



Canadian Apprenticeship Forum  
Forum canadien sur l'apprentissage

# IT PAYS TO HIRE AN APPRENTICE:

*Calculating the Return on  
Training Investment for  
Skilled Trades Employers  
in Canada*

A Study of 16 Trades  
Phase II

**FINAL REPORT**

June 2009

## Acknowledgements

The Canadian Apprenticeship Forum – Forum canadien sur l'apprentissage (CAF-FCA) gratefully acknowledges the individuals and organizations who contributed their time to this project. CAF-FCA would like to thank the project's working group for their assistance, R.A. Malatest & Associates Ltd. for conducting the research and the Government of Canada for its financial support. Finally, CAF-FCA would especially like to thank each of the employers who filled in the survey. The contribution of their time was greatly appreciated.

The opinions expressed in this research document do not necessarily represent the views or official policies of the CAF-FCA or other agencies or organizations that may have provided support, financial or otherwise for this project.

### Working group members

**Allan Bruce**

CAF-FCA Board of Director  
International Union of Operating Engineers

**Catherine Cottingham**

Electricity Sector Council

**Barbara Kirby**

Mining Industry Human Resources Council

**Rui Martins**

Canadian Tire  
Chair of the Automotive Human Resource Sector Council of Nova Scotia

**Trevor Sandwell**

Wood Manufacturing Council

**Michael Zagorac**

Arcelor-Mittal Dofasco

**Paul Stoll**

Human Resources & Skills Development Canada

**Jean Pageau**

Human Resources & Skills Development Canada

**Emily Arrowsmith**

Project Manager  
Canadian Apprenticeship Forum – Forum canadien sur l'apprentissage

**Allison Rougeau**

Executive Director  
Canadian Apprenticeship Forum – Forum canadien sur l'apprentissage

**IT PAYS TO HIRE AN APPRENTICE:**  
*Calculating the Return on Training Investment for Skilled Trades Employers in Canada*  
**A Study of 16 Trades Phase II FINAL REPORT**

© 2009 Canadian Apprenticeship Forum-  
Forum canadien sur l'apprentissage (CAF-FCA)

 Funded by the Government of  
Canada's Sector Council Program

**Canadian Apprenticeship Forum-  
Forum canadien sur l'apprentissage (CAF-FCA)**  
116 Albert Street, Suite 812  
Ottawa, Ontario K1P 5G3  
Tel: (613) 235-4004  
Fax: (613) 235-7117  
info@caf-fca.org  
www.caf-fca.org

Design: Walker Communications

---

## Executive Summary

### Introduction

What are the benefits of apprenticeship training for an employer? Can a financial return be calculated? Does the investment support an employer's bottom line? These are the main research questions that prompted the Canadian Apprenticeship Forum-Forum canadien sur l'apprentissage (CAF-FCA) to complete this study. To answer these questions CAF-FCA asked almost 1,000 employers in 16 different trades in a variety of sectors to fill in a survey on the costs and benefits of apprenticeship training. The results show that there is a positive return for those employers that invest in apprenticeship training.

This report will be of interest to industry. Trade-specific data is provided with a detailed breakdown of the costs and benefits of apprenticeship training as well as the average benefit for each trade. Employers, employer associations, and Sector Councils supported the collection of this additional data. Employers did say that they would consider this data when making a decision about whether or not to hire an apprentice.

Apprenticeship stakeholders who talk to employers about the value of investing in apprentices will also be interested in this report's findings. This information dispels myths that apprenticeship training has little or no financial benefit. This study confirms that the benefits of apprenticeship training outweigh the costs, especially when one considers the gains to overall business performance.

### Research Highlights

The main findings from this study reveal there is a strong business case for apprenticeship.

- Data from almost 1000 employers across Canada was obtained as a part of the research. This data set surpasses any previous study of this type in Canada.
- Employers receive a return when they invest in apprentices. For every \$1 spent on apprenticeship training, an employer receives a benefit, on average, of \$1.47 or a net return of \$0.47.
- Analysis over the four-year apprenticeship indicates a net benefit ranging from \$39,524 (Cook) to \$245,264 (Heavy Duty Equipment Mechanic)
- The largest monetary net benefits accrue to employers who train an apprentice in trades such as heavy-duty equipment mechanics (\$245,264); automotive service technicians (\$173,122); and construction millwright and industrial mechanics (\$148,985). In these trades, the revenue generated by an apprentice far exceeds the total training costs.
- Detailed analysis for 3 trades shows there is a return for all regions across the country and for all sizes of business.
- The net benefit of apprenticeship training increases in each year over the course of the apprenticeship period.

- The revenue generated by apprentices increases throughout the apprenticeship.
- Employers noted their journeypersons benefit from having an apprentice.
- The majority of employers believe a “home-grown” journeyperson who they trained as an apprentice is more productive. Employers estimated that a “homegrown” journeyperson is 29% more productive.
- Additional benefits to hiring apprentices include having employees which are a better fit with the organization and reduced risk of skills shortages.
- Employers were evenly split in terms of whether they view a poaching risk from other employers to be a very serious issue
- 14% of employers who hired journeypersons in one of the sixteen trades, but did not hire apprentices, indicated that they would be willing to hire an apprentice, except that there were few or no apprentices applying to their organization.
- When asked if anything would motivate them to hire apprentices, about half of the employers without apprentices said yes there was something that would motivate them. 30% indicated that they would hire apprentices if they could find them, suggesting that perhaps a number of employers are having difficulty getting access to apprentices.

**Employers receive a benefit, on average, of \$1.47 for every \$1 invested in apprenticeship training. This is up 9 cents since the 2006 pilot study!**

**Industry supported the completion of this additional return on training investment research. After the 2006 pilot was complete, employers said they wanted to see more trade-specific results. Others were interested in gathering data for new trades. Employers noted they would use this information when making a decision about whether or not to hire an apprentice.**

## Background

Given the anticipated shortages of skilled workers, reducing the barriers to apprenticeship and increasing investment in apprenticeship are critical. The findings of a 2004 study commissioned by the Canadian Apprenticeship Forum – Forum canadien sur l’apprentissage (CAF-FCA) indicated that employers perceive the cost of apprenticeship as a major barrier to apprenticeship training.<sup>1</sup> In order to more fully explore the extent to which apprenticeship represented a cost to employers, the CAF-FCA commissioned R.A. Malatest & Associates Ltd. and the Conference Board of Canada in 2006 to complete a landmark study, “Apprenticeship Building a Skilled Workforce for a Strong Bottom Line, Return on Apprenticeship Training Investment for Employers, A Study of 15 Trades, June 2006.” The results of this study indicated there was a positive net return of apprenticeship training. In fact, employers from all trades, except three, showed a positive net return in the first year of the apprenticeship.

<sup>1</sup> Canadian Labour and Business Centre (2004), Accessing and Completing Apprenticeship Training in Canada: Perceptions of Barriers.

## Objectives and Scope of Study

To gain a more comprehensive understanding of the return on apprenticeship training investment to employers, CAF-FCA commissioned R.A. Malatest & Associates Ltd. to assess the costs and benefits of apprenticeship training. The overall objectives of this research were:

- to determine the overall costs incurred by employers in hiring and training apprentices using the same methodology used in 2006 for ten trades included in the 2006 pilot study as well as six additional trades,
- to build on the dataset developed in 2006 by surveying a sample of employers who participated in the 2006 pilot study to update their data and,
- to examine reasons why employers do not employ apprentices by surveying employers who employ journeypersons in the sixteen trades of interest for the current study, but who have not hired an apprentice in the past three years.

Data was collected through a national survey of employers across sixteen trade areas, which was administered by R.A. Malatest & Associates Ltd. from June to November 2008. The survey instrument was initially developed by Prism Economics and Analysis and subsequently modified by R.A. Malatest & Associates Ltd. in 2006, in consultation with CAF-FCA, to ensure that it would capture the information required to conduct a detailed cost-benefit analysis.

The 2008 research builds on the results of the pilot study completed in 2006 by R.A. Malatest & Associates Ltd., and is intended to deepen

the results from the original study for ten trades areas:

- Automotive Service Technician,
- Bricklayer,
- Construction Electrician,
- Construction Millwright and Industrial Mechanic,
- Cook,
- Heavy-Duty Equipment Technician,
- Machinist,
- Motor Vehicle Body Repairer,
- Refrigeration and Air Conditioning Mechanic, and
- Sheet Metal Worker.

In addition, information was collected for six new trades not covered in the pilot. This information was collected to broaden the business case for apprenticeship. These six new trades included:

- Boilermaker,
- Cabinetmaker,
- Electrical Power Line and Cable Worker,
- Hairstylist,
- Plumber, and
- Partsperson.

**Data from over 784 employers across Canada was obtained as a part of the new research. This data set surpasses any previous study of this type in Canada. This additional data confirms once again there is a strong business case for apprenticeship!**

The information was provided by:

- 784 new employers who participated in Phase II of the project,
- 106 employers who completed a survey in the 2006 who updated their information in 2008, and
- 1,163 employers with journeypersons in one of the sixteen trades of interest who do not employ apprentices.

### *Research Considerations*

Here are some things to keep in mind when reviewing the results:

- The results are based on averages across all employers and may not necessarily reflect the costs and benefits of apprenticeship training on an employer-by-employer basis.
- While the data at the national level can be viewed with confidence given the participation of over 700 employers, the limited number of employer completions for some trades suggests that, in these cases, trade-specific data should be interpreted with caution. During the sample selection process, it was difficult to identify employers who hire apprentices in trades with a relatively small workforce. For example, the number of workers employed in the Boilermaker (3,830) and Power Line Technician (11,700) trades is significantly lower than the combined average employment of 63,601 of the fourteen remaining trades.<sup>2</sup> In addition, there were significant difficulties identifying Partsperson apprentices,

even with the 21,020 employers that were contacted. As a result, the sample sizes for the Boilermaker and Partsperson trades are below the minimum target of twenty employers. Caution should therefore be exercised when looking at these results.

- Although the costs associated with apprenticeship training are generally quantifiable, the benefits are more difficult to measure. A part of the survey given to employers was designed to capture qualitative benefits derived from apprenticeship training. Keep in mind employers provided their subjective assessments when they were filling in that part of the survey.
- The economic climate in which the survey was undertaken differs considerably from the current economic climate. For example, the bulk of the data collection occurred in the spring and summer of 2008 at a time when Canadian unemployment was very low, world oil prices were at record levels, and there was a general shortage of journeypersons across Canada. Since that time, there has been considerable decline in economic activity, higher unemployment, and increased competition in the market place. At this point, it is unclear as to whether or not the economic downturn will have an impact on the economic returns associ-

<sup>2</sup> National Occupational Classification for Statistics 2006 (720), Provinces, Territories, Census Metropolitan Areas and Census Agglomerations, 2006 Census - 20% Sample Data.

ated with apprenticeship. While employers have cited a decline in charge-out rates, other employers contacted as part of recent validation sessions noted that they had also witnessed a slight decline in wage rates, but, more importantly, increased quality in the caliber of individuals who were now pursuing apprenticeship training. This could imply that returns could be higher in periods of slower economic growth due to the increased quality of individuals available for apprentice positions.

- It is also important to keep in mind that even though Canada is experiencing an economic downturn during the present time, analysts still predict that Canada will not have enough skilled journeypersons to meet future shortages when the baby boomers retire. The importance of investing in apprenticeship is still a message that needs to be communicated.

### **Validation Roundtables**

R.A. Malatest & Associates Ltd. and CAF-FCA facilitated a series of roundtables across Canada in early 2009 with employers to determine if any significant costs and benefits of apprenticeship training had been excluded from the methodology.<sup>3</sup> One roundtable was held with employers representing Automotive Service Technicians and another session was held with employers representing Construction Electricians. A third session was conducted with Cabinetmakers. For each of the employer roundtable sessions, R.A. Malatest

<sup>3</sup> Roundtables were held in Edmonton Alberta (construction electricians) and Vancouver BC (automotive service technicians) and Calgary Alberta (Cabinetmakers).

### **Promising Practices in the Economic Downturn**

Many employers are trying to keep their apprentices during the economic downturn. They know from experience that when the economy picks up again they will need skilled workers. Some promising employer practices include:

- Cross-training apprentices so they have the capacity to work on a wider range of projects.
- Working with stakeholders including clients, managers, journeypersons, and unions to ensure, if possible, apprentices continue to be trained, even though the number of projects may be decreasing.
- Communicating with apprentices about their training options. Using the downturn, for example, to complete technical training is one option.

& Associates Ltd. presented the trade-specific cost-benefit results. Employers for the most part said that the costs and benefits were accurately captured in the study. Employers generally agreed that there was a positive net return associated with the training of apprentices.

## Cost-Benefit Model

The cost-benefit model is based on a standard cost-benefit analysis for a single firm that hires apprentices. Net benefits and costs are calculated on a per apprentice, per year of apprenticeship basis. The cost and benefit components are detailed in the following sections.

### Cost Components

#### Wages and Benefits

Wages and Benefits includes base pay and non-compulsory and compulsory benefits such as Workers Compensation, Employment Insurance, and Canada Pension Plan.

#### Opportunity Costs

Opportunity costs include costs related to the resources that apprentices draw from the organization as part of their training process. Opportunity costs associated with journey-person time and wastage were included in the model. Wastage was defined as the material costs associated with any mistakes made by the apprentices. The time required to correct the mistake was also included. The costs were estimated on a per apprentice, per year basis. In each situation, an attempt was made to price these factors and to determine the scale of their usage by apprentices.

#### Disbursements

Disbursements refer to costs incurred by the employer related to the ongoing training and development of apprentices, such as registration fees and wages during in-school training.

#### Administration

An estimate of the costs associated with the administering of apprenticeships was made. These costs included filling in the appropriate paperwork. These costs were allocated on a per apprentice basis.

### Benefit Components

#### Revenue Generated by Apprentice

Using employer-supplied data on charge-out or mark-up rates and the total annual chargeable hours of work, an estimate was made of the average revenue associated with each apprentice.

It should be noted however, that while many employers could easily compute a “charge-out” rate for their apprentices and, hence, develop an estimate of the revenue that would be derived from the apprentice, some employers had more difficulty in estimating a charge-out rate. For example, among employers of Cooks and Partspersons, employers were unable to provide an estimate of the charge-out rates of the apprentices. For these trades, the consultant utilized a “mark-up” rate based on the journey-person wage rate. As a result, caution should be exercised in the interpretation of results for these two trades.

**The cost-benefit model used tried to accurately capture the variety of costs and benefits associated with apprenticeship training. The methodology used has generated interest in Switzerland, New Zealand, Australia, and the United States.**

## Cost-Benefit Results

### *Summary of Cost-Benefit Results by Trade*

The following observations can be made regarding the findings of the cost-benefit analysis for each of the sixteen trades:

- The net benefit of apprenticeship training increases in each year over the course of the apprenticeship period.
- The revenue generated by an apprentice increases throughout the apprenticeship.
- Wages and benefits paid to apprentices increase commensurately with training and experience.
- The cost in terms of journeyman time declines through each year of the apprenticeship.

The overall results of the cost-benefit analysis indicate that the benefits of apprenticeship training exceed the costs for the majority of trades. All but two<sup>4</sup> of the trades, showed a positive net return. The net benefit ranged from \$39,524 (Cook) to \$245,264 (Heavy Duty Equipment Mechanic). In addition, the results indicate that for every \$1 spent on apprenticeship training, an employer receives a benefit, on average, of \$1.47 or a net return of \$0.47. Notwithstanding other qualitative benefits, these findings suggest that apprenticeship training is a worthwhile investment for employers.

There are particular circumstances that may contribute to a negative return for selected trades. The specific circumstances and characteristics for each trade are discussed below:

- **Electrical Power Line and Cable Worker apprentices** incurred a negative return primarily due to the high wage rates paid to apprentices in this trade and the considerable use of journeyman time required to supervise the apprentice. This could reflect the safety aspects of the job, which may require more “hands on” supervision by journeymen. For example, in contrast to construction electrician activities, in many instances, Electrical Power Line and Cable Workers have to work in a “hot” environment meaning that they are working in an environment whereby power can not always be turned off while working. Furthermore, the relatively generous benefit provisions provided to apprentices in this trade area also contributed to a higher cost structure for these apprentices relative to apprentices in other trade areas.
- **Hairstylist apprentices** also incurred a negative return, primarily due to the relatively low level of revenue that could be attributed to a first or second year apprentice. As the apprenticeship period for this trade is only two years, it appears that employers have only a limited period to recoup costs. In contrast, for most other trades, which typically involve a four-year apprenticeship period, employers generally observe higher economic returns in the third and fourth years of apprenticeship.

**Analysis over the four-year apprenticeship indicates a net benefit ranging from \$39,524 (Cook) to \$245,264 (Heavy Duty Equipment Mechanic)**

<sup>4</sup> The two trades are hairstylist and electrical power line and cable worker.

