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INCOME CONTINGENT STUDENT LOANS FOR THAILAND: ALTERNATIVES COMPARED

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Income Contingent Student Loans for Thailand: Alternatives Compared

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SUMMARY

In Thailand there is an on-going debate concerning the most desirable form of higher education financing, with the critical concern being the form such a loan scheme should take. Conceptually there are two generic possibilities: a mortgage-type loan, in which repayments are made on a consistent basis over a set time period; and an income contingent loan, in which the level and timing of repayments depend on a borrower's future income stream.

From 1996 to 2006 Thailand's preferred approach to higher education financing took the form of a mortgage-type loan known as the Student Loan Fund. The SLF involved targeted funds being allocated for both income support and tuition, with a time limited repayment period of 17 years after graduation. In a sister paper for this conference Piruna, Sarachitti and Thitima (2008) (PST) analysed the SLF with respect to two important dimensions: taxpayer financed interest rate subsidies; and measures of so-called "repayment hardships", calculations of the proportion of borrowers' future incomes that would need to be allocated to SLF repayments.

Very similarly to the findings of Adrian Ziderman and others, PST conclude that the SLF was associated with very substantial subsidies, perhaps of the order of 65 per cent. The source of the subsidy can be traced overwhelmingly to the interest rate regime. Consistent with these high subsidies, and in a unique contribution, they find also that the SLF has low rates of repayment hardships of around 4 per cent on average and only around 10 per cent for graduates whose future earnings are very low. In short, the SLF is a very generous scheme for students.

In the current paper we seek to replicate some significant aspects of PST with respect to various suggested forms of income contingent loan schemes for Thailand. By definition this type of loan has "repayment hardships" set as a collection parameter; for example, in the TICAL system explained below and in place in Thailand for 2007 only, the highest rate of repayment was set at 12 per cent of a borrower's income, and with the current Australian system the figure is 8 per cent. For these schemes repayment hardships are not an issue.

However, there can be considerable implicit interest rate subsidies with income contingent loan schemes. The major contribution of this paper lies in the illustration of the extent of these subsidies for four different possible income contingent loan policies for Thailand. We show that the size of the subsidies are of the order of 25 - 40 per cent for a TICAL-type of arrangement calculated for graduates with average earnings, and for this group these subsides can be almost eliminated with alternative loan schemes with a form of a real rate of interest. But a more disaggregated, and preferred, approach to computing loan subsidies reveals that TICAL-type schemes have subsidies of 30-55 per cent, and even improved loan systems with respect to interest rate regimes have the potential to result in subsidies of 3-18 per cent, even for low levels of debt.

A major benefit of our approach is that we have used the same data, econometric techniques and present value methods as employed by PST, providing a consistent basis from which to assess alternate loan schemes. We find that in design terms, and with respect to taxpayer subsidies, there seem to be viable possibilities for an income contingent loan scheme for Thailand. But this conclusion is more credible for relatively low levels of debt than for the sizes of tuition that are more likely to be associated with higher price private institutions. In this latter case the subsidies of even well designed schemes can be as high as 50 per cent. Whether or not Thai institutional and administrative arrangements are well suited to the collection of an income contingent loan is a critical policy issue not addressed in what follows.

1 Introduction

In 2007, for one year only, Thailand introduced an income contingent loan system for higher education, known as the Thai Income Contingent Allowance and Loan system (TICAL). TICAL was based on Australia's Higher Education Contribution Scheme (HECS), an income contingent loan system in which tuition charges are collected through the income tax system depending on a student's future income. HECS was instituted in 1989, and similar student loan policies commenced over the 1990s and beyond in, among other countries, New Zealand, Chile, South Africa, Ethiopia, Hungary and the UK. Other countries, notably Colombia and Israel, are involved currently in research-based debate on the usefulness of income contingent loan approaches to higher education financing.

This paper examines the conceptual bases of alternative student loan systems, and it is argued that income contingent approaches are generally seen to be desirable arrangements compared to alternatives. However, such an assessment is associated with two extremely important qualifications: one is that the administrative institutions of a country are such as to allow efficacious collection of a former student's debt; and two, is that an income contingent scheme needs to be properly designed with respect to some key parameters.

We are unable to ascertain with complete certainty if potential Thai collection arrangements are such as to enable efficient and fair collection of an income contingent loan, and we leave the answer to that critical question to administrative, tax and/or social security specialists[1]. Our aim instead is to throw significant light on the second concern, the importance of design parameters with respect to the likely outcomes of such a system, with our focus being on the critical issue of implicit taxpayer interest rate subsidies. Internationally this is now perhaps the most important non-administrative design issue for an assessment of the efficacy of income contingent loan schemes.

Interest rate subsidies, along with loan repayment hardships, have been explored in a sister paper for this conference by Piruna, Sarachitti and Thitima (2008) (from now on, PST), which is concerned with analysis of the previous Thai student loan scheme, the Student Loan Fund. PST and our analysis use exactly the same data set and empirical methods so we can compare and contrast confidently the effects of disparate past and prospective Thailand student loan arrangements.

While interest rate subsidies are a major aspect of our paper, it is useful to make a comment on the other major component of the PST analysis, so-called repayment hardships associated with the SLF. The results of their research are summarized below, and it is important to recognize that one of the principal benefits of an income contingent loan system is that, unless the loan is designed poorly, it is not possible to incur important repayment hardships, as measured by the proportion of a graduate's income that needs to be allocated to the repayment or a student loan. That is, because such a loan is repaid up to a maximum percentage of income, there will not be

[1] The analysis below of requirements suggests the importance of being able to collect the debt on the basis of observed lifetime incomes, and this might imply for Thailand the use of the social security system instead of the income tax system. With the former there are already income contingent collections of funds for pensions.

repayment hardships. In the Australian system this maximum is 8 per cent, and for TICAL it is 12 per cent; for mortgage-type loans these figures could be very different.

However, there are important reasons to explore the findings of PST with respect to implicit interest subsidies for the SLF and, in this paper, various forms of an income contingent loan for Thailand. As implied above, all the authors collaborated closely in the two exercises in order to be in a position to make similarly-based assessments of the effects of the different schemes in terms of subsidies.

The PST results can be compared to our findings for two different interpretations of how TICAL might have worked in practice had it not been discontinued, as well as with an alternative proposed income contingent loan scheme for Thailand. Two versions of the latter are explained and explored, with these variants having been motivated by our curiosity with respect to the possible role played by different forms of the requirement that former students cover, at least in part, the opportunity cost to the government of borrowing to finance the income contingent loan. As with PST, we use not only average predicted lifetime graduate incomes for our empirical exercises, but low, median and high estimates of incomes as well, and for both sexes.

Our estimates and calculations illustrate the empirical significance of different levels of income thresholds for repayment, and for disparate approaches to the imposition of real rates of interest for a wide spectrum of graduate incomes, and take into account the possible roles of graduate unemployment rates and potential loan losses associated with collection inefficiencies. The findings suggest that in design terms there is a viable option for an income contingent loan scheme for Thailand, but this conclusion seems to be more credible for relatively low levels of debt than for the sizes of tuition that are more likely to be associated with higher price private institutions.

2 Traditional Student and Income Contingent Loan Schemes: Conceptual Issues

2 (i) The need for government intervention in higher education financing

A significant financing issue for higher education is that there is generally seen to be a case for both a contribution from students and a taxpayer subsidy (Barr, 2001; Chapman, 2006). An important question is: is there a role for government beyond the provision of the subsidy?

An understanding of the issue is facilitated through consideration of what would happen if there were no higher education financing assistance involving the public sector. That is, a government, convinced that there should be a subsidy, could simply provide the appropriate level of taxpayer support to higher education institutions, and then leave market mechanisms to take their course. Presumably this would result in institutions charging students up-front on enrolment for the service.

However, there are major problems with this arrangement, traceable in most instances to the potent presence of risk and uncertainty. This critical point was first raised in Friedman (1955). The argument can be best understood with reference to the nexus between labour markets and human capital investments. The essential point is that

educational investments are risky, with the main areas of uncertainty being as follows[2]:

(i) Enrolling students do not know fully their capacities for (and perhaps even true interest in) the higher education discipline of their choice. This means in an extreme they cannot be sure that they will graduate with, in Australia for example, around 25 per cent of students ending up without a qualification;

(ii) Even given that university completion is expected, students will not be aware of their likely relative success in the area of study. This will depend not just on their own abilities, but also on the skills of others competing for jobs in the area;

(iii) There is uncertainty concerning the future value of the investment. For example, the labour market — including the labour market for graduates in specific skill areas — is undergoing constant change. What looked like a good investment at the time it began might turn out to be a poor choice when the process is finished; and

(iv) Many prospective students, particularly those from disadvantaged backgrounds, may not have much information concerning graduate incomes, due in part to a lack of contact with graduates.

These uncertainties are associated with important risks for both borrowers and lenders. The important point is that if the future incomes of students turn out to be lower than expected, the individual is unable to sell part of the investment to re-finance a different educational path, for example. For a prospective lender, a bank, the risk is compounded by the reality that in the event of a student borrower defaulting on the loan obligation, there is no available collateral to be sold, a fact traceable in part to the illegality of slavery. And even if it was possible for a third party to own and sell human capital, its future value might turn out to be quite low taking into account the above-noted uncertainties associated with higher education investments.

It follows that, left to itself — and even with subsidies from the government to cover the value of externalities — the market will not deliver propitious higher education outcomes. Prospective students judged to be relatively risky, and/or those without loan repayment guarantors, will not be able to access the financial resources required for both the payment of tuition and to cover income support. There would be efficiency losses (talented but poor prospective students would be excluded), and distributional inequities (the non-attainment of equality of educational opportunity). Government intervention of some form is thus required.

