

Long run shifts in the industry and workforce structure of the Australian construction industry: Implications for a sustainable labour supply

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ABSTRACT

This study examines long run changes in the industry and workforce structure of the Australian construction industry. The major focus of the study is on-site vocational occupations in the industry and the way in which changes in industry and workforce structure are affecting the adequacy of labour supply. The primary data sources are the 1986 and 2001 Population Censuses and economic and labour force surveys. The principal variables examined are changes in the occupational, industry, educational attainment and demographic structure of employment in the industry. There was significant change in all four variables over the last two decades. The major drivers of this change include the intensification of sub-contracting through the intra-industry division of labour, outsourcing of activities through the inter-industry division of labour and new technologies and evolving consumer tastes. Another driver of change identified was the increasing 'educational segmentation' within and across occupations in the industry. There was a large, though relatively static share of occupations with no qualifications, but a rising share of persons with post-Certificate qualifications even within the same occupation. The study finds that a combination of changes in industry structure and demographic trends suggests that vocational skill shortages in construction are unlikely to improve in the medium term.

Introduction: Scope and purpose of the study

This study examines shifts in the industry and workforce structure of the Australian construction industry over the last two decades. The purpose of the paper is to examine how these changes in industry and workforce structure are affecting the capacity of the construction industry to invest in vocational training.

The primary focus of the paper is the on-site 'vocational' occupations, that is, those occupations that have the acquisition of an Australian Qualifications Framework level III or lower credential as an entry point for employment in the industry. Vocational occupations include Australian Standard Classification of Occupation (ASCO) (Second Edition) Major Groups Trades, Clerical and Service, Intermediate Production and Transport Workers and Labourers. These occupations comprise the great bulk of occupations in the industry and public policy concern regarding skill shortages has been largely restricted to these occupations, most notably the trade group (Department of Education, Training and Youth Affairs 2001). The paper is intended to contribute to the analysis of, and public policy response to, the sustainability of labour supply in the Australian construction industry.

