A System for Monitoring Shortages and Surpluses in the Market for Skills

Final Report to the Australian Workforce and Productivity Agency (AWPA) by the National Institute of Labour Studies (NILS)

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Executive Summary

Research Outline and Objectives

The objective of this project is to identify indicators of under and oversupply of qualifications and to develop a methodology and a tool that can be used to form an assessment of current and emerging skill needs in the case of priority occupations of policy relevance.

The underlying question considered by the project is: to what degree can the market or institutions address issues of under or oversupply of an occupation, and at what point, and to what extent, should the government intervene?

One purpose of the project is to assist with monitoring the impacts of demand-based funding in tertiary education, with the main focus being on universities, but also touching on vocational education and training.

The project is informed by Australian and international literature on indicator methodologies and suites that are used to monitor the under and oversupply of specialised occupations. The project provides a thorough examination of Australian data sources, assesses what is available and useable, and advises on possible improvements in data quality for ongoing monitoring of Australian skills and qualifications.

The methodology developed in this report is intended to be highly transparent and completely open to replication. Further, the methodology is designed in such a way that it enables new information (through new or better data), or extensions to other occupations, to be incorporated in the framework without the need for redesign.

The method

The National Institute of Labour Studies (NILS) proposed that attempting to model demand and supply of qualifications and skills within the occupational framework of Australia would be fraught with identification difficulties, and expressed their deep scepticism about workforce predictions that are based on conventional demand and supply models.

The NILS team suggests that instead, we should try to identify instances of disequilibrium in the labour market that can be understood to result from under or oversupply of skills. Our approach is based on the basic tenet of economic analysis that observing disaggregated changes at the margin provide a stronger signal of underlying forces than observing the stock. We take advantage of that insight in the way that we define our set of indicators. In practice, this means that disaggregated analysis is required, whereby instead of trying to identify changes in the whole stock of qualifications and skills in the labour market, we focus on those parts of the market where the change happens more sharply.

We design four sets of indicators to trace changes that may be used to identify skills in over or undersupply. The first set uses information on the state of the labour market (overall and by occupation). The second set uses information from the recruitment process. The third set uses information from university and vocational education and training data. The fourth set uses information from labour market entrants, including skilled migrants on 457 visas.

Before examining any occupation-specific indicators, we construct a national benchmark that includes all occupations. The indicators provide an assessment by way of two types of comparisons. First, we compare what happens to each occupation over the period of 2007 to 2011. This allows us to examine what changes happened, and whether they can be attributed to skills disequilibrium. The Global
Financial Crisis (GFC) offered an extremely useful and very easy-to-interpret background for understanding how sensitive occupational demand and supply have been to external shocks. Second, we compare each occupation with the national benchmark to see how change may be happening in a different way among different occupations.

The indicators based on the state of the labour market use both aggregate and within-occupation information. They provide the essential backdrop to assessments made by individual employers and workers of whether particular types of skills are abundant or in short supply. National labour market indicators were used to provide evidence of the current state of the business cycle, which is necessary to interpret signals of skills imbalance properly. Occupation-specific labour market indicators were used to provide evidence on the way each occupation is faring.

The indicators on the recruitment experience focus on vacancies, applications for jobs, and occupational unemployment. Both the international literature and our analysis support the view that the level of difficulty experienced by employers in recruiting skilled workers is indicative of the degree of oversupply or undersupply of a particular skill. The Department of Education, Employment and Workplace Relations (DEEWR) Survey of Employers who have Recently Advertised (SERA) is the principal reliable source of data on this aspect of our indicators. The key issue is not only how many skilled vacancies there are, but how hard they are to fill.

Demand-driven education provision is increasingly gaining ground in Australia. Our indicators on student responses are based on the opportunities that skill shortages create for prospective employees. Current and commencing students can be expected to favour courses leading to qualifications that are in higher demand by employers, as they will improve their chances of finding employment after graduation and of having higher earnings.

Finally, the labour market entry indicators are based on the extent and the speed at which the market absorbs graduates immediately after course completion, the level of their pay, and the quality of the match between their qualifications and their job. These are all good measures of potential disequilibrium in the market for graduates. The way these measures change is also informative.

The data and their use

The project used a large quantity of Australian data in the public domain, alongside several confidentialised data sets that were obtained from different sources, including data sets that were assembled from administrative collections by DEEWR, specifically for this project. All data sets were examined to see if they were of a reliable and robust nature and fit for purpose in terms of sample size, frequency of collection and, of course, information content.

Several data sets were rejected because of insufficient content, irregular collection, lack of timely collection, small sample size, and other similar reasons. We are confident that all data sources that we recommend can be accessed without problems.

We have used the simplest of methods in order to be able to guarantee that the recommended suite of indicators is transparent in its construction and replicable without further input from NILS.

The AWPA–NILS skills index

In addition to the national benchmark information, we present three case studies to illustrate the design and construction of the skills index by occupation for: accountants, registered nurses, and civil engineers. For each occupation, we present a table that shows the data that can be collected for the
years from 2007 to 2011. After each table, we provide a qualitative assessment for each set of indicators which contains three parts named in a self-explanatory way: (i) Overview; (ii) Present; and (iii) Watch for. These qualitative assessments are followed by a brief summary and a graphical representation for each occupation of the overall position, degree of accuracy in the assessment, and the current trend.

The innovation of the research

This research presents several methodological innovations in understanding and measuring skill shortages. It purposefully requires only the simplest statistical calculations and uses data in the public domain that are clear to interpret. The research brief required that the work be transparent and easy to replicate. The research used many well-known and widely-used data sets, but it also examined many other related data sets that were ultimately judged to be insufficiently informative for the purposes of this research.

The main conceptual innovation of this research was the use of market disequilibrium as the underpinning concept for understanding skill shortages. We generalised the concept of disequilibrium to include both shortages and surpluses, as both have economic and social costs. The main innovation in operationalizing the concept of disequilibrium was that we placed the emphasis on the margin, where changes give an amplified signal of the underlying economic message. We focussed on those pertinent margins in the relevant labour markets that were supported by robust data: (i) student choices; (ii) labour market/occupation entry; and (iii) the recruitment process. We examined data representing both demand and supply. In constructing the final skills index, we combined data series in novel ways that are explicitly guided by fundamental economic principles.

We avoided ad hoc thresholds in our measurements, as these introduce discontinuities that are often difficult to interpret. Instead, we argue that the best way to synthesise the evidence of disequilibrium is by providing a qualitative judgement of the picture suggested by all of the available data for each occupation. Our skills index informs these judgements by identifying: (i) whether each of the individual indicators suggests the presence of skills disequilibrium; (ii) how much the presence of disequilibrium is jointly supported by several indicators; and (iii) whether the indicators have been changing in the last 3-4 years, and in what direction.
1. Introduction and Context

The overarching aim of this project is to:

*Identify indicators of under and oversupply of qualifications and to develop a methodology and tools that can be used to assess current and emerging skill needs across the occupations on Skills Australia’s Specialised Occupations List (SpOL).*

By considering this research aim, the project will assist Skills Australia to understand:

*To what degree the market or institutions can deal with issues of undersupply or oversupply of an occupation, and at what point, and to what extent, if at all, government should intervene.*

The questions at the centre of the project are about changes in the supply of and demand for specialised skills; indicators of disequilibrium or mismatch in this supply-demand nexus; the impact that the shift towards demand-led education funding has had on that nexus; and the right time, place, and mechanism for government intervention to restore market balance.

As a first step, we briefly introduce the economic ideas that underpin our approach to the investigation. There is never a perfect match between the education and the capabilities of the workforce (supply) and the requirements of employers (demand). Furthermore, it is not only the availability of qualifications and skills but also their utilisation that affect productivity, wages, job satisfaction, and the extent of skills shortage or surplus.

In a dynamic world, the policy challenge is to obtain as good a match as can be realistically expected between the skills on offer and the skills required, recognising the high costs of education and the losses that arise from mismatches.

1.1 Education and Economic Growth

The demand and supply of tertiary graduates and their connection to technological progress and economic growth have been topics of vigorous debate for decades. Endogenous growth theorists argue that nations should not wait for the demand for education to build naturally. Rather, economic growth can be accelerated by expanding the educated workforce to attract investment and encourage innovation. This theory and the considerable empirical evidence supporting it (for example Zhang 1996; Hanushek and Woessmann 2007), provide the economic underpinning for proactive education policies. There remains a debate, however, about just how much tertiary education is appropriate.

An important aspect of modern growth theory is the notion of skill-biased technological change (SBTC). This suggests that the structure of labour demand, driven by computer and other technology, is switching in favour of highly skilled (more-educated) labour (see Berman, Bound and Machin 1998; Card and DiNardo 2002). At the same time, there is polarisation of the workforce into high-wage and low-wage jobs, at the expense of intermediate-skill jobs, as routine tasks are automated (see Autor, Katz and Kearney 2006). This is sometimes referred to as a ‘hollowing out’ of the labour force. In turn, there has been a focus in a number of countries on the need to increase the number of students studying the so-called Science, Technology, Engineering, and Mathematics (STEM) subjects. For instance, the South Australian Government has recently introduced a STEM Skills Strategy, on the basis that there is a growing demand for these skills in local industries, particularly in mining and defence.
1.2 Producing the Right Number of Skills

Since the start of the higher-education expansion in Western economies in the 1960s, there have been concerns about producing too many graduates. In the intervening years, the total number of graduates (that is the supply) has risen substantially, but so has the number of graduate jobs (that is the demand). Graduates continue to benefit from higher wages and lower rates of unemployment. The average lifetime returns to investment in tertiary education remain positive in most Western economies. In Australia, data from the Australian Bureau of Statistics (ABS) Survey of Education and Training (SET) indicate that, between 1989 and 2009, and for most age groups, real wages grew more rapidly for workers with university degrees than for those with vocational education and training (VET) qualifications or with no post-school qualifications. The story is of continually expanding numbers of graduates accompanied by simultaneously expanding employment opportunities. The evidence is clear in Australia, and in many other Western economies, that for decades both the demand and the supply curves for graduates have been shifting out.

The situation for VET graduates is more complex. Structural change in the economy is boosting demand for some types of VET qualifications (especially diplomas and those for the service sectors of the economy), and reducing it for others.

1.3 Producing the Right Types of Skills

Despite the ongoing success of tertiary graduates in the labour market, there are some causes for concern. University-qualified graduates are being found in large numbers working in jobs that can be described as non-graduate, a phenomenon known as over-education. In a recent appraisal of the literature, the European Centre for the Development of Vocational Training (CEDEFOP) cited some 40 studies published between 1981 and 2008 with 74 separate estimates of over-education, and they found that the average over-education incidence is about 25 per cent of the working population in 11 Western economies.\(^1\) The Australian literature shows that over-education and related forms of mismatch are widespread for all post-school qualifications and certainly in some cases are associated with reduced earnings, increased job churning, and reduced job satisfaction (see Mavromaras et al. 2011 and references therein).

In the literature, a distinction is made between vertical and horizontal mismatch, with the former referring to a situation in which the qualifications held by a job occupant are either higher or lower than those required to do the job, and the latter referring to a situation in which the level of qualifications matches, but the discipline or field of study do not.

Such mismatches create economic waste in one of the spheres of most importance for people: the way in which they contribute to society through their labour. Simply put, if we have too much education or too many skills of a particular type, then some of the excess will go to waste; and in certain cases we end up with frustrated workers with unrealised potential and a poor return on their large investment in higher education. If we have too little education or skills, then we also have waste, in the forms of lost potential production, productivity, and growth. Another consequence of over-education is that it drives down the employment and wages of non-graduates, by increasing the competition that they face from higher-educated workers. In the United States, for example, one reason for the continuing high rate of return to a college degree is that those without such an education have low wages; that is the falling denominator—as much as the rising numerator—keeps the returns to tertiary education high.

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\(^{1}\) CEDEFOP (2010), pp. 18-20, Table 2
1.4 The Skilled Labour Market in Australia

While the international literature provides much useful theoretical and empirical guidance, only an Australian study can satisfactorily capture the idiosyncrasies of the Australian education system, labour market, and data sets.

By international standards, the Australian university sector is well-resourced and commands a reputation for high-quality education. The early introduction of income-contingent loans has driven growth in the sector along with a reasonably equitable distribution of higher-education participation within the population. In recent years, there have been calls for further expansion, in part as a response to changes in the global economy, and the realisation that Australian productivity has been slowing down for reasons that are not fully understood. The case for more graduates was made strongly by the Bradley Review, which recommended an increase in higher-education attainment among 24 to 35 year olds to 40 per cent by the year 2020. This recommendation is in line with the rationale of endogenous growth theory, as discussed above.

The Council of Australian Governments’ policy (COAG 2010) provides for more demand-driven higher education. This policy has two elements. First, it provides additional funding for more student places. Second, it removes the cap on places offered by field of study. This allows the universities and their prospective students to interact, so that the numbers of places offered and accepted for each type of degree are determined through a more market-driven system. The idea behind this approach is that students themselves can (and have a strong incentive to) read and respond to market signals in the labour market more effectively than a central planner or a bureaucracy. In addition to having more student places, the policy aims to let students decide what subjects are best matched to their aspirations and perceptions of future labour market needs.

1.5 Focus on Specialised Occupations

Of the thousands of occupations in Australia, a subset has been identified by DEEWR as being of particular policy interest. These are referred to as Specialised Occupations and are identified on the Specialised Occupation List (SpOL). The SpOL identifies those occupations which satisfy two of the following three criteria: long lead time; high use; and high risk; and they satisfy the fourth criterion of high information.2

A long lead time is defined as a situation in which skills required are at Level 3 or higher of the Australian and New Zealand Standard Classification of Occupations (ANZSCO), which equates to a Certificate III or above level qualification. The intuition behind the long lead-time criterion is that we should be more concerned about shortages in occupations that require higher-level qualifications, as it takes longer to obtain these qualifications and shortages cannot be easily or immediately rectified. There is also the possibility that responses to shortages will overshoot or undershoot the optimal level (the so-called cobweb phenomenon).

High use means there is a close occupational fit between the skills acquired in education and training and the use to which they are put. It is defined as a situation in which 60 per cent or more of those working in the occupation have the requisite level and field of qualification. We would expect in these cases that education and skill mismatch are uncommon.

If there is a high risk of skills being in short supply (for example likely to cause bottlenecks in the supply chain), then the consequences of shortages will extend beyond the individual employers that are seeking to find such skills. This problem will be aggravated where there are occupational licensing

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requirements, which preclude the substitution of other qualifications instead of those for which the licences are granted.

Of the 100 (4-digit) occupations on the 2011 SpOL, 79 meet all three of the above criteria of long lead time, high use, and High Risk.

1.6 Requirements for an Index of Skill Shortage or Surplus

Our principal objective is to produce a robust indicator of whether there is a shortage, balance, or surplus in the skills required for occupations on the SpOL. This indicator must meet a number of requirements. It must be well-grounded in a sophisticated understanding of how labour markets work to adjust to imbalances, and hence what signals they give when they are out of balance. It must use data that are reliable, timely, and available at the appropriate level of occupational detail (4-digit ANZSCO). It must be straightforward in its construction and interpretation, so that it may be replicated in future years. Its constituent parts must complement each other and be able to be summarised in a single assessment. The NILS Skills Indicator that we develop and present in this report meets all of these criteria.

1.7 Structure of This Report

We commence the body of this report with a review (Part 2) of the international and Australian literature on the challenge of identifying shortages and (less commonly) surpluses of skills. We draw conclusions from the literature about common approaches to assessments of shortages. These conclusions provide the foundation for the development of the indices that we recommend.

Part 3 of the report describes our recommended strategy for identifying skills imbalances and it develops the set of indicators. It identifies and justifies each indicator and it shows each one in practice.

Part 4 of the report then shows how our set of indicators can be put together and how they operate in practice. We construct a national benchmark of all of the indicators, and then demonstrate their use for three specific occupations: accountants, registered nurses, and civil engineers. We provide an interpretation of the information provided by each indicator and a graphical representation of all of the evidence.
2. Literature Review

2.1 Introduction

The international literature provides a wealth of material that is relevant to the development of skills-imbalance indicators. This literature is generated by academics, government departments, consultants, and other research and public-interest groups.

Two important strands emerge from the literature. The first is theoretical and definitional. It is concerned with how skills imbalances arise and how these can be classified and differentiated from other labour market phenomena. The second strand of the literature is empirical and practical. It is concerned with the various issues of data, variable construction, and measurement that are involved in monitoring skills imbalances and developing indicators that inform policymakers of the severity.

This review briefly summarises the major contemporary contributions to thinking and understanding about these two issues. Some commentary is provided, where appropriate, to relate the international evidence to the Australian context, particularly in relation to data availability and data quality.

The purpose of the review is to provide a depth of insight about skills imbalances, rather than a breadth of coverage about skills-related issues. The review passes over many areas of skills research that are not central to defining and measuring skills imbalances at the occupational level. We begin by outlining the basis of our approach.

2.2 Why Focus on Skills Imbalance?

2.2.1 Support for our approach

There are two main ways to identify an imbalance in the demand for and supply of a skill. The first approach attempts to measure the numbers that are supplied and demanded, and compares the two. In practice, this approach is challenging because of some difficulties involved in quantifying supply and demand that are well-documented in the literature. For instance, there are many people who have obtained formal qualifications that would allow them to enter a particular occupation, but who do not currently work in that occupation and are not seeking employment in it. Should they be counted as part of the available supply? The demand side of the labour market is similarly difficult to quantify because employers’ changing skill needs are manifested in a multitude of ways that cannot easily be reduced to a single estimate of their demand. They may seek to recruit new workers, make different uses of their existing workers, offer training, raise wages, or use other strategies. These and other complications must be dealt with when attempting to capture skill imbalances by quantifying labour demand and labour supply.

An alternative approach looks for indicators of labour market disequilibrium, without needing to know the total supply and demand. We recommend this approach as being more efficient and feasible. The underlying rationale for this approach is that conditions of shortage or surplus for particular skills produce signals in the labour market for those skills that can be detected through careful monitoring. The main challenge in this approach is to identify indicators that provide conceptually valid, sensitive, and robust measures of the shortages or surpluses that may exist. However, no single indicator of disequilibrium can be expected to provide adequate information on its own. An additional challenge therefore exists in combining different indicators into a workable framework. The literature that we review in this section provides support for building such a framework to identify potential mismatches between skills supplied and demanded at the detailed occupational level. The literature also provides substantial guidance as to the types of indicators that are best suited to this purpose.
Richardson (2009) supports the use of skills-imbalance indicators by illustrating the conceptual and measurement problems associated with supply and demand. These problems include:

- Numbers of persons employed are not the same as the volume of services supplied; hours worked are also important
- The presence of people who are qualified to do the work, but are not currently doing it
- Sub-specialisations within occupations, which may not be equally prone to shortages
- Differences in the competency and other qualities, often personal, of the available workers
- Geographical mismatches between where workers live and where their services are in demand
- Employers adjust to surplus and shortage by varying the quality of workers hired and retained. These quality dimensions are hard to observe and, thus, measure

Keating’s (2009) review of skill policies in OECD countries also provides some support for the use of imbalance indicators. He notes that the effectiveness of a country’s skills policy is determined by whether the skills that are supplied by the education and training system match closely the skills that are needed by industry, both immediately and over the longer term. The degree of (mis)match is judged not only by the types of skills involved, but also by their location and timing. The education system may produce the right kinds of graduates, but in the wrong quantities, the wrong locations, or at the wrong times for their skills to be utilised fully by employers. A monitoring and evaluation tool that is based on indicators of imbalance can identify these mismatches more readily than one that requires precise measurement and comparison of supply and demand.

Skills Australia (2009, pp. 5-7) recognises that it is ‘neither possible nor appropriate’ to attempt to match skills demand exactly to skills supply for several reasons. One reason is that ‘skills’ are not fully captured by formal education. Many useful skills are acquired on the job, and ‘the relevance of people’s first post-school qualification fades as [they] progress through their careers’ (p. 6). Another reason that demand and supply may not be in perfect alignment is that compositional shifts occur constantly in the workforce, and in the education system. New technologies are altering the industry structure, creating new demands from employers, and changing students’ preferences for particular courses. These compositional shifts are accompanied by widespread job mobility and job turnover. Skills Australia (2009, p. 6) notes that ‘almost half the workforce changes their employer every three years’, which would include a number of highly mobile individuals who make several changes and a number of immobile individuals who make no changes.

These factors suggest that: (a) disequilibrium—rather than equilibrium—is the normal state of the labour market; and (b) certain occupations are likely to exhibit symptoms of mismatch from time to time as part of their normal growth. The policy challenge is to determine when these mismatches are becoming more serious and costly, and thus when government intervention may be warranted.

### 2.2.2 Occupations and qualifications

Related to the difficulty of quantifying supply and demand is the indirectness of the link between qualifications and occupations. This point is well recognised in the literature, and it has important implications for how we develop skills-imbalance indicators. Lewis (2008, p. 9) notes that ‘the extent of pure occupational labour markets—ones characterised by a required qualification—is limited ...
the match between training and the labour market is very loose'. One implication of this is that employers may be able to avoid or mitigate skills imbalances by substituting between different classes of workers. This substitution is much more likely to occur where workers with different types of qualifications are able to do the same job. Where substitutability is high, employers have a larger pool of potential recruits from which to choose and thus have more options for resolving skills imbalances. Conversely, where specialisation is high, imbalances between demand and supply are more likely because employers cannot substitute easily between different types of workers for a particular role (Holt, Sawicki, and Sloan 2010, p. 24; Infometrics Ltd 2006, p. 18). In a recent report, Skills Australia (2009, p. 3) makes similar observations, but goes on to note that 'there are many jobs that are not skill-specific and national forecasts of the likely growth in employment by occupation are of limited utility for many jobs'.

