Indicators of Skill Shortage

for

Department of Labour

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1. INTRODUCTION

The New Zealand immigration system uses a point system to determine the eligibility for permanent residency of skilled migrant applicants. Applicants are allocated points that associate with their age, qualifications, work experience and their ties with New Zealand (in particular employment or an offer of employment). At present applicants are discouraged from applying if their point total is less than 100, while applicants with a points total in excess of 140 are given the impression that acceptance of their application is virtually guaranteed.

The point system also includes bonus points for migration applicants who have qualifications and work experience in occupations that have been identified as being in "absolute shortage" within New Zealand. The concept behind the skill shortage list is that migrants to New Zealand are likely to add more value to the nation's welfare if there is both a strong demand for the skills that these migrants bring with them and if their skills complement, rather than compete with, the skill set possessed by New Zealand residents.

However, identifying which occupations should be added or removed from this list is not a straightforward task. Objective data on the supply and demand for different skill sets is typically incomplete. An alternative is to canvas perspectives from interested parties. Unfortunately sector interests can distort the reliability of subjective information about skill shortages (self interest will influence the perspectives of different groups). Finally even in situations where an absolute skill shortage is identified it may not necessarily follow that immigration is the appropriate policy response, as better outcomes might result from capital substitution, reallocation of output across industries or though more training activity.

The objective of the study reported here is to foster a better understanding of which indicators provide useful information about the presence of skill shortages and how such indicators should be interpreted when developing immigration policy advice. We adopt a general to specific approach. The first step is to develop a conceptual framework for assessing what constitutes a skill shortage that should or could be addressed by skilled immigration. Within this conceptual discussion we spend a bit of time defining what we mean by skills, the types of skill gaps that can develop and discuss the immigration policy issues that arise when skill gaps are identified.

The next section attempts to identify the 'ideal' set of indicators that would inform an assessment of skill shortages. We identify a suite of seven types of indicators:

- Vacancy fill rates
- The relative volume of vacancies
- Evidence of excessive wage pressures
- Assess the occupations exposure to product and labour market competition
- Evidence that the current demand for the skill will be sustained

- Evidence about the length of time it might take for the New Zealand education system to address identified skill shortages
- Evidence about the degree of specialisation in different occupations

The first three set of indicators are our recommended prime means for identifying the presence of skill shortages, which should be used to monitor as many occupations as possible on an ongoing basis. The next three indicators are more about identifying in which of the cases of skill shortage might an immigration intervention be appropriate. Finally, indications of occupational specialisation can provide a list of occupations where skill shortages are more likely to occur and potentially would have disruptive impacts.

We finish with a discussion of the sources of information on each of the proposed indicators and practical issues that might limit either the construction or interpretation of indicators.

2. CONCEPTUAL CONSIDERATIONS

In this section we discuss the definition and implication of a number of important concepts that underpin both why we should be interested in producing indicators of skill shortage and what factors are needed to be addressed when developing such indicators. We begin by discussing the nature of skills and their role in economic production. We then address allocative issues in the matching the supply and demand for workers with different skill sets. Finally we discuss the relevance of skill mismatches to government policy, but with particular emphasis on immigration policy issues.

Skills

From an economic perspective, skills can perhaps be defined as the quality aspect of human capital. Skills define the way that human effort produces outputs. That is, the skills we posses determine our ability to convert physical and mental effort into productive outputs. This might come from our ability to use tools and equipment, our ability to solve problems, our ability to communicate with others. As such skills are difficult to observe or measure; they relate to latent abilities that are only observable as an aspect of the residual between outputs and inputs.

People will posses both generic and specific skills. Generic skills (literacy, numeracy, attitude) have value to all users. Specific skills will be application and time specific. For example, the sporting skills of a professional sports person may be highly valued during their playing days, but have little value to employers when they retire from the sport (although their fame and any other skills they posses may still be valued highly by later employers). In this regard one might consider that the value of skills, like beauty, is often in the eye of the beholder.

Skills can also erode over time. For example, previously useful skills can become redundant, say because of a technology change (spell check reduces the importance of spelling ability and accurate typing skills). The other chief source of skill erosion is underuse of the skill leading to the skills being forgotten. In this regard the erosion of skills is quite different to the depreciation of physical capital, which occurs because of the wear and tear from the use of the equipment or through the length of time exposed to the environment. Skills generally have to be maintained by regular use.

There is a trade-off between developing skills and current consumption due to training costs and foregone income while training. As a result there is an expectation that there will be a future payback from investing in training. This expectation is usually correct, people with higher skills tend to attract a wage premium and face a lower risk of unemployment during periods of weak economic demand.

However, formal training is only part of what makes up highly valued skills. For example, much of the rise in income dispersion in the United States in recent decades has been between observationally similar people (ie people with similar qualifications working in similar occupations) indicating that “soft” skills (attitude, presentation,

communication skills etc) are an important dimension to the economic value of skills (Acemoglu 2002).

Measuring skills

This leads us to how do we measure skills? Borland (2000) notes three practical methods that have been used to measure skills:

- Identifying observable characteristics such as education, qualifications, occupation, experience.
- Define skills relating to objective measures of the attributes possessed by individuals or required to undertake a certain job, eg cognitive abilities, motor skills, inter-personal skills.
- Define workers' skill levels as corresponding to their wages, ie higher wages correspond to their opportunity cost which will reflect the productivity and relative scarcity of the skills they possess.

The first approach tends to be the most commonly adopted in practice. This largely reflects practical considerations, as factors such as qualifications, occupation, age are more readily observable and are the types of individual information collected in surveys and in administrative data sets. But as noted above, observable skill proxies only explain a proportion of the divergence in worker wages; while workers with higher qualifications and more experience are more likely to earn more than those with lower qualifications and less experience, it does not preclude observations where this does not hold nor the divergence of outcomes for observationally similar workers.

Indeed there is potentially some self-selection behind the positive relationship between qualifications/education and the earning ability of workers. This is illustrated in the six transmission paths that influence the (supply side) determination of earning ability in Figure 1 (sourced from Boissiere et al, 1985).

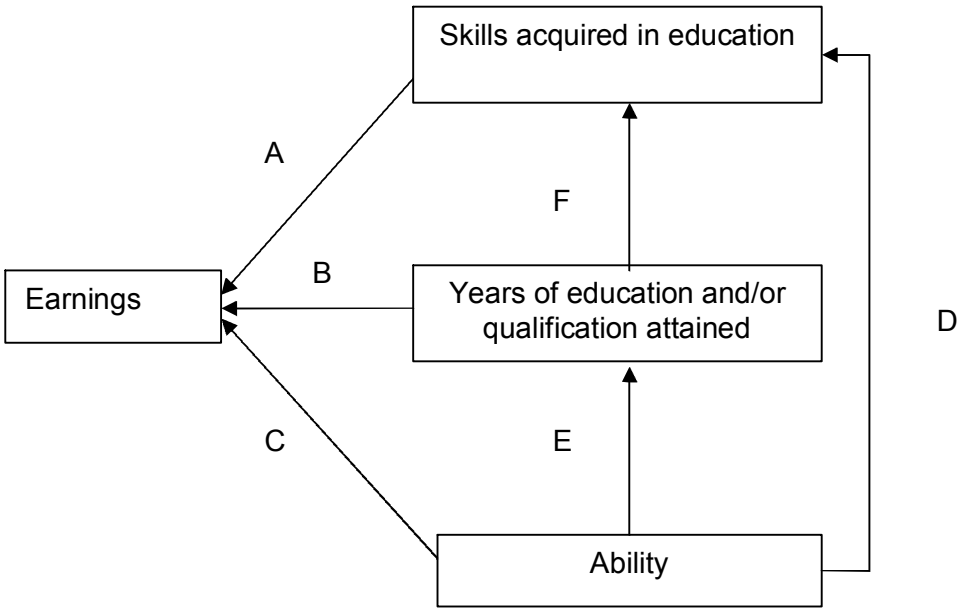

Figure 1

Focussing just on observable measures such as years of schooling and qualifications attained, essentially just covers transmission path B. In fact using education as a proxy of skills actually presumes that one is capturing transmission path A, ie that years of schooling and qualifications directly capture the skills acquired through education. However the true story is likely to be more complex than this. Years of education can be used as a signalling device suggesting that workers have certain skills irrespective of the skills or ability they actually possess.[1] That is years of education and/or qualification attainment can provide an influence on wages (path B) that is independent of the skills acquired in education (path A).

