

# Unmet student demand for tertiary education

*Margaret Giles  
Michael McLure*

University of Western Australia

*A Michael Dockery*

Curtin University of Technology



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ABN 87 007 967 311

Level 11, 33 King William Street, Adelaide SA 5000

PO Box 8288 Station Arcade, Adelaide SA 5000, Australia

ph +61 8 8230 8400, fax +61 8 8212 3436

email [ncver@ncver.edu.au](mailto:ncver@ncver.edu.au)

<<http://www.ncver.edu.au>>

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# Key messages

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Unmet demand for tertiary education is difficult to define and to estimate. In this report, data from the Australian Bureau of Statistics 2001 Survey of Education, Training and Information Technology are used to shed light on defining and enumerating unmet demand.

- ✧ Unmet demand occurs when potential students apply for a place at university or in the vocational education and training (VET) sector and their application is unsuccessful. It also occurs when potential students are discouraged from applying because their preferred course was not available, had limited places or was perceived to be highly competitive.
- ✧ The report finds that unmet demand at a general level (ability to obtain any place) in 2001 was very low at 16 000 or 1% of total applications, but considerably higher in terms of getting a place in a preferred course at a preferred institution (10% of total applications, or 175 000).
- ✧ A potential difficulty with these figures could be that they are understated. This is based on the widely acknowledged understanding that some individuals are not applying for courses because they assume that their applications will be unsuccessful. However, the data do not support that this is the case. That is, the estimates of unmet demand noted above are not understated.

# Executive summary

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This project examined student demand for post-school courses in terms of met and unmet demand. Community concern for applicants who fail to gain a place in their preferred courses has sparked debate regarding the extent of post-school education demand and the areas/sectors to which it applies. The particular research questions which form the focus of this project are:

- ✧ How has unmet demand been measured and analysed in previous studies?
- ✧ What is known about the prevalence and cause of unmet demand?
- ✧ What factors influence the decision to apply for post-school education?
- ✧ What factors influence the outcomes of post-school applications?

There is a lack of consensus in the literature over what constitutes total demand and its constituent parts, unmet and met demand.

Numerous narrow and broad definitions of unmet demand are available. A narrow definition applies to applicants who are unsuccessful in obtaining a place in their preferred field of study at their preferred institution. A broad definition applies to all persons who wanted to study and either did or didn't apply, and who were not subsequently enrolled in a post-school course. In relation to this project report, it is important to choose a definition relevant to a policy context. Also important is how to estimate unmet demand so that policy initiatives designed to reduce it (assuming that this is the intention) can be evaluated.

One source of figures which could be used to estimate unmet demand is the 2001 Survey of Education, Training and Information Technology conducted by the Australian Bureau of Statistics (ABS). This database contains variables related to socio-demographic characteristics (such as age and gender), employment characteristics (such as occupation and labour force status), prior education (such as highest level of educational attainment), access to and use of education and training opportunities (such as current post-school study), and access to and use of information technology (such as computer ownership and internet access at home). Importantly, there is sufficient information to attempt a broad estimate of demand, both met and unmet, for post-school education in Australia in 2001. Hence, unmet demand is between 1% and 10% of total demand, or between 16 000 and 175 000 individuals. The range accommodates narrow and broad definitions of unmet demand.

The availability of the 2001 Survey of Education, Training and Information Technology also enables an examination of predictors of application submission and application failure. In terms of characteristics of applicants, it appears that the probability of applying for post-school education decreases with age. Moreover, people without Year 12 completions, with children and/or with a disability are less likely to apply. People with a computer at home, born overseas, not married, not working and/or have incomes below the median income are more likely to apply.

In terms of characteristics of unsuccessful applicants, those aged 20 to 24 years and/or those with a computer at home are less likely to have unsuccessful applications. Applicants aged 35 to 44 years, without Year 12 completion and/or with a disability are more likely to have failed applications.



Concerns that some of the characteristics of people applying for post-school courses may also be contributing to the success or failure of these applications appear to be unfounded; that is, estimates of unmet demand based on applicants alone are not biased or understated.

One of the key limitations of using the 2001 Survey of Education, Training and Information Technology for deriving these predictors is the absence of a variable for ability, or a prerequisite variable such as a tertiary entrance score. Such a variable is likely to be an important determinant of both application submission and application failure.

Notwithstanding, policy-makers concerned with the extent of unmet demand should be aware of the cost and supply constraints and their influence on total demand. Without a clear idea of total demand, the relative size of unmet demand remains imprecise.

# Methodology

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This project examined student demand for post-school education in terms of met and unmet demand. There are two parts to the project. In the first part, the 2001 Survey of Education, Training and Information Technology database is used to enumerate met and unmet demand for post-school courses in Australia in 2001. Different definitions are used to provide a range of figures. These definitions stem from both theoretical nuances raised in the literature and data peculiarities in the Survey of Education, Training and Information Technology.

It is important to recognise that the data used in this analysis have an important impact on the definition of unmet demand for the purpose of this study. In this regard, survey questions concerning individuals' decisions to participate in higher education and training are asked in the context of the current highly subsidised system. Consequently, even though the level of met demand for education and training exceeds that which would be provided in the absence of subsidised fees, unmet demand in this study is only considered relative to the prevailing level of subsidised fees.

In the second part of the project, the examination of unmet student demand considered whether some of the factors contributing to the decision to apply for courses may also contribute to the success or failure of these applications. For example, poorly qualified individuals may be less likely to apply for courses and their application may be less likely to be successful for the same reasons (for example, never attended secondary school). If so, then the sample enrolment data may be overrepresented with better-quality candidates (those who are more likely to apply).

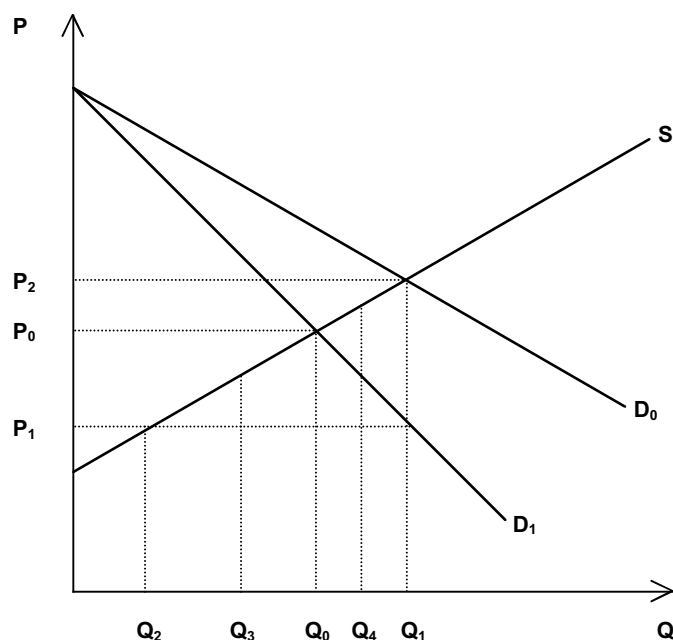
In view of this potential distortion, a goal of this study was to determine whether estimates of unsuccessful post-school applications derived from applications data are subject to selectivity bias and, if so, to estimate the necessary corrections. The appropriate procedure in this situation is the estimation of a bivariate probit model of the joint determination of application failure and whether an application is made, with selectivity bias being controlled for through a measure of association between the two equations. This modification is necessary in order to obtain robust estimates of the various factors influencing application failure, and therefore unmet demand. The basic modelling strategy used in the estimations is that espoused by Greene (n.d.) and O'Higgins (1994) for use with a bivariate probit model. The alternative strategy by Heckman (1979, 1980) was argued by O'Higgins to be inappropriate within the context of non-linear models. The underlying theoretical model is presented in appendix 1, which can be found in the support document on NCVER's website <<http://www.ncver.edu.au>>. Appendices 2–7 can also be found at this address.