In the light of the above points, a key empirical question for this research is whether the occupations on the SpOL are comprised of workers from a limited range of specific qualifications, or whether these occupations are more mixed in their composition. We provide a detailed analysis of this issue in Appendix 7 (see Additional Material). We show that many SpOL occupations have a diverse composition; their workers come with varied qualifications, rather than having a more uniform skill-set. This evidence suggests that there is a degree of substitutability within SpOL occupations between workers with different types of qualifications. The evidence also constitutes an argument against using projections or forecasts of future employment to monitor skills imbalances in the SpOL occupations.

Given that our current research aim is to develop a tool for monitoring potential skill shortages and surpluses within specific occupations of interest, it is appropriate to examine the mixture of qualifications held by workers within these occupations. But the connection between qualifications and occupations can also be approached from the opposite direction—by considering the extent to which persons with a given qualification can work in different occupations. There may be value in such an approach where the focus is on supply-side issues and the aim is to project the future supply of workers to particular occupations. One difficulty, however, is that previously observed supply patterns may not be optimal, and processes that we do not observe in the data are already at work to change them (for example any changes in student enrolments in particular fields). Projecting future supply based on historical data therefore risks assuming that past patterns will continue, irrespective of the existence of skills imbalances in the present, or their emergence in the future. These concerns are especially relevant where the main data source is the Census of Population and Housing, which is conducted infrequently and with significant lags between data collection and data availability.

2.3 Conceptualising Skills Imbalance

*What is meant by skills imbalance? What varieties of skills imbalance exist? How are imbalances related to other labour market phenomena, such as skill utilisation, skill shortage, and mismatch?*

2.3.1 Varieties of imbalance

Zurn et al. (2002) provide a detailed discussion of alternative conceptions of skills imbalance. First, they distinguish between *economic* and *non-economic* definitions. In the economic perspective, ‘a skill imbalance occurs when the quantity of a given skill supplied by the workforce and the quantity demanded by employers diverge at the existing market conditions’ (p. 1). Variants of this definition

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3 The evidence suggests that this observation also applies to the vocational education and training (VET) system, which aims to prepare graduates for specific lines of work. Karmel, Mlotkowski and Awodeyi (2008) show that most VET graduates do not move into their ‘intended’ occupation after training, and that the least likely to do so are graduates from ‘courses designed for arts and media professionals and sports and personal service workers’ (Karmel, Mlotkowski and Awodeyi. 2008, p. 20).
are found very widely in the literature, especially in studies of skill shortages. Non-economic definitions, by comparison, tend to prescribe normative standards. In the healthcare industry, for instance, mandated staff-patient ratios determine the adequacy of supply, and deviations from these ratios imply imbalances in either direction.

The authors then describe further alternative conceptions of skills imbalance. They distinguish between static and dynamic imbalances, where the latter are largely self-correcting by market forces and the former are longer-lived. Their observation that imbalances may be temporary or more persistent implies that indicators need to be developed in a way that enables consistent monitoring over time to detect meaningful changes. In economic theory, competitive markets prevent static imbalances through price (wage) adjustments. But ‘real world’ labour markets differ from the competitive norm in various ways that preclude immediate or complete adjustment. These imperfections include ‘sticky’ wages, long lead times in the education system, and information asymmetries (Zurn et al. 2002, p. 9).

Finally, the authors distinguish between quantitative and qualitative imbalances, where the former represents a skill ‘shortage’ (new workers cannot be found in existing market conditions) and the latter is akin to a skills ‘gap’ (where existing workers lack some preferred qualities). Qualitative imbalances are harder to detect, because they do not generate job vacancies. Instead of positions being left unfilled (as in a skill shortage), offers are made by employers but to candidates who are less than ideal. This form of imbalance requires a different type of indicator.

Other authors (Holt, Sawicki, and Sloan 2010) argue that it is also useful to separate imbalances over time. These authors make a distinction between skill shortages (a current problem) and skill needs (a future prospect). They contend that skill needs should be evaluated through projections of occupational demand under plausible alternative scenarios. These projections would provide an additional layer of information to complement other indicators of imbalance, such that: ‘a coincidence of the two would perhaps convey a particularly powerful message for any given occupation, indicating the possibility that a current skill shortage was in danger of growing worse’ (Holt, Sawicki, and Sloan 2010, p. 50).

The use of such occupational demand projections has been discussed in Australia, most recently by Lewis (2008). Drawing extensively on the work of Richardson (date), Lewis noted that forecasting skill needs in the manner suggested by Holt, Sawicki, and Sloan (2010) is problematic. One reason is the imperfect correspondence between qualifications and occupations in many cases, noted above (and see further in Appendix 7). Forecasting is notoriously difficult, and may be unnecessary—for instance, if there is a high degree of substitutability between types of skills, if workers can move relatively easily into an occupation with minimal retraining, or if training lead times are short. If they are used, projections should not be regarded as strict forecasts, but as signals for employers, students, and policymakers of what will transpire if current trends continue (Lewis 2008, p. 7). Projections thus alert participants to one possible scenario of the future against which to weigh alternatives. It is essential that any projections be compared against actual (observed) labour market trends so that their reliability can be evaluated over time.

2.3.2 Imbalances due to skill shortages

The bulk of the literature is concerned with skill shortages: imbalances that are due to deficiencies of supply, relative to demand. Numerous authors define skill shortages and offer recommendations for detecting them at the occupational level.

Shah and Burke (2005) provide an excellent introduction to this part of the literature. They begin with three (stylised) perspectives on skill shortages from economists, employers, and unions.
For economists, skill shortages occur when there is an insufficient supply of appropriately qualified workers available under existing market conditions. This basic definition is widely used in Australian research and policy. The definition used by the Commonwealth Department of Education, Employment and Workplace Relations (DEEWR) follows the economists’ approach:

Skill shortages exist when employers are unable to fill or have considerable difficulty filling vacancies for an occupation, or significant specialised skill needs within that occupation, at current levels of remuneration and conditions of employment, and in reasonably accessible locations (DEEWR 2010).

The economists’ definition allows for shortages that are isolated within certain occupations or limited to certain geographical areas. Hard-to-fill vacancies are widely used as an indicator of shortage. DEEWR collects vacancy statistics for Australia in selected skilled occupations. The information includes the average total number of applicants for each vacancy in an occupation, the average number of applicants that employers deem ‘suitable’ for work in that occupation, and the proportion of vacancies that remain unfilled after a designated period. We provide further discussion of the uses and limitations of these statistics in Part 3 and Part 4 of this report.

Employers do not always use the economists’ strict definition of a skill shortage when reporting their perceptions of labour market conditions. Employers will not necessarily have unfilled or hard-to-fill (HTF) vacancies when they report facing a skill shortage. Some will construe a deficiency of the skills within their current workforce (that is a ‘skill gap’) as evidence of a shortage in the wider labour market. Other employers may be reluctant to increase their wages in line with competitors, and consequently they may encounter difficulties in recruiting or retaining workers, which resemble skill shortages (see Healy, Mavromaras and Sloane 2011). This variability in meanings creates difficulties when attempting to reconcile employers’ views of skills imbalances with other labour market evidence. There is also the possibility that some employers exaggerate concerns about skill shortages in the hope that this will motivate government action to reduce their labour costs.

Some of these concerns are echoed in the trade union perspective on skill shortages as presented by Shah and Burke (2005). It is important for unions that employers’ assertions about the presence and severity of skill shortages are checked for veracity against other relevant labour market indicators. If these checks are not in place, unions fear that employers will persuade governments to implement measures, such as an expanded skilled-immigration intake, which disadvantage union members (and possibly unemployed persons). Like employers, unions may have reasons to exaggerate skill shortages if this helps them to improve union members’ wages or to increase union membership. But unions may also influence the balance between skill supply and demand in more tangible ways, such as through licensing or registration requirements that regulate the flow of new workers into an occupation.

The above three definitions—from economists, employers, and trade unions—demonstrate that the meaning of a ‘skill shortage’ varies with the interests of different parties and is open to considerable ambiguity. Shah and Burke (2005) describe a continuum of skill shortages that distinguishes ‘hard-to-fill’ vacancies from ‘skill gaps’ and ‘recruitment difficulties’. The main distinction that DEEWR now uses is between ‘skill shortages’ (as defined above) and ‘recruitment difficulties’. The latter type of imbalance occurs ‘when some employers are unable to attract and recruit sufficient, suitable workers for [other] reasons’ (DEEWR 2010).

Shah and Burke (2005) next consider the causes of skill shortages. They identify three main causes, which are useful for developing the indicators of skills imbalance in this report. These are:

1. **Slow wage adjustment.** This may occur because employers are slow to recognise a shortage or are simply reluctant to respond to it by increasing wages. Institutional factors may also be
important, such as in education and health, where ‘government has significant influence on the management of the market’ (Shah and Burke 2005, p. 52). Similar points are made by Veneri (1999) with reference to the United States.

2. **Slow adjustment of labour supply.** This may occur because of lags in education and training provision, or because of occupational licensing and registration requirements that limit the supply relative to the optimal market equilibrium. Slow responses from education providers mean that it is beneficial to monitor institutional performance indicators and student flows. The indicators presented in this report include information on student commencements and completions by qualification field, to monitor the labour supply to specific occupations.

3. **Information deficiencies.** These prevent qualified workers from ‘finding’ the employers who need them, thus interrupting or delaying the equilibration of supply and demand.

Richardson (2009) provides a further detailed examination of the skill-shortage problem. Like some other authors, Richardson emphasises the distinction between shortages that are due to a lack of technical skills, and those that are due to perceived deficiencies in other areas. Employers often ‘want much more than just the essential technical skill’ (Richardson 2009, p. 334).

Richardson offers the following typology of skill shortages, which has been influential in Australian research and policy:

1. **Level 1 shortage**—technical skills are lacking and there is a long lead time to develop the necessary skills
2. **Level 2 shortage**—not enough people have the required skills, but the time to acquire them is relatively short
3. **Skills mismatch**—sufficient numbers of people possess the necessary skills, but they cannot be induced to apply for vacancies under current market conditions
4. **Quality gap**—there are sufficient numbers of qualified people who are applying for vacancies, but they lack certain qualities that employers deem necessary or very important

Richardson (2009) notes that, although ‘wages do move in response to shortages and surpluses of particular skills’, this movement tends to be limited, and ‘many other forms of non-wage adjustment occur’ (p. 345). Similar observations about wage and non-wage adjustment options have been made by other authors. Veneri (1999) notes that employers often have a range of possibilities open to them when faced with skill shortages, and will ‘generally try the least expensive response first’ (p. 17). This suggestion is confirmed by recent empirical evidence showing that employers facing skill shortages are most likely to respond by increasing the working hours of their current staff. Raising wages or improving other working conditions are generally only contemplated after other responses have failed to resolve a complicated shortage (Healy, Mavromaras, and Sloane 2011).

In the UK literature, a generally accepted view of skill shortages is that these are a subset of ‘hard-to-fill’ vacancies (Greig, Glancey, and Wilson 2008, p. 9). This view informs much of the work that has been done to develop shortage indicators, particularly by the UK Commission for Employment and Skills (UKCES) and the Migration Advisory Committee (MAC) (both discussed more fully later in this review). Holt, Sawicki, and Sloan (2010, p. 14) capture this perspective well, stating that:

> Implicit in the notion of a skill shortage is a sense of a recruitment difficulty that persists through time. Empirical researchers typically seek to capture this by considering only

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4 An earlier study in the United Kingdom described these non-technical worker qualities as ‘social skills’ (Green, Machin, and Wilkinson 1998).
those vacancies that employers identify as ‘hard-to-fill’—and perhaps more specifically those that are not just hard-to-fill but that employers attribute to shortages of suitably skilled candidates.

As noted above, one problem with making these finer distinctions is that employers do not necessarily recognise them. Green, Machin and Wilkinson (1998) observe that ‘in a substantial number of cases, the term “skills shortage” appears to mean for employers something wider or different from “hard-to-fill vacancy”’ (p. 167). Many employers reporting skill deficiencies among their current staff do not report skill shortages, and vice versa. This appears to be the case even when the qualities that existing workers are believed to lack (which employers are asked to specify) are clearly classifiable as ‘skills’ (for example literacy and numeracy). These considerations about the indeterminacy of different types of skill shortages for many employers will be important if imbalance indicators rely extensively on their views.

In contrast to the detailed distinctions made in many recent UK studies between the concepts of skill gaps, recruitment difficulties, and hard-to-fill vacancies, some studies refer to much broader types of distinctions. A recent review by the Migration Advisory Committee (MAC 2010) referred in the UK policy debate to four main types of skill shortage:

- Cyclical—dependent on the point in the business cycle
- Structural—due to a lack of necessary skills in the workforce
- Due to constraints on public spending—meaning that wages are sticky and unresponsive
- Due to global talent shortages—where there is a worldwide shortage of the very best talent

2.3.3 Imbalances due to skill underutilisation

Considerably less attention is paid in the literature to the possibility of imbalances arising from the over-provision (surplus) of certain types of skills. One form of this occurs when people work in jobs that do not require the level or type of skills that they possess. Another form occurs when their skills are broadly commensurate with the job, but are underutilised.

Skills Australia (2011) reports that ‘policy interest in skill utilisation is increasing’ (p. 2) but that, despite this, ‘the specific practices involved in good skills utilisation are rarely, if ever, described’ (p. 9). The key elements of skill utilisation identified by Skills Australia are: employee participation, autonomy (for example task discretion), use of ‘skill audits’ to identify internal skill gaps, job design (for example teamwork and flexible job descriptions), and knowledge transfer between workers. It is these skill-utilisation practices that ‘really matter for productivity’, rather than skills acquisition per se (Skills Australia 2009, p. 10).

There are several indications that skills are currently being underutilised in the Australian labour market. One indicator is that ‘some 30 per cent of Australian tertiary education graduates work in jobs classified at a lower skill level than their qualification’ (Skills Australia 2009, p. 10). Another indicator is that ‘a substantial proportion of employers—over 40 per cent in recent years—report that their workforces have in general more skills than the organisation requires’ (Skills Australia 2009, p. 10). These two figures suggest that, in aggregate, the skills supplied by Australian workers are not being fully utilised by employers. This raises the possibility of wastage arising from over-provision of certain skills, with consequent losses of income (for affected workers) and of productivity (for the national economy). Analysis of the extent and consequences of over skilling and over-education in Australia (Mavromaras, McGuiness and Fok 2009 and 2010; Mavromaras 2009; Mavromaras et al. 2010; Mavromaras et al. 2011) shows that the consequences of both are negative (for wages and job satisfaction) and persistent. The strong evidence from this research about the extent of and harm caused by underutilisation of both skills and qualifications shows that imbalance indicators for Australia must not only enable the identification of skill shortages, but must also allow
for the possibility of skill surpluses. This conclusion echoes earlier recommendations for research and policy made by Lewis (2008).

Drawing on earlier Canadian contributions, Buchanan et al. (2010) make a number of recommendations about how to conceptualise and measure skill utilisation. They describe four different dimensions of utilisation and highlight the need to ‘reach agreement on, or commence the process of, establishing standards’ for each of these (Buchanan, et al. 2010, p. 16 and p. 34). Their four dimensions of skill utilisation are:

1. ‘Entry credential matching’—the match at the point of hiring
2. ‘Performance matching’—the ongoing match between job requirements and workers’ capabilities
3. ‘Field of study matching’—the relevance of prior education and learning to the job
4. ‘Subjective matching’—how well workers think their job matches their skills and interests

The indicators that we develop later in this report are relevant to several of these dimensions of skill utilisation.

2.4 Measuring Skills Imbalance

What indicators of skills imbalance are currently used by other countries and institutions with concerns similar to Skills Australia? Are there potentially useful indicators suggested elsewhere that have not been applied because of data unavailability or inadequacy, but that may nonetheless be of value to Australian policymakers?

2.4.1 Approaches in the United Kingdom

Internationally, the most sophisticated approaches to measuring skills imbalances—and gathering the labour market information that is required to support this objective—are found in the United Kingdom. The two leading policy organisations are the UKCES and the MAC. The indicators that they have developed and rely on are reviewed in this section.

2.4.1.1 UK Commission for Employment and Skills (UKCES)

The UKCES is the main public authority providing public policy advice and information on skills-related issues in the United Kingdom. It is a ‘social partnership’, with Commissioners drawn from different backgrounds representing employers, trade unions, and local administrations. The UKCES collects and disseminates information about the UK labour market to assist policymakers and market participants to match skill supply to skill demand better.5

The UKCES conducts the UK Employer Skills Survey (ESS), the country’s largest survey of employers’ skill needs, utilisation, and investment (and among the world’s largest surveys of its kind). The 2011 ESS collected data via telephone interviews with some 87,500 employers, who were representative of the UK employer population in terms of size, sector, and region. At present, there is no Australian survey that is comparable in scope or size to the UK ESS.6

The first results from the 2011 UK ESS were reported in December 2011 (Vivian et al. 2011). The key findings are:

5 Mission statement quoted from the UKCES website: http://www.ukces.org.uk/about-us
6 The closest Australian counterparts are the ABS Survey of Employee Earnings and Hours, which has a large sample size but very limited information on employee skill, and the Business Longitudinal Database, which includes questions on skill shortages but has a much smaller sample size.
• 12 per cent of UK firms reported vacancies; equivalent to 2.3 per cent of total UK employment.

• Only 4 per cent of firms reported having hard-to-fill (HTF) vacancies, suggesting that the market is quite responsive to employer demands. [We note that this may also indicate that there is high overall excess supply of labour].

• HTF vacancies are frequently said to have an impact on business operations or performance, with 83 per cent of affected firms reporting an increase in the workload of existing staff, and 42 per cent reporting loss of business to competitors.

• Most HTF vacancies (72 per cent) are ‘skill-shortage vacancies’ (SSV), meaning that they are due to deficiencies in the skills, qualifications, or experience of job applicants.

• Unmet demand for skills is not only about vacancies. ‘Skill gaps’, where existing workers are not fully proficient in their jobs, occur in many more UK firms (13 per cent) than SSVs (3 per cent).

• The patterns of skill gaps and SSVs vary across occupations. Where SSVs are most prevalent (as a proportion of all vacancies) in the trades, skill gaps are most likely to be reported for sales and customer service workers, and for elementary staff.

• Skill gaps are less likely than HTF vacancies to be adversely affecting firm performance, with 39 per cent of the firms with skill gaps reporting that they have no performance implications.

• The majority of UK firms (59 per cent) had funded or arranged training for their employees in the previous year. Firms with skill gaps were much more likely to have done so than other firms (after controlling for differences in size), suggesting that training is an important response to perceived skill deficiencies among existing staff.

There is a strong emphasis in the ESS data on vacancies as potential measures of skills imbalance. Data limitations and conceptual differences inhibit the construction of comparable vacancy estimates for Australia. The available Australian data do not cover all occupations and do not distinguish between the different varieties of vacancy (for example HTF vacancy, skill-shortage vacancy) in the same ways as the UK ESS. Nonetheless, it is possible to use the current Australian data to track changes in the number of vacancies for selected occupations and to devise indicators of ‘recruitment difficulties’, such as vacancy fill rates and the number of suitable applicants per vacancy (by occupation). We develop these ideas and discuss the data source later in Part 3 and Part 4 of this report.

2.4.1.2 Migration Advisory Committee (MAC)

Another leading contributor to UK analysis of skills imbalances is the MAC. The MAC is a non-statutory authority, operating under the auspices of the UK Border Agency, which advises the UK government on migration issues. Its research programme includes monitoring skill needs and making recommendations to the government about skilled occupations that should be given preferential treatment for immigration purposes. In 2008, the first Shortage Occupation List (SOL) for the United Kingdom was announced. Several subsequent reviews have evaluated both this list and the indicators which inform it. These reviews provide useful guidance for developing skills-imbalance indicators in Australia.

The first version of the SOL was informed by a ‘rapid evidence assessment’, conducted by York Consulting (Greig, Glancey, and Wilson 2008), of approaches to measuring skill shortages and skill gaps and the applicability of these approaches to the United Kingdom. The report’s authors find
consensus support in the literature for using a ‘suite’ of indicators to assess the evidence about skill shortages. They also recommend combining macroeconomic (‘top-down’) evidence, based on national statistics, with microeconomic (‘bottom-up’) evidence drawn from employer surveys.

The following table summarises the observations made in the York Consulting report about potential indicators of skill shortages. All page references are to Greig, Glancey, and Wilson (2008).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Observations about use and limitations</th>
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<tbody>
<tr>
<td>Vacancies</td>
<td><strong>Comment:</strong> ‘The most widely used macroeconomic measure of skill shortages’ (p. 25).</td>
</tr>
<tr>
<td></td>
<td><strong>Rationale:</strong> ‘a rise in the stock of vacancies or vacancy duration may indicate the presence of hard to fill vacancies and possible increased skill shortages’ (p. 25).</td>
</tr>
<tr>
<td></td>
<td><strong>Measurement issues:</strong> it is preferable to use relative levels, such as the vacancy rate expressed as a proportion of total employment or total unemployment in an occupation, rather than simply the number of vacancies (see also Richardson 2009).</td>
</tr>
<tr>
<td></td>
<td><strong>Applications:</strong> Other widely used vacancy indicators are vacancy duration and vacancy fill rates (p. 19). Hard-to-fill vacancies are sometimes favoured as a measure of skill shortage, but they can lead to overestimation problems if employers ‘misinterpret recruitment problems due to other issues (for example, poor working conditions) as skill shortages’ (p. 26).</td>
</tr>
<tr>
<td>Wage movements</td>
<td><strong>Rationale:</strong> ‘an upward movement of wages will signify a tightening of the labour market and therefore increasing skill shortages’ (p. 27).</td>
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<tr>
<td></td>
<td><strong>Caveats:</strong> Wages move for reasons other than skill shortages. Also, they may not move much, even when skill shortages are present. The adjustment may occur mainly in non-wage elements of the work (p. 27).</td>
</tr>
<tr>
<td></td>
<td><strong>Measurement issues:</strong> A measure of wage (or earnings) growth is preferable to a measure of levels. Data quality is a key consideration (especially at more disaggregated levels of analysis).</td>
</tr>
<tr>
<td>Unemployment</td>
<td><strong>Rationale:</strong> ‘a fall in unemployment may indicate a rise in demand and/or a fall in supply of labour, and therefore possible increased skill shortages’ (p. 28).</td>
</tr>
<tr>
<td></td>
<td><strong>Caveats:</strong> At the aggregate level, unemployment can coexist with skill shortages if different types of labour or different locations are affected. At disaggregated levels, unemployment can fall for reasons unconnected to skill shortages (for example discouraged workers leaving the labour force).</td>
</tr>
<tr>
<td></td>
<td><strong>Measurement issues:</strong> Occupational unemployment rates typically relate to a person’s last paid job, which may or may not be the one that they are now searching for, or are most qualified to do. This can lead to an overstatement of unemployment levels within an occupation (p. 20).</td>
</tr>
<tr>
<td>Employment growth</td>
<td><strong>Comment:</strong> one of several ‘indirect indicators’ of skill shortages (p. 22). The others are: overtime, recruitment intensity, and turnover.</td>
</tr>
<tr>
<td></td>
<td><strong>Rationale:</strong> employment growth within an occupation ‘signifies increased demand and may be an indicator of rising skill shortages’ (p. 29). Overtime seems to be widely accepted as a shortage indicator (p. 22). The literature on other measures, such as recruitment intensity and turnover, is ‘sparse’ (p. 22).</td>
</tr>
</tbody>
</table>
Caveats: Employment growth on its own is not indicative of skill shortage. Rather, it is seen to establish the conditions under which a skill shortage is more likely to occur (p. 22).