The capital market failure with respect to higher education financing is apparently understood by the governments of most countries, given that public sector loan interventions are commonplace internationally. Until recently, government intervention often took the form of public sector guarantees for commercial bank provision of education loans, but over the last decade or so has increasingly involved

[2] As discussed by Barr (2001), Palacios (2004) and Chapman (2006).

income contingent loans. While quite different in practice, both approaches are motivated in part by the recognition that, left alone, higher education markets will function poorly.

2 (ii) The costs and benefits of mortgage-type loans

A possible solution to the capital market problem described above is used in many countries is the provision of student loans — either directly by the government or indirectly through guarantees of repayments to banks by the government in the event of default. Typically, and most simply, these loans involve fixed repayments, as, for example, with a house mortgage. While this seems to address the capital market failure, it raises other problems.

Students face an important default issue. This is that some may be reluctant to borrow for fear of not being able to meet future repayment obligations. Not being able to meet repayment obligations has the potential to inflict significant damage to a person's credit reputation (and thus access to future borrowing, for example, for the purchase of a house). These concerns imply that there will be less borrowing than there would be in the absence of this default concern.

A reluctance to borrow due to the uncertainty of repayment constitutes what might be labeled an *ex ante* default problem for prospective students. There is also an *ex post* problem, which is that a proportion of those students who took the credit risk of borrowing for a human capital investment will end up not being able to repay because of low incomes. In these circumstances default imposes a potentially large cost on those unlucky borrowers who do poorly in the labour market. Significantly, research suggests that members of the default group are predominantly those who ultimately experienced relatively high unemployment rates and relatively low earnings[3].

The prospect and consequences of a student defaulting on a loan obligation is a potentially critical issue for borrowing to finance human capital investments, due to the uncertainties noted above. A consequence is that some eligible prospective students will not be prepared to take bank loans. This problem can be traced, in part, to the fact that bank loan repayments are insensitive to the borrower's financial circumstances.

A final possible practical problem of government guaranteed bank loans relates to the fact that in many countries loans of this type are not universally available, or available loan levels are limited[4]. This is because loan provision and/or amounts available are usually means-tested on the basis of family income. This raises the important issue explained by Carneiro and Heckman (2002), concerning the role of the sharing of financial resources within families. Some students will be unable to access necessary levels of borrowing and will face the same credit market failure as they would in the

[3] Dynarski (1994) used the National Post-secondary Student Aid Study and found strong evidence that experiencing low earnings after leaving formal education is a strong determinant of default. Importantly, borrowers from low-income households, and minorities, were more likely to default, as were those who did not complete their studies.

[4] Eligibility for Canada student loans is limited to less than half of all students (Finnie and Swartz, 1994).

absence of a government guarantee of a bank loan. Making loans available on a means tested basis (as is the case in the US and Canada) suggests that some prospective students will have difficulties accessing the system.

The bottom line is that, even though government assisted conventional loans are a common form internationally of public sector involvement in higher education financing, such an approach has several apparently very significant weaknesses.

2 (iii) The costs and benefits of income contingent loans

A different approach to student financing involves income contingent loans, such as Australia's HECS. The attraction of these schemes is that they can be designed to avoid many of the problems associated with alternative financing policies.

First, there is no concern with intra-family sharing so long as the scheme is universal. That is, no students would be denied access through the imposition of means-testing arrangements that could exclude some whose parents or partners who are unwilling to help.

Second, given an efficient collection mechanism, there is no default issue as such for the government. That is, if the tax system works well and is used to collect the debt (at least for Australia, this is essential because the Australian Taxation Office is the only institution with reasonably good information on a former students' income), it is extremely difficult for the vast majority of graduates to avoid repayment. There is a form of a default issue in that some students will not pay back in full, because income contingent systems are designed to excuse some former student's payments because their lifetime incomes are too low. Harding (1995) calculates that the total repayments remaining uncollected because of the nature of HECS would be of the order of 20 per cent for the original scheme (when the repayment conditions were particularly generous for the student). Other reasons loans may not be repaid include death and emigration.

Third, because repayments depend on income, there should be no concerns by students with respect to incapacity to repay the debt, or hardships associated with repayments. That is, once an individual's income determines repayment, and so long as the repayment parameters are sufficiently generous, it is not possible to default or hardship because of a lack of capacity to pay. This is the critical practical advantage of income contingent collection schemes — unlike any other form of assistance, there is insurance against default and repayment difficulties

Income contingent schemes have significant advantages over alternative financing arrangements, in that they can be designed to avoid the major problems of their alternatives. This does not make such approaches a panacea generally, however: for an income contingent scheme to be made operational it is essential that there is an efficient administrative collection mechanism.

The matter of collection is of great importance for the introduction of income contingent loans in countries without the necessary institutional apparatus. Chapman (2006) argues that the minimum conditions for a successful income contingent loan seem to be:

(i) accurate record-keeping of the accruing liabilities of students;

(ii) an effective collection mechanism with a sound, and if possible, computerised record-keeping system; and

(iii) an efficient way of determining with accuracy, over time, the actual incomes of former students.

While most OECD countries will have income tax or social security systems that enable efficient collection of income contingent debts, it is very unlikely that developing countries have the capacity to meet requirement (iii) above. This issue requires critical attention in the Thai policy context.

3 The Student Loan Fund, TICAL and the Need for Alternatives

3 (i) The recent history of student loans in Thailand

A loan scheme for Thailand´s higher education students, known as the Student Loan Fund, was introduced in 1996, and has been analysed extensively by Ziderman (2003) and for this conference by Piruna, Sarachitti and Thitima (2008) (PST). The main features of the loan scheme are documented in PST with the most important design issues for our purposes being as follows.

The SLF is in essence a traditional student loan scheme, with a fixed repayment period of 15 years after a grace period of two years, but with the novel feature that the proportion of the total debt repayment obligation increases with time, starting at 1.5 per cent in the first year and reaching 13 per cent of the total debt in the final year. This aspect of the SLF can be seen to be a part-concession to the benefits of income contingent loans, since the repayment obligations will be correlated with increases in average earnings with age, as is clear from the analysis presented in this paper. What these arrangements mean for repayment hardship is summarised below.

An important feature of the SLF relates to the nature of the interest rate subsidies. As pointed out in Ziderman (2003) and PST, these arise principally from: the zero nominal interest rate in the period before repayment begins; and that the nominal interest rate of 1 per cent per annum, when imposed, is significantly below the true cost of borrowing for the government of perhaps 2 to 3 per cent in real terms per year. The importance of these arrangements in an understanding of the overall interest rate subsidies is summarised below.

In 2007 the SLF was suspended and was replaced by (the short lived) TICAL. The main design features of TICAL, and their financial implications, are explained and examined in detail below. In 2008 TICAL was replaced with what is essentially a new form of the SLF, but with the same fixed repayment period of 17 years. This new scheme has not been analysed by PST and nor will it be explored here, but it is very likely that the new loan system's implications for both repayment hardship and interest rate subsidies are very similar to those of the SLF.

3 (ii) The effects of the SLF in summary: Repayment hardship and interest rate subsidies

The paper for this conference by PST analysed two critical aspects of the Thai former SLF: repayment hardships and interest rate subsidies. The former is defined as the proportion of a graduate's income that is used to repay the loan, and is calculated for both graduates earning average incomes in the periods of repayment, and so-called "unlucky graduates" who earn in the bottom 10 per cent of the graduate income distribution by age and sex.

For the same sample of graduates used in this paper, and using the same methods to project graduate incomes by age and sex, PST find that the measures of repayment hardships on average are around 4 and 3.5 per cent for females and males. For the "unlucky graduates" the results are about 12.4 and 9.7 per cent for females and males. It is reasonable to describe these outcomes as fairly low, certainly compared to the situation in other countries with similarly motivated and designed student loan schemes[5].

Related to the above finding is that the SLF delivers very considerable interest rate subsidies, of the order of 67 per cent overall, a finding very similar to that found also for the SLF by Ziderman (2003). These very high subsidies are explained by a combination of policy parameters, but by far the most important empirically can be traced to the fact that SLF debt is adjusted annually by a nominal rate of interest of only 1 per cent, implying a real rate of interest of about -3 per cent per annum. Interest rate subsidies are a very important aspect of the Thailand student loan debate, and they are now considered further with respect to the design of alternative possible income contingent loan schemes for the country.

3 (iii) TICAL and an alternative form of an ICL described

TICAL was motivated by the perceived benefits of ICL considered in section 2, although it is reasonable to suggest that there are some controversial design aspects of the scheme. There are several important and arguably contentious design issues associated with scheme that are addressed in our empirical exercises.

The first relates to the first income threshold of repayment, set at 192,000 Baht per year, which seems to be very high given the age-earnings profiles of graduates presented below[6]. This particularly matters if the debt has no real rate of interest, since it is necessarily the case that the longer it takes to repay a government loan which does not have a real rate of interest the greater is the size of the associated subsidies from taxpayers. A major goal in what follows is to illustrate the empirical significance of this feature of TICAL.

Because the first income threshold of repayment of TICAL seems to be very high, we suggest a different income contingent loan model for Thailand for illustrative

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[5] Recent calculations by Bruce Chapman and Colombian education officials illustrate that for the ICETEX loan scheme in that country the repayment hardship results for "unlucky graduates" in that country are of the order of 35-45 per cent.

[6] For example, from the data presented in this paper it would seem to take an average female graduate around 12 years before any TICAL repayments are made.

purposes, and we label this ILLUSTRATIVE. It has two repayment features different to TICAL: one, the first income threshold of repayment is very much lower, at 100,000 Baht per year; and two, the rates of repayment we have chosen are much closer to those of HECS, meaning that they are considerably lower than is the case for TICAL, particularly at high levels of income. Table 1 presents the repayment thresholds and rates of income for the two broad schemes.

