Anticipating Future Skills (AFS) Series

Job openings and replacement demand in Queensland

Adapted from Shah C (2023), Forecasting replacement demand and job openings, unpublished.

Why are job openings important?

Every day, people, firms, and public institutions are making choices about jobs and education and training. Students are making decisions about the education and training they might undertake. Job seekers are assessing their prospects of finding jobs in different occupations and deciding whether to retrain or not. Similarly, firms are making decisions on recruitment and human resources management, and education and training authorities are assessing which education and training programs to support with funding and other incentives. Many are medium- to long-term decisions requiring information about the prospective labour market. Such information is important for the efficient operation of dynamic and complex labour and training markets. It has an important role in reducing skills imbalances which can adversely affect productivity growth (Shah & Dixon (2018)).

Future employment patterns reflect the structural changes in the economy as it adjusts to changes in technology, business investment decisions, government spending, consumer preferences and international trade. The outsourcing of services by firms, globalisation, the 'gig economy' and the offshoring of jobs have an additional effect on the structure, as does the reorganisation of firms and the adoption of new human resource management practices. Structural adjustment often means the elimination of old jobs and the creation of new ones, as well as changes in the industrial and occupational distribution of employment (Shah & Dixon (2018)).

Of particular interest for many is whether the broad trends in labour demand observed in recent years will continue and, if not, where to expect significant changes. They are interested in knowing in which industries and occupations to expect future job opportunities. For those making decisions on education and training, it is more important to know what opportunities there will be for new entrants to an occupation or industry. These opportunities are additional to jobs filled by those changing jobs in the same occupation.

Future job opportunities for new entrants in an occupation arise from:

- growth in employment
- replacement demand.

Growth in employment is simply the net change in the number of people employed in the occupation over a fixed time period. Replacement demand provides a measure of the number of new and usually relatively younger workers required in an occupation due to workers retiring or permanently leaving the occupation.[1] In many instances replacement demand is a larger source of job opportunities. Indeed, in declining occupations, replacement demand is the only source of job opportunities. From the perspective of education and training policymakers and for those wishing to enter the labour market, both sources of job opportunities are important.

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[1] There are two concepts of replacement demand – total and net (Shah & Burke (2001); US Bureau of Labor Statistics (2008)). Our focus is on net replacement and, henceforth, we refer to it simply as replacement demand.

The amount of education and training varies across occupations, with some requiring very specific education and training, both off-and on-the-job, while in others generic education and training may be sufficient. In some elementary occupations, entry-level training is specific, all on-the-job, provided by the employer and does not require any public subsidy.

Method for forecasting job openings

Forecasts of employment by occupation and industry from the Anticipating Future Skills (AFS) modelling and replacement demand estimates, from a separate independent model, are used to provide forecasts of job openings for new entrants in Queensland.

There are three steps to forecasting job openings for new entrants:

1. Employment growth

The first step involves forecasting employment growth by occupation, which is one source of job openings for new entrants to each occupation. To do this, employment is forecast using the Victoria University Employment Forecasts (VUEF) model, a dynamic computational general equilibrium model of the Australian economy. The VUEF model brings together, rationally and coherently, the demand for labour and all the interactions in the economy that affect it. The model has the capability to explore the effect of a policy shock in equilibrium, which is when supply equals demand in all markets. This aspect of the model is important when examining the employment outlook in different scenarios.

The VUEF model is configured to produce the AFS, with forecasts of new employment by industry, occupation, region and qualification.

2. Replacement demand

Occupations

Job opportunities in an occupation also arise when workers permanently leave the occupation. While permanently leaving a job is usually associated with retirement from the labour force in some occupations (e.g. teachers, doctors, etc.), in others it is associated with changing occupations (e.g. retail and hospitality workers). A young person working in hospitality, for instance, is often concurrently studying to qualify to work in another occupation. On completing the qualification, he or she permanently changes from the hospitality job to a job more related to their qualification. Job opportunities are thus created for new entrants when existing workers leave their occupations permanently. People changing jobs but remaining in the same occupation do not create opportunities for new entrants and do not usually require additional general training to make this change. Thus, to assess the number of job openings for new entrants in an occupation, and the numbers to train (if training is required), we need only count those people who are permanently leaving the occupation and not those who are changing jobs in the same occupation.

Much of the data to directly estimate the number of permanent leavers from an occupation at the level of detail that we need are unavailable from regular labour force surveys.[2] We can however use a cohort-component method, which has demographic applications, and cohort data from the labour force surveys to estimate permanent job separation rates from each occupation.[3]

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[2] Participation, Job Search and Mobility, Australia (Cat. no. 6226.0) does not have the detail to satisfactorily estimate permanent job separations from ANZSCO 3-digit occupations.

