
# Canadian Labour Market and Skills Researcher Network

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# Crucial Contributors? Re-examining Labour Market Impact and Workplace-training Intensity in Canadian Trades Apprenticeship

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## Executive Summary

An analysis of 2006 census data and a series of 33 employer interviews are used to test four apparently influential assumptions in current Canadian apprenticeship policy and research. These are that: (a) apprenticeship is the main source of skill supply for trades occupations; (b) employers of apprentices are generally high investors in workplace training; (c) the costs and risks of workplace training are a deterrent to employer participation; and (d), as a general description, the apprenticeship system in Canada consists of a productive core of employer-delivered, workplace-based training, supported by a variety of publicly-provided services.

### Literature

These assumptions are clearly evident in the academic literature and popular media, and form the basis for current federal and provincial policies, including financial incentives for apprenticeship participants. Yet the Canadian literature offers little or no analysis of the premises themselves, and few resources for investigating them. In popular and official discourse, terms such as ""the trades" and "apprenticeship" are used casually and often interchangeably, reinforcing a perception that low participation and completion rates in apprenticeship constitute a crisis in the skills supply. Investigating the "trades"/"apprenticeship" relationship has been impeded by imprecise and non-aligned data classification systems, a problem partly resolved by the 2006 census. The apparent under-performance of apprenticeship in Canada is conventionally explained in terms of market failure, caused by supply-side "barriers" that deter investment by employers and/or trainees. The federal apprenticeship job creation tax credit (AJCTC) aims to offset the deterrent risks ostensibly incurred by employers of apprentices. Again, research into the nature and actual deterrent effect of such barriers is limited. A common weakness has been the extrapolation of participant characteristics (based on survey and focus-group data) onto non-participants. Research on employer costs and risks is also limited and inconclusive. The Canadian Apprenticeship Forum's (2006) estimates of the cost of apprenticeship to employers appear excessive on methodological and theoretical grounds, and are inconsistent with other empirical research.

### Research methods and findings

Assumption (a) was tested by examining 2006 census data on occupation and educational attainment. Of the total adult labour force in 74 "trades" occupations (NOC-S group H), the proportion found to hold an apprenticeship qualification is 37%, slightly smaller than the proportion with education below the apprenticeship level (39%). When certificates granted to "trade qualifiers" are excluded from the total, registered apprenticeship certification is found to contribute roughly 25% of the skilled trades labour supply. The data further reveal strong inter-occupational differences in the certification rate and in the ratio of certified to less-than-certified workers, suggesting a *de facto* hierarchy of trades occupations. In a small number of occupations at the "top" of the hierarchy (mainly in electrical and pipe trades), workers who hold apprenticeship certification make up at least 50% of the labour force, and outnumber uncertified workers by a ratio of 2:1 or more. The remaining occupations show a progressively lower

prevalence of apprenticeship certification, and higher proportions of uncertified workers. The census findings demonstrate, first, that the apprenticeship system is not the principal source of labour for most "trades" occupations, and secondly, that the labour market's uptake of apprenticeship-trained workers varies strongly by occupation.

In-person interviews with 33 employers of trades workers were used to investigate the remaining three assumptions, and the occupational patterns revealed in the census research. The interviews are not a survey, but rather a source of insight into employers' training and HR strategies, based on structured discussions of their investment behaviour, business characteristics, perceptions, and understandings. Premise (b) is countered by the discovery of sharp variations in employers' workplace training efforts, within and across occupations. On the basis of the interview data, the employers are categorized as high or low investors in workplace training, and assigned to several subgroups reflecting distinct strategies. These are interpreted as rational adaptations to differing product markets and regulatory constraints. Despite this diversity of practice, and contrary to assumption (c), all of the participating employers are evidently able to minimize training-related risk. Finally, the diverse employer practices are interpreted as a challenge to assumption (d) which depicts the apprenticeship system as a rather monolithic institution, centred on employer-delivered training, and (imperfectly) protected from market failure by public policies and services. Instead, the interviews reveal that labour market actors incorporate the institutional resources of the apprenticeship system into a range of distinct interest strategies, with diverse consequences for skill formation. While these strategies respond to a variety of demand-side conditions mentioned above, they also capitalize in different ways on distinct institutional facets of the apprenticeship system, including wage-setting, registration/indentureship, certification, and in-class technical training.

## Conclusions and implications

The findings challenge a policy orientation in Canada that has arguably overestimated the contribution of apprenticeship to the labour supply, while underestimating the diversity of labour market actors' training behaviour and the nature of their engagement with the institutions of apprenticeship. The findings point to a research agenda that, on the one hand, would further investigate the diversity of needs, capabilities, and strategies for skill formation in the industrial labour market, and on the other would help put current Canadian practice into historical and comparative perspective.

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## Abstract

Canadian apprenticeship policy has recently turned to direct subsidies for participants, including a federal tax incentive for employers. Some assumptions underlying the employer subsidy are: that apprenticeship training is a principal contributor to the skilled trades labour supply; that employers of apprentices typically incur high training cost and risks; and that in the absence of offsetting incentives, these would deter their participation. These assumptions are tested, using an analysis of 2006 census data and a series of 33 employer interviews. The census data reveal that, in 74 "skilled trades" occupations (NOC-S group H), the proportion of the labour force reporting an apprenticeship credential is 37%. When certificates granted to "trade qualifiers" are excluded from the total, registered apprenticeship certification is found to contribute roughly 25% of the skilled trades labour supply. A closer examination of the census data reveals strong inter-occupational differences in the certification rate and in the ratio of certified to less-than-certified workers, suggesting a *de facto* hierarchy of trades occupations. The interviews reveal sharp variations in employers' workplace training efforts, challenging the twin suppositions that employers of apprentices are uniformly high contributors to skill formation, and that high training-related costs risks generally deter their participation. Differences in training behaviour are attributed to high-skill versus low-skill business strategies that in turn reflect differing product markets and regulatory constraints. Whatever the level of their training effort, all of the participating employers are able to minimize the training-related risks that have been cited as the principal rationale for employer subsidies. The paper argues for a more nuanced approach to skills policy and research in Canada, with greater attention to the diversity of actors' strategic interactions with the training system.



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## INTRODUCTION & LITERATURE REVIEW

For decades, the Canadian apprenticeship system has been characterized in academic research, the popular media, and public policy discourse as an institution in crisis (Economic Council of Canada, 1992; Sharpe, 2005). In the face of apparently strong demand for trades labour, the apprenticeship system's persistently weak performance has been regarded as posing an imminent (or actual) crisis of supply. This in turn has been attributed to a variety of market-disrupting "barriers" that impede employers' and workers' participation. Urgently seeking to raise registration rates, current policies seek to overcome these investment obstacles by directly subsidizing apprenticeship participants. The Apprenticeship Incentive Grant and the Tradesperson Tool Tax Credit to address purported financial barriers for trainees, while the Apprenticeship Job Creation Tax Credit (AJCTC) subsidizes employers for indenturing apprentices. This policy orientation appears to rest on a set of assumptions about the labour market and the apprenticeship system that might be schematized as follows:

(a) Apprenticeship is the principal source of labour for skilled trades occupations.

(b) Apprenticeship depends crucially on practical training that employers provide in the workplace.

(c) Employers' workplace training efforts typically carry substantial costs and risks that are a deterrent to their participation.

(d) The institutions, services and policies of the public apprenticeship system serve as ancillary supports to a productive core of training provided by employers in the workplace.

The research presented here challenges this argument on both empirical and conceptual grounds. Part 1 investigates the first premise by examining 2006 census data on educational attainment by occupation. Within the broad group of occupations conventionally defined as "trades," apprenticeship is found to be a relatively minor contributor to the labour supply, and indeed certified workers in these occupations are slightly outnumbered by those with education below the level of apprenticeship. However, the census data also reveal dramatic inter-occupational variations in the patterns of educational attainment, raising questions about differences in employers' skill requirements. In Part 2, interview research is presented to explore these differences and to pursue the second and third assumptions. Contrary to claim (b), the interviews reveal that employers' workplace training practices and investments range widely from the substantial to the negligible. With respect to claim (c), the interviews suggest further that, whatever their actual levels of workplace training investment, the respondent employers are generally able to manage and minimize training-related risk by assuming one of several distinct business strategies. Claim (d) is taken up in the final section of the paper, which proposes an alternate conception of the contemporary Canadian apprenticeship system: not as a relatively uniform system of employer-delivered training with ancillary public supports, but rather as an array of institutional resources that economic actors (including employers and workers) incorporate into diverse strategies, with different direct and indirect effects. In this context, some of the apprenticeship system's strategically important resources include its mechanisms of

indentureship, wage-setting, in-class technical training, and certification. The study calls for a broader and more nuanced vision in skills policy and research. An alternate perspective would look beyond registration and completion rates to other indicators, mechanisms, and objectives related to apprenticeship; and, more importantly, beyond apprenticeship to a broader view of the skill supply and skill formation processes in the contemporary Canadian labour market.

## Literature

For a variety of reasons, the literature on apprenticeship to date does not make it easy to substantiate, or even to investigate, the four separate premises or the overall policy narrative outlined above. To begin with claim (a), the actual impact of apprenticeship training on the labour market has been very difficult to assess, partly due to the ambiguity of key terms and categories used in the field. In common speech, terms like "the trades," "skilled trades," "apprenticeable trades," "apprenticeship," and "vocational training" are often used casually and almost interchangeably in general reference to a broad realm of manual work and sub-baccalaureate training. A general affinity between trades and apprenticeship seems to be taken for granted in popular discourse, but the exact boundaries of the two fields and the nature of the connection between them remain vague. The categories of the main data sources for social research have also made it difficult to study the relationship between skilled trades occupations and apprenticeship training. Category H of the National Occupational Classification (NOC-S) covers "Trades, Transport and Equipment Operators and Related Occupations" but does not specifically define the distinction between "trades" and other occupations. Nor is the connection with apprenticeship clear or predictable. Among the Group H occupations, some are apprenticeable (in some provinces/territories); some are recognized inter-provincially under the Red Seal system; and others are not apprenticeable at all. Meanwhile, apprenticeship and Red Seal certification are available for some occupations outside of Group H, such as cooking and hairdressing.

The 2006 version of the census, which allows respondents to indicate "apprenticeship" as their highest level of education, contributes greatly to research on this topic, making it possible for the first time to gauge the rate of apprenticeship certification within specific occupations. The picture is sharpened further by new information from the Registered Apprenticeship Information System (RAIS) (Statistics Canada 2010) that makes it possible to distinguish between certificates granted to apprenticeship completers and "trade qualifiers."

The second premise of the dominant policy narrative has also eluded substantive research. As the apprenticeship model is obviously oriented to work-related skills, and depends fundamentally on workplace-based learning, it is commonly portrayed as a system of training delivered primarily by employers. For example, Statistics Canada's (2008) introduction to its National Apprentice Survey (NAS) report describes apprenticeship as "a combination of practical on-the-job training (80%) and intensive in-school technical training (20%)." While this description captures the usual ratio of in-class to workplace *time* in apprenticeship programs, the proportion of *training* that occurs in the workplace is an important question for empirical investigation. The intensity of workplace training in apprenticeship is scarcely broached in the literature, or examined empirically in the standard apprenticeship research. While several questions on the NAS were related to on-the-job training, the results were not reported in the official summaries and have yet to be published elsewhere. The RAIS (Statistics Canada, 2004) collects no information relevant to the issue, suggesting that provincial apprenticeship authorities

may have little systematic knowledge of the quality of workplace training in their jurisdictions. Where apprentices have been surveyed on the topic (e.g. Government of Newfoundland and Labrador, 2004), most have expressed satisfaction with their workplace experience; however, it is unknown what (if anything) such reports reveal about inputs made by employers, or how apprentices' perceptions compare with those of other, non-apprenticed workers who are also learning in the workplace.

The third premise in the above argument builds on the second, interpreting employers' supposedly intense involvement in workplace training as a source of costs and risks that deter them from participating (Sharpe and Gibson, 2005:63-64; CAF, 2004). This view reflects a dominant theme in the apprenticeship research literature, which traces chronic problems of low enrolment and completion to a variety of "barriers" encountered by learners and/or employers (CAF, 2004; Conference Board of Canada, 2002; Betcherman et al, 2000). A common limitation for research into the barriers thesis, however has been its dependence on data derived from individuals already participating in apprenticeship. Survey and focus group research with apprentices and employers has queried the groups ostensibly least affected by barriers, and then extrapolated their views and experiences onto non-participants (GPC International, 2001; CAF, 2004).

In a notable recent effort, the Canadian Apprenticeship Forum has added a quantitative dimension to the barriers thesis by calculating the value of employers' inputs to workplace training. In its 2006 study the CAF reported that employers invest an average of $207,000 per trainee over the term of a four-year apprenticeship, but also that (on a completed apprenticeship) this investment is repaid at the rate of $1.38 for every dollar spent. These estimates seem to serve dual purposes: on the one hand, the CAF has incorporated them into a public relations effort that promotes employer participation by demonstrating the profitability of employing apprentices. On the other, the initial cost estimate conveys a powerful impression that employers of apprentices are exceptionally high-value and (considering the rate of apprentice attrition) high-risk investors in workplace training. As such, the CAF estimate bolsters the case for public subsidies that would offset employers' costs.

There are good reasons to treat the CAF's cost estimates with caution. In the first place, its study is weakened by both of the issues described above: it covered only employers of apprentices, generating no basis for comparison with other employers of the same occupations; and it estimated an average level of employer investment across the entire population rather than reporting variations that might be correlated with employer characteristics or other factors. More fundamentally, however, the CAF methodology seems to have systematically overestimated the cost of training, partly by treating the time that journeypersons spend with apprentices as a pure cost with no productive value.[1] Theoretically, the study is at odds with the basic economic principle that, in an open labour market, employers will always pass training costs onto employees in the form of lower wages (Becker, 1964, ch. 2). Empirically, as well, the CAF estimates are unconvincing. In a study of skilled workers at an industrial construction site in Northern Alberta, Robinson Fayek and her colleagues (2003) found that apprentices were highly productive in many tasks; that combining apprentices with journeypersons on work teams actually enhanced team productivity; and that on those tasks where apprentices were less

[1] In the case of automotive service technicians, the CAF reported that the value of lost journeyperson time in Year 1 is over $32,000, implying that for well over half of the apprentice's first year the supervising journeyperson is entirely unproductive. Over the four-year apprenticeship, there is a loss of almost two full years of journeyperson salary.

productive, their lower wages more than compensated for their lower productivity. In his recent review of apprenticeship literature, Gunderson (2009:33) cites two studies that also found that the employment of apprentices in German firms had a generally positive effect on productivity. The view of employers as generally high investors in workplace learning is also contested by apprentices. The NAS shows that over 15% of apprentices reported having worked for at least some time with no journeyperson supervision and six to eight percent of apprentices reported that a lack of journeyperson supervision had impeded their progress toward completion (Statistics Canada, 2008: Table A.1.8.1.1). In a recent survey of Saskatchewan apprentices (Meredith, 2009), more than one fifth cited lack of workplace learning opportunities as an obstacle to completion, and fewer than 10% reported receiving financial assistance from their employers during their in-class training.

An alternate line of apprenticeship research has associated low participation and completion rates, not with market-distorting barriers, but with lack of labour market demand. Gunderson (2001) found, for instance, that the rate of trade certification was much lower in the single-family residential than in the commercial/institutional sector of the construction industry in Ontario, reflecting an environment of price-based competition among small, non-unionized contractors with narrow profit margins and low capital inputs. That market and regulatory environment, it seemed, did not entail the demand for skill or certification that would make it rational for either employers or workers to invest in apprenticeship training. Potential correlates of labour market demand for apprenticeship-level skills include industry sector, firm size, unionization, and regulations mandating trade certification as a prerequisite to employment in particular occupations.

