercises of this nature (Cowell, 2000). We employ the Singh–Maddala distribution to approximate the income distribution of the borrowers’ cohort given that this calibration distribution outperforms lognormal and gamma distributions in approximating skewed income distributions (McDonald, 1984; McDonald & Ransom, 1979; Singh & Maddala, 1976). The function takes the form:

\[ F(x) = 1 - \left( \frac{1}{1 + (x/b)^a} \right)^b, \]  

(2)

where \( a \geq 0, b \geq 0, q > 1/a \) are parameters for random variable \( x \), in this case income. The shape of the distribution is determined by parameters \( a \) and \( q \), while parameter \( b \) scales the distribution. By denoting \( z = 1 + (x/b)^a \), the distribution function can be written as \( F(x) = 1 - z^{-q} \); the corresponding probability density function is then:

\[ f(x) = \left( \frac{aq}{b^a} \right) z^{-(q+1)} \left( \frac{x}{b} \right)^{(a-1)}. \]  

(3)

4.3. Income functions and age–income profiles

For calculations of expected repayment burdens we need estimates of expected graduate income paths, and for this we use variants of the standard earnings function of the following form:

\[ \ln I_{it} = \beta_0 + \beta_1 x_{it} \text{experience}_{ij} + \beta_2 x_{it} \text{experience}^2_{ij} + \epsilon_{it}, \]  

(4)

where \( i = 1, 2, 3, \ldots, n \) represent individuals; \( j = \) all graduates, public and private sector lawyers; \( I \) is the sum of annual earnings, social security payments and unemployment insurance payouts of individual \( i \), differentiated by sex; and, potential experience is defined as:

- age – time to complete a degree/dropout
- age at which schooling begins

The unconditional quantile regression (UQR) technique is employed to estimate earnings functions, with this technique being chosen to address the shortcomings associated with the use of OLS, in two senses. The first is that OLS estimates the mean value conditional on the distribution of the dependent variable, with a concern arising if the conditional distribution of a dependent variable is skewed, asymmetric, and/or does not have a unique mode. Using OLS estimates may not give robust results, this problem being common in the context of wage determination given the asymmetry in wage distributions.\(^{12}\)

A second attractive feature of (and the most important reason for us to use) unconditional quantile regression is that it provides a disaggregation of income distributions. This advantage is crucial to our analysis of student loans since repayment burdens must be highest for those in the lowest parts of the income distribution (Chapman et al., 2010; Chapman & Lounkaew, 2010), a feature which cannot be captured by the use of standard OLS. Thus we estimate age–income profiles for the 10th, 25th, 50th (median) and 75th quantiles of income distributions by age, with separate estimations being carried out for males and females.\(^{13}\)

Our unconditional quantile regression method follows Firpo, Fortin, and Lemieux (2009), a technique which relies on a transformation known as re-centered influence function (RIF). The RIF for the quantile of interest \( q_t \) is

\[ \text{RIF}(l; q_t) = q_t + \frac{\tau - D(l \leq q_t)}{\hat{f}(q_t)}, \]  

(6)

where \( \hat{f}(\cdot) \) is the marginal density function of \( l \) where \( D \) is an indicator function. In practice \( RIF(\hat{q}_t; q_t) \) is not observed, hence its sample counterpart is used instead:

\[ \text{RIF}(l; \hat{q}_t) = \hat{q}_t + \frac{\tau - D(l \leq \hat{q}_t)}{\hat{f}(\hat{q}_t)}, \]  

(7)

where \( \hat{q}_t \) is the sample quantile and \( \hat{f}(\hat{q}_t) \) is the kernel density estimator, with this transformed variable being used in place of the original dependent variable. One crucial distinguishing feature of the UQR is that it provides us with a way to recover the marginal impact of the regressors on the unconditional quantile of \( l \); in the context of this study it is the marginal impact of additional years of potential experience on income of each income quantile. Usual inference procedures of the OLS are also applicable to the UQR estimates.

5. Data and results

Description of the data now follows with estimates of income distribution and the probabilities that a borrower experiences repayment hardships being reported in the second subsection. We then illustrate the levels of average and median repayment burdens for borrowers followed by disaggregated analyses of repayment burdens. The penultimate section examines the repayment burden of the extreme case of lawyers whose debts reach the life-time limit of Stafford loans.