**Figure 1  
Total Per Apprentice Costs and Benefits by Trade**

Trades	Duration <sup>1</sup> of Apprenticeship (Years)	Costs <sup>2</sup> (\$)	Benefits <sup>3</sup> (\$)	Net Benefit <sup>4</sup> (\$)	Benefit-Cost Ratio <sup>5</sup>
Automotive Service Technician	4	250,016	423,138	173,122	1.69
Boilermaker	4	246,889	473,696	226,807	1.92
Bricklayer	4	237,687	316,853	79,166	1.33
Cabinetmaker	4	180,369	247,298	66,929	1.37
Construction Electrician	4	196,811	293,048	96,237	1.49
Construction Millwright and Industrial Mechanic	4	254,287	403,272	148,985	1.59
Cook	4	125,344	164,868	39,524	1.32
Electrical Power Line and Cable Worker	4	336,770	319,759	(17,011)	0.95
Hairstylist	2	77,096	42,620	(34,476)	0.55
Heavy Duty Equipment Mechanic	4	252,371	497,636	245,264	1.97
Machinist	4	204,921	383,877	178,955	1.87
Motor Vehicle Body Repairer	4	210,088	362,237	152,149	1.72
Plumber	4	237,681	329,728	92,047	1.39
Refrigeration and Air Conditioning Mechanic	4	240,060	344,601	104,541	1.44
Sheet Metal Worker	4	258,160	322,022	63,862	1.25
Partsperson	4	215,323	361,276	145,954	1.68
<b>Average</b>	<b>4</b>	<b>220,242</b>	<b>330,371</b>	<b>110,128</b>	<b>1.47</b>

1 Source: Apprenticeship Survey (Q28)

2 Represents the total per apprentice costs incurred over the apprenticeship period.

3 Measured as the revenue generated by an apprentice.

4 Benefits – Costs

5 Benefits / Costs

Detailed in Figure 1 are the net cost and benefits associated with the sixteen trades examined in this study. The benefit/cost ratio represents the total return to the employer

for each dollar invested in an apprentice. A benefit/cost ratio of greater than one implies a positive net return, while a ratio of less than one implies a net cost.

## Analysis of Benefit-Cost Returns by Region, Size of Employer

In addition to collecting information at a national level with respect to the net costs/benefits of apprenticeship by trade area, a goal of the research was to ascertain whether or not the net return on apprenticeship varied on the basis of regions, defined as Atlantic, Quebec, Ontario, West, or on the basis of the size of employer in terms of number of employees, defined as less than 10, 10-19, and 20+.

**The largest monetary net benefits accrue to employers who train an apprentice in trades such as Heavy-Duty Equipment Mechanics (\$245,264), Automotive Service Technicians (\$173,122), and Construction Millwright and Industrial Mechanics (\$148,985). In these trades, the revenue generated by an apprentice far exceeds the total training costs.**

The regional/employer size analysis was completed for those trades in which there were sufficient numbers of employers to allow for robust estimates. These trades included Automotive Service Technicians with 159 employers, Construction Electricians with 166 employers, and Refrigeration and Air Conditioning Mechanics with 118 employers.

On average, employers in all regions witnessed a positive return on their apprenticeship investment. Overall, while results suggest that employers in Western Canada have a greater ability to earn higher revenues from their apprentices, they also incur significant costs in terms of wages and benefits and use of journeyperson time. Relative to the national average, employers in Quebec

Generally, the key costs were the apprentices' wages and benefits and journeyperson time to supervise the apprentice. Other costs such as wastage, other disbursements, or administration, represented only a small proportion of the total cost of an apprentice. This information may bring into question the commonly held perception that the administration costs of apprenticeship are prohibitive.

experienced net benefits that were, on average, 12% to 16% higher than the national average. This return occurs because Quebec employers generally reported a lower cost in terms of average wages and benefits paid to apprentices, lower levels of "other" costs such as disbursements and less use of journeyperson time to supervise such apprentices.<sup>5</sup> Employers in Ontario generally witnessed net benefits that were slightly below the national average due primarily to lower charge-out revenues attributable to apprentices. Employers in Atlantic Canada generally experienced a net positive return within 5% of the national average.

All employers, no matter what their size, had a return. Larger employers have a higher return for the Automotive Service Technician and Refrigeration and Air Conditioning Mechanic trades. In the Construction Electrician trade, medium-sized employers (10-19) showed the highest return.

<sup>5</sup> The less use of journeypersons' time could be a result of the way the educational system is structured in Quebec. In that province apprentices typically attend college prior to entering into an apprenticeship so the apprentices may be more experienced.

**Figure 2**  
**Analysis of Differences in Net Return on the Basis of Region and Size of Employer**  
**Selected Trades**

Characteristic % Difference from National Average	AST	Refrig. & A/C Mechanic	Construction Electrician	Average- Three Trades
<b>Region</b>				
Atlantic	n/a <sup>1</sup>	-2.8%	+3.4%	-0.3%
Quebec	+12.4%	+16.0%	+12.1%	+13.5%
Ontario	-4.7%	-11.8%	-2.0%	-6.2%
West	-7.1%	+9.7%	-0.6%	+0.7%
<b>Size of Employer</b>				
< 10 employees	-7.9%	-13.9%	+1.0%	-10.4%
10-19 employees	+3.69%	+10.0%	+22.5%	+12.0%
20+ employees	+14.1%	+19.6%	-9.0%	+8.2%

1 Insufficient Sample Size

Highlighted in Figure 2 is a summary of the difference in net benefits<sup>6</sup> for the three trades which analysis could be completed on the basis of region and size of employer.<sup>7</sup>

### Summary of Trends Since 2006

The results from the pilot study, “Apprenticeship Building a Skilled Workforce for a Strong Bottom Line, Return on Apprenticeship Training Investment for Employers, A Study of 15 Trades, June 2006,” were compared to the current study. Comparing the results of the two studies suggests that while the cost to hire, train, and supervise an apprentice has increased over the past two years, the ability of employers to generate revenues from

apprentices increased at a higher rate than the costs. This analysis was not only identified through the comparison of overall costs/benefits among the ten trades studied in 2006 and 2008, but was also confirmed through the detailed examination of employer costs/benefits for those 106 employers who provided data in both 2006 and 2008. Examining the cost/benefit data for the employers who participated in both studies suggests that, while apprenticeship wage costs increased for these employers, on average, apprenticeship-related revenues increased at a greater rate.

6 Percentage difference from the national average.

7 Based on number of employees

**Figure 3**  
**Summary of Changes in Apprenticeship Costs/Revenues**  
**Selected Categories**  
**Average for Ten Trades<sup>1</sup> Studied in 2006 & 2008**

Category	2006	2008	% Change
Average Charge-Out Revenue	\$285,710	\$351,155	+23%
Apprentice Wages/Benefits	\$144,918	\$154,399	+7%
Use of Journeyman Time	\$51,088	\$53,385	+5%
Other Costs <sup>2</sup>	\$12,940	\$15,190	+17%
Total Costs	\$208,946	\$222,975	+7%
Benefit/Cost Ratio	1.37	1.57	+15%

1 Trades include AST, Bricklayer, Construction Electrician, Millwright, Cook, Heavy Duty Equipment Technician, Machinist, Motor Vehicle Body Repair, Refrigeration and A/C Mechanic and Sheet Metal Worker.

2 Other costs include wastage, disbursements and administration.

Summarized in Figure 3 are the changes in key cost/revenue components for the ten trades examined in both 2006 and 2008 for all employers. As highlighted in the table, it can be seen that:

- charge-out revenues increased by 23% between 2006 and 2008 for the ten comparable trades,
- with the exception of “other costs,” most cost elements increased between 5% and 7%, and
- the net-benefit cost ratio for the ten trades increased from 1.37 in 2006 to 1.57 in 2008 – an increase of 15%.<sup>8</sup>

8 The 1.57 figure refers to the 10 trades included in the Phase I and Phase II studies. It does not include the 6 new trades added for Phase II. The 1.47 figure is based on the data from all 16 trades.

## Survey Results

### *Proportion of Employers with Apprentices*

Although the study was not designed to measure the “incidence rate” of apprentices among eligible employers, it does appear that there was a modest increase in the use of apprentices among Canadian employers. For example, relative to the 16.7% of employers who had an apprentice in 2006, the proportion of employers who indicated that they employed an apprentice increased to 19.7% for this 2008 study.

**Qualitative Benefits of Apprenticeship Training**

When filling in the survey, employers were asked a series of questions designed to measure the importance of the several qualitative benefits of apprenticeship training. Employers were asked about:

- the benefit of apprenticeship training to journeypersons, and
- the advantages of employing a “home-grown” journeyperson.

Benefits of Apprenticeship Training to Journeypersons

The majority of employers (81.3%) indicated that their journeypersons derive a benefit from training an apprentice.

Advantages of Employing a “Homegrown” Journeyperson

Over sixty percent (61.3%) of employers consider a journeyperson they trained as an apprentice to be more productive relative to an external journeyperson, with only 3.5% indicating that “homegrown” journeypersons are less productive. Approximately, thirty five per cent (35.2%) of employers indicated that there is no difference in the productivity between a “homegrown” journeyperson and an externally hired journeyperson. Overall, employers estimated, based on their experiences, that a “homegrown” journeyperson is, on average, 29.0% more productive.

Employers rated “better fit with the organization” as the most significant benefit of employing a journeyperson who they trained as an apprentice. Employers also indicated

**Figure 4**  
**Benefits of Employing a “Homegrown” Journeyperson**



Source: Apprenticeship Survey (A11, n=589-602)

that training their own journeyperson results in “reduced risk of skill shortages,” “increased potential for career advancement for the apprentice in the company,” “greater overall productivity,” and “fewer mistakes.”

### Perceived Productive Value vs. Training Costs

Employers estimated when an apprentice's productive value to their organization begins to exceed the training costs. More than one-quarter (30.2%) of surveyed employers indicated that the benefit of training the apprentice exceeds the costs by the end of the second year of the apprenticeship. In other words, the employer perceives a net benefit of apprenticeship training at the mid-point of the apprenticeship period, which averages four years. In addition, more than one-third

(32.7%) of employers perceive a net benefit to apprenticeship training by the end of the first year or earlier. Interestingly, the data collected from employers suggests that many trades witness a positive return in the first year of an apprentice's employment in the trade.

**Employers were evenly split in terms of whether they view poaching risk from other employers to be a very serious issue**

**It works!**

Hydro Ottawa has found that apprenticeship in their organization led to better business performance through increased productivity and efficient project completion, increased morale, higher retention, and revitalization of workforce.

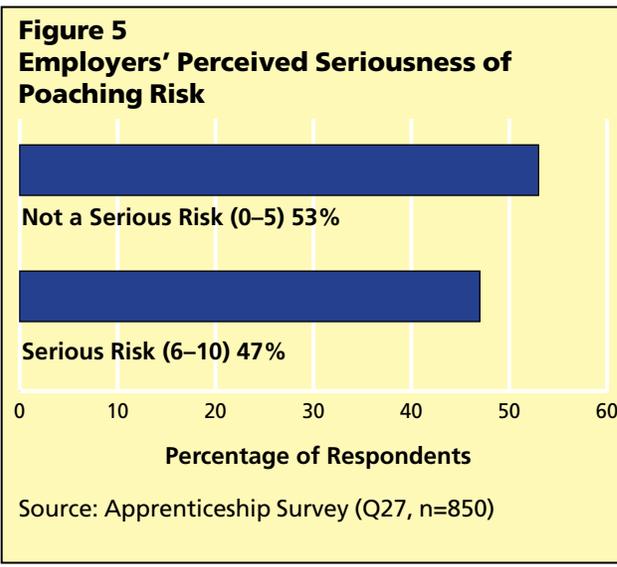
Arcelor-Mittal Dofasco has found that apprenticeship training results in higher productivity and higher completion when compared to employees that receive shorter or more informal training.

United Kingdom employers found apprenticeship training improves their business performance by making them more competitive, enhancing productivity, and reducing staff turnover.

Training in Northern Ireland has led to higher profits, higher labour productivity, growth, creativity, and entrepreneurship.

### Poaching Risk

Employers were evenly split in terms of whether they view the poaching risk from other employers to be a very serious issue. Fifty-three per cent of employers gave poaching a risk value of 1 to 5 (not serious). Forty-seven percent gave poaching a risk value of 6 to 10 (very serious). These results indicate that there is some concern among employers with respect to poaching.



As highlighted in Figure 6, there are some regional differences in employers' assessments of the poaching risk. The concern was greatest in the West and least in Atlantic Canada. The issue of poaching did not differ much based on employer size.<sup>9</sup>

### Comparison of 2006 and 2008 results

A comparison of the survey results from 2006 to 2008 study yields interesting observations as outlined in Figure 7.

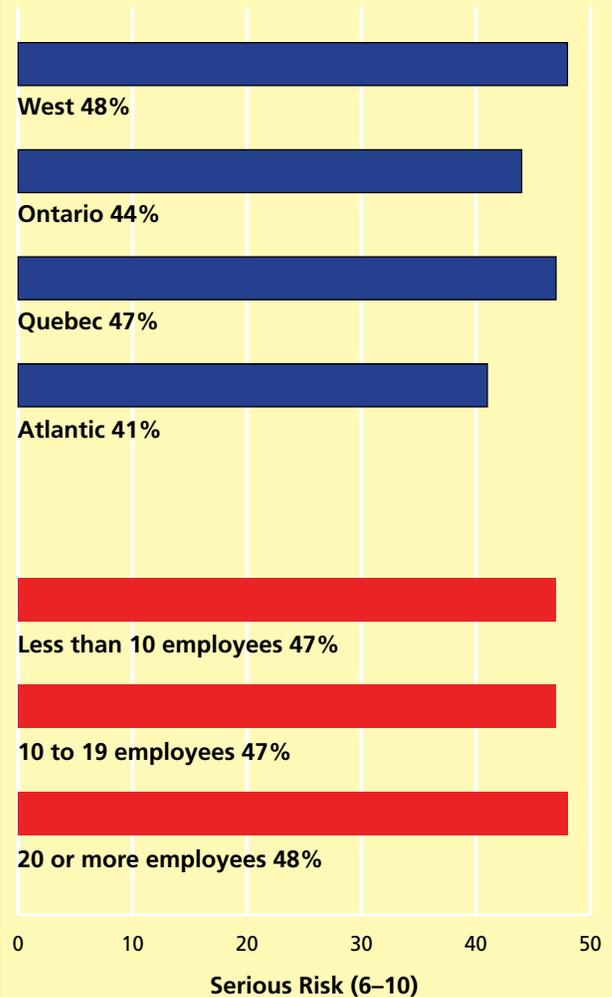
- The proportion of employers who feel that their journeypersons benefit from having apprentices increased from 67.6% in 2006 to 81.3% in 2008.
- A high proportion of employers, more than 60%, feel that a "homegrown" journeyperson is more productive than an externally-trained journeyperson.
- Employers' assessment of the "poaching risk" remained relatively unchanged over the past two years.

#### Employers with Journeypersons, but no Apprentices

Employers who hired journeypersons in one of the trades included in the study, but did not employ apprentices, were asked to complete a short survey. They were asked about the reasons that they did not invest in apprenticeship. As outlined in Figure 8, the most common reason reported by employers for not hiring an apprentice was that their business did not have enough continuous contracts to support hiring an apprentice (30%). Another common reason for not investing in apprenticeship

<sup>9</sup> Number of employees

**Figure 6**  
**Employers' Perceived Seriousness of Poaching Risk**  
**(Regional Basis & Basis of Employer Size)**



Source: Apprenticeship Survey (Q27, n=850)

was that the business was too small and there was no reported need for additional workers (25%). Of great interest, however, is the 14% of employers who indicated that they would be willing to hire an apprentice, except that there were few or no apprentices applying to their organization.