In British Columbia, where the field research for this project was undertaken, labour market interest groups have fiercely debated whether unionization and compulsory trades regulations promote industrial training and certification by creating demand, or suppress them by erecting barriers to participation (e.g., MacNeill, 1994; Fenn, 2000; Canadian Union of Public Employees, 2003). Since 2001, BC has introduced ambitious reforms to create an "industry-driven" apprenticeship system (BC Ministry of Advanced Education, 2002). The roots of the reform lie in the province's historically polarized industrial relations environment. One legacy from the labour tensions that preceded the 1986 world fair in Vancouver (Expo '86) was a weakening of organized labour's traditional dominance of industrial and commercial construction. Where "craft" unions (organized on occupational lines) had formerly dominated the sector, a series of changes to labour law permitted the entry of non-unionized employers as well as signatories to "industrial" unions (representing workers of multiple occupations).

Advocates of the open-shop movement were also instrumental in framing the reforms represented in the prevailing, "New Model" of apprenticeship in B.C. These included the lifting of any enforceable obligations that an apprenticeship registration agreement imposed on the employer, and the rescinding of legislation that directly mandated trade certification for particular occupations. Under the present system, certification is not a legal requirement for workers in any apprenticeable trade in the province, although it is indirectly mandated in several cases through safety legislation. In the automotive sector, trade certification is a prerequisite for becoming an Authorized Vehicle Inspector.[2] Regular safety inspections are compulsory for

[2] http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/369550/MV3065_Booklet_3.pdf

commercial vehicles, but not for most private automobiles. Mechanics who do not perform official inspections do not require certification, and repair shops that choose not to offer inspection services are under no obligation to employ certified workers. Similarly, in the electrical and some pipe fitting trades the Safety Authority Act (2003) specifies a journeyperson credential as one of the acceptable prerequisites for becoming an authorized Field Safety Representative. FSR certification is required by anyone applying for an electrical or gas permit for a construction project, but the legislation allows various kinds of piping and electrical work to be performed by non-certified personnel. There is no legal requirement for certification in other apprenticeable trades in British Columbia.

The question of labour market demand opens intriguing avenues for apprenticeship research, arguably at a more fundamental level than the competing "barriers" thesis. By focusing attention on actors' investment behaviour, the demand thesis does not simply initiate a search for the environmental factors that determine the payoffs to apprenticeship. It also raises the possibility that different actors may engage with the apprenticeship system in different ways in the pursuit of their particular interests.

# PART 1 CENSUS RESEARCH: Apprenticeship and the trades skill supply

## Methodology

Data from the 2006 census of Canada were analyzed to determine the proportion of workers in apprenticeable occupations who report apprenticeship training as their highest educational credential. The analysis was confined to occupations in NOC-S 2006 category H: "Trades, Transport and Equipment Operators and Related Occupations." According to the census data dictionary the "Apprenticeship" educational category includes all journeyperson certificates, including those earned through a challenge process rather than apprenticeship. Although it is understood that category H neither consists exclusively of apprenticeable occupations nor lists every occupation for which apprenticeship training is available, it does cover the trades in which the majority of apprenticeship training in the country is provided (CCDA, 2008). The analysis described here involves the 74 occupations at the 3-digit level of group H.

## Findings

The census data provide an unprecedented view of educational attainment, including apprenticeship certification, in the skilled trades labour force in Canada. Appendix tables A1 and A2 present the distributions for each of the 74 occupations by count and percentage. For clarity, the original 10 census categories for "Highest certificate, diploma or degree" are collapsed into six. The tables permit the following, initial observations:

- The proportion of the Canadian labour force 15 years and over who report apprenticeship as their highest level of education is 11.7%.
- Across the 74 selected trades occupations the mean proportion of workers reporting apprenticeship as their highest credential is 37%.
- The mean proportion holding a credential lower than apprenticeship is 38.6%.
- The proportion of workers with apprenticeship varies considerably by trade, from a high of 60.8% among gas fitters to a low of 20.8% for painters and roofers.
- Within the 28 Red Seal trades in the data set, 40% of workers report apprenticeship credentials..
- In the five Red Seal trades with the greatest registration volume, the average proportion of workers with apprenticeship rises to 45%. In the same occupations, on average, workers with less than apprenticeship make up 27% of the labour force.

While the census data shed new light on rates of certification among skilled trades workers, they overstate the contribution of workplace-based apprenticeship training. In all jurisdictions in Canada trade certification is granted not only to registered apprentices who complete their program, but also to "trade qualifiers" who demonstrate employment experience in the trade (typically 1.5 times the normal apprenticeship period) and pass a written exam. The census fails to distinguish between these groups, but the difference can be roughly estimated with the help of administrative data from the Registered Apprenticeship Information System (RAIS). A recent study of RAIS data (Statistics Canada 2010) found that approximately 35% of trade certificates granted by provincial authorities for the period 1991 to 2006 had gone to trade qualifiers. Applying this rate to all trade certificates captured by the census, the mean percentage of workers in group H occupations who earned trade certification through an apprenticeship declines to under 25%. Table A3 presents both the census and RAIS data to estimate the proportions of workers in selected occupations who have earned certification through an apprenticeship.

### Interoccupational differences

The census data reveal striking variations in the in the apprenticeship mechanism's contribution to the labour supply across the 74 group H occupations. Charts A1 through A4 (appendix) explore these differences from several perspectives. Chart A1 lists the occupations according to the sheer prevalence of apprenticeship certification among workers in them, while A2 lists them according to their apparent ability to exclude non-certified workers. As will be

seen below, a small number of occupations, particularly in electrical and pipe trades, rank highly in terms of both prevalence and exclusivity.

Chart A3 highlights the proportions of workers in each occupation who hold credentials higher than apprenticeship. The presence of more highly educated workers in a generally low-attaining labour force might be evidence of "wasted training" (Livingstone, 1996) or, perhaps, of specialized industry niches which demand higher levels of certification. For several occupations (e.g., Industrial power system electricians, Power station operators, Stationary engineers, Aircraft mechanics, and several telecommunications occupations) the proportion of workers with certification at the college/CEGEP level is as great or greater than the share with trade certification. For these occupations, it is apparent that both apprenticeship and college/CEGEP training are possible routes to employment. Because the census educational categories are understood as a hierarchy, it is not possible to tell how many of the higher-qualified workers may have held an apprenticeship qualification that later became "hidden" under a higher credential. University degrees are fairly rare among workers in NOC group H occupations. Further research would be required to understand the roles of apprenticeship and other educational options in these occupations. Whether the relatively high rates of university experience in some other occupations (e.g., Pest controller, Shoe maker, Jeweler), are evidence of under-employment, perhaps of foreign-trained professionals, is also a question for further research.

To better indicate the quantitative impact of apprenticeship on the skill supply, Chart A4 arranges the occupations by volume of employment. Here, the occupations with a high prevalence of apprenticeship are scattered throughout the chart, revealing that trades with a high apprenticeship rate are not necessarily high employers. Across the 19 occupations that account for 75% of the employment in category H, the total proportion of workers who report an apprenticeship credential is 39.3%. In the nine occupations that account for half of the employment, the average rises slightly to 41%.

Drawing on the preceding charts, Table 1 groups 53 apprenticeable occupations on two axes: by the prevalence of apprenticeship; and by the "exclusivity" of the occupation, understood as the ratio of apprenticeship credential holders to workers with a lower level of education. To help contextualize the information, Table 1 also highlights three other features of the listed occupations: Red type denotes occupations where the interprovincial Red Seal is available; Boldface type indicates employment volume; together the eight, bolded occupations account for 50% of the employment in NOC-S category H; and Italic type indicates the volume of apprenticeship registration. The italicized occupations are the five Red Seal trades with the highest registration in 2008 (CCDA, 2008:20); they are also high employment occupations.

## Table 1 Prevalence of apprentice training and exclusivity of occupations in NOC-S Group H

| Exclusivity: Ratio of apprenticed workers to those with education lower than apprenticeship | Prevalence: Proportion of workers with apprenticeship as highest educational credential | | |
|---|---|---|---|
| | **High** (>50%) | **Med** (30-50%) | **Low** (<30%) |
| **High** At least 2:1 | **A**<br>• **113 Gas fitters (61)**<br>• **322 Boilermakers (55)**<br>• 211 *Electricians* **i54)**<br>• 111 Plumbers **(54)**<br>• **112 Steam/pipe/spklr fitters (53)**<br>• **418 Elevator constructors (51)** | **B**<br>• **214 Elect pwr & cable wkrs (49)**<br>• **212 Industrial electricians (48)**<br>• **213 Power systm electricians (47)**<br>• **433 Electrical mechanics (47)**<br>• **413 Refrig & A/C mechs (46)**<br>• *411 Construction millwrights* **(46)**<br>• **221 Stationary engineers (39)** | **C** |
| **Med** At least 1:1 | **D**<br>• **Ironworkers (52)** | **E**<br>• *326 Welders* **(49)**<br>• **412 HD Equip mechs (49)**<br>• **431 Oil & s.f. heating mechs (48)**<br>• **321 Sheet metal workers (48)**<br>• *421 Auto/bus/truck svc techs* **(47)**<br>• **434 Motorcycle mechanics (47)**<br>• **422 MV body repairers (44)**<br>• 311 Machinists **(41)**<br>• **435 Small eng & equip mechs (40)**<br>• **432 Elect appliance repairers (39)**<br>• **416 Machine fitters (37)**<br>• **312 Tool & die makers (34)** | **F**<br>• **415 Aircraft mechs & insp. (28)** |
| **Low** Less than 1:1 | **G** | **H**<br>• **621 Crane operators-(41)**<br>• **131 Bricklayers (40)**<br>• **143 Insulators (37)**<br>• *121 Carpenters* **(34)**<br>• **323 Struct metal fabrctrs (32)**<br>• **623 Water well drillers (37)** | **I**<br>• **222 Power syst/station oprtrs (22)**<br>• **534 Pest control & fumigtrs (22)**<br>• **215 Telecom line cable wkrs (22)**<br>• **217 Cable television svc techs (19)**<br>• **514 Jewelers, watch repairers (19)**<br>• **216 Telecom instal & rpr wkrs (17)**<br>---<br>• **122 Cabinet makers (29)**<br>• **132 Concrete finishers (23)**<br>• **133 Tile setters (27)**<br>• **134 Plasterer/lathers (26)**<br>• **141 Roofers & shinglers (22)**<br>• **142 Glaziers (28)**<br>• 144 Painters & decorators **(21)**<br>• **145 Floor covering installers (23)**<br>• **511 Upholsterers (19)**<br>• **532 Waterworks & gas mtnc wkrs (26)**<br>• **513 Shoe repair/makers (19)**<br>• **531 Resid & comm. installers (17)**<br>• **533 Automotive installers (14)**<br>• **535 Other repairers & svcrs (16)** |

**Bold**: high employment volume Red type: Red Seal available *Italic*: high registration volume
Percentage reporting trade certification is shown in parentheses. Source: 2006 Census.

The top row of Table 1 lists occupations that are relatively exclusive, meaning that the ratio of workers with apprenticeship[3] certification to those with less education is at least 2:1. Occupations in cell A are exclusive in this sense, but also have high prevalence in that 50% or more of the workforce holds apprenticeship certification as their highest educational credential. Cell A is dominated by electrical and pipe trades. Occupations in cell B are equally exclusive of low-educated workers, but here the proportion of apprenticeship graduates declines as the rate of higher credentials rises. The labour force in these occupations, mainly in electrical and industrial mechanics fields, is dominated by certified journeypersons, but also includes a substantial proportion of college/CEGEP and university graduates.

In the less exclusive occupations in the middle row, apprenticed workers continue to outnumber those with high school graduation or less, but by a ratio of less than 2:1. In cell D the rate of apprenticeship in the Ironworker trade is over 50%. In the occupations in Cell E, journeypersons account for between a third and a half of the labour force, with the remainder of employment divided about equally between higher and lower educated workers. In cell F, apprenticed workers make up a smaller proportion of the aircraft maintenance trade, which is dominated by workers with college-level credentials.

Finally, the bottom row of Table 1 lists occupations where holders of apprenticeship certification are outnumbered by less-educated workers. In cell H journeypersons remain the second largest group by education. Cell I is divided into two subgroups: in the occupations above the line 30% or more of the workforce have credentials at the college level or higher. The occupations below the line – including seven Red Seal trades – are dominated by low-educated workers, with both apprenticed and higher-educated workers making up fairly small minorities.

The patterns of apprenticeship prevalence and exclusivity revealed in Table 1 can be expected to correspond with other occupational characteristics such as rates of earnings, unionization, regulatory controls, industry sector, size of firm, and the nature and level of skills required. While specifying these sorts of relationship would take further research, even a cursory scan along the diagonal from cell A through cell I suggests a hierarchy of apprenticeable trades occupations arranged, among other ways, in order of declining technical intensiveness.

## Summary

The 2006 census data reveal hitherto unknown patterns of educational attainment, with important implications for apprenticeship policy and research. The data clearly demonstrate that the apprenticeship system is not the principal source of labour for most occupations in NOC-S category H. Workers with apprenticeship as their highest credential make up somewhat more than one-third of the group-H labour force as a whole, and on average 40% in those occupations where Red Seal certification is available. A small number of trades particularly in electrical and pipe fields are relatively closed to workers with less than apprenticeship certification. However, in the majority, non-certified workers account for substantial proportions of the labour force, and in many cases outnumber those with apprenticeship qualifications. At the aggregate level, the census data dispel the commonly assumed equivalence of “the trades” and “apprenticeship. ” But they also reveal dramatic interoccupational differences in the labour market’s apparent valuation of apprenticeship credentials. From a policy perspective these findings challenge the urgency of

[3] In keeping with the 2006 census definitions, “apprenticeship certification” and “Journeyperson” here include both apprenticeship completers and trade qualifiers.

raising apprenticeship participation across the board as a means of securing the skills supply. They also call for a better understanding of the causes and consequences of these very uneven patterns of training and certification in the industrial labour force.

## Part 2 EMPLOYER INTERVIEW RESEARCH: Training inputs and perceptions of risk

Employer interviews were used to investigate the second and third assumptions listed in the introduction – i.e., that employers of apprentices generally incur substantial direct and indirect costs for the workplace training they provide, and that in the absence of offsetting incentives, the risk of failing to recover these costs would deter their participation. In addressing these issues, the interviews also reveal considerable diversity in employers' approaches to utilizing and developing skill in the workplace, and in the nature of their engagement with the apprenticeship system.

### Methodology

The guided interview was chosen as a data collection method appropriate to the time, budget, and exploratory purpose of the study (Kvale, 1996). The aim was to understand employers' approaches to apprenticeship, including their specific training practices and related costs as well as their motivations, expectations, and values or rationales behind them. Face-to-face interviews were held with 33 employers of trades workers in automotive and construction trades in metropolitan Vancouver and Victoria. In selecting target workplaces, the objectives were to cover a range of occupations from NOC-S Group H, including relatively high-employment occupations; and, as far as possible, to include a variety of workplace characteristics for each occupation, including unionization, firm size, industry sector (e.g. public/private) and business model (e.g. independent/franchise). The interviews targeted the senior representative(s) of each workplace directly responsible for hiring and supervising trades workers. Typical respondent positions were owner, service manager, production supervisor, superintendent, and foreman. All interviews were conducted at the employers' workplaces, and followed a written guide. Interviews usually ran 60 to 90 minutes, and were audio recorded.