# Literature review

The acquisition of human capital via compulsory schooling, post-school studies and informal and formal on-the-job and off-the-job training contributes to the growth and productivity of an economy. Governments encourage individuals to participate in, and employers to offer, education and training by either directly providing a subsidised service or indirectly by subsidising costs. However, the willingness of individuals to participate in such activities can be frustrated by the lack of available or suitable places in particular courses and at particular institutions. To some extent this disparity results from financial constraints at both the individual and the institution levels.

The starting point for a study of this kind is to define student demand for post-school education and its components—met and unmet demand. Demand is the quantity of a good or service that individuals are willing to buy at a given price. Generally, the lower the price, the higher the demand, leading to the standard downward sloping demand curve (such as  $D_1$  in figure 1). This reflects that consumers have limited means. The higher the price of one good or service, the greater the opportunity cost of purchasing that good or service in terms of foregone consumption of other goods and services, and the lower demand will be. Thus changes in the price will lead to movements along the demand schedule  $D_1$ , *assuming all other things are held constant*.

**Figure 1: Demand and supply for post-school education**



Note: D = demand; P = price; Q = quantity; S = supply

In reality, at any given price, demand may increase or decrease as a result of a range of other factors, notably changes in tastes and preferences, wealth, population and the price of complements and substitutes. For example, the demand for post-school education can be expected to increase as the population and incomes grow. An example of a complementary good may be transportation. For individuals who have to travel a considerable distance to attend an educational institution, a rise in

transport costs will reduce their demand for post-school education. It is also common for educational participation (demand) to increase when the labour market is weak. Higher unemployment and/or lower incomes result in a lower expected return from entering the labour market and thus a lower opportunity cost of post-school education. However, rather than a consumption good, economists typically treat education and training as an 'investment' in which initial costs and foregone earnings are recouped through increased post-training productivity and earnings. Thus the impact of changes in price and other factors is not so straightforward. The effect on demand will depend upon the impact of a change on both current costs and expected future returns.

In the perfect market model, in which the external benefits of education are ignored, quantities demanded and supplied are equal at  $Q_0$  with price of  $P_0$ . Thus the market is cleared, but at a sub-optimal level of  $Q$ . A price subsidy of  $P_0 - P_1$  recognises that private demand for education,  $D_0$ , is less than social demand,  $D_1$ —the classic positive externality scenario. At  $P_1$ , quantities demanded and supplied are  $Q_1$  and  $Q_2$  respectively. Figure 1 shows that, if the student price is subsidised at  $P_1$  to encourage enrolment at the socially optimum level of  $Q_1$ , then the supplier must also be subsidised to the tune of  $P_2 - P_0$ . In this way quantity demanded and supplied are equal at  $Q_1$  and the market is cleared, this time at the optimal level of  $Q$ .

In the Australian context, price subsidies are offered to domestic students (via the Higher Education Contribution Scheme) and through funding models to both private and public post-school educational institutions. However, quotas are also applied. The general consensus is that, in aggregate, these quotas fall short of meeting a socially optimal level of demand,  $Q_1$ . Thus if the quotas result in educational provision at  $Q_3$ , for example, then at the subsidised price of  $P_1$ , there will be some unmet demand of  $Q_1 - Q_3$ . That is, there are people willing to purchase a place in education and training, but for whom there is no place. In the case of employment-based qualifications, the supply of places available for apprentices and trainees is also contingent on employers making those entry-level positions available.

The size of this unmet demand is subject to debate. Some might argue that the quota  $Q_3$  should be compared with the quantity demanded at the unsubsidised price,  $P_0$ . In this case, unmet demand would be  $Q_0 - Q_3$ . Then if the quota was at  $Q_4$ , there would be no unmet demand. The alternative argument, described above, compares the quota  $Q_3$  (or even  $Q_4$ ), to the quantity demanded at the subsidised price,  $P_1$ . Here unmet demand would be  $Q_1 - Q_3$  (or  $Q_1 - Q_4$ ). This scenario is more probable given persistent government expenditure constraints.

Unmet demand, for the purpose of this report, is defined as an excess of persons willing to purchase post-school education places at the prevailing price level and for whom no place is available. Thus, actual enrolments would approximate met demand and thwarted applications would approximate unmet demand. The sum of the two would then represent total demand at current price levels. However, there are some grey areas even with this dichotomy.

Birch, Koshy and McLure (2002, p.4) suggest that 'unmet demand' occurs 'where students would enrol if more places were available'. This definition conforms to the definition arising from figure 1 and suggests that unmet demand may be greater than the number of unsuccessful applications. The Australian Institute of Health and Welfare (2002), in its report on unmet need for disability services refers to 'met demand' as people receiving an appropriate service, and 'unmet demand' as people expressing a need for a service and either not receiving it, or receiving an inadequate or inappropriate service. Here, expressing a need may reflect a formal application process but this is not necessarily the case.

In contrast, the Australian Bureau of Statistics (ABS) defines demand for post-school education in relation to 'people who applied to attend an educational institution other than a school' (ABS 2002). Also, unmet demand is defined as 'those unable to gain a place (at the time of the survey)' and met demand as 'those able to gain a place at a non-school educational institution (not necessarily in the course of their choice)'. Here met demand includes those studying or deferring

their study in the current period having not studied or were studying at a different institution in the previous period.

In discussing these definitions of met and unmet demand, we have so far treated post-school education as being a single, homogenous service. There is, of course, a variety of forms of post-school education and training, including the university sector, technical and further education (TAFE) diplomas and certificates, qualifications such as apprenticeships and traineeships which combine on-the-job experience with off-the-job technical training, and other short courses and privately provided courses. Within these, there are further specific disciplines and vocational streams. To the extent that these different forms are substitutes, then prices, availability and demand in one area of post-school education will also influence demand in other areas. An expansion of university places, for example, may reduce demand for TAFE places. Expectations about what qualifications and skills will be in demand in the labour market in the future will also have a large effect on the distribution of demand between different courses and institutions.

This creates a further potential dimension to the definitions of met and unmet demand. In terms of the provision of educational services, met demand could be students studying what and where they wish to study. Unmet demand could be those not studying but wanting to, and those who are studying but enrolled in less preferred courses, fields of study or institutions. Field of study and institution are the only two preferences included in the Survey of Education, Training and Information Technology database. Appendix 2 refers to the difficulties arising from the way in which these preference characteristics are included in the database.