Rationale: Eliciting employers’ views can ‘address the issue of skill shortages directly, [without] relying on proxy measures as is the case for macro measures’ (p. 35).

Caveats: Employers may intentionally or inadvertently overstate the extent of the skill-shortage problem. Employers may also fail to distinguish a tight overall labour market from a shortage of specific skills.

Measurement issues: The best ways of managing the overstatement problem are to: (1) supplement the employer data with ‘hard’ macro data, for example on vacancies and the overall state of the labour market; and (or) (2) collect detailed data only from the employers that are known to have advertised a vacancy recently and thus are actively searching the labour market (p. 23).  

### 2.4.1.2.1 The MAC skill shortage indicator framework

Drawing on the York Consulting report described above, and its own investigations, the MAC eventually settled on 12 indicators of shortage. These indicators are organised into four groups, based on their focus and data requirements. The following table, adapted from MAC (2008, Chapter 7), and particularly Table 7.2 (p. 116), describes the 12 indicators of shortage adopted by the MAC, the reasoning behind their use, and the relevant data sources. All of its indicators have ‘a sound basis in terms of either common sense and/or economic theory’, but ‘each is [also] limited in terms of its explanatory power, which supports an approach that uses a range of indicators’ (MAC 2008, p. 115).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Observations about use and limitations</th>
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<tbody>
<tr>
<td><strong>Employer perceptions</strong></td>
<td><strong>Rationale</strong>: Eliciting employers’ views can ‘address the issue of skill shortages directly, [without] relying on proxy measures as is the case for macro measures’ (p. 35). <strong>Caveats</strong>: Employers may intentionally or inadvertently overstate the extent of the skill-shortage problem. Employers may also fail to distinguish a tight overall labour market from a shortage of specific skills. <strong>Measurement issues</strong>: The best ways of managing the overstatement problem are to: (1) supplement the employer data with ‘hard’ macro data, for example on vacancies and the overall state of the labour market; and (or) (2) collect detailed data only from the employers that are known to have advertised a vacancy recently and thus are actively searching the labour market (p. 23).</td>
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<th><strong>Indicators</strong></th>
<th><strong>Rationale</strong></th>
<th><strong>Data sources</strong></th>
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<tbody>
<tr>
<td><strong>Employer-based indicators</strong></td>
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</tr>
<tr>
<td>1. SSV as a percentage of employment (by occupation)</td>
<td>Employers are best positioned to report on labour market conditions in their sector or in key occupations. But evidence is subject to misreporting and inconsistencies across firms.</td>
<td>Surveys of employers’ views, principally the National ESS (NESS).</td>
</tr>
<tr>
<td>2. SSV as a percentage of all vacancies</td>
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<td></td>
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<tr>
<td>3. SSV as a percentage of HTF vacancies</td>
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<tr>
<td><strong>Price-based indicators</strong></td>
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<tr>
<td>4. Percentage change in median hourly pay</td>
<td>Expected increase in wages in response to market pressures arising from an excess of demand over supply. But wages may be unresponsive (sticky) and pressures may be manifest in other (non-wage) changes.</td>
<td>Nationally representative employee surveys, principally the Annual Survey of Hours and Earnings (ASHE).</td>
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<tr>
<td>5. Percentage change in mean hourly pay</td>
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<tr>
<td>6. Relative wage premium to an occupation, controlling for age and region</td>
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*The Survey of Employers who Recently Advertised (SERA), collected by DEEWWR, is an Australian exemplar of this approach.*
### Indicators

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<tr>
<th>Indicators</th>
<th>Rationale</th>
<th>Data sources</th>
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<tr>
<td><strong>Volume-based indicators</strong></td>
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<tr>
<td>7. Percentage change in the number unemployed by sought occupation</td>
<td>These ‘represent the ways in which employers develop coping mechanisms in an effort to minimise the impact of anticipated shortages’ (p. 113). But changes in these measures may be caused by factors other than shortages.</td>
<td>Combination of data from administrative records JobCentre Plus (JCP) and national surveys (ASHE and LFS). Selected based on data quality and collection frequency.</td>
</tr>
<tr>
<td>8. Percentage change in hours worked for full-time employees</td>
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<tr>
<td>9. Percentage change in the number employed</td>
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<tr>
<td>10. Absolute change in the proportion of workers in the occupation for less than one year</td>
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<tr>
<td><strong>Other indicators of imbalance</strong></td>
<td></td>
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</tr>
<tr>
<td>11. Absolute change in median vacancy duration</td>
<td>Provides direct evidence of supply/demand imbalance, by comparing the number of vacancies to jobseekers and estimating vacancy duration.</td>
<td>JCP administrative data on advertised vacancies and counts of unemployment-benefit claimants.</td>
</tr>
<tr>
<td>12. Stock of vacancies to unemployment-benefit claimant-count by sought occupation</td>
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</tbody>
</table>

The MAC report then deals with the important issue of thresholds—that is ‘at what level we considered an indicator to demonstrate shortage’ (MAC 2008, p. 119). Their initial assumption in deciding these thresholds is that ‘an occupation is not showing signs of shortage if [it] is at the centre of the distribution for that indicator’ (p. 119). But by what margin above the median does a shortage occur? The MAC concludes that this question cannot be answered definitively or universally for each of its 12 indicators. Where the distribution permits, their preferred threshold is the median value plus 50 per cent of the median. An occupation is deemed to be in shortage on any indicator for which its value exceeds this primary threshold. In other cases (for instance, where the distribution of indicator values is non-normal or centred close to zero), the secondary threshold is values in the top quartile of the distribution. The MAC recognised that this second threshold entails an absolute cut-off: there will always be some occupations that are deemed to be in shortage where the top-quartile threshold is used (MAC 2008, p. 121).

Using these approaches, the MAC investigated the number of skilled occupations in the United Kingdom (out of 192 groups) that were likely to be in shortage according to its 12 indicators. It considered that there was ‘good top-down evidence for a potential shortage if an occupation passes [the threshold] on 50 per cent or more of the indicators’ (MAC 2008, p. 132). The percentage of indicators was used instead of the number of indicators, because the occupations did not always have complete data for all 12 indicators. The determinant of shortage was that an occupation passed the relevant threshold for at least half of the indicators for which it had data available. On this basis, the MAC found that 20 of the detailed skilled occupations it examined were likely to be experiencing conditions of shortage. These shortages spanned a wide range of occupations, from chief executives of major organisations to veterinarians, engineering technicians, midwives, computer engineers, and welders (MAC 2008, p. 123).
2.4.1.2.2 Subsequent reviews of the MAC skill shortage indicators

There have been two major external reviews of the MAC skill-shortage indicator framework described above. The first of these (Holt, Sawicki, and Sloan 2010) is more theoretical in content, and focuses on the economic justification for each of the indicators. The second (Frontier Economics 2009) examines the practical utility of the indicators and recommends ways of refining the indicators to maximise their empirical validity. This section briefly summarises the findings of the two review reports.

Holt, Sawicki, and Sloan (2010) endorse the MAC approach of monitoring potential shortages at the occupational level. They note that ‘in practical terms it is useful to think of skill shortages operating within boundaries: and occupations are perhaps the most obvious set of boundaries to use’ (p. 4). At the same time, they highlight an important assumption in the use of occupation-level indicators that is generally overlooked in the literature. This approach necessarily assumes that ‘there are many labour markets, that not only experience diametrically opposed pressures, but also experience little or no arbitrage between them’ (Holt, Sawicki, and Sloan 2010, p. 11).

Holt, Sawicki, and Sloan (2010) recognise that ‘there is no single “correct” measure of skill shortages and no theoretical benchmark’ (p. 5). This observation has important implications for developing imbalance indicators, as it ‘counsels against us being over-demanding in looking for clear theoretical justifications for the measures of skill shortages’ (p. 35).

Skill shortages can manifest in several ways:

Mechanisms include wage pressure (although not always), unfilled vacancies, plus other phenomena such as increased over-time working. Skill shortages will also be generated by strong growth in demand in the economy—something which can be assessed by comparing the ratio of reported vacancies or skill shortages to unemployment (Holt, Sawicki, and Sloan 2010, p. 4).

The observations of the review authors about the merits and limitations of the 12 MAC skill-shortage indicators are summarised in the table below. All page references refer to Holt, Sawicki, and Sloan (2010).

<table>
<thead>
<tr>
<th>Indicator grouping</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancy indicators</td>
<td>These have a strong intuitive appeal as measures of skill shortages. Vacancy duration has particular potential as an indicator. The ratio of vacancies to unemployment is harder to interpret as a measure of skill shortage. It is important to distinguish HTF vacancies from other vacancies, if the intent is to identify skill shortages. Otherwise, too many frictional, temporary vacancies will be misinterpreted as shortages.</td>
</tr>
<tr>
<td>Wage pressure indicators</td>
<td>Economic theory highlights pay increases over time as a good potential indicator of skill shortages. The MAC currently monitors annual percentage changes in mean and median hourly rates of pay. It also estimates the relative wage premium for employees in a given occupation, after controlling for differences in age and region. A problem with the latter indicator is that it refers to levels, not changes. The change in occupational relative pay levels over time is recommended as a slightly different but ‘much better’ indicator (p. 40).</td>
</tr>
<tr>
<td>Broader labour market indicators</td>
<td>The MAC currently monitors annual percentage changes in employment and unemployment by occupation. It is recommended that these be estimated relative to vacancies, to determine whether intervention is</td>
</tr>
</tbody>
</table>
### Indicator grouping

<table>
<thead>
<tr>
<th>Indicator grouping</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>needed to improve market matching-processes (p. 40). The change in hours worked is also used by the MAC as a signal of demand pressure. It is recommended that this indicator be expressed relative to total employment (for example average hours worked). Care is needed in how hours worked are measured, to avoid complications arising from unpaid overtime. The MAC also examines the proportion of employees with tenure of less than one year in their occupation. This may signal high turnover or churn, but it may simply represent high occupational growth (and not necessarily a skill shortage).</td>
</tr>
</tbody>
</table>

Overall, the review’s authors conclude that the 12 MAC indicators:

- are indeed related to the core notion of skill shortages but have different likelihoods of over- or under-predicting the scale of any shortages. Taken as a whole, it seems reasonable to think of them as a workable and pragmatic response to the inherent difficulties in pinning down the concept of skill shortages (Holt, Sawicki, and Sloan 2010, p. 41).

The report by Frontier Economics (2009) provides a sophisticated review and critique of the MAC skill-shortage indicators. Many of the principles and approaches outlined in this report are likely to be relevant for developing skills-imbalance indicators in Australia.

The Frontier Economics report has two main parts. The first offers refinements for the 12 existing MAC indicators; the second suggests refinements to the underlying methodology. The report generally offers support for the 12 current indicators and endorses their retention by the MAC. No major overhaul is prescribed, but minor revisions are suggested. These include averaging one of the indicators over a longer time period to avoid spurious variation between data observations, and improving the regression specification for another indicator (Frontier Economics 2009, p. 2).

The following general comments from the Frontier Economics report about skill-shortage indicators and data quality are likely to be applicable in the Australian context:

- **Period-to-period data volatility:** Many estimates from the UK Labour Force Survey are found to be potentially unreliable at detailed occupational levels. Many occupation cell sizes in the LFS (Labour Force Survey) are found to be small (for example, 30 per cent of occupations have fewer than 10 observations).

- **Coverage of key data sources:** For example, several of the MAC indicators are based on administrative data for unemployment-benefit claimants. These data are found to be far from comprehensive, particularly for unemployed people who were previously working in skilled occupations (who are less likely to be claiming benefits).

- **Measurement intervals:** This issue is illustrated in relation to the data on median vacancy duration. In the form that it is currently monitored by the MAC, this indicator is sensitive to the choice of starting period and the length of time over which the measurement is taken. Seasonality in the data particularly affects the comparisons (Frontier Economics 2009, p. 22). It is recommended that the average vacancy duration be taken over a 12-month period and be compared with an equivalent average for the previous year.
- **Estimating the relative wage premium in an occupation**: The MAC methodology estimates a regression model within occupations, using age and region as control variables. The Frontier Economics report recommends that the logarithm of wages be used instead, and that the set of control variables in the regression equation be expanded to include sex, marital status, full-time or part-time employment, and dummies for qualification levels.

- **Occupational unemployment rates**: One of the recurring criticisms in the literature on these statistics is that they typically relate to the occupation previously held, rather than the one that the unemployed person is actually seeking. The JCP data allow for empirical testing of this criticism, as both the ‘usual’ and ‘sought’ occupation of the unemployed are recorded in these data. It is found that ‘there is very little difference between the two’ (Frontier Economics 2009, p. 17).

The second part of the Frontier Economics report deals with the conceptual relevance of the MAC indicators and the reliability of the data supporting them. It evaluates how well each indicator ‘works’ as a warning sign of shortage. The following table summarises the report’s findings. All page references are to Frontier Economics (2009).

<table>
<thead>
<tr>
<th>MAC indicator category</th>
<th>Conceptual relevance and reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer-based indicators</td>
<td>There are three indicators, all of which are based on vacancy data from the NESS. The most useful of these indicators is seen to be ‘skill shortage vacancies as a percentage of employment by occupation’, which is ‘clearly a potential measure of skill shortage’ (p. 37). The other two indicators are not seen as direct measures of skill shortage.</td>
</tr>
<tr>
<td>Price-based indicators</td>
<td>There are three indicators, two concerned with the change in mean or median hourly pay and another concerned with the relative wage premium to an occupation. One conceptual difficulty with the change in hourly pay measures is that ‘wages in an occupation don’t only change in response to changes in skill shortages. This is most obviously true in markets—like the public sector—where wages are effectively bureaucratically determined’ (p. 38). The measure of occupational wage premium, on the other hand, is about the level not the change in price. Under strong assumptions, it could be seen as a measure of ‘shortage in equilibrium’ (that is the premium paid to individuals in one occupation over other identical individuals in another occupation). But this requires the assumption that human-capital wage equations capture all of the meaningful differences between individual characteristics—a very strong assumption (p. 39).</td>
</tr>
<tr>
<td>Volume-based indicators</td>
<td>There are four indicators, based on changes in employment and unemployment, hours worked for full-time employees, and the proportion of workers with short tenure (less than one year) in their occupation. These indicators are generally seen as less well-connected to the core issue of skill shortage. The percentage change in employment, for instance, has ‘no necessary connection with shortage, those swift increases ... may be an indication of pressure in the labour market’ (p. 40). The measure of short tenure is even more problematic, since ‘it could be more a measure of a labour market functioning well ... than an indicator of skill shortage’ (p. 41). The measure of change in hours worked</td>
</tr>
</tbody>
</table>
from the above observations, Frontier Economics reaches several conclusions about the MAC skill-shortage indicators:

- The ones that can potentially be seen as direct shortage indicators are: SSV, wage and hours changes, changes in median vacancy duration, percentage change in unemployment and the vacancy-unemployment ratio.

- The indicators that are regarded as indirect measures of shortage are: the change in employment and the change in the proportion of workers in their occupation for less than a year. These indicators ‘may be related to skill shortages, but the conceptual link is less clear’ (Frontier Economics 2009, p. 43).

- Finally, there is the measure of the relative wage premium to a particular occupation. This is seen as a different sort of indicator, one that is not part of the main suite, because it is ‘attempting to use different wage levels as an indicator of (long-run) shortage’ (Frontier Economics 2009, p. 43, italics in original). The authors are unsure about the value of such a measure of ‘equilibrium shortage’ and they suggest that it warrants ‘further consideration’ by the MAC.

The Frontier Economics report also includes a careful evaluation of the data supporting each of the MAC indicators. Several worthwhile robustness tests are undertaken. It is not necessary to record the findings from these tests, but it is clearly of value to note what types of information and analysis are undertaken in ascertaining data quality and limitations, since similar approaches may eventually be necessary with the Australian data. The most instructive tests are:

- Simple correlations between indicators: do they yield similar or conflicting conclusions? The report finds that correlations between the 12 MAC indicators are often weakly positive or even negative. This raises the possibility of underlying data and (or) measurement problems (Frontier Economics 2009, p. 47).

- ‘Noisy’ data due to small numbers of observations: this is particularly problematic with indicators that are based on percentage changes between two points in time, where the measures are highly volatile from period to period, and accordingly should not be given a high weighting (Frontier Economics 2009, p. 44 and p. 49).

- Negative autocorrelation between observations for the same indicator at different times: this suggests inconsistency in measurement or importance. Where a negative autocorrelation is found, it is recommended that measurement occur over a longer time
period. The report recognises that this approach will reduce the immediacy of the available evidence (Frontier Economics 2009, p. 54).

Based in part on the above data-quality issues, Frontier Economics proposes several modifications to the MAC indicator methodology:

- **Weighting:** Using weights for the indicators would recognise that they vary in conceptual relevance and data reliability. This approach entails some subjectivity and judgement, but is seen as reasonable and appropriate (Frontier Economics 2009, pp. 62-63). Where the quality of data supporting an indicator is lower, that indicator would be given a lower (or possibly zero) weight in the analysis.

- **Averaging:** Taking the averages of percentage changes over longer time periods would avoid problems with negative autocorrelation between estimates for the same indicator at two different times.

- **Accounting for cyclical effects:** The report recommends that the MAC explore ways of linking its skill-shortage indicator thresholds to the aggregate economic cycle. This would introduce appealing ‘automatic stabiliser properties’, because the threshold levels would be adjusted during economic expansions and contractions. The report recognises that this recommendation is challenging to implement and ‘requires more analysis’ (Frontier Economics 2009, p. 74).

- **Thresholds:** The report recommends using a percentile-score approach to thresholds, rather than a pass-fail approach. The report notes that a percentile score ‘carries considerably more information about an occupation’s relative performance on each indicator’ (Frontier Economics 2009, p. 70).

### 2.4.1.2.3 The MAC review of the skill-shortage indicator framework

In 2010, the MAC completed its comprehensive review of the methodology used to identify occupational skill shortages that might sensibly be filled by immigrants to the United Kingdom. The review refers to and responds particularly to the recommendations made by Frontier Economics (2009). The MAC immediately adopted some of these recommendations (or indicated an intention to adopt them in the future) but has rejected others or left them aside for further research and consideration. The MAC’s responses are summarised in the table below. All page references are to MAC (2010).

<table>
<thead>
<tr>
<th>Area of concern</th>
<th>Action taken or proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data sources</td>
<td>This covers matters of reliability and frequency. For instance, the NESS is identified as the best existing source of vacancy data, but it is collected biennially and only covers England (p. 47). The MAC notes that it would be ‘extremely valuable’ for it to have an ESS for all of the United Kingdom that follows a consistent methodology to enable cross-country comparison. Such data have more recently become available in the ESS conducted by the UKCES, and described earlier.</td>
</tr>
<tr>
<td>Indicators</td>
<td>Frontier Economics (2009) made a range of recommendations which the MAC considered to be useful and well set out. Many of these suggestions are about overcoming or at least reducing data volatility. For instance, it suggested ‘smoothing’ some of the indicators by averaging over longer time periods, and checking for negative autocorrelation between time periods. The MAC noted its intention to adopt three of these suggestions (see the top of p. 60).</td>
</tr>
<tr>
<td>Area of concern</td>
<td>Action taken or proposed</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Thresholds</td>
<td>There are two main issues here. The first is the usefulness of ‘relative’ versus ‘absolute’ thresholds. The MAC notes that it is ‘theoretically appealing to strive for an absolute threshold, because it allows the number of occupations passing a threshold to vary with the labour market conditions’ (p. 53). The second issue (related to the first) is whether it is advisable to anchor (or ‘benchmark’) the indicators to a point in the economic cycle. The MAC has experimented with this (see Box 5.2, p. 56) but decided not to modify its existing methodology without undertaking further research on the feasibility of the benchmarking option and its implications for the indicators.</td>
</tr>
<tr>
<td>Aggregating the indicators</td>
<td>The two main issues here are: whether to weight the indicators, and whether some approach other than the ‘pass-fail’ approach should be used to decide when an occupation is in (or at risk of) shortage. The MAC noted that there is subjectivity in any weights and has declined to take this approach (p. 58). It also notes that the ‘percentile-score’ approach, which Frontier Economics recommended as an alternative to the pass-fail approach, may not result in very different conclusions about which occupations are regarded as being in shortage (p. 59).</td>
</tr>
</tbody>
</table>

The MAC report also considers the merits of using labour demand forecasting to understand future skill needs, as recommended by Holt, Sawicki, and Sloan. (2010). It notes that the Committee had ‘not been able to identify any suitably robust indicators of future skill needs at the 4-digit SOC [occupation] level to inform our top-down analysis’ (MAC 2010, p. 43). This assessment suggests that labour demand forecasting is not seen as an important addition to the current MAC framework for identifying occupational skill shortages.

