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Financing tertiary education in Indonesia: assessing the feasibility of an income-contingent loan system

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Abstract
This paper examines the feasibility of an income-contingent loan system to finance tertiary education in Indonesia. Using graduates' income data from the 2015 National Labor Force Survey, we modeled the life-cycle income distribution of university graduates using unconditional quantile regression. We used these estimates to simulate different income-contingent loan (ICL) schemes to observe the effect on the amount of repayment, length of repayment, government subsidy, and repayment burden of males and females in different quantiles of income. We simulated three loan schemes: without real interest, with a 25% surcharge on the total loan, and with 2% real interest. Implicit government subsidy was lowest with the 25% surcharge scheme. Results showed that ICL with a lower repayment burden is feasible in Indonesia and can increase access to tertiary education. We also discussed the administrative capacity among tax authorities.

Keywords Income-contingent loan · Student loan · Tertiary education financing · Indonesia

Introduction

Tertiary education in Indonesia is mostly funded privately (e.g., student fees and other self-generated funds). The contribution of private fees (i.e., tuition and other fees and levies) constitutes three-quarters of the total spending on tertiary education (World Bank 2012). Public expenditure on tertiary education, at 0.3% of GDP, is the third lowest in East Asia, only higher than Laos and Cambodia (Hill and Thee 2013). Meanwhile, financial aid provided by universities only covers 3% of the total cost, while coverage from government scholarships is limited (World Bank 2012). This has resulted in low tertiary education enrolment. The gross enrolment rate at tertiary level was only 36% in 2017 (UNESCO Institute of Statistics data portal).

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International experience showed that to increase access to tertiary education, students need support from a better government financing policy (World Bank 2012). An alternative is to create a student loan system. Generally, there are two types of student loan systems. The first type is a mortgage-type loan for which the repayment period is already set. This type of loan usually entails a high repayment burden, especially among those with lower incomes. Hence, it increases the risk of default. The second type is an income-contingent loan (ICL) system, for which debtors start repaying after their income reaches a certain threshold. Therefore, the length of repayment is not fixed upfront. This is a scheme practiced in many countries such as Australia, Sweden, England, and Germany.

In this paper, we simulated the pattern and implementation of income-contingent loan schemes in terms of affordability, feasibility, duration, and necessary policies. We also compared the performance of ICL with a mortgage-type loan simulation conducted by Chapman and Suryadarma (2013). In this paper, our case is university graduates. However, the same model could also be applied to other tertiary qualifications.

We found the following. First, ICL with a lower repayment burden can reduce or even eliminate default associated with mortgage-type loans. Secondly, the government should expect to provide subsidies for student loans, with the amount dependent on the type of ICL scheme implemented. In this study, implementing a 25% surcharge results in a smaller implicit subsidy, although the repayment period is longer than in schemes with no surcharge using a zero real interest rate or a 2% interest rate. Thirdly, females, especially those in income Q25, start paying off debt later than do males and have a higher implicit subsidy. This result showed that females experience slower income increases than do males and need higher subsidies from the government to be able to repay their loans.

We organize the rest of the paper as follows. The next section discusses several issues concerning Indonesia's tertiary education financing system and policy context. We then discuss the conceptual and empirical issues associated with repayment burden, before elaborating in the subsequent sections on the concept of two different hypothetical student loan schemes: one using a mortgage-type loan and the other ICL. Afterwards, we explain the econometric approach taken to model the income distribution of fresh graduates in Indonesia. These estimates are then used to examine the effects of a simulated ICL in terms of the time spent to repay loans and the implicit burden on the government. Finally, we discuss the results and conclude.

Tertiary education funding and policy in Indonesia

Currently, around 10 million people in the Indonesian labor force have a university degree. In comparison, 32 million have primary-level education (6 years), 22 million have 9 years of education, and 34 million are senior secondary level graduates (Ristekdikti 2016). According to UNESCO Institute of Statistics, the gross tertiary education enrolment rate was 36% in 2017, implying that an increase in the proportion of tertiary-educated individuals in the Indonesian labor force will not happen in the short term.

The current tertiary education funding scheme, in which students pay the full costs, significantly limits chances for those coming from lower-income families. Based on the family income levels, 55% of tertiary students come from the top income quintile (the richest 20%), 24% from the fourth quintile, and only 2.6% from the bottom (Hill and Thee 2013). People from poor families are extremely underrepresented in universities. Even with government and

universities providing financial aid for lower-income students, only a small portion of these students (less than 20%) fulfill the merit-based selection criteria to win scholarships (Hill and Thee 2013). Furthermore, such financial aid falls short of the initial target of covering one-third of the total cost of education. It only covers one-eleventh of it (Wicaksono and Friawan 2006).

The government, financial institutions, and philanthropic institutions have previously attempted to implement a student loan system for tertiary education. None of these efforts have been successful. Wicaksono and Friawan (2006) stated that the default rate on loans was reported to reach 95%, and programs suffered from poor administration and failure in monitoring and tracking graduates. Most banks consider student loans a high-risk business and are reluctant to be involved. The Sampoerna Foundation redesigned student loans with the involvement of the International Finance Corporation and Bank Internasional Indonesia. However, only 15 students have received the loan since the scheme was established (Wicaksono and Friawan 2006). Therefore, at the moment, there is no student loan scheme that is widely accessible to all those wishing to pursue tertiary education in Indonesia.