The desire for post-school education—wanting to study—can be considered within a neoclassical economic theoretic framework. In terms of education, individuals will continue their studies as long as the net present value of gaining a qualification is positive. That is, there is an expectation that future higher incomes at least offset the opportunity costs of study at current prices. Similarly, Toner (2002) suggests that training will occur up to the point at which the marginal cost of training is equal to the marginal benefit of such training, assuming that the net benefit of employing trainees is positive over the term of the training, that the relativity between the wages of a trainee and those of a qualified person is high, and that training systems, such as apprenticeships, have flexibility of delivery and time for completion.

What, then, is the policy significance of the existence of unmet demand for participation in post-school education? In the ‘perfect market’ model unmet demand would not arise. Potential students or trainees would be willing to purchase places up to a price such that the cost of participation equates to the benefits from higher future earnings. If places are ‘scarce’, then providers will increase prices to eliminate any excess demand. If providers are then deriving abnormal profits from the higher prices, then incentives exist for current providers to expand the number of places provided and for new providers to enter the market. They will do so until the marginal cost of places equates to the marginal benefits (which in turn equates to the price trainees are willing to pay), and this represents a social optimum. By and large, however, society does not entrust the free market to arrive at a socially optimal allocation of education opportunities and there are a number of reasons given for public intervention through subsidisation or direct provision of post-school education places. These include:

- ✧ Positive social externalities may exist from wider participation in post-school education which private parties do not take into account when deciding how many places to provide or purchase, leading to fewer places available than would be socially optimal. Examples of such positive social externalities include higher tax receipts, lower unemployment levels and welfare transfers, a more competitive and flexible economy and stronger social capital networks.
- ✧ Financial markets may be too inefficient, preventing financially constrained individuals to borrow to finance their own participation in education even where it may be profitable to do so. This may be particularly so as the investment is in human capital rather than physical capital which can be held as collateral against a loan.

- ✧ On equity grounds, there is a desire for equality of opportunity for post-school education across persons of all socioeconomic backgrounds.

Having accepted a public role in the subsidisation and provision of post-school education, the government must also decide upon appropriate allocation mechanisms in the absence of pure market signals. Other indicators must be used to approximate the 'socially optimal' number of places, and to this end, the government collects information on labour market conditions within occupations, graduate destinations, the number of applications for different institutions and courses, along with assessments of labour market trends through industry and state training bodies and representative groups for employers and employees. The important policy question is how well the system of allocation operates, or how it closely approximates a social optimum (albeit a theoretical one). One indicator is the extent of unmet demand.

Broadly speaking, adjustments can be made through the price and/or the quantity of places available. If the government's intent is to offer a subsidy to overcome the problem of positive externalities and it believes it can set the subsidy to reasonably accurately reflect the value of externalities, then the market should again reach a social optimum, where the subsidised price equates to the private marginal cost and benefits of participation. Unmet demand in this case would indicate that inadequate numbers of places have been made available. On the other hand, the government may not attempt to manage the price, but may instead believe it is better equipped to approximate the optimal outcomes by setting the number of places. In this case excess demand would indicate that the government has underestimated the optimal number of places and/or the subsidy is too great (the price too low). Over-subsidisation would result in an unnecessary transfer to those who gain entry at the expense of those who miss out on places and other taxpayers in general. As mentioned above, unmet demand may also arise in terms of the unavailability of preferred courses or institutions rather than in aggregate. In this case, unmet demand is likely to reflect a failure in the allocation mechanisms to accurately adjust to structural change in the labour market. Further, correlation between cases of unmet demand and individual characteristics within the population may signal problems of equity and access.

These considerations suggest that the presence of substantial unmet demand may be endemic to shortfalls in allocation mechanisms for post-school education and training places. A minor level of 'frictional' unmet demand due to the matching process between many individuals and many different courses would be expected, and indeed this may coexist with 'unmet supply'. It may also be argued that some individuals who apply for post-school education and training do not, in any case, meet the entry requirements and should not be included as 'unmet demand'. Essentially this argument suggests that, due to lower academic ability or other individual characteristics, the benefits from these individuals participating do not exceed the full social costs, but they are still enticed to apply due to the extent of subsidisation. The problem with this argument, however, is that entry requirements themselves are endogenous. Faced with an excess of applicants over available places, institutions will raise entry requirements as a means of rationing places among the applicants.

Clearly it is not possible to undertake a comprehensive cost-benefit analysis for participation in all post-education courses to determine the optimal number of places that should be made available. Rather, the less ambitious aim of this study is to provide evidence of the extent of unmet demand for post-school education under a range of definitions, evidence on the factors associated with applications for places and their success rate, and to investigate whether the likelihood of success potentially disguises some unmet demand by discouraging applications.

Few previous studies have directly addressed this issue. Kilpatrick and Allen (2001), in their overview of factors affecting vocational education and training (VET) demand, refer to the need to identify the relative contribution of these factors, both economic and social, to the demand for VET by various stakeholder groups, in particular, individuals and employers. Gallagher (2001) identified two further demand categories—society as a whole, and VET providers.

The issue of unmet demand, particularly by individuals, is complicated by the fact that the markets for higher education and VET are both expanded (as prices are generally subsidised) and constrained (as quantity supplied is limited by the number of funded places). These complications were exposed by Birch, Koshy and McLure (2002) in their estimation of VET fee elasticities. Thus, any change in the objective or observable quantity demanded of post-school education by individuals is more likely to be influenced by changes in non-price factors.

The demand categories—individual, employers, society and providers—are not independent. For example, the demand by employers for employees to participate in VET is a derived demand. It reflects the demands of the firm's production process, in the short and longer terms, which in turn is influenced by product demand. To obtain employment, individuals must meet the skill requirements of prospective employers, hence their demand for VET and other courses. The focus of this research is restricted to the demand for further (post-school) education by individuals.

Examining the factors that affect both application submission and application failure will provide important signposts to government of the extent to which student demand for educational services may be unmet, or supply of educational services may be inadequate. Appendix 3 summarises studies in the United Kingdom and United States into student demand for post-school education.

Most of the studies in appendix 3 follow groups of students from a point in time before their high school graduation to their participation in post-school education. These groups thus comprise successful applicants and, in most cases, fit the broader definition of met demand. The empirical work in these studies does not attempt to compare successful applicants with unsuccessful applicants, nor does it recognise potential selection bias from the exclusion of non-applicants. Thus no specific conclusions regarding the magnitude or characteristics of unmet demand were made. The studies are included here as indicators of factors influencing choice in the post-school sector. The context and main findings of these studies are now discussed.

Hagy and Staniec (2002) examined how immigrant generational status and race/ethnicity interact to affect the post-school enrolment behaviour of over 10 000 eighth grade graduates using the National Educational Longitudinal Study<sup>1</sup> (NELS:88). Their choice model distinguished between five post-secondary enrolment alternatives, one of which was non-enrolment in any post-secondary institution. This enrolment/non-enrolment dichotomy is similar to the distinction in the present study between enrolled (successful applications) and not enrolled (failed or no applications). This encompasses the weak definition of met demand. A multinomial logit procedure was used to estimate the effects of each of the individual, family and school characteristics on the probability of each of the enrolment alternatives being chosen. One of the differences between the National Education Longitudinal Study sub-sample and the Survey of Education, Training and Information Technology sample is that, while the former included only high school graduates, the latter included 15 to 64-year-olds irrespective of whether they had completed the final year of school. Thus Hagy and Staniec's estimates were based on 'eligible' applicants and non-applicants. One-third of their high school graduates did not enrol in post-secondary institutions in the year following high school. The present study can only control for prior levels of educational attainment in a very loose way, and enrolments are not confined to the immediate post-high school graduation period.