As a part of the short survey, employers were also asked if anything would change their minds about hiring apprentices. About half of

**Figure 7  
Comparison of Employer Opinion  
2006 vs. 2008**

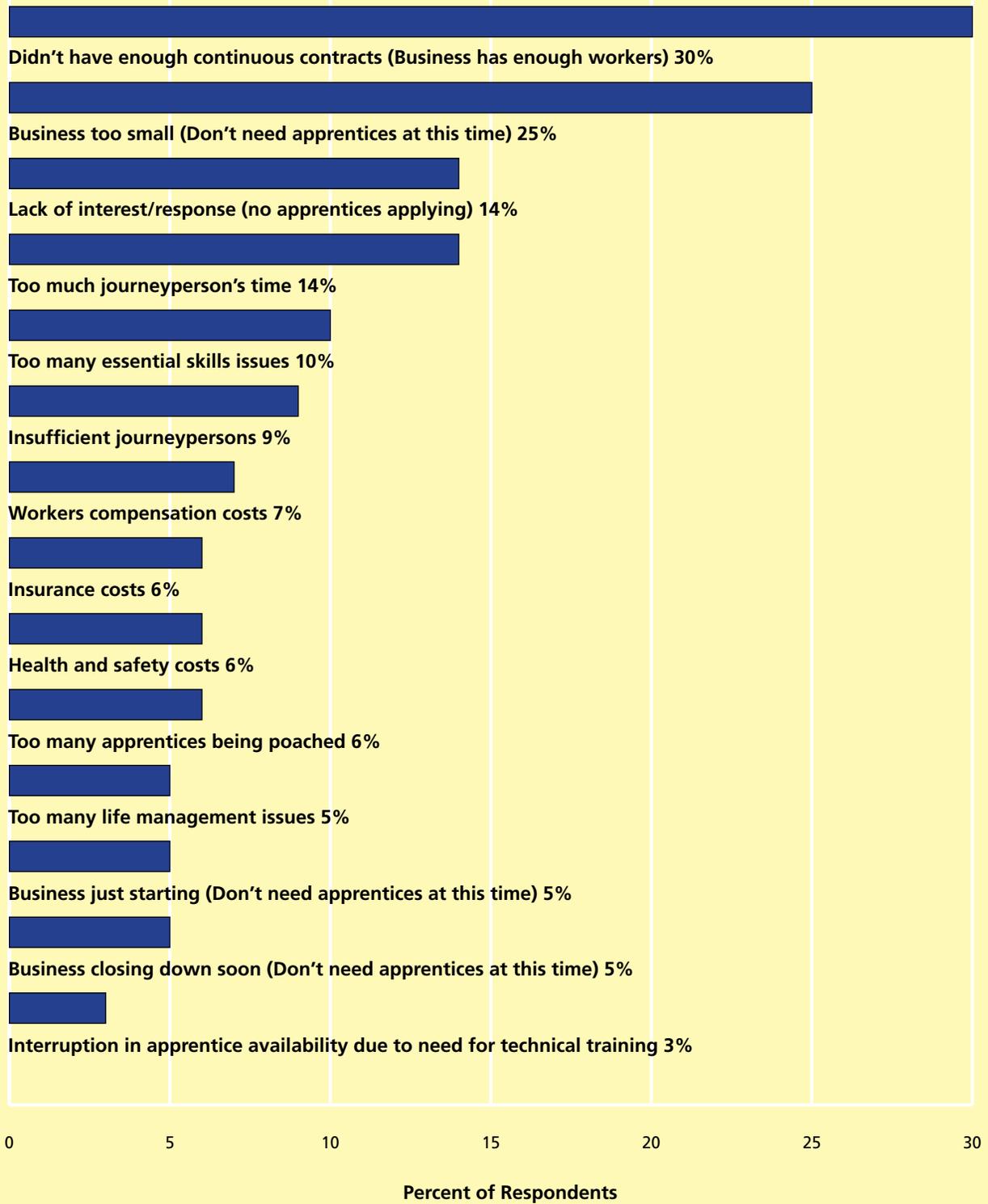
<b>Trends</b>	<b>2006</b>	<b>2008</b>	<b>Conclusion</b>
Benefits of Apprenticeship Training to Journeypersons	67.6%	81.3%	Employers continue to strongly believe that their journeypersons benefit from training apprentices
Advantages of Employing a “homegrown” Journeyperson: More productive	65.3%	61.3%	Persistent perception among employers that “homegrown” journeypersons are more productive
Most Significant benefit	Better fit with the organization (rating 8.5 out of 10)	Better fit with the organization (rating 8.5 out of 10)	Agreement among employers about the most significant benefit of apprenticeship training
Poaching	Average of 5.1 on a scale from 1 (not at all serious) to 10 (very serious)	½ (approx) 1 to 5 ½ (approx) 6 to 10	Some concern over poaching

the employers answered yes to this question. As outlined in Figure 9, this group identified some factors that would change their minds. Over 40% of employers indicated that they would hire apprentices if there were a need for them in their business. Nearly one-third (31%) of respondents indicated that they would hire apprentices if there were more financial support for employers doing so, such as tax credit incentives. Importantly, 30% of employers, without apprentices, indicated that they would hire apprentices if they could find them, suggesting that employers may be having difficulty getting access to apprentices.

**14% of employers who hired journeypersons in one of the sixteen trades, but did not hire apprentices indicated that they would be willing to hire an apprentice, except that there were few or no apprentices applying to their organization.**

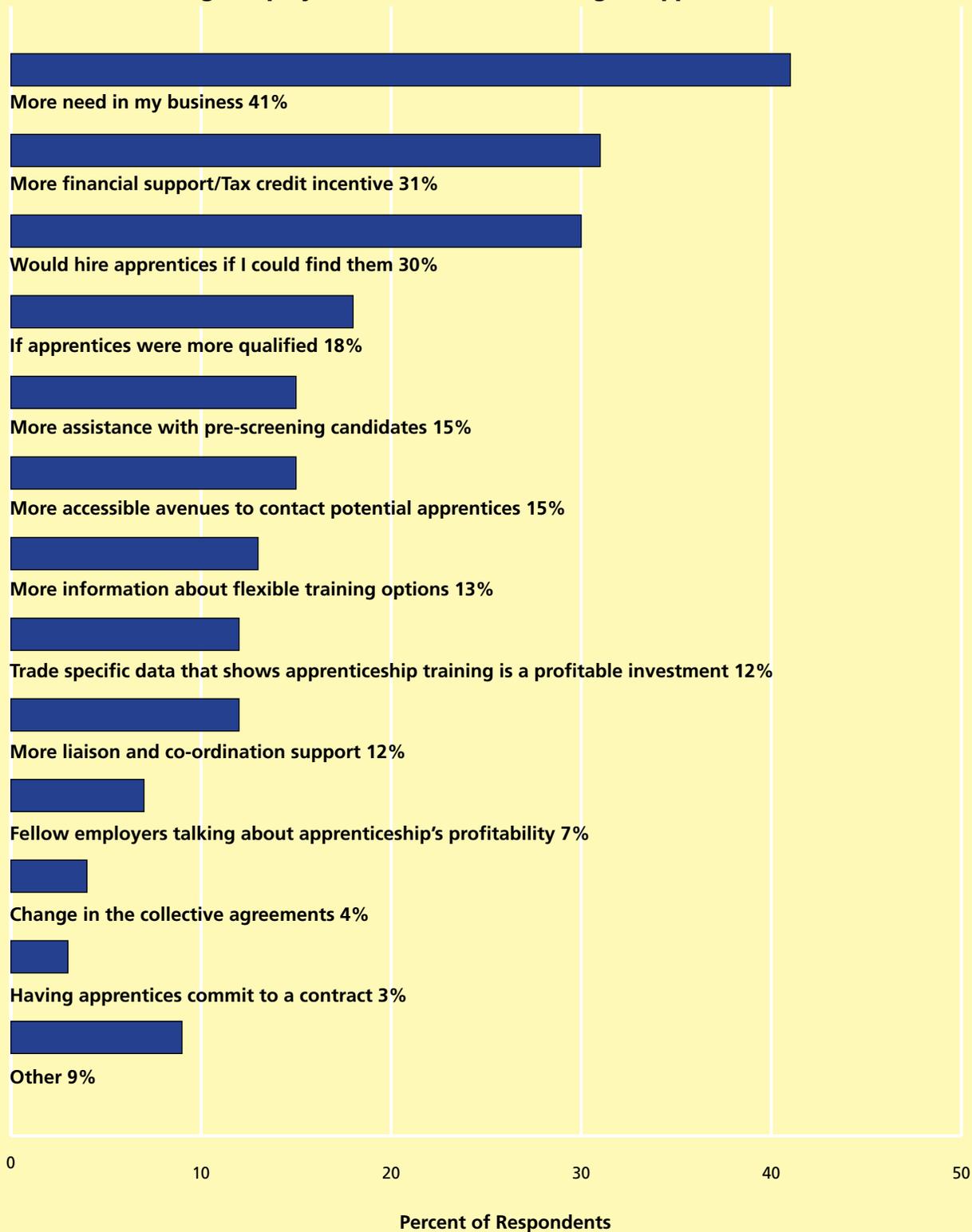
**30% of employers without apprentices indicated that they would hire apprentices if they could find them, suggesting that employers may be having difficulty getting access to apprentices.**

**Figure 8**  
**Reasons that Employers Without Apprentices Did not Hire an Apprentice**



Source: Apprenticeship Survey – Survey of Employers without Apprentices (Q2, n=1,163)

**Figure 9**  
**What Would Change Employers' Decisions About Hiring an Apprentice**



Source: Apprenticeship Survey – Survey of Employers without Apprentices (Q3, n=627)

---

## Conclusion

This study allows industry and other apprenticeship stakeholders to gain a more accurate understanding of the costs and benefits of apprenticeship training for sixteen trades. This information is valuable in dispelling myths that investing in apprentices reaps little financial benefit. According to the data collected from almost 1,000 employers, there are direct financial benefits. For every \$1 invested, employers receive a return, on average, of a \$1.47. This is 9 cents up from the 2006 pilot study. In fourteen of the trades, employers received a return by the end of the second year or earlier. In these tough economic times, Canadian companies can further enhance their business performance through apprenticeship. The majority of employers who filled

in the survey believe “homegrown” journeypersons who they trained as apprentices are more productive. Additional benefits to hiring apprentices include having employees which are a “better fit with the organization.” According to the survey findings with employers who did not hire apprentices, some of them perceived that no apprentices were applying to their companies. This finding indicates there are still opportunities to increase investment in apprenticeship by connecting those interested in apprenticeship with employers. Ongoing dialogue with industry about the value of apprenticeship and continued support for employers will be essential to ensure Canadians have the opportunities to train and to gain skills.

---

# Contents

Part 1: Introduction..... 2

Part 2: Cost-Benefit Model ..... 7

Part 3: Cost-Benefit Results..... 10

Part 4: Survey Results ..... 52

Part 5: Conclusions ..... 58

Appendix A: Survey Administration..... 60

Appendix B: Follow-up with Respondents to the Pilot Study..... 62

Appendix C: Cost-Benefit Methodology..... 66

Appendix D: Detailed Cost-Benefit Results by Region..... 75

Appendix E: Detailed Cost-Benefit Results by Employer Size ..... 82

## Part 1: Introduction

This section outlines the background, objectives, and research considerations that will provide important context for readers when analyzing the results.

### 1.1 Background

A commonly held belief that apprenticeship training had few financial benefits motivated CAF-FCA to complete this return on training investment research. One of the nine barriers identified in the Canadian Apprenticeship Forum – Forum canadien sur l'apprentissage (CAF-FCA) report, "Assessing and Completing Apprenticeship Training in Canada, Perceptions of Barriers," was the perceived cost of apprenticeship training. According to CAF-FCA's 2006 "Employers' Perceptions and Attitudes Survey," only 11 per cent of employers said it makes financial sense to hire an apprentice.<sup>1</sup> Only 5 per cent of employers surveyed said that hiring an apprentice makes good business sense.<sup>2</sup> Perceived cost-related barriers included: the overall cost of apprenticeships, loss of company productivity during the initial phase of an apprenticeship that requires extra supervision and training, possible loss of apprentices who depart after certification, and possible loss of apprentices to larger firms. These issues precipitated the need for more in-depth research into the return on apprenticeship training investment. In 2006,

1 CAF-FCA, "Employers' Perceptions and Attitudes," February 2006.

2 *Ibid.*

on behalf of the CAF-FCA, R.A. Malatest & Associates Ltd. completed a pilot Phase I study with employers in 15 trades from across the country. As a part of this study very detailed surveys with 433 employers were completed. This research formed the basis for the CAF-FCA's publication, "Apprenticeship Building a Skilled Workforce for a Strong Bottom Line, Return on Apprenticeship Training Investment for Employers, A Study of 15 Trades, June 2006." The pilot research study suggested there was a positive return for employers who invest in apprentices.

### 1.2 Objectives and Scope of Study

To gain a more comprehensive understanding of the return on apprenticeship training investment for employers, CAF-FCA commissioned R.A. Malatest & Associates Ltd. to complete another Phase II study in 2008.<sup>3</sup> The overall objectives of this research were:

- to determine the costs/benefits incurred by employers within the apprenticeship community in hiring and training apprentices using the same methodology used in 2006. Ten trades included in the 2006 pilot were selected as well as 6 additional trades;
- to determine differences in the benefit-cost ratio for employers of different sizes and regions;

3 Funding for this study was provided by Human Resources and Skills Development Canada (HRSDC).

- to build on the dataset developed in 2006 by surveying a sample of employers who participated in the 2006 pilot study to update employer data concerning apprenticeship training costs and benefits; and
- to examine reasons why employers do not employ apprentices by surveying employers who do employ journeypersons in the 16 trades of interest for the current study, but who have not hired an apprentice in the past three years.

Data was collected through a national survey of employers across 16 trade areas, which was administered by R.A. Malatest & Associates Ltd. from June to November 2008. The survey instrument was initially developed by Prism Economics and Analysis and subsequently modified by R.A. Malatest & Associates Ltd. in 2006, in consultation with CAF-FCA, to ensure that it would capture the information required to conduct a detailed cost-benefit analysis. Using the data provided by employers, R.A. Malatest & Associates Ltd. produced trade-specific cost-benefit estimates to determine the net benefit of apprenticeship training.

The 2008 research is intended to deepen the results from the original study for 10 trades areas:

- Automotive Service Technician;
- Bricklayer;
- Construction Electrician;
- Construction Millwright and Industrial Mechanic;
- Cook;
- Heavy-Duty Equipment Technician;

- Machinist;
- Motor Vehicle Body Repairer;
- Refrigeration and Air Conditioning Mechanic; and
- Sheet Metal Worker.

In addition, information was collected for six new trades not covered in the pilot study. The interest in the results for these additional trades was industry driven:

- Boilermaker;
- Cabinetmaker;
- Electrical Power Line and Cable Worker;
- Hairstylist;
- Plumber; and
- Partsperson.

This report summarizes the findings based on the following employer respondents:

- 784 new employers who participated in the 2008 Phase II of the project,
- 106 of the 321<sup>4</sup> employers who completed a survey in the 2006 who updated their information in 2008, and
- 1,163 employers with journeypersons in one of the 16 trades of interest who do not employ apprentices.

By comparing the results provided by 106 employers from the 2006 study who also par-

<sup>4</sup> Even though 433 employers completed surveys in the Phase I study, this total was based on the 15 trades that were examined. Only 10 of the trades included in Phase I were included in Phase II. The 321 figure is based on the number of employer surveys received in the 10 trades that are being included in both phases of the study.

anticipated in the 2008 study, it was possible to extrapolate changes in charge-out rates/costs to the entire sample collected in 2006.

Detailed in Figure 1.1 are the number of surveys completions from the 2006 pilot study,

the 2008 survey, and the combined file that contains data from the pooled sample. The pooled sample includes the 2008 surveys plus the 2006 surveys adjusted based on changes in costs/benefits for employers in both samples.

**Figure 1.1  
Survey Completions – 2008, 2006 & Pooled Sample**

Trade	NOC	2008 Useable Employer Surveys	Pilot Surveys (2006)	Total Number of Surveys (Pooled)
Automotive Service Technician	7321	114	45	159
Motor Vehicle Body Repairer	7322	41	21	62
Cook	6242	31	21	52
Refrigeration & Air Conditioning Mechanic	7313	78	40	118
Heavy-Duty Equipment Technician	7312	29	37	66
Construction Millwright and Industrial Mechanic	7311	7	23	30
Electrician (construction)	7241	114	52	166
Bricklayer	7281	32	21	53
Machinist	7231	15	33	48
Sheet Metal Worker	7261	23	28	51
Cabinetmaker	1272	48		48
Partsperson	1472	15		15
Boilermaker	9612	5		5
Plumber	7251	75		75
Electrical Power Line & Cable Worker	7244	27		27
Hairstylist	6271	38		38
<b>TOTAL</b>		<b>692</b>	<b>321</b>	<b>1,013</b>

### 1.3 Research Considerations

This study provides an estimate of the costs and benefits of apprenticeship training to employers across 16 trade areas. Here are some things to keep in mind when reviewing the results:

- The results are based on averages across all employers and may not necessarily reflect the costs and benefits of apprenticeship training on an employer-by-employer basis.
- While the data at the national level can be viewed with confidence given the participation of over 700 employers, the limited number of employer completions for some trades suggests that, in these cases, trade-specific data should be interpreted with caution. During the sample selection process, it was difficult to identify employers who hire apprentices in trades with a relatively small workforce. For example, the number of workers employed in the Boilermaker (3,830) and Power Line Technician (11,700) trades is significantly lower than the combined average employment of 63,601 of the 14 remaining trades.<sup>5</sup> In addition, there were significant difficulties identifying Partsperson apprentices, even with the 21,020 employers that were contacted. As a result, the sample sizes for the Boilermaker and Partsperson trades are below the minimum target of 20 employers. Caution should therefore be exercised when looking at these results.
- Although the costs associated with apprenticeship training are generally quantifiable, the benefits are more difficult to measure. A part of the survey given to employers was designed to capture qualitative benefits derived from apprenticeship training. It should be noted that employers provided their subjective assessments when they were filling in that part of the survey.
- The economic climate in which the survey was undertaken differs considerably from the current economic climate. For example, the bulk of the data collection occurred in the spring/summer 2008 at a time when Canadian unemployment was very low, world oil prices were at record levels, and there was a general shortage of tradespersons across Canada. Since that time, the considerable decline in economic activity, higher unemployment, and increased competition in the market place may have an impact on charge-out rates and could impact the net returns for the 16 studied trades. At this point, it is unclear as to whether or not the economic downturn will have a positive or negative impact on the economic returns associated with apprenticeship. While employers have cited a decline in charge-out rates, other employers contacted as part of recent validation sessions noted that they had also witnessed a slight decline in wage rates, but, more importantly, increased quality in the caliber of individuals who were now pursuing apprenticeship training. This could imply that returns could be higher in periods of slower economic growth due to the increased quality of individuals available for apprentice positions.
- It is also important to keep in mind that even though Canada is experiencing an economic downturn during the present time,

<sup>5</sup> National Occupational Classification for Statistics 2006 (720), Provinces, Territories, Census Metropolitan Areas and Census Agglomerations, 2006 Census - 20% Sample Data.