The tertiary education system has several characteristics that must be considered in a student loan design (Chapman and Doris 2018). These also apply to the Indonesian context. First, the quality of tertiary education in Indonesia, with only 55% of tertiary education institutions receiving government accreditation, is still relatively low (Ristekdikti 2016). This implies that the returns on tertiary education may not be high enough to enable the graduates to pay back their loans. Secondly, students who drop out may not be able to repay any of their outstanding loans. Thirdly, the return to tertiary education are not constant over time, making the calculation of potential returns to a particular degree very difficult. These characteristics pose risks that may deter prospective students. This is the main reason that, in most countries, the government covers these risks.

In the next section, we provide a discussion of repayment burden, a central concept in a student loan system.

The concept of repayment burden

Loan repayment burden (RB) is defined as the proportion of income required to service a loan (Chapman and Doris 2018). Therefore, the RB in period t is:

$$Repayment\ burden_t = \frac{Loan\ repayment_t}{Earnings_t} \tag{1}$$

The equation shows that repayment burden increases with higher loan amounts or lower earnings. As the RB increases, the probability of default also increases. Shen and Ziderman (2009) showed that RB of around 8% is still feasible. A study examining factors leading to student loan default indicated that debtors report hardship when RB exceeds 8%, inability to manage the debt when RB reaches 11%, and default on the loan when RB is at 20% (Gross et al. 2009).

A hypothetical student loan scheme: mortgage-type loan

In this section, we provide a summary of Chapman and Suryadarma (2013), who conducted a simulation of RBs for a mortgage-type loan. This is the most popular type of student loan

system, including in the United States, Canada, the Philippines, and Thailand. Basically, loan repayments are made in pre-determined amounts over a given time period.

Cross-country comparison of RBs showed that mortgage-type loans usually have RBs that exceed the ideal rate of 8%. As an example, low-earner graduates in Vietnam face an RB of up to 85% of their annual income (Chapman and Liu 2013), while in Thailand, it reaches 30% (Chapman et al. 2010). The experience in developed countries is not much different. In the USA, the RB goes as high as 60% of income and, in Germany, female borrowers in the lowest quintile are prone to live in poverty due to loan repayments (Chapman and Sinning 2014). With such high RB, it is highly likely that many of the borrowers will end up defaulting.

To simulate the RB of a mortgage-type loan in Indonesia, Chapman and Suryadarma's (2013) hypothetical loan scheme has the following features:

> "First, the loan covers both education costs (tuition and other associated cost) and living expenses (assumed to be the same as the education costs) for four years. Second, the loan repayment starts after the student graduates from university, with a one-year grace period. In this paper, we assume that individuals enroll in universities at 18 and graduate at 21. Therefore, the repayment starts when the individual is 23. Third, the loan must be fully repaid within 10 years
> In addition, we assume that the loan carries a nominal interest rate of 8%, and an annual inflation rate of 5% in the economy. The real interest rate of 3% and the 10-year repayment period are similar to those used in the US and Canada."

Using data from the 2006 National Socioeconomic Survey (*Susenas*), Chapman and Suryadarma (2013) discovered that the RB for graduates working in Java ranges from 20% for those earning in the 75th quantile to 50% for those earning in the 25th quantile. Using the 8% threshold discussed in the previous section, loans would have a very high default risk for graduates in the 25th and 50th earnings quantiles, as well as for those earning in the 75th quantile, except for the last few years of the repayment schedule.

The authors also simulated the RBs for graduates in Sumatra and for male and female workers separately. Figure 1, reproduced from Chapman and Suryadarma (2013), shows the results.

To conclude, the authors found that the RBs for a mortgage-type loan system would be extremely high for the majority of Indonesian graduates and would also create financial difficulties for the majority of borrowers. The prospects for default, and the adverse consequences for both students and the government, are clear. These conclusions indicate that a different loan type to finance tertiary education is needed. In the next section, we describe the ICL scheme.

The concept of an income-contingent loan

The significant feature that differentiates an ICL from a mortgage-type loan is that debtors are expected to start paying off their loan once their income reaches a certain pre-determined threshold, with the RB set at a relatively low proportion of the income. When income is low, the absolute amount of repayment is low. The repayment amount increases as income increases. This feature, which follows the age-earning profile, will smooth the repayment process, enabling more people, including those coming from disadvantaged families, to participate in tertiary education (Chapman et al. 2014).