It is apparent from the foregoing discussion that the UK literature on skills imbalance indicators is helpful for the development of indicators of skills imbalance for Australia, and we take full account of them in our proposals. The quality of evidence and evaluation is high, in relation both to the available data sources and the indicators chosen.

We next consider the indicator methodologies used in other developed countries, before returning to the Australian context.

2.4.2 Other approaches internationally

Researchers in other countries have also contributed to the development of understanding about skills imbalance indicators, although these offerings are more fragmented and less current than in the United Kingdom.

The World Health Organization has contributed a useful transnational perspective on indicators of imbalance (Zurn et al. 2002). While the paper is focused on the health workforce, it contains ideas that are likely to be of wider relevance.

These authors recognise, as others have, the need for a multidimensional approach to indicators and for high-quality supporting data:

Relying on a single indicator is insufficient to capture the complexity of the imbalance issue. It is suggested that a range of indicators should be considered, to allow for a more accurate measurement of imbalances, and to differentiate between short and long-term indicators. In addition, further efforts should be devoted to improve and facilitate the collection of data (Zurn et al. 2002, p. 4).
The Zurn et al. (2002) paper outlines a number of potentially useful indicators, grouped into ‘four main categories’. The first three of these appear to have relevance beyond the health workforce, while the fourth is unlikely to be useful:

- **Employment indicators:** for example vacancies, employment growth, occupational unemployment rate, turnover
- **Activity indicators:** for example overtime work
- **Monetary indicators:** for example rising relative wages; rates of return on educational investment
- **Normative population-based indicators:** for example nurse-patient ratios

These indicators are mostly the same as those discussed above. In the table below, we draw out the novel observations. All page references are to Zurn et al. (2002).

<table>
<thead>
<tr>
<th>Proposed indicator</th>
<th>Measurement and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancies</td>
<td>The indicator is either the mean vacancy rate by occupation, or a three-month vacancy rate (representing HTF positions). The authors note that: ‘One major limitation of the vacancy-rate measure is that there is no single level of vacancies considered to reflect shortages’ (p. 34). Hence, it is the change and not the level that matters. Another potential problem is that vacancy statistics may understate the degree of shortage, if employers do not bother to advertise for the positions they think will be hard to fill (p. 35).</td>
</tr>
<tr>
<td>Employment growth</td>
<td>A relatively high growth in employment in an occupation could indicate that: (a) a shortage is looming; (b) a past shortage is being corrected; or (c) that there is a growing risk of surplus (p. 35).</td>
</tr>
<tr>
<td>Turnover rate</td>
<td>Turnover is easily measured and imposes costs that may be both direct (for example recruitment) and indirect (for example lower morale, lower group productivity). But turnover need not imply poor job quality or skills mismatch.</td>
</tr>
<tr>
<td>Relative wages</td>
<td>The choice of reference group for relative wage estimates is important (p. 38). A complication is that relative wages change for reasons that are not related to skills imbalances, such as regulations, union bargaining, and monopsony power of employers (p. 38).</td>
</tr>
<tr>
<td>Rate of return</td>
<td>Calculated by estimating the costs of education investment, relative to the expected higher financial returns achievable as a result of that investment. A shortage is implied by a rate of return above that of a person who has made a similar investment (p. 38). The authors note that ‘the rate of return is a relatively sophisticated indicator and provides valuable information, but it is more difficult to calculate in comparison to other indicators’ (p. 39). The rate of return is seen as an indicator that is distinct from the change in the relative wage.</td>
</tr>
</tbody>
</table>

Zurn et al. (2002) illustrate how these proposed skill-shortage indicators would operate in practice, using registered nurses in the United States as a case study. They show that some of the indicators have increased (for example vacancies), some have decreased (for example turnover), and others have remained stable (for example real wages) for workers in this occupation (Zurn et al. 2002, Table 4, p. 42). The authors conclude that ‘most of these indicators suggest the existence of conditions
reflecting a shortage for registered nurses in the United States’. They qualify this remark, however, by noting that ‘the looming shortage has not yet given rise to a substantial wage increase’ (Zurn et al. 2002, p. 43). This statement highlights the larger challenge of interpreting evidence of skill shortages where the indicators appear to be moving in different directions. Even for a relatively clearly delineated occupation, such as nursing, there may not be a uniform change in every indicator of skill shortage. Judgement is required in weighing the various indicators and reaching a view about the current state of the labour market for each occupation being evaluated.

Veneri (1999) also discusses the complications involved in using multiple indicators to determine whether a skill shortage is present in an occupation. A major concern, as noted above, is that the indicators may yield different or even contradictory conclusions. This presents significant challenges in terms of both the choice of indicators and the interpretation of their signals. We should not expect each specific indicator to behave in a uniform way (otherwise it would be unnecessary to have multiple indicators), but we should expect each to capture a dimension of behaviour or response that can be meaningfully interpreted as evidence of a skills imbalance. A further issue is that indicators may be impaired by the absence of data, or by weaknesses and imperfections in the data collected. In many occupations, for instance, ‘data on supply … are incomplete or unavailable’ (Veneri 1999, p. 18). One reason for this, as discussed earlier in this review and demonstrated further in Appendix 7, is that there is rarely a neat correspondence between a specific field of study and employment in a specific occupation.

Veneri (1999) identifies three primary indicators of occupational shortage relating to changes in: (1) employment, (2) full-time median wages, and (3) unemployment. The paper develops predictions about how each of these indicators should behave if the occupation is in shortage (Veneri 1999, p. 18). These predictions are:

- **Strong employment growth**: Is the occupation’s employment growth rate (measured for wage and salary earners only) at least 50 per cent faster than the average growth for all occupations?
- **Relative wage increases**: Is the occupation’s wage increase (measured as the median weekly earnings of full-time wage and salary earners) at least 30 per cent faster than average?
- **Reductions in the occupational unemployment rate, or the maintenance of an already low rate**: Is the occupation’s unemployment rate (measured for wage and salary earners only) at least 30 per cent below average?

The paper then carries out a brief empirical analysis of the available data to test claims that the United States was experiencing occupational shortages during its strong economic expansion phase from 1992 to 1997. The results indicate that only seven of 68 occupations met all three of the above conditions of shortage during this period (Veneri 1999, p. 19).

Veneri’s methodology is notable for its simplicity and its use of average comparisons. Occupations are judged to be in shortage if they exceed certain thresholds given by the average outcome for all occupations. This raises the interesting question of what averages an Australian analysis of skills imbalances might use. One possibility would be to use the average outcome for all occupations, following Veneri (1999). An alternative would be to use the average for occupations on the SpOL. This latter approach would reflect the average changes for a subset of specialised occupations that

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8 An important data limitation at the time in the United States was the absence of ‘comprehensive [that is nation-wide] occupational vacancy data’ (Veneri 1999, p. 18). For this reason, the paper says little about vacancies, apart from acknowledging their importance and recommending that data collection be improved.
are considered to be more susceptible to skills imbalance (either surplus or shortage). We return to the issue of benchmarking in Part 4 of this report.

Like the UK government, the New Zealand government has commissioned external advice on indicators of skill shortages that may be relevant to immigration policy. The report it commissioned (Infometrics Ltd 2006) provides useful guidance for developing Australian skills-imbalance indicators, given the similarities between the two countries’ data, particularly in the area of vacancy statistics.

Infometrics Ltd (2006) identifies seven ‘ideal’ indicators of skill shortages for New Zealand, three of which are regarded as the primary measures. The table below summarises their comments about each of these primary indicators. All page references are to Infometrics Ltd (2006).

<table>
<thead>
<tr>
<th>Suggested indicator</th>
<th>Rationale, data source, and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancy fill rate</td>
<td>A low rate provides ‘evidence that employers are having difficulty filling the vacancies that they have’ (p. 19). The data source used in New Zealand is the SERA, which is equivalent to Australia’s survey of the same name. The standard applied in New Zealand is that a vacancy fill rate below 80 per cent in an occupation represents a shortage. But this threshold is arbitrary and has ‘no formal basis’ (p. 21).</td>
</tr>
<tr>
<td>Relative volume of vacancies</td>
<td>A high number indicates ‘strong demand for the occupation relative to the potential supply’ (p. 19). What constitutes ‘high’ is not specified. The number of vacancies ‘by itself is of limited value, but gains value when compared with benchmark data’. Vacancies should therefore be expressed relative to other measures of employment (or unemployment) for an occupation. A limitation, noted elsewhere, is that vacancy counts from job advertisements may underestimate total demand. They should be treated as proxy indicators of unmet demand (p. 22).</td>
</tr>
<tr>
<td>Wage pressure</td>
<td>Wages are expected to increase above the average rate if there are genuine skill shortages. The report notes that ‘a skill shortage that does not result in wage pressure is likely to have other labour market performance issues’ that will not be resolved by, and may be exacerbated by, increasing labour supply (p. 20). The report recommends that wage-growth measures be adjusted for changes in productivity. In New Zealand (and Australia) this objective is most likely to be met by using the Labour Price Index data, which estimate the change in wage rates for a set of constant-quality jobs. The utility of these data for developing occupational skills imbalance indicators is limited, however, by a lack of occupation-level estimates.</td>
</tr>
</tbody>
</table>

2.4.3 Australian approaches

Shah and Burke (2005) were among the first to consider how skills imbalances can be identified and measured using Australian data. They note, as others have, that ‘it is rarely possible to provide an unambiguous single measure of skills imbalance. It is thus important to use a range of measures’ (p. 54). They define ‘two broad classes’ of measures. One relies on market economic indicators, such as vacancy statistics and relative wage movements. The other relies on targeted employer-based surveys and focus groups.

The authors acknowledge that data considerations (availability and reliability) are paramount to the choice of indicators. Other considerations they note are: the level of aggregation; time dimension (how often to monitor); and spatial dimension (awareness of possible regional variations). They make the useful point that imbalances are more likely to be found at highly disaggregated levels of
analysis, ‘because imbalances tend to offset each other in aggregate data’ (p. 55). Their point is not that disaggregated analysis is misleading, but rather that aggregate analysis may conceal important differences that are present at more detailed (regional, occupational, or demographic) levels.

The most useful part of Shah and Burke’s paper, for our present purposes, is their discussion about which imbalance indicators to use. They make the following observation, which relates closely to our current research aims:

Since a single indicator of skills shortage does not exist, a suite of indicators is used to assess job market conditions. Based on these indicators and judgement, a view is then formed on the likelihood of a shortage or a surplus. Often these indicators have to be observed over time before firm conclusions can be drawn on the existence of an imbalance (Shah and Burke 2005, p. 56).

The authors discuss four indicators in detail. These are:

1. **Vacancy rates.** They caution that these may overstate market needs, because workers are mobile between jobs, both within and across occupations.

2. **Occupational unemployment rates.** They caution that there is a risk of mismeasurement with these data, as the information is often about a person’s last occupation.

3. **‘Net’ vacancies.** The ratio of 1 to 2 in this list. The ratio is easier to produce and interpret at the aggregate labour market level than at the detailed occupation level.

4. **Relative wage differentials.** This might include, for example, the gap between average wages in one occupation and average wages for all workers over time. A widely noted complication is that wage changes reflect other factors that are not related to skill shortages.

Shah and Burke (2005) also mention other indicators that may be ‘potentially useful’, depending on data reliability. These are:

- Hours and intensity of work (for example overtime)
- Production levels
- Change in employment levels
- Flows of new entrants and leavers
- Training expenditure by firms
- Levels of subcontracting
- Hiring standards
- Levels of immigration and emigration

Richardson (2009) discusses the measurement of skill shortages in Australia and identifies vacancies as a particularly useful indicator. However:

what is important about vacancies as an indicator of skill shortage is that they are hard to fill. This is signalled by the fact that employers take a long time to fill the vacancy. Thus the key empirical indicator of shortage is the duration of (or time taken to fill) vacancies. The absolute number of vacancies on its own tells us little: a large number, for example, may just indicate that this is an occupation in which it is normal to have high turnover (Richardson 2009, p. 332).

A general problem with skill-shortage indicators is that they rely heavily on employers’ perceptions of the labour market. Employers may exaggerate claims about skill shortages because they do not bear the costs (to individuals or the wider economy) of surpluses and mismatches. An alternative to
reliance on employers’ views is to consult recruitment agencies (Richardson 2009, p. 349). Another approach—which is close to our present research aims—is to ‘construct an index that incorporates the various signs of labour shortages that the market will generate’ (p. 349). Relevant indicators include:

- Rising wages
- Low unemployment
- High or persistent vacancies
- Increasing use of overtime (paid or unpaid)
- Increasing use of temporary workers
- Improving terms of employment
- Low rates of redundancy or dismissal and high rates of quits
- People employed with lower than average levels of qualifications or experience
- Increasing use of ‘non-traditional’ workers (older, migrant, male/female depending on job)
- Other evidence of substitution effects (either capital for workers, or less for more skilled)

Perhaps the most important point that Richardson (2009) makes about the above set of indicators is that ‘in practice, a sub-set of this list should be satisfactory, with components chosen to reflect the quantity and quality of data that are available or easily collected’ (p. 349). The insight is that the final set of indicators should be selective. Restricting the set of indicators is recommended to avoid mixed signals that do not lead to clear policy responses, and to reduce the reliance on lower-quality data.

The Australian government collects and publishes a wide array of information about occupational labour markets and skills imbalances. The Department of Education, Employment and Workplace Relations (DEEWR) tracks job vacancies, both through a count of advertisements on major jobseeker websites and through a targeted, phone-based ‘Survey of Employers who have Recently Advertised’ (SERA). The latter assesses labour market conditions for between 120 and 150 key skilled trades and professional occupations, by reference to the number of job applicants per vacancy, the number of ‘suitable’ applicants, and the proportion of vacancies filled within four to six weeks of advertising. The SERA is not a random or representative sample of Australian employers and it cannot be used to generate comprehensive estimates of vacancy duration or vacancy-to-unemployment rates for the whole Australian labour market. Nonetheless, it provides valuable evidence of demand conditions and recruitment difficulties for the particular occupations that it covers, and is therefore an essential resource for analysing skills imbalance in Australia.

The SERA is a key source of information for DEEWR’s biennial publication, *Skill Shortages, Australia*, which also draws upon other quantitative labour market indicators and consultations with industry and occupational associations (see DEEWR 2012). This publication describes employers’ recruitment experiences and assesses the prevalence and severity of shortages, both in aggregate and for various skilled occupations. The reports summarise the quantitative information from SERA about changes in vacancy fill rates, average numbers of suitable job applicants per vacancy, and the overall proportion of assessed occupations experiencing skill shortage conditions at each point in time. From 2007-08 to 2011-12, for instance, the proportion of all SERA occupations assessed in shortage fell from above 80 per cent to below 60 per cent (DEEWR 2012, p.5). In addition, the *Skill Shortages, Australia* reports contain qualitative information about employers’ perceptions of the labour market and why some may be unable to attract the skilled workers they need. For instance, the June 2012 report notes that some employers were leaving vacancies unfilled because applicants lacked the desired work experience, even though they may have had an appropriate qualification (DEEWR 2012, p.4).

Extensive information about occupational labour markets is collated and communicated by DEEWR on the Job Outlook website (www.joboutlook.gov.au). The website provides a facility for jobseekers, students, and researchers to view and compare the latest information about entry requirements and
employment prospects for many different occupations. A range of statistical information is provided (in numerical and graphical formats) about: employment growth, average weekly earnings, average working hours, demographic composition (e.g. gender and age), educational attainment of current employees, job turnover and job vacancy rates. In addition, DEEWR provides information about the expected future prospects for each occupation, based on forecast growth rates and the industries in which the occupation’s employees are concentrated. This information is presented qualitatively; for instance, the five-year employment growth forecast for Accounting is described as ‘Strong’ while the vacancy rate for that occupation is ‘Moderate’. For many of these indicators, DEEWR also provides comparative data for the whole Australian workforce, so that prospective workers can assess each occupation’s favourability on essential criteria relative to the national average. The wide-ranging and high-quality nature of the Job Outlook information makes it a valuable tool for career guidance and labour market research.

The Australian Workforce and Productivity Agency (AWPA; formerly Skills Australia) is responsible for monitoring the changing skill needs of the Australian economy and advising the Australian government on policy measures to meet those needs. AWPA conducts ongoing in-house analysis of labour market trends, commissions external research to inform its recommendations, and publishes annually-updated versions of two key lists that contribute to government policy-making. The first of these is the Specialised Occupations List (SpOL), which identifies occupations in which market forces are less likely to correct skill demand and supply imbalances – i.e. where there is a risk of ‘market failure’ due to incomplete adjustment. Occupations are included in the SpOL where they meet two of the following three criteria: (1) a long training lead-time; (2) high importance to the Australian economy; and (3) high utilisation of the underlying qualifications leading into the occupation; and where the information available for assessing these three criteria is of sufficiently high quality. The 2011 version of the SpOL, which is a major reference for this report, listed 100 ‘unit group’ (4-digit) occupations from the Australian and New Zealand Standard Occupational Classification (ANZSCO).

The second key list maintained by AWPA is the Skilled Occupation List (SOL), which guides the selection of independent skilled immigrants to Australia under the General Skilled Migration Programme of the Department of Immigration and Citizenship (DIAC). The SOL is a subset of the SpOL; occupations can be included in the latter without being included in the former. This can happen, for instance, where an occupation is considered likely to be in surplus in the medium to long term, based on evidence of its workforce demographics, future employment growth expectations, and trends in student enrolments/completions. The purpose of the SOL is to identify those specialist skills that are essential and under-provided for in the Australian economy, and that can be sourced from abroad without disrupting domestic labour and training markets. The development of the SOL involves extensive labour market analysis, including use of the DEEWR resources noted above, and further consultation with industry, trade unions and other relevant professional organisations. The current version of the SOL includes 192 highly-detailed (6-digit) ANZSCO occupations.

The Australian Bureau of Statistics (ABS) has also investigated the range of skill-shortage indicators available for Australia. In 2006, it published a two-part study of skill shortages in Western Australia. The first of these parts (ABS 2006a) discusses the identification of skill shortages, and is most useful for our present purposes. The main indicators identified in the ABS analysis are shown in the table below. For each potential indicator, we note the rationale for its use (where one is given), the data sources, and any potential complications in its use. The following indicators ‘are not direct measures of shortages, but large rates of change in these indicators can point to the emergence of a skills shortage, in the absence of complete labour market adjustment’ (ABS 2006a, p. 15).
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rationale, data source, and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancies</td>
<td><strong>Data:</strong> DEWR Skilled Vacancies Index (trend). This index was based on counts of newspaper advertisements in major city newspapers, but has subsequently been discontinued. It was replaced by the Internet Vacancy Index (IVI) which counts job advertisements from major websites (for example seek.com.au). IVI data are published in monthly reports, and can be downloaded at the detailed (4-digit) occupation level from the DEEWR website.</td>
</tr>
<tr>
<td>Employment</td>
<td><strong>Rationale:</strong> ‘During a skills or labour shortage, strong growth in demand for labour will initially lead to growth in employment as any excess labour is absorbed, before being constrained by the availability of labour, including skilled labour’ (p. 17). <strong>Data:</strong> Trend employment growth from the LFS. <strong>Complications:</strong> Employment data are highly volatile at a detailed occupation level, which may create the appearance of shortages (or surpluses) when none exist.</td>
</tr>
<tr>
<td>Occupational unemployment rates</td>
<td><strong>Rationale:</strong> ‘The unemployment rate ... can be expected to decline during a skills or labour shortage, as businesses utilise a greater proportion of workers in the labour force’ (p. 17). <strong>Data:</strong> LFS <strong>Complications:</strong> ABS does not publish occupational unemployment rates in detailed occupations. The quarterly LFS data cubes provide data on occupation of last job for unemployed persons, but only at the 1-digit occupation level. DEEWR commissions the ABS to provide 4-digit occupational data to inform its Job Outlook reports, but the estimates are not published and are only used to make qualitative judgements about labour market conditions in each occupation.</td>
</tr>
<tr>
<td>Labour force participation rates</td>
<td><strong>Rationale:</strong> ‘During a period of skills shortage or strong labour demand, participation in the labour force can be expected to increase, as improved job opportunities and employment conditions encourage people to enter the labour market’ (p. 18). <strong>Data:</strong> Trend participation rates from the LFS (need to be disaggregated by sex). <strong>Complications:</strong> Ambiguous link between overall participation rate and specialised occupations. May be possible to focus on participation rates of graduates from key fields of education that are most relevant to specialised occupations on the SpOL.</td>
</tr>
<tr>
<td>Hours worked</td>
<td><strong>Rationale:</strong> ‘An increase in hours worked can be indicative of a skills or labour shortage, as employers try to make the most of their existing workforce’ (p. 18). <strong>Data:</strong> Either LFS data on average weekly working hours, or Survey of Employee Earnings and Hours (EEH) data on weekly hours worked by non-managerial adult employees. In both cases, data are available for detailed occupations.</td>
</tr>
<tr>
<td>Wages</td>
<td><strong>Rationale:</strong> ‘When the labour market is “tight” or the demand for labour (including skilled labour) is well above supply, the price of labour rises. During these times, workers are in a stronger position to bargain for larger wage increases and businesses tend to pay higher wages to retain or attract workers’ (p. 19). <strong>Data:</strong> ABS Labour Price Index (LPI). <strong>Complications:</strong> LPI data are not published by occupation, but disaggregated data are available by industry, sector (public and private), and State and Territory.</td>
</tr>
</tbody>
</table>
The second part of the analysis of skill shortages for Western Australia (ABS 2006b) is less useful for our purposes, because it deals with the causes and consequences of shortages, rather than with their identification. Nonetheless, it includes some additional suggestions about indicators that may be relevant. The table below summarises the most unusual of these.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rationale, data source, and limitations</th>
</tr>
</thead>
</table>
| Workforce ageing           | **Rationale:** ‘An ageing workforce detracts from the supply of workers in an economy by raising the rate of retirement from the labour force’ (p. 28).  
**Data:** LFS. The measure is the proportion of workers aged 55 years or over. This idea could be extended to specific occupation workforces.                                                                                                                                                                                                                                                                                                                                                             |
| Skilled migration          | **Rationale:** ‘A potentially large and immediate supply of skilled workers can come through migration’ (p. 30).  
**Data:** Net overseas migration is defined as ‘the aggregate of Permanent arrivals, Long-term residents returning, and Long-term visitors arriving, less the aggregate of Permanent departures, Long-term residents departing, and Long-term visitors departing’ (p. 30). The ABS produces *Overseas Arrivals and Departures* (ABS cat. no. 3401.0) which includes relevant data. The Commonwealth Department of Immigration and Citizenship (DIAC) also collects administrative data on immigrant arrivals under different visa classes. The most useful of these are the numbers of approved arrivals under the subclass 457 visa scheme, which enables employers to sponsor temporary skilled immigrants for positions that are unable to be filled by Australian workers.  
**Complications:** Contribution of migration to reducing vacancies in an occupation may be clouded by movements between occupations or non-participation in the workforce.                                                                                                                                                                                   |
| Education and training     | **Rationale:** ‘given there is a strong relationship between skilled workers and education and training, the number of people participating in education and training, and the types of education and training being undertaken, should shed some light on why certain skills are in short supply’ (p. 32).  
**Data:** The report focuses especially on apprentice/apprentice commencements and completions. Data source is National Centre for Vocational Education Research (NCVER) *Australian VET Statistics*. Data may also be available from the ABS SET.  
**Complications:** Deficiency of skills may be quantitative or qualitative. ABS report notes that, in Western Australia, ‘skill shortages appear to be more the result of an insufficient number of persons participating in education or training [that is quantitative], rather than the fields in which they are studying not matching the skills that are in high demand [that is qualitative]’ (p. 32).                                                                                     |