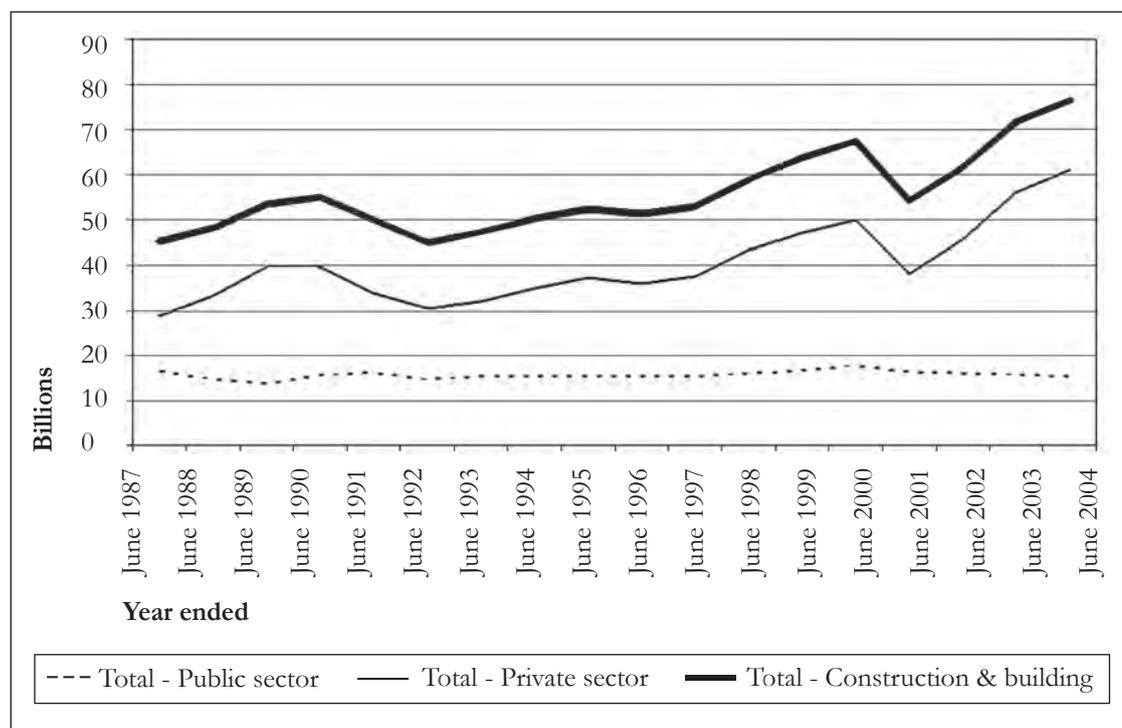
Changes in industrial structure

The construction industry is a key supplier of infrastructure and investment goods to the economy, with buildings and structures accounting for just under half of all fixed capital investment in Australia. (The other half is equipment) (ABS 2004a). The efficiency of the construction industry is therefore a key determinant of the competitiveness of the supply of infrastructure and investment goods into the Australian economy. Total real output of the construction industry increased by 69 percent between June 1987 and June 2004, slightly faster than total GDP (Figure 1). Based on Population Census estimates total employment in construction increased by 31 percent between August 1986 and August 2004, compared to 28 percent across all industries.

Over the last two decades the industry has undergone major changes in its industrial and workforce structure. These changes are summarised below.

FIGURE 1

Real construction
and building
output
1987-2004
Australia



Source: ABS Value of Work Done in Construction, Cat No. 8782.0
Reference year for Chain Volume Measures is 2002-2003.

INCREASED SUBCONTRACTING: The most important change in the Australian construction industry over the last two decades has been an increase in the intra-industry division of labour or subcontracting of work. This intensification of subcontracting is a general trend in the global construction industry in developed and developing countries (ILO 2001). Changes in the industrial structure of the Australian construction industry reflect this intensification in subcontracting. Firms within the construction industry that provide subcontracting services (such as carpentry, painting, plumbing, electrical and earthmoving) to other construction firms are classified to the Construction Trade Services industry. This industry increased its share of employment over the period from 59.5 percent to 64 percent (Morgan 2004).

A number of demand-side and supply-side factors have been identified which have encouraged the growth of subcontracting. On the demand side outsourcing provides flexibility in the use of labour as the contractee only pays for labour when it is used. This is important in construction which historically is subject to major cyclical changes in output (ILO 2001). Subcontracting reduces on-costs such as superannuation, long service leave, payroll tax, sick pay, holiday pay, workers compensation and the administration of these costs that apply to the direct employment of labour. These costs in the Australian construction industry can be equal to 25-30 percent of direct wage costs (Toner 2000:297). On the supply-side there are relatively low barriers of entry into the industry. Subcontracting confers the benefits of autonomy to self-employed contractors and potential tax concessions in transferring from the PAYE system (Underhill, Worland and Fitzpatrick 1998; Buchanan and Allen 1998).

CHANGES IN THE STATUS OF EMPLOYMENT: The obverse of increased subcontracting is growth in self employment. In 1978 21 percent of all persons in the industry were self-employed as either own account workers or employers (Underhill 2004: 211). In 2001 36 percent of persons in the industry were self employed (ABS 2001a). (This data under-estimates the level of self employment as owners of incorporated companies are classified by the ABS as employees of these companies. ABS 2004b: 10). In contrast in 2001 14 percent of the whole workforce was self employed. The growth of subcontracting and the high share of self-employment are also a cause and effect of the much smaller average firm size in construction compared to the economy as a whole (Department of Employment and Workplace Relations 1998: Table 4.3). Growing reluctance of construction firms to directly employ workers is reflected in the dramatic decline

in firm size in the construction industry, which fell from an average of 4.1 persons per firm in the late 1980s to 2.5 persons in the latter 1990s (Toner 2000: 293). In turn this led to a near doubling in the number of establishments from 98,000 in 1998-99 to 194,000 in 1996-97 (Toner 2000:293). This reluctance also contributed to the somewhat higher propensity of the industry to engage employees on a casual basis. (Casual employees have no paid annual leave or sick leave). In 1985 17.3 percent of all employees in construction were casuals. By 2001 this had increased to 32.6 percent. For the economy as a whole 15.9 percent of employees were casual; by 2001 it was 27.2 percent. Growth of self-employment, reduced firm size and increased casualisation have contributed to a large decline in union density. Union density collapsed from nearly half of the construction workforce in 1986 to just under one quarter of the workforce. This reduction closely matches that in the broader economy (ABS1986; ABS 2001a).