Of course, years of education will also influence the amount of skills acquired (path F). The longer one spends in school will influence skill acquisition independent of student ability – even the most delinquent student will learn something in their last year of education. But ability is likely to complicate the story further. The abilities of individuals will have a direct influence on earning ability irrespective of education and specific skills (path C). Ability is also likely to influence the number of years in education: higher ability will increase the likelihood of education success, thus reducing the likelihood of dropping out of school and increasing the potential for higher qualification attainment (path E). Finally more able students are likely to acquire more skills from their education than less able students with the same duration in education (path D).

In a study to investigate the relative importance of these transmission paths using a comprehensive data set of the earnings, schooling, ability and cognitive skills of an East African population of workers, Boissiere, Knight and Sabot (1985) found that the direct returns to reasoning ability in the labour market were small, those to years of education moderate, and those to literacy and numeracy were large. They concluded that:

- literate and numerate workers are more productive,
- education is valuable to workers because it can give them skills that increases their productivity,
- the main reason why secondary leavers earn more than primary leavers is their higher level of cognitive ability,
- within each education group high achievers earn more than low achievers, however
- there exist lower achievers with more education who earn more than high achievers with less education.

This suggests that cognitive ability is the key source of skills and that education attainment is a reasonable, but partial, proxy for these skills. However, this study was based in reasonably undeveloped economies and, as we have already stated the importance of non-education based skills appear to have increased in the twenty years since this study. Also

[1] Indeed Boissiere et al (1985) in their study of earnings, schooling and cognitive skills in a population of East African workers found some evidence to support the signalling role of years of education. They found there were a number of workers with low cognitive scores but with more years of education who earned more than high achievers with less education.

there is a growing appreciation of the importance of non-cognitive skills. For example, Heckman and Rubinstein begin their 2001 article by noting:

> *It is common knowledge outside of academic journals that motivation, tenacity, trustworthiness, and perseverance are important traits for success in life.*

Indeed it could be some of these qualities that allowed otherwise low achieving students to obtain higher levels of education and ultimately high earnings in the Boissiere et al study. Heckman and Rubinstein looked at the issue from the other angle by looking at the earning performance of General Educational Development recipients in the United States.

General Educational Development (GED) is a second-chance programme that administers a battery of cognitive tests to self-selected high-school dropouts to determine whether or not they are the academic equivalent of high school graduates. Heckman and Rubinstein conclude that passing the GED is a mixed signal: they are smarter than other high school dropouts but they have lower levels of non cognitive skills. GEDs are "wiseguys" who lack the abilities to think ahead, to persist in tasks or to adapt to their environments. GEDs ultimately earn less in later life and work less than others with similar cognitive skills. It is a lack of valued personal qualities rather than technical ability that inhibits their prospects.

Thus it seems that we have established the following stylised facts:

- Cognitive skills are an important determinant of earnings ability
- Education attainment is a useful, but partial, proxy for skills – higher cognitive ability workers will tend to have higher education attainment, lower cognitive ability workers with the same education attainment potentially have higher non-cognitive skills and this potentially explains both their above average (for their cognitive ability) education attainment and earnings.
- Where education attainment, even in conjunction with other observable characteristics such as age, experience, occupation, is unhelpful is that there has been considerable wage movement in recent years independent of these factors.

In all of this we have kept returning to relating to skills as being reflected by the earning ability of workers. We have been using education attainment and cognitive skills as proxies for earning ability, thus it is useful to explore the third option for measuring skills suggested by Jeff Borland: simply define workers' skill levels as corresponding to their wages, ie higher wages correspond to their opportunity cost which will reflect the productivity and relative scarcity of the skills they possess.

That is forget about trying to describe the relative contributions of different types of skills and simply use wages as a metric of the skills possessed by different workers. This approach implicitly discounts non-market skills. There are also issues relating to bargaining power between employers and workers, and some allocative efficiency issues.

The argument for using wages as a proxy for the value of the skills possessed by a worker relates to the perfect competition results that indicate that the wage rate of workers will equal their marginal productivity. Thus wages provide a marginal measure of the productive

ability of workers, which equates to our initial definition of skills, it is the value placed on a worker's ability to convert mental or physical effort into productive output.

Of course the results obtained from analysis of prefect competition conditions depend on a number of assumptions that do not hold in real world conditions. So how does the relaxation of some of these assumptions affect the usefulness of wages as a proxy of worker skills? In particular we need to consider the implications of a heterogeneous workforce (workers with different abilities and experiences) and barriers to the free entry and exit of both firms and workers.

To illustrate we use a wage equation derived in Blazquez and Jansen (2003). This is still based on a very simplified view of the world but it generalises from the perfect competition model sufficiently to allow us to observe some of the potential problems associated with using wages as a proxy for the skills possessed by workers.

Consider that we can differentiate between workers with different skills, i, (at its simplest this could be between "low" and "high" skilled workers) and between types of jobs, j (again at its simplest this could be between unskilled and skilled jobs). Further that the personal value of a person of type i spending an indefinite time in unemployment as $U(i)$ and thus that the value of spending the current period in unemployment is $rU(i)$, where r is the discount rate (ie reflecting people's time preference). One might consider $U(i)$ as representing the net present value of income from the unemployment benefit (or other income sources) as well as factors such as their value of leisure (or inversely the negative value they put on having to travel to and remain at work). The term $rU(i)$, is therefore the reservation wage for workers of type i, this is the minimum wage that they require to be offered to induce them to work in paid employment rather than remaining unemployment or outside the labour force. Thus if the value the output produced by a worker of type i in a job of type j is defined as $y(i,j)$ then one can derive a wage equation such that:

$$w(i,j) = rU(i) + \beta\left[y(i,j) - rU(i)\right] \qquad (1)$$

Effectively this equates the observed wage of an i-type worker in a j-type job is equal to their reservation wage plus the potential profit accrued from the job to the employer adjusted by a bargaining power parameter, β. The implication of this equation is that the observed wage of workers will differ from the productivity of their work depending on their bargaining power. If bargaining power is even between workers and employers then the wage will equal the marginal productivity (as suggested by the perfect competition model). If the worker's bargaining power exceeds the employer's then the wage will exceed marginal productivity, and conversely it will be less if the employer's bargaining power is greater.[2]

What then influences this bargaining power?

[2] Note this wage equation allows observed wages to differ between firms and industries due to different productivity performances. Thus workers can share some of the benefits of the organisational abilities of their firm, and the better performance of their industry. Wages will also rise if there is a better match between types of workers and types of job, if we presume that they will enjoy a higher level of productivity.

First there is the relative scarcity of appropriate skills and appropriate jobs. This can come about for both supply and demand reasons. For example, a scarcity of appropriately skilled workers (either through increased product demand or decreased worker supply) will increase worker bargaining power, their ability to seek above productivity wages, and so allow them to take an increased share of the available profit from the business owners. Conversely an abundance of workers (either through reduced product demand or increased worker supply) will reduce worker bargaining power.

There may also be institutional factors behind differences in bargaining power. For example, worker bargaining power could arise due to monopsony selling power (eg through collective bargaining or occupational licensing) and/or through the monopoly power of the firm in its product market.