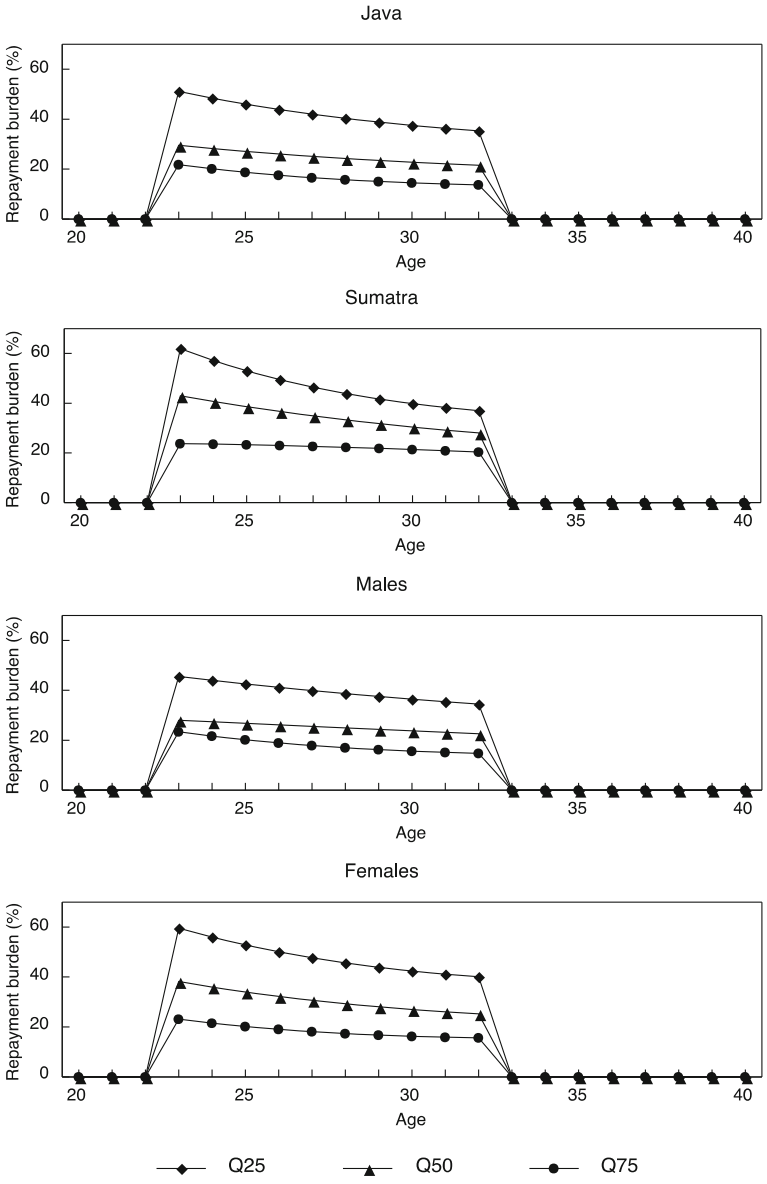


Fig. 1 Loan repayment burdens of mortgage-type Loans. Source: Chapman and Suryadarma (2013)

Two major advantages of implementing ICL are default protection through government subsidies and guarantees and consumption smoothing due to the lower RB. Several countries applied a 25–30-year time limit on the life-cycle of the loan repayment, meaning that when the time limit is exceeded, the loan will be written off. Australia is an exception, as there is no time limit for repayment. In Australia, the level of unpaid debt of those whose income is insufficient over the life cycle is around 15–18% of the total debt. Chapman and Doris (2018), however, argued that this should not be considered as default but rather the cost and insurance of implementing ICL.

Several important discussion questions arise regarding the shape and the implementation of an ICL scheme: differences in loan calculation, collection, and policy issues in the country. The major differences lie in the interest rate and the amount of subsidy that the government is willing to provide. When governments do not charge the full cost of government borrowing (e.g., the interest rate that the government pays on government-issued bonds), then, essentially, it is subsidizing the loan. In addition, the cost of administering the loan is often covered by the government. These types of subsidies are usually called implicit subsidies, because even if the graduates repay the debt in full in real terms, the government is still subsidizing the loan to a certain extent. As a rule of thumb, the subsidy is smaller when the debt is fully repaid quicker.

There are different subsidy schemes across the world. Australia sets a zero real interest rate. In contrast, Canada, the Czech Republic, Namibia, and the Netherlands provide almost no subsidy for the loan (Shen and Ziderman 2009). That is, they charge the full cost of government borrowing, usually by setting a real interest rate that is equal to the cost of government borrowing. Another way of addressing the interest rate issue is by setting a surcharge on the loan as soon as the student graduates. In addition, hybrid arrangements, in which surcharges are combined with a particular rate of interest, are considered less regressive than most interest rate options (Chapman et al. 2014). Britton et al. (2018) compared ICL designs in England, Australia, New Zealand, and the USA. They showed that variations in interest rate, loan write-off, repayment threshold, and repayment rates could have different effects on government subsidies depending on the size of the total loan at graduation relative to average earnings.

Currently, the literature on ICL has expanded to include simulations using data, among others, from Ireland (Chapman and Doris 2018), the USA (Barr et al. 2018), China (Cai et al. 2018), and Japan (Armstrong et al. 2018). The ICL schemes in these simulations are tailored to the conditions in each country. Overall, however, they all show that an ICL is feasible with regard to repayment period and government subsidies. More importantly, the ICL performs much better than a mortgage-type loan.

Another important discussion is that ICL implementation depends highly on a country's institutional regime, especially on a good taxation program that enables the government to acquire personal income data. Despite the weaknesses in Indonesia's current tax system (Arnold 2012), the increased compliance rate after tax amnesty (Hamilton-Hart and Schulze 2016) indicates an improving taxation administrative system. The current improvement in tax administration is a cause for optimism for implementing ICLs.