5.1. The CPS data

Data used to estimate a typical graduate and lawyer age–earning profiles are from the Current Population Survey March Supplement 2009. However, a single CPS does not contain sufficient observations for lawyers and we therefore pool law graduates’ data from four March data sets: 2005, 2007, 2008, and 2009.\(^{14}\) The income information in the early year data sets have been adjusted by wage inflation of 3% per

\(^{12}\) Many recent studies have used disaggregated approaches to analyze wage distribution and wage determination (Buchinsky, 1994; Machado & Mata, 2001). Firpo, Fortin, and Lemieux (2009) use unconditional quantile methods in a detailed exploration of wage distributions.

\(^{13}\) These profiles have been adjusted using OLS standard errors (see Wooldridge, 2006).

\(^{14}\) We exclude the 2006 data due to some data interpretation problems. When the 2006 data are pooled with the data in 2007 to 2009 some of the age–income profiles do not exhibit a regular empirical pattern of downward concavity, the cause of which is unclear; using the 2005 data, the age–income profiles behave as they are expected to.
to obtain their 2010 values. The CPS data contain information concerning sex, income, age, education, and employment status. Since we are interested in the calculation of RBs of borrowers generally the age–income relationships are examined for the whole sample (that is, irrespective of being employed).

Two groups of individuals have been omitted, the self-employed and individuals who are studying; the former because it is difficult to determine their incomes with any precision, and the latter because members of this group are not required to repay student loans (if they are studying at least half-time). Descriptive statistics of the data are reported in Table A1 (Appendix A).

5.2. Calculating the proportion of graduates with excessive repayment burdens

This section uses the Singh–Maddala income distribution model to illustrate the proportion of graduates that are likely to face excessive RBs, focusing on the youngest graduates since it is members of this group which is most at risk of loan repayment difficulties. For the denominator of Eq. (1) we analyze income distribution data separately for males and females, and with respect to lawyers.

In these hypothetical exercises borrowers are assumed to begin a 4 year degree at age 18 and graduate in the minimum time. For illustrative purposes a subset of the data is presented in Fig. 2, the probability distributions of income for all male and female graduates aged 22–25. We focus on this group because it is in the first years after graduation that relatively high RBs are likely to be experienced, given that this is when incomes are relatively low in a lifetime context.

Some features of these income distributions for all graduates aged 22–25 are:

(i) Roughly around half of the male sample earn less than $38,000 per annum; and
(ii) In proportionate terms more females than males earn relatively low incomes, defined as less than about $20,000 per annum

The next step is to translate the data into an income threshold below which for the debt level assumed there will be associated with repayment difficulties, assumed from the analysis reported earlier to be at RBs equal to or greater than 18%.

To illustrate how the income cut-off is derived, suppose that a graduate has a standard 10-year repayment Stafford debt of $20,000 (about the average debt size in 2010), which means that the annual repayment requirement is $2762 per annum. The income threshold can be found by calculating the level of income a graduate has to devote 18% of annual income or more to service the loan, with simple algebraic manipulation indicating that this level of income is $15,344 ($2762/0.18 = $15,344). According to the 18% benchmark the this means a debtor whose income is at or less than $15,344 will face an excessive RB, which is then the income level used as a cut-off to calculate the proportion of graduates with excessive RBs. Table 3 reports the results.

Under our debt assumptions and “excessive” RB definition the most important results from Table 2 are as follows:

(i) The proportion of graduates whose incomes are at or below the cutoff is about 43–49% in the first 2 years after graduation, but declines subsequently to around 8–18% in the last 2 years of repayment;
(ii) Under the assumption of very high debts, and even given their relatively high incomes, the probability that law graduates using the standard repayment plan experience repayment hardships is about 80–82% in the first 2 years after graduation (about 40 percentage points more than for all graduates with average debt);
(iii) Even for the last 2 years of repayment, the proportion is still around 44–62% for lawyers under the standard Stafford repayment system, which is about 4–5 times higher than is the case for a typical graduate; and
(iv) The extended repayment arrangement (under which borrowers with debts exceeding $30,000 are able to extend their repayment to a maximum period of 25 years) reduces the proportion of law graduates estimated to experience repayment difficulties to 30–35 in the first 2 years after graduation and by the last 2 years of repayment, the proportion falls to zero for males and to about 20% for females.