---

analysts still predict that Canada will not have enough skilled tradespeople to meet future shortages when the baby boomers retire. The importance of investing in apprentices is still a message that needs to be communicated.

### **1.4 Validation Roundtables**

R.A. Malatest & Associates Ltd. and CAF-FCA facilitated a series of roundtables across Canada with employers to determine if any significant costs and benefits of apprenticeship training had been excluded from the methodology and to validate the cost-benefit results.<sup>6</sup> Roundtables were held with employers representing Automotive Service Technicians, Construction Electricians and Cabinetmakers. For each of the employer roundtable sessions, R.A. Malatest & Associates Ltd. presented the trade-specific cost-benefit results. For the most part, the employers validated the results.

---

<sup>6</sup> Roundtables were held in Edmonton, AB (construction electricians), Vancouver, BC (automotive service technicians) and Calgary, AB (cabinetmakers).

### **1.5 Report Structure**

Information obtained through the survey research is presented in several sections. Detailed in Section 2 is a description of the cost-benefit model. Summarized in Section 3 are the detailed cost-benefit results for the 16 trade areas and the findings of the validation roundtables. Section 3 also includes an examination of net costs and benefits on the basis of region and size of establishment. Section 4 provides the qualitative survey results, including the survey findings from the employers without apprentices. The conclusions are contained in Section 5 of the report.

## Part 2:

# Cost-Benefit Model

The cost-benefit methodology for this study was originally developed by Prism Economics and Analysis, and subsequently modified by R.A. Malatest & Associates Ltd. to more fully capture a range of benefits that accrue to employers who participate in apprenticeship training. Highlighted in this section are the major elements that comprise the cost-benefit model adopted for this study. A detailed discussion of the cost-benefit methodology is included in Appendix C.

### 2.1 Overview of the Model

The model is based on a standard cost-benefit analysis for a single firm that hires apprentices. Net benefits are calculated on a per apprentice, per year of apprenticeship basis.

### 2.2 Cost Components

#### *Wages and Benefits*

Wage rates include base pay and non-compulsory and compulsory benefits such as Workers Compensation, Employment Insurance, and Canada Pension Plan.

#### *Opportunity Costs*

Opportunity costs are related to the resources that apprentices draw from the organization as part of their training process. These include journeyman time spent supervising the apprentice and wastage. Wastage

was defined as material costs and any time required to fix mistakes. In each situation, an attempt was made to price these factors and to determine the scale of their usage by apprentices. In the case of journeyman time and wastage, a per-apprentice, per-year cost was estimated. It should be noted that lost productivity of major assets, such as tools and equipment valued at more than \$50,000 that are pulled out of production to train apprentices, is another opportunity cost associated with apprenticeship training. However, as only a small percentage of surveyed employers (7.3%) indicated this as a cost, it was excluded from the analysis.<sup>1</sup>

#### *Disbursements*

Disbursements are primarily related to the employer share of costs to support the ongoing training and development of apprentices. These include costs associated with registration fees and continuing training.

#### *Administration*

An estimate of administrative costs associated with hiring and training apprentices was made. Administration included the time required to fill in paperwork related to apprenticeship and the staff time to manage the process. These costs were allocated on a per apprentice basis.

<sup>1</sup> Apprenticeship Survey (Q14a, n=752)

## 2.3 Benefit Components

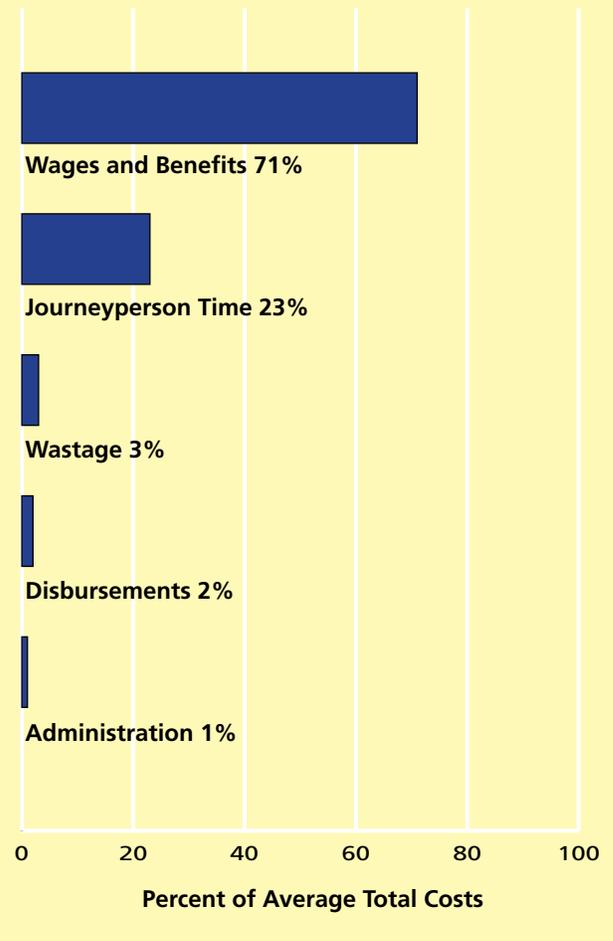
### *Revenue Generated by Apprentice*

In most cases, apprentice labour is priced to market either in terms of direct charge-out rates or mark-ups on labour. Based on data on the total annual chargeable hours of work, an estimate was made of the average revenue associated with each apprentice.

It should be noted however, that while many employers could easily compute a “charge-out” rate for their apprentices and, hence, develop an estimate of the revenue that would be derived from the apprentice, some employers had more difficulty in estimating a charge-out rate. For example, among employers of Cooks and Partpersons, employers were unable to provide an estimate of the charge-out rates for the apprentices. For these trades, the consultant utilized a “mark-up” rate based on the journeyman wage rate. Caution should be exercised in the interpretation of the results for these two trades.

Analysis was completed to assess the overall cost of apprenticeship using the major cost elements detailed. While the cost elements varied by trade, it was generally found that the key costs were the apprentices wages and benefits, which, on average, represented approximately 71% of the cost of an apprentice. The cost of the journeyman time to supervise the apprentice represented approximately 23% of the cost. Other costs such as wastage (3%), other disbursements (2%) or administration (1%) represented only a small proportion of the total cost.

**Figure 2.1**  
**Relative Share of Apprenticeship Costs—**  
**by Key Cost Elements**  
**Overall Average across All Trades**



## 2.4 Reporting Framework

Results are reported by trade and broken out by year of apprenticeship. This analysis demonstrates the time profile for costs and benefits. The results of the model are presented in a simplified table format that clearly shows the net benefit by year of apprenticeship. There is no attempt to discount these through a present value type of analysis.

The reported net benefits are best interpreted as partial gross benefits per apprentice per year. Even though the model may produce a positive benefit in a particular year, each firm

---

will have its own standards on the necessary level of benefit required to participate in an apprenticeship program (the so-called “hurdle rate”). These “hurdle rates” will depend on the broader cost structure of the organization, particularly the cost of capital. In addition, the analysis does not address whether investment in apprenticeship training would be superior to other potential investments including hiring of qualified journeypersons, training of existing staff, or purchase of capital equipment.

## **2.5 Use of Data from the Pilot Survey (2006)**

One of the goals of the current study is to build on the dataset developed in 2006 by surveying a sample of employers who participated in the 2006 pilot study to update employer data concerning apprenticeship training costs and benefits. Of the 321 employers who completed a survey in the 2006, 106 employers updated their information in 2008. Appendix B summarizes the

trends in costs and benefits reported by employers who responded to both the 2006 and 2008 surveys. Data provided in 2006 and 2008 by 106 employers was used to assess consistency between the previous study and present day costs/charge out rates. The percentage change in charge-out rates, wages, benefits, and other costs between 2006 and 2008 was also used to impute updated data for 215 employers who participated in the 2006 study, but who did not provide updated information in 2008. In this way, it was possible to pool the results of the 2006 study with that of 2008, although it should be emphasized that the 2008 study relies primarily on cost/benefit data of 692 employers (68.3% of total employer results) who provided usable data in 2008.

---

## Part 3: Cost-Benefit Results

This section provides the trade specific results for the 16 trades analyzed. It also provides a summary of the differences between the 2006 and 2008 results. In three trades where there was enough results, a further breakdown by region and size of business has also been provided. The main findings in this section indicate there is a strong business case for apprenticeship:

- Analysis over the four-year apprenticeship indicates a net benefit ranging from \$39,524 (Cook) to \$245,264 (Heavy Duty Equipment Mechanic).
- The largest monetary net benefits accrue to employers who train an apprentice in trades such as heavy-duty equipment mechanics (\$245,264), automotive service technicians (\$173,122), and construction millwright and industrial mechanics (\$148,985). In these trades, the revenue generated by an apprentice far exceeds the total training costs.
- All regions showed a return in the three trades examined. Quebec tended to show higher returns than other regions.
- All business sizes showed a return in the three trades examined. Larger businesses tended to show higher returns than smaller businesses.

### 3.1 Detailed Cost-Benefit Results by Trade

In this section, detailed cost-benefit results are presented for the 16 trade areas:

- Automotive Service Technician (n=159);
- Boilermaker (n=5);
- Bricklayer (n=53);
- Cabinetmaker (n=48);
- Construction Electrician (n=166);
- Construction Millwright and Industrial Mechanic (n=30);
- Cook (n=52);
- Electrical Power Line and Cable Worker (n=27);
- Hairstylist (n=38);
- Heavy Duty Equipment Mechanic (n=66);
- Machinist (n=48);
- Motor Vehicle Body Repairer (n=62);
- Plumber (n=75);
- Refrigeration and Air Conditioning Mechanic (n=118);
- Sheet Metal Worker (n=51); and
- Partsperson (n=15).

As detailed above, the total number of employer responses included in the analysis for 14 of the 16 trades exceeds the minimum sample target of 20. The Boilermaker and Partsperson trades, which have relatively small workforces, are represented by fewer than 20 employers.

A detailed example of the cost-benefit calculations for Automotive Service Technician is included in Appendix C.

### *Automotive Service Technician*

The results of the cost-benefit analysis for the Automotive Service Technician trade are presented in Figure 3.1. According to the model, there is a net benefit of \$14,227 during the first year of the apprenticeship. The net benefit increases each year to \$70,428 by the fourth year. The cost in terms of journeyman time declines considerably from year 1 to year 4, indicating that the apprentice becomes more proficient and requires less training as he/she progresses through the apprenticeship. Cash disbursements and administration costs are relatively small components of the total cost of apprenticeship training, comprising 1.8% and 1.1% of total costs, respectively.

**Figure 3.1**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Automotive Service Technician (n=159)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 81,927.82	\$ 96,029.04	\$ 115,897.79	\$ 129,283.39	\$ 423,138.04
<b>Costs</b>					
Wages and Benefits	\$ 26,273.13	\$ 30,747.62	\$ 36,583.27	\$ 43,316.66	\$ 136,920.68
Journeyman Time	\$ 34,304.71	\$ 26,890.31	\$ 20,442.07	\$ 12,921.84	\$ 94,558.92
Wastage	\$ 4,755.01	\$ 3,102.86	\$ 2,229.89	\$ 1,120.19	\$ 11,207.95
Disbursements	\$ 1,682.35	\$ 1,068.09	\$ 1,026.83	\$ 811.38	\$ 4,588.65
Administration	\$ 684.93	\$ 684.93	\$ 684.93	\$ 684.93	\$ 2,739.71
<b>Total</b>	<b>\$ 67,700.12</b>	<b>\$ 62,493.81</b>	<b>\$ 60,966.99</b>	<b>\$ 58,854.99</b>	<b>\$ 250,015.91</b>
<b>Net Benefit</b>	<b>\$ 14,227.70</b>	<b>\$ 33,535.23</b>	<b>\$ 54,930.81</b>	<b>\$ 70,428.39</b>	<b>\$ 173,122.13</b>

**Boilermaker**

As shown in Figure 3.2, there is an overall net benefit of apprenticeship training for employers in the Boilermaker trade. The net benefit increases considerably from year 1 to year 4, due in part to the higher revenue generated by more experienced apprentices. There are no costs related to wastage and cash disbursements, according to the employer survey

respondents. The costs related to administration are negligible. In addition, the cost in terms of journeyman time that is spent training an apprentice declines from 26.6% of total costs during the first year to 4.1% during the fourth year. Readers should note only five employers from this trade filled in the survey so some caution should be exercised in drawing conclusions based upon the results.

**Figure 3.2  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Boilermaker (n=5)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 91,584.72	\$ 114,260.00	\$ 129,666.25	\$ 138,185.00	\$ 473,695.97
<b>Costs</b>					
Wages and Benefits	\$ 41,338.15	\$ 50,739.81	\$ 60,102.98	\$ 67,632.35	\$ 219,813.29
Journeyman Time	\$ 15,047.34	\$ 4,836.64	\$ 3,851.40	\$ 2,866.16	\$ 26,601.55
<b>Wastage</b>					
<b>Disbursements</b>					
Administration	\$ 118.52	\$ 118.52	\$ 118.52	\$ 118.52	\$ 474.07
<b>Total</b>	<b>\$ 56,504.00</b>	<b>\$ 55,694.98</b>	<b>\$ 64,072.90</b>	<b>\$ 70,617.03</b>	<b>\$ 246,888.91</b>
<b>Net Benefit</b>	<b>\$ 35,080.71</b>	<b>\$ 58,565.02</b>	<b>\$ 65,593.35</b>	<b>\$ 67,567.97</b>	<b>\$ 226,807.05</b>

**Figure 3.3**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Bricklayer (n=53)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 69,227.01	\$ 76,232.62	\$ 82,363.37	\$ 89,030.41	\$ 316,853.40
<b>Costs</b>					
Wages and Benefits	\$ 35,133.55	\$ 41,711.47	\$ 48,935.20	\$ 64,132.25	\$ 189,912.48
Journeyman Time	\$ 18,772.95	\$ 8,250.09	\$ 5,916.39	\$ 4,823.23	\$ 37,762.66
Wastage	\$ 3,641.22	\$ 1,927.65	\$ 1,143.87	\$ 549.06	\$ 7,261.79
Disbursements	\$ 797.90	\$ 482.77	\$ 443.51	\$ 145.41	\$ 1,869.59
Administration	\$ 191.78	\$ 305.14	\$ 191.78	\$ 191.78	\$ 880.49
<b>Total</b>	<b>\$ 58,537.40</b>	<b>\$ 52,677.12</b>	<b>\$ 56,630.75</b>	<b>\$ 69,841.74</b>	<b>\$ 237,687.01</b>
<b>Net Benefit</b>	<b>\$ 10,689.60</b>	<b>\$ 23,555.50</b>	<b>\$ 25,732.62</b>	<b>\$ 19,188.68</b>	<b>\$ 79,166.40</b>

### *Bricklayer*

As shown in Figure 3.3, there is an overall net benefit of apprenticeship training for employers in the Bricklayer trade. The revenue generated by first, second, third, and fourth year apprentices exceed the costs incurred by employers. The productive contribution of the apprentice in terms of revenue generated increases throughout the apprenticeship. In addition, the cost associated with journeyman time declines indicating that the apprentice becomes more proficient throughout the apprenticeship period. Administration costs are a relatively insignificant cost component, comprising 0.4% of total costs.