Interview records, structured on the interview guide, were compiled from the field notes and audio files. Information from these records was further distilled into standardized workplace profiles covering (a) general workplace characteristics (the type of enterprise; number of employees, journeypersons and apprentices; wage information; and regulatory factors relevant to training, including unionization and compulsory certification) and (b) indicators of training intensity. Appendix Table A4 lists the workplaces according to training intensity and subgroup, and summarizes the key indicators for each. The assessment of training intensity was based on several indicators including employers' estimates of their direct and indirect training inputs and costs, such as the proportion of paid time spent by trainees in "unproductive" learning activities; the impact of training on the productivity of senior worker/mentors; direct costs such as tuition and wages for in-school training; and wasted materials. Note was also taken of employers' perceptions and rationales for training, including their sense of whether they incur a financial loss by employing trainees, and if so their reasons for tolerating it and/or for participating in

apprenticeship. To facilitate comparison and interpretation of the interview data, workplaces are rated high, medium, or low on three summary measures – Training practices, Training capacity, and Training ethos – each built from several interview questions. These summary measures are listed in the right-hand column of Table A4.

## Findings

Before turning to the case descriptions, Tables 2 through 9 provide a numerical perspective on the participating workplaces. Clearly, the interviews cannot be considered a survey, and there is no statistical basis for inferences beyond the participant group. Nonetheless, the following tables help to describe the participant group, and reveal some internal relationships that are suggestive for further research.

Table 2 presents frequency distributions of the key variables captured in the workplace profiles.

**Table 2 Workplace characteristics (distributions)**

| Sector | | Employees | | Regulation | | Training practices | |
|---|---|---|---|---|---|---|---|
| Construction | 19 | Under 10 | 13 | None | 8 | High | 10 |
| Automotive | 14 | 10 to 25 | 10 | Weak | 12 | Med | 5 |
| Total | 33 | Over 25 | 10 | Strong | 13 | Low | 16 |
| | | Total | 33 | Total | 33 | Total | 31* |
| **Target trade** | | **Apprentices** | | **Training costs** | | **Training capacity** | |
| Carpenter | 8 | 0 | 4 | High | 5 | High | 10 |
| Siding applicator | 1 | 1-5 | 16 | Med | 5 | Med | 11 |
| Wall & ceiling | 1 | 6-10 | 3 | Low | 23 | Low | 12 |
| Flooring installer | 2 | >10 | 8 | Total | 33 | Total | 33 |
| Plumber | 1 | Total | 31 | | | | |
| Painter | 1 | | | | | | |
| Electrician | 3 | | | | | | |
| Power line tech | 1 | **Union** | | **Reports loss** | | **Training ethos** | |
| Auto svc tech | 8 | None | 20 | Yes | 10 | High | 13 |
| HD/CV tech | 4 | Craft | 7 | No | 21 | Med | 3 |
| Auto body tech | 2 | Industrial | 4 | Total | 31 | Low | 17 |
| Multiple | 1 | Public sector | 2 | | | Total | 33 |
| Total | 33 | Total | 33 | | | | |

* Totals of less than 33 are due to missing data.

## Cross tabulations

**Table 3 Training practice by Trade**

| | Trade | | | | | | |
|---|---|---|---|---|---|---|---|
| **Training practice** | Carpenter | Flooring mech | Electrician | Auto svc tech | Auto body | HD/CV mech | Other |
| High | 1 | 1 | 2 | 2 | 0 | 3 | 1 |
| Med | 2 | 0 | 0 | 3 | 0 | 0 | 0 |
| Low | 5 | 1 | 1 | 3 | 2 | 1 | 3 |

Within most of the trade groups covered by the interviews, there were examples of both higher and lower intensity training practices.

**Table 4 Training practice by Training capacity**

| | Training capacity | | |
|---|---|---|---|
| **Training practice** | High | Med | Low |
| High | 9 | 1 | 0 |
| Med | 1 | 4 | 0 |
| Low | 0 | 6 | 10 |

**Table 5 Training practice by Training ethos**

| | Training ethos | | |
|---|---|---|---|
| **Training practice** | High | Med | Low |
| High | 10 | 0 | 0 |
| Med | 2 | 0 | 2 |
| Low | 0 | 2 | 14 |

Among the participating employers, the intensity of training practices is clearly linked to both training capacity and ethos. Respondents who provide substantial supports for workplace training also have the capacity to provide it, and they articulate a commitment to skill development and meaningful certification.

**Table 6 Training practice by Unionization**

| | Unionization | | | |
|---|---|---|---|---|
| **Training practice** | Non-union | Craft | Industrial | Public |
| High | 4 | 4 | 1 | 1 |
| Med | 4 | 1 | 0 | 0 |
| Low | 11 | 2 | 3 | 1 |

Historically, craft unions and producer associations have been strong defenders of apprenticeship and high-quality workplace training, for reasons of both group interest and capacity (see, e.g., Rock, 1995; Thompson, 1968; Williams, 1957 ch.1). It has been argued that the transformation from “craft” to “industrial” modes of production in North America seriously undermined the viability of apprenticeship (see, e.g. Seyboldt, 1917; Douglas,1921). In the visited workplaces, unionization per se does not guarantee high training intensity. It is true that the majority of both non-union and industrial-union firms had low levels of training practice. However, this was also true of two workplaces with craft union agreements. The group of ten workplaces with the most

intense training practices included four craft-union but also four non-union employers. Of the two workplaces organized under public-sector unions, one is a high-intensity investor while the other systematically declines to hire apprentices.

**Table 7 Training practice by Regulation**

| | Regulation | | |
|---|---|---|---|
| **Training practice** | Strong | Weak | None |
| High | 9 | 0 | 1 |
| Med | 2 | 2 | 1 |
| Low | 1 | 9 | 6 |

Training behaviour is clearly related to regulatory environment. Of ten employers with the most intense training practices, nine operate under strong regulations, whether enshrined in legislation, collective agreements, or corporate/contractual obligations. By contrast, 15 of the 16 low-intensity employers operate where training-related regulations are weak or absent.

**Table 8 Apprentice hiring by Training practice**

| | Training practice | | |
|---|---|---|---|
| **Apprentice hiring** | High | Med | Low |
| High 20+ | 1 | 1 | 3 |
| Med 10-19 | 2 | 0 | 3 |
| Low 3-9 | 3 | 1 | 2 |
| Very low <3 | 4 | 3 | 8 |

Employers who hire large numbers of apprentices do not necessarily provide intense workplace training. Three of the five highest-volume employers of apprentices were rated as low-intensity trainers. On the other hand, among the ten respondents with high-intensity training practices, seven employ fewer than ten apprentices, and four employ fewer than three.

**Table 9 Perceived economic loss by training practice**

| | Training practice | | |
|---|---|---|---|
| **Perceives econ loss** | High | Med | Low |
| Yes | 5 | 1 | 4 |
| No | 5 | 4 | 15 |

Nor is it the case that employers' perceptions of the financial costs and risks of training align with the observable intensity of their training practices. In all, ten employers reported that they experienced a period of economic loss while training a junior worker. Of these, five were high,

and four were low-intensity workplace trainers. Moreover, it appears that at least some employers can provide high-intensity training without financial loss. Of the ten employers with the most intense training practices, half reported a period where training costs exceeded productivity, while half did not.

## Employer interviews – case descriptions

The following section presents a thematic discussion of the interview findings. The workplaces are first categorized broadly as representing high or low investors in workplace training, and each group is broken into further subgroups based on apparent differences in training behaviour and business strategy. The classification is inevitably imprecise: workplaces will differ in some respects from others in the same group, just as they will share features with workplaces in other groups.

### GROUP H HIGH INVESTORS

Ten of the 33 workplaces are classified as high-intensity training investors. As shown earlier in Tables 3 and 4, these workplaces score highly on all three of the summary indicators of training intensity. They demonstrate high training capacity, in that they perform the full scope of their respective trades and employ certified trades workers who are expected to mentor apprentices in the workplace. In most cases, the employers/supervisors themselves are certified tradespersons, and all are familiar with the curriculum that their apprentices will follow during in-class technical training.

They score high on training "ethos" by expressing high regard for trades skills and certification, and usually a strong sense of vocational identity or "trade pride". They explicitly assume a responsibility for training apprentices, whether in the specific interests of their own firm or as a broader contribution to their industry or trade. They demonstrate their commitment to training as a long-term investment strategy by retaining their trainees once they have achieved certification. Integrating the ideas of occupational identity and lifelong learning, several employers in this group described journeyperson certification as "only the beginning" of a learning process which, ideally, continues throughout a tradesperson's career.

Finally, these employers demonstrate all or most of the practices regarded here as indicators of intense training practice. In general, they are distinguished by attending explicitly to apprentices' role as *learners*, (Fuller and Unwin, 2003) though this does not necessarily imply reduced expectations of productivity. Concretely, they ensure that apprentices are always or nearly always overseen by certified journeypersons, and they maintain apprentice-journeyperson ratios of no more than 1:1. They make an effort to expose trainees to the full scope of the trade, often by systematically rotating them through various departments and/or assigning them to diverse tasks or projects involving different procedures, problems, and skills. Typically, they align this progressive trades experience with at least the broad outlines of the in-school training curriculum in a conscious effort to enrich and reinforce the learning process. In some cases, this integration of workplace and institution-based learning is formalized in written training plans

that are monitored and reviewed by the supervisor or a designated apprenticeship coordinator within the organization. Not uncommonly in these training-intensive organizations, apprentices are rewarded for high achievement at technical training – and in some cases may be penalized or terminated for poor in-school performance.

#### *H1 High-value operations*

The seven firms in group H1 are private-sector employers, representing the automotive and construction sectors about equally. General contractor #01 specializes in one-of-a-kind construction and renovation projects in commercial, institutional, heritage, and up-scale residential markets. He has a steady workforce of 10 carpenters, including two apprentices at present. Flooring contractor #02 operates in the institutional and commercial sector. His roughly 45 unionized floor covering mechanics install carpet and other floor covering materials in large projects such as hospitals and office buildings. Electrical contractors #03 and #04 have fairly diverse and complex portfolios, covering a wide range of service work as well as new construction, primarily in commercial and industrial projects. Auto dealerships #05 and #06 specialize respectively in Asian and European imports and employ automotive service technicians in their service departments. Employer #07 is a truck and diesel engine rebuild shop and an authorized service centre for several brands of heavy equipment including marine and stationary diesel engines.

Employers in this group are quite selective in their apprentice hiring. All have some form of probationary process, and five make pre-apprentice training (typically 6 to 10 months of full-time study at a local vocational institute) a prerequisite for entry-level employees. One of the electrical contractors explained that workers with pre-app training need far less “hand holding” than those without and also have a more realistic understanding of the trade and a firmer commitment to pursuing it. Both auto dealerships and the diesel rebuild shop require a combination of preparatory training and probation. Junior employees – preferably recent high school grads with recommendations from their automotive shop teachers – start out as “lot boys” or, in the case of the diesel shop, shop maintenance workers. Those who have not completed a pre-app program must do so before being considered for apprenticeship. New hires for the flooring contractor do not require advance training, but entry is tightly controlled nevertheless by a word-of-mouth vetting system that depends largely on social network and family connections among members of the flooring union. Candidates are hired as material handlers for a probation period of at most one month.

The general approach to apprentice training throughout group H1 is direct workplace immersion. Apprentices are assigned to work with a journeyperson, or in the case of the construction and flooring contractors, possibly a small crew. Junior apprentices work initially as helpers, a role that frequently includes relatively unskilled work of material handling, “prep” work, and clean-up. In all cases, however, apprentices are regarded first and foremost as employees – expected to be productive from the outset, but also to be gaining proficiency at progressively higher-value tasks.

This expectation is fundamental to the apprentice pay scale, which, in broad terms, was similar in all of the workplaces in this study (unionized or not) where apprentices were employed. The details differ slightly according to employers’ preferences and collective agreement provisions, but the general pattern is a starting rate of 50 or 55% of the journeyperson wage followed by regular increases over the apprenticeship period. The increments may be based

on time (e.g. 5% every 6 months) and/or triggered by the apprentice's completion of a level of in-class technical training. Whatever the specifics, a generally escalating wage scale is arguably the most concrete and consequential implication of an employer's agreement to indenture an apprentice. And in broad terms, the ways in which employers respond to the apprentice wage scale is the difference between high and low- intensity workplace trainers.

The Group H employers are unanimous in viewing their apprentices' continued skill development as an economic imperative. While all ten of these employers fully anticipate long-term payoffs from their investments (reflected in their intention to retain their apprentices after certification), they do not view the training period as a time of sunk costs whose repayment must be deferred to a distant and risky future. On the contrary, they describe the function of management – both at the operational level of the shop foreman or supervising journeyman and at the planning and budgeting stage – as fundamentally a matter of balancing the cost of labour against the value of production, over both the immediate and the longer terms.

For the private-sector employers in group H1, the general strategy is to ensure that the value of apprentices' output rises at least as quickly as their wages. Since the sheer volume of output stops rising as the apprentice reaches top efficiency on a given task, the potential for sustainable growth lies in raising the unit value of the product by increasing its skill content. In general, the H1 employers express very little concern over economic risk posed by employing apprentices. In the short term, risk is minimized by ensuring that trainees are assigned to work that they can profitably perform. Careful selection and the requirement of pre-apprentice training are ways of ensuring that even first-term apprentices are optimally productive. The typical practice of assigning junior apprentices to "helper" roles is a means of simultaneously extracting a degree of immediate productivity (commensurate with their wages) and of preparing them for higher-value and more independent work.

In practice, the line between workplace supervising and "training" is not easy to see, and may differ depending on the workplace. Although the constant presence of a journeyperson is one of the criteria used here for high-intensity workplace training, employers in group H1 do not generally view the mentor role as a significant drag on senior workers' productivity. Indeed, several employers noted that their journeypersons themselves would not tolerate an apprentice who substantially slowed their production, again signaling the apprentice's primary role as an employee. Even in these training-intensive workplaces, the mentor-learner relationship is not seen as one that conflicts with or displaces productivity, but is rather integrated with it. These employers' descriptions of workplace practice depict a balance between producing and learning that evolves over the course of an apprenticeship. Throughout the process, apprentices will alternate among learn-work situations, at some times helping a journeyperson to perform a task (especially one that requires four hands), at others receiving direction and instruction on what to do and how to do it, but largely working independently under the direction of a senior worker who is present but not directly involved. All three types of situation occur throughout the training period, although the proportion – and more importantly the value – of the independent work rises over time. The apprentice mechanics at the two auto dealers and the diesel shop spend their first several months attached to a senior mechanic before being assigned their own service bays. There, they initially work on tasks delegated by the journeyperson, but as their skills develop they are assigned work orders in their own names, and call on the senior worker only as needed. As they return from successive levels of in-school technical training, they are assigned

increasingly advanced tasks. A similar pattern applies to the electricians, flooring mechanics, and carpenters in the other workplaces in group H1.

This close integration of work and learning makes it difficult for employers to quantify the indirect costs of workplace training arising from trainees' inefficiency and mentors' reduced productivity. When pressed, interviewees in group H1 gave varying estimates (see Appendix B) but two broad assessments were consistent. In the first place, their estimates of specific training costs were quite low (e.g. "unproductive learning" time of 0 to 10%; mentor productivity reduced by at most 25% for a short period). More significant was the consensus that, over all, employing apprentices does not impose net costs or deterrent risks. On the contrary, all of the high-intensity employers explicitly regard apprenticeship as an economically rational business strategy.

In managing the economics of apprenticeship, these employers not only use the shop-floor management practices described above, but also capitalize on the apprentice wage scale. For the repair shop employers, apprentices' profitability is based not only in their own comparatively low wages, but also in the fact that they can be assigned to relatively low-value mechanical tasks, freeing the senior workers for higher-value work. In the words of auto dealer #05, "… there's no doubt, they do make you money". For the construction firms, which typically operate on stipulated-price contracts, the apprentice wage scale offers a margin of profit. The following descriptions of the bidding process were echoed by several other construction employers:

> When we bid a job, we look at what can be done with apprentices and what can be done with journeymen, and we basically blend our costs to facilitate the use of apprentices.… But, does it actually cost us to use apprentices? I would say in the majority of times, no. Because you allow for this in how you approach the job. (Employer #03)

> Typically, you don't make a lot of money on the labour; you make money on the job as a whole. So, having an apprentice is supposed to benefit the job, because you've got someone who's making half as much, but you've bid the job on the basis of two journeymen. And hopefully you can bring it in as fast as if you had two journeymen. (Employer #02)

#### *H2: Regulated utilities*

The workplaces in Group H2 also qualify as high investors in workplace training, but operate in a quite different business environment from those in H1. Contractor #08 employs powerline technicians to construct new overhead and underground lines on private property such as industrial sites and new subdivisions, and to perform maintenance and emergency repair services under contract to the provincial hydro authority. Employers #09 and #10 are both public-sector machinery repair facilities: a municipal equipment depot and a maintenance garage for a public transit system. Heavy duty and commercial transport mechanics in the transit garage work solely on the regional bus fleet, while those in the municipal depot repair a wide array of machinery and vehicles ranging from chain saws through police cruisers, garbage compactors, and earth movers.