State government departments have also contributed to the identification and measurement of skill imbalances in Australia. The South Australian Training and Skills Commission (TASC) publishes annual reports with detailed statistics on skills and workforce development in that State. The Commission’s most recent report (Training and Skills Commission 2011) considers the outlook for demand and supply within 87 specialist occupations. The criteria used to identify these occupations ‘align closely with those used by Skills Australia to identify specialised occupations at the national level’ (Training and Skills Commission 2011, p. 26). These criteria are: Long lead time; High use; Opportunity cost; and Industry intelligence. Eighty-seven occupations from the ANZSCO were found to meet these four criteria in South Australia in 2011, and the majority of these (52 out of 87) were professional occupations.
The Commission notes that ‘the criteria used [above] to define a specialist occupation do not, of themselves, indicate whether an occupation is currently facing a prospective excess or shortage of skills’ (Training and Skills Commission 2011, p. 26, italics in original). Its primary interest is to identify where imbalances in supply and demand were likely to occur over the five-year forecast period. Further analysis is presented in the report to determine which of the specialist occupations are expected to have:

a) A sufficient supply of qualifications to meet industry demand
b) An insufficient supply
c) A supply that is more than sufficient.

The Commission considers supply to be ‘sufficient’ when:

the projected difference between demand and supply is expected to be within plus or minus two times the standard error of the imbalance for qualifications associated with that occupation. In other words, where the difference is significant and unlikely to be the result of chance (Training and Skills Commission 2011, p. 27, footnote 17).

The assessments of whether each occupation would have sufficient, insufficient, or more than sufficient supply were made using three main information sources:

1. Modelling comparisons between total projected demand and supply. Projections were made with and without the contribution from net migration, reflecting the Commission’s view that ‘migration should not be seen as a long-term strategy to address skills needs—rather it should act as a “safety valve”’ (p. 27).
2. Whether the occupation is currently in shortage in South Australia, as determined by the skill-shortage research of the Commonwealth DEEWR.
3. Evidence from industry stakeholders that supports a different conclusion from the modelling.

Applying this approach, the Commission concludes that a majority (50/87) of specialist occupations in South Australia would have a sufficient labour supply to 2014–15. A minority (33/87) would have an insufficient supply, and a few (4/87) would have a more than sufficient supply. Most of the occupations for which the Commission foresaw an insufficient supply were reliant upon university graduates. These occupations include accountants, mining engineers, veterinarians, and psychiatrists (Training and Skills Commission 2011, p. 28).

2.5 Conclusions

There are consistent themes in the literature on measuring the extent of skills shortages. Very little attention is paid to the problem of skills surpluses, but the strategies for measuring shortages are mostly symmetrical and could equally be applied to the identification of surpluses.

The main themes are:

- Multiple indicators are required, because no single indicator will do the job
- Information is needed at quite a detailed level of occupation
- The most widely utilised indicator is persistent (HTF) vacancies for the specific occupation, expressed as a proportion of total employment in the occupation
- Growth in employment and in overtime hours provide complementary evidence
- In theory, relative wages would rise (fall) for occupations in shortage (surplus), but in practice this will often not occur
The rate of return to relevant qualifications should rise if there is a shortage, but in practice this is hard to measure or observe.

- Employer opinions are useful but must be interpreted with caution
  - The term ‘skill shortage’ is interpreted in a variety of ways
  - There is a natural bias to want more and better suited applicants and employees

- Inadequate detail and quality in the data is a serious constraint on the generation of reliable indicators of skill disequilibrium at the detailed occupation level

- The threshold at which an indicator is deemed to show ‘shortage’ is arbitrary and different indicators can give conflicting results. In the end, judgement is required.
3. Constructing the AWPA–NILS Skills Index

3.1 Our Recommended Indicators

This section endorses the main conclusions of the literature review and recommends four sets of indicators of skills imbalance which are suitable for the Australian economy, and which can be easily constructed using widely available and robust Australian data. The proposed indicators focus on: (1) the state of the labour market; (2) the recruitment experience; (3) student responses; and (4) labour market entrants.

The literature review demonstrated support for several potential measures of skills imbalance, such as HTF vacancies, wages, unemployment, and the quantity and utilisation of employment in relevant occupations. We endorse these conclusions and incorporate the suggested indicators in the indices that we now present.

Specifically, we recommend indices for the following broad areas of economic activity where skills imbalances may be usefully observed:

- **The State of the Labour Market.** This focuses on indicators that measure the parts of the broader economic environment that can be closely related to skills imbalances. As the basis for our national benchmark, we provide indicators of the state of the Australian labour market in aggregate. Then, when monitoring skills imbalances within specific occupations, we provide indicators of the state of the labour market for that occupation.

- **The Recruitment Experience.** This focuses on the experiences of employers who try to recruit and workers who try to be recruited.

- **The Education Experience.** This focuses on the student response to skills imbalances, which is becoming increasingly important with the emphasis on demand-led education provision and funding. This set of indicators treats students’ choices regarding qualifications and skills as a potential response to labour market signals that are generated by current or emerging skills imbalances.

- **Labour Market Entrants.** This focuses on the outcomes and experiences of new and recent labour market entrants, including graduates from universities and the VET system, and new immigrants arriving with employer-sponsored skilled visas.

We present each of these broad categories of economic activity in detail in this section, and propose specific individual indicators that will allow us to measure skills disequilibrium. The objective is to explain the basic economic principles informing each indicator. In the next section, we combine all of the proposed indicators into a national benchmark case, which represents the national picture for each indicator over the past five years. We then present case studies of how we propose to monitor skills imbalances for three specific occupations: accountants, civil engineers, and registered nurses.

**The First Set of Indicators Focuses on the State of the Labour Market.** There are many ways in which the state of the labour market, either in aggregate or within an occupation, may influence the emergence, measurement, and consequences of skills imbalances. Cyclical stresses in the labour market—driven by the state of the business cycle—are of great importance in interpreting signals of skills disequilibrium. Periods at the peak of the business cycle, with their related high level of utilisation of the whole workforce, and low unemployment, have quite different consequences for skills shortages from periods at the trough of the business cycle, with their associated underutilised workforce and high unemployment. From a policy viewpoint, there is a profound difference between signals of disequilibrium that arise from an individual skill shortage or skill surplus, and those that...
arise from full employment or high unemployment, even though the signals themselves will be quite similar. A skill shortage or surplus implies a misalignment between the quantity and types of skills offered by the workforce, and the quantity and types of skills demanded by employers. Where the mismatch is costly and persistent, it is appropriate for government, among others, to explore ways of ameliorating it. Full employment, by contrast, although sending similar signals as a skill shortage, does not imply a misalignment in the composition of skills offered and demanded, but an overall shortage which has to be interpreted and responded to by government in different ways. Full employment would convey a far more optimistic message about the performance of the labour market, and would call for less emphasis on the occupation-specific skills front, and more emphasis on issues related to productivity, inflation, and the appropriate level of frictional and structural unemployment. Where there is a generalised excess supply of labour (a recession), then the appropriate policy response should be focused at the macroeconomic level, and not concentrated on particular occupations. Measures of disequilibrium must differentiate between generalised and occupation or skills-specific, situations. The distinction between full employment and a skills shortage goes largely unremarked in the literature. We argue that it is a key distinction.

We make this distinction explicit, by monitoring the state of the labour market as part of the suite of skills-imbalance indicators. For the purposes of constructing our national benchmark, the most important aggregate labour market indicators include the unemployment rate, the employment-to-population ratio of persons aged 20 to 65 years (separately for men and women), and changes in total hours worked. For the purposes of monitoring skills imbalances within specific occupations, the most important labour market indicators are the total number employed, average hours worked, average wages, and the proportion of the workforce aged 55 years and over.

For all of our indicators, we advocate using time series. The extent and direction of change is an important dimension of the indicators (earlier periods providing a form of benchmark). In the case of indicators of the aggregate state of the labour market, we take advantage of the recent macroeconomic variation caused by the GFC as an informal test of the sensitivity of the indicators to the state of the macro-economy. We are also constrained in our choices by the available data.

**The second set of indicators focuses on recruitment experience.** Vacancies are a most powerful indicator of labour market disequilibrium. The vacancy rate varies from occupation to occupation, in part because of differences in normal rates of turnover. The most readily interpretable indication of skills imbalance is the time it takes to fill a vacancy. If this period is shorter than normal, then applicants of acceptable quality are relatively abundant. If it is longer than normal, then such applicants are scarce. Robust duration data are difficult to collect. Vacancies in selected skilled occupations are available from the DEEWR SERA. The SERA data also provide information on the proportion of vacancies filled in a defined period, though not average vacancy duration. There is also information on the average number of suitable applicants per vacancy. This is most useful information, especially when tracked over time, although it does suffer the limitation of not being based on a randomly drawn survey of employers. SERA data do not provide comprehensive coverage of all occupations in Australia; rather, skilled occupations are selected for their policy relevance.

The implication of the selective occupational coverage of the SERA data is that in some instances the relevant data may not be available for an occupation in which we are interested. However, it can be expected that where an occupation is known to be of great importance, it is highly likely that the SERA data will be collected for it. This may not be so for emerging occupations of importance, in which case a request can be made for extending future collections of the SERA data to include such occupations. Additional SERA data-collection requests could be supported by the remaining indicators proposed here, especially where these may be showing the possibility of development of skill shortages.
Another possible problem may arise if the available SERA data collection is only provided for few of the 6-digit constituents of the broader 4-digit occupation at which we are looking. In that case, we may be faced with incomplete information or even conflicting information. For example, a broader 4-digit occupation may comprise five distinct 6-digit (sub) occupations and we may only have SERA data for three of them. There is no single rule that can be applied about what should be done in such cases, but there are several principles which we recommend should be followed. These are that (i) additional data must be requested; (ii) the full information that is available must be presented and discussed; (iii) consideration must be given to the possible problems with sample size of 6-digit occupational splits; (iv) the remaining indicators should be discussed and interpreted more cautiously with explicit consideration of the possible implications from the lack of SERA data for this occupation.

More specifically, where the occupation is important, a request should be lodged for a new or extended SERA data collection to close this gap. Even if all such requests are granted, it will take some time for the new data to become available. Until then (and also for those cases where new data are not forthcoming), the information from the rest of the indicators should be used, with appropriate caveats regarding its completeness. The proposed methodology for the construction of our index has been intentionally designed so that it does not rely exclusively on any single indicator, but incorporates information stemming from many different sources, so as to provide a judicious interpretation about the whole. This is because a disequilibrium may cause a response on one front (for example wages) but not on another (for example numbers employed or hours worked), and because the complexity of the economy makes it difficult to predict exactly which of the many possible margins will respond to a skills shortage in any specific occupation.

Different labour market conditions may apply for certain specialisations even within 4-digit occupations. Thus, a high vacancy rate may not in all cases represent a labour shortage. Employers may have specialist requirements; applicants may lack particular types of experience; or pay and conditions may not be sufficiently attractive. SERA occupational reports assess whether there are shortages, recruitment difficulties, or no shortages according to the proportion of vacancies filled within six weeks, whether there are multiple suitable job applicants, whether there are some employers who have not attracted any applicants, and whether these situations apply across all sectors of the occupation. These are highly pertinent direct observations of disequilibrium. We propose that the most useful approach is to compare how recruitment indicators are changing over time, and how they compare with some measure of average experience.

To sum up, we examine changes over time in the vacancy rate, in the proportion of HTF vacancies, in the number of applicants per vacancy, in the number of suitable applicants per vacancy, and in the unemployment rate for the occupation, as indicators of disequilibrium and we supplement these with additional evidence. One example of an attempt to do just this is Norton (2012), who identifies 24 skill-shortage occupations over the period 2001 to 2010 on the basis of DEEWR information, supplemented by the results of the Graduate Destination Survey. Markets were defined as tight where 90 per cent of recent graduates found work after four months and very tight where this figure is 95 per cent.

The third set focuses on demand-driven post-school education. Students invest a great deal of effort, time, and money in the courses they choose. For many people the investment they make in their education will be the biggest investment in their lifetime. In doing so, they have a very strong motivation to choose courses that will, among the many benefits of education, provide them with good and satisfying employment opportunities on graduation. Given these incentives, the behaviour of students and the observable outcomes of their educational choices represent a set of potential responses to skills imbalances. A shortage (surplus) of workers with a particular skill is likely to strengthen (weaken) the incentives for students to enrol in the courses that confer that skill. In the case of a shortage, the queue for particular courses can be expected to grow. Where queues grow two things may happen. Either, the price of the good increases and the queue reduces, keeping the
level of supply of the good constant, or the supply of the good increases and the queue reduces, keeping the price of the good constant. Usually, it is a mix of the two, depending on the inflexibilities that may be present either at the quantity or the price adjustment side. In the case of a skills or qualification shortage, it will either be that the Australian Tertiary Admission Rank (ATAR) required for the qualification in shortage will increase (keeping the number of places constant), or the number of places will increase (keeping the ATAR required constant), or both. We cannot know in advance which of the two adjustment mechanisms will respond faster (level of ATAR required or number of places offered), but to the degree that the education system allows students to choose, we can expect a shortage to manifest itself in the form of an adjustment along the lines described here. Very similarly, we can expect that the more an occupation is in shortage, the more the qualification that feeds into it will result in higher completion rates; hence the rate of completions may also offer useful information. We therefore propose three indicators that are inter-related and should all be read together: the rate of commencements, the level of ATARs required for each qualification, and the rate of completions for each qualification.

There are several noteworthy aspects of the education-related set of indicators. First, our indicators are based on the expectation that students will make choices that are informed by market signals and that reflect market incentives. For this to hold, we do not need to assume that all students will always make the best choice. We know that much is happening around students at the time they make these vital choices so that it is not uncommon for some to get it wrong and for a few to get it seriously wrong. For our indicators to operate as intended—that is as signals of potential skills imbalance—we need only to assume that some students will, in most cases, make choices that are guided by their desire for a good job after graduation. We believe this to be a reliable basis for our education indicators.

There may be several instances where either the ATARs or the level of commencements may not respond strongly to a qualification that is in shortage. For example, highly regulated professions may not permit an increase in the number of students, even when the demand for more places is obvious. One such example could be medical qualifications. In such cases, where a quantity adjustment is not forthcoming, we can expect that the adjustment will be carried out by a higher level of required ATAR. As more students queue for a limited number of places, it will be those with the higher ATARs that will be chosen, thus driving the average enrolment ATAR higher. A case where the minimum required ATAR may not be allowed to fall would be where a professional body stipulates a certain level of prospective student, in order to preserve the standards of the resulting qualification. The important point to note is that restricting either the ATAR or the number of commencements alone will not matter, as both ATAR and commencement numbers would have to be restricted by external factors for them to not pick up the signal of a skill shortage.

The recent changes in Australian policy—towards demand-driven education choices—will influence the strength of the signals that these indicators will provide. As the current trend is towards more choice offered to prospective students, we expect the responsiveness of the indicators to increase over time.

Another particular aspect of the proposed indicators is that not all newly commencing university students take the conventional route of gaining a place on the basis of an ATAR. Mature-aged students, international students, and courses that utilise Recognised Prior Learning are examples of non-ATAR-based routes of entry to university. While recognising these exceptions, we stress that they do not undermine the basic logic of using ATAR changes to monitor student demand. The presence of these cases might be a reason why the signal given by an ATAR is weakened, but the signal would remain valid and correct for all students who enrol for a qualification, as skill shortages will apply to all graduates, irrespective of their ATAR or non-ATAR university entry route.
The fourth set of indicators focuses on the experience of new and recent entrants to the labour market. The economic principles that underpin the labour market entry indicators proposed here are well-understood and could be generalised. The demand for labour is derived from the demand for the product that labour produces. When a product that uses heavily a skill that may not be in abundance experiences excess or rising demand, there is an elevated risk of skill shortages in related occupations that use that skill. Given that the cost of this disequilibrium to the economy can be high, workers and employers alike are likely to react. Workers with the relevant skills are unlikely to be sitting around unemployed. Evidence suggests that employers who want to expand their output substantially will, in the first instance, increase the hours worked by their existing workforce, and will subsequently try to attract workers from other areas of production as well as new graduates. In such circumstances and for workers with the relevant skills, we would expect wages to rise relative to other skills, the duration of unemployment to reduce, the proportion of full-time employment and the number of hours worked to increase, and the mismatch between skills and job to decrease, as employers compete for the limited stock of skills. The problem with detecting the response of the economy to these skill shortages is that the total stock of skills (demanded and supplied) changes only slowly.

However, changes in the total stock of skills are observable more immediately and more sharply at the margins of the labour market. In effect, we can obtain an amplified signal of the forces that may generate skills imbalances by focusing on the experiences of recent graduates seeking to enter the affected occupation. A basic tenet of economic analysis is that changes at the margin provide a stronger signal of underlying forces than do changes in the average stock. We take advantage of that insight in this set of indicators. Specifically, for recent graduates of both universities and the vocational education system, we report the percentage employed full-time, the average hours worked if employed full-time, the wages they obtain, and the extent to which they report that their job matches their new qualification. We also report the limited information available on the views of employers on whether they are finding it hard to recruit graduates with the skills they need.

3.2 The State of the Labour Market

The state of the labour market (both in aggregate and within an occupation) provides the essential backdrop to assessments made by individual employers and workers of whether particular types of skills are abundant or in shortage. Labour market indicators provide evidence of the current state of the business cycle, which is necessary to interpret signals of skills imbalance properly.

The peak of the business cycle is characterised by high utilisation of the labour force, at all skill levels (that is full employment). For workers and employers, a state of full employment will ‘feel’ the same as a state of individual skill shortage. That is, an individual skilled worker will find it easy to obtain a good job, and an individual employer will find it hard to attract well-qualified and high-quality workers with the specific skill that they need. Surveys of and consultations with employers will report that skills are in short supply. It will take time to fill vacancies; the number of applicants per vacancy will be low; the unemployment rate in the occupation will be low; and hours worked on average and in total will be rising. The reverse will be true at times of recession and high levels of unemployment. But none of these indicators taken in isolation enable us to conclude with certainty that there is a skill shortage to which a response is needed. If there is a tight labour market in most of the major occupations, then the stresses arise from operating in a period of full utilisation of the labour force, rather than from some misalignment between the skills of the labour force and the skills needs of employers. In the interpretation of the disequilibrium indicators that we propose, it is essential to be alert to the possibility that they are signalling not the shortage or surplus of particular skills, but rather, the overall tightness or slack in the labour market.

The vibrancy of the aggregate labour market will be reflected in the proportion of the population that is employed. The degree of utilisation of those in employment will be reflected by the hours
worked and how these may change, as well as by the unemployment rate. If hours worked are growing below trend, this suggests an increasing degree of slack in the labour market. In that case, the labour market signals reaching employers and workers are that (constant-quality) workers are increasingly easy to find and (constant-quality) jobs are harder to find. If workers with a particular skill are nonetheless hard to find (as may be indicated by the occupation-specific indicators that we set out subsequently), then this could imply that a shortage exists for that particular skill. As we mention below, occupational unemployment may be difficult to measure, but we would argue that it should always be at hand when trying to assess the labour market.