The United States-based Hagy and Staniec study found a number of effects on the enrolment choice. They found that students who were black, female, had a father in a professional occupation or with a college qualification, had a mother with a college qualification, went to a private high school or a high school in the north-east were more likely to enrol in a private four-year post-school institution. Maths tests scores and income were found to be positively related to enrolment in a private four-year post-school institution. Students with either parent living in a different household or who attended a high school in the west were less likely to enrol in this type of post-school institution.

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<sup>1</sup> This is a nationwide (US) survey of a representative sample of students who were enrolled in the eighth grade in 1988.

McVicar and Rice (2001) used time series evidence for 1954 to 1994 to examine participation rates in further education in England and Wales. In particular they used co-integration analysis to estimate the long-run relationship in the data consistent with an augmented human capital model. They found varied growth in post-school participation rates—slow growth prior to 1988 and ‘exceptionally rapid growth’ (p.49) between 1988 and 1994. This prompted them to ask two questions:

First, to what extent does (the latter) represent an increase in the long-run rate of participation, as distinct from short-run dynamic adjustment? Secondly, what are the relative contributions of social and economic factors to the growth in participation, and hence to what extent can the higher rates of participation be expected to persist over the economic cycle? (McVicar & Rice 2001, p.49)

Unlike the model in the present study, McVicar and Rice were concerned less with individual characteristics that might encourage participation in post-secondary education (in this study’s vernacular, determinants of successful applications) and more with labour market attributes such as level of youth unemployment (labour demand) and the size of the higher education sector. They were concerned also with aggregate participation rates rather than the probabilities of a particular individual participating/enrolling in further studies.

While the McVicar and Rice model differs from the present study in a number of ways (such as time series versus cross-sectional data, and full information maximum likelihood estimates of participation rates versus log odds of having a successful application), their key finding regarding the importance of ability, measured by average level of General Certificate of Secondary Education attainment as a determinant of participation, flags the data deficiency that the present study faces. That is, the Survey of Education, Training and Information Technology database does not have a specific ability or prerequisite variable. McVicar and Rice also found that the unemployment rate for young people was directly related to the rate of participation in further education in England and Wales. This result could not be tested in the present study due to its ‘point in time’ data orientation.

A study by Andrews and Bradley (1997) used Careers Service data on all young people who completed their compulsory schooling in 1991 in Lancashire. Their choice model differentiated between six post-compulsory education alternatives, three of these related to further studies, two to employment options and the last to unemployment. As with the Hagy and Staniec (2002) study, a multinomial logit procedure was used to estimate the effects of personal, school, socioeconomic, occupation and local labour market characteristics on the post-school choices, with unemployment as the reference ‘choice’. As the dependent variable disaggregates those not studying into employed and unemployed, it is not clear who in these categories may be unsuccessful applicants for further study. Also it is unclear to which category those who are both studying and employed belong.

The key finding from the Andrews and Bradley study was that discontinuing their education is more likely for young people from big schools, and the lower are the school’s academic performance and the individual’s expected lifetime earnings. In addition, they conclude that:

Moreover the estimates usually suggest a clear ranking of outcomes, where the most able end up following non-vocational continuing education, and the least able end up either unemployed or with jobs with only on-the-job training. This might be interpreted as evidence of a segmented youth labour market. (Andrews & Bradley 1997, p.408)

While Andrews and Bradley argue that ‘it is not appropriate to model the staying-on decision as a simple binary choice’ (p.408), it is not always possible to further disaggregate. In the present study, which is broader than just school leavers, the Survey of Education, Training and Information Technology database, while splitting post-school enrolments between various course levels, is unable to also disaggregate failed applicants by course level. This problem, discussed in more detail later in this report, is one of the significant limitations of the Survey of Education, Training and Information Technology data source.

No Australian studies have looked specifically at decisions to apply per se, although there has been some work on factors affecting choice of institution (Brennan 2001) and factors influencing



participation (Roussel 2002). While neither of these studies have the exact focus of this project, the factors they identify could provide a starting point for examining factors that may influence decisions to apply for post-school study.

Brennan (2001) looked at students' choices of university courses in Victoria from a consumer behaviour perspective. Her approach was to survey, by mail, a random selection of 2400 school leavers enrolled in undergraduate engineering, business and arts courses at six Victorian universities in Semester 1 1999. The response rate was 24% (576 usable responses). Brennan highlighted the (then) marketisation of higher education in Australia in which it is assumed that consumers (school leavers and others) make economically rational decisions that inform production (the delivery of higher education courses). However, her results show that this assumption is optimistic at best. Indeed, consumer sovereignty may not operate in the higher education market.

To some extent this conclusion takes account of the issues of price subsidies and quantity constraints raised earlier. Brennan suggests that, in this constrained market, students are not necessarily making sovereign choices; they are themselves being chosen. Hence modelling the choice decision based on student-centred characteristics (the demand side) is going to be less informative than taking a supply-side approach. By comparison with the present study's focus on outcomes that define met and unmet demand, Brennan's study is more concerned with the underlying processes by which those outcomes are reached. The present study is more interested in outcomes as they pertain to the categories of met and unmet demand derived from Survey of Education, Training and Information Technology data.

Roussel's (2002) study estimated probabilities of educational participation for 15 to 64-year-olds based on ABS household surveys of education and training for 1989, 1993 and 1997. Her study was premised on the framework of human capital theory according to Becker (1993) and Mincer (1974) as follows:

According to this theory, investment in human capital responds to economic incentives and, like other investment, is profitable up to the point where marginal benefits are equated to marginal costs. (Roussel 2002, p.79)

Roussel's approach is thus quite different from that of Brennan (2001). There is, in the former, a confidence that the patterns of post-school education and training participation of various socioeconomic and demographic groups of the Australian population can be identified. She used logit modelling with factors affecting participation, including individual and labour market characteristics, depending on the data sample. Roussel's expectations are similar to those of the current study and include:

- ✧ Younger people are more likely to participate in further studies as they have longer periods over which to recoup their investment in education and training.
- ✧ Females have interrupted periods of work that predispose them to retraining.
- ✧ Those with high levels of prior education are predisposed to further studies, and those with lower levels of educational attainment are more in need of education and training.
- ✧ Those with high incomes are less likely to participate due to higher opportunity costs but are more likely to be able to afford up-front fees, and those with low incomes have more to gain from further studies but are less financially able.
- ✧ Those with part-time or casual work have more incentive to participate in formal education.
- ✧ Those who are unemployed have lower opportunity costs and therefore have higher participation rates.

