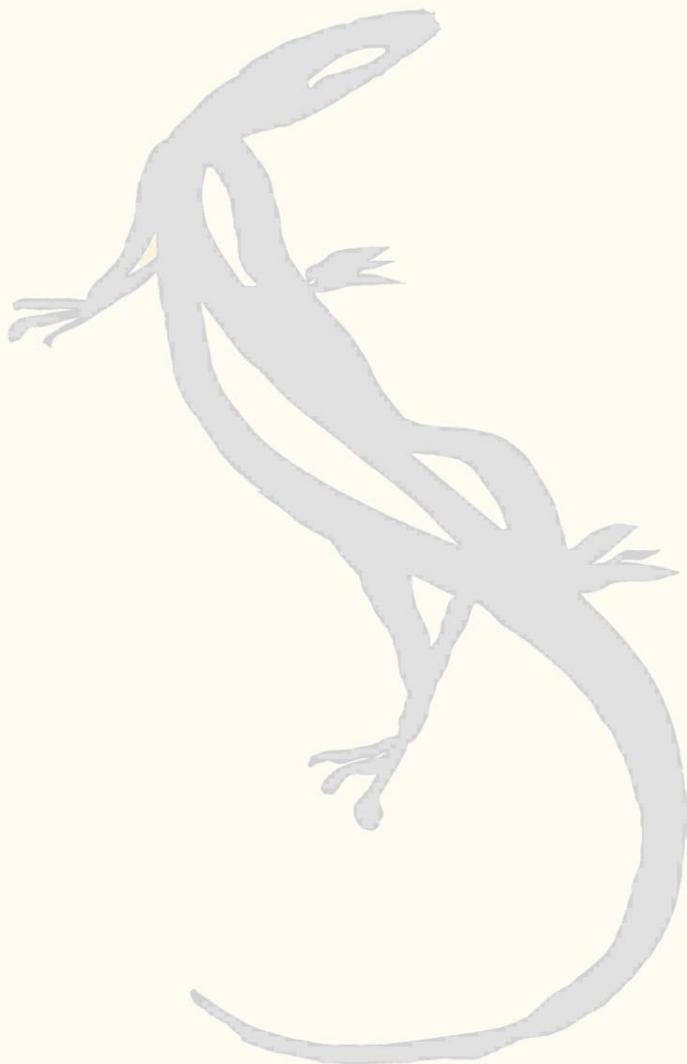


Barbara Preston Research

Getting teacher workforce planning right

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Getting Teacher Workforce Planning Right: Towards a Robust Framework for Modeling Supply and Demand

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Abstract

In many Western countries there is an urgent need for effective quantitative macro-level teacher workforce planning as the immanent retirement of the large cohort of teachers recruited around the 1970s looms and there are uncertainties around the recruitment and retention of replacements. Yet much recent workforce planning that is intended to inform practical policies on matters such as initial teacher education intakes is limited or flawed in scope, methodology, or data sources.

This paper proposes a model for projecting supply and demand that overcomes the major limitations of other work. Its detail is based on the Australian circumstances of the teaching workforce, teaching labor market and data sources, but the framework has application in other nations.

Introduction

Effective macro-level, quantitative teacher workforce planning is becoming a matter of urgency in many Western countries as they face the immanent retirement of the large cohort of teachers recruited around the 1970s and the uncertainties of recruitment and retention of replacements.

Workforce projections and their application to practical policy decisions can be controversial and risky (Kutscher 1992, p. 217). However, the cost of not using such projections and assuming that current circumstances will remain unchanged can be high (Preston 2009, pp. 28-30). It is important to maximise the quality of projections through the use of appropriate methodologies and data. The ultimate objective is to minimise teacher shortages or surpluses. The damaging effects of shortages are readily apparent, but, surpluses, too, can be very damaging (Barber & Mourshed 2007, p. 18).

Workforce planning is broadly defined as a process of analysis and policy action with the objective of having the right number of people with the right skills and other attributes in the right place at the right time. The paper is concerned with macro level quantitative workforce planning for school teachers. The central element of the analysis for such workforce planning is the preparation of demand and supply projections, usually for periods of five to ten years into the future, depending on the purpose.

Workforce planning can be contrasted with an explicit or implicit reliance on market mechanisms. While market mechanisms can be adequate for many occupations most of the time, there are circumstances where the market will fail and damaging shortages or surpluses occur, or significant mismatches between individuals and positions arise. There is also a false dichotomy between workforce planning and market mechanisms: an effective market needs to be a well-informed market, and workforce analyses (including projections and scenarios) are essential to inform the players in particular labour markets, especially those for occupations that Skills Australia (2010) identifies as 'specialised occupations'. Those players include individuals

considering entering an occupation and pre-requisite training programs, employers considering policies to attract, retain, train or retrain staff, and governments and other authorities considering migration, regional development, industry development, or higher education or vocational education and training policies.