Skill gaps

Of course our key interest here is not the definition of skills but to identify useful indicators of the presence of skill shortages or skill gaps. Wallis (2002) defines a skill shortage as:

> *A situation where there is a genuine shortage in the accessible external labour market of the type of skill being sought, and which leads to difficulty in recruitment.*

Skill shortage vacancies are thus vacancies explicitly attributed to a lack of job applicants with the required skills, qualifications or work experience. This is the type of skill shortage that the Immigration Service is likely to be most interested in, however, there are a number of other reasons why employers might have difficulties in hiring appropriate staff, which we first need to define and then ensure that indicators to be used by the Service can, where necessary, differentiate between the different types of shortage.

Internal skill gaps: a situation where employees current skills are insufficient to meet the business objectives of the employer. In this situation staff numbers are probably adequate, but the current skill mix is no longer appropriate. The options available to the employer are either to train up existing staff members in the desired skill area or to hire new staff with the desired skills. An internal skill gap can potentially lead to an external skill shortage if the employer chooses to hire new staff and then has difficulty finding appropriately skilled candidates.

Recruitment difficulties: a situation where there are adequate numbers of potential workers in the labour market with the appropriate skills, but employers have difficulty attracting them to work for their organisation. In this situation there are likely to be factors other than a lack of skilled workers at the heart of the employers' problems. It may be that the employer is not prepared to pay an adequate wage to attract the desired staff (thus suggesting that there really is not the genuine demand for the employer's products). It might be that there are institutional factors limiting the employer's ability to offer adequate employment conditions to new recruits (for example there may be regulations influencing who can be hired in different positions, union or occupation association limits on flexibility, etc). Finally there may be firm, industry or region specific

factors that make the positions unattractive to potential employees (for example, the firm may have a reputation as a poor employer, the industry might have a bad image or the job location might be unattractive to workers and their families).

Labour shortages: cyclical shortages, principally attributable to macroeconomic phenomena. While the presence of excess aggregate demand conditions will lead to perceived skill shortages in many occupations, such shortages are difficult to avoid, and cannot be averted, say, by increasing investment in training. The appropriate policy responses are macroeconomic, which in the case of New Zealand is primarily the responsibility of the Reserve Bank.

Latent skill gaps: can be present either because employers fail to report problems or because they do not perceive they have a problem. There is little one can do to help firms that do not perceive they have a problem, ultimately one has to rely on business sector competitive forces (or political processes in the public sector) to either force organisations to confront their latent problem or to divert resources to organisations with more perceptive management teams. Wallis (2002) argues that the presence of latent skill gaps can mean that surveys of business perspectives on recruitment can understate the true level of skill shortages. An alternative view is that some businesses or industry organisations might overstate the presence of skill shortages, either because they can not perceive the true macro situation[3] or because they see some benefit from doing so (eg by encouraging government assistance).

The implications of these factors for skill shortage indicators include:

- We can not necessarily rely on the stated perceptions of employers, industry organisations and the like;
- Evidence of employment search, such as advertising, provides some evidence that the potential skill shortage is external rather than internal;
- Wage indicators, in addition to advertising data, should be used to help differentiate between skill shortages and recruitment difficulties;
- Occupation specific advertising and wage data needs to be benchmarked against economy wide averages to help assess the extent that shortages are skill specific rather than simply reflecting economy wide labour scarcity.

[3] If excess demand conditions exist in a market, most businesses in the industry will be aware that there is more demand than they can meet, but they will not be aware of the extent that extra labour might alleviate this demand pressure. For example, imagine a town with ten car repair shops with excess demand conditions. All the repair shops perceive they need to hire more mechanics, they all advertise, giving the perception of strong demand for mechanics, but potentially one or two extra mechanics might resolve the excess demand and thus eight of the ten advertised positions are not actually required.

Immigration policy issues

The purpose of this section is to discuss the role of policy (and particularly immigration policy) in alleviating skill shortages. While this is slightly outside the brief of the paper, the purpose of including this discussion is to both provide context and to assist identifying the skill shortage indicators that are likely to be of greatest relevance to the Immigration Service.

The skill composition of any labour force can be modified through training, demographic changes (eg migration) and skill requirements change with technology. An economy can respond to a change in the relative demand for specific skills in a number of ways. This normally results in upward pressure on the wages for the scarce resource, which will lead to a combination of potential responses including one or more of the following:

- The relative wage rise provides an incentive for workers to enter or re-enter the occupation. Longer term, if the relative wage differential is maintained, it will provide encouragement for students to train in the area and enter the occupation.
- The wage rise might encourage a rise in the price of the product or service provided by the scarce resource, which depending on the relative demand for the product will lead to some reduction in sales and some reduction in spending on other products (due to customers' budget constraints).
- Depending on the net impact on company profits from customer responses, a change in the relative profits between firms will encourage some marginal redistribution of investment between industries (ie higher profit industries will encourage more investment, at the expense of the lower profit industries).
- If employers can not pass on the cost rise to customers, say through price rises, then the wage rise implies an unambiguous reduction in profitability. There are potentially two (not necessarily exclusive) response to this; firms in the industry could grow slower and other sectors of the economy will grow relatively faster (or less slowly) or firms within the industry could seek production methods that use less of the relatively scarce form of labour (eg through capital substitution). In either situation, the demand for the skill type is likely to fall, thus relieving the wage pressure.

Situation specific circumstances (the nature of the initial shock, the nature of demand for the product, institutional influences etc) will determine which of the events above will occur and which will tend to dominate. However, the key point is that there tend to be natural self-equilibrating forces that tend to eventually resolve the impacts of shocks. But "eventually" is a key word in that sentence. There may be policy responses that can either speed up the process or alleviate some of the disruptive impacts. There may also be some socially undesired effects of the new market equilibrium that might encourage a policy induced alternative. One obvious means of speeding up the transition process is to allow foreign workers with the appropriate skills to work in New Zealand. Below we discuss how migrants interact with the local labour force.

Competition of migrants with domestic workers

The approach used in this section builds on the static analysis presented in Borjas (1995). To begin with we assume homogenous labour (everyone has equal skills and ability), there is a fixed supply of native labour (N), the stock of capital is fixed, there are constant returns to scale and diminishing marginal productivity of labour. We can then produce a simple supply and demand for labour diagram where the demand for labour is given by the marginal product of labour (MP), which has a downward slope due to diminishing returns[4], and in the absence of migration employs N workers at the market wage of W_0 (Figure 2).