Roussel's results note that participation in education and training in Australia is unevenly distributed across individuals. Lower participation rates are experienced by older people (as expected), those with low levels of education (as expected), females with dependent children (as expected), people who are not employed (not expected), and workers who are at the bottom of the occupation hierarchy or

earning lower incomes (as expected). In terms of the application failure model in the current study, these results and their *a priori* expectations are relevant. They are less relevant in terms of the application submission model, as non-participants are not disaggregated into applicants and non-applicants.

The United Kingdom and United States studies shown in appendix 3, including those by Hagy and Staniec (2002), Andrews and Bradley (1997) and McVicar and Rice (2001), and the Australian studies by Brennan (2001) and Roussel (2002) provide a variety of factors that might impact on the decision to apply for post-school study and the outcome of applications. A number of these factors match variables in the Survey of Education, Training and Information Technology dataset. These include age (Heckman & Smith 2003; Jackson & Weathersby 1975), country of birth (Fligstein & Fernandez 1985; Ganderton & Santos 1995; Hagy & Staniec 2002; Heckman & Smith 2003; Vernez & Abrahamse 1996), English proficiency (Heckman & Smith 2003), sex (Hagy & Staniec 2002), income (Corrazzini, Dugan & Grabowski 1972; Hagy & Staniec 2002; Heckman & Smith 2003; Hoenack 1967; Hoenack, Weiler & Orvis 1973; Jackson & Weathersby 1975; Kohn, Manski & Mundel 1976; McVicar & Rice 2001; Radner & Miller 1970), and marital status (Heckman & Smith 2003). Some of the factors such as ability (Hagy & Staniec 2002; Kohn, Manski & Mundel 1976; McVicar & Rice 2001; Radner & Miller 1970) and aspirations (Hilmer 1998) are not included in Survey of Education, Training and Information Technology, although highest level of educational attainment (Hagy & Staniec 2002; Heckman & Smith 2003; Spies 1973), which is recorded, might be used as a proxy for either. Some factors such as high school location (Hagy & Staniec 2002), costs of college (Kohn, Manski & Mundel 1976) and parental social class/occupation (Burnhill, Garner & McPherson 1990) do not match the Survey of Education, Training and Information Technology variables so cannot be tested. In light of Brennan's findings, however, it is unlikely that individual characteristics alone will inform the models in the current study.

# Enumerating met and unmet demand

As discussed in the previous chapter, substantial unmet demand is likely to reflect allocative inefficiency in the market for post-school education. The existing literature provides little guidance as to what definitions of 'met' and 'unmet' demand are preferable or what level of unmet demand may be considered to be excessive or problematic. This chapter provides initial estimates of met and unmet demand under a range of alternative definitions using the Survey of Education, Training and Information Technology data. Appendix 2 discusses variables within Survey of Education, Training and Information Technology that can be used to enumerate demand for post-school study. These variables were used to construct table 1.

Table 1 shows that, under a strict definition of met demand, 1 665 552 persons were studying in their preferred field of post-school study in 2001. This is 90.5% of total demand for post-school study in 2001 and 91.7% of all people enrolled in post-school study in 2001. Unmet demand ranges from 16 309 people (under 1% of total demand) to 174 780 people (9.5% of total demand), depending on the definitions of met demand. For example, if the strict definition of met demand is relaxed to include all people enrolled in post-school study in 2001, unmet demand decreases to 1.3% of total demand.

**Table 1: Estimates of met and unmet demand for post-school study in 2001**

Application/enrolment in post-school study in 2001	Strict met demand		Weak met demand 1		Weak met demand 2		Total demand
	Met	Unmet	Met	Unmet	Met	Unmet	
Enrolled in preferred field of study	1 665 552 (90.5%)		1 665 552 (90.5%)		1 665 552 (90.5%)		1 665 552 (90.5%)
Enrolled but not in preferred field of study		151 716 (8.2%)		151 716 (8.2%)		151 716 (8.2%)	
Application successful or deferred but not enrolled due to no places or suitable courses		6755 (0.4%)		6755 (0.4%)		6755 (0.4%)	
Application unsuccessful and not enrolled/ no places or suitable courses		16 309 (0.9%)		16 309 (0.9%)		16 309 (0.9%)	
Total	1 665 552 (90.5%)	174 780 (9.5%)	1 817 268 (98.7%)	23 064 (1.3%)	1 824 023 (99.1%)	16 309 (0.9%)	1 840 332 (100.0%)

Source: Survey of Education, Training and Information Technology 2001

Determining the scope of unmet demand (what it includes and excludes) is crucial for those policy-makers who are charged with distributing funds to and within the post-school education sector. Buckell (2003b) highlighted a number of definitions used in the university sector for estimation reasons. For example, the Australian Vice Chancellors Committee also adjusts data in a number of ways and might argue that the unmet demand figures are intended to show trends rather than exact numbers (Buckell 2003b).

Using tertiary entrance rank cut-off scores and the equivalent for mature-age students to define eligible students and therefore total demand has been mooted by the Association of Tertiary Admission Bodies (Buckell 2003b). This attempt at defining demand is also deficient to the extent that it is contingent on the assumption that all eligible students will want to pursue post-school

education of some form. However, eligibility would appear to be a poor measure for defining demand.

Given that student places are primarily funded on an ‘equivalent full-time student unit’ basis, the magnitude of unmet demand must be of concern to both administrators of post-school institutions and the federal government as the purveyor of subsidies and allocations, particularly in the higher education sector.

The difficulty of choosing one or any of the estimates of unmet demand shown in table 1 necessarily reflects the differing views of the purpose and value of education to the individual and the society. That is, should an individual who wants to pursue post-school education be entitled to whatever course at whatever institution they prefer? If so, then the strict definition of met demand is appropriate and unmet demand is about 10% of total demand (strict met demand). This represents a considerable amount of dissatisfaction with the system of allocating places and setting the number of places.

If the society values education only in relation to the contribution it makes to the accumulation of human capital, then ensuring an exact match between what the individual wants to study and where and what the society, through its education and training institutions, is prepared to offer is unnecessary. If this is the prevailing view, then unmet demand for post-school education is under one per cent (weak met demand 2).

The tools of the researcher, including statistical and econometric techniques, do not inform choosing between these two viewpoints. However, for the purposes of the multivariate data analyses to follow, unmet demand is defined in terms of the middle ground—weak met demand 1. It should be noted that this does not represent a preference in terms of choosing between the two viewpoints on the role of education.

The data analyses that follow are an attempt to set aside the issue of enumeration of unmet and met demand and look at factors affecting individual’s post-school choices (application submission) and enrolment (application success). The first set refers to factors affecting the decision to apply for post-school study (the selection model). The second set of analyses relates to factors affecting the failure of applications for post-school study (the substantive model). The final analysis re-estimates these models, correcting for the bias in application failure that may arise from a bias in applications.

# Data analysis

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The enumeration of met and unmet demand under various definitions provides some indication of the efficacy of mechanisms that govern the allocation of post-school education places in aggregate and between different courses. A further policy issue relates to whether or not access to post-school education places is equitable across different groups within the population. In this section, multivariate analysis is used to identify the factors associated with the likelihood of an individual contributing to unmet demand—that is, having unsuccessfully applied for a place in post-school education. A two-stage modelling approach is used. First, individual models of the probability of applying for post-school education (the application submission model) and of that application being unsuccessful conditional upon having applied (the failure model) are estimated. However, if the probability of an individual applying in the first place is correlated with their probability of failure, the extent of unmet demand for people with given characteristics may be underestimated. In recognition of this, the two models are then estimated jointly with a correction for selection bias. Neither of the two models, by their nature, will estimate aggregate levels of unmet or met demand.