There are particular labor markets in particular circumstances for which explicit macro level, quantitative, occupation-specific workforce planning, involving high quality projections, is important. These labor markets and circumstances include some combination of the following:

- **Shortages and/or surpluses are damaging** Shortages and/or surpluses have a substantial detrimental effect on significant industries or areas of society, or risk public safety.
- **Substitution of employees is difficult and/or undesirable** There are specific required qualifications or other developed attributes for the occupation, which might be a legal requirement for a regulated profession or skilled trade, or the circumstances of the work entail that little if any substitution of individuals with different qualifications or attributes is possible without significant diminution of the quality of work or risks to public safety. If substitution is likely to occur, then the supply and demand situation of the substituting occupation may need to be considered (Skills Australia 2010, p. 21. (This has been an issue in nursing, with enrolled nurses being substituted for registered nurses, and assistants in nursing being substituted for enrolled nurses; and extending the scope of practice for registered nurses has been touted as a partial solution to doctor shortages).
- **Lengthy pre-requisite training** A relatively long and/or expensive period of training is required before entry into the occupation. This may include required periods of internship or on-the-job training before autonomous or unsupervised practice is possible.
- **Strong attachment** There is a high level of attachment to the occupation - that is, a relatively high proportion of those who are qualified to work in an occupation work in that occupation and not in unrelated occupations.
- **Expected sharp changes in supply or demand** Particular circumstances exist which are expected to result in a significant change in levels of demand for or supply of new recruits. Such circumstances include an occupation with a particularly large cohort about to reach retirement age, or a decision to lengthen all, or a large proportion, of pre-requisite courses.
- **Limited mobility in or out of the jurisdiction** There is limited potential mobility between jurisdictions (interstate or international) to meet shortages or absorb surpluses. This includes a policy (or ethical) position to not actively recruit potential employees from jurisdictions in which those employees make an essential contribution, especially where developed nations are considering active recruitment from developing countries¹.
- **A thin labor market** The occupation is small, perhaps even obscure, but essential to particular industries. In such circumstances the labour market will be 'thin', with small numbers of individuals seeking positions and small numbers of positions becoming available, in both cases the numbers may fluctuate sharply and the information flow between potential employees and employers poor. The situation would be more

¹ This has been a major issue for the nursing profession with policy research, debate and action in international forums such as the World Health Organisation (Buchan & Sochaski 2004), the International Centre on Nurse Migration and the International Centre for Human Resources in Nursing (Little & Buchan 2007). There does not appear to have been similar attention to international movement of school teachers.

pronounced where employers are in regional and remote areas. (Mineral Council of Australia, quoted in Skills Australia 2010, p. 20)

- **Appropriate, quality data is available** Quality projections require adequate sources of data and appropriate methodologies. Without these the conclusions of projections may be as erroneous as the aggregate estimates of the uninformed market, but have a false status of reliability.

The profession of school teaching fits a number of these criteria to a greater or lesser degree (except the seventh on this list - the teacher labor market is not a thin market!).

Partly overlapping and briefer criteria are discussed in Skills Australia 2010, pp. 20-21. The National Workforce Development Strategy that Skills Australia has developed includes the identification 'specialised occupations' for which it is suggested governments (and others) can intervene with explicit workforce analysis and planning:

A specialised occupation is one where specialised skills, learned in formal education and training, are needed at entry level, and the impact of market failure is potentially significant. (p. 21)

Almost one hundred occupations are listed as 'specialised', including primary and secondary school teachers.

Purpose

The purpose of this paper is to propose a model (Figure 1 and Table 1) for projecting the demand for and supply of initial school teacher education graduates. The major purpose of the projections is to inform decisions about intakes into initial teacher education. They can also help inform policies and practices related to international and interstate movements of teachers, recruitment campaigns, policies related to extended leave, part time work opportunities, retirement and other aspects of conditions and salaries. The model also provides a background (or framework) for investigations and policy related to the qualitative and mesa and micro aspects of workforce planning, including those related to hard-to-staff localities and schools, and shortage specialisations.

The model overcomes limitations of existing approaches (for example those discussed in Owen et al 2008; Barnett et al 2008, and Boe & Gilford eds 1992). It does this by its:

- comprehensive coverage of the teaching workforce (covering all teachers in all schools, not just those in systemic public schools and those with on-going work contracts), and all those with teaching qualifications are incorporated in the model, whether or not they are working as teachers
- consistency with the actual segmentation of the teaching workforce (between primary and secondary levels)
- coverage of an appropriate geographical area
- appropriate treatment of differences between headcounts of teachers and full time equivalents (FTE)
- appropriate methodology for projecting net separation rates
- accounting for international and interstate migration
- accounting for any accumulating shortage or surplus
- appropriate methodology for projecting initial teacher education graduate numbers.

While many existing methodologies cover some of these matters well, none do so comprehensively and optimally.