A hypothetical student loan scheme: income-contingent loan

The following are the characteristics of the ICL in this simulation:

1. A total debt of Rp48,800,000 (US$3754), calculated from the average education expenditure of families in Java and Sumatra that have a child in university undertaking a 4-year degree (in the 2015 *Susenas*—national socioeconomic survey). The loan consists of total tuition fee of Rp24,400,000 (US$1877) for a 4-year degree and a living cost allowance that is assumed to be the same amount.
2. Repayment begins after a graduate reaches a certain threshold of earnings. In our case, we used the median income of fresh graduates (22–24 years old) from the 2015 *Survei Angkatan Kerja Nasional* (*Sakernas*—national labor force survey), which is

Rp9,000,000 per annum (US$692) for male graduates and Rp5,400,000 per annum (US$415) for female graduates. This ensures that half of the male and female graduates start repaying immediately.

3. The repayment period is set at 25 years, from the first year of repayment, after which the outstanding debt is written off.

We simulated three different schemes of ICL:

1. A loan with a zero real interest rate
2. A loan with a 25% surcharge on the total loan, charged as soon as the graduate earns the degree, with a zero real interest rate
3. A 2% real interest rate on the outstanding principal, starting immediately after graduation with a 4-year degree. Since the interest is on the outstanding principal, any repayment will immediately deduct from the principal. From an administrative point of view, this scheme is the most difficult to implement as it requires calculating real interest rates.

In each scheme, we set RBs at two different levels: 8% and 10%. We used these schemes to calculate repayment periods and government subsidies for graduates in the 25th, 50th, and 75th percentiles of income.

Modeling the age-earning profiles of university graduates in Indonesia

Data

Before calculating the repayment period and government subsidies, we modeled graduate age–earnings profile. Given our interest in various points of the income distribution, we used an unconditional quantile regression. The data was obtained from the 2015 *Sakernas*, a nationally representative labor force survey administered annually by Statistics Indonesia. It collected data on individual characteristics of adults, their activities and, if they are working, information on their incomes, and hours of work. We focused our analysis on the sample of 16,330 tertiary education graduates aged 22–60 years old living on Sumatra and Java, Indonesia's two main islands. Since *Sakernas* does not record the earnings of self-employed individuals, our sample consists of university graduates who were employed as wage workers or not employed. The characteristics of wage workers are those whose employment status is employee or casual workers in agriculture and non-agriculture.

In our dataset, the employment rate of university graduates is 84% (91% for males, 77% for females). Of those employed, 90% were wage workers. More than two-thirds of the non-employed (either unemployed or out of the labor force) university graduates were females. In order to ensure the non-employed sample is included when we estimated the age-earnings profile, we use the inverse hyperbolic sine transformation (Bellemare et al. 2013).

Methodology

Our method to estimate life-cycle income is shown in Eq. 2:

$$\ln Y_i = \alpha + \beta PE_i + \gamma PE_i^2 + \varepsilon_i \quad (2)$$

where $ln\ Y_i$ is the monthly earnings of worker i and PE_i is the potential workforce experience of the individual, calculated as current age minus 22.[1] The result of this calculation is the prediction of life-cycle income in different quantiles. This is particularly important to assess the burden of loan repayments on the lowest income quantile.

Higgins and Sinning (2013) argued that income and employment dynamics need to be incorporated to get an accurate estimate of life-cycle income. Dearden (2018) found that in most cases, using Eq. 2 led to an estimate of subsidies that are too high. However, the approach proposed by Dearden (2018) requires a panel dataset where the same individuals are observed in adjacent ages. In addition, the sample needs to be sufficiently large.[2] To our knowledge, no Indonesian dataset fulfills these two conditions. The only panel dataset available is the Indonesia Family Life Survey, with surveys in 1993, 1997, 2000, 2007, and 2014. However, the sample size is too small to allow an estimation of dynamic lifetime income.[3]

Therefore, in this paper, we estimated conditional quantile regression on Eq. 2. Dearden (2018) argues that conditional quantile regression is preferred to unconditional quantile regression in estimating life-cycle income. The use of conditional quantile regression follows Cai et al. (2018). We note that based on findings from Dearden (2018), our subsidy calculations are likely to be over-estimated and should be treated as an upper bound.

Results

Based on the data in Fig. 2, the income distribution starts to decrease among males and females in their mid-late 40s for those in Q25. The incomes of males and females in Q50 and Q75 begin dipping in their early 50s.

Using this estimation, we calculated the period of payment, monthly RB, and the subsidy that the government needs to provide in an ICL system. As previously mentioned, in each scheme, we set RBs at two different levels: 8% and 10%. We used these schemes to calculate the repayment period and government subsidies for graduates in the 25th, 50th, and 75th quantiles of income. The results for males are shown in Figs. 3, and 4 shows the results for females. Among the male employees, those in Q25 start paying at a later age (i.e., 31 years old). Using the 8% RB, all graduates across different income quantiles and schemes are able to finish repaying their debt within 25 years. The longest repayment period is for Q25 on the surcharge scheme, which would need 17 years to repay. A much lower subsidy is apparent when an additional surcharge or 2% real interest is applied to the loan, compared to the zero real interest scheme (Fig. 3). In the surcharge scheme, Q75 only need a 3.1% subsidy.