## The application submission (selection) model

The selection model reflects factors affecting the decision to apply for post-school study. This model might be used to predict whether an individual with characteristics included in the model will apply or not for post-school study.

A number of the factors shown in table S5 (in appendix 3) can be matched to variables in the Survey of Education, Training and Information Technology. For the purposes of the modelling, these variables have been recoded and include age (five-year age groups from ‘15 to 19 years’ with 60 to 64 years as the benchmark group), educational attainment (‘Not finished Year 12’), gender (‘Female’), ethnicity (‘Father born overseas’, ‘Mother born overseas’ and ‘Born overseas’), socioeconomic indicator (Socio-Economic Indexes for Areas [SEIFA] quintiles), disability (‘With disability’), the presence of children in the household (‘With children’), marital status (‘Not married’), labour force status (‘Not working’), English as a second language (‘ESL’), parents’ occupations and education levels (‘Computer at home’), and income (four income groups: below median income; median income \$600 to \$640 (the benchmark group); above median income; and income not known/applicable).

Age is an important indicator of participation in education and is likely to motivate post-school applications. Younger people are more likely to want to study beyond school by virtue of the ease of articulation from school into VET or higher education. They are also less constrained by high opportunity costs as their incomes tend to be low. Nonetheless, the growth in demand by mature-age students, who account for just under half of all applicants, is dominating growth in total demand (Buckell 2003a). It is expected that the coefficients of each age group will be positive. That is, compared with people aged 60 to 64 years, individuals in younger age groups are more likely to apply for further study. It is also expected that the age effect on application submission diminishes as age increases.

Females have had a rapid growth in their level of post-school qualifications compared with men. For example, the number of women with bachelor degrees increased by 132.7% between 1991 and 2001, compared with the growth in bachelor degree completions for men of 66.2%. By 2001,

women were more likely to hold a bachelor degree than men (Austen & Giles 2003). This trend suggests that females may be more likely to apply for higher education study. However, the same is not necessarily true for VET. Kilpatrick and Allen (2001) found that young women participated less in VET than young men. Whether the same is true of VET applications is not known. On balance, it is expected that females will be more likely to apply.

Socioeconomic disadvantage continues to be an issue, despite government and community endeavours to improve the equity of educational opportunities. People, particularly young people, who live in disadvantaged neighbourhoods (high unemployment, low median income etc.) are still less likely to want to participate in education beyond the compulsory schooling level. As with gender, the participation rates for VET and higher education may differ by SEIFA category. For example, there is some evidence that VET participation is higher in low socioeconomic areas (McIntyre 2000). It is expected that the coefficients of the SEIFA variables will be positive relative to the benchmark group of the bottom quintile, particularly for those in the lower quintiles. The top quintiles are more likely to include people on higher incomes and with better labour market credentials, such as experience and qualifications. They may be less likely to apply for post-school education because they already have qualifications and established careers. Moreover, the opportunity cost of further study will be high for these people. On balance, it is not clear whether their propensity to apply will be higher or lower than that of the benchmark group.

Income variables might be chosen in lieu of the SEIFA variables. In the Survey of Education, Training and Information Technology, income is grouped, with the median income group being \$600 to \$640. The study hypothesises that the lower-income groups may be less likely to apply, although, as with some of the other variables, younger people who are more likely to apply for post-school study, are probably overrepresented in this low-income group. In the high-income group, the expectation is for the coefficient to be negative, as this group is overrepresented with older people who have probably achieved higher income through skill acquisition.

For people with minimal education (below Year 12), the propensity to apply for post-school study is likely to be low compared with people who complete Year 12. There are a number of reasons for this. Applications for many post-school courses, particularly higher education courses, have minimum schooling prerequisites such as Year 12 tertiary admission scores. Given that application processes make these requirements known prior to applications being submitted, unsuitable potential applicants will not apply. There is some evidence that the experience of schooling beyond compulsory levels contributes to a lifelong learning ethos generally. This applies particularly to continued informal learning by highly educated people (Fahr 2003). Thus it is expected that individuals without Year 12 completions will be less likely to apply.

The influence of ethnicity is included in the model with three binary variables 'Father born overseas', 'Mother born overseas' and 'Born overseas'. There are two opposing influences in regard to this influence. First, migrants may be less likely to access educational opportunities through the language barrier and/or not having established networks of friends and families with long ties to the community. Second, given that more educated people tend to encourage higher levels of education in their progeny through the income and/or role effects, the skilled migration push means that new migrants with 'greater pre-immigration human capital' (Chiswick, Lee & Miller 2002) are more likely to encourage their children to study. They may also, despite having particularly well-sought-after qualifications from their home country, need to take some study courses to convert their qualifications so that they are recognised in Australia. The differing influences on the education decision of first- or second-generation migrants suggest that expectations regarding the likelihood of applying are ambiguous.

Two of the known determinants of educational participation are parents' occupations and their levels of education. No variables for either of these characteristics are available in the Survey of Education, Training and Information Technology. The study thus uses as a proxy, a recoded variable for computer access at home. This follows from Bill and Lloyd (2003) who, using 2001

census data, reported a high correlation of computer access at home with parents with post-school education. It is expected that individuals with computer access at home will be more likely to apply.

The literature suggests that unmarried people are more likely to participate in education. To some extent this is correlated with age, with younger people being less likely to be married. However, age influences are already accounted for in the model. This study expects that unmarried individuals are more likely to apply for post-school study.

There are two considerations in the effect of labour force status on the decision to apply for post-school study. First, someone wishing to study may position themselves in the labour force so that any opportunity to study (successful application) can be taken up. For example, someone wanting to change careers may be working casually in anticipation of future study. A second consideration is that someone who has difficulty in obtaining work with their current skill set may consider study as necessary to improving their future labour market status. The subtleties of this difference cannot be extracted from the Survey of Education, Training and Information Technology data. Nonetheless, in either case, the expectation is that people who are unemployed or not in the labour force are more likely to apply to study than those who are working full-time or part-time.

Outside the specific literature identified in table S5 (see appendix 3), two additional influences on the decision to apply for post-school education are thought to be important. These are the variables for parenting, disability and English as a second language—‘With children’, ‘With disability’ and ‘ESL’ respectively.

The respondents include those with and without children. The hypothesis is that those with children are less likely to pursue further study. There are a number of scenarios that support this. Younger people are more likely to be childless (the average age of first parenthood is late twenties) and are also more likely to be studying (continuing their studies immediately post-school or with only a short break from school). Raising children is costly and for older people with children, undertaking further study could involve financial sacrifices/opportunity costs that outweigh the perceived benefits of the study. Thus it is expected that individuals with children are less likely to apply for post-school study.