Figure 1 Flow chart of the model for projecting the demand for and supply of initial school teacher education graduates - primary OR secondary, each state/territory

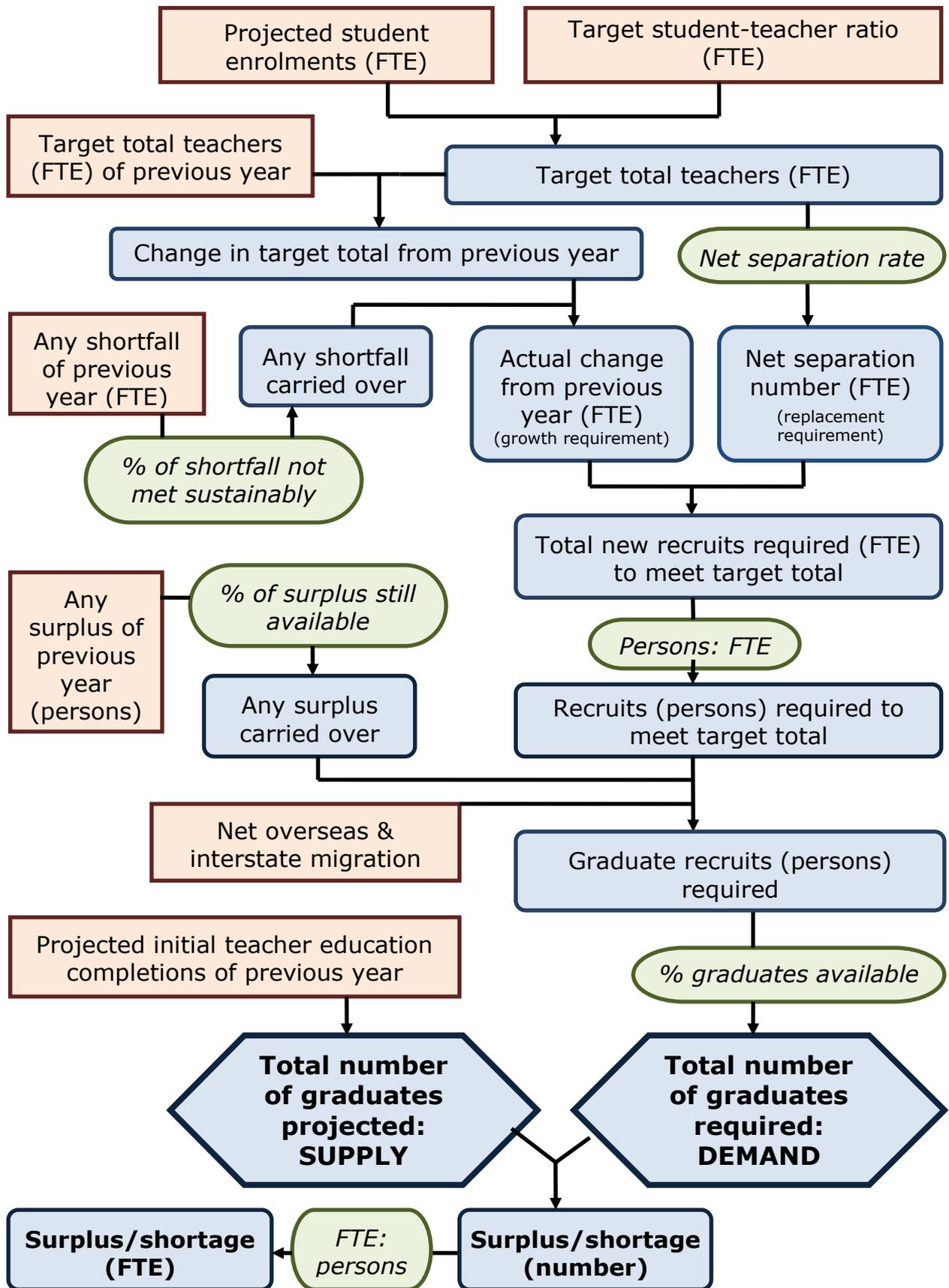


Table 1 Elements of the model for projecting the demand for and supply of initial school teacher education graduates - primary OR secondary, each state/territory

For projections calculations, the elements are set out in rows in a spreadsheet, with columns for each year from the current or previous year, and projected through a given period (for example, five years)