These changes in industrial structure and status of employment are argued below to have greatly influenced the occupational structure of the industry over the last two decades.

PUBLIC SECTOR: The other major change in both the international and Australian construction industry is the decline in the role of government 'as a direct provider...of construction services and employer of construction labour' (ILO 2001:21). The Australian public sector share of construction output and employment has declined markedly over the last two decades (Figure 1). In 1987 the public sector accounted for 36 percent of total construction output, by 2004 this had declined to 20 percent. In the 1980s the public sector accounted for 10 percent of all construction apprentices; it currently accounts for 1-2 percent (Toner 2004).

AFFECT OF CHANGES IN INDUSTRIAL STRUCTURE AND STATUS IN EMPLOYMENT ON TRAINING:

The effect of the intensification of subcontracting, growth of small firms, increased casualisation and reduced role of the public sector in employment has been to increase the barriers to employer investment in training. Small firms have a lower propensity to invest in training. For example, the propensity of firms to invest in apprentice or trainee training increases with firm size. In 2002 12 percent of firms with less than 20 employees engaged apprentices or trainees. For firms with 20-99 employees 25 percent had apprentices or trainees and this increased to 50 percent for firms with 100 or more employees (ABS 2003: Table 17). Casuals much lower level of employer provided investment than full-time employees (Hall and Bretherton 1999). The reduced role of the public sector in training vocational occupations has not been compensated by an increase in private sector training.

Over the last 13 years from 1991 to 2003 the ratio of construction apprentices to construction tradespersons was around 15 percent lower than for the previous decade (Toner 2003, 2004). There has been no reduction in the demand for the services of construction tradespersons. (This is taken up further below). More generally, construction has the lowest level of employer investment in training of all industries. Construction industry employer expenditure on net direct training as a percentage of gross wages and salaries in 2002 was the lowest of all industries and only 66 percent of the all industry average (ABS 2003: Table 7).

Changes in the workforce structure of the Australian construction industry

CHANGES IN THE OCCUPATIONAL STRUCTURE: It was found that over the period 1986 to 2001 there were significant changes in the occupational structure of the Australian construction industry. These changes are due to three main factors. The first major factor is the intensification of subcontracting and consequent large increase in the number of smaller firms. The number of Managers in construction increased at a much greater rate than total employment due to the number of firms increasing at a much greater rate than total employment. Secondly, technological change and evolving consumer tastes saw a large rise in the number of electrical and airconditioning tradespersons and static numbers of Carpenters. The latter was due largely to the prefabrication of wooden structures and substitution of concrete and steel for wood. The continuing mechanisation of production saw the proportion of Labourers decline. Finally, the inter-industry division of labour had differential effects across occupations.

The absolute number of many Professional occupations directly employed in construction firms, such as engineers and architects, actually declined as these services were contracted out to the Property and Business Services industry. On the other hand the number of in-house computer related Professionals trebled over the period.

Between 1986 and 2001 total employment in the Australian construction industry increased by 31 percent, from 426,140 to 558,551 persons. This compares to 27.6 percent for the total economy (Morgan 2004). All Major Group occupations increased their absolute level of employment, though differential rates of growth resulted in the Major Groups changing their share of total employment over the period. Interestingly, the construction industry is becoming more dependent on Tradespersons, as the Trade Group increased its share of employment from 46.9 percent to 48.2 percent. There was considerable movement however, within the Trade Group, with the number of Carpenters and Joiners increasing by only 8 percent. This low growth resulted in the share of Carpenters and Joiners in total Trades employment falling from 25 percent to 20 percent. This low growth reflects greater use of prefabricated wooden components, such as roof trusses, frames and kitchens and increased use of prefabricated concrete substituting for wood. By contrast the number of Electrical Mechanics increased by 55.8 percent; and Refrigeration and Airconditioning Mechanics increased by 218 percent. This reflects changes in technology and consumer tastes with more electrical, electronics and communications equipment incorporated into new and existing structures. Over the last two decades there has been a substantial lift in the ratio of the value of equipment embodied in structures to the total value of new structures (Toner 1999). Again, as a result of changing consumer tastes, the number of horticultural tradespersons grew by 140 percent.