**Figure 3.4  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Cabinetmaker (n=48)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 50,733.05	\$ 56,880.12	\$ 64,549.80	\$ 75,135.29	\$ 247,298.27
<b>Costs</b>					
Wages and Benefits	\$ 25,195.67	\$ 30,699.67	\$ 36,062.04	\$ 41,732.41	\$ 133,689.80
Journeyman Time	\$ 13,304.74	\$ 11,738.77	\$ 8,473.64	\$ 6,011.88	\$ 39,529.03
Wastage	\$ 1,705.14	\$ 1,215.16	\$ 1,029.67	\$ 948.38	\$ 4,898.36
Disbursements	\$ 441.48	\$ 370.21	\$ 376.27	\$ 251.92	\$ 1,439.88
Administration	\$ 202.93	\$ 202.93	\$ 202.93	\$ 202.93	\$ 811.71
<b>Total</b>	<b>\$ 40,849.96</b>	<b>\$ 44,226.73</b>	<b>\$ 46,144.55</b>	<b>\$ 49,147.52</b>	<b>\$ 180,368.77</b>
<b>Net Benefit</b>	<b>\$ 9,883.09</b>	<b>\$ 12,653.39</b>	<b>\$ 18,405.25</b>	<b>\$ 25,987.77</b>	<b>\$ 66,929.49</b>

**Cabinetmaker**

As shown in Figure 3.4, there is an overall net benefit of apprenticeship training for employers in the Cabinetmaker trade. The net benefit increases considerably from year 1 to year 4, due in part to the higher revenue generated by more experienced apprentices. Costs related to wastage, cash disbursements, and administration are not significant. In addition, the cost in terms of journeyman time that is spent training an apprentice declines from 32.6% of total costs during the first year to 12.2% during the fourth year.

## Construction Electrician

The cost-benefit results for the Construction Electrician trade are presented in Figure 3.5. During the first year of the apprenticeship, employers experience a net benefit of \$15,725. A second year apprentice generates a net benefit of \$20,648, increasing to \$32,434 by the fourth year. Overall, the total net benefit to employers of apprenticeship training over the course of the apprenticeship for this trade is \$96,237.

**Figure 3.5**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician (n=166)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 60,447.51	\$66,721.49	\$77,827.35	\$ 88,051.58	\$ 293,047.93
<b>Costs</b>					
Wages and Benefits	\$ 29,056.83	\$35,396.78	\$42,191.38	\$ 50,219.16	\$ 156,864.16
Journeyman Time	\$ 11,879.41	\$ 8,321.64	\$ 6,282.19	\$ 3,573.05	\$ 30,056.29
Wastage	\$ 2,492.91	\$ 1,345.44	\$ 925.57	\$ 819.03	\$ 5,582.94
Disbursements	\$ 987.91	\$ 704.12	\$ 693.39	\$ 701.23	\$ 3,086.66
Administration	\$ 305.14	\$ 305.14	\$ 305.14	\$ 305.14	\$ 1,220.58
Total	\$ 44,722.21	\$46,073.12	\$50,397.67	\$ 55,617.62	\$ 196,810.62
<b>Net Benefit</b>	<b>\$ 15,725.30</b>	<b>\$20,648.37</b>	<b>\$27,429.68</b>	<b>\$ 32,433.96</b>	<b>\$ 96,237.30</b>

**Figure 3.6**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Millwright and Industrial Mechanic (n=30)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 93,093.29	\$ 97,938.66	\$ 102,167.87	\$ 110,072.31	\$ 403,272.13
<b>Costs</b>					
Wages and Benefits	\$ 37,245.72	\$ 43,305.53	\$ 49,345.47	\$ 55,511.55	\$ 185,408.27
Journeyman Time	\$ 16,172.36	\$ 14,756.69	\$ 10,855.13	\$ 5,675.06	\$ 47,459.25
Wastage	\$ 4,471.66	\$ 3,214.72	\$ 4,012.14	\$ 3,058.86	\$ 14,757.38
Disbursements	\$ 957.20	\$ 821.30	\$ 846.90	\$ 535.71	\$ 3,161.11
Administration	\$ 875.35	\$ 875.35	\$ 875.35	\$ 875.35	\$ 3,501.42
Total	\$ 59,722.29	\$ 62,973.59	\$ 65,935.00	\$ 65,656.54	\$ 254,287.42
<b>Net Benefit</b>	<b>\$ 33,371.00</b>	<b>\$ 34,965.06</b>	<b>\$ 36,232.87</b>	<b>\$ 44,415.77</b>	<b>\$ 148,984.70</b>

**Construction Millwright and Industrial Mechanic**

As detailed in Figure 3.6, the net benefit of apprenticeship training increases over the course of the apprenticeship, from \$33,371 during the first year to \$44,416 by the fourth year. Wastage costs in this trade are higher in comparison to other trades. These costs account for 5.8% of the total costs. Overall, the total net benefit of apprenticeship training for this trade is \$148,985.

**Figure 3.7**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Cook (n=52)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue <sup>1</sup>	\$ 33,028.26	\$ 39,199.73	\$ 46,235.81	\$ 46,404.18	\$ 164,867.98
<b>Costs</b>					
Wages and Benefits	\$ 18,492.90	\$ 20,090.53	\$ 22,948.58	\$ 25,480.28	\$ 87,012.29
Journeyman Time	\$ 9,477.70	\$ 7,410.42	\$ 5,873.53	\$ 3,111.44	\$ 25,873.09
Wastage	\$ 3,438.24	\$ 1,547.91	\$ 1,287.98	\$ 643.99	\$ 6,918.12
Disbursements	\$ 1,970.71	\$ 1,428.77	\$ 1,149.55	\$ 260.20	\$ 4,809.24
Administration	\$ 182.73	\$ 182.73	\$ 182.73	\$ 182.73	\$ 730.92
Total	\$ 33,562.28	\$ 30,660.37	\$ 31,442.37	\$ 29,678.64	\$ 125,343.66
<b>Net Benefit (Cost)</b>	<b>\$ (534.02)</b>	<b>\$ 8,539.36</b>	<b>\$ 4,793.44</b>	<b>\$ 16,725.54</b>	<b>\$ 39,524.32</b>

### Cook

The results for the Cook trade are presented in Figure 3.7. A negative net benefit accrues to employers who train cook apprentices in the first year of the apprenticeship. However, by the second year, employers experience a positive net return of \$8,539. It should be noted that due to the inability of employers to provide a charge-out rate, the consultant utilized a mark-up rate, which was 100% of the journeyman rate.

**Electrical Power Line and Cable Worker**

The cost-benefit results for the Electrical Power Line and Cable Worker trade are presented in Figure 3.8. Employers in this trade area tend to be larger than employers in other trade areas. For example, almost three-quarters (74%) of employers in this trade had 20 or more employees, compared to the survey average of 33% who had 20 or more employees. During the four-year apprenticeship period, the model estimates that there is a total net cost of \$17,011. This is due, in part, to the relatively high wages paid to the apprentices and the relatively high cost of journeyman time to supervise the apprentices. The costs associated with journeyman time account for 23.8% of the total costs of apprenticeship training in this trade. This higher percentage likely reflects

the safety considerations for this occupation. For example, in contrast to construction electrician activities, in many instances, Electrical Power Line and Cable Workers work in a “hot” environment, meaning the power can not always be turned off while working. The high wage rates paid, even to first year apprentices, suggests that it is difficult for employers to experience a net benefit until the 3rd or 4th year of an apprenticeship. The relatively generous benefit provisions also contribute to a higher cost structure when compared to apprentices in other trade areas. Employers reported benefits representing approximately 25% of total wages, which was higher than the average of 19% reported for other construction-related trades.

**Figure 3.8**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Electrical Power Line and Cable Worker (n=27)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 73,111.15	\$ 75,459.17	\$ 84,590.53	\$ 86,597.66	\$ 319,758.51
<b>Costs</b>					
Wages and Benefits	\$ 48,918.17	\$ 55,840.70	\$ 62,013.39	\$ 68,359.20	\$ 235,131.46
Journeyman Time	\$ 9,408.98	\$ 22,526.03	\$ 17,216.34	\$ 13,413.08	\$ 82,564.42
Wastage					\$ -
Disbursements	\$ 4,764.58	\$ 2,672.81	\$ 2,672.81	\$ 1,510.72	\$ 11,620.92
Administration	\$ 1,863.26	\$ 1,863.26	\$ 1,863.26	\$ 1,863.26	\$ 7,453.04
<b>Total</b>	<b>\$ 84,954.98</b>	<b>\$ 82,902.79</b>	<b>\$ 83,765.80</b>	<b>\$ 85,146.26</b>	<b>\$ 336,769.83</b>
<b>Net Benefit (Cost)</b>	<b>\$ (11,843.83)</b>	<b>\$ (7,443.63)</b>	<b>\$ 824.74</b>	<b>\$ 1,451.40</b>	<b>\$ (17,011.32)</b>

**Figure 3.9**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Hairstylist (n=38)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Total</b>
<b>Benefits</b>			
Attributed Revenue	\$ 18,374.49	\$ 24,245.67	\$ 42,620.16
<b>Costs</b>			
Wages and Benefits	\$ 16,923.48	\$ 20,680.49	\$ 37,603.98
Journeyman Time	\$ 20,406.32	\$ 13,573.15	\$ 33,979.46
Wastage	\$ 1,591.81	\$ 941.15	\$ 2,532.96
Disbursements	\$ 777.80	\$ 413.30	\$ 1,191.10
Administration	\$ 894.47	\$ 894.47	\$ 1,788.94
<b>Total</b>	<b>\$ 40,593.89</b>	<b>\$ 36,502.55</b>	<b>\$ 77,096.44</b>
<b>Net Benefit (Cost)</b>	<b>\$ (22,219.40)</b>	<b>\$ (12,256.88)</b>	<b>\$ (34,476.28)</b>

### *Hairstylist*

According to the results of the cost-benefit analysis for the Hairstylist trade, which are presented in Figure 3.9, employers incur a net cost of apprenticeship training. This is due to the relatively lower attributed revenue associated with apprentices in the Hairstylist trade. On average, employers reported that first year apprentices spent 18 hours on work chargeable to a customer per week, and generate \$18,374 in revenue in year 1. The very low charge out revenue attributed to 1st and 2nd year apprentices minimizes their net contribution. As this trade only has a two-year training period, unlike other trades, employers are generally less able to recoup costs. Overall, there is net cost of apprenticeship training to employers of \$34,478 per apprentice.

**Figure 3.10**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Heavy Duty Equipment Mechanic (n=66)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 98,156.26	\$ 116,321.65	\$ 132,937.68	\$ 150,220.18	\$ 497,635.77
<b>Costs</b>					
Wages and Benefits	\$ 35,517.19	\$ 42,345.47	\$ 48,246.50	\$ 54,225.81	\$ 180,334.97
Journeyman Time	\$ 18,809.17	\$ 14,292.36	\$ 9,627.61	\$ 8,041.12	\$ 50,770.26
Wastage	\$ 4,471.66	\$ 3,214.72	\$ 4,012.14	\$ 3,058.86	\$ 14,757.38
Disbursements	\$ 1,547.56	\$ 1,214.20	\$ 1,030.02	\$ 812.69	\$ 4,604.47
Administration	\$ 476.10	\$ 476.10	\$ 476.10	\$ 476.10	\$ 1,904.40
<b>Total</b>	<b>\$ 60,821.68</b>	<b>\$ 61,542.85</b>	<b>\$ 63,392.37</b>	<b>\$ 66,614.57</b>	<b>\$ 252,371.47</b>
<b>Net Benefit</b>	<b>\$ 37,334.58</b>	<b>\$ 54,778.80</b>	<b>\$ 69,545.31</b>	<b>\$ 83,605.61</b>	<b>\$ 245,264.30</b>

### *Heavy Duty Equipment Mechanic*

The cost-benefit results for the Heavy Duty Equipment Mechanic trade are presented in Figure 3.10. During the four-year apprenticeship period, the model estimates that there is a total net benefit of \$245,264. The costs associated with journeyman time and wastage account for 20.1% and 5.8% of the total costs of apprenticeship training in this trade, respectively. This trade has one of the highest net returns due to the high charge-out rates that employers report for their apprentices across all years.

**Figure 3.11**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Machinist (n=48)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 82,421.69	\$ 93,090.79	\$ 102,583.19	\$ 105,781.21	\$ 383,876.88
<b>Costs</b>					
Wages and Benefits	\$ 28,143.18	\$ 33,280.41	\$ 38,359.54	\$ 44,275.13	\$ 144,058.25
Journeyman Time	\$ 20,365.14	\$ 9,175.31	\$ 6,353.60	\$ 5,898.44	\$ 41,792.49
Wastage	\$ 3,304.18	\$ 3,002.72	\$ 2,759.56	\$ 2,703.35	\$ 11,769.81
Disbursements	\$ 1,838.25	\$ 1,366.76	\$ 1,357.44	\$ 1,258.49	\$ 5,820.95
Administration	\$ 369.99	\$ 369.99	\$ 369.99	\$ 369.99	\$ 1,479.97
Total	\$ 54,020.74	\$ 47,195.19	\$ 49,200.14	\$ 54,505.40	\$ 204,921.47
<b>Net Benefit</b>	<b>\$ 28,400.95</b>	<b>\$ 45,895.60</b>	<b>\$ 53,383.06</b>	<b>\$ 51,275.80</b>	<b>\$ 178,955.41</b>

### *Machinist*

As illustrated in Figure 3.11, the net benefit of apprenticeship training increases over each year of the four-year apprenticeship period for the Machinist trade. The revenue generated by a fourth year apprentice is 28.3% higher relative to a first year apprentice. In addition, costs associated with journeyman time, wastage, and disbursements decline as the apprentice progresses through the apprenticeship. Overall, the model estimates that the total per apprentice net benefit for this trade is \$178,995.

**Figure 3.12**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Motor Vehicle Body Repairer (n=62)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 76,671.89	\$ 81,803.95	\$ 95,632.77	\$ 108,128.33	\$ 362,236.94
<b>Costs</b>					
Wages and Benefits	\$ 26,598.57	\$ 31,819.95	\$ 36,114.31	\$ 41,052.51	\$ 135,585.33
Journey-person Time	\$ 22,083.62	\$ 19,339.69	\$ 14,006.61	\$ 8,978.30	\$ 64,408.22
Wastage	\$ 2,768.01	\$ 1,533.87	\$ 1,029.79	\$ 604.18	\$ 5,935.85
Disbursements	\$ 723.38	\$ 434.59	\$ 434.65	\$ 195.85	\$ 1,788.47
Administration	\$ 592.57	\$ 592.57	\$ 592.57	\$ 592.57	\$ 2,370.29
Total	\$ 52,766.15	\$ 53,720.66	\$ 52,177.93	\$ 51,423.41	\$ 210,088.16
<b>Net Benefit</b>	<b>\$ 23,905.73</b>	<b>\$ 28,083.29</b>	<b>\$ 43,454.83</b>	<b>\$ 56,704.92</b>	<b>\$ 152,148.77</b>

**Motor Vehicle Body Repairer**

The cost-benefit results for Motor Vehicle Body Repairer trade are presented in Figure 3.12. The benefits of apprenticeship training exceed the costs during the first year of apprenticeship. According to the model, there is a total net benefit of \$152,148 that accrues to employers over a four-year apprenticeship. The largest components of the training costs are wages and benefits (64.5%) and journey-person time (30.7%).

## Plumber

The cost-benefit results for the Plumber trade are presented in Figure 3.13. The benefits of apprenticeship training exceed the costs during each year of the apprenticeship. According to the model, there is a total net benefit of \$92,047 that accrues to employers over a four-year apprenticeship. The largest components of the training costs are wages and benefits (68.6%) and journeyman time (28.7%). As with other trades, costs associated with wastage and cash disbursements are relatively small.

**Figure 3.13**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Plumber (n=75)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 63,391.24	\$ 76,410.70	\$ 91,907.81	\$ 98,017.84	\$ 329,727.60
<b>Costs</b>					
Wages and Benefits	\$ 30,770.86	\$ 37,049.06	\$ 43,823.35	\$ 51,481.85	\$ 163,125.13
Journeyman Time	\$ 27,105.34	\$ 24,366.70	\$ 9,754.17	\$ 6,903.89	\$ 68,130.10
Wastage	\$ 1,475.79	\$ 1,049.33	\$ 727.25	\$ 432.78	\$ 3,685.14
Disbursements	\$ 546.17	\$ 476.78	\$ 376.05	\$ 353.67	\$ 1,752.67
Administration	\$ 246.90	\$ 246.90	\$ 246.90	\$ 246.90	\$ 987.59
Total	\$ 60,145.05	\$ 63,188.77	\$ 54,927.73	\$ 59,419.08	\$ 237,680.63
<b>Net Benefit</b>	<b>\$ 3,246.19</b>	<b>\$ 13,221.93</b>	<b>\$ 36,980.08</b>	<b>\$ 38,598.76</b>	<b>\$ 92,046.97</b>

**Figure 3.14**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration and Air Conditioning Mechanic (n=118)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 65,018.57	\$ 83,084.99	\$ 91,520.04	\$ 104,977.74	\$ 344,601.34
<b>Costs</b>					
Wages and Benefits	\$ 30,048.87	\$ 36,929.08	\$ 44,994.05	\$ 54,012.59	\$ 165,984.60
Journeyman Time	\$ 24,079.34	\$ 18,351.46	\$ 9,603.29	\$ 5,549.45	\$ 57,583.55
Wastage	\$ 2,858.10	\$ 2,234.46	\$ 1,531.62	\$ 1,127.89	\$ 7,752.08
Disbursements	\$ 1,872.66	\$ 1,536.91	\$ 1,389.75	\$ 1,288.34	\$ 6,087.66
Administration	\$ 663.03	\$ 663.03	\$ 663.03	\$ 663.03	\$ 2,652.13
Total	\$ 59,522.01	\$ 59,714.94	\$ 58,181.75	\$ 62,641.31	\$ 240,060.01
<b>Net Benefit</b>	<b>\$ 5,496.56</b>	<b>\$ 23,370.04</b>	<b>\$ 33,338.30</b>	<b>\$ 42,336.43</b>	<b>\$ 104,541.33</b>

**Refrigeration and Air Conditioning Mechanic**

As shown in Figure 3.14, the revenue generated by an apprentice is greater than the total costs for each year of the apprenticeship. As a result, the model estimates an overall net benefit of \$104,541 over the four-year period. As a proportion of total costs, wastage (3.2%), disbursements (2.5%), and administration (1.1%) are not significant relative to wages and benefits (69%) and journeyman time (24%).