In terms of their training behaviour, the three employers in this group are distinguished by their intensive candidate selection processes, their high levels of direct and indirect investment in skill development, and the long tenure of their trades employees. All three employers use formal screening and probation processes to select candidates for apprentice positions. Entry-level workers at the powerline company are hired as "trades helpers" for a 6-month probationary period, after which successful candidates are sent to a training and assessment program ("boot camp") to determine their suitability for apprenticeship and to receive formal safety training before commencing their trainee role. Both repair depots require entry-level applicants for mechanical positions to have completed a pre-apprenticeship program. Both also have formal occupational structures that clearly differentiate skilled (apprenticeable) from semi-skilled mechanical positions. New hires serve 18 to 24 months in an "automotive service worker" position for before becoming eligible for an apprenticeship. At the transit garage, junior workers deemed to lack apprenticeship potential may be retained permanently as "utility workers", who perform semi-skilled mechanical work such as oil changes and engine steam cleaning. The intensive screening processes and occupational hierarchies help to ensure that permanent trades workers have the capacity and the work assignments that will enable them to concentrate on high-value activities. As a manager from the municipal depot explained:

> We guard the front door pretty carefully. And then when we hire people we promote them and move them through…. We don't want to see people make a career of sweeping the shop floor or pumping gas.

The functional division of labour also highlights the apprentice's status as a trainee or learner who is being prepared for a specialized, technically intensive role. Strict safety regulations at the powerline company mean that apprentices are closely supervised and prohibited from certain kinds of work until they have received formal training. In tandem with their progression through in-school training, they are assigned to increasingly advanced work roles on the crew. In the two maintenance facilities, apprentice mechanics are systematically circulated through all departments or work areas. Managers explained that their aim is both to give trainees a global awareness of the organizations' business and to build sufficient breadth of skill that workers can be re-assigned within the shops as necessary. The manager of the transit garage confided that another benefit of circulating apprentices through the facility is as a means of injecting enthusiasm and up-to-date technological skills into work units where older, incumbent workers may be less up to date.

The argument that employers may be deterred from apprenticeship by the risk of "poaching" supposes that the costs of training exceed the net value of apprentices' productivity. On the one hand, all three of the employers in this group report high direct and indirect costs related to training apprentices. The two public-sector workplaces pay apprentices their full wages during their annual in-school training, and the transit garage provides accommodation and living allowances in cases where apprentices must attend training out of town. All three employers are conscious that, while apprentices spend most of their workplace time on productive activity, they may be inefficient on unfamiliar tasks, and they require effort from the mentoring journeyperson. Managers at municipal garage #09 estimate that, even accounting for the apprentice's contribution as a helper, a journeyperson supervising a first-year apprentice will be 20% to 25% less productive than if working alone. The most extreme case is the transit garage, where the supervisor estimates that …

> … in the first year you basically have 2 FTE's of cost, and less than one FTE of productivity.

On the other hand, none of the respondents expressed much concern about either the absolute cost of training or the risk of losing their training investments through attrition. In part, this reflects these employers' confidence that their skilled workers will remain with them, attracted by very competitive wages, job security, and working conditions. Ninety percent of heavy duty mechanics at transit garage #10 remain until retirement age. Some older powerline technicians at #08 may leave the company for less physically demanding work (often with the provincial hydro authority), but over half of its certified workers have ten or more years' seniority with the organization. It is also likely that their position in the utilities sector enables these workplaces to absorb training costs that would put others at a competitive disadvantage. As the supervisor for the powerline contractor observed:

> I'm sure the company isn't losing. We know we have to train and we have to maintain our safety standards. And not just for apprentices: the tailgate meetings and safety upgrading are for the whole crew, journeymen included. But this is the nature of the industry. Every other outfit in the business has to do the same things.

#### *A public sector contrarian*

Employer #11 is an interesting departure from the public-sector employers of Group H2. This facilities maintenance department for a large school district employs approximately 50 certified journeypersons in at least nine Red Seal trades. As the unit performs some new construction work in addition to maintenance, its scope of activity as well as its complement of certified workers would seem to constitute a substantial capacity for apprentice training. Furthermore, the interviewee (a senior manager and certified tradesperson) expressed the commitments to certification, training, and trades employment that qualify here as a strong training ethos.

Despite this apparent capacity, however, employer #11 cannot be considered a high investor in workplace training for the simple reason that it systematically avoids hiring apprentices. The employer's explanation is that the labour relations environment militates against apprenticeship training. School district employees belong to a public-sector union whose membership is not defined on craft lines but covers a broad spectrum of hourly employees including tradespersons, custodians, and clerical workers. Because job opportunities are allocated on the basis of seniority, any vacancy for a trades apprenticeship would be open first to long-term incumbents. Despite the employer's enthusiasm in principle for the apprenticeship model, his view is that candidates acceptable to the union would not likely have the attributes (including youth) desirable in an apprentice. As a result the school district renews its trades labour force exclusively through external hiring of certified journeypersons.

## GROUP L LOW INVESTORS

The employers included in Group L generally score substantially lower on training intensity, capacity, and ethos than those in Group H. As above, the employers in this category are placed in subgroups according to additional commonalities. Those in group L1 are small-scale entrepreneurs, usually certified tradespersons themselves, with varying capacity for and sporadic involvement in apprentice training. The generally larger employers in group L2 engage systematically with the apprenticeship system, employing relatively large numbers of apprentices. But they do so primarily as a wage strategy rather than from a commitment to skill development. Those in L3, by contrast, are less systematic in their dependence on the apprenticeship system and in fact indifferent to the occupational boundaries that apprenticeship conventionally relies on. Group L4 represents another interesting anomaly within the trades-employing labour market: that of workplaces organized on piecework. Finally, group L5 consists of employers whose training capacity is so weak as to effectively exclude them from participation in apprenticeship.

### *L1 Independent artisans*

The six employers in group L1 are small, independent firms owned by certified tradesmen who remain closely involved in day to day operations. With the help of one other certified carpenter, contractor #12 builds one or two houses per year, either "on spec" or customized for a specific client. The five mechanical repair shops are also small operations, providing basic repair services, largely to repeat customers. Four provide various combinations of retail automotive repair services, while the last shop in the list specializes in heavy truck and commercial vehicle repair. In four cases, the owners' wives handle the bookkeeping on a part-time basis.

This pattern of personal relationships also characterizes their approach to apprentice training. Only three of the employers have apprentices at present, although all five have trained at some time in the past. When asked their rationales for indenturing apprentices, three said that the main impetus had usually been the trainee's own insistence. Otherwise, their general objective in apprenticing has been to cultivate an employee whose skills – both technical and social – will be compatible with the enterprise and its customers. Accordingly, apprentices are often hired through the entrepreneurs' own social networks: personal friends, fellow church or service club members, and family.

On the economics of apprenticeship, these employers' views again reflect their rather organic, artisanal approach to business. All of them regard their apprentices as productive workers and estimate the amount of "unproductive learning" time during an apprenticeship at very near zero (the high estimates were 2%). Although the entrepreneurs and/or their certified employees necessarily spend some time guiding and directing apprentices in the workplace, none of the respondents saw this as a drain on productivity worth estimating. Apart from the usual wage progression, none have formal policies on financial support for apprentices. None pay apprentices' wages during technical training, though three had provided various forms of *ad hoc* financial assistance (e.g. partial tuition payment; wages during EI waiting period) in hardship cases.

To some extent, these employers' reliance on social networks, and their preference to "grow their own" workers through apprenticeship, reflect a broad distrust of trade certification

that was apparent throughout this study. On the one hand, all six employers in this group value and respect craft skill, and all are proud to be certified tradesmen themselves. But when it comes to hiring others, they share a skepticism of trade certificates as reliable indicators of competency. As truck repair shop owner #17 put it, "[a trade qualification] is like a driver's license: some people shouldn't have one." His particular concern was with certified heavy duty mechanics whose experience is confined to logging or mining operations, and who are unprepared for the wide range of vehicles and mechanical problems that his shop encounters. But his general doubt is shared by the other automotive shops in this group, which service all makes of car, and by builder #12, who chooses to perform all of the carpentry work on his homes, from foundation through finishing. While these employers generally view the trade certificate as evidence of valuable in-school technical training, they have no such confidence in its value as a rigorous mark of the workplace-based learning that they also consider essential.

#### *L2 High-volume construction*

All seven employers in Group L2 are in the construction sector. Although all employ relatively large numbers of apprentices, they do not manifest most of the workplace practices, nor necessarily reflect the capacity or ethos, that would qualify them here as intensive training investors.

Employer #2 is a building contractor who, at the time of the interview, was overseeing a large tract housing project and the construction of pre-fabricated wood-frame homes. Painting contractor #23 and electrical contractor #24 also work in the wood-frame residential market. However, as evidence that low-intensity training practices are not confined to the wood-frame sector, general contractors #3, and #4, and wall and ceiling contractor #21 operate in the ICI (institutional, commercial, and industrial) segment of the construction industry. Mechanical contractor #22 specializes in plumbing and sprinkler fitting for highrise residential buildings.

The high ratios of apprentices to journeypersons in this group of workplaces reflect quasi-industrial production processes that depend on large inputs of routine manual labour and relatively smaller inputs of planning and problem-solving at the point of production. Typically, work crews consist mainly of apprentices and labourers, directed by a foreman or lead hand who may (or may not) be certified. Supervisors are not generally expected to provide training, except to the extent that guidance and instruction may help them achieve their main objective: i.e. optimizing the productivity and cost efficiency of a mixed-ability crew.

In this context, the significance of apprenticeship is not so much as a framework for skill development as for the rational division of labour and wage costs. To some extent, this was the case for all of the employers interviewed here, as reflected by the following comment from the "high-investing" electrical contractor #03:

> For instance, if all the conduit is in, and all we need is to pull the wire, then that's a junior job, essentially a labouring job, where you'd use first or second term apprentices. On another job, maybe you'd plan to use fifth or sixth term apprentices.

The low investors of the present group are distinguished, however, by their almost exclusive attention to the wage-setting rather than the skill-formation implications of apprenticeship. Whereas the high-investing employers strove to align their apprentices' rising

wages against progressively higher-value outputs, employers in the present group are unable to do this because the bulk of their labour costs are spent on relatively low-value work. The rational business strategy here is not to invest in capacity for high-skill production, but rather to optimize wage and skill levels within the company's market niche.

For electrical contractor #24, this means maintaining a labour force mainly of junior apprentices: the foreman who was interviewed was himself a 3rd year apprentice, overseeing a crew of more junior apprentices on a large house wiring project, and reporting weekly to an off-site field safety representative. Mechanical contractor #22 organizes his trades workers for high-efficiency production within narrowly defined roles. Because each floor of a residential highrise is identical to the one below, foremen assign plumbers to repeat the same subassemblies on every floor of the building. As a result, an apprentice plumber may work for months or even years but experience only a fraction of the materials and practices used in the trade. Asked his rationale for participating in the apprenticeship system, the employer was succinct:

> Well, it's not my gift to humanity, lets' put it that way. The simple fact is that it's the only way I can get two man-days of production out of one-and-a-half man-days of wages. It's not pretty, but unfortunately it's a fact of business in [the highrise residential] sector.

Consistent with their limited skill requirements, employers in this group are uniformly unimpressed by full trade certification. Mechanical contractor #22 is obliged to hire through the union dispatcher, but discards certified plumbers – even broadly skilled ones – who are inexperienced in the specifics of highrise construction. Residential painting contractor #23 openly concedes that journeyperson certification is not an asset that his company expects when hiring, and would imply an excessive level of skill. Illustrating the intersection of the wage and output curves, contractor #20 explained that his firm does not always find it economical to re-hire apprentices who have been released to attend in-school technical training, or necessarily to grant raises to those who attain certification.

#### *L3 Craft skeptics*

As general contractors in the ICI sector, the two employers in group L3 are broadly similar to #19 and #20, described in the previous section. The difference is not that they are necessarily higher-intensity workplace trainers. Rather, their smaller numbers of apprentices, and their correspondingly lower apprentice-journeyperson ratios, reflect their "flexible" view of occupational titles. Unlike the high-intensity workplaces in group H1, which carefully segregate low-skilled support positions from high-skilled "trades", these employers minimize job-title hierarchies and use a broad continuum of "construction worker" roles in which labourer, carpenter, and project superintendent are intermingled. Both firms employ apprentices, sometimes indenturing capable labourers who wish to acquire in-school training, and sometimes hiring apprentices who have begun their programs elsewhere. But the companies' investments in training – both institutional and workplace-based– are neither premised on conventional titles nor imply any commitment to trade certification. Rather, the career ladder here leads to a core group of long-term project management positions, gradually replenished from a broad base of temporary project labour. Training is provided as and where necessary, but it is primarily targeted to "up and coming" workers regarded as having management potential. To this end, a carpentry apprenticeship – or parts of it – may be a valuable training investment, but not

necessarily more so than a college course in construction technology or commerce, and certainly not because trade certification is valued in its own right.

#### *L4 Flat rate shops*

The three automotive employers in Group L4 have been classified separately on the basis of their common business model. These employers are a North American automotive dealership, a combination auto-service centre/department store, and a network of franchised collision repair centres. Unlike the construction contractors and automotive dealerships discussed above, who generally charge their clients a fixed price for the completion of a project and pay their employees an hourly wage, the employers in this group use a "flat rate" system. Under the system, every repair service offered by the shop is assigned a pre-determined amount of labour time. Regardless of the time the repair actually takes to perform, this figure becomes the basis for calculating the customer's invoice and the tradesperson's earnings.

The system seems to have interesting implications both for workplace training practice and for employers' perceptions of the costs of apprenticeship. In the first place, all three of the employers in this group volunteered that the model tends inherently to suppress training effort, because of the incentives that it creates for journeypersons. (This point was repeated by the other two auto dealers, who operate on the alternative, "straight time" system.) Although technicians in flat-rate shops are formally employees they also have a quasi-entrepreneurial status, plying their trade within the employer's premises but substantially determining their own earnings by their productivity. One service manager described his role as a "broker" for the certified technicians in his facility. Experienced technicians are able to earn substantially more than their nominal hourly wages by completing work tasks in less time than the flat rate schedule specifies. By the same token, anything that would impede output – including time spent training an apprentice – constitutes an opportunity cost to the journeyperson. In recognition of this deterrent effect, one body shop employer had introduced a formula that would give the journeyperson a share of the apprentice's billable output, but neither the journeypersons in the shop nor the owner were completely comfortable with it.

The flat-rate employers also shared a particular outlook on the economics of apprentice training. Under BC labour law, apprentices are paid an hourly, rather than a flat rate. On the one hand, junior apprentices are a source of low-cost labour that can contribute to the shop's overall productivity by handling low-value tasks (prep work in the body shops; lubes and tire work in the auto service centres) and non-billable duties such as shop clean-up. However, it also means that apprentices must be paid for eight hours of work regardless of the shop's volume of business on a given day. It was this mismatch between fixed labour costs and variable revenue that led several of the flat-rate employers to conclude that they "lost" money on apprentices, since not every hour of wage costs could be aligned with an hour of revenue. Meanwhile, other employers observed, first, that the perceived losses disappear when they are amortized over a longer period, and secondly that they have nothing to do with training; rather, they are a fact of life in retail commerce, and no more peculiar to apprentices than to any other hourly-paid employee.