The Labourer group fell from 13.2 percent to 11.7 percent (Morgan 2004). One factor in this decline was increased mechanisation. Supporting evidence for this was that the construction industry's net capital stock (buildings, equipment and software) increased by 48 percent between June 1986 and June 2001 (ABS 5204.0a: Table 89). The net capital stock for the entire economy (buildings, equipment and software) increase by 44.9 percent. Over the same period the Census data recorded an increase of 31 percent in total employment in the construction industry implying a real increase in capital per worker of 17 percent.

The share of Intermediate and Transport occupations remained largely unchanged over the period, though the number of Excavating and Earthmoving plant operators increased by 44 percent over the period due, in part, to the increased mechanisation of construction production processes. Interestingly, other occupations associated with the mechanisation of the industry, notably truck drivers have decreased in absolute numbers, presumably, as these services have been outsourced to the transport industry.

The white collar share of total construction employment increased from 28 percent to 29.6 percent. However, there are quite divergent trends within the white collar group. The number of Managers and Administrators increased by 48 percent, increasing their share of total employment from 9 to 10.1 percent. The increase in the proportion of Managers and Administrators was influenced by the reduction in average firm size, which by definition, increases the employment of this occupational group.

There was a marginal reduction in the proportion of Professionals due mostly to a fall in the number of architects and engineers directly employed by construction firms. The services of these Professionals have been outsourced and would be classified to the Property and Business Services industry. This is a consequence of the inter-industry division of labour whereby firms tend to increase their level of specialisation as the size of the market in which they operate increases. Supporting evidence for this affecting the occupational structure of the construction industry is provided by input-output data, which records the use by one industry of intermediate inputs to production from other industries. In 1983-84 the construction industry purchased 9.3 percent of its intermediate inputs from the Property and Services industry (ABS 1985: Table 14). By 1998-99 this had grown to 20.7 percent: an increase of 123 percent. (ABS 2001: Table 14). (This data underestimates the growth in the use of inputs from Property and Business Services as the 1983-84 data includes inputs from the Finance industry, such as repayments of interest and principal on loans to construction firms, where the 1998-99 data only includes inputs from Property and Business services).

On the other hand, the number of Business and Information Professionals, mostly computer related occupations, increased three fold. In 1986 Business and Information professionals represented only 18 percent of total Professionals; in 2001 they were 40 percent of total Professionals. These computer professionals would be engaged in a range of activities, notably project management functions. The fact that these services, unlike many other Professional services have not been contracted out suggests that construction firms regard their services as an essential element in the firms' core competence and competitive advantage.

The share of Associate Professionals increased from 4.1 percent to 5.2 percent due largely to a doubling in the number of Building, Architectural and Surveying Associate Professionals to 16,500. This stands in contrast to the Professionals group, with engineering, architectural and surveying professionals outsourced to other industries. (Why there should be a difference in the outsourcing behaviour of firms for these related occupations needs to be further investigated). The increase in Associate Professionals is also due to a very large rise in the number of Business and Administration Associate Professionals reflecting mostly the rise in Office Managers. The large increases in the occupational groups Office Managers and the Major Group Managers and Administrators is due in large part to the near doubling in the number of firms in the construction industry over the last decade, growing at a much faster rate than total construction employment which grew by just under a third. As noted above, the main driver of the growth in the number of firms is the intensification of subcontracting within the industry and the increased specialisation of production activities.