## Sheet Metal Worker

Similar to the Refrigeration and Air Conditioning Mechanic trade, the revenue generated by an apprentice is greater than the total costs for each year of the apprenticeship, shown in Figure 3.15. As a result, the model estimates an overall net benefit of \$63,862 over the four-year period. As a proportion of total costs, wastage (3.2%), disbursements (1.2%), and administration (0.4%) are not significant relative to wages and benefits (62.7%) and journeyperson time (32.4%).

**Figure 3.15**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Sheet Metal Worker (n=51)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 65,646.10	\$ 78,586.57	\$ 81,661.96	\$ 96,127.29	\$ 322,021.91
<b>Costs</b>					
Wages and Benefits	\$ 28,887.35	\$ 40,696.42	\$ 42,659.43	\$ 49,667.01	\$ 161,910.22
Journeyperson Time	\$ 30,135.36	\$ 24,248.65	\$ 18,189.27	\$ 11,014.72	\$ 83,587.99
Wastage	\$ 3,105.94	\$ 2,152.04	\$ 1,656.87	\$ 1,422.13	\$ 8,336.98
Disbursements	\$ 1,051.10	\$ 819.99	\$ 677.52	\$ 620.53	\$ 3,169.13
Administration	\$ 288.84	\$ 288.84	\$ 288.84	\$ 288.84	\$ 1,155.36
Total	\$ 63,468.59	\$ 68,205.93	\$ 63,471.93	\$ 63,013.23	\$ 258,159.67
<b>Net Benefit</b>	<b>\$ 2,177.51</b>	<b>\$ 10,380.63</b>	<b>\$ 18,190.03</b>	<b>\$ 33,114.06</b>	<b>\$ 63,862.24</b>

**Partsperson**

One caveat associated with the results for the Partsperson trade is that only fifteen survey responses were received, due to the difficulty in recruiting employers with Partsperson apprentices. As illustrated in Figure 3.16, employers incur a net benefit of apprenticeship training during all four years of the apprenticeship. In total, the model estimates

an overall net benefit of \$145,953.52 associated with the Partsperson trade. Similar to the Cooks trade, few employers could provide a charge-out rate for apprentices in this trade. A mark-up rate of 100% was utilized to compute the revenue for this trade group. Due to the small sample size, results for this trade should be interpreted with caution.

**Figure 3.16  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Partsperson (n=15)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue <sup>1</sup>	\$ 59,322.72	\$ 83,870.05	\$105,008.03	\$113,075.33	\$ 361,276.11
<b>Costs</b>					
Wages and Benefits	\$ 33,198.14	\$ 38,903.72	\$ 45,245.46	\$ 50,875.21	\$ 168,222.53
Journeyman Time	\$ 16,168.12	\$ 13,685.20	\$ 8,657.41	\$ 5,069.05	\$ 43,579.78
Wastage					\$ -
Disbursements	\$ 489.07	\$ 438.51	\$ 441.23	\$ 61.66	\$ 1,430.47
Administration	\$ 522.46	\$ 522.46	\$ 522.46	\$ 522.46	\$ 2,089.82
<b>Total</b>	<b>\$ 50,377.79</b>	<b>\$ 53,549.89</b>	<b>\$ 54,866.54</b>	<b>\$ 56,528.38</b>	<b>\$ 215,322.60</b>
<b>Net Benefit</b>	<b>\$ 8,944.92</b>	<b>\$ 30,320.16</b>	<b>\$ 50,141.48</b>	<b>\$ 56,546.95</b>	<b>\$ 145,953.52</b>

### 3.2 Summary of Cost-Benefit Results by Trade

To summarize, the following observations regarding the cost-benefit results can be made:

- For the 14 out of 16 trades, the total benefits of apprenticeship training exceed the total costs over the apprenticeship period;
- The cost in terms of journey person time to supervise the apprentice declines during the apprenticeship;
- Wastage, disbursements and administration are relatively small components of the total costs of apprenticeship training; and
- The revenue potential of an apprentice increases through each year of his/her apprenticeship.

Figure 3.17 presents a summary of the cost-benefit results by each of the 16 trade areas. The figures presented represent the total costs and benefits to employers over the entire period of 4 years of apprenticeship training. Overall, all trades show a net benefit per apprentice over the apprenticeship period, except for Electrical Power Line & Cable Worker and Hairstylist trades.

Overall, the most significant cost components for employers who train apprentices are wages and benefits and journey person time. The lowest costs of apprenticeship training occur in the Hairstylist trade at \$77,096, which is well below the average total training costs

of \$220,242. Trades where employers incur relatively high training costs include Construction Millwright & Industrial Mechanic (\$254,287), Sheet Metal Worker (\$258,160), and Heavy-Duty Equipment Mechanic (\$252,371). This is due in part to the relatively high wages paid to apprentices in these trades.

The largest monetary net benefits accrue to employers who train apprentices as Automotive Service Technicians (\$173,122), Boilermakers<sup>1</sup> (\$226,807), Machinists (\$178,955), and Heavy-Duty Equipment Mechanics (\$245,264). In these trades, the revenue generated by an apprentice far exceeds the total training costs. In the case of Heavy-Duty Equipment Mechanics it would appear there are high training costs, but also high monetary benefits.

A standardized measure that can be used to compare the cost-benefit results by trade is the benefit-cost ratio. For example, the average benefit-cost ratio for the 16 trades is 1.47, which indicates that for every \$1 spent on training an apprentice, an employer receives a benefit, on average, of \$1.47 or a net return of \$ 0.47 per apprentice. Trades with the highest benefit-cost ratios include Heavy-duty Equipment Mechanic (1.97), Boilermaker (1.92), Machinist (1.87), Motor Vehicle Body Repairer (1.72), and Automotive Service Technician (1.69). In other words, the return on apprenticeship training investment is relatively high in these trades. Conversely, trades with a low benefit-cost ratio include Hairstylists (0.55), Electrical Power Line and Cable

<sup>1</sup> Results need to be interpreted with caution due to small sample size.

Workers (0.95), Sheet Metal Worker (1.25), Cook (1.32), Bricklayer (1.33), and Cabinetmaker (1.37). Nevertheless, the model estimates that employers in most of these trades receive a net return on their apprenticeship training investment by the third year of

apprenticeship, if not earlier. The results have not been discounted to take into account the time profile of the costs and benefits of apprenticeship training

**Figure 3.17**  
**Total Per Apprentice Costs and Benefits by Trade**

Trade	Duration <sup>1</sup> of Apprenticeship (Years)	Costs <sup>2</sup> (\$)	Benefits <sup>3</sup> (\$)	Net Benefit <sup>4</sup> (\$)	Benefit-Cost Ratio <sup>5</sup>
Automotive Service Technician	4	250,016	423,138	173,122	1.69
Boilermaker	4	246,889	473,696	226,807	1.92
Bricklayer	4	237,687	316,853	79,166	1.33
Cabinetmaker	4	180,369	247,298	66,929	1.37
Construction Electrician	4	196,811	293,048	96,237	1.49
Construction Millwright and Industrial Mechanic	4	254,287	403,272	148,985	1.59
Cook	4	125,344	164,868	39,524	1.32
Electrical Power Line and Cable Worker	4	336,770	319,759	(17,011)	0.95
Hairstylist	2	77,096	42,620	(34,476)	0.55
Heavy Duty Equipment Mechanic	4	252,371	497,636	245,264	1.97
Machinist	4	204,921	383,877	178,955	1.87
Motor Vehicle Body Repairer	4	210,088	362,237	152,149	1.72
Plumber	4	237,681	329,728	92,047	1.39
Refrigeration and Air Conditioning Mechanic	4	240,060	344,601	104,541	1.44
Sheet Metal Worker	4	258,160	322,022	63,862	1.25
Partsperson	4	215,323	361,276	145,954	1.68
<b>Average</b>	<b>4</b>	<b>220,242</b>	<b>330,371</b>	<b>110,128</b>	<b>1.47</b>

1 Apprenticeship Survey (Q25)

2 Represents the total per apprentice costs incurred over the apprenticeship period.

3 Measured as the revenue generated by an apprentice.

4 Benefits – Costs

5 Benefits / Costs

### 3.3 Summary of Trends Since 2006

The results from the 2006 pilot study were compared to those from the current study. As Figure 3.18 illustrates, charge-out revenues have increased by a substantially greater magnitude than wages/benefits or the cost to have journeypersons train apprentices. The average charge-out rates were highest for Heavy Duty Equipment Technician (64%), Machinist (35%), and Construction Millwright and Industrial Mechanic (35%). Comparatively, wages and benefits increased since 2006. The greatest increases were 17% for Motor Vehicle Body Repairer and Bricklayer. Overall the increases in wages were lower than the average increases in charge-out rates. Changes in the cost associated with time required for a journeyperson to train an apprentice varied

by trade. If the training took place when the journeyperson's time was chargeable to a customer, or used to earn revenue, then the cost was less than if the journeyperson was taken out of productive work. For trades such as Refrigeration and Air Conditioning Mechanic, the cost in 2008 was lower compared to 2006 because employers reported that a higher percentage of the time spent by the journeyperson with the apprentice was chargeable to a customer.

**Figure 3.18**  
**Changes in Charge-out Revenue and Key Apprenticeship Training Costs**  
2008 compared to 2006

Trade	Charge-out Rate	Wages and Benefits	Journeyperson Time
Automotive Service Technician	+29%	+10%	+20%
Motor Vehicle Body Repairer	+23%	+17%	+8%
Cook	-1%	+3%	+64%
Refrigeration & Air Conditioning Mechanic	+8%	+4%	-17%
Heavy-Duty Equipment Technician	+64%	+11%	+94%
Construction Millwright & Industrial Mechanic	+35%	+6%	-4%
Electrician (construction)	+15%	-3%	-20%
Bricklayer	+17%	+17%	+1%
Machinist	+35%	+14%	+6%
Sheet Metal Worker	+7%	+13%	-13%
Average (unweighted)	+23%	+9%	+14%

**Figure 3.19**  
**Changes in Charge-out Revenue and Key Apprenticeship Training Costs**  
**Employers Responding in 2008 and 2006**

<b>Year of Apprenticeship</b>	<b>Charge-out Rate</b>	<b>Wages</b>	<b>Journeyman Time</b>
First	19%	7%	-13%
Second	16%	9%	-5%
Third	14%	11%	3%
Fourth	15%	16%	3%

One limitation of the analysis presented in Figure 3.19 is that the sample of employers differed from 2006 to 2008. As a result, it is possible that changes in average charge-out rates and key costs may be due to differences in the employer sample. One hundred and six employers that completed the pilot survey in 2006 were contacted again in 2008 and asked to update the information that they provided in 2006. This data can be used to compare longitudinal changes in charge-out rates in the same sample of employers. A comparison of the responses provided by 106 employers in 2006 and 2008 indicates that wages have increased, but not as dramatically as the charge-out rates. With respect to opportunity costs, use of journeymen’s time supervising apprentices has remained fairly consistent with slightly less supervisory time for first and second year apprentices.

The results from the 2006 pilot study, “Apprenticeship Building a Skilled Workforce for a Strong Bottom Line, Return on Apprenticeship Training Investment for Employers, A Study of 15 Trades, June 2006,” were compared to

the current study. Comparing the results of the two studies suggests that while the cost to hire, train and supervise an apprentice has increased over the past two years, the ability of employers to generate revenues from apprentices increased at a higher rate than the costs. This analysis was identified through the comparison of overall costs/benefits among the 10 trades studied in 2006 and 2008. It was also confirmed through the detailed examination of employer costs/benefits for those employers who provided data in both 2006 and 2008. Examining the cost/benefit data for the employers who participated in both studies suggests that, while apprenticeship wage costs increased for these employers, on average, apprenticeship-related revenues such as charge-out revenues increased at a greater rate than did costs associated with apprentices.

**Figure 3.20**  
**Summary of Changes in Apprenticeship Costs/Revenues**  
**Selected Categories**  
**Average for Ten Trades<sup>1</sup> Studied in 2006 & 2008**

Category	2006	2008	% Change
Average Charge-Out Revenue <sup>2</sup>	\$285,710	\$351,155	+23%
Apprentice Wages/Benefits	\$144,918	\$154,399	+7%
Use of Journeyman Time	\$51,088	\$53,385	+5%
Other Costs	\$12,940	\$15,190	+17%
Total Costs	\$208,946	\$222,975	+7%
Benefit/Cost Ratio	1.37	1.57	+15%

1 Trades include AST, Bricklayer, Construction Electrician, Millwright, Cook, Heavy Duty Equipment Technician, Machinist, Motor Vehicle Body Repair, Refrigeration and A/C Mechanic and Sheet Metal Worker.

2 Other costs include wastage, disbursements and administration.

Summarized in Figure 3.20 are the changes in key cost/revenue components for the ten trades examined in both 2006 and 2008. As highlighted in the table, it can be seen that:

- charge-out revenues increased by 23% between 2006 and 2008 for the ten comparable trades;
- with the exception of “other costs,” most cost elements increased between 5% and 7%;
- the net-benefit cost ratio for the ten trades increased from 1.37 in 2006 to 1.57 in 2008 – an increase of 15%.<sup>2</sup>

2 The 1.57 figure refers to the 10 trades included in the Phase I and Phase II studies. It does not include the 6 new trades added for Phase II. The \$1.47 figure is based on the data from all 16 trades.

### 3.4 Validation Roundtable Findings

A series of roundtable discussions were held with employers representing 3 trade areas: Automotive Service Technician, Construction Electrician, and Cabinetmaker. The purpose of these roundtables was to identify any possible omissions in the cost-benefit calculations and to determine if the cost-benefit results were consistent with employers' experience and knowledge of apprenticeship training. Detailed in the following sections is the feedback received during each of the roundtable sessions.

These comments only represent the opinions of those who participated in the validation roundtables and do not represent the opinions of CAF-FCA or any of its stakeholders.

#### *Construction Electrician*

Three employers attended the roundtable for Construction Electrician. Two were small employers with 8 journeypersons and 8 apprentices in each firm. There was also one large employer with 40 journeypersons and 40 apprentices.

Participants were asked to comment on the costs outlined in the study. The participants felt that the Alberta wage rates were higher than the national average.<sup>3</sup> As the journey-person rate in Alberta is higher than the national average, the apprentice wage rates are also higher. In Alberta, apprentice wages are set as a percentage of those for journeypersons. The rates are 60% for the first year, 70% for the second year, 80% for the third year, and 90% for the fourth year. Participants did agree that the stepped increase in apprentice wage rates utilized in the model seemed reasonable. Employers in general agreed that most other costs, including the use of journeyperson time, wastage, and administrative costs were realistic and in-line with their own costs.

Employers talked in detail about charge out rates. Originally, all three employers agreed that the charge-out rate for construction electricians at approximately \$65 per hour was reasonable and reflected their own charge out rates. However, at the end of the session, when confirming the net benefit/costs, 2 of the three employers noted that while they had a charge out rate of approximately

---

<sup>3</sup> The national average was around \$33 to \$35 for a journeyperson.