5.3. The level of repayment burdens: the use of aggregate (mean/median) analysis

The results reported above show an important aspect of the incidence of RB, the probability that graduates on average are likely to experience difficulties in meeting loan obligations. While this aspect of the exercise is instructive, it does not show the level of RBs experienced. There are two quite distinct approaches in an illustration of RB levels, which can be labeled aggregated and disaggregated. As argued above, much of the literature has focused on very broad calculations of RB, and this is where we begin.

This section considers average, and median, RBs associated with the standard repayment plan16 with respect to three groups of borrowers: all graduates and law graduates working in the private and public sectors. Based on the income functions discussed in the previous section, we construct expected lifetime profiles separately for males and females for each of the three groups. Fig. 3 reports age–income profiles for graduates derived from OLS estimates of the income functions.

Our analysis reveals that RBs do not differ importantly between unsubsidized and subsidized Stafford loans, and as a result discussion now focuses on the RBs associated just with unsubsidized Stafford loans. RBs for graduates receiving average (that is, derived from the use of OLS estimates) and median income are shown in Table 4.

The major findings are as follows:

(i) Graduates’ mean and median repayment burdens are around 7–9 and 4–5%, which should be considered to be low and unproblematic;

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15 This is about the average of wage inflation in the period 1995–2009.

16 Less than 6% of borrowers choose to use the graduated payment plan (Choy & Carroll, 2006).
(ii) Private sector lawyers under the standard Stafford plan have RBs of the order of 10–12% for males and females; (iii) However, the average and median RBs under the standard repayment plan for lawyers employed in the public sector are as high as 16–22% for males, and 20–29% for females; and (iv) The RBs are reduced by half when the lawyers are in the extended Stafford repayment plan.

Overall the results reveal that RBs calculated at the mean and median incomes should not be considered to constitute a serious problem, even when the level of debt is high (with the exception of public sector lawyers). However, the critical issue involves the consideration of RBs with the use of disaggregated incomes, and this is now reported.

5.4. The real situation of repayment burdens: disaggregated analysis

The major contribution of our exercise is to illustrate the great importance in an understanding of RBs of disaggregated analyses of the income data. Indeed, we contend that it is not possible to understand the importance of the US loan RB issue outside this context. Since the standard Stafford repayment system imposes the same (nominal) repayment throughout the repayment period, the associated RB is typically higher at
Table 3
Probabilities of experiencing high repayment burdens.

<table>
<thead>
<tr>
<th>Borrower</th>
<th>Debt ($)</th>
<th>Income cutoff (PA) ($)</th>
<th>Years of repayment after graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1–2</td>
</tr>
<tr>
<td>Male</td>
<td>All graduates</td>
<td>20,000</td>
<td>≤15,400</td>
</tr>
<tr>
<td></td>
<td>All lawyers (Standard)</td>
<td>100,000</td>
<td>≤108,250</td>
</tr>
<tr>
<td></td>
<td>All lawyers (Extended)</td>
<td>100,000</td>
<td>≤46,333</td>
</tr>
<tr>
<td>Female</td>
<td>All graduates</td>
<td>20,000</td>
<td>≤15,400</td>
</tr>
<tr>
<td></td>
<td>All lawyers (Standard)</td>
<td>100,000</td>
<td>≤108,250</td>
</tr>
<tr>
<td></td>
<td>All lawyers (Extended)</td>
<td>100,000</td>
<td>≤46,333</td>
</tr>
</tbody>
</table>

* We only calculate the proportion for the first 10 years of the extended repayment plan.

Table 4
Average and median repayment burdens.

<table>
<thead>
<tr>
<th>Borrowers</th>
<th>Debt level</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average Median</td>
<td>Average Median</td>
</tr>
<tr>
<td>All graduates</td>
<td>$20,000</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
<td>Private sector lawyers (standard)</td>
<td>$100,000</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td>Public sector lawyers (standard)</td>
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<td>0.22</td>
<td>0.16</td>
</tr>
<tr>
<td>Private sector lawyers (extended)</td>
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<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>Public sector lawyers (extended)</td>
<td>$100,000</td>
<td>0.11</td>
<td>0.09</td>
</tr>
</tbody>
</table>

We only report the repayment burdens for the first 10 years of the extended repayment plan.