Table 1: The Australian Labour Market, 2001–2011

<table>
<thead>
<tr>
<th>Averages of the 12 Monthly Estimates</th>
<th>Unemployment Rate (per cent)</th>
<th>Employment/Population Ratios (Aged 20-64 Years)</th>
<th>Change in Total Hours Worked per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>2001</td>
<td>6.8</td>
<td>71.7</td>
<td>37.0</td>
</tr>
<tr>
<td>2002</td>
<td>6.4</td>
<td>71.5</td>
<td>36.5</td>
</tr>
<tr>
<td>2003</td>
<td>5.9</td>
<td>71.6</td>
<td>36.8</td>
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<tr>
<td>2004</td>
<td>5.4</td>
<td>72.2</td>
<td>37.2</td>
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<tr>
<td>2005</td>
<td>5.0</td>
<td>72.8</td>
<td>38.0</td>
</tr>
<tr>
<td>2006</td>
<td>4.8</td>
<td>72.9</td>
<td>38.9</td>
</tr>
<tr>
<td>2007</td>
<td>4.4</td>
<td>73.7</td>
<td>39.7</td>
</tr>
<tr>
<td>2008</td>
<td>4.2</td>
<td>73.7</td>
<td>40.0</td>
</tr>
<tr>
<td>2009</td>
<td>5.6</td>
<td>71.5</td>
<td>39.3</td>
</tr>
<tr>
<td>2010</td>
<td>5.2</td>
<td>71.8</td>
<td>39.0</td>
</tr>
<tr>
<td>2011</td>
<td>5.1</td>
<td>72.3</td>
<td>39.4</td>
</tr>
</tbody>
</table>

Note: ABS cat. No. 6291.0.55.001—Labour Force, Australia, Detailed—Electronic Delivery, May 2012. For the unemployment rate and the employment/population ratios: Data Cube LM1 (Labour Force Status by Sex, Age, Marital Status, Capital City/Balance of State). For hours worked: Data Cube EM1 (Employed Persons by Sex, Age, Hours Worked, State).

Table 1 shows that at the start of the decade there was considerable underutilisation of the available labour supply. Unemployment was relatively high; the full-time employment of men and of women was relatively low and steady, as was their total employment. As the decade progressed, the indicators show a tightening of the labour market. Unemployment fell; and the full-time employment of both men and women rose, as did the proportion of both sexes that had any employment. The total hours worked rose, but at variable rates. All the indicators showed a peak utilisation of the labour force in 2008, just before the GFC. The impact of the GFC is clearly apparent in the data. The unemployment rate, full-time and total employment of men, and total hours worked all indicate a sharp reversal in the utilisation of labour.

For the purposes of monitoring changes in the state of the labour market, month-to-month or quarter-to-quarter fluctuations should be treated as white noise (that is, it contains too much short-term information that evens out in the longer run). We recommend using the annual averages of monthly or quarterly data.

The following are the proposed indicators for the state of the aggregate labour market:

THE EMPLOYMENT-TO-POPULATION RATIO provides a powerful summary of the extent of utilisation of the potential labour force. It needs to focus on those of the main range of working age (we propose age 20 to 64) and to report separately for men and for women. Most men of working age wish to
work full-time. Women often wish to work part-time, and some do not wish to have paid employment at all. We assert that the single best indicator of the state of the overall labour market is the proportion of adult men who are in full-time employment. We argue that most adult men do not choose voluntarily either to work part-time or to not be employed; thus, states other than full-time employment are an indication of underutilisation of their available labour. There has been a secular rise in the proportion of the adult female population that is employed. Cyclical variations occur around this trend. Employment-to-population ratios can be derived from the regular and frequent ABS LFS.

The Unemployment Rate is an important and widely used measure of the degree to which the aggregate labour force is being utilised. The rate of unemployment is well-understood as a measure, is reported frequently, regularly, and reliably by the ABS and is measured in a consistent manner over time. Other measures of the degree of labour force utilisation, such as the under-employment rate, are available. But they tend to display similar trends to the unemployment rate, would not be used instead of the unemployment rate, and do not add sufficient extra information to justify their inclusion as an indicator.

Total Hours Worked provide a summary picture of the extent of aggregate labour demand (on the assumption that the ‘short side’ of the labour market is demand rather than supply).

In addition to the aggregate indicators outlined above, we recommend that the following indicators be used to monitor the state of the labour market for specific occupations. These indicators are chosen for similar reasons as the aggregate indicators, but are adapted to enable monitoring at the occupational level with currently available data. The aggregate indicators contribute to a national benchmark, against which we evaluate the levels and changes in the occupational-level indicators.

Number Employed (already described)

Wages (already described)

The Proportion of Workers Aged 55 Years or Over should be included as an indicator of replacement needs. Employees become more likely to retire voluntarily or involuntarily at around their mid-fifties and this indicator will reveal the proportion of employees within an occupation that will need to be replaced on a regular basis.

3.3 The Recruitment Experience: Vacancies, Applicants, and Unemployment

Table 2 provides a number of measures that go directly to the issue of how hard it is to recruit particular skills. We illustrate these using the occupations of accounting, civil engineering, and nursing. The key figure is the proportion of vacancies that remain unfilled after 6 weeks. This is the only available indicator of HTF. It is complemented by data on the average number of applicants per vacancy (which is almost never zero, even for HTF vacancies—indicating that employers have minimum expectations of the qualities they require in a newly appointed recruit) and the average number of suitable applicants per vacancy. The last two columns in Table 2 compare the vacancy rate with the unemployment rate for the occupation. This gives a feel for the unsatisfied demand for the skill, on the one hand, and the unsatisfied supply of the skill on the other. It also shows the size of the overall recruitment task relative to the numbers already employed.
With all the indicators, the absolute value is informative, but changes in the value over time may be even more so. In displaying the power of the indices we choose, it is advantageous that we have a period of very strong aggregate demand for labour up to 2008, followed by a sharp decline in growth during the GFC and subsequent more-subdued labour market conditions. The SERA data at hand enabled us to produce an approximation of the national graduate labour market and to use it as our benchmark. DEEWR advises that the occupational coverage of the data changes over time. For this reason, we advise caution in the interpretation of these data and recommend that the best benchmark should probably be the change over time in the indices for the particular occupation in question.

Table 2 presents the data for the three chosen occupations. It shows clearly the impact of the GFC, most especially for accountants. Prior to the GFC, around half of the vacancies for accountants were still unfilled after six weeks of looking; employers were getting a total of 12 to 14 applicants for each job (but only about two suitable applicants for each job); and about 8 per cent of advertised jobs in accounting were unfilled. The unemployment rate among accountants was 1 per cent. All these figures changed sharply in 2009 and beyond. By 2011, only 12 per cent of vacancies were unfilled after six weeks; there were around 28 applicants per vacancy; the vacancy rate had halved; and the unemployment rate had doubled. A degree of shortage in 2008 had become a degree of surplus by 2009, and this surplus has persisted.

The picture for civil engineers is a little different. A GFC effect is apparent from the fact that HTF vacancies declined sharply and the number of applicants per vacancy doubled between 2008 and 2009 (although there was little change in the number of suitable applicants). The effects of the GFC moderated in the years that followed. Specifically, the HTF vacancies reappeared. But looking at all five of our indicators, we judge the labour market for civil engineers to be more favourable for employers (the degree of shortage has declined) in the last two years compared to the picture prior to the GFC. Compared with 2007–08, the numbers of total and suitable applicants per vacancy are higher, the vacancy rate is substantially lower, and the unemployment rate is substantially higher.
Table 2: Indicators of Recruitment Experience, Selected Occupations, 2007–2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Proportion of vacancies unfilled after 6 weeks</th>
<th>Average number of applicants per vacancy</th>
<th>Average number of suitable applicants per vacancy</th>
<th>Vacancy rate as a percentage of employment</th>
<th>Unemployment rate as a percentage of employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accountants (ANZSCO code 2211)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>55</td>
<td>13.9</td>
<td>1.9</td>
<td>8.0</td>
<td>1.1</td>
</tr>
<tr>
<td>2008</td>
<td>47</td>
<td>12.3</td>
<td>1.7</td>
<td>8.0</td>
<td>1.0</td>
</tr>
<tr>
<td>2009</td>
<td>32</td>
<td>29.3</td>
<td>3.4</td>
<td>4.6</td>
<td>2.0</td>
</tr>
<tr>
<td>2010</td>
<td>17</td>
<td>21.8</td>
<td>2.6</td>
<td>3.8</td>
<td>2.6</td>
</tr>
<tr>
<td>2011</td>
<td>12</td>
<td>27.7</td>
<td>4.5</td>
<td>4.0</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>Civil Engineers (ANZSCO code 2332)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>67</td>
<td>5.9</td>
<td>0.9</td>
<td>15.5</td>
<td>0.7</td>
</tr>
<tr>
<td>2008</td>
<td>69</td>
<td>2.9</td>
<td>0.8</td>
<td>23.1</td>
<td>1.0</td>
</tr>
<tr>
<td>2009</td>
<td>45</td>
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<td>1.0</td>
<td>11.2</td>
<td>2.5</td>
</tr>
<tr>
<td>2010</td>
<td>62</td>
<td>14.0</td>
<td>0.9</td>
<td>8.0</td>
<td>2.8</td>
</tr>
<tr>
<td>2011</td>
<td>60</td>
<td>9.4</td>
<td>1.2</td>
<td>9.2</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Registered Nurses (ANZSCO code 2544)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>55</td>
<td>1.3</td>
<td>0.7</td>
<td>1.4</td>
<td>0.9</td>
</tr>
<tr>
<td>2008</td>
<td>53</td>
<td>1.5</td>
<td>0.7</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td>2009</td>
<td>39</td>
<td>2.3</td>
<td>0.9</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>2010</td>
<td>48</td>
<td>4.1</td>
<td>0.8</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>2011</td>
<td>32</td>
<td>4.4</td>
<td>1.3</td>
<td>1.5</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Notes: (1) Vacancies filled/unfilled. A vacancy is filled if the employer recruited a suitable applicant within 6 weeks for the professions or 4 weeks for other occupations. (2) Vacancy count used to calculate vacancy rate (percentage of employment) averaged over 12 monthly estimates. (3) Unemployment rate (percentage of employment) averaged over 4 quarterly estimates.

Sources: (1) For the proportion of vacancies unfilled and the average number of applicants per vacancy: DEEWR SERA, customised data. (2) For the vacancy count used to calculate the vacancy rate (percentage of employment): DEEWR Internet Vacancy Index, 4-digit data, June 2012. Available at: http://www.deewr.gov.au/lmip/default.aspx?LMIP/VacancyReport. (3) For the employment counts used to calculate the vacancy rate (percentage of employment): ABS cat. no. 6291.0.55.003–Labour Force, Australia, Detailed, Quarterly, May 2012, Data Cube E08_aug96 (Employed Persons by Sex, Occupation, State, Status in Employment, August 1996 onwards). (4) For the unemployment rate (percentage of employment): DEEWR Job Outlook, customised data provided by Skills Australia.

A high proportion of nurses are employed in the public sector or by enterprises that rely heavily on public funds. Hence, the effective demand for their services is somewhat insulated from the broader macro-economy. Despite this, the indicators for nurses also show some response to the impact of the GFC. Over the past three years, unfilled vacancies are lower and the number of applicants per vacancy is higher than before the GFC. There is almost no variation in the vacancy and unemployment rates, both of which are very low. The outstanding feature of the indicators for nurses is the very low number of applicants per vacancy (both in total and suitable). When the demand was relatively strong (prior to the GFC), an average of only one applicant was recorded for each nursing vacancy. As demand receded relative to supply during and after the GFC, this average
figure rose to four. Accountants, in comparison, had an average of 27.7 applicants (4.5 suitable) per vacancy in 2011. Unlike engineers and accountants, there is almost no unemployment among nurses.

The three occupations that we chose to illustrate the indices we propose make it clear that the information they contain cannot be reduced to a universal and single benchmark of shortage or surplus of a particular skill. The market for nurses is different from the market for accountants. The data for each occupation need to be interpreted with a clear appreciation of these differences. The illustrated occupations vindicate the use of more than one indicator for judging the position of each occupation (indeed, this is part of our argument and our strong recommendation that all sets of proposed indicators should be judged as a group and not individually). In the case of accountants, all recruitment indicators moved in harmony over the period examined. But in the case of engineers, while the proportion of unfilled vacancies quickly returned almost to pre-GFC levels, the other four indices suggest that a more subdued demand for engineers has persisted. For nurses, both the HTF vacancies and the number of applicants per vacancy suggest that the shortage of nurses eased after 2008. But the vacancy and unemployment rates have barely changed: both remain very low.

The concept of an occupation-specific unemployment rate warrants further discussion. Conventionally, this rate is calculated by taking all those who are currently employed in an occupation and those who are currently unemployed and were previously employed in the same occupation (the ABS exclude people who have not worked in two years, or who have not worked for more than two weeks). Note that the general understanding about unemployment and skill shortages is that where we see skill shortages, we would also expect to see low levels of unemployment of skilled workers that are in shortage. However, this principle does not translate readily into the case of unemployment by occupation. The main reason for this is that the concordance between occupations/skills and qualifications/skills is not a direct one. Each occupation can employ people with several different qualifications and each qualification can be employed in several different occupations. Therefore, the very concept of occupation-specific unemployment contains inbuilt indeterminacy. The implication is that when we observe someone who has become unemployed, we can know with certainty what their past occupation is, but we cannot know with much certainty what their next occupation will be. It follows that the length of their unemployment will not only depend on the state of their previous occupation, but also on the state of other occupations where their qualifications could be usefully employed. Whether their past occupation was in decline or growing will be pertinent. Someone who becomes unemployed from an occupation in strong decline can be expected to offer their skills quickly to a different occupation where demand is stronger. In contrast, someone who becomes unemployed from an occupation in strong demand may quickly find another job in the same occupation. It is worth noting that each one of these two very different persons will create a similar data point of a short unemployment spell. If we associate this unemployment spell with the past occupation of the former (latter), we will be driven to the wrong (correct) conclusion about skill shortages. A very similar point where the data can lead to erroneous conclusions is when we observe the SpOL occupations that are the fastest-growing and the fastest-shrinking ones. As we show in the supplementary material, in each of the 10 fastest-growing and the 10 fastest-shrinking occupations in the SpOL category, there are six out of 10 that report skill shortages (see Appendix 5), but obviously for very different reasons. These examples illustrate forcefully our recommendation that the proposed indicators should be read as a group, and not individually. In the case of these two examples, it is imperative that the development of employment levels should be part of the picture too.

The following are the proposed indicators for the recruitment experience:
HTF vacancies can be measured by the proportion of vacancies that were not filled within six weeks from the time they were created.⁹ Long-lasting vacancies are a prime indication of labour market disequilibrium. The danger exists with such an indicator that it may be manifesting a more general labour shortage or a case where an appropriate wage may not be feasible by one sector that uses an occupation, as another (more profitable) sector may be attracting the most-appropriately qualified workers.

**Competition for a vacancy by all who may be appropriately qualified can be measured by the average number of applicants per vacancy.** This measure will include all those who perceive themselves to be appropriately qualified for the job. An occupation with few applicants is one where there are potential employees, but they do not wish to apply, or there are no potential employees. Both cases could be the manifestation of a skills shortage.

**Competition for a vacancy by all who may be appropriately qualified can be measured by the average number of suitable applicants per vacancy.** This measure is similar to the total number of applicants, but it measures the number of applicants that are perceived by the employer to be appropriately qualified for the job. An occupation with fewer suitable applicants is one where the employers perceive a skills shortage, with the possibility of skill gaps arising.

**The prevalence of vacancies within an occupation can be measured by the vacancy rate as a proportion of employment.** An occupation with many vacancies per employed person is one where a skills shortage may be possible, but it could also be a growing occupation if the duration of these vacancies is not long.

**Competition for a vacancy between those who may be qualified and are unemployed can be measured by the proportion of unemployed over the total of those employed within an occupation.** Measuring unemployment for a specific occupation is not a precise exercise, as we can only know the occupation of the unemployed workers in their previous job, and not the occupation that they in which seek to be employed in the future. Nonetheless, an increase in the number of people who are presently unemployed and who were previously employed within an occupation suggests that the occupation is shedding workers in excess of its replacement demand.

### 3.4 Student Responses: Demand-driven Education

| Skill shortages create opportunities for prospective employees. Current and commencing students can be expected to favour courses leading to qualifications that are in higher demand by employers, as they will improve their chances of finding employment after graduation and of having higher earnings. |

We obtained detailed higher education statistics from DEEWR and the Department of Industry, Innovation, Science, Research, and Tertiary Education (DIISRTE). The data are university applications, acceptsances, enrolments, and completions from 2001 to 2010. These data allow us to examine inflows to the labour market from key fields of education and how these inflows may respond to demand-based funding arrangements. We use data on the number of first-year commencements and final-year completions. We have also been provided with the average Australian Tertiary Admission Rank (ATAR) of school-leavers, by field of study, who applied for and were offered domestic undergraduate university places.

The shift toward demand-driven education in the Australian higher education system is designed to encourage prospective students to study the subjects that they expect will generate the best future.

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⁹ Note that the six-week threshold for defining HTF vacancies is applicable to professional occupations. DEEWR uses a shorter period—four weeks—for determining the proportion of vacancies filled and unfilled for trade occupations. This measurement difference is reflected in our indicators of the recruitment experience.
outcomes for them. The removal of barriers to the number of students who are allowed to enrol in a
course for all post-school qualifications—which is presently coming into force—is designed to enable
the preferences of students to be reflected in their choices of course. To the degree that prospective
or current students receive and respond to labour market information about the employment
prospects associated with specific qualifications, we would expect their educational choices to trace
where an occupational skill shortage or surplus is present or anticipated.

The economic principle underpinning these indicators is simple. An increase in enrolments would
suggest that the student demand for a course has increased and that this demand has been met by a
corresponding increase in the supply of student places. Where the supply of student places may be
restricted, we would expect that an increase in student demand would not result in increased
enrolments but in an increase in the minimum ATAR requirement for enrolment, as the students with
the highest ATARs will be preferred by the universities. In an oversimplified way, one could think of
student places as the quantity supplied, of student applications as the quantity demanded, of ATARs
as the ‘price’ for the enrolment, and of actual enrolments as the equilibrium market outcome in the
form of an observed number of enrolled students and the minimum ATAR that was acceptable. This
analogy is useful for thinking about the indicators we propose, as it helps to explain the way that the
adjustment to change may be through a higher ‘price’ or through a larger ‘quantity’. As in all
markets, an adjustment to changed demand (which is what we expect if there is a skill shortage) will
result in either more enrolments, higher ATARs, or both.

Bearing in mind the simple economic principle we described, we note that the news about skill
shortages filters down to the public in many different ways that are difficult to record individually in
a meaningful way. Notwithstanding, prospective and current students can be expected to respond to
such information through their choice of subject. When a subject is perceived to offer better
opportunities, more people will want to enrol and complete it. We expect to observe several
adjustments that will depend on the additional number of students who wish to study each subject,
as well as the additional places that may be offered by the teaching and training organisations. The
indicators that will convey this information are presented in Table 3. We emphasise that no single
one of them will tell the whole story about student responses to labour market conditions, but put
together they can. It is important to recognise the interdependence of these indicators.

<table>
<thead>
<tr>
<th>Year</th>
<th>Average ATAR</th>
<th>First-year Enrolments (number)</th>
<th>Completions (number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>82</td>
<td>177694</td>
<td>102783</td>
</tr>
<tr>
<td>2002</td>
<td>83</td>
<td>175666</td>
<td>106162</td>
</tr>
<tr>
<td>2003</td>
<td>83</td>
<td>166499</td>
<td>109167</td>
</tr>
<tr>
<td>2004</td>
<td>83</td>
<td>165688</td>
<td>110980</td>
</tr>
<tr>
<td>2005</td>
<td>82</td>
<td>175712</td>
<td>110856</td>
</tr>
<tr>
<td>2006</td>
<td>81</td>
<td>180313</td>
<td>111027</td>
</tr>
<tr>
<td>2007</td>
<td>81</td>
<td>186691</td>
<td>111470</td>
</tr>
<tr>
<td>2008</td>
<td>81</td>
<td>189516</td>
<td>111691</td>
</tr>
<tr>
<td>2009</td>
<td>81</td>
<td>204879</td>
<td>115346</td>
</tr>
<tr>
<td>2010</td>
<td>81</td>
<td>220104</td>
<td>117362</td>
</tr>
</tbody>
</table>

Note: DEEWR Higher Education Statistics, customised data provided on request. ATARs are available only for
first-year domestic undergraduate students who recently completed secondary school. These comprise about
half of the first-year domestic university intake. The remainder are classified as mature-age students and they
have a different entry path.
Like students, employers also respond to skill shortages in various ways. One way that they can do this is by attempting to recruit the skilled workers they need by sponsoring applicants from overseas to obtain a subclass 457 visa. These visa-holders are another important source of new entrants to the skilled labour market, in addition to (domestic) higher education graduates. Below, we develop an indicator for monitoring this additional contribution to the skill supply.

The following are the proposed indicators for student responses:

**The average ATAR for a subject of study** will increase in response to increased demand for a subject. This will be more so, where educational institutions are slow to respond by offering more places of study in that subject.

**The number of enrolments in a subject of study** will increase in response to perceived better labour market opportunities after graduation. Where educational institutions are unable to respond, the increase in demand will canalise itself to an increase in the ATARs which will act as a form of price for selecting the more able students in the more desirable subjects.

**The number of completions in a subject of study** will increase in response to perceived better labour market opportunities after graduation. This will be the result of students switching from related subjects that offer fewer opportunities and by reduced student drop-out.

### 3.5 Labour Market Entrants

Our final set of indicators focuses on new entrants to the skilled labour market who come from both the domestic higher education system and from international migration. We discuss, in three sub-sections, the data sources and their purposes, before setting out the indicators.

#### 3.5.1 After graduation: Four to six months after qualification completion

The extent and the speed at which the market absorbs graduates right after course completion, the level of their pay, and the quality of the match between their qualifications and their job are measures of potential disequilibrium in the labour market for graduate employment. The way these measures change is also informative.