Major element	Notes and data sources
1. School enrolments	Projections for each year level in public and private schools in each state and territory are routinely prepared by the Australian federal education department. Take account of the impact of recent or proposed changes in school starting age, changes in the structure of schooling, changes in the compulsory years, or the youth labor market (perhaps in alternative scenarios).
2. Student-teacher ratio, full time equivalent (FTE)	Historical data is available from official sources (ABS). Scenarios can vary ratios over time according to specific assumptions such as changed schools funding levels.
3. Target total teachers	Derived from rows 1 & 2.
4. Net separation %	From separate modeling incorporating the net separation rate for each one year (derived from ABS Census data on those with teaching qualifications, whether or not working as teacher, by age) and current and projected age profiles of the teacher workforce.
5. Net separation number	Percentage in row 4 applied to row 3
6. % of any shortfall of previous year not met sustainably	An estimate. 'Sustainable' includes overseas recruitment of permanent settlers, 'not sustainable' includes placing final year student teachers in teaching positions or delaying retirement. This estimate is especially important where a shortage occurs because of short term changes in demand caused by matters such as changes in school starting age.
7. Shortfall (if any) carried over from previous year	Percentage in row 9 applied to row 20 in the previous year if a shortage (sign changed to positive for this row)
8. Change from previous year	Difference between row 3 in consecutive years (columns), plus any value in row 7. It is positive if the size of workforce is increasing, and negative if the size of the workforce is decreasing. This is the FTE number required for 'growth' (or 'decline').
9. Recruits required (FTE)	Sum of rows 5 & 8 (recruits required for 'replacement' and accumulated shortage and growth).
10. Persons:FTE (teachers)	From separate modeling incorporating official data for base year then projected age profiles.
11. Recruits required (headcount)	Derived from rows 9 & 10
12. % of any surplus of previous year remaining available	An estimate which will vary according to the magnitude of the surplus, likelihood of suitable positions becoming available, policies implemented to retain availability, the nature of alternative activities, and so on. This estimate is especially important where a surplus occurs because of short term changes in demand caused by matters such as changes in school starting age. The surplus in the base year of the projections (that exist in the current or most recent year) is important, but difficult to assess and often controversial.

Table continued on following page

Table 1 continued

13. Surplus (headcount) carried over from previous year	Percentage in row 12 applied to row 20 in the previous year if a surplus, otherwise left as zero
14. Net overseas migration	Projected values estimated from an analysis of data on the international movement of teaching professionals (from the federal department of immigration - DIAC) and the jurisdiction's data on registration of teachers with overseas qualifications, and any other relevant information, such as government policy decisions and actions regarding matters such as active recruitment campaigns targeting overseas teachers, and changes in the relative attractiveness and availability of overseas positions for Australian teachers.
15. Net interstate migration	Projected values estimated from an analysis of data on the registration of interstate teachers by the local and all other Australian jurisdictions, and any other relevant information.
16. Graduates required	Row 11, minus the sum of rows 13, 14 and 15
17. % Availability / suitability of graduates	This is an estimate of the percentage of graduates who are available and suitable for actual vacancies. Data from Graduate Careers Australia and DIAC data on overseas movements of younger Australian resident teaching professionals may assist with the estimate. The figure arrived at will need to be consistent with the estimated net separation rate for younger teachers (recent graduates and early career teachers) so that together the percentage of those with teaching qualifications who are working as teachers in the mid 30s age range calculated from these figures is consistent with Census data.
18. Total number of initial teacher education graduates required (DEMAND)	Row 16 divided by the percentage in row 17 (thus the figure will be greater than row 16)
19. Total number of initial teacher education graduates projected (SUPPLY)	Derived from the total number of appropriately qualified graduates projected for each year in the projections period by teacher education providers supplying the jurisdiction. Graduates with early childhood specialisation will be allocated between school and nonschool settings according to the nature of their qualification, and graduate destinations data. Similarly, graduates with middle school qualifications will be allocated between primary and secondary. Graduates of the multi-state Australian Catholic University will be allocated to the jurisdiction of their campus; and there may be some appropriate allocation of distance education graduates. Most international students will be included, except those in programs designed for teaching in their home country. Scenarios for later years in the projections period (say, after current commencing students have completed) can incorporate varying options for course intake levels. They may also take account of matters such as developing shortages of academic teacher educators limiting the number of places that can be offered, or reduced student demand.
20. Surplus/shortage (number)	Row 19 minus row 18. This is also usefully provided as a percentage of SUPPLY, DEMAND and total teacher numbers. The addition of projected training rates (SUPPLY as a percentage of total teacher numbers in row 5) may also be useful.
20. Surplus/shortage (FTE)	Row 20 divided by row 10.

Theoretical framework and perspective

The paper is within the broad theoretical framework of policy analysis. Workforce planning draws from a number of theoretical strands, including human capital theory, labor market search theory, labor market uncertainty theory, economic theory of public fiscal behaviour (Boe & Gilford eds 1992, p. 222), and statistical theories such as Markov chains (Batholomew & Forbes 1979, pp. 85-133). While such theories from economics and statistics provide background, the paper is not highly technical.

Appropriate methodologies for workforce planning in different nations can be based on similar broad models, such as that discussed in OECD (2005, pp. 32-35). However, the policy contexts, appropriate data sources, and features of the teaching labor market and the teaching workforce will vary between nations. This paper is primarily concerned with the Australian situation, though the framework discussed has relevance elsewhere.

In Australia private schools are a large and expanding sector. Private school teachers comprise 36% of all Australian teachers, and between 2006 and 2008 their number increased by 4907 (5.2%), while the number in public schools increased by only 4623 (2.6%). Public schools are managed on a systemic basis by the eight state (and territory) governments. Around half the private sector (mostly Catholic) is also managed systemically, though with less comprehensive administrative data, while the remainder ('independent') are managed as individual schools or small groups of schools for which only limited data is available. The private sector, especially the independent sector, tends to draw students from higher income families (Preston 2007), and to be strong in the teaching labor market.