[3] Replacement demand is generally estimated by occupation rather than by industry because workers in an occupation have more similar job separation behaviour than workers in an industry.

We can then apply these rates to VUEF employment forecasts to estimate future replacement needs in each occupation.

If employment in an occupation declines, then replacement demand will be the only source of job openings in that occupation.[4] It is therefore not simply a case of adding new net jobs to replacement demand to calculate job openings, as each year must be considered independently (see Table 1).

Many countries use this method, or a variant of it, to estimate replacement demand (see, for example, Shah & Burke (2001) for Australia; Sexton et al. (2001) for Ireland; United States Bureau of Labor Statistics (2008) for the United States, Bijlsma et al. (2016) for the Netherlands; and Cedefop (2012) for Europe). Our model estimates the average annual replacement demand rate in each occupation for the applicable time period. These rates are applied in all scenarios.

Industries

Forecasting replacement demand for industries is more complex as it is calculated indirectly from occupational forecasts.

Industry employment is comprised of the total of employment of the various occupations within that industry. To calculate industry replacement demand, it is assumed an occupation contributes replacement demand to an industry in the same proportions as it exists within the industry. For example, the occupation of Electrician makes up 10 per cent of the Construction industry. So given 10 per cent of Electricians are employed in Construction, then 10 per cent of replacement demand in Electricians will be assigned to this industry. The replacement demand in Construction will then be the sum of all such occupational contributions. The occupational share of employment in each industry was determined from the VUEF occupation-industry matrix of forecasts.

3. Job openings for new entrants

Job openings for new entrants in an occupation are a result of growth in the occupation, or for an industry, the occupations of which it is composed, and replacement demand. In occupations where employment is not growing, replacement demand is the only source of job openings.

Table 1: Example of calculation of job openings

	Annual change	Replacement demand	Job Openings
Year x	100	30	130
Year y	110	25	135
Year z	-20	45	45

If training is required, this measure provides a lower bound for the number of people to train for the occupation as some people who complete the training may not end up working in the occupation.

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[4] This is a simplified description of the replacement demand model. The actual model is more complex and uses historical time series of cohort data from 1987 to the present. It uses time series forecasting methods that smooth the business cycle and the high volatility that is inherent in highly disaggregated data. The model assumes all workers aged 70 years and over retire from the labour force.

A note on aggregation

A 'bottom up' approach was adopted to derive forecasts of replacement demand and job openings at higher levels of occupation and industry groupings. This ensured that the totals were consistent at all levels of aggregation and aggregation bias was reduced. Notably, job openings calculated using aggregated data can result in fewer job openings than actual. This is because growth in employment in one occupation can cancel out an equal decline in another occupation. For example, let there be two occupations, A1 and A2, in the same occupational group A (see table below).

Employment is forecast to decline in A1 from 100 to 90 and to grow in A2 from 100 to 110. This means the employment total in group A remains unchanged at 200. Thus, the number of job openings from growth in A1 will be 0 and in A2 they will be 10, giving a total of 10 job openings. If, however, we were to use aggregated data of group level A to calculate job openings, the result would be 0 because in aggregate the employment is unchanged at 200.

	Year 1		Year 2		Total Job Openings
A1	100		90		0
	+		+		+
A2	100		110		10
	=		=		=
Group A	200	-	200	=	**10**

Hence, job openings can be underestimated if aggregated data are used in the calculation.

Application of the data

The job openings forecasts provide a baseline from which to begin the process of estimating the future demand for education and training.

The relationship between job openings in occupations and the demand for education and training courses is complex. The match between training course and occupation is most direct in jobs with licensing or registration requirements, as is the case for many trades, teaching and nursing. The job destination data show many people find jobs in areas unrelated to their training, which suggests the generic component of their training together with their personal attributes and experience could be the major factors in the match. This means generic training may be sufficient in some occupations.

In a tight labour market, employers may be willing to take a risk in hiring people without the exact occupation-qualification match in the hope that supplemental specific on-the-job training would fill any skills gap. In some jobs, formal training is probably unnecessary as the skills that are necessary can be acquired quickly on-the-job. For example, checkout operators learn their skills entirely on the job and generally do not require publicly subsidised off-the-job training.

The precise estimation of the demand for education and training is complicated by the fact that students may commence a course, and sometimes complete it, but then decide to train for something different. This means there is a certain level of wastage in the system. Similarly, people often retrain for another occupation after having worked in another, which will add to the demand for training.

In summary, the forecasting of job openings for new entrants is the first, and important, step for estimating the demand for education and training. It should be juxtaposed and cross-validated with other data, including qualitative, to estimate the final future demand for education and training.