We use the Australian Graduate Survey (AGS, an annual sample of all Australian university graduates) and the Student Outcome Survey (SOS, an annual sample of VET graduates) to measure the eagerness of the market to absorb graduates. The information provided in these surveys is not identical, but it is sufficiently comparable to use in our indicators. There are three main types of measures: employment, pay, and skill-matching. Evidence for each of these is presented in Table 4 and Table 5.

We expect the possibility that skill shortages may arise and their consequences, should they arise, to be more serious when the proportion of employees in full-time employment is higher. Similarly, we expect pay increases to be associated with the emergence and continuation of skill shortages, although economic theory (and our earlier literature review) emphasises that many other factors also affect pay.

With respect to indicators of match and mismatch, a better qualification-job match can be positively associated with a skills shortage. Although the mechanics of matching indicators can be complicated, especially when we consider the possibility of imperfect matching between qualifications and occupations, the principle is relatively simple. When new graduates enter the labour market with

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10 We recommend that all analysis of student outcomes be confined to domestic students. The experience of recent international student graduates is quite different from their Australian counterparts, as illustrated in Appendix 3 in the Additional Material.
skills and (or) qualifications that can be used in an occupation in shortage, they are more likely to be well-matched. The jobs to match them well will be readily available, employers will be willing to pay higher wages for these jobs, and the graduates will respond to the higher wages. In contrast, skills and (or) qualifications that can only be used in occupations that are not in shortage will be characterised by the employment of graduates who are less likely to be well-matched, as they may choose to work in related occupations where their skills are not ideally matched, but where wages may be better.

Table 4: Labour Force Status of All Domestic University Graduates Four Months After Completion

<table>
<thead>
<tr>
<th>Year</th>
<th>Sample size</th>
<th>Per cent working full-time</th>
<th>Per cent not working</th>
<th>Mean salary of full-time workers</th>
<th>Per cent education-occupation match</th>
<th>Average weekly working hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>29052</td>
<td>93.6</td>
<td>16</td>
<td>46690</td>
<td>-</td>
<td>40.2</td>
</tr>
<tr>
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<td>30638</td>
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<td>15</td>
<td>48444</td>
<td>-</td>
<td>40.4</td>
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<tr>
<td>2008</td>
<td>31637</td>
<td>92.2</td>
<td>14</td>
<td>50726</td>
<td>65</td>
<td>40.4</td>
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<td>90.2</td>
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<td>53250</td>
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<td>40.5</td>
</tr>
<tr>
<td>2010</td>
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<td>89.1</td>
<td>18</td>
<td>53813</td>
<td>61</td>
<td>40.0</td>
</tr>
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<td>88.4</td>
<td>19</td>
<td>55626</td>
<td>61</td>
<td>40.5</td>
</tr>
</tbody>
</table>

Note: Per cent working full time = full-time/ (full time + part time); per cent not working = not working/ (working + not working). Annual salaries are presented. Data: Graduate Destination Survey 2006–2011.

Table 5: Labour Force Status of VET Graduates Six months After Completion

<table>
<thead>
<tr>
<th>Year</th>
<th>Sample size</th>
<th>Per cent working full-time</th>
<th>Per cent not working</th>
<th>Mean salary of full-time workers</th>
<th>Percentage with training highly relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Diplomas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>5416</td>
<td>59</td>
<td>16</td>
<td>894</td>
<td>40</td>
</tr>
<tr>
<td>2007</td>
<td>12226</td>
<td>61</td>
<td>15</td>
<td>925</td>
<td>45</td>
</tr>
<tr>
<td>2008</td>
<td>5424</td>
<td>62</td>
<td>16</td>
<td>961</td>
<td>46</td>
</tr>
<tr>
<td>2009</td>
<td>13617</td>
<td>59</td>
<td>19</td>
<td>1014</td>
<td>47</td>
</tr>
<tr>
<td>2010</td>
<td>6406</td>
<td>62</td>
<td>19</td>
<td>1047</td>
<td>50</td>
</tr>
<tr>
<td>2011</td>
<td>16579</td>
<td>64</td>
<td>16</td>
<td>1176</td>
<td>53</td>
</tr>
<tr>
<td>All Certificates III and IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>16865</td>
<td>63</td>
<td>17</td>
<td>815</td>
<td>47</td>
</tr>
<tr>
<td>2007</td>
<td>43480</td>
<td>64</td>
<td>16</td>
<td>835</td>
<td>49</td>
</tr>
<tr>
<td>2008</td>
<td>18822</td>
<td>65</td>
<td>16</td>
<td>889</td>
<td>51</td>
</tr>
<tr>
<td>2009</td>
<td>52086</td>
<td>64</td>
<td>19</td>
<td>916</td>
<td>51</td>
</tr>
<tr>
<td>2010</td>
<td>23192</td>
<td>63</td>
<td>20</td>
<td>942</td>
<td>51</td>
</tr>
<tr>
<td>2011</td>
<td>57189</td>
<td>63</td>
<td>19</td>
<td>1051</td>
<td>52</td>
</tr>
</tbody>
</table>

Note: Per cent working full time = full-time/ (full time + part time); percentage not working = not working/ (working + not working). Weekly salaries are presented. Student Outcomes Survey 2006–2011.

It is worth noting that the measure we use is qualification-based and that if we were to derive an occupation-based measure, the outcome would not be as clear-cut. The reason is that employers would respond to a skills shortage in two stages. Initially, they would make sure that all employees are well-matched and well-utilised. However, after all possibilities for hiring and utilising potentially
well-matched employees have been exhausted, a skills shortage may lead to hiring people with either the right level of education but not the exact degree type or subject (a horizontal mismatch), or someone with lower-level qualifications but who could possibly be trained (a skills gap).

3.5.2 From overseas: Skilled migration through subclass 457 visas

We propose that the number of granted subclass 457 primary applications be used to construct an indicator of skills shortage in the relevant occupation. Where there is a skills shortage that cannot be readily dealt with by domestic supply, an employer may seek to hire from overseas. The speed of the process and the clarity of incentives make this an accurate and timely indicator. Its relationship with the number of people completing relevant qualifications domestically is noted.

Migration into Australia through a business visa (subclass 457) is a major route through which employers can sponsor potential employees who have specific skills that are in shortage in Australia, but which may be available overseas. Applications are typically handled with speed, which improves the timeliness of an indicator based on the number of applications granted. Applications that are granted will reflect the needs of the sponsoring employer for specific types of skills that cannot be sourced within their local labour market, at least not at the prevailing market wage. The granting of the (subclass 457) visa indicates that the qualifications of the potential migrant have been vetted by Australian authorities and the employer and have been found appropriate and recognised within the Australian jurisdiction.

We expect that when the demand for an occupation rises, but the relevant domestic labour supply is insufficient, and especially when an increase in the (insufficient) supply cannot happen at short notice, the number of subclass 457 primary applications granted will rise as employers try to obtain the relevant skills from overseas. The absolute number of visas granted cannot be expected to be very informative on its own. However, its proportion relative to the total number of new labour market entrants with the relevant qualification will indicate the degree to which employers judged that their demand for suitable employees would not be met by the domestic supply. Moreover, the change in this proportion from year to year will describe the degree of adjustment that occurred. Given that this is a highly specific indicator, its operation is illustrated in Table 6 using the example of accountants (ANZSCO 2211).

The general interpretation of the immigration data is clear. In years where there is no skill shortage, employers are unlikely to resort to sourcing additional skilled labour from overseas. In these cases, the number of subclass 457 visas granted for the occupation (as a proportion of the total number of new entrants) will be lower. In years where skill shortages arise or persist, the opposite will hold. The change portrayed in the final (right-hand) column in Table 6 may be the clearest way to express this indicator. Given that the response of the employers aims at alleviating skills disequilibrium, we would not expect to see these changes persisting over time, and therefore monitoring should focus on short-term variation.

<table>
<thead>
<tr>
<th>Year</th>
<th>457 visa applications granted</th>
<th>Total labour market entrants (domestic plus 457 visas)</th>
<th>Percentage of 457 visas/Total visas</th>
<th>Percentage points change from last year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>451</td>
<td>3710</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>2008</td>
<td>598</td>
<td>3762</td>
<td>16</td>
<td>+4</td>
</tr>
<tr>
<td>2009</td>
<td>275</td>
<td>3390</td>
<td>8</td>
<td>-8</td>
</tr>
<tr>
<td>2010</td>
<td>691</td>
<td>3468</td>
<td>20</td>
<td>+12</td>
</tr>
<tr>
<td>2011</td>
<td>763</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: Source of subclass 457 data: DIAC internal calculations. Source of completions data: DEEWR internal calculations. ANZSCO was introduced in DIAC on 1 July 2010. Applications lodged prior to that date using the Australian Standard Classification of Occupations (ASCO) 2nd Edition were converted to an ANZSCO code, using a standard DIAC mapping approved by the ABS.
### 3.5.3 After graduation: Three years after university completion

As graduates settle into the labour market, and as they become better matched with their longer-term aspirations, any longer-term (dis)equilibrium begins to show. The Beyond Graduation Survey (BGS) provides information about the destination of university graduates three years after they obtained their qualification. The BGS sample consists of a subset of respondents to the AGS and has been collected annually by Graduate Careers Australia since 2009. The BGS contains detailed information on field of education (for all respondents) and occupation (for employed respondents). We have been advised that only the 2010 and 2011 data are comparable, but that the series will continue and its future samples will be comparable. The BGS sample sizes are significantly smaller than the AGS, but still adequate in most cases for producing disaggregated figures that focus on those fields of study that may be most relevant to labour market skills disequilibrium.

We propose that indicators of the longer-term employment outcomes of graduates be calculated for future use, as they are only currently available for 2010 and 2011. The recommended indicators are measures of employment and pay similar to those recommended (above) for the AGS and SOS data. The mean hours worked by graduates employed full-time after three years should also be monitored as an additional indicator of employer demand. Table 7 illustrates how these indicators operate for the full BGS samples of 2010 and 2011. These indicators could be disaggregated to show the longer-term outcomes of graduates within a specific occupation of concern.

#### Table 7: Labour Force Status of University Graduates, Three Years After Completion

<table>
<thead>
<tr>
<th>Year</th>
<th>Sample size</th>
<th>Employed full-time after three years (per cent)</th>
<th>Median annual earnings of FT workers ($’000)</th>
<th>Average hours worked by FT workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>4375</td>
<td>79</td>
<td>55</td>
<td>41.3</td>
</tr>
<tr>
<td>2011</td>
<td>4788</td>
<td>75</td>
<td>63</td>
<td>42.0</td>
</tr>
</tbody>
</table>

The following are the proposed indicators relating to labour market entrants:

**The Percentage working full-time** soon after completion of their qualification is a sensitive measure of the state of demand for university and (or) VET skills. When demand is high, the proportion of graduates employed full time will be high. While not all graduates wish to work full-time, over intervals of less than, say, five years, it is reasonable to assume that a stable proportion do wish to do so. This allows us to interpret changes in the full-time employment rate as arising on the demand side (from employers). Full-time employment rates should also be monitored for university graduates three years after graduating, using the BGS data. We also recommend monitoring the mean working hours of the graduates who are in full-time employment three years after completing their studies.

**The Percentage not working** soon after completion of their qualification is a measure of the difficulty that recent graduates are having in finding acceptable employment. Not all will be seeking work, but a fall in this proportion indicates a strengthening in the demand for the skills that the graduates have to offer.

**The mean salary of full-time workers** soon after completion indicates the value that employers place on the graduates’ new skills. It is likely to be more sensitive to the state of supply and demand than is the pay for all graduates, as employers can adjust the pay of new recruits with relatively little impact on their total wage bill. A higher growth in pay indicates a strengthening demand for graduate skills. The trajectory of graduates’ earnings growth should be assessed further by using the data from the BGS on their circumstances three years after completion.

**The proportion of graduates with a good match between their qualification and their job** shows the demand for the particular skills obtained through their qualification. A higher proportion of good matches would indicate a higher level of demand for those particular skills.
THE PROPORTION OF SKILLED EMPLOYEES’ 457 VISAS GRANTED AMONG ALL GRADUATES IN ANY GIVEN YEAR shows the degree to which employers perceive that their demand for appropriate skills cannot be satisfied by Australian new graduates. A higher proportion suggests that employers responded to an imbalance.

3.6 Additional Relevant Material not Directly Used for the Indicators

Our research objective has been to develop an indicator framework—based on robust and readily accessible data—that is simple in its conception, and that can be reliably and transparently replicated. In the process of developing this framework, we produced much information which does not pass one or two of these inclusion criteria, but which we considered worth retaining in a residual form as useful qualitative background to the theory and facts that underpin our main indicators. We briefly list these areas of inquiry here and encourage the interested reader to consult the Additional Relevant Material that accompanies this report for further details, but we note that reading that is optional.

APPENDIX 1—THE SpOL-non-SpOL DISTINCTION is important for understanding skills imbalances and how they can be measured. In many ways, the research has been informed by the distinction between SpOLs and non-SpOLs. Although the indicators we have developed do not depend on this distinction, they encapsulate many of the characteristics that define a SpOL.

APPENDIX 2—GENDER COMPOSITION OF THE WORKFORCE: Women are a growing proportion of the Australian workforce and are the majority of new university graduates. Yet, women have quite different labour supply patterns from men. They are significantly more likely to work part-time and to leave the workforce to care for children. Monitoring the gender composition of employment in occupations of interest is therefore important to an understanding of their current and future supply of skills. For the same reasons, it will also be useful to distinguish between male and female workers with respect to other indicators of supply and demand disequilibria. Although we do not find major gender differences over and above the indicators we have proposed, we acknowledge that many such indicators are gender-related. The occupational gender composition would provide useful background information.

APPENDIX 3—INTERNATIONAL STUDENTS: These students typically will not enter the labour market upon graduation. However, those who do so have very different experiences to those of the Australian graduates or the 457 visa immigrants. We show how the experiences of international students who end up working in Australia are different, as they take longer to find a job and are also paid less than Australian students.

APPENDIX 4—MISMATCH IN THE WORKPLACE: Several types of such mismatch are present. We examined the mismatch between what the job requires and what the workers have to offer in terms of the level of qualifications (overeducation or under-education) or skills (overskilling or under-skilling), and mismatch between the hours they worked and their preferred hours. The hours and skills mismatch measures in the HILDA data have been used to illustrate the presence of such relationships, but the data cannot provide sufficient evidence, as they are neither recent enough, nor of a sufficient sample size for the necessary occupational split. Nonetheless, research based on the HILDA data and other similar data sets is providing evidence about the principle of mismatch and skill shortages, so that we can then utilise the more direct information on the qualitative matching of the new VET and university graduates in a meaningful way.

APPENDIX 5—EMPLOYMENT TRENDS IN DETAILED OCCUPATIONS: Whether an occupation is increasing in size or is declining will influence the way we interpret the signals of disequilibrium. This appendix explores the principles of the thinking behind this statement and explains how it may apply to the way we identify and measure skill shortages.
APPENDIX 6—WHAT EMPLOYERS THINK: There is very little quantitative information about the employers’ perceptions of skill shortages. We present the possibility of using the Graduate Outlook Survey in the present context. We include this data collection here as an example of a data set that could be enhanced and enlarged to provide useful information in the future. In its present form it is of limited use.

APPENDIX 7—OCCUPATION-QUALIFICATION CONCORDANCE: The first topic deals with the concordance between occupations and qualifications. Some occupations and qualifications will match very closely (for example a medical degree and being a doctor) and some will not (for example degrees in business management, in economics, and in many other disciplines may lead to a wide variety of occupations). We present evidence showing that some qualifications will feed into several different occupations and that some occupations can be equally well served by people with several different qualifications. The research in this report is clearly occupation-based, as we are working on defining shortages by occupational groupings. We show that in many cases the correspondence may not be strong and in such cases we recommend the use of the closest possible qualification for the education indicators, appreciating that their signals will be weaker than in the cases of more direct qualification-occupation concordance. It is also possible to view the research from a qualification-based perspective, especially where we wish to understand the skills-related aspects of the education system. A qualification-based analysis could be used to examine the overall capacity of the labour market as measured by the total of available qualifications. This would be a very complex exercise given that many occupations feed into many more than just a few occupations. The occupation-qualification concordance is a most important relationship in the present research context.
4. The AWPA–NILS Skills Index

Having proposed an array of skills-imbalance indicators in the previous section, we now need to put these indicators together in a meaningful way that demonstrates their practical utility. This section begins by building a national benchmark of the indicators. This benchmark enables assessments to be made about labour market conditions, and possible skills imbalances for specific occupations. We then show how the complete AWPA–NILS Skills Index operates in practice for three occupations that are on the SpOL: accountants, civil engineers, and registered nurses. We compare the evidence for each of these occupations to the national benchmark data, and provide a summary qualitative judgement about whether each is likely to be experiencing symptoms of skill shortage or surplus.

4.1 A National Benchmark for Assessing Skills Imbalance

This section follows the same logic of exposition as we used to set out the indicators in the previous section. To construct a national benchmark of skills imbalance, we consider:

(i) The state of the aggregate labour market
(ii) The recruitment experience
(iii) Student responses
(iv) Labour market entrants

The national benchmark information is presented in Table 8, after which each component of the benchmark is evaluated. We present the evidence by year, beginning with 2007, although for several of the measures we also have information for 2005 and 2006. We begin with 2007 in order to include the years 2007 and 2008, where the financial crisis had not influenced the Australian labour market. Earlier information may not be as useful, because the occupational classification system changed in 2006, and the necessary concordance of much of the flow data may distort the picture.
## Table 8: A National Benchmark for Assessing Skills Imbalance, 2007–2011

<table>
<thead>
<tr>
<th>Indicator and Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of the aggregate labour market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male full-time employment/population ratio (per cent)</td>
<td>73.7</td>
<td>73.7</td>
<td>71.5</td>
<td>71.8</td>
<td>72.3</td>
</tr>
<tr>
<td>Male total employment/population ratio (per cent)</td>
<td>83.0</td>
<td>83.0</td>
<td>81.4</td>
<td>82.4</td>
<td>82.5</td>
</tr>
<tr>
<td>Female total employment/population ratio (per cent)</td>
<td>67.6</td>
<td>68.3</td>
<td>68.1</td>
<td>68.1</td>
<td>68.6</td>
</tr>
<tr>
<td>National unemployment rate (per cent)</td>
<td>4.4</td>
<td>4.2</td>
<td>5.6</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Total hours worked (percentage change from previous year)</td>
<td>1.4</td>
<td>5.8</td>
<td>-1.5</td>
<td>2.5</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Recruitment experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of vacancies unfilled after 6 weeks</td>
<td>53</td>
<td>51</td>
<td>36</td>
<td>48</td>
<td>41</td>
</tr>
<tr>
<td>Average number of applicants per vacancy</td>
<td>4.2</td>
<td>4.8</td>
<td>10.4</td>
<td>9.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Average number of suitable applicants per vacancy</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Vacancy rate (percentage of employment)</td>
<td>3.1</td>
<td>3.1</td>
<td>1.8</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Occupational unemployment rate (percentage of employment)</td>
<td>2.7</td>
<td>2.5</td>
<td>3.3</td>
<td>3.4</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Student responses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ATAR</td>
<td>81</td>
<td>81</td>
<td>81</td>
<td>81</td>
<td>-</td>
</tr>
<tr>
<td>Commencements ('000s)</td>
<td>186.7</td>
<td>189.5</td>
<td>204.9</td>
<td>220.1</td>
<td>-</td>
</tr>
<tr>
<td>Completions ('000s)</td>
<td>111.5</td>
<td>111.7</td>
<td>115.3</td>
<td>117.4</td>
<td>-</td>
</tr>
<tr>
<td><strong>Labour market entrants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>University graduates: 4 months after completion</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage employed full-time</td>
<td>93</td>
<td>92</td>
<td>90</td>
<td>89</td>
<td>88</td>
</tr>
<tr>
<td>Percentage not employed</td>
<td>15</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>40.4</td>
<td>40.4</td>
<td>40.5</td>
<td>40.0</td>
<td>40.5</td>
</tr>
<tr>
<td>Mean full-time annual salary ($’000)</td>
<td>48.4</td>
<td>50.7</td>
<td>53.2</td>
<td>53.8</td>
<td>55.6</td>
</tr>
<tr>
<td>Percentage with education-job match</td>
<td>-</td>
<td>65</td>
<td>62</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td><em>University graduates: 3 years after completion</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>79</td>
<td>75</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41.3</td>
<td>42.0</td>
</tr>
<tr>
<td>Median annual earnings of full-time workers ($’000s)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>55.0</td>
<td>63.0</td>
</tr>
<tr>
<td><em>VET graduates: 6 months after completion</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>64</td>
<td>65</td>
<td>64</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Percentage not employed</td>
<td>16</td>
<td>16</td>
<td>19</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Mean full-time weekly pay</td>
<td>835</td>
<td>889</td>
<td>916</td>
<td>942</td>
<td>1051</td>
</tr>
<tr>
<td>Percentage with education-job match</td>
<td>49</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td><em>Skilled immigration intake</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subclass 457 visas granted (as percentage of all new entrants)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4.1.1 State of the aggregate labour market

Overview: Between 2007 and 2011, the aggregate labour market has moved from a very strong position, peaking in 2008, to a sharp easing in 2009 precipitated by the GFC, and is now in a continuing modest recovery phase spanning the two most recent years.

The present: Moderate.

Watch for: Reduced rate of growth in hours worked, signalling an easing of the demand for labour.

4.1.2 Recruitment experience

Overview: The overall ease of recruiting rose sharply in the more subdued labour market following the GFC. The number of applicants per job at least doubled, and the proportion of vacancies unfilled after six weeks fell substantially.

The present: Ease of recruitment is moderate.

Watch for: Declining number of applicants per vacancy.

4.1.3 Student responses

Overview: University courses are attracting a rising number of students, especially post-GFC, a slowly rising number of bachelor degree completions, and no fall in entry scores. Students are continuing to see value in obtaining a university degree.

The present: Both commencements and completions of undergraduate degrees by domestic students are at recent highs, with no sign of a decline in the quality of commencing students. Students are signalling a relatively high level of confidence in the future need for graduates.

