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Modeling income dynamics for public policy design: An application to income contingent student loans☆

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ABSTRACT

This paper studies the importance of dynamic earnings modeling for the design of income contingent student loans (ICLs). ICLs have been shown to be theoretically optimal in terms of efficiency in the presence of risk aversion, adverse selection and moral hazard, and have attractive equity properties. Recognition of their benefits has led to their adoption for tertiary education tuition fees in countries including Australia, New Zealand, and the UK. Since the design of ICLs relies on the prediction of the underlying costs, we explore the extent to which the complexity of earnings modeling affects the estimation of loan subsidies. The use of Australian data allows us to compare our simulated debt repayments to actual repayments under the Australian Higher Education Contribution Scheme (HECS). Our findings reveal that the complexity of earnings modeling has considerable implications for the calculation of loan subsidies.

1. Introduction

An important and challenging task in the formulation of policy design is to ensure that decisions are informed by accurate cost projections. Many areas of policy, including for example income tax, social security and retirement scheme design, require accurate predictions of future individual incomes. Without such predictions, there is a risk of misstating the tax burden and consequent labor market effects, as well as the magnitude of individual consumption and savings, including pension scheme contributions and wealth accrual. It is also important that incomes are accurately predicted in the design and assessment of education policy, particularly if the policy design is dependent on expected repayment burdens, loan repayments, or returns to education. An obvious area where accurate prediction of future assessable incomes is critical is in the design and analysis of income contingent loans (ICLs) for university students. ICLs in the context of university fees have been shown to be theoretically optimal in terms of efficiency in the presence of risk aversion, adverse selection and moral hazard (Gary-Bobo & Trannoy, 2013). As a policy instrument, ICLs address student liquidity constraints, and have clear advantages in terms of equity and provision of access over graduate taxes. In ICL design, future assessable incomes are used to calculate a number of relevant quantities, including the

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rate of repayment of a university graduate and – depending on the design of the scheme – the resulting costs to taxpayers. Since ICL costs are sensitive to future assessable incomes, the empirical strategy that is employed to model future assessable incomes has considerable implications for the instrument design.

Research on the application and costing of ICL typically utilizes conventional earnings models based on single or pooled cross-sectional data (see, e.g., Chapman & Lounkaew, 2010), however, this ignores important aspects of earnings and employment dynamics. Models of earnings dynamics were first proposed in the literature in the late 1970s to capture life cycle dynamics (Lillard & Willis, 1978), and have since been used extensively in the exploration of earnings inequality (Baker & Solon, 2003; Cappellari, 2004; Guvenen, 2009; Haider, 2001; Moffitt & Gottschalk, 2002) and in microsimulation modeling for the projection of social security and public pension schemes, long-term care, social welfare and taxation policy (Caldwell, 1996; Harris & Sabelhaus, 2003; Holmer, Janney, & Cohen, 2010; O'Donoghue, 2001; Toder et al., 2000). Indeed, the limitations of static earnings functions in the investigation of higher education policy have been recognised by some, with Migali (2012) incorporating stochastic variation in the growth rate of graduate earnings, and dynamic microsimulation of lifetime earnings having been applied to the modelling of higher education finance and ICLs specifically (e.g., Flannery & O'Donoghue, 2011; Harding, 1995). What has not been explored to date, however, is the extent to which ICL policy conclusions are sensitive to the earnings model assumptions used. In this paper, we study the extent to which the complexity and realism of labor force transition assumptions and earnings models affect ICL repayments and costs, using a sample of university graduates from the Household, Income and Labor Dynamics in Australia (HILDA) Survey. The use of Australian data allows us to compare simulated debt repayments to actual repayments under the Australian Higher Education Contribution Scheme (HECS). In order to model earnings dynamics, we combine a model of labor force transitions with a model of earnings conditional on labor force state. We further compare our results obtained from a static (cross-sectional) model to those of a dynamic panel model that allows for permanent and transitory shocks.

Our empirical analysis is related to a growing literature that examines the covariance structure of earnings and distinguishes between transitory and permanent components of earnings (examples include Abowd & Card, 1989; Dickens, 2000; Kalwij & Alessie, 2007; Lillard & Willis, 1978; MaCurdy, 1982; Meghir & Pistaferri, 2004). Our work builds on Higgins (2011) who provides a detailed discussion of the technical issues related to the implications of earnings model complexity in the context of ICL modeling. Our analysis contributes to the literature by using a sample of university graduates to compare alternative empirical approaches and apply predictions to HECS to investigate the extent to which the choice of the underlying empirical model affects the prediction of loan subsidies.

HECS constitutes an excellent example for the purpose of our empirical analysis. The Scheme was introduced in 1989 to finance tuition fees of Australian university students. HECS was designed to address the problem of student credit constraints, while providing insurance to mitigate the risks associated with university participation. Like a graduate tax, an income contingent loan overcomes the private market failures from asymmetric information and lack of physical collateral that are the central problems when offering loans for human capital investments. However, as an income contingent loan, HECS is characterized by two important features (Chapman, 2006). First, the scheme provides default insurance because those with incomes below a particular threshold do not have to repay, and there is debt forgiveness on death of the debtor. Second, the scheme ensures consumption smoothing because repayments depend on current income and, unlike graduate taxes, the present value of repayments is limited to the original debt plus interest (that is, an ICL is debt finance as opposed to equity finance).

The cost to the taxpayer for a risk-sharing ICL scheme such as HECS arises due to administrative costs, and due to non-repayment of debt among some debtors as a consequence of default insurance and debt being written off on death. In Australia costs also arise in the form of interest subsidies, because outstanding debt is indexed at a rate of growth in the Consumer Price Index (CPI) which is less than the government's cost of borrowing.[1] That is, debtor's who repay their total loan will receive an interest subsidy because of the time lag between borrowing and repayment. In 2012, the total nominal value of outstanding debt of HECS-HELP was $26.3 billion (Norton, 2013). The percentage of the outstanding debt not expected to be repaid (DNER) was about 23.6% ($6.2 billion), representing the sum of the debt write-off and interest subsidies.

Of particular interest is how estimates of the total subsidy differ under different labor force and earnings models. In addition to providing information on the implication of model choice and development on existing ICL scheme costs, the results are of importance when designing new ICL schemes. In particular, cost recovery of loan outlays requires applying an indexation rate that covers the risk of loan non-repayment (the 'cohort risk premium'). Understanding how labor force and earnings model choice affect estimation of the cohort risk premium will mitigate poor scheme design.

We find that the results obtained from static and dynamic models are quite different. We obtain repayment and debt predictions under the assumption that, firstly, earnings variability manifests predominantly as temporary shocks, and secondly, that earnings variability is highly persistent. We compare these results with the case when both temporary and permanent variation and shocks are incorporated. We further examine the implications of considering labor force dynamics, and we demonstrate that ignoring dynamic aspects may severely bias the prediction of outstanding debts. We also show that outstanding debt levels of male university graduates

[1] Historically, the Australian government cost of borrowing (being the long-term government bond rate) over the last decade has averaged 5.5% nominal, representing a real rate of approximately 3%.