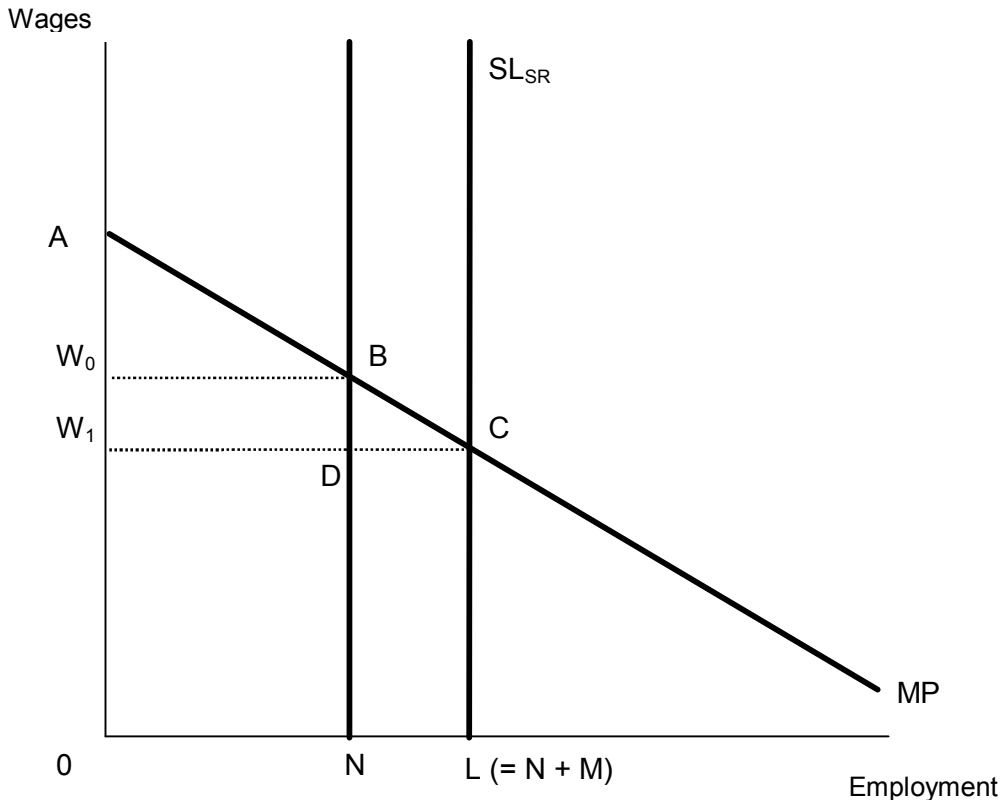

Figure 2

In this situation total income is equivalent to the area of the trapezium, 0ABN, which can be split into wage income, $0W_0BN$, and capital or consumer surplus income, W_0AB. In the event of immigration, which in this case increases the labour supply and employment by M, from N to L, total income increases from 0ABN to 0ACL. The increase in the supply of labour competes down the wage from W_0 to W_1. Migrants' income is represented by the rectangle NDCL. The income of native workers falls by the rectangle W_1W_0BD. Native profits (either capital income or consumer surplus) increases by the fall in the income of native workers plus the triangle DBC. Thus the arrival of migrants reduces the income of native workers but increases the surplus available to native capitalists

[4] The downward slope does not mean that extra workers are less capable, but that with a fixed capital stock, there is less that can be done with each extra worker (the first drives the digger, the second the truck, the third uses the shovel, the fourth directs the traffic, the rest play cards…).

and consumers. Overall native income rises by the triangle DBC. This triangle represents the 'immigrant surplus', which represents the gross efficiency gain to the domestic economy as a consequence of immigration.

Although the net impact in this case is a positive gain for the native economy, any native labour that directly competes with migrant labour is likely to experience a fall in real incomes. While this group of native workers may extract some of the increase in national surplus, eg through capital investments (eg home ownership or shares in businesses) or through cheaper consumption (ie an increase in the consumer surplus), the larger this group is the larger is the potential for native opposition to immigration.

There are varying views on how important this impact of immigration on domestic wages actually is in reality. Longhi, Nijkamp and Poot (2004) conclude from a meta-analysis of eighteen papers, which altogether generated 348 estimates of the percentage change in the wage of a native worker with respect to a one percentage point increase in the ratio of immigrants over native workers that "the impact of immigration on wages is statistically significant but quantitatively small" (p23).

There are a number of reasons why the impact of immigration on native wages is smaller than is suggested by Figure 2. Below we look at the impact of changing demand, which better illustrates the circumstances that are likely to prevail when skill shortages are present.

Impact of more demand

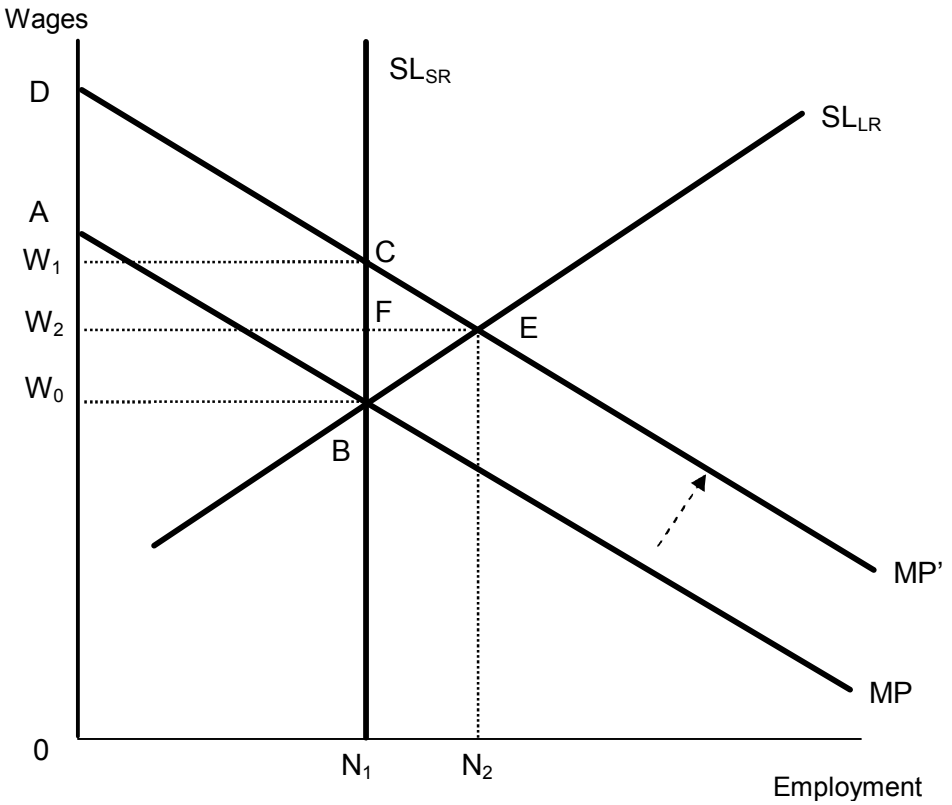

Figure 3

Figure 3 illustrates the impact of an increase in the demand for labour in the absence of immigration. An increase in demand is represented by an outward movement in the marginal productivity of labour curve from MP to MP'. In the short run, the supply of labour is assumed to remain fixed at N, which given the increased demand for labour drives wages up from W_0 to W_1 and the increase in wage income is represented by the rectangle W_0W_1CB. The national surplus (accruing to consumers and owners of capital), measured as the area of the triangle W_1DC, has not changed since this triangle is simply a parallel shift of the original surplus triangle, W_0AB.

Although the supply of labour may be considered fixed in the short term, the increase in wages is likely to encourage an increase in labour market participation. That is people on the periphery of the labour market (students, unpaid caregivers, superannuitants etc) might be enticed by the higher wage to move into paid employment. Thus the long run supply curve for labour is not necessarily vertical, although it is likely to retain an upward slope. This is represented by SL_{LR} in Figure 3.

With more workers eventually entering the labour market, this is likely to compete down the wage rate to W_2. Ultimately wage income settles at $0W_2EN_2$ and the national surplus settles at W_2DE. The ultimate impact of the increase in income resulting from the improvement in labour productivity is then:

- Existing workers lose their short-term income windfall of W_2W_1CF, but have still increased their incomes by the amount represented by the rectangle W_0W_2FB as a result of the increase in demand for labour;
- The $N_2 – N_1$ encouraged workers are financially enriched by an amount represented by the rectangle N_1FEN_2; and
- Consumers and capitalists are enriched by an amount represented by the trapezium W_2W_1CE.

Of course one can re-interpret Figure 3 from an immigration perspective by replacing encouraged domestic workers by immigrant workers and one might conclude that immigration in the presence of demand growth is likely to be a win-win situation for all involved. If we assume that immigration acts faster than encouraging domestic workers, then the key difference is that existing native workers might not enjoy super-high wages for as long a period, but the net gain to the country is once again the 'immigrant surplus', represented in Figure 3 by the triangle FCE.

The other place where immigration is likely to differ from encouraging domestic workers is that the potential supply of immigrant workers could be considered to be for analytical purposes close to infinity and that the long run supply curve for labour is no longer upward sloping but essentially horizontal at the prevailing wage. In this situation (Figure 4) when immigration is used to meet an expansion in the demand for labour, an increase of M migrant workers:

- would shift the supply of labour from N_1 to L;
- the wage would stay constant at W_0;
- native wage income would stay constant at $0W_0BN_1$;

- migrant income would be represented by the rectangle N_1BFL, and
- the national surplus would increase by the trapezium W_0W_1CF.