Twenty-eight per cent of people in the Survey of Education, Training and Information Technology have a disability. Given continuing difficulties experienced by mentally and physically disabled people in terms of accessing community services and opportunities for work and education, this study expects that respondents with disabilities would be less likely to apply for further study. English as a second language is also thought to be a deterrent for many Australians attempting to participate in education and work. This study therefore hypothesises that the coefficients of the disability and English as a second language variables are negative.

In summary, this study expects that:

- ✧ Applications for post-school study will be positively correlated with:
  - ◆ age (relative to the 60 to 64-year age group)
  - ◆ females
  - ◆ prior education level
  - ◆ home computer access.
- ✧ Applications for post-school study will be negatively correlated with:
  - ◆ English as a second language
  - ◆ disability
  - ◆ working
  - ◆ married.
- ✧ Applications for post-school study have an unpredictable correlation with:
  - ◆ migration status
  - ◆ socioeconomic status
  - ◆ income.

Five models of application submission were estimated. These reflect an attempt, given the variables of interest, to estimate the combination of influences that are most informative. The results and the technical discussion are contained in appendix 5.

Using model 4 results to summarise, it appears that the probability of applying, which decreases with increasing age, is high relative to the benchmark group of 60 to 64-year-olds; that persons without Year 12 completions, with children and/or with a disability are less likely to apply; and that persons who have a computer at home, are born overseas, are not married, are not working and/or have incomes below the median income are more likely to apply for post-school study in 2001. These results are significant at the 1% level.

## The failure (substantive) model

The substantive model indicates factors affecting the failure of post-school applications or unmet demand. Some of these factors were introduced in the previous section. The application failure model (either uncorrected as shown in this section, or corrected as shown in the next section) can be used to predict the conditional probability that, given an application, an individual with particular characteristics will have an unsuccessful application.

Age may be an indicator of failure of applications. For example, younger people who are more recently qualified are more likely to have prerequisites for further study that meet current guidelines. Mid-aged people who may be applying for similar courses to upgrade skills will have fewer current prerequisites. Older people, who may be less inclined to study for career reasons, may choose less competitive courses. Table S6 in appendix 4 shows the results of bivariate analyses of age and application success.

The current debate over higher education reform has focused on the equity implications of changes to student fees. This has been an ongoing issue for the federal government since the halcyon days of free tertiary education 1975–89. With the introduction of the Higher Education Contribution Scheme on the basis of shared benefit<sup>2</sup> in 1990, there have been attempts to recover more from students, thereby halting the escalation in government expenditure for this sector. While it is not unfeasible to suggest that socioeconomic disadvantage will impact on applications, its effect on the success of these applications is less clear. Correlations of application success with socioeconomic disadvantage and income using the SEIFA and income variables in the Survey of Education, Training and Information Technology are shown in table S7 in appendix 4.

Respondents who have not completed Year 12 may be less likely to have successful applications due to a lack of prerequisites. The presence of, or type of prerequisites cannot be tested within the Survey of Education, Training and Information Technology. However, using Year 12 completion as a proxy for a general prerequisite for post-school study, it is expected that applicants without Year 12 completions will have a higher probability of failed applications (unmet demand). A correlation of application success with 'Not Year 12' is shown in table S8 in appendix 4.

The effect of ethnicity on the success of applications for post-school study is included using the variable 'Father born overseas'. It is unclear how this influence will affect the success of applications for post-school study. In the absence of an ability variable in the data, indirect ability effects could be being picked up by other variables, including this ethnicity variable. The direction of the influence is unclear.

In the previous section, a proxy variable for parental influence was introduced. This variable is computer access at home. There are both direct and indirect effects of this characteristic. Indirectly,

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<sup>2</sup> Education is thought to benefit graduates by way of higher lifetime earnings and the society in terms of greater productivity and overall economic growth. This is the basis of the externality model introduced earlier. Hence, the argument for free education is not defensible. The extent to which students should pay for their education has fuelled the post-school education debate for the past decade.



parental influence may affect application success for two reasons. To the extent that computer access at home reflects better educated parents with white collar occupations, respondents with computer access at home are more likely to receive guidance with regard to an appropriate course choice. Also these respondents are more likely to score better on pre-entry tests etc. A direct influence of having a computer (and internet) at home is the ability to search for courses that suit the individual's abilities. Thus students may be choosing courses for which the probability of a successful application is high. Thus it is expected that this variable will be negatively correlated with application failure.

Three other characteristics with the potential to affect application failure are whether or not the applicant is married, has English as a second language and has a disability.

Table S11 in appendix 6 presents the results of three models of application failure (unmet demand).

Using model 3 results it appears that applicants aged 20 to 24 years are less likely to fail, as are applicants without a computer at home. The probability of failure is higher for applicants who have not finished Year 12 and applicants with a disability. These results are significant at the 1% level.

## Correcting for selection bias

As mentioned earlier, some of the factors contributing to the decision to apply for courses may also be contributing to the success or failure of these applications. Two examples will be given here. First, mature-age individuals with little prior education may not apply for post-school education because they haven't developed an ethos of lifelong learning, and their applications may be unsuccessful because they don't have the prerequisites for post-school courses. A second example also concerns mature-age individuals whose highest level of educational attainment is VET or higher education. They may not apply because they know there are strict quotas on their preferred courses of study and they may be unsuccessful if they apply because their previous study was too long ago. As a result, successful applications for post-school study may be overrepresented by younger applicants.

There are likely to be other factors that influence both the decision to apply and the success of applications. In these cases, enrolment data not only understate the demand for post-school courses, but understate this in a non-random way. This phenomenon, known as selectivity bias, is a common feature of many data collections in the social sciences. For this project, the estimates shown in table S11 in appendix 6 could be biased because they are based on the sample of applicants only.

In terms of the *fail* and *apply* models, there is a means of re-estimating the influences on application failure to take account of application bias. The appropriate procedure is the estimation of a bivariate probit model of the joint determination of application failure and application submission, with correction for selection bias being controlled for through a measure of association between the two estimating equations. Table S12 in appendix 7 gives the results of this estimation. These suggest that the influences on the failure of applications for post-school study are unlikely to be biased by excluding non-applicants from the sample used to estimate those influences. To some extent the results are driven by the models—what variables are included and excluded. Of particular concern is the lack of a specific ability variable in the Survey of Education, Training and Information Technology.

# Conclusions

This study was intended to investigate unmet demand for vocational and educational training using data collected in the 2001 Survey of Education, Training and Information Technology. This is a comprehensive survey of, inter alia, education and training enrolments and intentions. However, interrogation of this data set revealed that unmet demand for VET could not be isolated from within unmet demand for post-school study. This is due to respondents whose applications were unsuccessful not being asked to indicate whether they had applied for VET, university or any other form of post-school education. As a consequence, the study has been re-oriented by using the Survey of Education, Training and Information Technology data to investigate unmet demand for post-school education. Nonetheless, an attempt to disaggregate these using sensitivity analysis has been undertaken, with results shown in table S9 in appendix 4.