Table 1
Repayment Thresholds and Collection Parameters (per cent of taxable income)[7] of Different Income Contingent Loan Schemes for Thailand

TICAL		ILLUSTRATIVE	
Annual Income (Bath)	**Collection parameters**	**Annual Income (Baht)**	**Collection parameters**
Less than 192,000	0	Less than 100,000	0
192,000-360,000	0.05	100,000-110,000	0.03
360,001-840,000	0.08	110,001-120,000	0.04
Higher than 840,000	0.12	120,001-130,000	0.05
		Higher than 130,000	0.06

A second design issue concerns the indexation arrangements with respect to the income thresholds of repayments and this is a critical point in trying to understand what the effects of TICAL might have been. The concern is that it is not clear if the income threshold of repayment of the loan was to be indexed, and to what, as is the case for all relevant parameters of Australia's HECS, for example. To address this we raise two possibilities.

The first possibility is that the income thresholds are eventually indexed to average nominal wage increases, but we are unsure what this means in a Thai context in which regular indexing is typically not part of the economic policy fabric. To illustrate the significance of this possibility, however, it is necessary that an indexation arrangement of some form is imposed and the one we have chosen is full (assumed to be 5 per cent per annum) wage indexation being imposed 10 years after the initiation of the policy, and continuing annually after that. This scenario of eventual indexation of the repayment thresholds is referred to from now as TICAL1.

The second possibility is that the TICAL thresholds are not to be not indexed, meaning that over time as nominal wages increase the threshold becomes effectively lower and graduates would increasingly be repaying their debts earlier; in the event of

[7] This form of collection is the same as that used in the Australian loan scheme, HECS, in which once a given threshold of income is reached a given proportion of total income is owed. While this seems to imply an extremely high effective marginal tax arte at the first income threshold, work by Chapman and Leigh (2007) suggest this has only small behavioural effects.

real interest rate subsidies this would mean lower taxpayer subsidies over time. This unindexed scenario is referred to from now as TICAL2.

A third, related, and controversial aspect of TICAL is that there is no real rate of interest on the debt, with an adjustment being made annually to a student's or graduate's debt for changes in the CPI only. This aspect of the scheme looks to be identical to Australia's HECS arrangement, but there is a critical difference. This is that for HECS there is a 20 per cent discount for an up-front payment of the tuition obligation, which in effect means that students choosing to take the debt are subject to a 25 per cent surcharge[8] (meaning that effectively there is a blunt form of a real interest rate for HECS). The motivation for analyzing in depth the conceptual issues associated with interest rate regimes, and for providing an empirical approach to explore this further, are now considered.

3 (iv) Understanding the role of the form of real interest rates

The issue of interest rate subsidies in student loan schemes is extremely important. Moreover, there are major differences between countries even with apparently similar approaches to income contingent loan policies. As examples: given the write-off of the interest rate of loans in nominal terms in New Zealand, the effective interest rate for that country is negative in real terms; for both the UK and TICAL the real rate of interest is zero; and for HECS there is a surcharge on the debt once it is incurred, but the on-going adjustment of the debt is equal only to the rate of price inflation.

There are important disagreements between researchers on the appropriate level and form of a rate of interest on the debt associated with income contingent loans. Barr (2007) makes a compelling case that the Australian form which uses a surcharge introduces distortions in both efficiency and equity terms, although on average it still means that there is some attempt to require students to contribute to the government's opportunity costs of borrowing. Chapman (2006) argues that the issue is quite complex in the case of an income contingent loan, since such schemes are designed to offer insurance against the costs of poor future outcomes, and in the case of a former student experiencing low future incomes they may find themselves in an *ex post* situation of accumulating high real debts due simply to unpredictable poor luck.

Three broad points can be highlighted:

(i) There is a strong case for an income contingent loan scheme to require borrowers to contribute to diminishing the costs of borrowing for the government of the loan (which must mean that both the UK scheme and TICAL, and now the New Zealand system, have important design weaknesses);

(ii) In the circumstances in which loans are offered in part for income support (as they are in New Zealand, but not in Australia), the case for having an on-going real rate of interest such as suggested by Barr is strong, since

[8] This can be explained as follows. If there is a charge of $1,000 a student can avoid the debt by paying $800 - this means that students paying later take on an additional 25 per cent, that is, $200/800.

otherwise some borrowers will be able to use their loans to make profits in the commercial money market, at taxpayer's expense; and

(iii) There might be a case for a surcharge instead of an on-going real rate of interest for tuition charges if it is the case that borrowers are averse to having rapidly increasing debts in times of on-going low incomes, a possibility that seems to be recognized through most loan schemes having a so-called "forgiveness" clause, after which all the outstanding loan is written off.

We are unable to determine with confidence what the correct form of a real rate of interest should be for income contingent tuition charges in the Thai context, so in what follows we have designed two alternatives forms of the suggested alternative to TICAL1 and TICAL2, and this is known as ILLUSTRATIVE. The first form is called ILLUSTRATIVE1, and this variant imposes the same rule as HECS by adding a surcharge of 25 per cent to the debt, after which the real rate of interest is zero (that is, with an on-going CPI adjustment only).

The second is called ILLUSTRATIVE2, which has a conventional real rate of interest imposed on the debt, of 3 per cent real per annum, with adjustments beginning immediately after the debt is incurred[9]. It is a significant goal of our research to determine the extent to which these different approaches matter with respect to the extent of taxpayer subsidies, and whether the size of the debt matters to an assessment of the relative appeal of these different approaches. This last point might become very important if the income contingent loan system is allowed to move to the private sector where tuition charges are much higher

4 The Data and Earnings Function Results

4 (i) Motivation

We are interested in estimating earnings functions in order to provide structure and understanding of the lifetime earnings streams of male and female graduates, on average. This will assist in an overall understanding of the Thai graduate labour market, allowing insight into increments to wages from additional education, and the internal rate of return to investing in a university education. In this sense our single cross-section provides restricted but complementary information for the exercises reported for this conference in Lathapipat (2008).

More significantly for the policy aspect of our exercise, the OLS results will allow us to determine the extent of interest rate subsidies on average from our four different variants of income contingent loans for Thailand. This is done by using predicted smoothed average earnings to ascertain the timing and structure of loan repayments under different debt obligation parameters.

It is also interesting and important for subsidy calculations to examine the extent to which interest rate subsidies vary between debtor groups with quite different *ex post*

[9] Very roughly this is about the long term government bond rate, at least for Australia.

income levels. This is approached in a separate exercise explained and reported below by truncating the earnings data, our preferred method to the use of quantile regressions for reasons to be explained. Our method reveals that the use of OLS to determine interest rate subsidies from different forms of income contingent loans has the potential to overstate aggregate loan repayments and thus to understate loan subsidies. The differences are not trivial, and this matters for the policy debate.

4 (ii) The data

We use cross-section individual survey data from the Labour Force Survey (LFS), collected in the third quarter of 2006. The LFS is administered by the National Statistical Office, and it contains information on individuals' characteristics such as age, marital status, household size, educational attainment, and geographical location, as well as job-related information such as employment status, occupation, earnings, and hours of work. The LFS covers every province in Thailand and has a total sample size of over two hundred thousand; thus, it is the most comprehensive data set for labor market available in Thailand to be used for analysing returns to education at the aggregate level. Summary statistics are presented in Table 2.

Our analysis is restricted to individuals aged from 15 to 60[10]. We have omitted: a very small number of individuals whose earnings are significantly different from the population at large; the self-employed; part-time workers[11]; and those who work in the agricultural sector.

The major points are as follows. There are 19,856 males and 17,491 females in the sample. Earnings per hour are calculated as weekly earnings received from the main job divided by total hours worked in the main job per week., and gross hourly wages in 2006 for males and females are 52.47 and 54.68 Baht, and we have adjusted these to derive average annual earnings for men and women, of 106,769 and 108,385 Baht.

Binary variables (0,1) are used to represent the highest educational qualification of each individual in the sample and in the econometric work we use individuals who did not complete primary school as the reference point for comparisons. About 18 and 13 per cent of males and females have the highest qualification recorded as being primary school level or lower, and about 32 and 29 per cent of males and females have attained lower secondary or upper secondary education. The receipt of an undergraduate qualification differs markedly between males and females, with the proportions being 17 and 33 per cent for males and females[12]. Average hours of work per week are 45.7 and 44.9 for men and women.

One drawback of the LFS is that respondents are not asked how long an individual has been employed in paid work, an important variable in the estimation of the earnings functions. To deal with this issue we have constructed the usual proxy, known as "potential experience", which is the difference between age and the sum of total years of schooling and the minimum age required to begin school. Based on this calculation, average potential experience is 19.4 years for males and 17.3 years for females.

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[10] 60 is the official retirement age in Thailand.
[11] A part-time worker is defined as a person who works less than 20 hours per week.
[12] These sex differences in university participation are commonly found in Thailand. It is an area of future research by one of the authors of this paper.