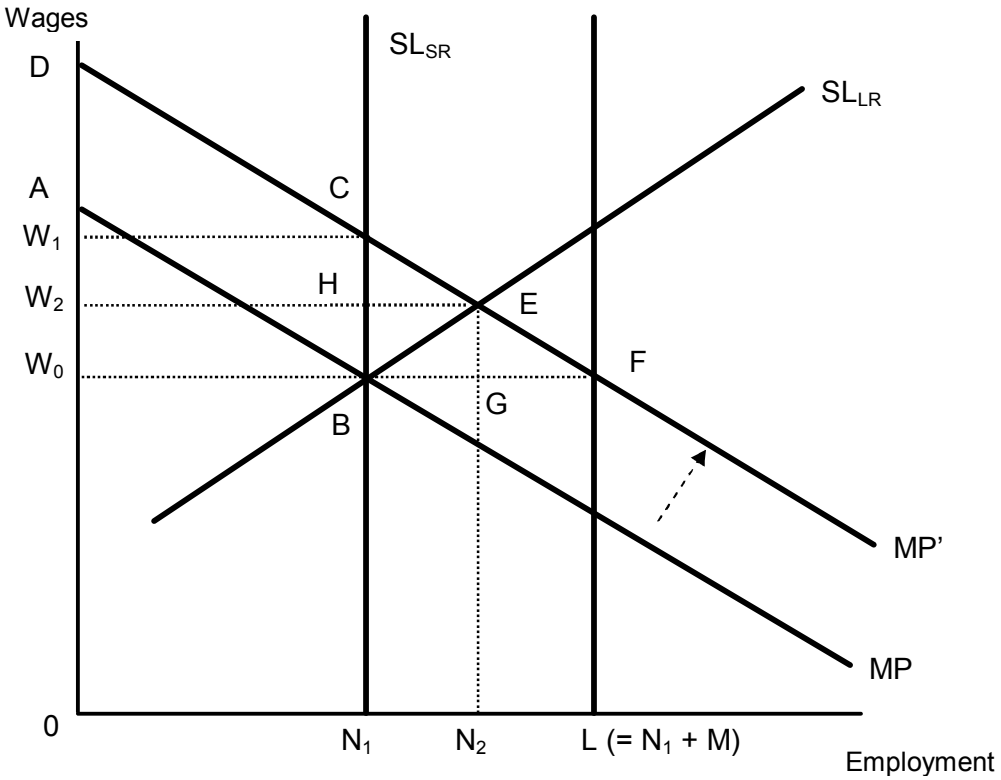

Figure 4

From a national perspective one might argue that immigration in this situation is superior to relying on domestic labour. The immigration surplus in Figure 4 is represented by the triangle BCF, which is considerably larger than the encouraged worker surplus of HCE. But it is less clear when one considers this from a native population perspective. Although existing native workers are no worse off, they have missed out on some potential income growth (W_0W_2HB). There is also the income lost by potential market entrants (N_1HEN_2).

In a static model with no population growth, like we have here, the societal welfare loss resulting from this loss of market income for native workers (N_1HEN_2) may be considerably smaller than is implied in Figure 4 as these people may generate a high level of societal welfare from undertaking non-market activities, eg caring for children, voluntary work or just enjoying their leisure. It becomes more problematic when one considers new entrants to the labour market over time. At the margin the arrival of immigrant workers (particularly skilled workers) will depress wages and act as a disincentive for local workers to develop their skills and human capital. The arrival of migrant workers can lower the lifetime prospects of individual native workers, even if the aggregate impact is positive.

The danger for such groups is that they do not have a voice, the issue is about foregone opportunities, many of which are for people who might never be aware that they missed an opportunity. But are such costs that important? A recent study suggests maybe.

Mailath, Samuelson and Shaked (2000) create a model of an endogenous labour market with two types of workers labelled “red” and “green” workers, where the labels have no bearing on the skills or performance of workers. Workers may acquire skills. Skilled workers search for vacancies, while firms search for workers. One of their results is that there can occur asymmetric equilibria in which firms search only for green workers, as a result more green than red acquire skills (because red workers are less likely to be employed there is less incentive to invest in obtaining skills), skilled green workers receive higher wages (purely because they are higher skilled) and the unemployment rate is higher among red workers (purely because they are on average less skilled). If one group of workers are perceived as more skilled, and therefore more desirable workers, this can generate self-reinforcing behaviour that exacerbates the initial shock.

Translating this result to an immigration response to skill shortages, there is a risk that the use of immigration to solve one specific problem can generate a long term dynamic where there is undue reliance by business on immigration to be the supply source for skilled workers. It begins with one specific problem where the shortfall is met by migrants, but as this increase in supply diminishes entry into the industry from domestic workers, it increases the risk that there will be future shortfalls, which again need to be met by migration solutions.

Specialisation and training

Underpinning concern about skill shortages is necessarily a perception that workers have different skill sets and that many jobs require very specific skills. This means that for many jobs the pool of potential workers is limited to those who have specific training in the area of interest. As we have already discussed even within this narrow field candidates are likely to exhibit different levels of cognitive and non-cognitive abilities which will influence employer preferences. That is, for a given group of suitably qualified candidates, employers will prefer candidates that exhibit greater technical aptitude in the specialisation and/or greater “soft” skills like diligence, communication skills, affability etc. Increasingly it has been differences in these within field abilities that have been responsible for different income outcomes (Acemoglu 2002). However, while employers would prefer and may be willing to pay more to employees who have greater within field skills, they will potentially be prepared to employ “lower quality” but similarly qualified workers. They may wish for better candidates, but this need not prevent them from making a job offer to a qualified candidate.

Skill shortage starts to emerge when there is a lack of candidates with the minimum specific qualifications or skill set. This suggests that measures of occupational specialisation, or conversely measures of the substitutability of workers between occupations can provide an indication of the occupations that are likely to be more susceptible to skill shortages

than others. That is, a highly specialised occupation has a greater potential to experience skill shortages than an occupation that can draw on candidates with a wider range of qualifications. The length of time to undertake the specialised training will also have an impact on the time it will take to resolve skill shortage problems.

Thus indicators of the degree of occupational specialisation and the potential for domestic training imbalances are likely to be useful supplementary indicators for the Immigration Service. They do not of themselves indicate skill shortage, but specialisation indicators would help identify the occupations or skill sets that are susceptible to skill shortages, and training indicators would highlight the occupations that in the event of a skill shortage potentially merit an immigration policy response. We return to list potential indicators in the next section.

Institutional settings

It is important that indicators of skill shortage assist analysts' attempts to differentiate between causes and effects. There will potentially be examples where a problem appears to manifest itself through an apparent skill shortage when this is a symptom of a problem with other causes. This suggests that a multiple indicator approach is likely to be merited. For example the presence of a high number of unfilled vacancies might reflect a skill shortage, but it might also simply indicate hiring difficulties. Likewise high wage growth might reflect the interaction between an industry with monopoly power in the presence of aggregate demand growth.

Being able to identify the source of what appears to be a skill shortage problem can help the Immigration Service narrow the list of potential occupations that could be on the Skill Shortage Lists to the ones that an immigration solution is likely to be most helpful.

There will of course be some circumstances where, even if policy makers know that the source of the problem is not a skill shortage, tackling the true source of the problem is impractical or not politically feasible. In these circumstances using immigration to address the problem is a legitimate "second-best" solution. Having a suite of indicators that increase awareness of the potential problem sources is still useful as it means that one can identify when the use of immigration is a preferred solution and when it is the make-do solution. In the latter case it may also raise awareness of when supplementary policies might be required.