\$65 per hour for journeypersons, the pricing model that they used relied on a “blended labour cost” that incorporated a different hourly rate than the standard charge out rate. For these two employers, they felt that the “real” rate included, wages, plus benefits, overhead, materials, and “10% profit.” This rate did not equate to the \$65 per hour for their apprentices or journeypersons. Of course, this would have ramifications for the actual charge out rate, and would suggest for these 2 employers that the charge-out rate was likely closer \$40 to \$45 per hour for an apprentice, averaged across all years, rather than the stepped rates rising from \$38.80 in 1st year to \$53.11 in 4th year. The third employer noted that he charged his apprentices out at the journeyperson rate of \$65 per hour and said that the net benefit from an apprentice as cited in the study was correct. The other two employers felt that the net benefit of an apprentice was lower than what was reported due to the practice of providing a “blended labour rate” for jobs in which they submitted competitive bids. The main issue they had was if they were doing small jobs, they would use the \$65/hr “standard” Alberta charge out rate for construction electricians and charge the same rate whether they used a journeyperson or apprentice, but for larger jobs, where they had to compete for work, they used a lower rate. Some follow-up analysis indicated that even if the current model used these employers’ average rate of \$40 per hour, the result is not much different.

### *Automotive Service Technician*

Two employers participated in the Automotive Service Technician session. They employed one apprentice each. The employers consulted indicated that charge out rates for Automotive Service Technician apprentices are similar to those of journeypersons because the employers tend to use industry standard rates. The only difference between a journeyperson and an apprentice would be in the type of work that the employer would have them do. For instance, the apprentice would tend to do maintenance work, and the journeyperson would be more likely to take on more complex tasks.

One employer indicated that in his business about 55% of the time he paid staff for what was actually billed to customers. This is much lower than the industry average in the current report. He said there would be a big difference between the larger businesses which are now sometimes advertising that they will maintain new cars only, which the employer described as being more profitable than repair work for older vehicles.

One employer indicated that even though he felt the study had captured all the important costs of apprenticeship, that it was extremely difficult to estimate costs such as lost journey-person time.

## Cabinetmakers

Four employer representatives attended the roundtable for Cabinetmaker trade in Calgary, Alberta. Two employers had a residential sector focus, while one employer with two representatives indicated that they focused primarily on commercial work. The size of the firms ranged from 25 to more than 100 employees. Two of the firms had only 1 apprentice, while one firm employed 5 apprentices.

Employers, in general, agreed with the costs presented in the presentation, although it was felt that the charge-out rates had likely declined somewhat between the time of the study, early to mid-2008, to the time of the validation session in March 2009. Most participants acknowledged that the revenues/costs would be valid for the 2008 time period.

There was some discussion as to the chargeable hours of apprentices in this trade, as one employer felt that 32 hours of chargeable time for a 1st year apprentice was too high. He noted that 25 hours would be more realistic. The two other employers were comfortable with the estimate of chargeable hours presented. There was also discussion around wastage, as one employer felt that wastage costs were too low. Other validation session participants noted that they felt that wastage costs were reasonable.

One employer noted that their disbursements to apprentices were higher than what was presented. The amount presented was \$441 per apprentice in the first year. The employer noted that they would pay the full cost of technical training, which was approximately \$900 per year, if the apprentice had marks of "A" or better. The employer noted that he

typically paid between \$500 to \$600 "on average" for apprentices. Administration costs were viewed as negligible.

Employers generally agreed that there was a positive net return associated with the training of apprentices.

Employers at the Cabinetmakers session provided a range of other comments with respect to apprenticeship. Among these included:

- preference to use apprentices rather than the Temporary Foreign Worker (TFW) to fill labour needs. Two of the three employers who had made use of the TFW program noted that foreign workers, in their opinion, did not have equivalent skill sets of Canadian workers, and, in most cases, if they could, they would have preferred to hire/train apprentices;
- difficult to find apprentices for non-compulsory trade area. Because the cabinetmaker trade is not a compulsory trade, many workers are not certified. Employers note that it is difficult to convince individuals to sign up for a four year apprenticeship program when individuals can work in the sector and obtain journeyman wage rates without a certificate of qualification;
- economic downturn has contributed to better quality apprenticeship candidates. While employers were concerned about the economic impact of the recent downturn, participants noted the improvement in the quality of individuals interested in apprenticeship in their region/province. Employers said that their current apprentice candidates were better skilled and "more productive" when compared to apprentices hired 2-3 years ago.

---

### 3.5 Cost-Benefit Results by Region

This section of the report summarizes the regional results for the Automotive Service Technician, Refrigeration & Air Conditioning Mechanic and Construction Electrician trades. These trades had more than 100 employers fill in the survey so more detailed analysis could be performed in these cases. The regions used were divided into four main areas:

- Western Canada;
- Ontario;
- Quebec; and
- Atlantic Canada.

Overall all regions showed a return. Quebec, in general, showed higher returns than the rest of the regions. Although Quebec employers generally reported charge-out rates lower

than that of employers in Western Canada, Quebec employers typically had lower cost structures, in that they paid their apprentices less, and reported less use of journeyperson time to supervise apprentices. In contrast, employers in Ontario generally experienced net returns that were below the national average. Employers in Quebec may experience higher returns due to the way their educational system is structured. Apprentices in Quebec typically complete their technical training prior to registering with an employer for an apprenticeship. In this context, there may be less journeyperson time required and lower costs associated with disbursements and/or program administration.

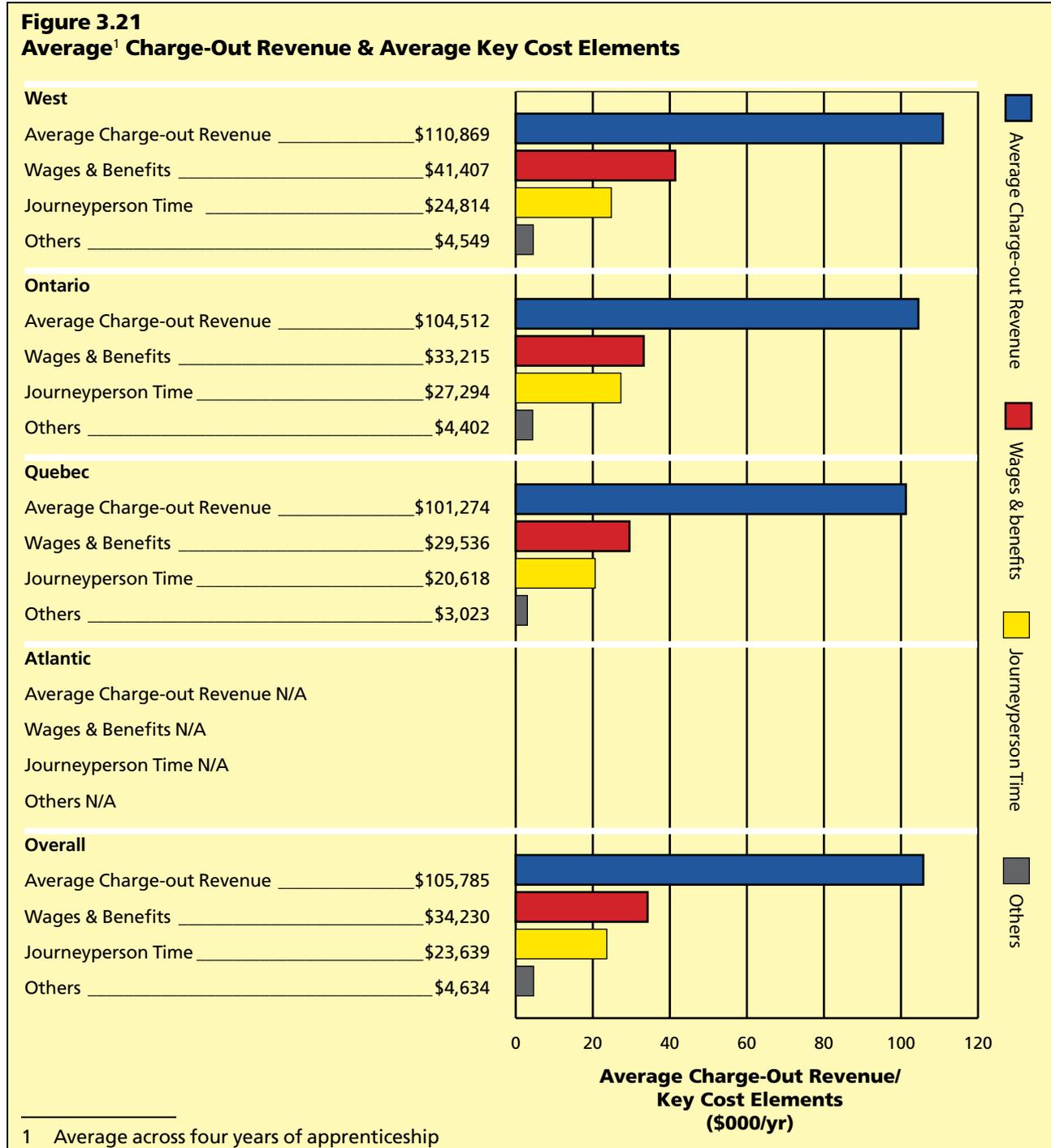
The detailed regional cost-benefit results for the three selected trade areas are included in Appendix D.

### Automotive Service Technician

For the automotive service technician, there were 159 employers in the sample from across Canada. More specifically there were 66 employers in Western Canada, 43 employers in Ontario, 48 in Quebec and 5 employers

in Atlantic Canada. Due to the insufficient number of employers in Atlantic Canada, data for this region is not presented for this particular trade.

Figure 3.21 depicts the average charge-out revenue per apprentice and the average key

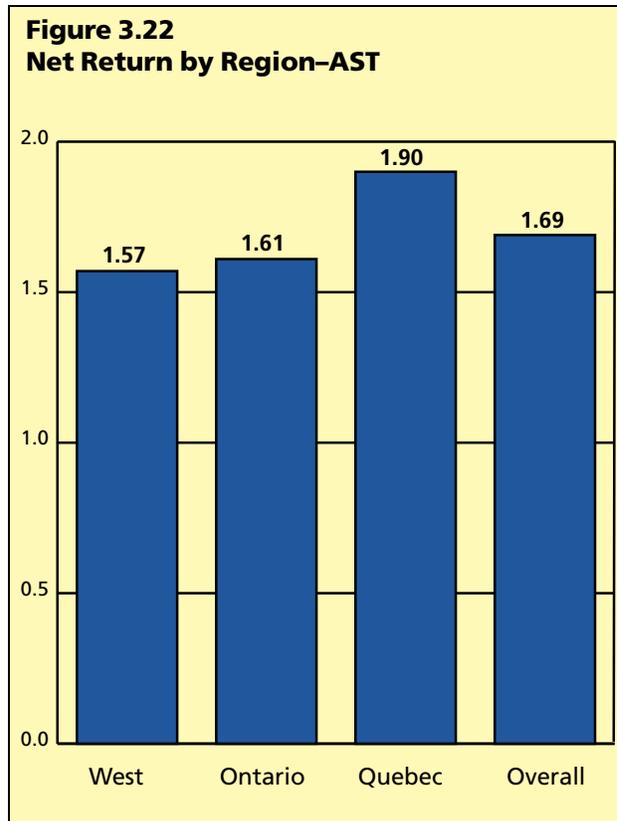


costs including wages and benefits, journey-person time to supervise the apprentice, waste, disbursements, and administration costs.

As detailed in the previous Figure 3.21, while employers in Western Canada reported higher charge-out revenues for apprentices relative to other regions in Canada, they also reported higher costs associated with journey-person time required to supervise apprentices. While employers in Quebec had the lowest charge out revenue, the costs of training an apprentice were much lower than in Western Canada /Ontario.

Figure 3.22 represents the benefit-cost ratio/net return by the three regions. As detailed in the chart, employers in all regions witnessed positive net returns.

To summarize, even though employers in Western Canada have higher charge-out revenue, on average, when compared with the rest of regions, they have higher key costs as well. The benefit-cost ratio by region depicted in Figure 3.22 indicates that employers in Quebec have the highest net return since they have lower key costs compared with those in the rest of Canada.



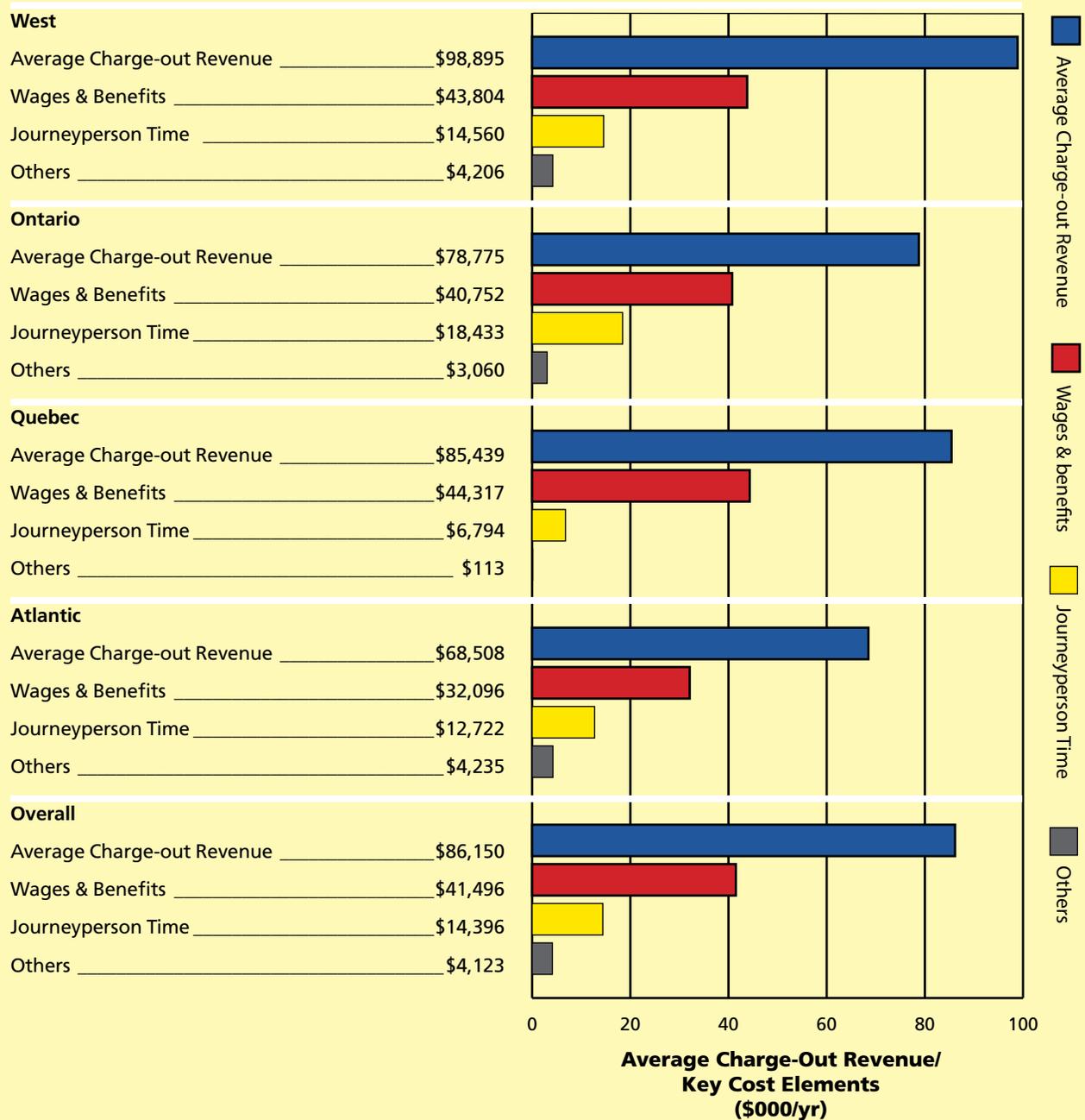
**Refrigeration & Air Conditioning  
Mechanic**

In total, there were 118 employers grouped in the trade area of Refrigeration & Air Conditioning Mechanic. There were 45 employers

in Western Canada, 43 employers in Ontario, 13 employers in Quebec, and 17 employers in Atlantic Canada.

The average charge-out revenue and the average key costs associated with the wages and

**Figure 3.23  
Average Charge-Out Revenue & Average Key Cost Elements**

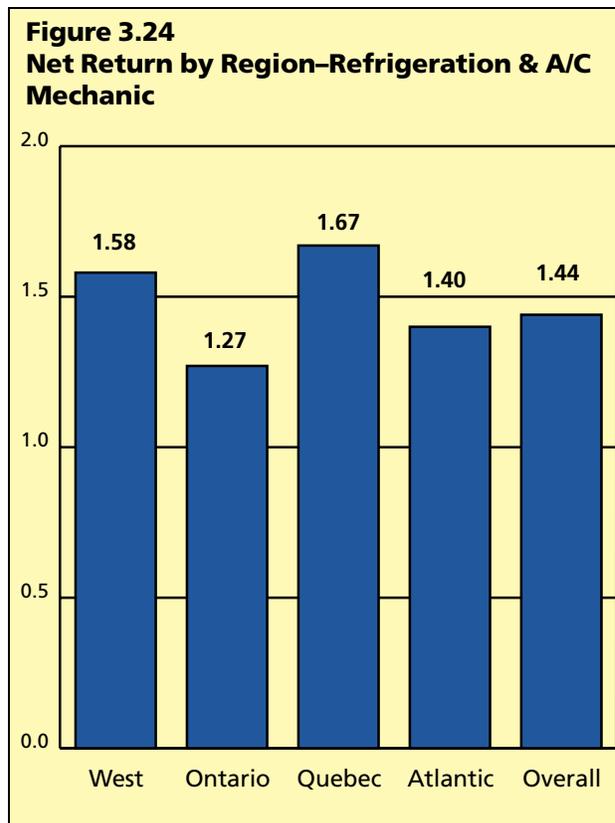


benefits, journeyman time and other costs, including wastage, disbursements and administration costs are shown in Figure 3.23.