Table 2
Variable Definitions and Summary Statistics

Variable	Definition	Male		Female	
		mean	std dev	mean	std dev
Dependent Variables					
Earnings per hour	Gross hourly wages from main job in 2006 (Baht)	52.47	42.67	54.68	45.83
Annual earnings	Gross annual earnings in 2006 (Baht)	106,769	77,680	108,385	81,2491
Educational Variables					
Incomplete school	Dummy=1 if did not complete school	0.178	0.383	0.154	0.361
Primary school	Dummy=1 if highest qualification is primary	0.184	0.387	0.133	0.339
Lower secondary	Dummy=1 if highest qualification is lower secondary	0.178	0.383	0.123	0.329
Upper secondary	Dummy=1 if highest qualification is upper secondary	0.148	0.355	0.148	0.355
Diploma	Dummy=1 if highest qualification is diploma	0.082	0.275	0.080	0.271
Undergraduate	Dummy=1 if highest qualification is undergraduate	0.172	0.376	0.337	0.473
Postgraduate	Dummy=1 if highest qualification is postgraduate	0.020	0.140	0.025	0.025
Other Variables					
Hours per week	Hours of work per week in main job	45.72	8.10	44.87	7.86
Potential Experience	(Maximum) time in paid work in years	19.38	10.89	17.32	10.14
Number of Observations		19,856		17,491	

4 (iii) OLS earnings functions

The standard earnings equation is used in this study and is of the following form:

$$\ln w_i = \mathbf{X_i'\beta} + \boldsymbol{\varepsilon}_\mathbf{i}$$

where $i = 1, 2, 3, ..., n$ represent individuals, w_i is the gross hourly earning of individual i, and $\mathbf{X_i'}$ is a vector of characteristics that determine earnings.

We employ three variations of the model: the first uses years of schooling as a proxy for educational attainment; the second variant uses the education dummies described earlier; and the third extends the second model to include interaction terms between education dummies and potential experience. The last of these is essentially a relaxation of the restriction imposed in the second model that constrains returns to experience to be identical between education levels. The estimations for these models are carried out separately for males and females.

Based on the years of schooling coefficient model, on average, the earnings increases for one additional year of education are about 11.2 and 12.9 percent for males and females. Our estimates are reasonably close to the result from previous studies. The results from this study and selected previous studies are now shown in Table 3 (see Appendix A for the regression result).

Table 3
Selected Comparisons of Returns to Schooling Estimates for Thailand

Author	Year of data	Method	Return to one additional year of schooling (per cent)	
Psacharopoulos (1994)	1971	The Coefficient on Years of Schooling	Overall 10.4	
Patrinos (1995)	1986	The Coefficient on Years of Schooling	Overall 12.4	
Patrinos (1995)	1989	The Coefficient on Years of Schooling	Overall 11.5	
Psacharopoulos (1994)	1972	Returns to Education by Level of Education and Gender	Male 9.1	Female 10.0
This study	2006	The Coefficient on Years of Schooling,	Male 11.2	Female 12.9

Source: Psacharopoulos and Patrinos (2002) and authors' (2008) estimate.

Results from the dummies-and-interaction terms are reported in Appendix B. The findings from this model are consistent with economic theory; that is, earnings increase with education and experience, with the rate of increase with experience

falling over time. The earnings-experience slopes are relatively steep for graduates, although not by much; this is as expected, a prediction which follows from the general view that university graduates are more likely to be in higher training jobs with concomitant steeper earnings-experience slopes.

The percentage differences in earnings associated with educational qualifications are shown in Table 3. The reference group is made up of individuals who did not complete school.

The data from Table 3 show that on average, without any prior market experience, a male primary school graduate earns 15 per cent higher than a male without any formal qualifications, and this commensurate figure for females is 14 per cent. A male and female with lower secondary education experience higher earnings by 25 and 22 per cent. Upper secondary qualification increase earnings by 32 and 35 per cent for males and females. Average male and female diploma holders earn 58 and 55 percent than the "incomplete school" individual, with the earnings advantage for university graduates earning are 78 and 86 percent for males and females. These earnings advantages for postgraduate males and females are 102 and 110 per cent.

Table 3
Percentage Differences in Earnings

Educational attainment	Male	Female
Primary	15	14
Lower Secondary	25	22
Upper Secondary	32	35
Diploma	58	55
Undergraduate	78	86
PostGraduate	102	110

4 (iii) Age earnings profiles and internal rates of return

We use the estimation results in Appendix B to construct age-earning profiles[13]. These profiles are used to derive the earning path for male and female with upper secondary qualifications and undergraduate qualifications[14]. The profile for average males and females are shown in Figures 1 and 2. These profiles assume that the full working life of an average upper secondary high school graduate is 42 years, from age

[13] The predicted value of earnings have been adjusted by the formula $\hat{y} = \exp^{\left(\frac{\sigma^2}{2}\right)}.\exp^{\left(\ln \hat{y}\right)}$. See Wooldridge (2006) for details.
[14] Observations with age greater than 55 years were dropped due the presence of several large outliers.

18 to 60. For those who decide to undertake undergraduate study for 4 years, the full working life is reduced to 38 years, from age 22 to 60. As well, we adjusted the age-earning profiles by 1.5 percent to capture productivity growth, with the choice of this adjustment factor being based the average real wage growth in Thailand from 2003-2006.

Figure 1
Average Male Age-earnings Profiles (Thailand, 2006)

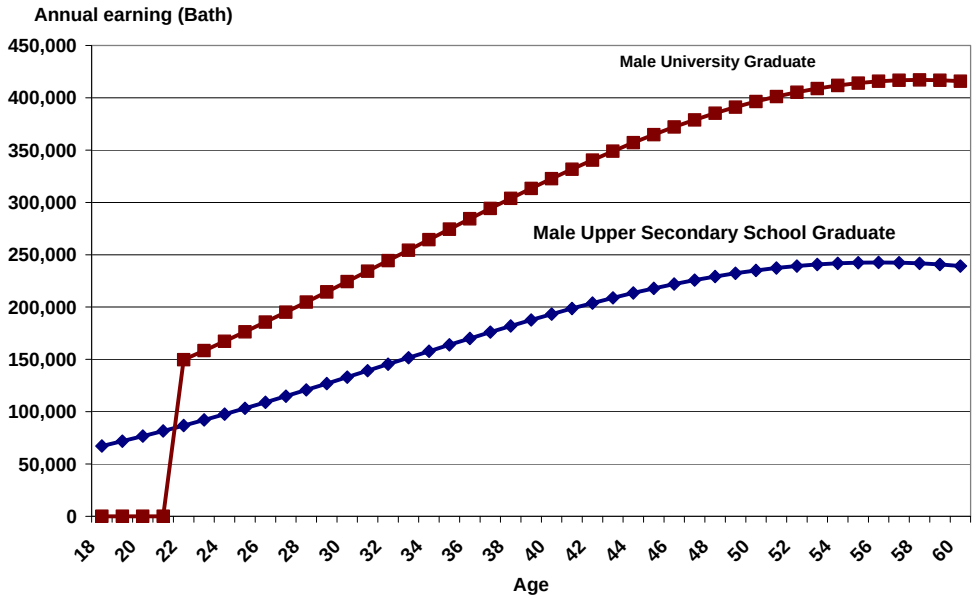
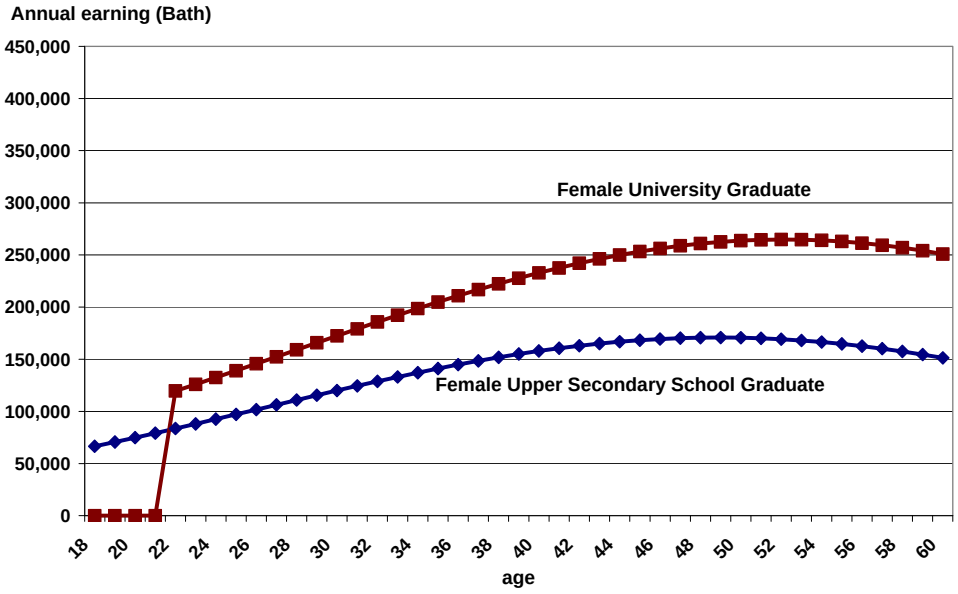


Figure 2
Average Female Age-earnings Profiles (Thailand, 2006)



As can be seen from the figures, earnings increase at a decreasing rate with age (experience) for both upper secondary graduates and university graduates. The age-earning profiles for both male and female university graduates are (slightly) steeper than they are for secondary school graduates. It is of comfort to note that these relationships are familiar with respect to the findings for a large number of countries at different points of time.

We can use these results to calculate the so-called internal rate of return to investment in university education, a measure of the value in earnings terms of process. Formally, the IRR is defined as the discount rate that equates the present value of additional benefits from the investment to the present value of the cost of obtaining the additional education. The benefits are additional earnings from higher education; and the costs are tuition fees plus the opportunity cost of not working in paid employment after the completion of upper secondary school. It should be noted that the result from the IRR estimate is contingent upon both the cost of investment and the earnings streams.