3. POTENTIAL INDICATORS

Current practice

The Department of Labour already produces a number of indicators that offer very useful insights about the presence of skill shortages. The key source of information is the Job Vacancy Monitoring Programme, which consists of four components:

- *Job Vacancy Monitor*: a monthly analysis of job advertisements appearing in 25 daily newspapers and two IT internet job boards. This component started from November 2002.
- A Survey of Employers who have Recently Advertised (SERA) with two sub-components:
    - *SERA Extensive*: a large sample survey of employers to establish whether the advertised positions were filled, and the number and suitability of applicants.
    - *SERA Intensive*: an in-depth survey of a small number of employers who advertised vacancies in occupations in shortage to gain an understanding of the forces contributing to the shortage.
- *Occupation reports*: The results of the SERA surveys are analysed together with other data sources to form a series of occupational reports, produced on an annual basis.

The occupational reports have been coming out since 2004. They offer a detailed assessment of the pressures on specific occupations looking at:

- Advertised vacancies
- SERA fill rates
- Employment growth
- Training rates
- Retirements and detachments from occupation (exits)
- Wage data, and
- Consultation with relevant groups (eg employers, ITOs, industry groups, education providers).

These reports are differentiated between trades, professionals, and ICT. In 2004 there were reports on 16 trade occupations. In 2005 there were reports on 14 trades and 10 professional occupations. Ten of the 14 trade occupations covered in 2005 were the same as had been covered in 2004, ie 20 different occupations have been covered over the two years. With professionals a second report covering a further 10 occupations is due out later in 2006. According to Andrew Whiteford at the Department of Labour there is likely to be an overlap of about six occupations with the previous reports. Andrew noted that decisions on choice of occupations covered were based on a number of criteria, including inter alia:

- The results of the SERA (ie low fill rate occupations)
- Ensuring that there is a spread in coverage across a number of industries (ie not all building industry)
- Investigating occupations where there were known issues
- Investigating occupations where there were unanswered questions from previous occupational reports.

Skill shortage indicators for Immigration

The purpose and interests of the occupational skill shortage assessment reports overlap with those of the immigration service but these reports are not sufficient for immigration requirements. To begin with, there will be a number of (perhaps many) occupations not covered by the reports that might have a strong case for being on the Immigration Service's long term or immediate skill shortage lists. Second, immigration is not necessarily the appropriate policy response for some occupations that the reports identify as being in shortage. Third, the preparation of the occupational reports take a considerable amount of time as the reports require:

- screening of SERA extensive results and other inputs to select occupations to be investigated,
- time to conduct follow-up intensive surveys,
- collection of ancillary labour market data, and
- extensive consultation with interested groups.

Indeed, while the results of the occupational skill shortage reports should inform the choice of occupations on the Immigration Service's skill shortage lists (eg suggesting the addition of some occupations, the removal of others, and perhaps a shift between immediate and long term lists), most of the information relevant to the selection of occupations for the Immigration Service's skill shortage lists are likely to come at the screening stage rather than at the report completion stage. It is at the screening stage that the meta-analysis takes place: when an assessment of the relative ease of finding labour with different skills takes place. The more in-depth analysis should inform why a shortage exists, how long it is likely to persist for, and thus what the appropriate long term policy response, if any, should be.

A screening process for identifying occupations that should qualify to be included on the Immigration Service's skill shortage lists will necessarily differ from that undertaken for choosing which occupations to cover in the skills shortage assessment reports.

Criteria for making it onto a skill shortage list will include:

1. A low fill rate of vacancies, ie evidence that employers are having difficulty filling the vacancies that they have.

2. A high volume of vacancies either relative to the size of the occupation or to the size of the labour market, ie a low fill rate is not sufficient, there has to be strong demand for the occupation relative to the potential supply.

3. Evidence of excessive wage pressure, ie a skill shortage that does not result in wage pressure is likely to have other labour market performance issues – increasing the supply of the skill is not likely to resolve the problem and may create more.

4. Evidence that excess wage pressures are not the result of product or labour market institutions, ie does wage growth reflect demand growth or a lack of competition?

5. Evidence that the current growth in demand for the skill will be sustained, ie that the shortage is not a temporary phenomenon.

6. Evidence that it will take time for the education system to fill the gap.

7. Evidence about the degree of specialisation in different occupations.

The first three set of indicators are our recommended prime means for identifying the presence of skill shortages, which should be used to monitor as many occupations as possible on an ongoing basis. The next three indicators are more about identifying in which of the cases of skill shortage might an immigration intervention be appropriate. A short-term skill shortage should not necessarily prevent the use of work permits to plug the gap, but this stop-gap measure should not be at the expense of creating further problems down the track, eg bringing people in permanently who do not have good long term job prospects or bringing in people at the expense of job prospects for New Zealand students. Finally, indications of education supply trends and occupational specialisation can provide a list of occupations where skill shortages are more likely to occur and potentially would have disruptive impacts.

4. GAP ANALYSIS

1. Fill rate

What is available

Fill rates provide evidence about the relative difficulty employers are having in filling vacancies. Fill rate data in New Zealand is available from the Department of Labour's Job Vacancy Monitor Programme and is a key result from the programme's Extensive Survey of Employers who have Recently Advertised (SERA).

The SERA Extensive is a telephone survey of employers who have advertised professional, technical/semi-professional or trade vacancies. The survey sample is drawn primarily from the Job Vacancy Monitor (see 2. Vacancy Count below). Employers who have advertised for trades workers are approached six to eight weeks after advertising. Employers seeking professionals, semi-professionals or technicians are approached eight to ten weeks after advertising. Employers are asked whether they have filled their vacancy, how many suitable applicants applied and some other questions relating to their recruitment experience.

One of the key summary statistics derived from the SERA Extensive is the fill rate which is simply calculated as the proportion of the vacancies included in the SERA sample, within the occupation classification of interest, that were filled with an adequately qualified and experienced person. Positions that are filled, but with employees who do not have adequate qualifications or skills, are treated as unfilled vacancies by the SERA.

The two SERA Extensive surveys that have been conducted (2003 and 2005) have covered 81 of the 567 occupations defined by NZSCO.

Issues

Reports on results of the SERA claim that "occupations with fill rates lower than about 80% [are] typically regarded as being in shortage". However, there is no formal basis for this claim. It appears to be a rule of thumb based on Australian experiences with fill rates but it is not clear how valid this rule really is. It would be useful to test the relationship of fill rates with other measures of skill shortage.

The SERA Extensive has been conducted just twice (2003 and 2005). An annual survey is probably sufficient, but its usefulness will decline if it is not conducted regularly.

Fill rates are apparently only calculated for occupations from which at least 10 employers are interviewed. From a measurement accuracy perspective this seems a reasonable rule, but from an occupation coverage perspective it suggests that fill rate information is not likely to be a sufficient basis for assessing skill shortage. Are there skill shortages in occupations not covered in sufficient numbers by the SERA?

2. Vacancy Count

What is available

The most useful vacancy count data available in New Zealand is that produced in the Department of Labour's Job Vacancy Monitor. The Job Vacancy Monitor collects and analyses data from selected editions of 25 regional newspapers and on selected websites. Its key strengths are:

- its regularity of collection (monthly),
- the classification of results so that the data is presented in manners that are consistent with Statistics New Zealand classifications,
- vacancies are counted per advertised position, rather than per advertisement,
- effort is made to remove duplicate vacancies, and
- the number of duplicate vacancies is limited by the practice of counting vacancies from newspapers on just one day a month (usually the first Saturday).

Issues

The number of advertised vacancies by itself is of limited value, but gains value when compared with benchmark data. For example the ratio of vacancies to unemployment (v/u) can provide a measure of labour market tightness. Alternatively the number of vacancies in a certain occupation relative to the total number of jobs in that occupation provides an indication of the relative importance of the number of vacancies. Finally the number of vacancies relative to the total number of vacancies provides and indication of the relative importance of the occupation to the total number of vacancies. For example, one might consider that an occupation with a very low fill rate should be placed on a skill shortage list, but this view might be tempered if the number of vacancies represent a very small part of the total number of vacancies or of employment in the occupation.