When increasing the repayment burden to 10% for male employees, the higher RB means significantly lower government subsidy, regardless of the schemes. The Q75 in the surcharge scheme do not need government subsidy. Also, the duration of payment is shorter by 1 to 3 years, with a 2% real interest rate scheme cutting the years of repayment the most. Despite

[1] The use of age 22 comes from the 16 years required to graduate with a 4-year university education, including 12 years of primary and secondary education, assuming a student first enrolls in school at the age of six (i.e., 22 = 16 + 6).

[2] In Dearden (2018), the dataset used has an average of 330 individuals per age transition for men and 400 for women.

[3] The IFLS contains a total sample of 1015 university graduates aged 21 to 60 that we observe in at least two waves. The average sample for each age is 25 (10 females, 15 males).

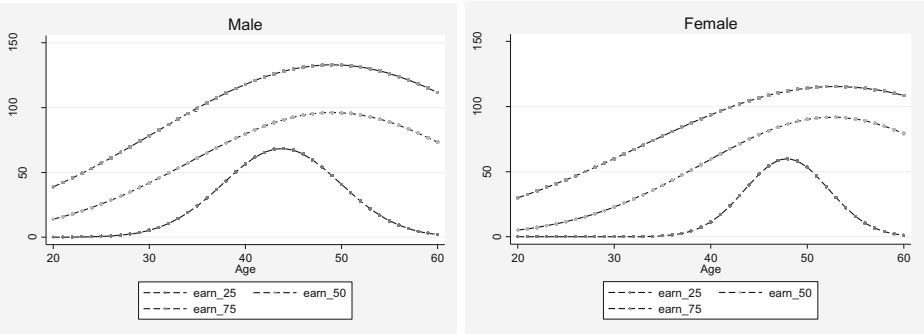


Fig. 2 Life-cycle predicted annual income distribution for males and females in the income quantiles 25, 50, and 75 using conditional quantile regressions. Source: National Labor Force Survey 2015

this, the reduction in government subsidy is not higher than when using the 25% surcharge scheme, due to the accumulation of interest. When comparing for male employees across repayment schemes, the 25% surcharge and 10% RB result in the lowest government subsidy for Q50 and Q75. Although implicit subsidy for Q25 is lower with the 2% real interest rate scheme, the scheme may not be desirable from an equity perspective, given that Q25 is paying the most in real terms.

For female employees in Q25, loan repayment starts later than for male employees at age 38. Most female borrowers could finish repaying in 25 years, except for those in Q25 when applying a 2% real interest rate scheme. Also, the Q25 on surcharge and 8% RB also fail to finish repaying the loan. Meanwhile, in the NRI scheme, those in Q25 are able to finish repaying the debt within 25 years, despite starting later than the rest of the income groups. With the 25% surcharge scheme with 10% RB, for female graduates, the government subsidy amounts to only 3.7% in Q75, with the debt fully repaid at age 33. Meanwhile, the implicit subsidy for Q25 females is 56% for the NRI scheme with 10% RB. Implicit subsidies are lower in the 25% surcharge and 2% real interest scheme despite not being able to fully repay the loan. For the former, it is because the 25% surcharge results in a higher absolute repayment. For the latter, it is because the principal is fully paid together with a partial payment of the interest amount.

Overall, male and female graduates in Q50 and Q75 could pay off the debt within the 25-year repayment period. Together with starting later in repayment, female graduates have a longer duration of loan repayment than have male graduates by around 2 to 3 years with most of the loan schemes. Male and female graduates whose income belongs to the lowest quantile are predicted to start paying off at a later date due to the longer period taken to reach the median income.

When comparing the results for both male and female graduates, a distinct feature is that government subsidy is consistently higher among females. The higher government subsidy is indicative of two things: first, the gender earnings gap and second, the lower employment rate for females, where those who do not work essentially received a full subsidy for their education.

We found that applying a real interest rate results in graduates in Q25 having to pay the highest comparative total loan repayment. Although this results in a lower government subsidy, policymakers need to consider the equity aspect of a policy that results in lower-income earners paying more than higher-income earners.