In our estimates we assume that university graduates undertake study on a full-time basis for four years and receive zero incomes at that time. The calculations have been carried out for a diversity of tuition fees, from 36,000 Baht to 350,000 Baht per program, which reflect very broadly the current range of Thai higher education annual tuition charges for different institutions. Table 5 shows the results with the IRRs, and these range from 8.0 to 12.8 per cent per annum for males, and 4.5 to 7.9 per cent per annum for females, estimates which are roughly in line with international experience (see Psacharopoulos and Patrinos, 2002). This familiarity should leave us with some confidence that the data and the methods employed are useful for describing the Thai graduate experience

Table 5
IRR Estimates (per cent per annum)

Tuition prices by type of institution*		**Total Tuition Fee (Baht)***	**Male**	**Female**
Public University	Low price	36,000	12.79	7.93
	High price	144,000	10.41	7.13
Private University	Low price	192,000	9.23	5.55
	High price	350,000	8.04	4.48

* Average estimates from various universities.

To this point the analysis has been based on average age-earning profiles derived from OLS estimations. In order to better capture the heterogeneity of outcomes across different age-earning groups, a truncated approach to estimation has been employed and this is now explained and the results are shown. A main reason that this more disaggregated approach is likely to be of considerable importance for the policy debate is that income contingent loan schemes typically have a first income threshold of repayment; this can mean that a small proportion of the graduate population does not repay (even the nominal debt) in full and this may have marked effects on estimations of interest rate subsidies that will not show up with the use of OLS.

4 (iv) Deriving truncated age-earnings profiles

While it is of considerable interest to understand the earnings relationships at the mean of the data, which is what is happening with the use of OLS, a fuller understanding of the implications of different income contingent loan schemes requires a more disaggregated method. We have approached this by doing the analysis separately for three parts of the lifetime graduate earnings distributions, and have thus divided the earnings data into three groups by year of age and sex: the bottom third, the middle, and the top third of earnings[15].

There is an important reason for considering the earnings and loan experiences for different parts of the earnings distribution, which is that for TICAL1, TICAL2 and ILLUSTRATIVE1 (but not ILLUSTRATIVE2)[16] there will be different subsidies depending on the lifetime earnings streams of hypothetical graduates; it is of interest to determine how big these are, and how much they differ between those earning low, medium and high lifetime incomes.

The truncation exercise provides an indication of the both the distributional effects of policy regimes, and related to this the possible future contributions of taxpayers given marked movements in graduate income distributions. More significantly, and as noted above, when loan schemes have the potential to have less than full collection from some parts of the graduate earnings distribution, these needs to be explicitly modeled in order that we estimate implicit interest rate subsidies properly.

However, there is a major limitation of this approach. It is the implicit assumption that graduates remain in the low, middle or top third of the earnings distribution throughout their lives, and this is clearly not going to be the case. Even so, the approach employed allows us to determine upper boundaries of implicit interest rate subsidies (for the lowest one third of earnings) and lower boundaries of implicit interest rate subsidies (for the highest one third of earnings).

The estimated parameters from the truncated OLS estimations are shown in Appendix C and these have been used to construct age-earning profiles for the three different graduate earnings groupings[17]. These are shown for males and females in Figures 3 and 4.

The results illustrated in the figures show quite different earnings outcomes for graduates by age and sex. For both sexes it is apparently the case that those in the highest third of the earnings distribution start out with earnings that are about two and

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[15] An alternative but similar way to have addressed this issue would be through the use of quantile regression techniques, which effectively divide the distributions into earnings categories. However, this approach assigns weights to all the data points in the sample, with the weights being lower the further the data point is from the group under consideration. Because of this weighting procedure we are unconvinced that such an approach usefully helps us understand the impact on subsidies of graduates being in different thirds of the earnings distribution. Our approach using truncations implicitly assigns a weight in the regression of zero to all data points outside the group.

[16] This is because ILLUSTRATIVE2 imposes the same real rate of interest on the borrowings as the real discount rate, and this must mean that there are no subsidies involved for any income groups, so long as all members of the group eventually pay off their debts in full.

[17] The profiles are adjusted for productivity change by the same method used for adjusting the OLS predictions.

half times higher than is the case for those in the bottom third of the distribution, and that this advantage increases considerably as age increases; at age 50, for example, the earnings advantage of the top third compared to the bottom third has grown to about five times for females and to about three and a half times for males. The size of these differences suggest strongly that estimated variations in implicit interest rate subsidies as a result of the parameters of the income contingent loan schemes are likely to be very important.

Figure 3
Male Graduate Age-earnings Profiles for Low, Median and High Earnings Groups

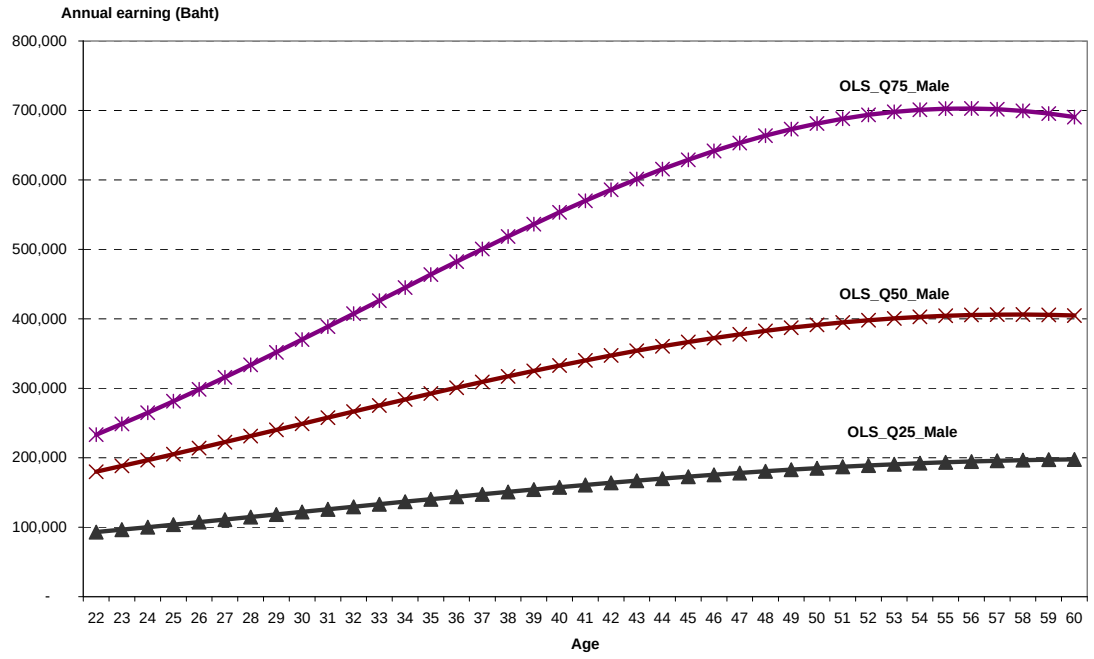
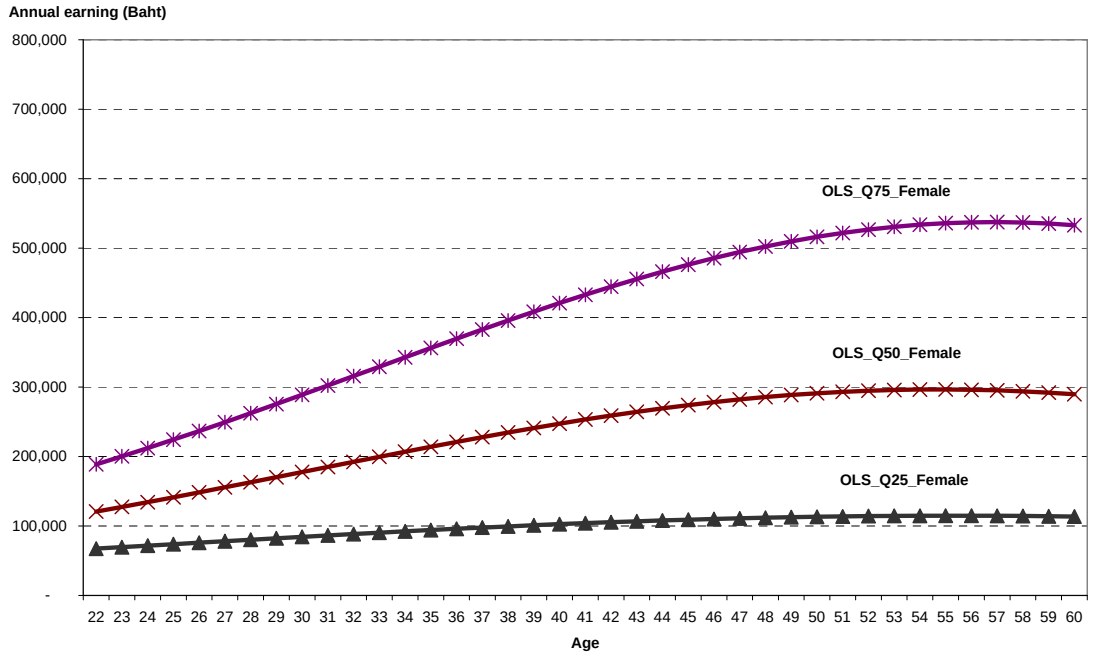


Figure 4
Female Graduate Age-earnings Profiles for Low, Median and High Earnings Groups



5 Loan Repayments and Interest Subsidies for Four ICLs

5 (i) The implicit subsidy calculation: concepts and assumptions

From a financial point of view the efficiency and sustainability of loan programs depend significantly upon the level of loan recoverability. In turn this is linked to the repayment conditions, the most important being: (i) the level and form of the real rate of interest on the debt; (ii) the first income threshold of repayment; and (iii) and the rates of repayment as a proportion of income.

