Anticipating Future Skills (AFS) Series

Job openings and replacement demand in Queensland

Adapted from Shah C (2024), Forecasting replacement demand and job openings (revised), unpublished.

Why is information on 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 will there 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:

- new jobs due to growth in employment
- replacement demand.

New jobs are created when employment increases in an occupation; no new jobs are created when employment decreases. Replacement demand provides a measure of the number of new 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, and the only source in declining occupations. From the perspective of education and training

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[1] This concept is often referred to as net replacement demand, as opposed to total replacement demand which measures all workers leaving an occupation irrespective of the reason (Shah & Burke 2001; US Bureau of Labor Statistics 2008). Net replacement demand is the relevant measure for estimating job openings for new entrants.

policymakers and for those wishing to enter the labour market, both sources of job opportunities are important.

Education and training requirements vary by occupation. In some occupations requirements are very specific, both on-and off-the-job, while in other occupations the requirements are generic. In some elementary occupations, specific entry-level training is provided on-the-job by employers with public subsidy often unnecessary.

Forecasting job openings

Forecasting job openings for the Anticipating Future Skills (AFS) project for Queensland involves a number of steps. Economic and demographic models are used to forecast future employment and replacement demand in the state. The forecasts are combined to produce forecasts of job openings for new entrants. The models use data from a variety of sources.

1. Forecasting employment

Forecasting employment in Queensland is the first step in the process of producing forecasts of job openings. In this step, the Victoria University Employment Forecasts (VUEF) model, a dynamic computational general equilibrium model of the Australian economy, is used (Dixon 2017; Wittwer & Dixon 2015). 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 policy shocks 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 model produces forecasts of employment by industry, occupation, region and qualification. Some forecasts also include demographic dimensions, which are important for forecasting replacement demand.

2. Replacement demand

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), 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 will generally leave the hospitality job for 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.

Data to directly estimate the number of permanent leavers from an occupation at the level of detail that we need are generally unavailable from regular labour force surveys.[2] The cohort-component method, which has demographic applications, however, can be used to estimate net cohort separation rates for each occupation.[3] The method uses panel data from labour force

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[2] For example, The ABS Survey of 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] The method, or a variant of it, is used in many countries 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). The cohort separation rates are adjusted in occupations which are experiencing declining employment.

surveys.[4] The forecasted cohort separation rates are applied to VUEF employment forecasts to obtain estimates of future replacement need in each occupation.

Replacement demand by industry

Replacement demand by industry is generally not modelled. Instead, it is approximated from occupational replacement demand using an industry-occupation shares matrix, which is an output of the VUEF model. For example, if the occupation of electricians makes up 10% of employment in the construction industry, then 10% of replacement demand for electricians is allocated to construction. The total replacement demand in construction is the sum of replacement demand contributions from all occupations that are employed in construction.

3. Job openings for new entrants

Job openings for new entrants in an occupation result from new jobs from employment growth and replacement needs. In occupations where employment is not growing, replacement demand is the only source of job openings. Table 1 illustrates the calculation of job openings in an occupation in Years 1, 2 and 3. In the first two years employment grows and new jobs are created but in Year 3 employment declines and no new jobs are created. In each year job openings are the sum of new jobs and replacement. Over the three years job openings are expected to be 310 (130+135+45). If training is required to work in this occupation, then this provides an indication of the minimum number of persons to train because some people who complete training may decide to work elsewhere.

Table 1: Example of calculation of job openings

	Change in employment from previous year	New jobs	Replacement demand	Job openings
Year 1	100	100	30	130
Year 2	110	110	25	135
Year 3	-20	0	45	45

Job openings by industry

Job openings by industry are also calculated by adding new jobs from growth to replacement demand. New jobs in an industry are approximated from data on new jobs by occupations using the industry-occupation shares matrix. The method ensures the total number of new jobs in the economy remain the same when added across industries or occupations. Table 2 illustrates the calculation of new jobs in an industry which employs two occupations. In Occupation A1 employment declines by 10 and no new jobs are created but in A2 employment grows by 10 and the same number of new jobs are created. In Industry A, despite zero employment change 10 new jobs are thus created. The example shows that the new jobs in an industry may not reflect employment change in it. If new jobs in Industry A were calculated on the basis of employment change in it, then the number of new jobs created would be zero. Consequently, the total number of new jobs across industries would be inconsistent with total across occupations.

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[4] Replacement demand is estimated by occupation because workers' job separation behaviours are more similar in an occupation than in an industry. For the purposes of planning training delivery, it is more important to know how many job openings for entrants are expected in an occupation because training is generally designed for occupations.

Table 2: Example of calculation of new jobs from growth by industry

	Change in employment from previous year	New jobs
Occupation A1	-10	0
Occupation A2	10	10
Industry A	0	10

4. A note on aggregation

Forecasts of new jobs, replacement demand and job openings are primarily made at the ANZSCO 4-digit level. These forecasts are aggregated up to ANZSCO 1-, 2- and 3-digit groups. Industry forecasts (group level) are approximated from ANZSCO 4-digit forecasts using the industry (group)-occupation (4-digit) shares matrix as explained above.

Once again, it is important that the calculation of new jobs is done bottom up from the lowest level of occupation or industry groupings, otherwise new jobs could be underestimated. Table 2 illustrates the possible error that could occur in estimating new jobs in an occupation group if the assessment is based on employment change at occupation group level. In Table 3, A1 and A2 are two occupations that comprise Group A. No new jobs are created in occupation A1 because employment declines but in A2 employment grows and 10 new jobs are created. This means that altogether 10 new jobs are created in Group A. However, if we were to calculate new jobs based on the aggregated employment in A, then the result would be zero new jobs, which is misleading because the actual number of new jobs is 10. Similar aggregation issue also arises when aggregating to industry subdivisions and divisions.

Table 3: Effect of aggregation on new jobs calculation

	Change in employment from previous year	New jobs
Occupation A1	-10	0
Occupation A2	10	10
Group A	0	10

Applications

The forecasts of job openings 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 can be 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 factors in the match. Thus, generic training may be sufficient for 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 most 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.

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