The main points from the quantile regression results are:

(i) For both males and females graduate incomes at the 10th quantile are about 30% of the median income; and
(ii) Incomes of graduates at the 25th quantile are about 60% of the median income, and incomes at the 75th quantile are about 40% higher than median incomes.

In addition to these results we also have been able to calculate the RBs for male and female lawyers in both the private and public sectors (not shown here). There are three major results:

(i) The median incomes of both male and female law graduates working in the private sector are both about 70% higher than the median incomes of law graduates working in the public sector;
(ii) Law graduates working in the private sector at the 25th quantile receive incomes which are 60% lower than the median incomes for this group. Incomes at the 75th quantile are about 60% higher than median income for this group of law graduates; and
(iii) Law graduates working in the public sector at the 25th income quantile receive about 70% of the median income of this group. Incomes at the 75th quantile are about 40% higher than their median income.

The second step in the process involves the calculation of RBs for all age and sex income quantiles computed for each job, using the loan obligations presented in Section III and employed to illustrate the aggregate burdens shown in Section 5. There are several ways to present these results, and a graphical example shows what the RBs look like for all job groups at the 10th and 25th income quantiles (Q10 and Q25), the lowest levels considered.

From Fig. 5 it can be seen that RBs decline with age, which is a result of a combination of higher incomes with age and falling per period loan servicing obligations in real terms. The most significant points are:

(i) For the 10th quantiles, RBs in the first year are the highest for public sector lawyers and the lowest for private sector lawyers. Compared to the 18% cut-off, repayment of public and private sector lawyers under standard repayment plan will be above the cut-off throughout the repayment period; RBs for all...
Fig. 3. OLS age–income profiles.
Fig. 4. Selected male and female graduates age-income profiles.

Grades fall below the cut-off in the 7th year of repayment and thereafter;

(ii) For young low income graduates, irrespective of job, RBs are around or above our cut-off of consumption hardship of 18% (at the lowest they are 13–14% for female graduates overall and 16–20% for comparable males);

(iii) The RBs for low income public sector lawyers using the standard repayment plan are extremely high generally, at around 60 and 77% for males and females; and
(iv) RBs for low income private sector lawyers using the standard repayment plan are much lower than in the case for the public sector, but are still very high at over 40 and 30% for males and females.  

Highly disaggregated results are shown in Table 5 which has columns for the maximum RB per year as well as the annual average RB experienced in the assumed loan servicing period.
There are several additional important points from the data of Table 4:

(i) For graduates at the median and 75th quantiles, RBs do not pose serious problems since at their maximum they are less than 5%.

(ii) With the standard repayment plan, the average RBs of graduates at the 10th quantiles range from 20 to 25%. The extended repayment plan reduces average RBs to around 9–10%.

(iii) Public sector lawyers with median incomes under the standard plan still face maximum RBs of 23–31%, which exceeds the 18% difficulty benchmark; and

(iv) Even with the extended repayment plan of 30 years repayment, for public and private sector lawyers in Q25 the RBs still exceed the 18% difficulty benchmark for both males and females, and by very large margins.

5.5. Will the graduated payment plan solve the repayment burdens problem?

As an alternative to the extended repayment plan a graduate can choose the so-called graduated payment plan, in which the repayment period spans up to 30 years depending on the loan size. Under this plan, from Table 6, the maximum RBs for graduates at the 10th quantile range between 16 and 26%, which are clearly lower than the maximum RB of the extended repayment plan for which values are of the order of 19–37%, and the average RBs are about the same as the extended repayment plan. Similarly, the average RBs for public and private sector lawyers under the graduated repayment plan do not differ importantly from the extended repayment plan. Lawyers at the 10th and 25th quantiles still face excessive RBs in the first few years of repayment.

5.6. Discussion of the findings

The empirical analyses have illustrated the importance of income paths and income distributions in determining RBs. With the use of a RB cut-off ratio implying consumption difficulties at an RB of 18%, as suggested by Baum and Schwartz (2006), we have been able to show for the first time the extent of repayment concerns for young US graduates. The results are very instructive, revealing that just less than half of the young graduate population of debtors are likely to face difficulties. The incidence of repayment problems for young lawyers is apparently much higher.