The difference between the present value of the sum of the repayment stream and the present value of the tuition fee paid through the loan scheme is called an "implicit subsidy" and it is likely to be an unintended consequence as a result of the design of the financing scheme. The word "implicit" is used to distinguish this form of subsidy from the intended tuition fee subsidy usually provided to public universities.

For our exercises, and those reported in PST, we used the following formula for calculations of implicit subsidies[18]:

$$\text{\% of Implicit Subsidy} = \left[\frac{\sum_{t=1}^{n} \frac{T_t}{(1+r)^{t-1}} - \sum_{l=1}^{N} \frac{P_l}{(1+r)^{t+l-1}}}{\sum_{t=1}^{n} \frac{T_t}{(1+r)^{t-1}}} \right] \times 100$$

Where

T_t = tuition fee paid in year t

t = year of tuition fee payment

P_l = loan repayment in year l

l = lenght of time to repay the loan

r = discount rate

An implication of the above formula is that a loan package that takes longer time to pay will result in a lower present value of repayment, and thus a higher subsidy, for all schemes except ILLUSTRATIVE2[19]. This is an important issue for loan design and, as is shown below, it is a critical point with respect to whether or not it is possible to develop a workable income contingent loan scheme for Thailand in

[18] Subsequently and fortunately we ascertained that it is the same formula derived by Adrian Ziderman (Ziderman, 2003).

[19] So long as the nominal debts are paid in full using a real rate of interest equal to the discount rate (both are set at 3 per cent per annum for ILLUSTRATIVE2) must result in implicit interest rate subsidies of zero.

circumstances in which debts are much higher than the low levels modeled here initially.

In what now follows we present calculations of the implicit subsidy with respect to the collection of tuition of four possible income contingent loan schemes for Thailand, described above and known as TICAL1, TICAL2, ILLUSTRATIVE1 and ILLUSTRATIVE2. The assumptions used in estimating the subsidies are as follows:

(i) Real interest rates: Zero for TICAL1 and TICAL2, as proposed for the original TICAL. A 25 per cent tuition surcharge with a zero real interest rate afterwards for ILLUSTRATIVE1, which is the same as is the case for HECS. A 3 per cent real rate of interest calculated from the beginning of the debt for ILLUSTRATIVE2, to represent a conventional method of covering the government's cost of borrowing.

(ii) Discount rate for the present value calculations: 3 per cent per annum in real terms[20].

(iii) Full employment. The hypothetical graduates are assumed to be engaged in full-time year round paid work.

(iv) Tuition fee (initially): The tuition fee is set at 100,000 Baht for a four year undergraduate degree. This is the approximately equal to the weighted average tuition fee of public and private university in Thailand, and is equivalent to the tuition imposed in the PST exercises. This assumption is relaxed later.

As noted above, we approach the interest rate subsidy calculations with both OLS and truncated estimations, beginning with the former.

5 (ii) The streams of repayments and interest rate subsidies: OLS

Using these assumptions and average earning profiles predicted from the OLS coefficients, we are able to construct repayment streams under all four schemes. The annual payments are shown in Figures 5 and 6.

[20] The choice of discount rate is somewhat subjective, but can be justified with reference to some data. For example, in Australia from December 2001-04 accountants used a 5.6 per cent nominal discount rate, and the average inflation rate was 2.3 per cent during that period, giving a real interest rate of 3.3 per cent per annum. Further, the real long-term bond rate is about the same as this. PST also used a real rate of discount of 3 per cent.

Figure 5
Male Graduate Average Repayment Streams under Alternative Schemes

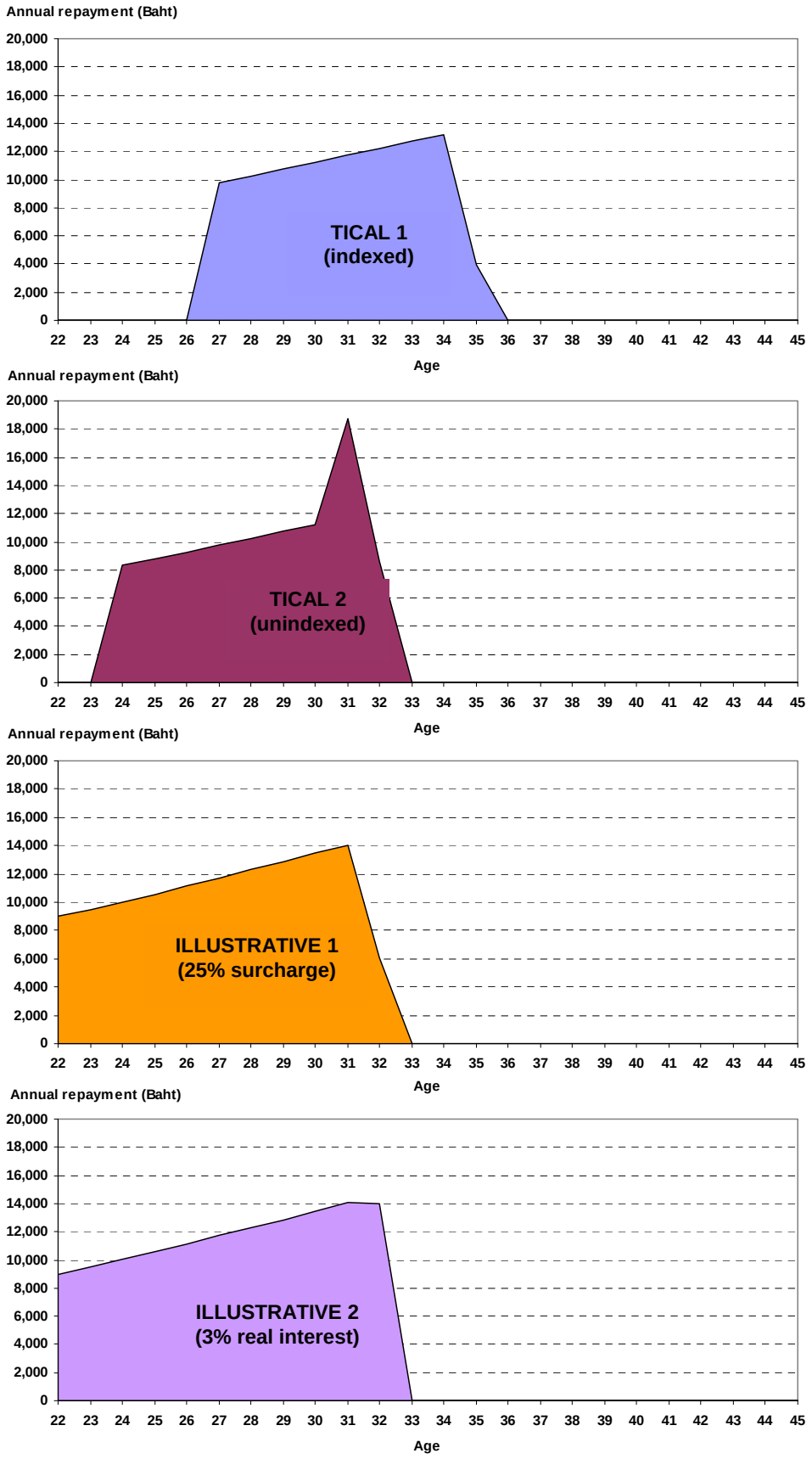
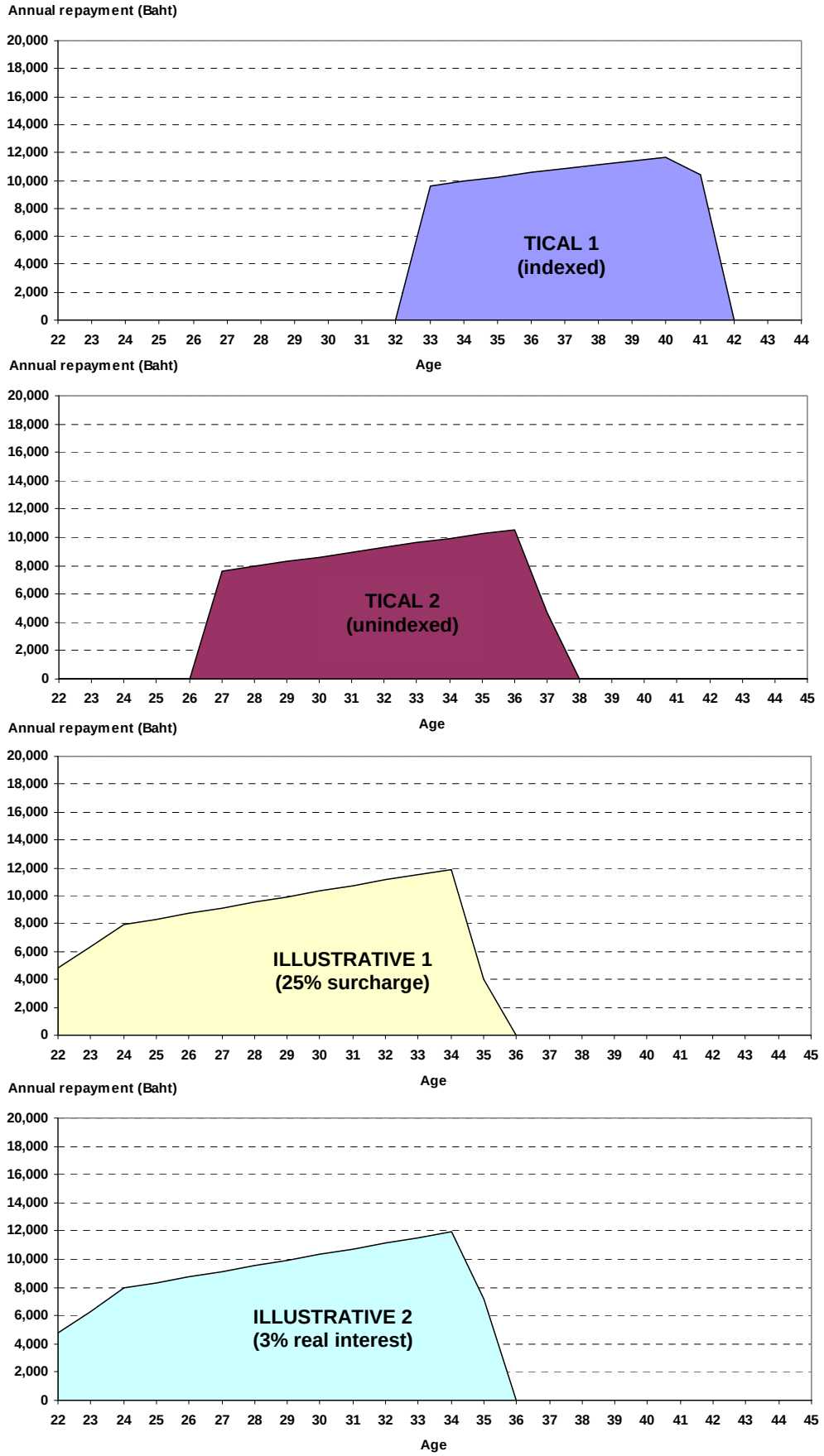