In the model public and private school teachers could be disaggregated up to row 9. This may provide useful transparency for the respective sector authorities, though care will need to be taken to ensure data and assumptions for the total workforce are accurate and appropriate where there are uncertainties regarding differences between the sectors.

Data sources

The paper draws from official repositories of data on the Australian teaching workforce, as well as policy documents and other material.

The most important data repository is the Australian Census, carried out every five years by the Australian Bureau of Statistics (ABS). This census of Australian residents includes questions on highest educational qualification received (which includes 'teacher education' and subcategories such as 'primary teacher education'), occupation (which includes 'school principals', and a separate 'education professionals' category with subcategories including 'primary school teachers'), and a classification differentiating public and private employers (useful for distinguishing between teachers in public and private schools) (ABS 2006). Census data is seldom used for teacher workforce planning in Australia, except to provide context. In this paper Census custom datasets are discussed as a source for estimating key elements of demand projections.

Data from the National Schools Statistics Collection (NSSC), published by ABS in *Schools Australia* (Cat. No. 4221.0), is also used

Analysis

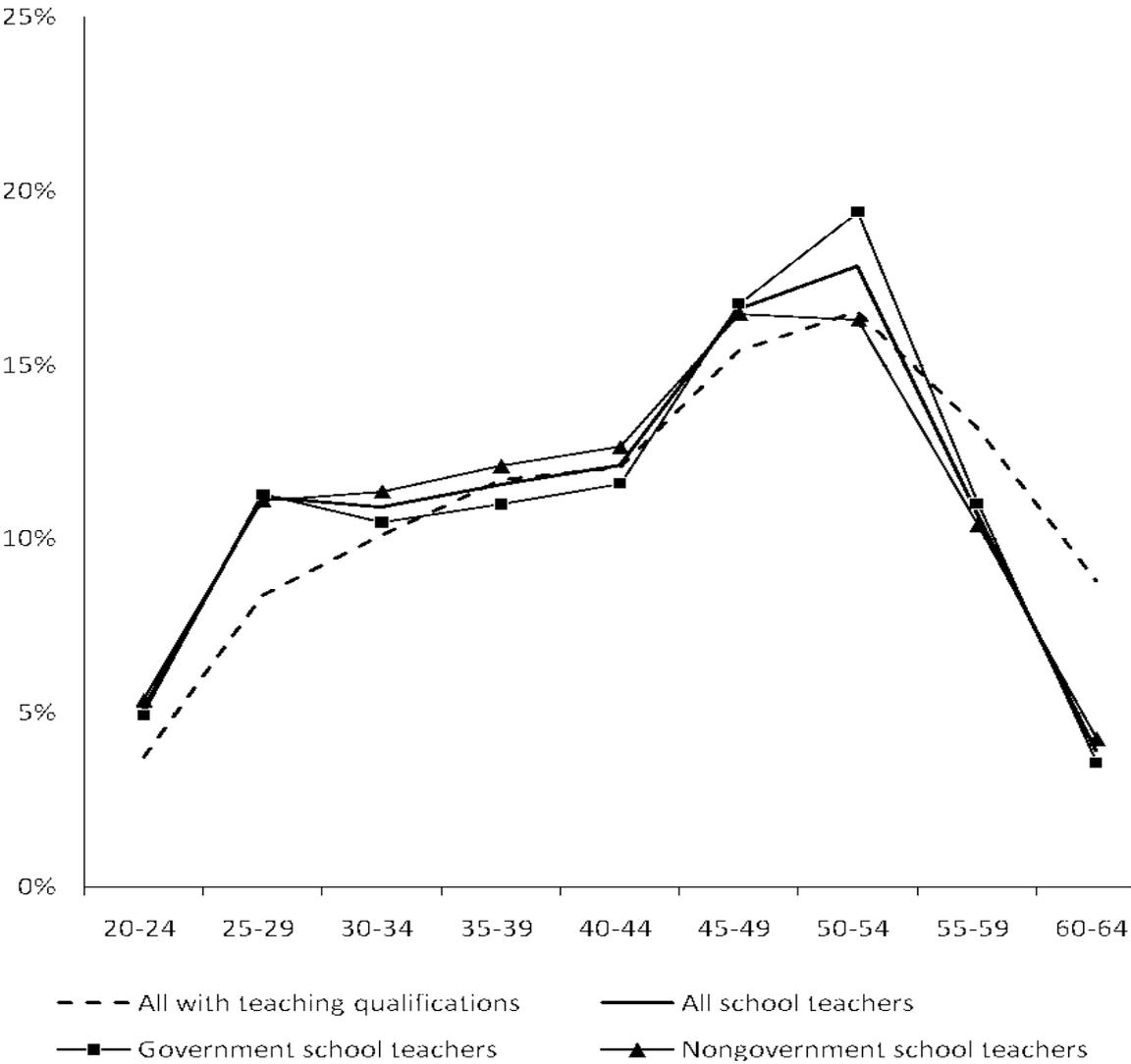
Planning for the Australian teaching workforce has been haphazard and partial, with a lack of coordination between stakeholders. It is now being given greater priority by the federal government and some public school authorities (COAG 2009, Owen et al 2008; Spoehr et al 2008, Barnett et al 2008, Western Australia Ministerial Taskforce on Education Workforce

Initiatives 2007). Research and scoping projects and collaborative forums have been initiated. However, to date the methodological assumptions and possibilities for such work have been limited by a primary focus on public school authority administrative data and that sector’s express concerns. There has been a consequent sidelining of the private sector and a failure to investigate the potential of other data sources, particularly the ABS Census.