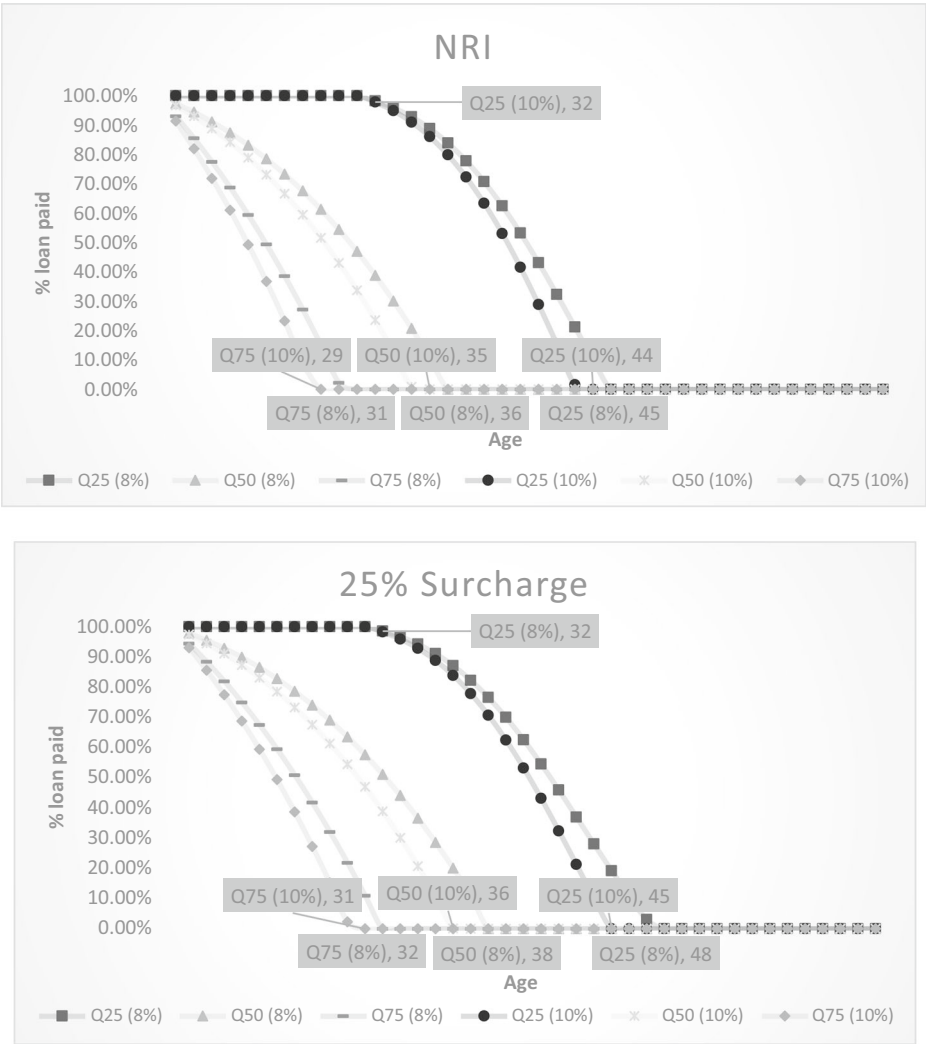
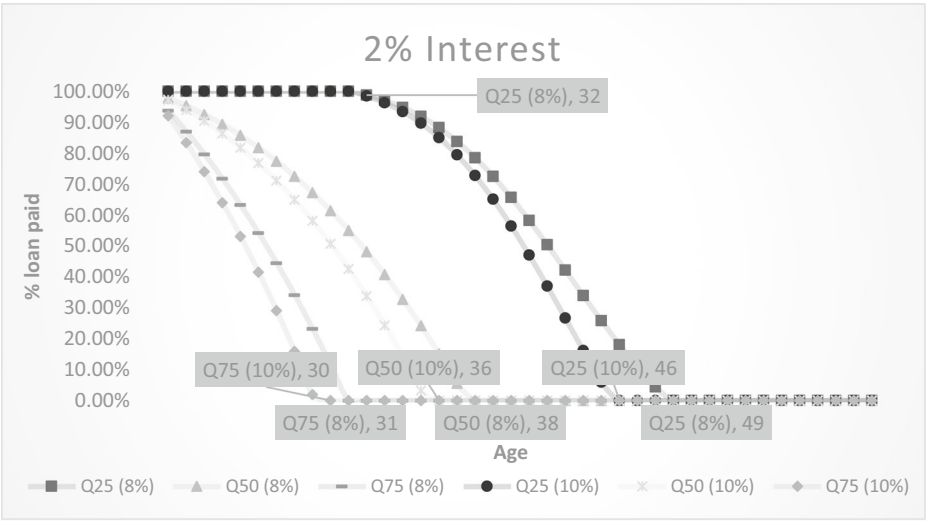


Fig. 3 ICL repayment patterns for male employees among three quantiles of income distribution (Q25, Q50, and Q75) for different repayment schemes (Using 8% and 10% repayment burden)

A more feasible scheme to reduce the government's subsidy for male and female graduates is adding a 25% surcharge on the total loan. Despite the relatively longer period of repayment, the government can expect to provide smaller implicit subsidies, except for Q25. Among males and females, a 10% RB with a 25% loan surcharge seems to be the most desirable scheme.

Discussion and conclusion

This study has several main findings regarding modeling student loans using ICL schemes. First, ICL with a lower RB can reduce or even eliminate default. Secondly,