CHANGES IN DEMOGRAPHIC STRUCTURE: There has been a significant increase in the age of the construction workforce with the share of persons aged 45 or older increasing from one in every four persons in the construction industry in 1986 to one in three persons by 2001. The share of 15-19 year olds in the construction industry declined by 28.4 percent over the period from 6.7 percent of the total persons employed to 4.8 percent. The reduced share of younger persons has been only marginally affected by an increase in the average age of new entrants (apprentices) to the construction labour market (Saunders and Saunders 2002). This lift in the age of young persons entering the labour market is caused by increased school retention rates over the last two decades. More importantly, the construction industry reflects the more general demographic trends of an aging population. The share of employed persons 45 and older in the total workforce increased from 25.7 percent in 1986 to 34.2 percent in 2001. A construction specific factor is the reduction in the ratio of construction apprentices to tradespersons over the last two decades. As noted earlier, this ratio (the training rate) declined by 15 percent between the 1980s and the 1990s. The trades' occupation, which includes apprentices, in construction represented over 65 percent of all 15-19 year olds in 1986 and 2001 in the industry.

The combination of demographic trends and a decline in the training rate suggests that skill shortages in construction and other industries are unlikely to improve in the medium term. Population projections suggest that the aging of the workforce, evident in the above data will continue. By 2050 the Australian Bureau of Statistics suggests that 24 percent of the Australian population will be over 65 years old, compared to 12 percent in 1995 (ABS 2000: 15).

CHANGES IN THE QUALIFICATIONS OF PERSONS EMPLOYED: The issue of change over time in the educational attainment of the construction industry was examined through Population Census data which cross classified the highest level of post school qualification obtained by persons employed in the industry by occupation (Morgan 2004).

There are three major findings from this analysis. Firstly, between 1986 and 2001 the share of the construction workforce reporting no post school qualification remained constant at 40 percent. Secondly, there was an increase in the share of persons reporting a post school qualification, with 48.5 percent of the workforce having such a qualification in 1986 compared to 55 percent in 2001. Both of these findings are affected by a substantial reduction over the period in the share of employed persons whose education qualifications could not be coded or was not stated. In 1986 the level of education could not be coded for 11.6 percent of the construction workforce compared to just 5.0 percent in 2001. Nevertheless, these findings are consistent with other data sources which indicate that the share of the workforce with a post school qualification has increased over the last two decades (ABS 2002b).

The third key finding is that there was a significant increase in the level of educational qualifications attained. In 1986 3.8 percent of the construction workforce had a qualification above a Certificate level. In 2001 8.5 percent had a qualification above a Certificate level. Moreover, most Major Group occupations showed an increase in the share of persons with a post-Certificate level of education. Nevertheless, the Certificate remains the most important single qualification with 44.8 percent of the workforce having this qualification in 1986 and 46.6 percent in 2001. (A Certificate level qualification is the typical entry level qualification for the trades' workforce).

These three findings suggest a growing 'educational segmentation' within the construction industry, with a consistent 40 percent of the workforce having no qualifications, but a growing proportion of the workforce obtaining post school qualifications and these qualifications at a higher level. This segmentation is occurring across most occupations. For example, only .7 percent of all tradespersons stated they had a post-Certificate qualification in 1986, by 2001 this increased to 3 percent. A striking example of this segmentation is that in 2001 10.9 percent of Amenity Horticulture Trades (nurserymen, landscape gardeners and green-keepers) had an Advanced Diploma or higher qualification (4.8 percent degree qualified). On the other hand 48 percent of persons employed in this trade have no qualifications. In 2001 8.1 percent of Communications trades and 6.4 percent of Electrical and Electronic trades have post-Certificate qualifications. This educational segmentation suggests that there is growing variability in the 'quality' of tradespersons in ostensibly the same occupation.

The increase in the share of the construction workforce with post school qualifications and the increasing level of these qualifications is due to a number of factors. Firstly, the construction industry is affected by the general upward shift in educational attainment across all occupations in the economy. Secondly, the share of total employment of those occupations having an above average rate of post school qualifications, Managers and Administrators, Associate Professionals and Trades (especially electrical, electronic, communications and horticulture) increased over the period. (The share of Professionals in employment remained largely static). Conversely, there has been a reduction in the share of total construction employment in those occupations with a below average rate of post school qualifications. Thirdly, the upward shift in the share of persons with post-Certificate qualifications in some trades, especially in electrical, electronic and communications is presumably being driven by the demands of new technologies.