#### *L5 Non-participants*

The workplaces in group L5 employ workers in "trades" occupations, but participate minimally or not at all in apprentice training. They operate relatively low-skill operations and neither perceive a need for certified workers nor have the capacity to train at the apprentice level.

Employer #30 runs a two-man foundation-forming and house-framing business in the single-family residential sector. Although he refers to both himself and his current employee as carpenters, neither has formal training in the trade. The owner has two years of college education in business, as well as former work experience as a travel agent and a construction labourer. Employer #31 has operated as an exterior siding contractor, also in the single-family residential market, for three years. During his time in business he has employed a total of 10 to 12 workers and currently employs two fully skilled siding installers and two labourers. Again, no one in the company holds trade certification. Brake and muffler franchise #33 is another example, in this case from the automotive sector, of a workplace on the margins of the apprenticeship system. The shop owner is not a certified tradesperson, and for census purposes the workers here would normally be classified as "automotive mechanical installers and servicers (NOC-S H533), not an apprenticeable trade. Nonetheless, the shop has employed a small number of apprentices over the years, normally at times when it had a certified auto mechanic on staff, although no apprentice ever stayed through to completion. Its very limited role in the apprenticeship system has more often been as an entry point, allowing inexperienced workers to log enough hours in the automotive sector to apply for employment in shops with higher wages and a prospect of formal certification.

Despite their weak training capacity and their minimal contact with the apprenticeship system, the employers in this lower echelon express some of the greatest concern about the costs of training. Though these accounts are not always coherent, their relevance lies both in the insights that they provide into these employers' practices and perceptions and in their similarity to some of the estimates cited in the CAF (2006) study of employers' training costs.

Forming/framing contractor #30 estimates that a "carpenter" trainee can attain basic competence in about 18 months. About 5% of the wage costs for this time will be lost to learning that has no direct production value. The more significant training cost, however, is that the mentor's (i.e. owner's) own productivity declines by as much as 80% for the first half of this period due to the effort of training. Over all, this employer estimates the output value of a trainee worker at 50% of the wage cost for the first year. This diseconomy is unavoidable, however, for the simple reason that employees cannot be found who will work for their actual value. Siding contractor #31 estimates that a new hire can become fully competent with 18 to 24 months of workplace experience. Differing from #30, he believes that trainee/helpers do not reduce but rather enhance the senior worker's productivity. Nonetheless, he estimates that new trainees produce only 70% of their wage cost for the first couple of months.

Brake and muffler operator #33 estimates that a trainee (whether a registered apprentice or not) can reduce the supervisors' own productivity by 40% for a period of one to two years, as well as costing the shop $400 to $500 a month in wasted materials and production delays. Surprisingly, the employer concludes that the overall impact is neutral, and that he does not actually "lose money" on trainees except when the shop is very busy (the opposite of the retailers above who reported that they lost when business was slow). On further probing, he explained that the "loss" he had in mind was the opportunity cost where potential customers are turned away because the shop is fully booked. Here again, an employer seems to characterize a business irritant – in this case, a peak-time skill shortage – as a cost of training.

The last workplace in this section revisits the issue of flat-rate compensation and its effect on training investment. Employer #32 operates a retail floor coverings centre and maintains a

roster of five two-man crews – an installer and a helper – to install carpet and other flooring products in customers' homes. For census purposes these workers would be classified, like the unionized employees of high-intensity workplace #02 above, as floor covering installers (NOC-S H145). However, whereas #02 is a closed-shop union firm catering to corporate and institutional clients, #32 operates in a highly competitive retail flooring market with a much narrower range of products and dramatically smaller-scale projects.

Despite his high regard for certification and formal training and his own history as a certified flooring mechanic, the shop owner finds himself in a market environment where training is not a rational investment, either for himself or for his workers:

> With these five guys that I have, nobody really wants to take on an apprentice. And you can't really blame them. They get paid by the square foot, so if he takes on an apprentice and pays him, at the beginning he pays him, say $15 an hour. But as the guy gets better he'll want more and more money. And sooner or later, he makes just as much as the installer does, and yet [the team] can only produce so many square feet per day. So, in time, the installer will let him go.
>
> Of course, the helpers aren't stupid either. They look at a job and can see that the installer is going to get $600 for it. So they say, 'why am I getting 100, and he's getting 500, and I'm doing half the work or more?' At this point, they tend to become installers themselves. It's a major, major, major problem for training.

## Apprenticeship incentives

As a stimulus to apprenticeship registration and completion, the federal government offers financial initiatives to employers and apprentices: an apprenticeship job creation tax credit (AJTC), and two apprenticeship incentive and completion grants (AIG and ACG). Interviewees were asked three questions about these incentives: (a) whether they were aware of the incentive; (b) whether they had applied for the tax credit, and where applicable whether their apprentices had applied for the grant(s); and (c) whether the incentive had influenced their decision or – for those who had been unaware of it – whether it would have influenced their decision if they had known of it.

**Table 10 Incentives**

| | |
|---|---|
| **Employer tax credit** | |
| Aware | 20 |
| Rec'd | 9 |
| Influenced | 0 |
| **Apprentice grant** | |
| Aware | 19 |
| Rec'd | 12 |
| Influenced | 1 |

Approximately two-thirds of respondents had prior awareness of each of the incentives. Nine employers had received the tax credit, and 12 were aware of apprentices who had received the AIG. Predictably, recipients were content with what they referred to as "a nice bonus" and "free money" (and two employers who had been unaware indicated that they would certainly apply for it). On the question of influence, however, they were unanimous and often emphatic. The response of this contractor was typical:

> No. There's no way we'd let a couple thousand dollars affect our HR practices. No way.

Although one contractor thought it plausible that the AIG could affect an apprentice's decision to continue, all of the others who were asked disagreed. The two apprentices who were asked indicated, similarly, that they welcomed the bonus but would certainly have completed their program without it.

## DISCUSSION

The above findings address three of the four claims presented in the introduction as implicit premises of current apprenticeship policies. In response to the first, the review of census data in section 1 demonstrates that apprenticeship is not the principal source of labour for "skilled trades" occupations. On average, under 40% of workers in the occupations categorized by the NOC as trades hold trade certification, and under 25% have successfully completed an apprenticeship. Dramatic differences of the educational profiles of group-H occupations suggest that the labour market's demand for apprenticeship credentials is far from uniform. The declining prevalence of certification across Table 1, and the progressively greater openness to uncertified workers, suggests a hierarchy among trades occupations in terms of their skill requirements and the consequent rationality – for either workers or employers – of investments in apprenticeship training. The census analysis casts doubt on a prevailing policy regime that has presupposed high and uniform demand for skill across "trades" occupations while attributing low participation and completion rates to supply-side barriers.

Two specific premises of the "barriers" thesis were explored through the employer interviews: that the apprenticeship process is inherently costly and risky for employers, and that, in the absence of offsetting compensation, these risks would deter investment in workplace training. Minimally, the interviews challenge these assumptions by providing some provocative counterexamples – for instance, of employers who provide little or no workplace training, or who claim that their training decisions are unaffected by either the fear of "poaching" or the lure of tax incentives. The interviewed employers also displayed a generally keen awareness of the cost-benefit implications of apprenticeship for their own operations. Within their particular contexts, participating employers had evidently found ways of managing the costs and risks of workplace training, generally, through a combination of workplace task assignment and employee retention decisions. The employers with the highest direct and indirect training costs expressed little or no fear of poaching and were confident that the working conditions and other benefits they provide would enable them to develop and retain high-quality, long-term employees. Those with less intensive workplace training practices were similarly unconcerned with the risk of lost training

investments, partly because of their lower inputs, but mainly because their business models depend on higher ratios of lower-skilled and often temporary production workers. Ironically, some of the most acute concerns over the cost of training were expressed by employers who do not employ workers in apprenticeable occupations. Further investigation will be needed in order to ascertain just how representative these cases are. In the meantime, the interview findings suggest that employers' reasons for and ways of engaging with the apprenticeship system are far from uniform.

To a certain extent these differences are consistent with the view of apprenticeship as a counterpart of "craft" as opposed to "industrial" production. In an ideal model of craft work, the individual artisan creates a product or performs a service from start to finish, exercising control over its conception, planning, and execution. In a similarly idealized model of industrial production, the line worker applies strictly procedural skill to a designated step within a production process that is planned, coordinated, and quality-controlled by others. The craft and industrial models are arguably represented to greater or lesser degrees among the workplaces described here, and in their utilization of apprentices. At several of the construction sites, crews consisting mainly of junior workers perform routinized, high-volume framing, wiring, and plumbing tasks that are coordinated and authorized by specialists who may seldom be present. At others, apprentices are in a minority, assigned to assist and learn from certified tradespersons who have key responsibility for jobs that require considerable planning and problem solving. In one group of automotive shops, highly trained technicians working in well-equipped maintenance facilities rebuild entire mechanical systems and fabricate special-purpose machinery. In others, mechanics and uncertified workers replace standard components, while bench tasks such as electrical or transmission repairs are "subbed out" to specialty subcontractors.

However, the employer interviews (as well as international comparisons) also indicate that high-quality apprenticeship training can occur in industrial environments, just as artisans' shops can be very poor sites for learning. In jurisdictions where the apprenticeship model has succeeded, it has been accompanied by a variety of institutional supports that have also sustained the viability of intensive workplace training. Some have served to sustain producer monopolies that restrict the labour supply and keep wages high enough to cover the costs of skill development. Others have sustained the demand for complex skill, for instance by regulating quality standards. The employer interviews reveal great variation in employment and workplace training practices, and in the organizations' operating environments. Stark differences in the capacity to utilize and develop skill are illustrated, for instance, by contrasts between flooring companies #02 and #32, between the transit garage and the "bottom feeding" auto repair shops, and between the niche-market construction firms and the semi-skilled subcontractors.

These differences in the firms' internal capacities appear to be adapted to external business circumstances that affect demand. A clear commonality among the intense trainers is their aim to develop highly skilled practitioners who can work autonomously while producing high-value outputs. This worker profile reflects both the skill requirements of the production process and a business environment that makes high-skill production profitable. An example of the former is the electricians at high-intensity firms #03 and #04, who must be able to manage complex service calls independently. Environmental factors common to the high-investing workplaces include market niche and regulatory environment. The high-intensity trainers often work in upscale markets, as do building contractor #01 and electrical contractor #03 who both

specialize in “odd ball” and complex projects; and the auto dealerships, whose clients are generally owners of new cars. In addition, the high-intensity workplaces all operate under regulatory constraints that demand high levels of craft skill while also mitigating the risk in training investments. The comments of the powerline contractor illustrate the market-leveling effect of strict safety regulations in that industry. Closed-shop unions may also help to equalize costs where entire sectors operate under the same collective agreements (e.g. industrial/commercial electrical work; flooring). Still, the examples of the highrise plumbing and drywall contractors also show that a closed-shop union *per se* is no guarantee of training intensity if the union is unwilling or unable to enforce the regulations.

Meanwhile, the examples of non-union workplaces that provide high-quality training illustrate that demand for high skills can be induced not only by producer monopolies, but also by external forms of regulation. Although BC law does not directly require trade certification for any occupation, several of the employers here have chosen to offer services that are regulated in some form or other. The two public-sector equipment depots, the factory-authorized diesel shop, and the franchised auto service centres all require that their technicians hold trade certification, partly in order to qualify these workplaces to perform regulated services such as vehicle safety inspections. Certification and training may also be stipulated in the terms of private contract. In the case of the auto dealerships, technician certification and regular upgrading are mandated by the auto manufacturers as a condition on franchisees. For collision repair shops that perform work through the provincial auto insurance corporation, similar requirements apply. Even in the construction sector, corporate clients may insist that bidders use only certified workers for particular projects, or for the installation of warranted components such as institutional flooring materials. By contrast with all of these cases, the low-investing employers covered by the study operate in markets or niches with few or no regulatory incentives to train. By highlighting the apparent effects of market niche and regulation on the demand for skill, these examples challenge a key premise of current Canadian apprenticeship policies, which rely on extensive direct and indirect subsidies to participants as means of overcoming supposed supply-side barriers.

### Apprenticeship institutions and stakeholder strategies

Current apprenticeship policy presupposes, not only that all trades employers face similar barriers to training investment, but also that they respond similarly to public inputs, including the direct subsidies of recent years but also the institutional elements of apprenticeship such as in-class technical training and apprentice registration and certification. Again, the interviews suggest that these public supports are not single-purpose remedies for widely prevalent sorts of market failure, but instead offer a variety of distinct resources that can be put to use within very different business strategies. The interviews reveal employer capitalizing in quite different ways on particular institutional facets of apprenticeship including the wage-setting function, the indentureship requirement, in-school training, and certification.

All of the interviewees, whether bound by formal wage constraints or not, were clearly conscious of the wage implications of an indentureship agreement. Where they differed was in their responses. For high-intensity employers, the pressure of rising wages was a clear impetus to ensure that apprentices received the training and experience that would keep the value of their productivity rising faster than their costs. For the high-volume construction employers, by contrast, the wage scale provided a standard grid for hiring predominantly short-term workers at

optimal wage and skill levels for particular types of production work. Finally, for highly price-sensitive employers in both the construction and automotive sectors, the prospect of fixed wage expectations was a reason to avoid apprenticeship commitments altogether or to dabble in the system only occasionally and at the lowest levels.

Similarly, all of the employers with experience of apprenticeship expressed respect for the value of in-school technical training, while again incorporating it into quite different strategies. While all of these employers recognized the productivity benefits of in-class training, and expanded the scope of their apprentices' responsibilities with each level of training they completed, high-intensity employers were far more careful to promote learning by actively linking apprentices' workplace tasks to the in-class curriculum. Low-intensity employers reflected their more limited portfolios and skill requirements by employing mainly second and third-year apprentices, and laying trainees off as both their skills and their wage entitlements rose beyond their optimal range.

Employers' differing approaches to workplace training have implications for the signaling value of trade certification. Their strong consensus on the value of technical training was matched by their caution as to the credibility of trade qualifications. As some of the employer comments above illustrated, this concern inevitably reflected an awareness, on the one hand, that apprentices may have had dramatically different kinds of workplace-based learning experiences, and on the other that provincially granted apprenticeship credentials are based entirely on in-class testing. Success on written tests was clearly important to some employers as a sign of worker's literacy and information skills. But interviewees generally agreed that paper-based certification is an unreliable indicator of job candidates' relevant work experience or practical skills. This mistrust of trade certification leads some employers to avoid hiring journeypersons, others to place new trades workers on various kinds of probation, and others to hire through established social networks. From one viewpoint these responses illustrate the negative market consequences of unclear occupational standards, and perhaps the case for reforming the evaluation and certification mechanisms in the skilled trades. On the other hand, a situation that may be inefficient for the labour market in the abstract may nonetheless have practical value at the local level, as in the case of employers who cite the unreliability of trades credentials as grounds for extracting wage concessions from new hires.