As well as estimating the probabilities that young graduates will experience loan repayment difficulties, we have also been able to estimate the actual RBs for graduates across the income distribution by age and sex, and have been able to compare these results with the aggregate calculations typically employed in the literature. It is clear that analysis based on average (or median) income show modest RBs only, but the much more interesting quantile regression analysis shows very marked differences to the aggregated situation, and in some cases the RBs are extremely high indeed for those receiving incomes in the bottom third of the distribution.

This is the first time that such an exercise has been attempted for the US, and arguably reveals that the extent of the problem is substantial. It is apparently the case that that some groups of graduates face RBs which are so harsh that,
if anticipated must presumably act as a deterrent for many students from pursuing less well-paid jobs (such as teaching and public sector law). If unanticipated by the individuals ending up in such situations the difficulties in maintaining loan servicing is presumably associated with extremely high consumption hardships and associated default probabilities.

The exercises allow us to understand the reasons for: expressions of concern with the US college loans system and what it might means for occupational choice; the considerable growth in the Loan Repayment Assistance Program (LRAP)\(^ {18}\); the clear movements toward income based repayment systems over the last 20 years or so; and the presentation to the US Congress in April 2013 of the ExCEL Act, legislation designed to incorporate as default option a universal income contingent loan (ICL) repayment mechanism. ICL, it should be noted, have RBs set at maximum proportions of income per period by law.\(^ {19}\)

### 6. Conclusion

Some of the problems associated with US student loans policy can be traced in large measure to the expected difficulties faced by many students in repaying their debts. So-called “repayment burdens”, the proportion of income needed to repay a debt, are critical to an understanding of the effects of a student loan scheme because of their implications for consumption hardship and loan default probabilities. There is arguably no more important issue for the design of student loan systems.

While RBs have been examined in the student financing literature for at least a quarter of a century, until now there has been no systematic attempt to document empirically the breadth of the issue for the US, nor did we know much about the very important role in such analysis of graduate income distributions (by age and sex) in determining RBs. In this paper we have analyzed very broad ranges of expected lifetime earnings distributions, including with respect to lawyers (in both the public and private sectors) and this has provide new insights into the meaning and importance of RBs. There are several important insights from these broadly-based empirical applications.

The most important and obvious of these in concept is that anticipated RBs are a function of loan size, interest rates and expected incomes. In empirical terms it can be shown that a significant proportion of student debtors can expect to face repayment difficulties if they end up in in the lower parts of the graduate income distribution. We show also that there are critical differences in the potential impact of RBs depending on the nature of employment; in particular, public sector lawyers are fairly likely to be in situations in which RBs make this type of employment quite difficult in consumption terms. It would seem to follow that occupational choice will be influenced by the design of student loans, although our research does not address this possibility directly.

Our modeling has several limitations. One is that, apart from with respect to lawyers, we have not as yet explored RBs for Stafford loan users with extremely high debt levels, and there is little doubt that the problems raised in our analysis are significantly understated for a small group of potential students who have very large debts but are not lawyers. Two, while our use of unconditional income quantiles is a major improvement over the use of either average graduate earnings or hypothetical income scenarios, so far we have focused on cross-sectional data only. An improved way to proceed would be the use of panel earnings information (such as the NSLDS) which allows a relaxation of the implicit restriction from the use of cross section data that individuals remain in the distributions imposed by point-in-time methods.\(^ {20}\)

### Acknowledgments

We are grateful to the Australian Research Council for financial support with Linkage grant number LP11000496. Financial support from Dhurakij Pundit University is gratefully acknowledged.

### Appendix A

#### Table A1

Descriptive statistics.

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<th>Variable</th>
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<th>Female</th>
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<tr>
<td></td>
<td>Mean</td>
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<td>Total annual income ($)</td>
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<tr>
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</tr>
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<tr>
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<td></td>
</tr>
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</table>

### References


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\(^ {18}\) The Loan Repayment Assistance Program (LRAP) is a program designed to help in the repayment of loans for graduates with low incomes.

\(^ {19}\) For example, in the Australian, New Zealand and English ICL systems the maximum RBs are 8, 10 and 9% of annual income.

\(^ {20}\) See Higgins and Sinning (2013) for illustrations of the importance of this issue.