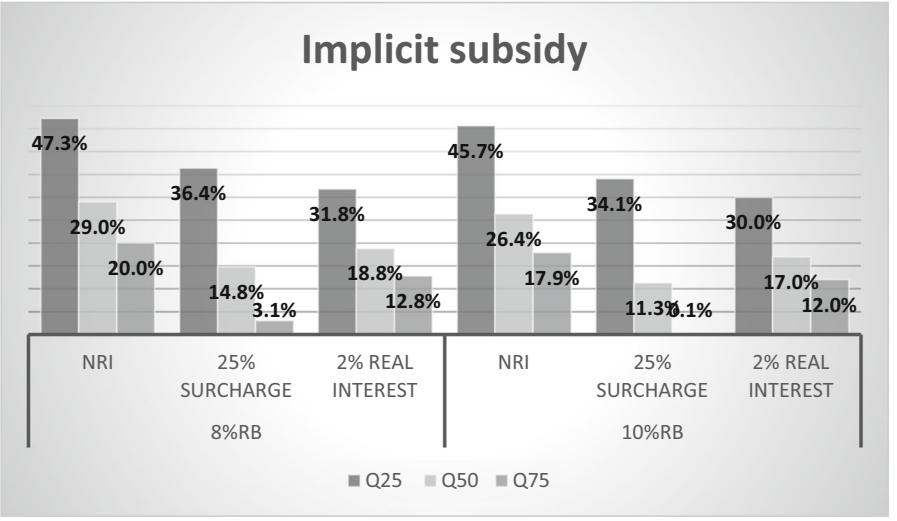
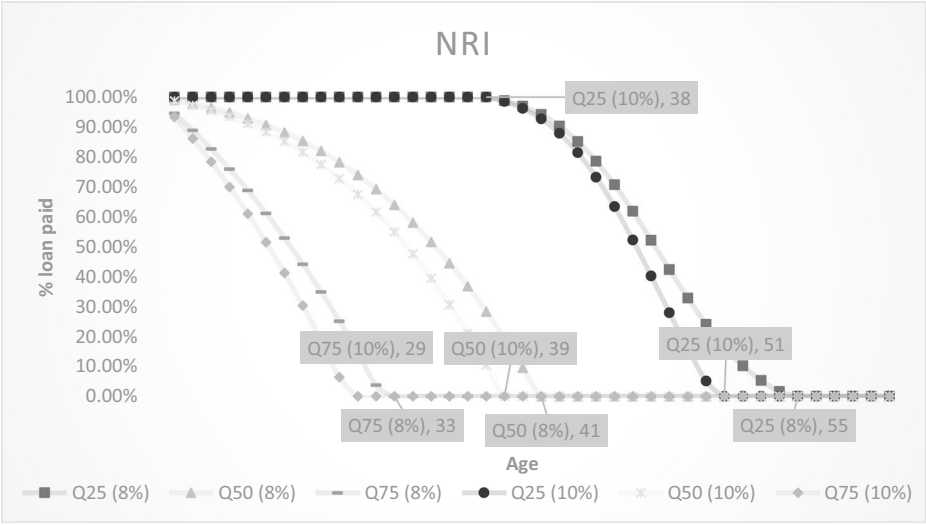


Fig. 3 (continued)

the government should expect to provide subsidies for student loans, with the amount depending on the type of ICL scheme implemented. But the subsidy is definitely smaller than the full subsidy that the government would need to provide if it provides scholarships or make tuition free. In this study, modeling a 25% surcharge results in a smaller implicit subsidy, although the repayment period is longer than in schemes using a zero real interest rate or a 2% interest rate and no surcharge. Thirdly, females, especially those in income Q25, start paying off debt later than do males and have a higher implicit subsidy than have males. This result reflects that females experience slower income increases than males do and need higher subsidies from the government to be able to repay their loans.



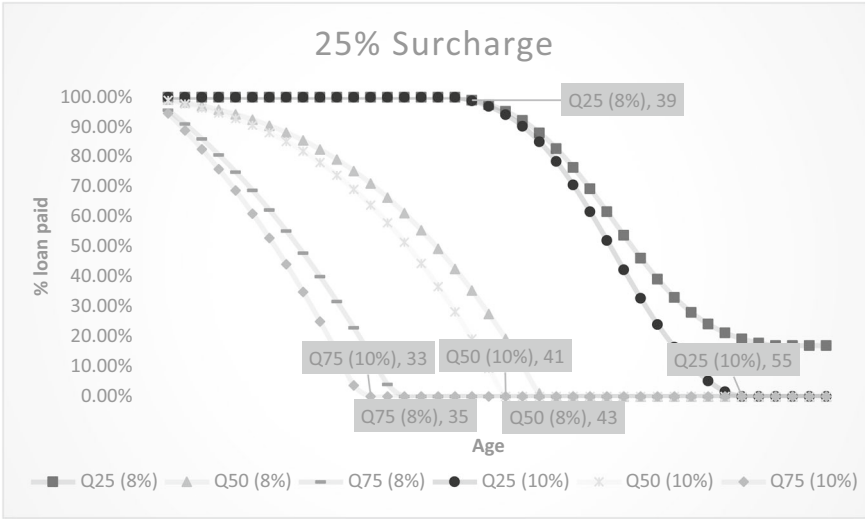
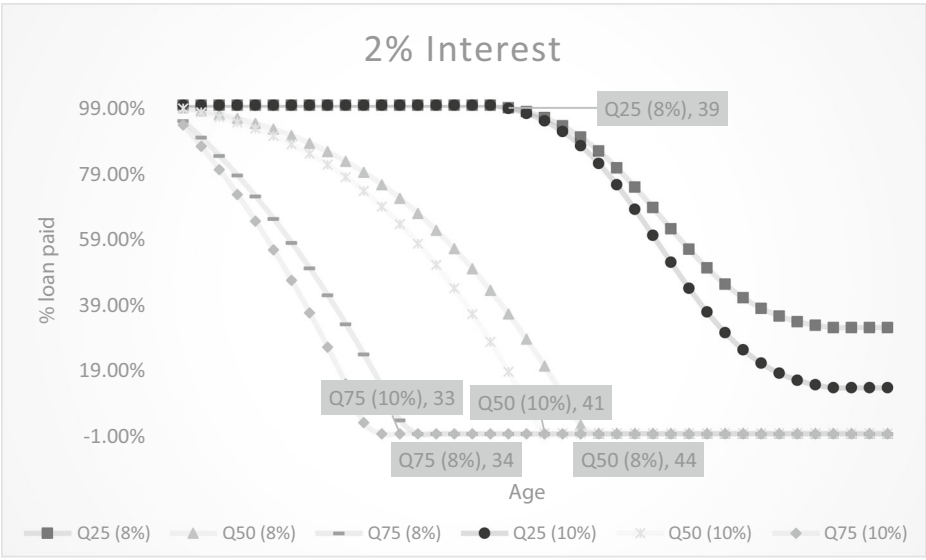