The interviews reveal other instances where particular institutional elements of apprenticeship are evidently put to strategic uses not captured by the standard assumptions. In all Canadian jurisdictions, apprenticeship is set apart from other forms of post-secondary education by the indentureship mechanism: the unique requirement that both the trainee and the employer register with the provincial apprenticeship authority. The contemporary function of indentureship is not obvious. It is often portrayed as evidence of the continuity of modern apprenticeship with its ancient roots, as a training system fundamentally dependent on employer-led instruction in the workplace. In that light, the indentureship agreement would protect the trainee's interest in fair compensation and effective workplace training, and the employer's investment of training effort. Even in historical terms, this image is unrealistically well-balanced, since agreements were far more often enforced in favour of masters over runaway apprentices than by trainees over abusive employers. In present-day Canada it is all the less plausible to construe apprenticeship registration as a two-way contract between employer/trainer and worker/learner. In the first place, the agreement is not an enforceable contract, as it can be terminated by either party without penalty. More importantly, any leverage that the contemporary agreement exerts is not

based in mutual obligations between employer and trainee, but rather arises from offering each party conditional access to public resources. Again, the benefits are rather lopsided. For the employer, the up side of the agreement is at least a basic assurance of an employee who is committed to spending several years in the occupation and eligible for high-quality, publicly subsidized in-school technical training. (However, as the interviews showed, employers differ in the value that they place on both of these). The down side is negligible: in British Columbia, a "sponsorship agreement" imposes no obligations whatsoever upon the employer, either with respect to training or compensation of apprentices. For both parties, the most reliable implication of the agreement is acceptance of a trainee wage scale (whether based in provincial legislation or, as in BC, in custom). The second is that only by registering a sponsorship agreement can the trainee be designated an "apprentice" and gain eligibility for in-class technical training. Together, these two elements give the modern indentureship agreement a coercive potential, effectively making the employer's ongoing sponsorship (and the apprentice's acceptance of the training wage) preconditions for the trainee's access to vocational training. Several interviewees – including a number of high-volume, low-intensity employers in the construction sector – alluded to this interlock, explaining that a key benefit of apprenticeship from their point of view was as an employee retention strategy. While there may be strong policy reasons for seeking to engage employers in the in-school training of their workers, the current indentureship mechanism has the potential to position employers as gatekeepers to publicly-provided training services that apprentices need, without imposing reciprocal controls over the quality or quantity of training that they provide in the workplace.

## Considerations for policy and research

Current policies place urgent priority on raising rates of apprenticeship participation, in part through financial incentives to employers for indenturing apprentices. The present research challenges the reasoning behind this policy orientation. The findings cast new light on the apprenticeship mechanism's actual contribution to the labour supply. And they challenge monolithic views of both the demand and supply sides of the skills system: on one hand, a supposedly distinct and homogeneous group of "trades" occupations; and on the other a well-matched, coherent skill formation system that is centred on employers' workplace-based training efforts and supported against market failure by a variety of public inputs. What the findings reveal, instead, is a complex labour market where employers in different market niches, and under different regulatory and business conditions, incorporate different facets of the training system into different strategies for deploying and developing skill and managing its costs.

In policy terms, this work argues for reconsidering current policies that reward employers for merely registering apprenticeship agreements: an approach evidently rooted in overestimating the impact of apprenticeship on "the trades", and of registration on training. Rather than continuing to treat apprenticeship enrolment as a goal in its own right, a clearer sense is needed of the links between fundamental skills policy objectives and the institutional options for pursuing them. Effective and efficient skills policies would adapt to and capitalize on the diverse needs, interests, capabilities, and strategies of labour market actors. The challenge is to reassess how particular tools – whether part of the existing apprenticeship toolbox or not – can be applied within a complex environment to achieve more fundamental objectives, whether in terms of labour supply, industrial innovation, economic productivity, or social inclusion.

In its particular combination of institutional parts, the Canadian approach to apprenticeship is an oddity in comparative terms. It is clearly very distant from the renowned German dual system with its very high participation rates, strict regulatory standards, and close collaboration among social partners. But it also stands in sharp contrast to the American model, where apprenticeship was all but abandoned in the early 19th century in favour of institution-based vocational training and a flexible industrial labour market. The Canadian system's particular mix of features is likely the result of historical processes that could only be discovered through further research. Such research may point to strong advantages of the Canadian system. But it would be remiss if it did not also explore the relationship between Canada's approach to industrial labour force development and its comparatively poor showing in terms of industrial innovation, productivity, and employer investment in skill formation.

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# APPENDICES

## TABLE A1 Highest credential by occupation (N)

Source: Statistics Canada Catalogue no: 97-564-X2006005

| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | H011 Suprvsrs, machinists & related occ's | 1055 | 1530 | 2360 | 1995 | 270 | 535 | 7745 |
| 2 | H012 Contractors & suprvsrs, electrical trades & telecom'ns occ's | 390 | 1430 | 5030 | 3390 | 385 | 595 | 11225 |
| 3 | H013 Contractors & suprvsrs, pipefitting trades | 355 | 770 | 2605 | 1040 | 85 | 190 | 5050 |
| 4 | H014 Contractors & suprvsrs, metal forming, shaping & erecting trades | 860 | 1380 | 4005 | 1350 | 155 | 195 | 7940 |
| 5 | H015 Contractors & suprvsrs, carpentry trades | 2600 | 3380 | 4710 | 2680 | 370 | 840 | 14590 |
| 6 | H016 Contractors & suprvsrs, mechanic trades | 1880 | 3240 | 7495 | 4275 | 580 | 695 | 18160 |
| 7 | H017 Contractors & suprvsrs, heavy construction equipment crews | 6095 | 6715 | 4185 | 3065 | 535 | 825 | 21430 |
| 8 | H018 Suprvsrs, printing & related occ's | 760 | 2030 | 1040 | 1155 | 260 | 695 | 5935 |
| 9 | H019 Contractors & suprvsrs, other construction… | 5710 | 7095 | 5850 | 3440 | 670 | 1565 | 24335 |
| 10 | H021 Suprvsrs, railway transport operations | 260 | 515 | 330 | 270 | 30 | 120 | 1530 |
| 11 | H022 Suprvsrs, motor transport & other ground transit operators | 1270 | 2525 | 1220 | 1465 | 225 | 605 | 7310 |
| 12 | H111 Plumbers | 3655 | 6380 | 24235 | 8755 | 780 | 1015 | 44820 |
| 13 | H112 Steamfitters, pipefitters & sprinkler system installers | 1885 | 3715 | 11665 | 4070 | 445 | 410 | 22185 |
| 14 | H113 Gas fitters | 250 | 415 | 3435 | 1245 | 150 | 155 | 5650 |
| 15 | H121 Carpenters | 33590 | 40610 | 53030 | 22310 | 2730 | 5255 | 157525 |
| 16 | H122 Cabinetmakers | 5010 | 6570 | 6935 | 4015 | 480 | 1370 | 24375 |
| 17 | H131 Bricklayers | 4585 | 3895 | 7520 | 2205 | 275 | 415 | 18885 |
| 18 | H132 Concrete finishers | 4510 | 3075 | 2655 | 885 | 130 | 180 | 11435 |
| 19 | H133 Tilesetters | 2065 | 2460 | 2290 | 955 | 160 | 440 | 8370 |
| 20 | H134 Plasterers, drywall installers & finishers & lathers | 11620 | 9455 | 8730 | 3065 | 395 | 770 | 34040 |
| 21 | H141 Roofers & shinglers | 8470 | 6635 | 4750 | 1655 | 245 | 380 | 22140 |
| 22 | H142 Glaziers | 2615 | 3300 | 2950 | 1200 | 140 | 305 | 10500 |
| 23 | H143 Insulators | 2250 | 2100 | 3325 | 1020 | 125 | 160 | 8975 |
| 24 | H144 Painters & decorators | 12860 | 16985 | 10445 | 5830 | 1120 | 2990 | 50225 |
| 25 | H145 Floor covering installers | 4890 | 5985 | 3910 | 1685 | 290 | 560 | 17325 |
| 26 | H211 Electricians (except industrial & power system) | 2195 | 9070 | 39385 | 17360 | 1815 | 2570 | 72395 |
| 27 | H212 Industrial electricians | 545 | 1780 | 14270 | 10470 | 1050 | 1845 | 29960 |
| 28 | H213 Power system electricians | 80 | 340 | 2530 | 2070 | 185 | 180 | 5380 |
| 29 | H214 Electrical power line & cable workers | 725 | 1975 | 5745 | 2685 | 315 | 255 | 11695 |
| 30 | H215 Telecom'ns line & cable workers | 850 | 3290 | 2100 | 2575 | 275 | 515 | 9610 |
| 31 | H216 Telecom'ns installation & repair workers | 1120 | 6195 | 3820 | 8400 | 1265 | 2085 | 22895 |
| 32 | H217 Cable television service & maintenance technicians | 455 | 1270 | 840 | 1385 | 150 | 330 | 4440 |
| 33 | H221 Stationary engineers & auxiliary equipment operators | 1010 | 1110 | 6020 | 5780 | 735 | 795 | 15450 |

## TABLE A1 Highest credential by occupation (N)

Source: Statistics Canada Catalogue no: 97-564-X2006005

| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher | Total |
|---|---|---|---|---|---|---|---|---|
| 34 | H222 Power systems & power station operators | 375 | 1395 | 1600 | 3065 | 365 | 635 | 7430 |
| 35 | H311 Machinists & machining & tooling inspectors | 5175 | 8840 | 21480 | 12610 | 1495 | 2475 | 52075 |
| 36 | H312 Tool & die makers | 1510 | 2715 | 5785 | 5980 | 630 | 600 | 17220 |
| 37 | H321 Sheet metal workers | 2895 | 4085 | 10235 | 3330 | 400 | 370 | 21325 |
| 38 | H322 Boilermakers | 345 | 430 | 2110 | 820 | 60 | 70 | 3830 |
| 39 | H323 Structural metal & platework fabricators & fitters | 2315 | 3160 | 3700 | 1735 | 225 | 405 | 11540 |
| 40 | H324 Ironworkers | 1960 | 2035 | 6505 | 1585 | 170 | 195 | 12450 |
| 41 | H325 Blacksmiths & die setters | 300 | 265 | 130 | 95 | 25 | 55 | 875 |
| 42 | H326 Welders & related machine operators | 15660 | 16915 | 50480 | 15985 | 1800 | 1680 | 102520 |
| 43 | H411 Construction millwrights & industrial mechanics (except textile) | 7165 | 9585 | 34750 | 20130 | 1910 | 2355 | 75900 |
| 44 | H412 Heavy-duty equipment mechanics | 4760 | 5025 | 19260 | 8770 | 805 | 520 | 39140 |
| 45 | H413 Refrigeration & air conditioning mechanics | 1185 | 2485 | 10300 | 6585 | 740 | 945 | 22240 |
| 46 | H414 Railway carmen/women | 330 | 825 | 1510 | 515 | 65 | 120 | 3360 |
| 47 | H415 Aircraft mechanics & aircraft inspectors | 625 | 1725 | 4325 | 7150 | 1000 | 870 | 15690 |
| 48 | H416 Machine fitters | 720 | 1210 | 1955 | 1240 | 85 | 140 | 5350 |
| 49 | H417 Textile machinery mechanics & repairers | 465 | 435 | 245 | 210 | 0 | 50 | 1410 |
| 50 | H418 Elevator constructors & mechanics | 225 | 500 | 1840 | 815 | 100 | 145 | 3620 |
| 51 | H421 Automotive service techns, truck & bus mechs & mech'l repairers | 18695 | 21715 | 69725 | 33380 | 3370 | 3110 | 149990 |
| 52 | H422 Motor vehicle body repairers | 6215 | 5895 | 13835 | 4270 | 590 | 445 | 31255 |
| 53 | H431 Oil & solid fuel heating mechanics | 275 | 420 | 1215 | 485 | 65 | 85 | 2545 |
| 54 | H432 Electric appliance servicers & repairers | 1065 | 1340 | 3105 | 1855 | 225 | 420 | 8005 |
| 55 | H433 Electrical mechanics | 660 | 1065 | 3890 | 2000 | 280 | 355 | 8245 |
| 56 | H434 Motorcycle & other related mechanics | 460 | 510 | 1630 | 780 | 45 | 40 | 3470 |
| 57 | H435 Other small engine & equipment mechanics | 1190 | 1385 | 2725 | 1310 | 130 | 75 | 6815 |
| 58 | H511 Upholsterers | 2020 | 1790 | 1165 | 655 | 180 | 195 | 5990 |
| 59 | H512 Tailors, dressmakers, furriers & milliners | 7615 | 5805 | 2875 | 2505 | 615 | 875 | 20295 |
| 60 | H513 Shoe repairers & shoemakers | 640 | 590 | 390 | 170 | 90 | 130 | 2010 |
| 61 | H514 Jewellers, watch repairers & related occ's | 925 | 1435 | 1085 | 1225 | 295 | 705 | 5670 |
| 62 | H521 Printing press operators | 4385 | 6925 | 5875 | 2975 | 430 | 685 | 21275 |
| 63 | H522 Commercial divers | 85 | 155 | 360 | 285 | 30 | 70 | 985 |
| 64 | H523 Other trades & related occ's | 1355 | 1820 | 3995 | 1785 | 185 | 270 | 9405 |
| 65 | H531 Residential & commercial installers & servicers | 9920 | 12340 | 5670 | 4080 | 705 | 1715 | 34430 |
| 66 | H532 Waterworks & gas maintenance workers | 790 | 1450 | 1170 | 920 | 65 | 190 | 4585 |

## TABLE A1 Highest credential by occupation (N)

Source: Statistics Canada Catalogue no: 97-564-X2006005

| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher | Total |
|---|---|---|---|---|---|---|---|---|
| 67 | H533 Automotive mechanical installers & servicers | 4575 | 4890 | 1740 | 1260 | 205 | 190 | 12860 |
| 68 | H534 Pest controllers & fumigators | 225 | 465 | 475 | 565 | 155 | 305 | 2195 |
| 69 | H535 Other repairers & servicers | 2730 | 3500 | 1775 | 1775 | 245 | 885 | 10920 |
| 70 | H611 Heavy equipment operators (except crane) | 30200 | 24535 | 19285 | 7120 | 735 | 840 | 82730 |
| 71 | H612 Public works maintenance equipment operators | 5255 | 5080 | 3500 | 1410 | 270 | 285 | 15800 |
| 72 | H621 Crane operators | 2885 | 3075 | 5535 | 1625 | 280 | 210 | 13615 |
| 73 | H622 Drillers & blasters - Surface mining, quarrying & construction | 870 | 910 | 770 | 370 | 35 | 35 | 2990 |
| 74 | H623 Water well drillers | 215 | 360 | 450 | 170 | 10 | 25 | 1225 |
| | Total | 275730 | 336305 | 587865 | 297340 | 35930 | 53610 | 1586780 |