Figure 6
Female Graduate Average Repayment Streams under Alternative Schemes



A critical reason that the repayment streams differ is that the first income repayment threshold for the two versions of TICAL is almost twice as high as is the case for the two versions of ILLUSTRATIVE. The very high first threshold means that under TICAL1 an average male does not start to repay the debt until he is 26 years old, and the non-payment period of an average female is even longer with repayment not beginning until she is 32 years old. It is also worth noting that the presumed indexation arrangement for the former TICAL is very important to the timing of repayment streams, with the unindexed version resulting in repayments beginning 3 and 6 years earlier for males and females. A final obvious point is that the different forms of the real interest rate for ILLUSTRATIVE1 and ILLUSTRATIVE2 appear to deliver almost identical repayment streams.

All the above points are broadly true for both males and females, with the main differences in the results lying in the timing of repayments. Because they earn lower incomes, females start to repay later with TICAL 1 and TICAL2, and repay longer and at lower rates with ILLUSTRATIVE1 and ILLUSTRATIVE2.

Table 7 reports the implicit subsidies associated with these streams of repayment in combination with the interest rate parameters of each of the schemes.

Table 7
Implicit Interest Rate Subsidies for Average Graduates (per cent)

	TICAL1 (indexed)	**TICAL2 (unindexed)**	**ILLUST1 (25 per cent surcharge)**	**ILLUST2 (3 per cent real interest)**
Male	31.54	26.20	2.03	0.01
Female	42.23	33.72	2.90	0.02

The major points with respect to the implicit subsidies from the four income contingent loan policies are:

(i) Having a zero real rate of interest, in combination with very high first income repayment thresholds, results in the high implicit interest rate subsides for both TICAL1 and TICAL2, of around 30-40 per cent for the former, and 25-34 per cent for the latter.

(ii) While the TICAL subsidies can be considered to be high and reflective of less than perfect design, it is worth recording that these subsidies are much less than those reported in PST for the SLF, of around 60 per cent.

(iii) It is clear that having a form of real rates of interest for ILLUSTRATIVE1 and ILLUSTRATIVE2 have a marked effect on calculations of subsidies compared to the two versions of TICAL; and

(iv) It is apparent that a 25 per cent surcharge with no further real interest rate adjustment (ILLUSTRATIVE1) delivers about the same implicit subsidies

of about zero[21] as having an on-going real rate of interest of 3 per cent per annum[22] (ILLUSTRATIVE2).

These findings are an important part of our contribution. The results from the use of basic econometric techniques promotes for discussion the advantages of an income contingent loan with a relatively low first income threshold of repayment, and with some form of a real rate of interest. However, the approach adopted thus far only reveals subsidies for the schemes at the means of the data by age and sex, since our method uses OLS earnings function results. We now move to consider the subsidies associated with the schemes for quite different lifetime earnings distributions.

5 (iii) The streams of repayments and interest rate subsidies: truncations

What now follows illustrates the streams of repayments and implicit subsidies of the three different lifetime earnings groups for both sexes illustrated above in Figures 3 and 4: high earners (Q75), median earners (Q50), and low earners (Q25)[23]. Table 8 shows the implicit subsidies for males and females for each of the three lifetime earnings distributions for the four loan schemes.

Table 8
Implicit Interest Rate Subsidies for Low, Median and High Earnings Groups (per cent)

Group		**TICAL1 (indexed)**	**TICAL2 (unindexed)**	**ILLUST1 (25 per cent surcharge)**	**ILLUST2 (3 per cent real interest)**
Male	Q25	77.42	43.20	17.40	0.05
	Q50	25.23	23.18	-0.85	0.00
	Q75	18.91	18.38	-9.01	0.00
	Average	**40.52**	**28.25**	**2.51**	**0.01**
Female	Q25	100.00*	100.00*	58.90*	53.04*
	Q50	42.71	33.42	1.42	0.02
	Q75	20.62	20.62	-6.92	0.00
	Average	**54.44**	**51.35**	**17.80**	**17.69**

An important aspect of the data from Table 8 needs to be explained, and this relates to the measure of the so-called “average”. The calculation is the average of the three

[21] The slight difference between the subsidies found for ILLUSTRATIVE2 and zero is the result only of a rounding error.
[22] This is very close to the results found for the HECS system for public sector undergraduates (Chapman and Lounkaew, 2008).
[23] The repayment streams data are available from the authors.

cohort-specific implicit taxpayer subsidy calculations and can be interpreted with the use of the following example with respect to the findings for males under the TICAL1 scheme.

The results suggest that if there are 100 men taking TICAL1 loans, around 33 of them will earn in the bottom third of graduate earnings for the period in which the loan is collected, and for this group the estimated subsidy is about 77 per cent; an important part of this subsidy can be attributed to the fact that when the retirement age is reached the loan is not paid off in full (in nominal terms). There will also be 33 men in the top third of graduate earnings in the period in which the loan is collected and for this group the estimated subsidy is about 19 per cent. Combined with the subsidy of about 25 per cent for the middle third of the male graduate earnings distribution we can then calculate the (weighted) average for males as a whole under TICAL1. In this case the answer is about 40 per cent ((77 + 25 + 19)/3).

The strength of this calculation compared to the use of earnings data at the mean only is that it broadly takes into account the importance of subsidy differences across the earnings distribution. This must matter because income contingent loans require no repayments from debtors at the time that they experience low earnings, meaning that there are important asymmetries with respect to collection above and below the first (and later) income threshold at which repayments exist. Our method is necessarily more accurate than the estimates using OLS only.

The major points with respect to the implicit subsidies from the four income contingent loan policies taking into account the earnings distributions are:

(i) In all cases, except for males in ILLUST1 and ILLUST2, estimates of implicit interest rate subsidies are higher than is the case for the calculations done at the mean only;

(ii) With TICAL1 the subsidies are now calculated to be around 40-55 per cent for males and females, which are not very different to the estimates from PST for the SLF of about 65 per cent;

(iii) With TICAL2 the subsidy for males remains relatively low, at around 28 per cent, but increases to over 50 per cent for females;

(iv) With both ILLUSTRATIVE schemes the subsidies remain at around zero for males, an interesting component of this result being that for males in the top third of the earnings distribution under ILLUSTRATIVE1 there is a negative subsidy of 9 per cent. This is because the 25 per cent surcharge on the debt represents an effective real rate of interest in excess of 3 per cent per annum; and

(v) With both ILLUSTRATIVE schemes the average subsidy for females increases to about 18 per cent, and this is due almost entirely to the fact that the subsidies for females in the bottom third of the earnings distribution are very large (59 and 53 per cent for ILLUSTRATIVE1 and ILLUSTRATIVE2). This important finding can be traced to the fact that a large proportion of women experiencing low earnings have unpaid debt at

the end of their working lives and thus the end of their debt repayments, of around 45 per cent.

The final point above is critical to our understanding of the potential for having an efficacious income contingent loan for Thailand. It means that, with reasonable repayment parameters and a real rate of interest, there remain important subsidies associated with income contingent loan schemes for some groups. This is because the lifetime earnings of some graduates are not sufficient to repay the debt in full, and this is traceable to the fact that Thailand's per capita real incomes are relatively low when considered in an international context. This is unlike the situation in many countries with income contingent loans such as Australia, New Zealand and the UK.

The results of Table 8 imply that schemes with design arrangements similar to TICAL are associated with very considerable subsidies and their level might be such as to suggest that alternative income contingent loan policies are more appropriate. While the subsidies for schemes with forms of a real rate of interest and a much lower first income threshold of repayment are not insignificant, for the policy debate it could be concluded that arrangements of this kind are acceptable with respect to taxpayer contributions.

However, it needs to be recognized that our subsidy calculations have been undertaken for a total tuition debt of 100,000 baht, and it will certainly be the case that with higher charges - and thus higher debt - these subsidies will increase. This issue matters with respect to the coverage of an income contingent loan for Thailand because outside the public sector university tuition charges are generally and significantly higher.

5 (iv) Interest rate subsidies for higher debts

The exercises reported above involve estimations of implicit subsidies from income contingent loans of various forms for a total tuition charge of 100,000 Baht. While this can be argued to be appropriate and typical for public sector universities in Thailand, the story is different in the case of the private sector where charges are much higher than this.