However, some care will be required in interpreting this type of data. The vacancy data from the Job Vacancy Monitor represents "advertised" vacancies and, as we have noted, just those from a selected number of newspapers (ie it represents a snapshot rather than a total count). These factors combined mean that the vacancy count will undercount the total number of jobs available in the economy at any point in time. This means that measures, like those suggested in the previous paragraph, are at best just indicators of the true measures they are trying to proxy. Observing how these measures evolve over time can still be very informative and useful. However, this raises a problem that there is little that we can do about at the moment: the Job Vacancy Monitor has been collected only since November 2002. This limits our ability to interpret the information content in new vacancy data, and provides another reason for examining a suite of indicators.

3. Wage data

What is available

The purpose of monitoring wage data is that changes in wages for specific occupations may often be symptomatic of changes in the relative

availability of workers with the skills required for the occupation. Ideally we would correct wage movements for measured changes in the productivity of workers. Productivity improvements are justified reasons for wage increases and do not constitute a lack of available workers.

We consider the monitoring of relative wage movements as important for identifying the presence of skill shortage. Unfortunately as we will discuss below, there are practical limitations with adapting the available wage data for our purposes. Ultimately selecting which wage data to monitor will be a judgement call based on an analysis of the data that goes beyond the scope of the current study. The limitations of the available wage data is part of the reason we recommend using a suite of indicators.

The four key of sources of data on wages in New Zealand are:

- The Labour Cost Index (LCI), is a "quality adjusted" measure of changes in base salary and ordinary time wage rates, and overtime wage rates for a fixed set of job descriptions, as collected from employers.
- The Quarterly Employment Survey, which measures average weekly and hourly earnings, as collected from employers.
- The Income Survey, this annual supplement to the Household Labour Force Survey collects income data from the perspective of the worker.
- Linked Employer-Employee Data

Issues

The key limitation with wage data based on the Quarterly Employment Survey is that it can not be disaggregated by occupation.

The Income Survey data can be broken down by both industry and occupation, but at a reasonably high level of aggregation (for example occupations are coded to the 3-digit level, but generally available at just the two or one-digit level). This effectively reflects the combination of a household based survey with a limited sample size (meaning that the coverage of detailed occupations and industries in the survey can be limited). The other limitation with the Income Survey is that it is collected annually and only since 1997 (implying a time series of just nine data points up to 2005). On the positive side, the Department of Labour does have access to unit record data for the Income Survey, which could allow the Department to undertake customised analysis.

The key concern with using the Labour Cost Index relates to the quality adjustment. This quality adjustment adjusts wages for inter alia the changing level of qualifications and experience of workers in a position. On first blush, this looks like an ideal wage measure for our purposes. However, as is pointed out in a recent report for the Department of Labour (Infometrics 2006a), the relationship between the aggregated quality adjustment in the LCI and movements in labour productivity is actually very low (a correlation of just 0.19). This suggests that the adjustments made to create the LCI are capturing more than pure productivity movements. In terms of equation 1, the Index appears to be adjusted for more than the $y(i, j)$, (job specific productivity) but also includes some of the relative bargaining power component, β.

The Linked Employer-Employee Data (LEED) is potentially a rich source of wage data as it is based on PAYE data returns lodged with IRD that is linked to the Statistics New Zealand Business Frame data. This means that it provides a comprehensive measure of labour income that can be directly related back to individual businesses. Unfortunately the business frame data does not provide details about the occupation of workers working for an enterprise and the income data provides no information about the number of hours worked.

Ultimately linked administrative-survey data systems like LEED hold the most promise for developing useful wage datasets, but this is not likely in the near future. This provides the Department with two avenues for developing useful wage-based indicators of skill shortage, analysis of wages based on the Income Survey unit record dataset. Exploration, with Statistics New Zealand, of extracting unadjusted wage data from the Labour Cost Index. The minimum requirement is to obtain wage data by occupation category so that wage movements in individual occupations can be compared with general economy-wide wage movements. Ideally, data would be available by industry and occupation so that occupational wages could be adjusted for industry movements in labour productivity.

4. Institutional measures

Issues

The bargaining component of wage determination can be influenced by institutional factors as well as the relative scarcity of appropriate jobs or skilled workers. In particular a lack of competition in the product market of employers is likely to generate an economic rent, which will be distributed between shareholders and workers depending on their relative bargaining strength. It is likely that firms in this position will have more difficulty resisting worker wage claims (the viability of the business will not be threatened by higher wages and industrial peace may seem relatively more important). As a consequence, workers in these circumstances may be receiving above average wage rise but this would not necessarily reflect a skill shortage. Indeed in such situations the chances are that excess supply is more likely (as the jobs would be very desirable).

The biggest risk is that in times of general labour shortages, occupations that benefit from some form of institutional advantage will appear to be deserving of policy assistance: there could be evidence of both vacancies and wage pressure. It may still be a second-best policy option to put the occupation on an immigration skill shortage list, but it would be preferable that this was done with full knowledge that this was because it was a necessary evil.

What is available

Indicators of institutional protection are never totally satisfactory. Potential factors to monitor include:

- Levels of industry assistance (eg subsidies, tariffs),
- Judgements on legislative or regulatory protections,
- Industry concentration measures (the degree that industries are dominated by a few firms),

- Rates of firm entry and exit from the industry,
- Numerical limits on education enrolment or qualification attainment,
- Evidence of occupational licensing,
- The degree of unionisation in an occupation/industry.

There are problems with each one of these indicators and this is an area where case by case assessments will be needed and where judgement and institutional knowledge will be important.

5. Occupational growth

Issues

Growth in numbers for individual occupations is of interest if the Department is contemplating an immigration solution to an identified skill shortage. One would like to be able to be sure that there will be sustained employment opportunities in any occupations placed on skill shortage lists. The future does not necessarily follow past trends but being aware of these trends is an important starting point. The types of information that should be covered include:

- Absolute growth rates in employment by occupations and industry,
- Changes in the relative share/importance of the occupation to the industry or the economy
- Changes in the age/sex structure of the occupation (allows the identification of any potential cohort issue and/or leakage patterns form the occupation),

What is available

Most data on the profile of occupations is available from Census data. The advantages of this is that it tends to be quite comprehensive and thus allows investigation at fine levels of detail (5 digit on the NZSCO). Shortcomings relate to the infrequency of Census – there is a five year gap between data points and data is always at least one year, and up to six years out of date. More up to data is available from the Household Labour Force Survey, but this is at a higher level of aggregation (2 or 3-digit NZSCO).

6. Education

Issues

There is international evidence that the supply of graduates from the education sector is subject to cycles of over and under supply. These cycles have been found to be consistent with herding behaviour by students (Drost 2002). That is, prospective workers use the revealed actions of market entrants as a proxy for labour market prospects for different occupations. Drost finds evidence in Germany that is consistent with herd behaviour in student decisions about field of study, which in turn could induce cycles in labour supply. A preliminary investigation of New Zealand tertiary education data, suggests that a number of New Zealand professions could also be subject to herding behaviour (Infometrics 2006b).

Further analysis needed to await the Ministry of Education recoding historical tertiary graduation data so that it is consistent with current NZSCED field of study definitions. This exercise was completed in August 2006 and now provides field of study completions classified on a full 6-digit NZSCED basis (ie for up to 375 qualification fields) for each year since 1994.[5]

Analysing this data could potentially provide the Department with a list of occupations:

- whose supply is independent or at odds with labour market signals,
- that are subject to supply cycles,
- that have the potential to have deep and long supply cycles,
- that appear to be subject to recent supply shortfalls.

Undertaking such analysis would provide the Department of Labour with an ability to rank qualification fields according to their susceptibility to lengthy over or under supply, an assessment of current supply conditions for qualifications in different fields of study and a methodology for forecasting the time it is likely to take for the education sector to redress supply imbalances.

7. Specialisation measures

Measures of specialisation maybe of use as indicating which occupations potentially have a higher susceptibility to skill shortage problems. The logic is that more specialised occupations will have a smaller local pool of people with appropriate qualifications and thus could have more difficulty dealing with labour shortages should a supply problem or a demand shock emerge.