Figure 1 and Table 1 set out a model for projecting teacher supply and demand that overcomes these and other limitations. Why this needs to be done, and how it is done in the model will now be outlined in reference to several major issues.

Private schools generally have less interest in macro level workforce planning because of their strength in the teaching labor market. But it is in the interests of public schools (and thus the quality of schooling for the most disadvantaged) that private school teachers are taken into full account.

Figure 2 Age profiles of all Australians with school teaching qualifications, all teachers, and public and private school teachers (percentage of those aged 20 to 64 in each five year age range), 2006



Source: ABS Census 2006 custom data

The greater annual numerical growth of the private sector (noted above) means that it needs more new teachers to meet ‘growth’ requirements, even though it remains smaller in total size. The private sector also differs from the public sector in the pattern of new teachers employed. Census data on the age profile of teachers in the respective sectors (Figure 2) and other sources (Ramsey 2000) indicate that the private sector tends to recruit teachers who have several years successful experience in the public sector, as well as recent graduates. Thus the public sector requires more beginning teachers to replace the early career teachers who move to the private sector. There are also differences in requirements to replace those retiring, with the public sector having a higher proportion of teachers around retirement age. All these differences indicate the methodological weakness of simply extrapolating from the public to the private sector or ignoring the private sector all together. The framework deals comprehensively with all teachers, though it is possible to disaggregate public and private.

The ‘bottom lines’ of teacher workforce projections are concerned with headcounts (rows 18 and 19), but must begin with staffing levels based on FTE (row 2). The ratio between FTE teachers and persons varies by age – according to ABS Census data, teachers aged 30 to 45 generally work fewer hours than those in other age ranges, and those around age 50 are most likely to work full time. Consistently with this and the age profiles in Figure 2, Census and NSSC data indicate that the private sector has a larger FTE to headcount ratio. This again shows the importance of taking full account of data on the private sector, and using appropriate data sources such as the Census and NSSC.

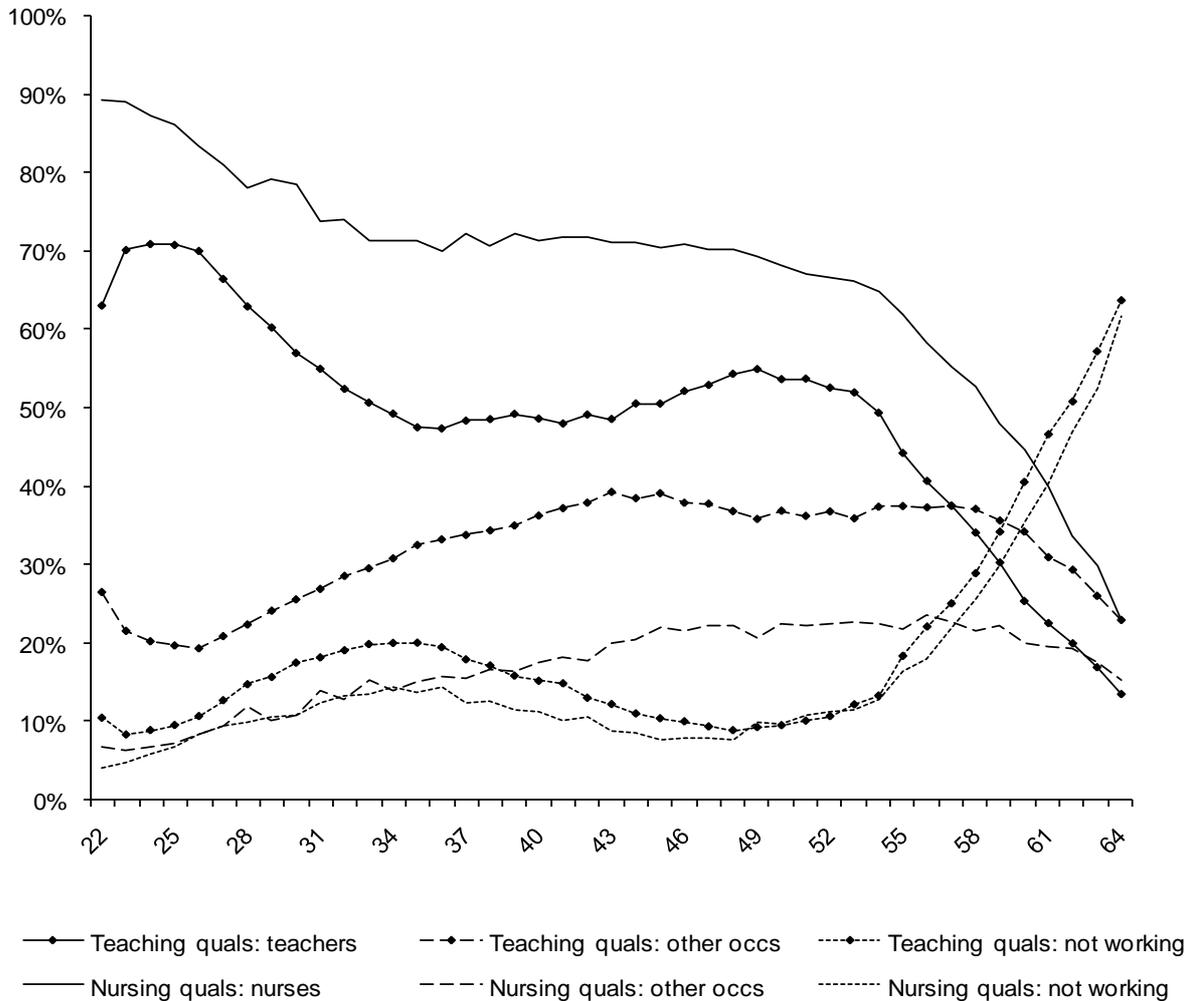
Separation (‘attrition’) is hard to estimate but is ‘the most fundamental’ element in workforce planning (Batholomew & Forbes 1979, p. 12). Separation rates used in Australian teacher workforce analyses are often based only on public sector administrative data (for example, Parnis et al 2008), and sometimes only data pertaining to on-going teachers, who may make up fewer than three quarters of teachers. Estimating separation rates from administrative data is inherently difficult for teaching with its relatively high rate of casual and short-term contract employment, and mobility between employers and in and out of the occupation. This indicates the value of a concept of ‘net separation’, and the use of data other than the limited administrative data of only some employers. In fact, with professional occupations such as teaching and registered nursing, which generally require formal qualifications for entry, the concepts of overall ‘attachment to’ and ‘separation from’ the ‘home’ occupation are appropriate (Thomas 1989).