Finally, a form of credentialism may also be important in explaining the increase in the share of the construction workforce with post school qualifications and the increasing level of these qualifications. For the economy as a whole over the last two decades there has been an increase in 'the under-utilisation of skills and education in the workforce' due to a rise in the share of persons working in occupations that require no qualifications or a lower level of qualification for entry than their highest qualification (Considine 2000:5). This is evident for example in the fact that in 2001 27.1 percent of all Intermediate Production and Transport Workers (typical jobs include steel fixers, crane drivers, exacting equipment operators, forklift drivers, and truck drivers) had a Certificate III or higher qualification. A similar proportion of labourers had these qualifications. In 1986 just under 20 percent of all Intermediate Production and Transport Workers and 16.4 percent of all Labourers had these qualifications. One driver of these trends is that studies of the career paths of tradespersons show that 25 percent of qualified tradespeople to work in occupations below the trades (ABS 1993: Table 1.8). Given the boom in construction employment it is likely that tradespersons outside of construction, such as those from manufacturing industry, are finding employment in the construction industry below the trade level. The possibility that a significant proportion of qualified tradespersons are working below the trade level in construction has important implications for current analysis of, and strategy for, redressing trades skill shortages. Currently there are no strategies focused on reducing the large 'leakage' of the stock of qualified tradespersons into lower skilled occupations. This issue warrants further research.

The increase in the proportion of persons below the trade having post-school qualifications could also have been affected by the growth of traineeships in construction. Traineeships are almost exclusively concentrated in the AQFII-III level. This was investigated and found to account for a maximum of 23 percent of the increase in the number of persons reporting a post school qualification employed in below trade occupations. The growth of traineeships over the period therefore is secondary to explaining the growth in persons with Certificate qualifications working in occupations below the trades.

Conclusion

Over the last two decades there have been major changes in the industrial and workforce structure of the Australian construction industry. This re-structuring has important implications for the sustainability of on-site skilled labour supply. The intensification of subcontracting has reduced firm size and induced large changes in the status of employment, notably growth in self employment and casualisation. These changes have created significant impediments to employer investment in training as evidenced by declining apprentice training rates and overall low employer investment in training.

There is also growing variability in the quality of labour supply due to increasing 'educational segmentation' across the industry and even within the same occupation. Over the last two decades the proportion of the construction workforce with no post school qualifications remains static at 40 percent, but on the other hand, there is a significant rise in the proportion of the vocational workforce with post-Certificate qualifications.

As in the wider economy the industry was subject to major demographic change. Between 1986 and 2001 the share of persons 45 years and older increased from one in every four worker to one in every three. This strongly suggests looming labour supply difficulties as the older cohort retire in the next decade. The combination of demographic trends and decline in the apprentice training rate suggests that trade skill shortages in construction are unlikely to improve in the medium term.

Paradoxically, a large number of qualified tradespersons are working in sub-trade construction occupations. It was suggested this may reflect a movement of tradespersons from outside construction into the industry, given buoyant labour market conditions in the industry. It is concluded that current strategies to deal with trade skill shortages outside of construction, focussed exclusively on increasing the flow of new entrants, may need revision.

The re-structuring of the Australian construction industry and the difficulties arising for the sustainability of skills supply have close parallels with many other countries (Winch 1998, Syben 1998, ILO 2001). Current and prospective skilled labour supply difficulties facing the construction industry are important, not just in terms of the direct costs associated with labour shortages. There are also a variety of indirect costs, notably a less skilled construction workforce has lower productivity, requires much higher levels of supervision and has less capacity to introduce product and process innovation (Clarke and Wall 2000, Clarke and Herrmann 2004).

This paper is produced under the aegis of an ARC linkage grant entitled Labour Supply Challenges in the Australian Construction Industry. The other principal investigators are Dr Stuart Rosewarne and Dr Susan McGrath-Champ, both from Sydney University. The Population Census data used in this report is derived from a background paper prepared for this project by Chris Morgan (20004).

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