Watch for: A slowdown in enrolment growth or a fall in ATARs if the overall labour market strengthens.

4.1.4 Labour market entrants

Overview: There is a clear decline in most of the indicators of the utilisation of recent university graduates. Their full-time employment rates (both 4 months and 3 years after completion), non-employment rates, and education-job matching rates all signal a decline in the relative demand for university graduates’ skills. There is more ambiguity in the signals given by the indicators on pay and hours worked for these graduates. For VET graduates, overall demand is steady, with conflicting signals from rises in both pay and the percentage not employed. A high proportion of newly acquired VET skills appear not to be utilised in early employment.

The present: The extent of the utilisation of recent university graduates’ skills is lower than it has been for at least five years. There is also considerable underutilisation of new VET skills, even though they are well paid.

Watch for: Continuing signs of wasted graduate skills, particularly rising unemployment and underemployment of VET completers.
4.2 Illustrating with Specific Occupations

The remainder of this section presents case studies of how the indicators operate in practice for specific occupations. The purpose of the analysis and discussion is to assemble all the information that is relevant to the assessment of these selected occupations. We follow the presentation format used above for the national benchmark information, and we accompany each occupation with its detailed assessment of skills imbalance.

We illustrate the operation of the AWPA–NILS Skills Index with information for the following three occupations:

- **ACCOUNTING**
- **REGISTERED NURSES**
- **CIVIL ENGINEERS**

The purpose of this section is to demonstrate how the indicators that we selected to represent skills imbalances in the labour market can be put together at the occupational level in a useful manner.

It is important to note that we are making qualitative judgements about the possible presence of occupation-specific skills imbalances on the basis of the assembled occupation-specific quantitative indicators. We also stress that although the individual indicators are grouped into several categories, these categories are intimately related. We argue that they often represent processes that interact, so that the measurement of one may determine the interpretation of another. We discuss these issues below.

The first qualitative judgement we make is about the change in each indicator for the specific occupation at hand. For the specific occupation, we ask: ‘how is each indicator tracking over time?’ For example, is the proportion of new graduates with accounting degrees who are unemployed four months after graduation increasing or decreasing? These changes focus on developments within each occupation. We judge whether these changes reveal a state of disequilibrium or not, and how the situation appears to be developing over time within each occupation.

The second qualitative judgement we make is how each occupation-specific measure compares with the relevant national benchmark. For example, is the proportion of new accounting graduates who are unemployed four months after graduation higher or lower than the national average? In some cases, this will be valuable knowledge about the overall pressures that may apply to an occupation.

The final judgement we make is about how the information should be interpreted for the specific occupation at hand, given the overall economic picture that the assembled indicators presents to us. We have argued from the outset of this report that the measures we present will be interdependent in several cases, and that this interdependence conveys valuable information about skill shortages or surpluses. For example, an increase in unemployment among new graduates may lend itself to a different interpretation regarding skills disequilibrium, depending on whether it is accompanied by a strong/increasing or a weak/declining number of student commencements.

After making each of the above judgements, we provide a summary of the labour market for the specific occupation at hand. As noted above, the interpretation of this evidence is important, in that we are using a large number of factual and quantifiable pieces of information to draw a qualitative conclusion in the form of a statement about the present position of the occupation and its outlook. The need for transparent and easy replication is paramount for the construction of a successful Skills Index.
4.3 Example Occupation 1: Accountants

Table 9: Accountants (ANZSCO 2211, ASCED 0801)

<table>
<thead>
<tr>
<th>INDICATOR AND YEAR</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of the labour market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number employed ('000s)</td>
<td>159</td>
<td>168</td>
<td>166</td>
<td>168</td>
<td>164</td>
</tr>
<tr>
<td>Total hours worked (percentage change from previous year)</td>
<td>7.3</td>
<td>4.1</td>
<td>1.1</td>
<td>-0.7</td>
<td>-2.3</td>
</tr>
<tr>
<td>Mean full-time weekly earnings in main job ($) *</td>
<td>1415</td>
<td>1481</td>
<td>1545</td>
<td>1535</td>
<td>1539</td>
</tr>
<tr>
<td>Proportion of workforce aged 55 years and over (per cent)*</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td><strong>Recruitment experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of vacancies unfilled after 6 weeks</td>
<td>55</td>
<td>47</td>
<td>32</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Average number of applicants per vacancy</td>
<td>13.9</td>
<td>12.3</td>
<td>29.3</td>
<td>21.8</td>
<td>27.7</td>
</tr>
<tr>
<td>Average number of suitable applicants per vacancy</td>
<td>1.9</td>
<td>1.7</td>
<td>3.4</td>
<td>2.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Vacancy rate (percentage of employment)</td>
<td>8.0</td>
<td>8.0</td>
<td>4.6</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Occupational unemployment rate (percentage of employment)</td>
<td>1.1</td>
<td>1.0</td>
<td>2.0</td>
<td>2.6</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Student responses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ATAR (Domestic)</td>
<td>80</td>
<td>81</td>
<td>80</td>
<td>80</td>
<td>-</td>
</tr>
<tr>
<td>Commencements (Domestic)</td>
<td>4109</td>
<td>3690</td>
<td>3956</td>
<td>3803</td>
<td>-</td>
</tr>
<tr>
<td>Completions (Domestic)</td>
<td>3259</td>
<td>3164</td>
<td>3125</td>
<td>2777</td>
<td>-</td>
</tr>
<tr>
<td><strong>Labour market entrants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University graduates: 4 months after completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>96</td>
<td>95</td>
<td>94</td>
<td>93</td>
<td>94</td>
</tr>
<tr>
<td>Per cent not employed</td>
<td>13</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>40.2</td>
<td>39.9</td>
<td>39.8</td>
<td>39.5</td>
<td>39.5</td>
</tr>
<tr>
<td>Mean full-time annual salary ($'000s)</td>
<td>47.9</td>
<td>49.8</td>
<td>52.1</td>
<td>51.4</td>
<td>54.0</td>
</tr>
<tr>
<td>Per cent with education-job match</td>
<td>-</td>
<td>78</td>
<td>75</td>
<td>70</td>
<td>71</td>
</tr>
<tr>
<td>University graduates: 3 years after completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>88</td>
<td>93</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41.4</td>
<td>42.3</td>
</tr>
<tr>
<td>Median full-time annual salary ($'000s)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>63.0</td>
<td>65.0</td>
</tr>
<tr>
<td>Skilled immigration intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subclass 457 visas granted (as % of all new entrants)</td>
<td>12</td>
<td>16</td>
<td>8</td>
<td>20</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: (*) These estimates are for the ANZSCO minor group, ‘Business, human resources, and marketing professionals’, which includes accountants. More detailed unit-group (4-digit) estimates are available from the ABS on request.
4.3.1 State of the labour market

This is a large professional market. The number employed as accountants peaked in 2008 and has remained almost constant since. The total hours worked increased (at a decreasing rate) from 2007 to 2009 and have been decreasing since. Pay peaked in 2009 and has remained almost constant since. The signals point towards considerable stability with possible modest surpluses.

4.3.2 Recruitment experience

*Overview:* Fast-filling vacancies and large number of applicants, both increasing strongly; high vacancy rate, but decreasing; low unemployment rate, but increasing.

*Present:* No signs of skill shortages; possible signs of skill surpluses.

*Watch for:* Signs of surplus.

4.3.3 Labour market/occupation entry

*Overview:* Entrants’ pay follows the national average, and is maintained after three years; mainly full-time employment, but decreasing; moderately decreased three years after graduation; high unemployment and increasing; low matching and decreasing; hours close to the national average and stable, moderately increased three years after graduation.

*Present:* Entry-level jobs close to average hours and pay; largely full-time employment, but high unemployment.

*Watch for:* Entry becoming less easy, unemployment rises; pay is holding its ground. Watch for possible surpluses.

4.3.4 Student responses

*Overview:* ATARs at the national average and stable. Falling commencements and above national average non-completions.

*Present:* Reduction in student numbers, but not in ATAR requirements.

*Watch for:* Signs that students are more pessimistic about the future prospects for accounting.

4.3.5 Summary

This is an occupation with strong signs of present surpluses. The sharp deterioration of recruitment between 2010 and 2011, and the increase in the percentage of unemployed graduates four months after graduation suggest that the signs of surplus intensified in the last year, suggesting a continuing trend towards more surpluses. However, the reduction in commencements and completions between 2009 and 2010 will be countering the trend of surpluses.
### 4.4 Example Occupation 2: Registered Nurses

#### Table 10: Registered Nurses (ANZSCO 2544, ASCED 0603)

<table>
<thead>
<tr>
<th>INDICATOR AND YEAR</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of the labour market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number employed ('000s)</td>
<td>184</td>
<td>181</td>
<td>198</td>
<td>216</td>
<td>217</td>
</tr>
<tr>
<td>Total hours worked (percentage change from previous year)</td>
<td>1.4</td>
<td>1.5</td>
<td>8.0</td>
<td>7.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Mean full-time weekly earnings in main job ($)*</td>
<td>1465</td>
<td>1457</td>
<td>1525</td>
<td>1562</td>
<td>1581</td>
</tr>
<tr>
<td>Proportion of workforce aged 55 years and over (per cent)*</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td><strong>Recruitment experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of vacancies unfilled after 6 weeks</td>
<td>55</td>
<td>53</td>
<td>39</td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td>Average number of applicants per vacancy</td>
<td>1.3</td>
<td>1.5</td>
<td>2.3</td>
<td>4.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Average number of suitable applicants per vacancy</td>
<td>0.7</td>
<td>0.7</td>
<td>0.9</td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Vacancy rate (% of employment)</td>
<td>1.4</td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Occupational unemployment rate (per cent of employment)</td>
<td>0.9</td>
<td>0.8</td>
<td>1.2</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Student responses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ATAR (Domestic)</td>
<td>75</td>
<td>73</td>
<td>73</td>
<td>74</td>
<td>-</td>
</tr>
<tr>
<td>Commencements (Domestic)</td>
<td>11712</td>
<td>11722</td>
<td>13215</td>
<td>14564</td>
<td>-</td>
</tr>
<tr>
<td>Completions (Domestic)</td>
<td>7069</td>
<td>7453</td>
<td>7537</td>
<td>7698</td>
<td>-</td>
</tr>
<tr>
<td><strong>Labour market entrants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University graduates: 4 months after completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>89</td>
<td>86</td>
<td>84</td>
<td>81</td>
<td>79</td>
</tr>
<tr>
<td>Per cent not employed</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>40.1</td>
<td>39.5</td>
<td>39.6</td>
<td>39.1</td>
<td>39.0</td>
</tr>
<tr>
<td>Mean full-time annual salary ($’000s)</td>
<td>43.8</td>
<td>45.6</td>
<td>48.3</td>
<td>49.7</td>
<td>50.9</td>
</tr>
<tr>
<td>Per cent with education-job match</td>
<td>-</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>University graduates: 3 years after completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent employed full-time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>68</td>
<td>66</td>
</tr>
<tr>
<td>Mean full-time hours worked per week</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>39.5</td>
<td>40.7</td>
</tr>
<tr>
<td>Median full-time annual salary ($’000s)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>60.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Skilled immigration intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subclass 457 visas granted (as % of all new entrants)</td>
<td>21</td>
<td>22</td>
<td>18</td>
<td>12</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: (*) These estimates are for the ANZSCO minor group, ‘Health professionals’, which includes registered nurses. More detailed unit-group (4-digit) estimates are available from the ABS on request.
4.4.1 State of the labour market
This is a large and growing professional market. The labour market for registered nurses experienced a small fall in headcount employment and in pay between 2007 and 2008, but total hours worked did not fall. From 2008 onwards, we observe increasing employment in both headcount and total hours worked and modest increases in pay. All signals point towards a steady and modest expansion.

4.4.2 Recruitment experience

*Overview:* Fast-filling vacancies, and increasingly so; extremely small number of applicants, but increasing; very low vacancy and unemployment rates, both stable over time.

*Present:* A balanced recruitment process with mild indications of additional supply in the post-CFC years.

*Watch for:* Stable outlook.

4.4.3 Labour market/occupation entry

*Overview:* Low entry pay, but almost followed the national increases; high proportion of full-time but falling rapidly; very low level of unemployed recent graduates; high-level matching and longer hours than the national average.

*Present:* With the exception of the falling proportion of full-time work, a stable occupation with lower pay and higher job security.

*Watch for:* Stable outlook.

4.4.4 Student responses

*Overview:* ATAR below the national average, but stable over time; increasing commencements at about the national average; average rates of completions.

*Present:* A stable occupation with no disequilibrium signs.

*Watch for:* Stable outlook. Students seem confident about their prospects in nursing.

4.4.5 Summary
This is a very stable occupation. Recruitment, matching, and entry conditions are producing an overall picture of stability. There are no signs of disequilibrium. The continued fall in full-time entry employment may indicate a surplus. The very small (but increasing) number of applicants per vacancy and the low (but also increasing) unemployment rates of recent graduates suggest an implicitly regulated supply of work, where there may be pockets of surpluses.
4.5 Example Occupation 3: Civil Engineers

Table 11: Civil Engineering Professionals (ANZSCO 2332, ASCED 0309)

<table>
<thead>
<tr>
<th>INDICATOR AND YEAR</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of the labour market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number employed (‘000s)</td>
<td>38</td>
<td>36</td>
<td>38</td>
<td>46</td>
<td>48</td>
</tr>
<tr>
<td>Total hours worked (percentage change from previous year)</td>
<td>5.5</td>
<td>-5.9</td>
<td>9.7</td>
<td>19.4</td>
<td>7.7</td>
</tr>
<tr>
<td>Mean full-time weekly earnings in main job ($)*</td>
<td>1511</td>
<td>1529</td>
<td>1625</td>
<td>1636</td>
<td>1741</td>
</tr>
<tr>
<td>Proportion of workforce aged 55 years and over (per cent)*</td>
<td>15</td>
<td>13</td>
<td>15</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

| **Recruitment experience** |       |       |       |       |       |
| Proportion of vacancies unfilled after 6 weeks | 67    | 69    | 45    | 62    | 60    |
| Average number of applicants per vacancy | 5.9   | 2.9   | 7.5   | 14.0  | 9.4   |
| Average number of suitable applicants per vacancy | 0.9   | 0.8   | 1.0   | 0.9   | 1.2   |
| Vacancy rate (percentage of employment) | 15.5  | 23.1  | 11.2  | 8.0   | 9.2   |
| Occupational unemployment rate (per cent of employment) | 0.7   | 1.0   | 2.5   | 2.8   | 2.6   |

| **Student responses** |       |       |       |       |       |
| Average ATAR (Domestic) | 87    | 87    | 86    | 85    | -     |
| Commencements (Domestic) | 1459  | 1483  | 1907  | 2247  | -     |
| Completions (Domestic) | 762   | 935   | 955   | 1040  | -     |

| **Labour market entrants** |       |       |       |       |       |
| University graduates: 4 months after completion |       |       |       |       |       |
| Per cent employed full-time | 97    | 98    | 96    | 96    | 97    |
| Per cent not employed | 5     | 6     | 8     | 12    | 12    |
| Mean full-time hours worked per week | 42.4  | 43.0  | 42.5  | 42.4  | 42.7  |
| Mean full-time annual salary ($’000s) | 54.0  | 58.1  | 59.7  | 59.4  | 61.5  |
| Per cent with education-job match | -     | 88    | 88    | 86    | 86    |

| University graduates: 3 years after completion |       |       |       |       |       |
| Per cent employed full-time | -     | -     | -     | 96.7  | 91    |
| Mean full-time hours worked per week | -     | -     | -     | 42.9  | 43.9  |
| Median full-time annual salary ($’000s) | -     | -     | -     | 71.5  | 68.0  |

| VET graduates: 6 months after completion** |       |       |       |       |       |
| Per cent employed full-time | 85    | 83    | 75    | 85    | 89    |
| Per cent not employed | 29    | 29    | 21    | 16    | 14    |
| Mean full-time weekly pay | 1024  | 957   | 1009  | 1093  | 1254  |
| Per cent with education-job match | 29    | 31    | 31    | 40    | 48    |

| Skilled immigration intake |       |       |       |       |       |
| Subclass 457 visas granted (as % of all new entrants) | 48    | 54    | 25    | 37    | -     |

Notes: (*) These estimates are for the ANZSCO minor group, ‘Design, engineering, science, and transport professionals’, which includes civil engineering professionals. More detailed unit-group (4-digit) estimates are available from the ABS on request. (**) Sample sizes are small (N<100) for Civil Engineering graduates in some years of the Student Outcomes Survey, resulting in some year-to-year volatility. However, there are sufficient numbers of observations to interpret the underlying trends for this group.
4.5.1 State of the labour market

This is a highly specialised medium to small-sized professional market. The labour market for civil engineers experienced a small and short-lived slowdown immediately after 2008. From 2009 onwards we observe a steady increase in headcount employment, total hours worked, and earnings. All signals point towards the presence of an expanding market.

4.5.2 Recruitment experience

Overview: Vacancies are hard to fill and a temporary relief in the GFC (2009) was met with a bounce back in 2010–11; the number of applicants is small, but increased moderately; the vacancy rate decreased with the GFC and has not picked up since; the low-level unemployment increased and has remained low.

Present: A tight market, which eased off considerably, but for very short time, in 2009 during the GFC. Some of the easing off remained after the GFC.

Watch for: Shortages. The possible development of the 2009 easing off (will it reverse completely or intensify?).

4.5.3 Labour market/occupation entry

Overview: Very high full-time proportions of university graduates. High (and recently rising) full-time proportions for VET graduates, too. Unemployment of new university graduates is low by national standards, but has doubled since 2009; unemployment of new VET graduates is higher but has been falling steadily since 2007; pay is above the national average for new university graduates and more so for VET graduates, and their long-run increase is just below the national average rate of increase. Hours are longer than the national average, but stable. University degree job-match is good; VET training job-match is lower but has been improving consistently since 2007. Longer-term prospects appear to be good, with high full-time rates and above average pay, but continuing above average long hours worked. Overall, a tight market with few signs of it (possibly) easing off after the GFC.

Present: A well-paid group with good post-graduation prospects and low unemployment. A tight market adjusting to increasing activity; managing well with tentative signs of easing. Adjustments are evident among VET graduates, particularly in non-employment rates and job-training matching.

Watch for: All indicators for shortages.

4.5.4 Student responses

Overview: The ATARs required are well above the national average. There was a strong increase in the commencements which began in 2009 and continues. Completion rates are above the national average. Despite the large increase in commencement numbers, ATARs show only a very a moderate decline since 2009. A vigorous response.

Present: High and continually increasing demand for degrees, leading to what is perceived to be a high-quality occupation. Educational institutions are responding to the increased demand with success. The demand for VET qualifications is also increasing.

Watch for: How or whether these trends continue. With numbers rising rapidly, and the continuing confidence of students on these educational pathways, more focus on vacancies and entry conditions is necessary.
4.5.5 Summary

The market is tight and could have been much more so, were it not for the considerable increase in new graduates. Educational institutions and students are responding vigorously with well above-average increases in commencements and completions. It is noteworthy that this has been happening with entry standards remaining high, despite the fact that they are well above the national average. With much response happening through increased numbers, entry-level wages are not rising as a whole more than the national entry-level wages. The VET sector also appears to be responding vigorously, and we note that there is potential for more full-time VET-level entry employment. Utilisation is high, unemployment is already low (for University graduates) and falling sharply (for VET graduates), working hours are long, and longer-term prospects appear to be good for these workers. Unfilled or HTF vacancies are a persistent problem.

4.6 A Graphical Watch List and Summary

4.6.1 Accounting: Watch for

Overall position: Stable to moderate surplus
Overall accuracy: Middle to high as most sources agree
Trends: Weakly trending towards surplus

Supporting summaries
State of the labour market: Recovery from GFC present but modest
Recruitment: Eased off with possible signs of surplus
Students: ATAR levels stable, student numbers dropping
Labour market entrants: Possible surplus (including 457 visa-holders), but pay is holding
Further remarks: Potential non-domestic student supply present. Well-matched occupation with qualifications
Data used: 2007 to 2011
4.6.2 Registered Nursing: Watch for

**Overall position:** Stable

**Overall accuracy:** High

**Trends:** No discernible trend

Supporting summaries

State of the labour market: Stable with increasing demand

Recruitment: Stable and secure. GFC the main effect on 457 visa-holders

Students: ATAR levels stable, student numbers increasing

Labour market entrants: Stable, entry pay rising

Further remarks: Non-domestic 457 visa-holder supply present. Highest match between occupations with qualifications

Data used: 2007 to 2011

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4.6.3 Civil Engineers: Watch for

**Overall position:** Expanding vigorously

**Overall accuracy:** Strong dependence on international factors

**Trends:** Vigorous change with strongly responding market

Supporting summaries

State of the labour market: Clear GFC effect; no full recovery yet

Recruitment: Remains difficult. Mixed post-GFC signals

Students: ATAR levels stable; student numbers rising steeply


Further remarks: Occupation with highly matched qualifications. Volatile predictions are due to the dependence on international developments.

Data used: 2007 to 2011
4.6.4 Watch for: How to read the graph

This is a graphical depiction of the information in the ‘watch for’ list. We use the accounting case to illustrate the use of the graph.

The **mid-point indicates present skills shortage or surplus**. If we see the occupation as one of shortage it will be positioned to the right of the centre, or one of surplus (to the left of the line).

The **left rectangle indicates the trend towards a skills surplus**. A longer rectangle will reflect a stronger expectation of a future surplus.

The **right rectangle indicates the trend towards a skills shortage**. A longer rectangle will reflect a stronger expectation of a future shortage.
References


Skills Australia (2009) Workforce futures overview paper, Skills Australia, Canberra.
Skills Australia (2011) Skills utilisation literature review, Skills Australia, Canberra.