Using Census data on the populations with relevant qualifications (school teaching, or professional nursing), we can determine the proportion working as teachers (or nurses), working in other occupations, or not working, at each age range. Figure 3 graphs such data for 2006. The data indicates that at all age ranges, those with professional nursing qualifications have a higher attachment to their home occupation than do those with teaching qualifications².

² Some possible explanations for this include:

- teacher education courses prepare graduates for a much wider range of possible occupations than do nursing courses
- the availability of shift work and other conditions of nursing work support the employment of parents of young children (even if on a very part time basis), while such workplace flexibility is generally not available for teachers (around 25% of females with teaching qualifications aged in their early 30s are not in the workforce, more than double the percentage for nursing professionals)

Figure 3 Percentage of all persons with a teaching qualification as their highest qualification at each year age 22 to 64, who are working as teachers, working in other occupations or not working, and percentage of all persons with a professional nursing qualification as their highest qualification at each year age 22 to 64, who are working as professional nurses, working in other occupations or not working, Australia, 2006



Source: ABS 2006 Census custom data

- the strict specialisation requirements for teachers results in a higher level of mismatch, and thus a larger proportion of those with teaching qualifications are unable to find suitable positions for which they are qualified (for example, there may be positions available for secondary maths teachers in a locality where those with primary teaching qualifications are unable to find teaching positions, and are thus working in other occupations)
- the more serious shortages in nursing have resulted in suitable positions being more readily available, and active recruitment by employing authorities
- on average, over recent decades there have been greater numbers of graduates produced by teacher education programs than there have been positions for them, while there have been shortfalls in the number of nursing graduates.

The slope of the lines of those in their home occupations indicates the net separation rate as individuals age (while this is cross-sectional data from the 2006 Census, datasets from previous Censuses for those with both teaching and nursing qualifications are very similar). For example, between ages 50 and 60 the percentage of those with teaching qualifications who are teaching drops from 52% to 27%, an average net separation rate of 4.8% for each year. In contrast, between ages 45 and 49 the percentage teaching increases from 50% to 55%, an average net separation rate for each year of -2.5% - indicating that the number (re)entering teaching is greater than the number leaving. The net separation rate for those under 30 is more difficult to estimate from this data, as new teachers enter at different ages, and many stay only briefly. This is not a serious methodological problem, as long as assumptions regarding the percentage of graduates who are 'available and suitable' (row 17) is consistent with assumed net separation rates for those under 30 (assumptions underlying row 9). This application of Census data to estimate net separation rates by age is consistent with the general finding that attrition varies substantially according to age (Zumwalk & Craig 2005, p. 131; Barro 1992, p. 178).