Our best estimate of a typical tuition charge for the private sector is a total of around 350,000 Baht[24]. Assuming an income contingent loan facility is offered by the government to cover this charge we are able to estimate the implicit subsidies associated with the four schemes. The calculations are presented in Table 9.

The main points from Table 9 are:

(i) With a much higher charge of 350,000 Baht the implicit subsidies are higher for all four schemes, although the increases for TICAL1 and TICAL2, to between 44 and 63 per cent, are not as high as the increases for ILLUSTRATIVE1 and ILLUSTRATIVE2. This is due to the fact that

[24] This is about the same as tuition fee for undergraduate business program at Assumption University.

both TICAL arrangements involve quite high collection rates (of up to 12 per cent of income) at higher levels of earnings;

(ii) With the higher charge there is now very little difference between the subsidies associated with TICAL1 and TICAL2 and those found for the SLF and reported in PST;

(iii) Having a surcharge of 25 per cent on the loan and no real rate of interest after the debt is incurred (ILLUSTRATIVE1) is associated with quite high subsidies of around 38 and 51 per cent for males and females; and

(iv) Even with an income contingent loan with an on-going real rate of interest of 3 per cent per annum (ILLUSTRATIVE2) high charges are associated with important levels of subsidies, of about 17 and 34 per cent for males and females.

Table 9
Implicit Interest Rate Subsidies for Low, Median and High Earnings Groups (per cent) with High Debts

Group		TICAL1 (indexed)	TICAL2 (unindexed)	ILLUSTR1 (25 per cent surcharge)	ILLUSTR2 (3 per cent real interest)
Male	Q25	93.55*	66.38*	49.29	50.41*
	Q50	40.55	35.72	35.18	0.00
	Q75	30.30	28.47	30.04	0.00
	Average	**54.80**	**43.52**	**38.17**	**16.80**
Female	Q25	100.00*	100.00*	84.33*	86.58*
	Q50	54.28	45.15	38.08	16.07*
	Q75	36.10	30.62	31.42	0.00
	Average	**63.46**	**58.59**	**51.28**	**34.23**

These findings are very important for Thailand's higher education financing debate, since they imply that widespread reform of student loans including their provision for relatively high cost courses is likely to involve sizeable taxpayer subsidies. We have not determined the possible overall costs for the government of broadly based coverage, and these might not be such as to undermine the basis for a universal income contingent loan facility since we note that private universities apparently enroll around 15 per cent of all undergraduates[25].

[25] Source: National Statistical Year Book 2006

On the other hand, the income contingent loan schemes under consideration for our exercises have involved debts for tuition only. Since additional loans for income support would seem to be a propitious aspect of higher education financing reform as well the level of debts modeled of 350,000 Baht could well be required for the public sector as well.

6 Conclusion

There is an on-going and very important debate in Thailand concerning higher education financing policy. For the ten years prior to 2007 a traditional mortgage-type loan, known as the Student Loan Fund, was in operation, and after being suspended a system very similar to the SLF was reintroduced in 2007. In a sister paper for this conference, Piruna, Sarachitti and Thitima (2008) analyse the SLF with respect to both taxpayer interest rate subsidies and graduate loan repayment hardships. As found also by Ziderman (2003), it is clear that the SLF has very high interest rate subsidies and, consistent with this, it is associated with low repayment difficulties for former students.

The main contributions of the current paper are as follows. First, we present a comparison in conceptual terms of the costs and benefits of schemes such as the SLF with the other main alternative, income contingent loans. Income contingent loans have advantages over mortgage-type loans in terms of providing insurance against both default and repayment hardships. However, a critical issue concerning this approach for many countries concerns the efficacy of collection on the basis of a student's future income stream, it being the case that quite sophisticated institutional mechanisms are required. It is unclear to us whether or not the Thai income tax and/or pension collection schemes are such as to make effective and operative the collection of an income contingent loan.

Using the same data, econometric approaches and accounting methods as those employed by PST, we are able to estimate the implicit interest rate subsidies for four different income contingent loan arrangements, differing importantly with respect to collection parameters and interest rate regimes. For the first time in analyses of the effects of income contingent loans we demonstrate that the use of averages provides misleadingly low estimates of the extent of interest rate subsidies. As well, it appears that schemes with high first income thresholds of collection, and without a real rate of interest, are associated with significant interest rate subsidies, and for high debts these subsidies are not very dissimilar to those estimated for the SLF.

Further, it is also apparent that, for relatively low levels of debt income, contingent loan policies with relatively low first income thresholds of repayment and with real rates of interest can be designed to be workable for Thailand in an aggregate financial sense. However, as debt levels increase so too do the interest rate subsidies with an important part of this result being due to the fact that Thai graduate incomes per capita are just not high enough for many groups to be able to repay all the debt before they leave the labour force.

Some important caveats are warranted. One is that we have not taken into account loan losses through poor collection outcomes, and this has the clear potential to repayments and thus increase subsidies. Related to this is that graduate unemployment rates are quite high for the first several years after the completion of a university degree, and from our calculations with the LFS remain as high as 5 per cent even five years after labour force participation begins. Taking this into account would necessarily increase subsidy estimates, and preliminary work in this area suggests that the figures would be about 5 percentage points higher.

Finally, it has to be stressed that our conclusions are derived on the basis of particular design rules concerning different income contingent loan approaches, and this should matter very significantly to the debate concerning the efficacy of income contingent loan approaches in Thailand. The important point is that subsidy calculations are very sensitive to choices concerning: the first income threshold of repayment; the proportions of income required for loan repayment; and real interest rates. The next step is to ascertain the extent to which our broad conclusions are reinforced or compromised with alternative loan design parameters.

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Appendix A

Years of Schooling Model

Variable	Female		Male	
	Coefficient	**t-stat**	**Coefficient**	**t-stat**
Schooling	0.129**	138.79	0.112**	113.58
Experience	0.036**	34.39	0.037**	34.60
Experience^2/1000	-0.1186**	-5.17	-0.178**	-8.13
Constant	1.692**	133.93	1.979**	164.27
n	17,491		19,856	
R^2	0.6146		0.5436	

*denotes statistical significance at the 5 percent level.
**denotes statistical significance at the 1 percent level.

Appendix B
Dummy Variables and Interaction Terms model

Variable	Female		Male	
	Coefficient	t-stat	Coefficient	t-stat
Experience	0.063**	32.34	0.077**	47.46
Experience^2	-0.001**	-34.55	-0.001**	-42.79
Primary	0.150**	3.65	0.146**	3.83
Lower Secondary	0.254**	7.28	0 .221**	5.49
Upper Secondary	0.315**	9.64	0.350**	8.33
Diploma	0.577**	11.79	0.548**	9.26
Undergraduate	0.776**	28.39	0.859**	19.37
Post Graduate	1.025**	15.95	1.104**	11.48
Experience*Primary/100	-0.019**	-4.12	-0.018**	-4.34
Experience^2*Primary/10000	0.006**	4.92	0.007**	3.58
Experience*LowerSecondary/100	-0.023**	-4.79	-0.018**	-4.14
Experience^2*LowerSecondary/10000	0.810**	8.31	0.734**	9.14
Experience*UpperSecondary/100	0.008**	4.14	0.005**	3.60
Experience^2*UpperSecondary/10000	-23.351**	-9.11	-30.058**	-9.39
Experience*Diploma/100	-0.003**	-4.13	0.023**	3.90
Experience^2*Diploma/10000	0.646**	4.53	-0.205**	-1.51
Experience*Undergraduate/100	-0.009**	-2.66	-0.025**	-6.08
Experience^2*Undergraduate/10000	0.845**	10.19	0.822**	7.70
Experience*Postgraduate/100	0.026**	2.31	0.028*	1.93
Experience^2*Postgraduate/10000	-0.487**	-1.49	-0.861**	-2.24
Constant	2.860**	145.93	2.720**	155.52
n	17,491		19,856	
R^2	0.6146		0.5106	

*denotes statistical significance at the 5 percent level.
**denotes statistical significance at the 1 percent level.

Appendix C
Truncated OLS by Income Groups

Variable	Male			Female		
	Q25	**Q50**	**Q75**	**Q25**	**Q50**	**Q75**
Constant	2.5382**	2.5804**	2.6332**	2.5621**	2.6190**	2.6571**
Educational attainment						
Primary	0.1117**	0.1553**	0.2443**	0.0744**	0.1154**	0.1840**
Lower secondary	0.2314**	0.3002**	0.4367**	0.1857**	0.2735**	0.4003**
Upper secondary	0.3874**	0.5331**	0.7328**	0.3542**	0.4740**	0.6615**
Diploma	0.6875**	0.8419**	1.0061**	0.6610**	0.8331**	1.0663**
Undergraduate	0.8647**	1.0676**	1.2960**	0.8280**	0.9467**	1.126**
Postgraduate	1.7256**	1.6819**	1.5987**	1.7043**	1.8011**	1.8186**
Experience						
Experience	0.0337**	0.0454**	0.0506**	0.0253**	0.0312**	0.0354**
Experience^2	-0.0004**	-0.0005**	-0.0004**	-0.0003**	-0.0003**	-0.0002**
Undergrad*Exper	0.0262**	0.0196**	0.0142**	0.0266**	0.0376**	0.0389**
Undergrad*Exper^2	0.00001	-0.0001	-0.0004**	0.0002**	-0.0003**	-0.0006**
Observations		19,856			17,491	
R^2	0.2838	0.3736	0.4341	0.3950	0.4950	0.5301

*denotes statistical significance at the 5 percent level.
**denotes statistical significance at the 1 percent level.