Fig. 4 Repayment patterns for female employees among three quantiles of income distribution (Q25, Q50, and Q75) for different repayment schemes (using 8% and 10% repayment burden)

Based on the analysis, the scheme that implements a 25% surcharge would be beneficial to both the government and students. First, compared to the other schemes, adding a 25% surcharge would lower the implicit subsidy provided to the majority of borrowers, which would benefit the government. Among males, this scheme requires the least amount of subsidy. Secondly, it is not regressive. Those in the lower-income distribution do not have to pay more in real terms than those earning a higher income. Finally, the surcharge scheme is easier to administer than the 2% real interest scheme, benefiting the evolving capacity of the Indonesian tax office. These are characteristics of a well-targeted program (Chapman et al. 2012).



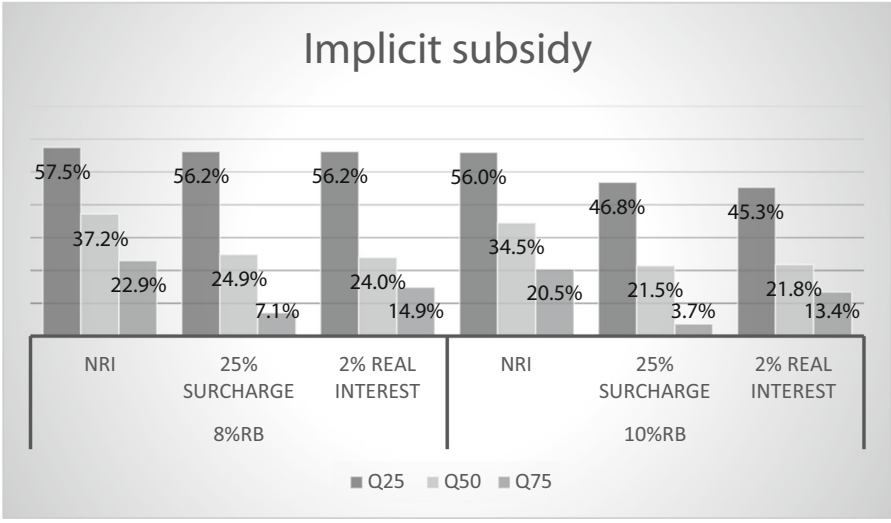


Fig. 4 (continued)

Considering the level of repayment burdens, we discovered that a 10% RB is a good compromise. The government does not have to provide as high subsidies as with an 8% RB. The average levels of subsidy of 15% (for males Q50) and 24% (for females Q50) are still reasonable, given the social returns of tertiary education. In addition, graduates are less burdened by the debt repayment and could still take out other types of loans, such as home or vehicle loans.

Another important discussion is that an ICL system requires reliable lifetime income documentation, which is more feasible for graduates working in the formal sector or in a

context where most self-employed individuals report their income accurately. The former is the case in Indonesia, where 90% graduates are working in the formal sector. In addition, a long-term longitudinal household survey in Indonesia, the Indonesia Family Life Survey, showed that more than 85% of university graduates remain in formal sector employment throughout the 14-year span of the survey.

Online income tax deduction processes have now been used widely in the formal sector in Indonesia, including the amount of annual salary, paid tax, and outstanding. This system is already provided by the tax office. Thus, participation by the tax office in student loan debt collection could use the same system. Using a benchmark mechanism explained in Barr et al. (2018), the mechanism for loan repayments would involve employers with holding the loan repayments based on employee's salary in the same way as withholding income taxes, government insurance, or other social security contributions. Therefore, implementing automatic loan repayment through employers for the majority of debtors is feasible.

Being the first simulation of an ICL system in Indonesia, this study has a number of limitations that must be addressed in future, more detailed studies. First, we have not controlled for university major choice, which significantly affects the amount of education expenditure. Health and science degrees have significantly higher costs due to the reliance on laboratory and practical activities. However, they also have higher potential returns and the government may wish to provide additional subsidy to attract students to study these much needed subjects. Secondly, our simulations do not take into account the possibility that an ICL would affect the returns to tertiary education as more people attain such education level. Such effects would need to be estimated in future studies. Lastly, we have not discussed those working in the informal sector. Although they only make up a small proportion of graduates, obtaining accurate earnings data and withdrawing loan repayments would be more difficult.

In conclusion, an ICL is more feasible than a mortgage-type loan. There are many ways in which ICL can be implemented, but all of them should guarantee smaller RB and protection against periods of hardships for graduates. However, there must be a discussion by government to establish policies and practices required for an ICL. This is where the discussion should proceed next.

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