Issues

A thorough approach to estimating the degree of specialisation would be to develop a constant elasticity of substitution (CES) model of the labour market and estimate the elasticities of substitution between different occupation groupings (eg as per Fitzenberger and Kohn, 2006). However, such an approach also requires the estimation of wage premia between occupations, and so potentially runs into many of the problems discussed in 3. Wage data above.

What is available

Maré and Liang (2006) developed specialisation indices across occupations, industry and by industry and occupation using data from the 1996 and 2001 Censuses. The measure of occupational specialisation used by Maré and Liang is the sum of squared employment shares by 3 digit occupation:

$$\gamma_{occ} = \sum_{i=occ} (x_i)^2 \qquad \text{where } x_i = \frac{E_i}{E_{Tot}}$$

[5] The Ministry of Education inform me that they consider field of study classifications to be robust for every year at the 2 and 4 digit level, but there may still be some inconsistencies at the 6 digit level for early data (ie 1994-95).

Maré and Liang also provide estimates of median income for in and out of field employment for each field of study. That is, is they provide an estimate of the premium for working within the field of study. The benefit of this study is that it provides a ready, off-the-shelf measure of many factors of interest. Potential issues are:

- The specialisation indicator does not provide a formal measure of the degree that employers can substitute between workers with different qualifications.
- The study relies on Census-based income data, which does not identify the source of income and reports income in reasonably large bands.
- Being based on the 2001 Census the information is becoming a bit dated.
- One needs to ensure that results are differentiated by age, as a key result of Fitzenberger and Kohn (2006) is to highlight that substitution estimates are likely to be spurious if they do not account for the age mix of workers.

What next

There are in essence three distinct purposes for developing and monitoring the seven recommended types of indicators:

- To assess the presence of current skill shortages (fill rates, vacancy counts and relative wage movements)
- To assess appropriate (if any) policy responses to identified skill shortages (institutional measures, occupational growth, education supply) and
- To develop a list of occupations or skills that have a higher propensity of being exposed to supply shortages (education supply, specialisation measures).

While it might be tempting to focus mainly on the first objective, the quality of immigration policy would benefit from increasing understanding and awareness in all three areas.

Thus we recommend that the Department endeavours to improve its monitoring in all three areas and develops a decision process for selecting skills/occupations to be placed on skill shortage lists that addresses each of the three issues.

Below we re-order our discussion from the perspective of ease of making progress, beginning with the quick wins towards the more difficult issues. This ordering is reasonably rough, things that appear at this stage to be quite straightforward may turn out to be more complicated in practice. Also we would not recommend ignoring the more difficult tasks: their difficulty in many ways highlights their importance. Instead what it might require is simultaneously running short and medium term strategies: using what is available now and investing to develop better measures in the future.

Vacancy counts, fill rates, specialisation and occupational growth measures

These elements are virtually off the shelf products. The vacancy count and fill rates are already being generated by the Department and the Department has already funded the development of specialisation measures (Maré and Liang 2006). Intercensus changes in occupational numbers are also readily available from within the Department (eg the Job Vacancy Monitoring team have developed a user friendly spreadsheet that presents a wide range of data including intercensus job growth, relevant to a large range of occupations).

As we have noted, there are a number of issues with these measures that the Immigration Service will need to be mindful of when using. For example, the vacancy counts provide an indicator of relative job vacancies (either across time or between occupations) not of the absolute number of vacancies. There are also a number of development issues:

- The vacancy count measures will need to evolve over time so that it reflects changes in job search practices (eg use of web based advertising) yet also ensure that this does not compromise interpretation of the counts over time.
- The Immigration Service will need to negotiate with the Job Vacancy Monitoring team to ensure that the timing and coverage of the SERA Extensive surveys (from which fill rates are calculated) meet an appropriate balance between the Department's requirements and resource constraints.
- The Immigration Service would benefit from discussions with Motu to ensure that they access specialisation data at high levels of disaggregation, that understanding and interpretation of specialisation measures is correct and to explore options for improving and updating such measures.
- Both the occupation growth and specialisation measures rely on Census data. There will be a task to update these measures next year to account for data from the 2006 Census.
- It may be useful to explore the usefulness of more timely, but also more aggregated, occupational employment data (eg from the HLFS) for skill shortage assessment purposes. That is, how much useful information is contained in movements in quarterly changes in occupation employment at the 2-3 digit level of classification?[6]

However, in general data in these four areas is readily available, is reliable and in a format that is of use to the purposes of informing the Immigration Service about skill shortages. Instead the critical task is one of interpreting the data, assessing what the critical trigger values are for each type of data that signal that the occupation is susceptible to skill shortages and/or that problems are emerging.

[6] Related to this is the issue that survey based information can have high noise to signal ratios for disaggregated data. That is, we can not be confident that the number of people surveyed in any particular 3 digit occupation are representative of the true population of people employed in that occupation at that point of time.

Thus for these four types of indicator, the tasks are to:

- Collect data in a suitable form,
- Ensure that data is updated at a frequency that meets the Service's requirements (the Service may have limited ability to influence this, and the issue may be more one of identifying intermediate proxy indicators),
- Analyse of the data to aid interpretation

Education supply

For the first time a database is available that measures the education sector's supply of qualifications by field of study on an annual basis. An analysis (as described in 6. Education above) would provide the Department of Labour with an ability to rank qualification fields according to their susceptibility to lengthy over or under supply, an assessment of current supply conditions for qualifications in different fields of study and a methodology for forecasting the time it is likely to take for the education sector to redress supply imbalances.

Wage data

Wage data by detailed occupation is not readily available publicly. Published LCI data tends to be published at high levels of occupational aggregation, in index form and after potentially distorting quality adjustments. The Department of Labour has three avenues for generating more useful measures of occupational wages, they could:

- negotiate with Statistics New Zealand to provide them with wage data based on raw data collected by Statistics New Zealand as the basis of generating the LCI,
- negotiate with Statistics New Zealand to provide them with wage data by occupation based on the annual Income Survey,
- negotiate with Statistics New Zealand to allow the Department to generate its own measures of occupational wage by customising the aggregation of wage data using the Income Survey database already held in the Department.

The preferred approach will depend on the level of disaggregation available, the willingness of Statistics New Zealand to provide either data or permission to analyse data, and the relative costs involved.

Once a reasonable dataset of wage data by occupation is available, the next step will be to develop wage measures normalised around average wage measures. This should be a straightforward task that allows wage movements to be corrected for general wage movements. But this adjustment does not correct for differences in productivity. Correcting occupational wage data for labour productivity will not be trivial task. This is mainly because productivity tends to be measured by the firm or by industry, rather than by occupation. There are also a number of other issues that will complicate the calculation (for example, there is often debate around the accuracy of productivity measures).

The Immigration Service (and the Department in general) will need to decide if the benefits of obtaining these type of wage measures will justify

the investment of time, money and risks involved. An additional consideration might be that the actual process of attempting to develop such measures might yield unanticipated insights into the operation of the New Zealand labour market.

Institutional measures

As stated earlier, indicators of institutional protection are never totally satisfactory. However, it is less obvious that a set measure of institutional protection is required. The key purpose for monitoring institutional factors is to provide the final reassurance that an immigration response to an identified occupational shortage is appropriate and to provide guidance for other ancillary policy options. These are by their nature case by case decisions. The types of indicators suggested in 4. Institutional measures, above, may facilitate such analysis, but it is difficult to prescribe a set of indicators that will cover every case and will always provide a clear signal to policy advisors. Indeed in most cases the institutional knowledge of the policy advisor will be as important as the objective data collected. Thus instead of focussing on a list of indicators, it may be more useful to develop a checklist of questions relating to the way that factors such as market structures, legislation, regulations might influence the supply and demand for workers of interest and put in place a process that ensures that these are addressed before changes are made to skill shortage lists.

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