Using weak met demand 1 shown in table 1, unmet demand across higher education and VET is 23 064. This is 1.3% of total demand for post-school study. Columns 1 and 2 respectively of table S9 give the distributions of enrolments and highest level of educational attainment for VET and higher education from the Survey of Education, Training and Information Technology weighted observations. Column 3 shows that applying the enrolment distribution from column 1 to the estimate of unmet demand gives unmet demand in VET of 11 900 individuals. Column 4 shows that the application of the educational attainment distribution from column 2 to the estimate of unmet demand gives unmet demand for VET in 2001 of 9400 individuals. A comparison of these figures with column 4 can be made. Column 4 hypothesises that the VET to higher education ratio is 1:2. That is, unmet demand would be 7700 individuals. Column 6 estimates the higher education and VET proportions based on their ratio in column 2. Here unmet demand for VET is 9400 individuals. Any or none of these estimates may indicate the true magnitude of unmet demand for VET.

Another way of distilling VET from higher education in unmet demand for post-school studies is as follows. The significant estimates in the application failure model show that applicants aged 20–24 years and applicants with home computers are less likely to have unsuccessful applications. Applicants aged 35–44 years and those with a disability are more likely to have failed applications. Table 2 shows the proportions of individuals with VET and higher education qualifications (highest level of educational attainment) with each of these characteristics. Also shown is the sign of the coefficient in the failure model.

**Table 2: Proportion of individuals with VET and higher education qualifications**

Characteristic	Propensity for failed application	VET (%) <sup>1</sup>	HE (%) <sup>2</sup>
Aged 20–24 years	-	9.6	9.0
Aged 35–44 years	+	26.3	26.7
Computer access at home	-	66.7	85.0
Disability	+	30.6	19.1
N (weighted observations)		2 188 452	3 182 739

Notes: 1 Percentage of individuals with VET as the highest level of educational attainment with the characteristic, e.g. 66.7% of individuals with VET qualifications have computer access at home.

2 Percentage of individuals with higher education qualifications with the characteristic, e.g. 19.1% of individuals with higher education qualifications have a disability.

The table shows that a larger proportion of individuals with VET qualifications reports a disability compared with individuals with higher education qualifications. Having a disability is shown to be positively related to failed applications. Given that failed applications predominate in the enumeration of unmet demand, it might be hypothesised that the distribution of unmet demand by sector is biased towards VET.

A smaller proportion of individuals with VET qualifications have computer access at home compared with individuals with higher education qualifications. This characteristic is negatively related to failed applications. Again, it could be hypothesised that the distribution of unmet demand by sector is biased towards VET.

For the purpose of this study, unmet demand comprises two major components: 'applied but not enrolled', covering potential students who applied for post-school study courses but did not enrol because no places or suitable courses were available; and 'did not apply', covering potential applicants who did not apply on the presumption that their application would be unsuccessful.

The 'applied but not enrolled' component of unmet demand can account for three types of non-enrolment: (i) successful applications that did not lead to enrolment because no places or suitable courses are available; (ii) unsuccessful applications because no places or suitable courses are available; and (iii) enrolled, but not enrolled in the preferred field of study. The position agreed in this study was that the most policy-relevant measurement of the 'applied but not enrolled' component of unmet demand should be limited to categories (i) and (ii) above. This reflects a judgement that participation itself in post-secondary schooling is a higher-order policy priority than the composition of participation in post-secondary schooling. On this basis, the 'applied but not enrolled' component of unmet demand does not appear to be a significant policy problem. In 2001, there were 23 064 cases of 'applied but not enrolled' out of 1 840 332 applications. This comprised:

- ✧ 6755 *successful applications*, or only 0.4% of all applications
- ✧ 16 309 *unsuccessful applications*, or only 0.9% of all applications.

The major research effort associated with this study has been directed towards estimating the significance of the 'did not apply' component of unmet demand; that is, to determine the number of potential applicants who did not apply on the presumption that their application would be unsuccessful. The first step to achieving this goal involved the development of probit models to estimate the likelihood that individuals, with various social characteristics likely to encourage or impede the pursuit of post-school education, will 'apply' for post-school education and 'fail' to enrol in post-school education. The second step involves correcting for selectivity bias using a bivariate probit technique, where factors contributing to the decision to apply may also be affecting the failure of applications.

The importance of correcting for selectivity bias to this study is that it provides an insight into the significance of unmet demand from potential students who 'did not apply' for post-school education. However, perhaps contrary to expectations, statistical analysis indicates that the 'fail' model does not require any correction for selectivity bias. That is, there is no statistical evidence to support the view that unmet demand from students who did not apply is significant. In practical terms, this means that unmet demand can be measured with reference to the 'applied but not enrolled' category alone. As noted above, this measure is relatively small—1.3% of applications in 2001.

However, this result must be interpreted in its correct context. The low level of unmet demand is a generic result: it ignores the distribution of this aspect of unmet demand across the many levels and types of education, some of which are complements and others of which are substitutes. There is the clear potential for unmet demand to be significant in some specific areas of post-school education, while being insignificant in others. To investigate this issue, it would be useful if future Survey of Education, Training and Information Technology data surveys collected information on the streams and levels of programs that non-applicants would have applied for had they not been prevented by other factors and unsuccessful post-secondary applications.

Furthermore, the policy aspect of post-school participation does not end with the issue of unmet demand. If applications for post-school education change significantly with respect to social characteristics, met demand may be inadequate, given social policy objectives. In this regard the 'apply' model is useful in identifying characteristics associated with below-average demand, which may need to be corrected in view of the possible 'public good' characteristics of education. Also when the characteristics of low demand from the 'apply' model are compared with the 'fail' model, possible policy-relevant issues can be identified. For example, the 'apply' model found that, while individuals with a disability are significantly less likely to apply for post-secondary education than other individuals, suggesting a lower level of demand, the 'failure' model also found that such applications are also more likely to fail. A *possible* hypothesis to explain this result is that limited facilities for students with disabilities is a factor in both the greater propensity for applications to fail (because limited facilities lead to rationing) and the lesser propensity to apply (in recognition of the rationing). This issue could be further investigated.

Two limitations are imposed on the study results. First, the results are constrained by the models—what variables are included and excluded. Second, the results are idiosyncratic to the database used—what variables are available and how they are constructed. Of particular concern is the lack of specific ability and prerequisite variables in the Survey of Education, Training and Information Technology.

Policy-makers concerned with the quantum of unmet demand should in the first instance examine the price and supply constraints in this market and the extent to which these are influencing total demand. Without a clear idea of total demand, the relative size of unmet demand is itself imprecise.

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# Support document details

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Additional information relating to this research is available in *Unmet student demand for tertiary education—Support document*. It can be accessed from NCVER's website <<http://www.ncver.edu.au>>. The document contains:

- ✧ Appendix 1: Theoretical model
- ✧ Appendix 2: SETIT database
- ✧ Appendix 3: UK and US studies
- ✧ Appendix 4: Tables
- ✧ Appendix 5: Selection (apply) model results
- ✧ Appendix 6: Substantive (fail) model results
- ✧ Appendix 7: Corrected models results
- ✧ References



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**National Centre for Vocational  
Education Research Ltd**

Level 11, 33 King William Street  
Adelaide SA 5000

PO Box 8288 Station Arcade  
South Australia 5000

Phone +61 8 8230 8400  
Fax +61 8 8212 3436  
Email [ncver@ncver.edu.au](mailto:ncver@ncver.edu.au)

[www.ncver.edu.au](http://www.ncver.edu.au)