The relatively high percentage of individuals with teaching qualifications who are not working as teachers indicates possible 'elasticity' in the availability of qualified individuals for teaching positions. There is evidence, especially from the recessions of the early 1990s and now, and the economic boom of recent years, that external labor market conditions do influence the teaching labor market on both the demand and supply sides. Significant changes in external conditions could suggest adjustment of the values for many of the components in the model (Table 1). For example, school student enrolments in post-compulsory years can vary according to the state of the youth labor market; student to FTE teacher ratios can vary according to the fiscal circumstances of governments and the consequent funding of schools (private as well as public); teachers may seek to change paid hours of work if other sources of household income change, and net separations, international and interstate migration, availability of graduates, and demand for teacher education places can all vary according to relative internal and external labor market conditions. However, these variations are often short term, and create fluctuations around the longer term trends.

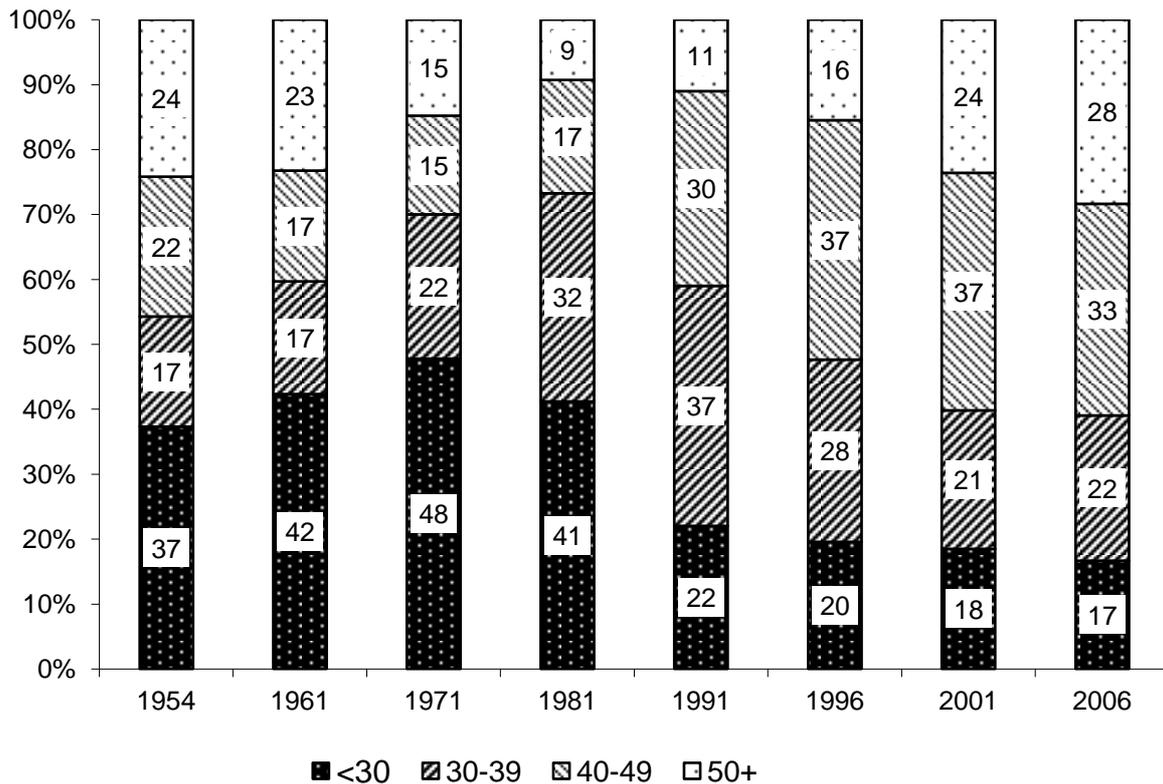
This paper began with reference to the immanent retirement of the large cohort initially recruited around the 1970s. This cohort can be tracked through the age profiles of the teaching workforce (Figure 4). In 1971 teachers under 30 made up almost half of all teachers, and only 15% of teachers were in their 40s. From 1996 teachers in their 40s were the largest group, with growing numbers in the oldest (50 plus) age range. In 2006 the peak of the age profile was at age 49, with almost 11,000 teachers (3.8% of all teachers) at that age. In contrast, there were fewer than 6,000 teachers at age 30, just 2% of the total workforce. Now in 2010, as that peak cohort reaches the mid 50s, the retirement rate is likely to surge, as indicated by the steep slope of the school teacher line at that age range in Figure 3.

Conclusion

There is an urgent need for high quality workforce projections to inform policy in areas such as intake levels into teacher education courses. In Australia this is not only to avoid damaging shortages that might result from an insufficient number of graduates to replace the large number of 1970s-recruited teachers who are likely to retire when the economy (and the value of retirement savings) improves, but also to avoid damaging surpluses of graduates unable to find the teaching positions they had hoped for if universities respond to federal government policy to substantially lift higher education participation by expanding initial teacher education intakes beyond the desirable quantity and quantity.

It is hoped that this paper, and the larger project of which it is a part, make a useful contribution to the development of such projections and to the national and international scholarly literature on teacher (and nurse) workforce planning.

Figure 4 Australian school teachers: percentage in each age group. <30, 30-39, 40-49 and 50+, selected years, 1954 to 2006



Source: ABS Census, selected years, custom data

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