## TABLE A2 Highest credential by occupation (%)

Source: Statistics Canada Catalogue no: 97-564-X2006005

| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher |
|---|---|---|---|---|---|---|---|
| 1 | H011 Suprvsrs, machinists & related occ's | 13.6 | 19.8 | 30.5 | 25.8 | 3.5 | 6.9 |
| 2 | H012 Contractors & suprvsrs, electrical trades & telecom'ns occ's | 3.5 | 12.7 | 44.8 | 30.2 | 3.4 | 5.3 |
| 3 | H013 Contractors & suprvsrs, pipefitting trades | 7.0 | 15.2 | 51.6 | 20.6 | 1.7 | 3.8 |
| 4 | H014 Contractors & suprvsrs, metal forming, shaping & erecting trades | 10.8 | 17.4 | 50.4 | 17.0 | 2.0 | 2.5 |
| 5 | H015 Contractors & suprvsrs, carpentry trades | 17.8 | 23.2 | 32.3 | 18.4 | 2.5 | 5.8 |
| 6 | H016 Contractors & suprvsrs, mechanic trades | 10.4 | 17.8 | 41.3 | 23.5 | 3.2 | 3.8 |
| 7 | H017 Contractors & suprvsrs, heavy construction equipment crews | 28.4 | 31.3 | 19.5 | 14.3 | 2.5 | 3.8 |
| 8 | H018 Suprvsrs, printing & related occ's | 12.8 | 34.2 | 17.5 | 19.5 | 4.4 | 11.7 |
| 9 | H019 Contractors & suprvsrs, other construction … | 23.5 | 29.2 | 24.0 | 14.1 | 2.8 | 6.4 |
| 10 | H021 Suprvsrs, railway transport operations | 17.0 | 33.7 | 21.6 | 17.6 | 2.0 | 7.8 |
| 11 | H022 Suprvsrs, motor transport & other ground transit operators | 17.4 | 34.5 | 16.7 | 20.0 | 3.1 | 8.3 |
| 12 | H111 Plumbers | 8.2 | 14.2 | 54.1 | 19.5 | 1.7 | 2.3 |
| 13 | H112 Steamfitters, pipefitters & sprinkler system installers | 8.5 | 16.7 | 52.6 | 18.3 | 2.0 | 1.8 |
| 14 | H113 Gas fitters | 4.4 | 7.3 | 60.8 | 22.0 | 2.7 | 2.7 |
| 15 | H121 Carpenters | 21.3 | 25.8 | 33.7 | 14.2 | 1.7 | 3.3 |
| 16 | H122 Cabinetmakers | 20.6 | 27.0 | 28.5 | 16.5 | 2.0 | 5.6 |
| 17 | H131 Bricklayers | 24.3 | 20.6 | 39.8 | 11.7 | 1.5 | 2.2 |
| 18 | H132 Concrete finishers | 39.4 | 26.9 | 23.2 | 7.7 | 1.1 | 1.6 |
| 19 | H133 Tilesetters | 24.7 | 29.4 | 27.4 | 11.4 | 1.9 | 5.3 |
| 20 | H134 Plasterers, drywall installers & finishers & lathers | 34.1 | 27.8 | 25.6 | 9.0 | 1.2 | 2.3 |
| 21 | H141 Roofers & shinglers | 38.3 | 30.0 | 21.5 | 7.5 | 1.1 | 1.7 |
| 22 | H142 Glaziers | 24.9 | 31.4 | 28.1 | 11.4 | 1.3 | 2.9 |
| 23 | H143 Insulators | 25.1 | 23.4 | 37.0 | 11.4 | 1.4 | 1.8 |
| 24 | H144 Painters & decorators | 25.6 | 33.8 | 20.8 | 11.6 | 2.2 | 6.0 |
| 25 | H145 Floor covering installers | 28.2 | 34.5 | 22.6 | 9.7 | 1.7 | 3.2 |
| 26 | H211 Electricians (except industrial & power system) | 3.0 | 12.5 | 54.4 | 24.0 | 2.5 | 3.5 |
| 27 | H212 Industrial electricians | 1.8 | 5.9 | 47.6 | 34.9 | 3.5 | 6.2 |
| 28 | H213 Power system electricians | 1.5 | 6.3 | 47.0 | 38.5 | 3.4 | 3.3 |
| 29 | H214 Electrical power line & cable workers | 6.2 | 16.9 | 49.1 | 23.0 | 2.7 | 2.2 |
| 30 | H215 Telecom'ns line & cable workers | 8.8 | 34.2 | 21.9 | 26.8 | 2.9 | 5.4 |
| 31 | H216 Telecom'ns installation & repair workers | 4.9 | 27.1 | 16.7 | 36.7 | 5.5 | 9.1 |
| 32 | H217 Cable television service & maintenance technicians | 10.2 | 28.6 | 18.9 | 31.2 | 3.4 | 7.4 |
| 33 | H221 Stationary engineers & auxiliary equipment operators | 6.5 | 7.2 | 39.0 | 37.4 | 4.8 | 5.1 |
| 34 | H222 Power systems & power station operators | 5.0 | 18.8 | 21.5 | 41.3 | 4.9 | 8.5 |
| 35 | H311 Machinists & machining & tooling inspectors | 9.9 | 17.0 | 41.2 | 24.2 | 2.9 | 4.8 |
| 36 | H312 Tool & die makers | 8.8 | 15.8 | 33.6 | 34.7 | 3.7 | 3.5 |

## TABLE A2 Highest credential by occupation (%)

Source: Statistics Canada Catalogue no: 97-564-X2006005

| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher |
|---|---|---|---|---|---|---|---|
| 37 | H321 Sheet metal workers | 13.6 | 19.2 | 48.0 | 15.6 | 1.9 | 1.7 |
| 38 | H322 Boilermakers | 9.0 | 11.2 | 55.1 | 21.4 | 1.6 | 1.8 |
| 39 | H323 Structural metal & platework fabricators & fitters | 20.1 | 27.4 | 32.1 | 15.0 | 1.9 | 3.5 |
| 40 | H324 Ironworkers | 15.7 | 16.3 | 52.2 | 12.7 | 1.4 | 1.6 |
| 41 | H325 Blacksmiths & die setters | 34.3 | 30.3 | 14.9 | 10.9 | 2.9 | 6.3 |
| 42 | H326 Welders & related machine operators | 15.3 | 16.5 | 49.2 | 15.6 | 1.8 | 1.6 |
| 43 | H411 Construction millwrights & industrial mechanics (except textile) | 9.4 | 12.6 | 45.8 | 26.5 | 2.5 | 3.1 |
| 44 | H412 Heavy-duty equipment mechanics | 12.2 | 12.8 | 49.2 | 22.4 | 2.1 | 1.3 |
| 45 | H413 Refrigeration & air conditioning mechanics | 5.3 | 11.2 | 46.3 | 29.6 | 3.3 | 4.2 |
| 46 | H414 Railway carmen/women | 9.8 | 24.6 | 44.9 | 15.3 | 1.9 | 3.6 |
| 47 | H415 Aircraft mechanics & aircraft inspectors | 4.0 | 11.0 | 27.6 | 45.6 | 6.4 | 5.5 |
| 48 | H416 Machine fitters | 13.5 | 22.6 | 36.5 | 23.2 | 1.6 | 2.6 |
| 49 | H417 Textile machinery mechanics & repairers | 33.0 | 30.9 | 17.4 | 14.9 | 0.0 | 3.5 |
| 50 | H418 Elevator constructors & mechanics | 6.2 | 13.8 | 50.8 | 22.5 | 2.8 | 4.0 |
| 51 | H421 Automotive service techns, truck & bus mechs & mech'l repairers | 12.5 | 14.5 | 46.5 | 22.3 | 2.2 | 2.1 |
| 52 | H422 Motor vehicle body repairers | 19.9 | 18.9 | 44.3 | 13.7 | 1.9 | 1.4 |
| 53 | H431 Oil & solid fuel heating mechanics | 10.8 | 16.5 | 47.7 | 19.1 | 2.6 | 3.3 |
| 54 | H432 Electric appliance servicers & repairers | 13.3 | 16.7 | 38.8 | 23.2 | 2.8 | 5.2 |
| 55 | H433 Electrical mechanics | 8.0 | 12.9 | 47.2 | 24.3 | 3.4 | 4.3 |
| 56 | H434 Motorcycle & other related mechanics | 13.3 | 14.7 | 47.0 | 22.5 | 1.3 | 1.2 |
| 57 | H435 Other small engine & equipment mechanics | 17.5 | 20.3 | 40.0 | 19.2 | 1.9 | 1.1 |
| 58 | H511 Upholsterers | 33.7 | 29.9 | 19.4 | 10.9 | 3.0 | 3.3 |
| 59 | H512 Tailors, dressmakers, furriers & milliners | 37.5 | 28.6 | 14.2 | 12.3 | 3.0 | 4.3 |
| 60 | H513 Shoe repairers & shoemakers | 31.8 | 29.4 | 19.4 | 8.5 | 4.5 | 6.5 |
| 61 | H514 Jewellers, watch repairers & related occ's | 16.3 | 25.3 | 19.1 | 21.6 | 5.2 | 12.4 |
| 62 | H521 Printing press operators | 20.6 | 32.5 | 27.6 | 14.0 | 2.0 | 3.2 |
| 63 | H522 Commercial divers | 8.6 | 15.7 | 36.5 | 28.9 | 3.0 | 7.1 |
| 64 | H523 Other trades & related occ's | 14.4 | 19.4 | 42.5 | 19.0 | 2.0 | 2.9 |
| 65 | H531 Residential & commercial installers & servicers | 28.8 | 35.8 | 16.5 | 11.9 | 2.0 | 5.0 |
| 66 | H532 Waterworks & gas maintenance workers | 17.2 | 31.6 | 25.5 | 20.1 | 1.4 | 4.1 |
| 67 | H533 Automotive mechanical installers & servicers | 35.6 | 38.0 | 13.5 | 9.8 | 1.6 | 1.5 |
| 68 | H534 Pest controllers & fumigators | 10.3 | 21.2 | 21.6 | 25.7 | 7.1 | 13.9 |
| 69 | H535 Other repairers & servicers | 25.0 | 32.1 | 16.3 | 16.3 | 2.2 | 8.1 |
| 70 | H611 Heavy equipment operators (except crane) | 36.5 | 29.7 | 23.3 | 8.6 | 0.9 | 1.0 |
| 71 | H612 Public works maintenance equipment operators | 33.3 | 32.2 | 22.2 | 8.9 | 1.7 | 1.8 |
| 72 | H621 Crane operators | 21.2 | 22.6 | 40.7 | 11.9 | 2.1 | 1.5 |

## TABLE A2 Highest credential by occupation (%)

Source: Statistics Canada Catalogue no: 97-564-X2006005

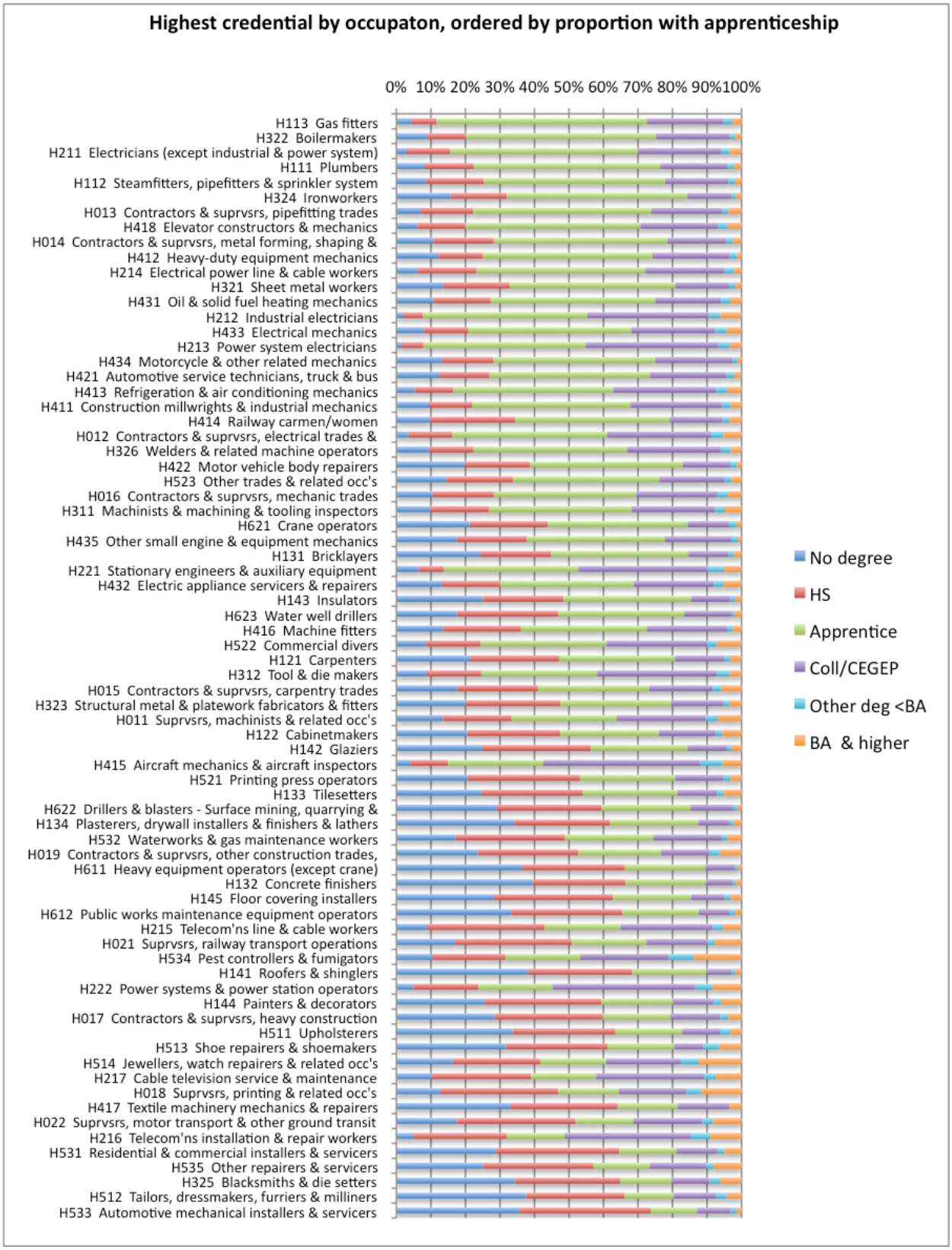
| | | No degree | High School | Apprenticeship | College/Cegep | Othr deg <BA | BA and higher |
|---|---|---|---|---|---|---|---|
| 73 | H622 Drillers & blasters - Surface mining, quarrying & construction | 29.1 | 30.4 | 25.8 | 12.4 | 1.2 | 1.2 |
| 74 | H623 Water well drillers | 17.6 | 29.4 | 36.7 | 13.9 | 0.8 | 2.0 |
| | Total | 17.4 | 21.2 | 37.0 | 18.7 | 2.3 | 3.4 |

## TABLE A3 Estimated contribution of apprenticeship training to the labour force in selected apprenticeable trades (%)

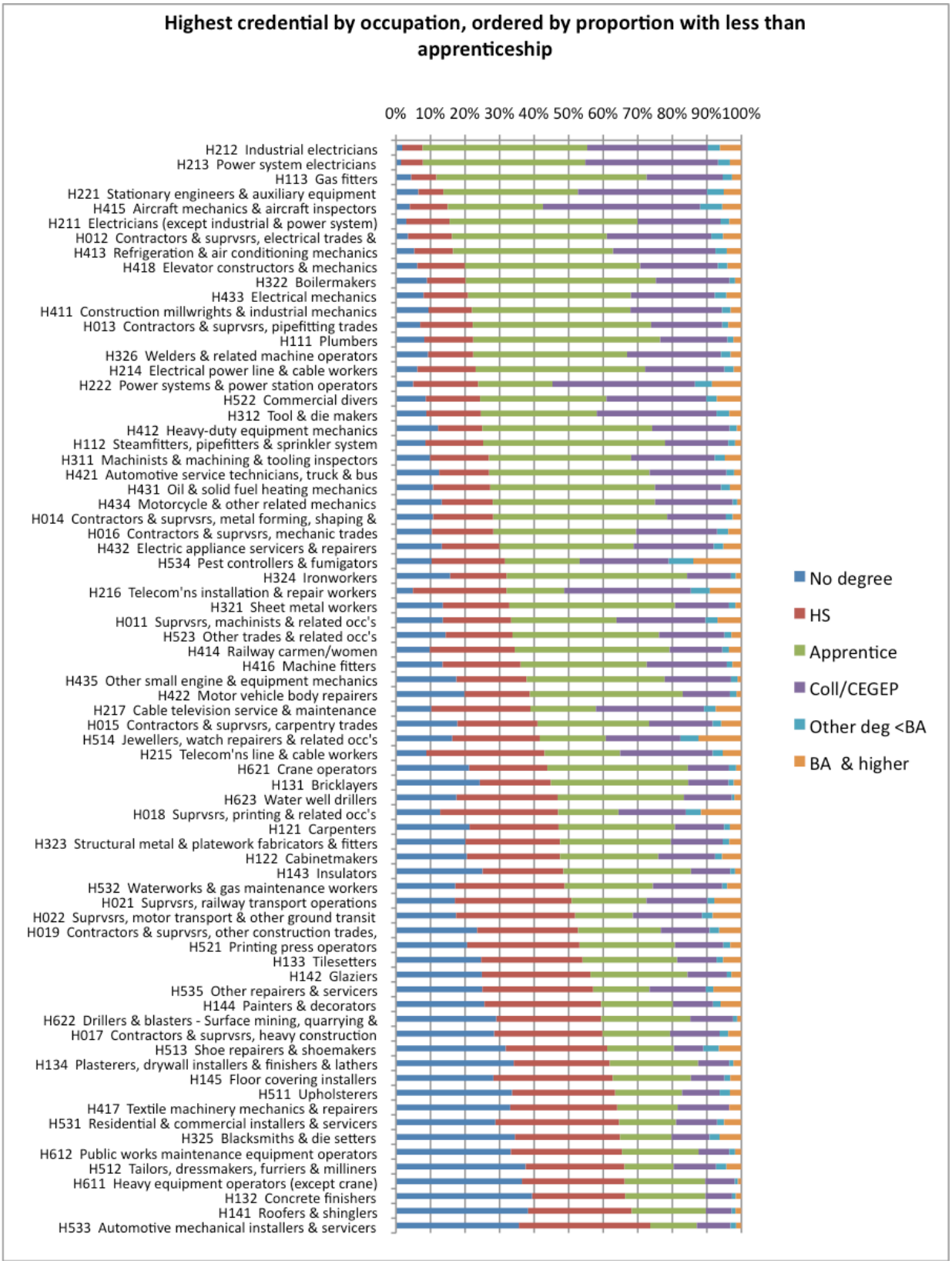
| Trade | A<br>Workers with trade certification* | B<br>Trade certificates granted to registered apprentices** | C<br>Labour force contribution of apprenticeship*** |
|---|---|---|---|
| Boilermakers | 55 | 87 | 48 |
| Plumbers | 54 | 88 | 48 |
| Sheet metal workers | 48 | 88 | 42 |
| Elect pwr & cable wkrs | 49 | 81 | 40 |
| Oil & s.f. heating mechs | 48 | 83 | 40 |
| Electricians I | 54 | 72 | 39 |
| Gas fitters | 61 | 63 | 38 |
| Ironworkers | 52 | 69 | 36 |
| HD Equip mechs | 49 | 72 | 35 |
| Auto/bus/truck svc techs | 47 | 70 | 33 |
| Machinists | 41 | 80 | 33 |
| Bricklayers | 40 | 79 | 32 |
| Insulators | 37 | 85 | 31 |
| Steam/pipe/spklr fitters | 53 | 52 | 28 |
| Refrig & A/C mechs | 46 | 60 | 28 |
| MV body repairers | 44 | 64 | 28 |
| Struct metal fabrctrs | 32 | 83 | 27 |
| Tool & die makers | 34 | 77 | 26 |
| Welders | 49 | 51 | 25 |
| Carpenters | 34 | 70 | 24 |
| Construction millwrights | 46 | 51 | 23 |
| Crane operators- | 41 | 57 | 23 |
| Glaziers | 28 | 71 | 20 |
| Industrial electricians | 48 | 40 | 19 |
| Concrete finishers | 23 | 70 | 16 |
| Roofers & shinglers | 22 | 55 | 12 |
| Painters & decorators | 21 | 52 | 11 |
| Floor covering installers | 23 | 27 | 6 |
| Power syst/station oprtrs | 22 | 21 | 5 |

* Percentage of workers reporting a trade certificate as their highest educational credential. Source: 2006 Census.
** Percentage of trade certificates granted by provincial authorities to registered apprentices in the occupation, Canada total, 1997-2006. Source: RAIS. Note: Percentages are approximate.
*** Product of A and B. Percentages should be read with caution due to rounding error and differences between the NOC-S and RAIS definitions of some occupations.

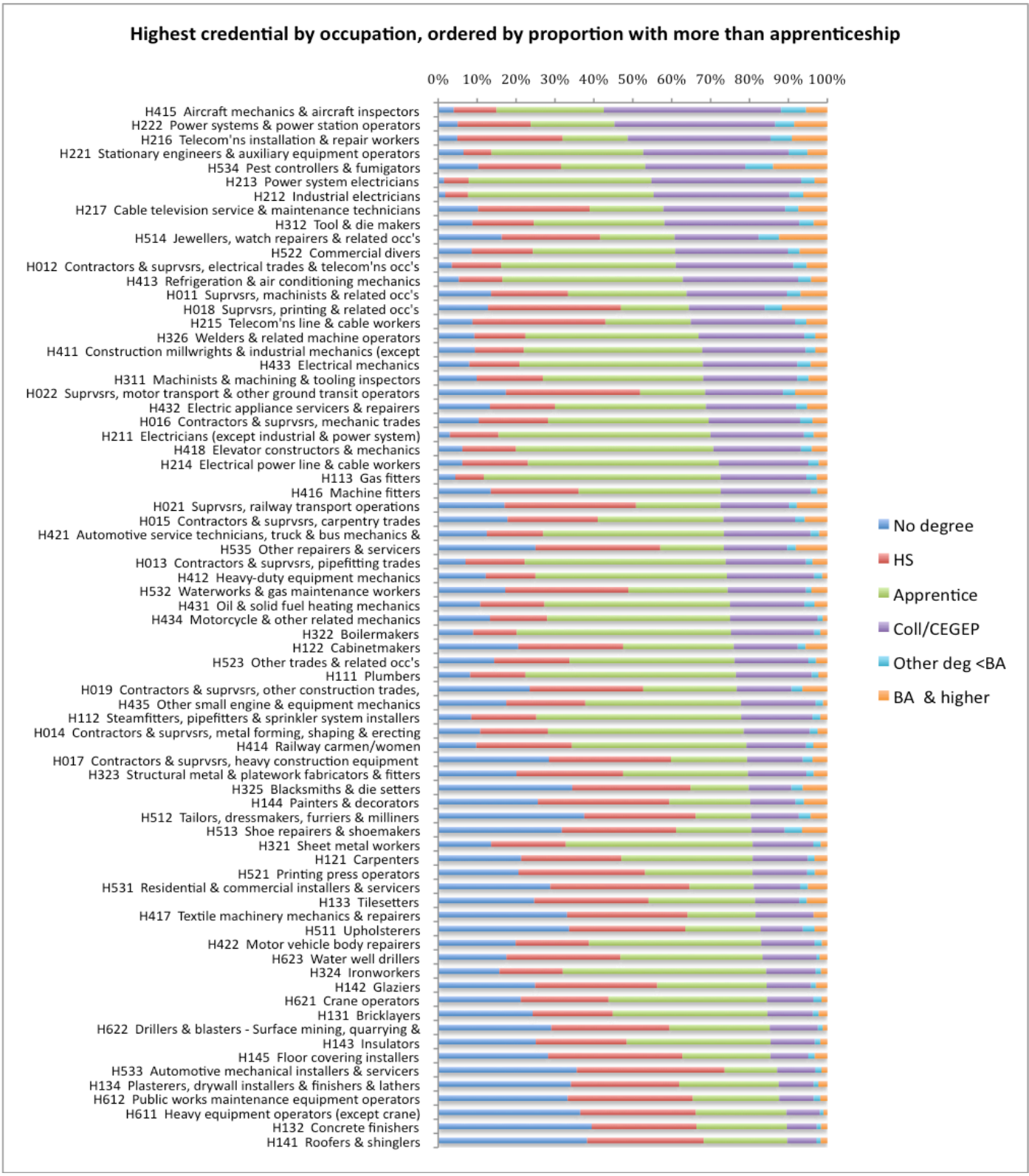
## CHART A1 Prevalence



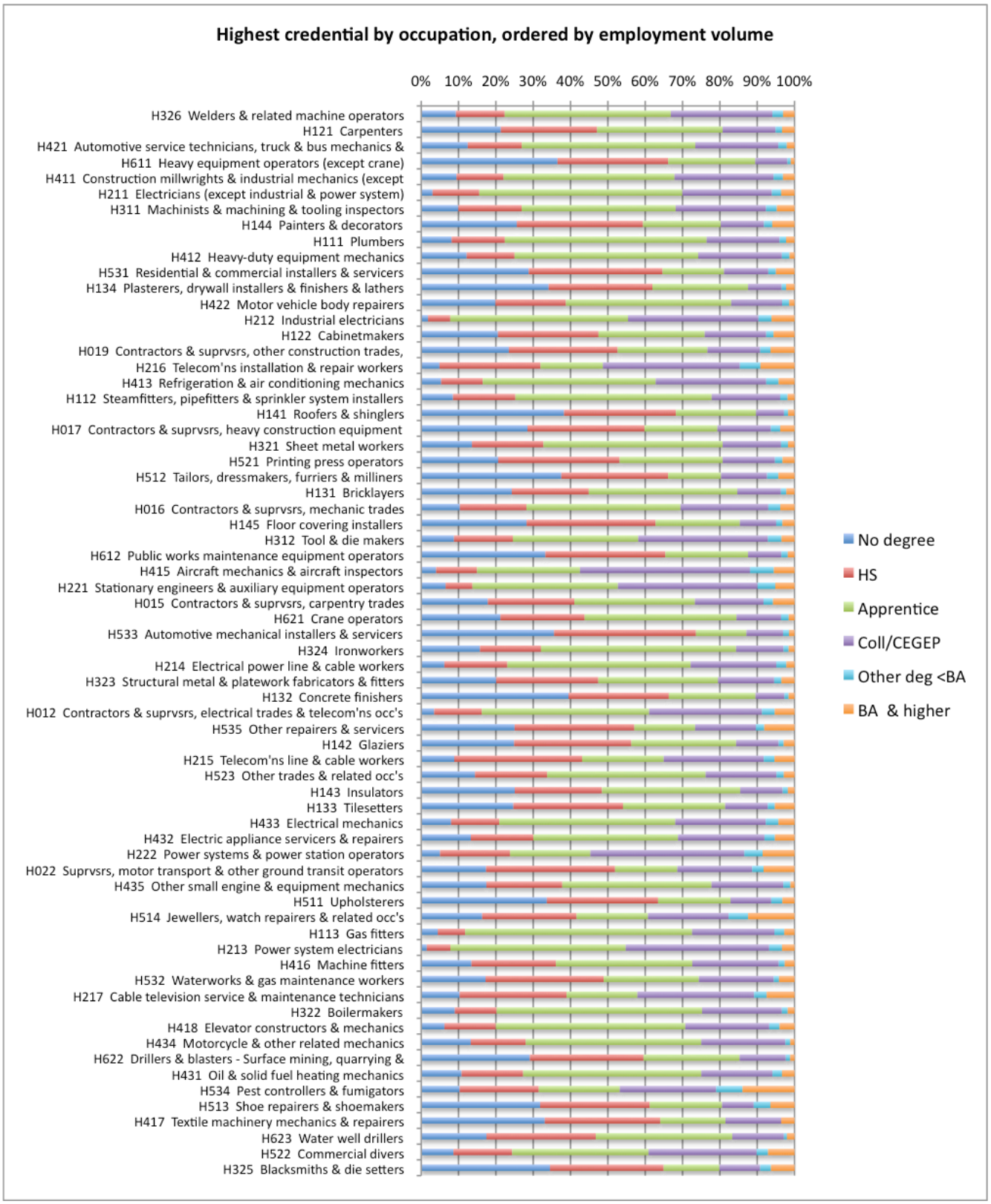
## CHART A2 Exclusivity



## CHART A3 Credentials higher than apprenticeship



## CHART A4 Employment



## TABLE A4 Workplace characteristics

| ID | Type | Trade | Size | Regl'n | Union | Ratio | Costs | Practice | Capacity | Ethos |
|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH INVESTORS** | | | | | | | | | | |
| Group H1 High value operations | | | | | | | | | | |
| 01 | Gen contractor | Carpenter | 5-10 | None | None | 1:4 | Med | High | High | High |
| 02 | Flooring contr | Flooring mech | 20-50 | Strong | Craft | 1:4 | High | High | High | High |
| 03 | Electrical contr | Electrician | 20-50 | Strong | Craft | 1:2 | Med | High | High | High |
| 04 | Electrical contr | Electrician | >50 | Strong | Craft | 1:1 | Low | Med | High | High |
| 05 | Auto dealership | Auto Svc Tech | 5-10 | Strong | None | 1:1 | Low | High | High | High |
| 06 | Auto dealership | Auto Svc Tec | 20-50 | Strong | None | 1:4 | Med | High | High | High |
| 07 | Truck & diesel | HD/CV Mech | 5-10 | Strong | Craft | 1:9 | High | High | High | High |
| Group H2 Regulated utilities | | | | | | | | | | |
| 08 | Powerline cont | Powerline tech | 20-50 | Strong | Craft | 1:2 | High | High | High | High |
| 09 | Municip garage | HD/CV Mech | >50 | Strong | Public | 1:2.5 | High | High | High | High |
| 10 | Transit garage | HD/CV Mech | >50 | Strong | Indust | 1:6 | High | High | High | High |
| 11 | School Dist. | Multiple | >50 | Strong | Public | n/a | n/a | -n/a | Low | High |
| **LOW INVESTORS** | | | | | | | | | | |
| Group L1 Independent artisans | | | | | | | | | | |
| 12 | Building contr | Carpenter | <5 | None | None | n/a | Low | Med | Med | Low |
| 13 | Auto service | Auto Svc Tech | <5 | Weak | None | 1:2 | Low | Med | Med | High |
| 14 | Auto & tire svc | Auto Svc Tech | 5-10 | Weak | None | n/a | Low | Low | Low | Med |
| 15 | Auto repair & body | Auto Svc Tech | 3 | Weak | None | 1:1 | Low | Low | Low | Low |
| 16 | Auto body | Auto bdy tech | 4 | None | None | n/a | - | - | Low | Low |
| 17 | Truck & trnsp | HD/CV Mech | 5-10 | Weak | None | 1:1.5 | Low | Low | Med | Low |
| Group L2 High volume construction | | | | | | | | | | |
| 18 | Gen contractor | Carpenter | 20-50 | None | None | 4:1 | Low | Low | Low | Low |
| 19 | Gen contractor | Carpenter | >50 | Weak | Indust | 1:2 | Low | Low | Med | Low |
| 20 | Gen contractor | Carpenter | 20-50 | Weak | Indust | 2:1 | Low | Low | Low | Low |
| 21 | Wall & ceiling | Drywall mech | 20-50 | Weak | Craft | 3:1 | L/med | Low | Med | Low |
| 22 | Mechanical cont | Plumber | 20-50 | Weak | Craft | 2:1 | Low | Low | Med | Low |
| 23 | Painting contr | Painter | 20-50 | None | None | 3:1 | Low | Low | Low | Low |
| 24 | Electrical contr | Electrician | 20-50 | Weak | None | 2:1 | Low | Low | Low | Low |
| Group L3 Craft skeptics | | | | | | | | | | |
| 25 | Gen contractor | Carpenter | 11-20 | Weak | None | 1:3 | Low | Med | Med | Low |
| 26 | Gen contractor | Carpenter | 11-20 | Weak | Indust | 1:4 | Low | Low | Med | Low |
| Group L4 Flat rate shops | | | | | | | | | | |
| 27 | Auto & tire svc | Auto Svc Tech | 5-10 | Strong | None | 1:25 | Med | Med | Med | Med |
| 28 | Auto body | Auto Body Tech | 50+ | Strong | None | 1:2? | Med | Low | Med | Low |
| 29 | Auto dealer | Auto Svc Tech | 5-10 | Strong | None | 1:7 | Med | High | Med | High |
| Group L5 Non-participants | | | | | | | | | | |
| 30 | Framing contr | Carpenter | 2 | None | None | n/a | Low | Low | Very low | Low |
| 31 | Siding contr | Siding appl | 4 | None | None | n/a | Low | Low | Very low | Low |
| 32 | Flooring contr | Flooring mech | 5-10 | None | None | n/a | Low | Low | Very low | Med |
| 24 | Brake & muffler | Installer/AST | 3 | None | None | n/a | Low | Low | Low | Low |