Again, employers in Western Canada have the highest charge-out revenue, on average, compared to other regions in Canada and the national average, but they are also likely to have higher costs. Employers in Atlantic Canada have the lowest charge-out revenue, on average, and the lowest average key costs.

The benefit-cost ratios by the four regions are represented in Figure 3.24. Similar with the trends in the Automotive Service Technician analysis, employers in Quebec have the highest net return, (1.67). Employers in Ontario have lowest net return, (1.27).

As illustrated in Figure 3.24, there was little difference in the net return for Refrigeration and Air Conditioning Mechanic apprentices on the basis of regions. For example, the net return for apprentices in Ontario was only 13% below the national average, while the net return for Quebec employers was less than 14% above the national average. This suggests that there is relative stability in the net return for apprentices in this trade across Canada.

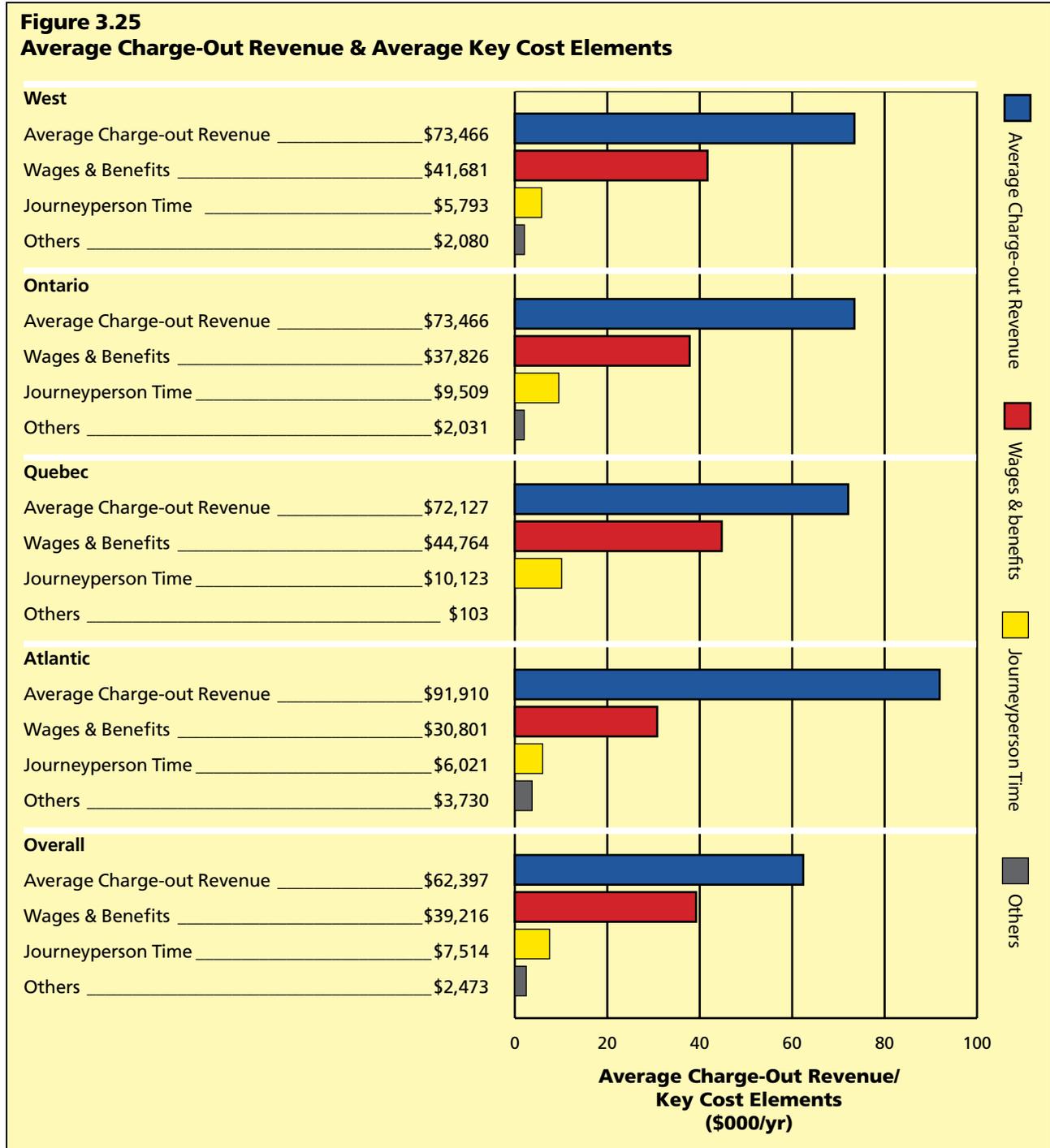


### Construction Electrician

Regarding the Construction Electrician trade, there were 67 employers who responded in Western Canada, 50 employers in Ontario, 20 employers in Quebec and 29 employers in Atlantic Canada. Overall, the regional analysis

was based on the responses provided by 166 employers.

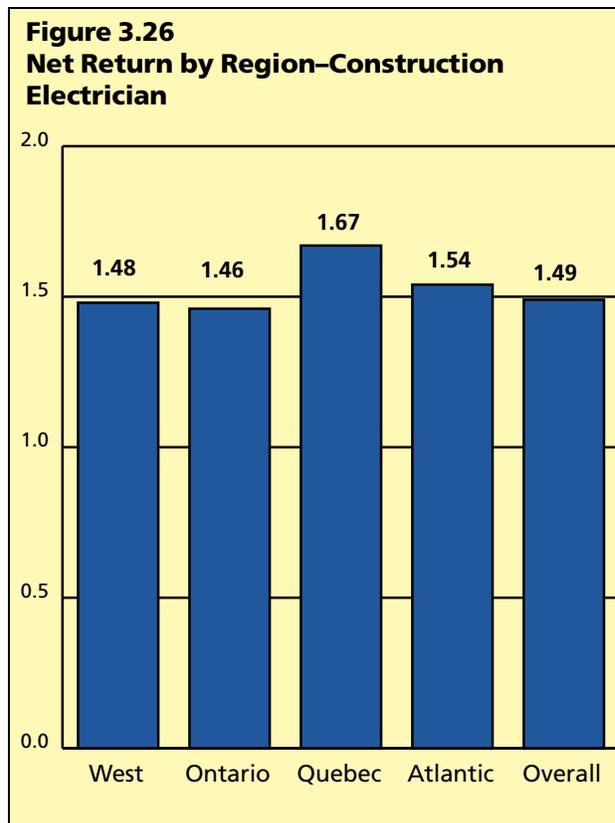
Figure 3.25 shows the average charge-out revenue and the average key costs associated with the wages and benefits, journeyperson time and other costs, including wastage,



disbursements and administration costs. Employers in Quebec have the highest average charge-out revenue and the highest key costs associated with journeyman time and disbursements, but had the lowest administration cost. Employers in Atlantic Canada have the lowest average charge-out revenue and lowest journeyman time. The rates are lower than the national average.

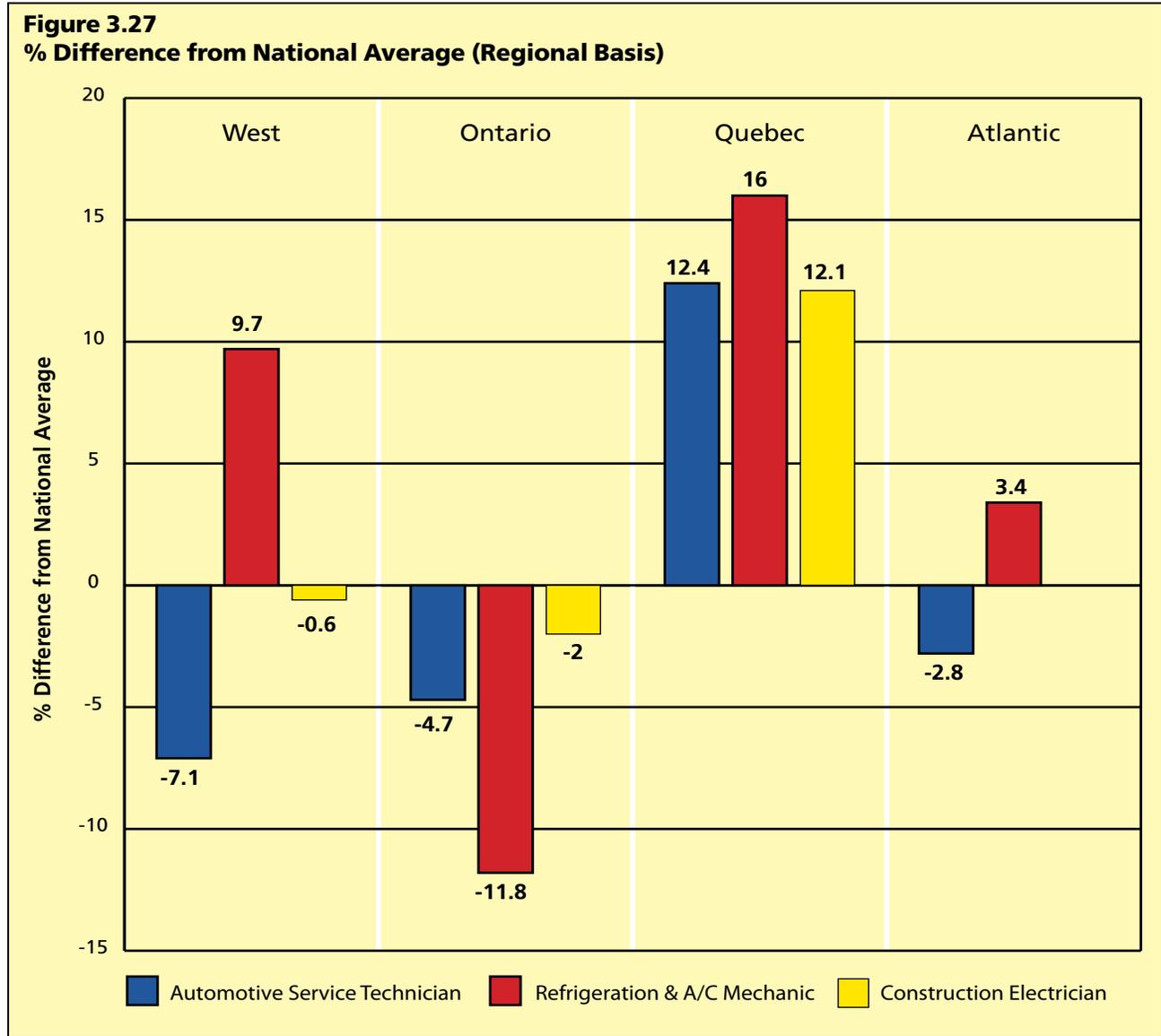
It should be noted that some caution should be exercised in the interpretation of data for Quebec, as the sample contained responses for only a relatively small number of employers. The number of employers was twenty.

The regional net benefit-cost ratios/net returns are provided in Figure 3.26. Quebec employers have the highest net return of 1.67. Western Canada has the lowest net return. Similar to the analysis of the Refrigeration and Air Conditioning Mechanic trade, analysis of the data suggests that the net returns do not vary substantially across regions. The range in net returns ranges from -11.8% in Ontario to +16% among employers in Quebec.



**Summary of Net Returns by Region**

The difference from the national average in each region is outlined in Figure 3.27.



---

### 3.6 Cost-Benefit Results by Employer Size

Automotive Service Technician, Refrigeration & Air Conditioning Mechanic, and Construction Electrician were selected to perform a cost-benefit analysis by employer size due to the high number of survey completions received in these trades.

The employer sizes were defined using the following classifications:

- small businesses have less than 10 employees;
- medium-sized businesses have 10 – 19 employees; and
- large businesses have 20 or more employees.

Overall all businesses, no matter what their size, receive a return on their investment. Generally larger businesses experience higher returns than smaller businesses. An exception was the Construction Electrician trade where the medium sized businesses tended to receive a higher return.

The cost-benefit results for these three trade areas by employer size are included in Appendix E.

### Automotive Service Technician

For the Automotive Service Technician trade there were 159 employers in total. There were 81 small businesses, 32 medium-sized businesses, and 46 large businesses.

The average charge-out revenue and the average key costs associated with the wages and

benefits, journeyperson time and other costs, including wastage, disbursements and administration costs are shown in Figure 3.28. Figure 3.28 indicates that large businesses have the highest charge-out revenue and have relatively average key costs. Small businesses have relatively lower average charge-out revenue.

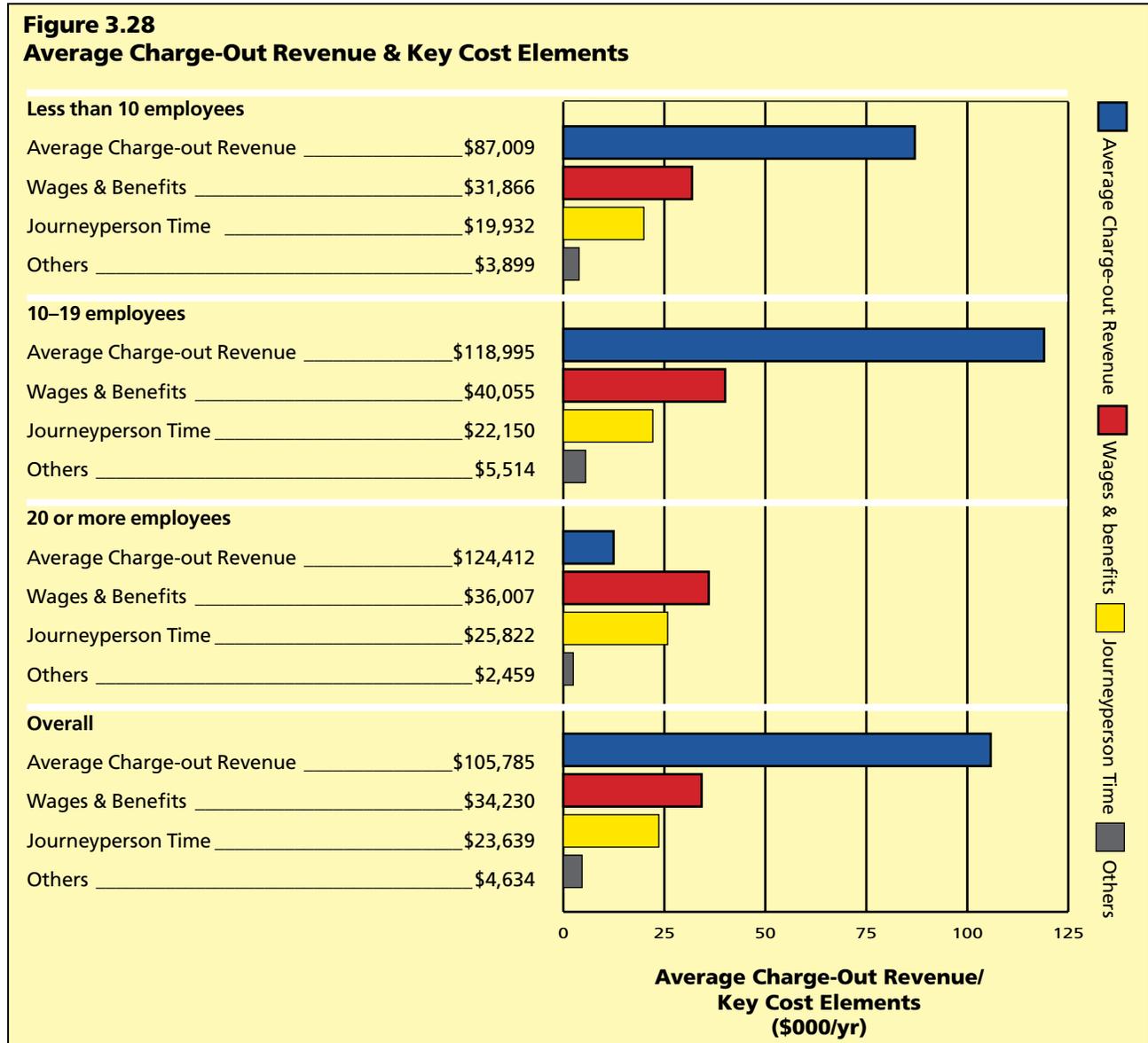
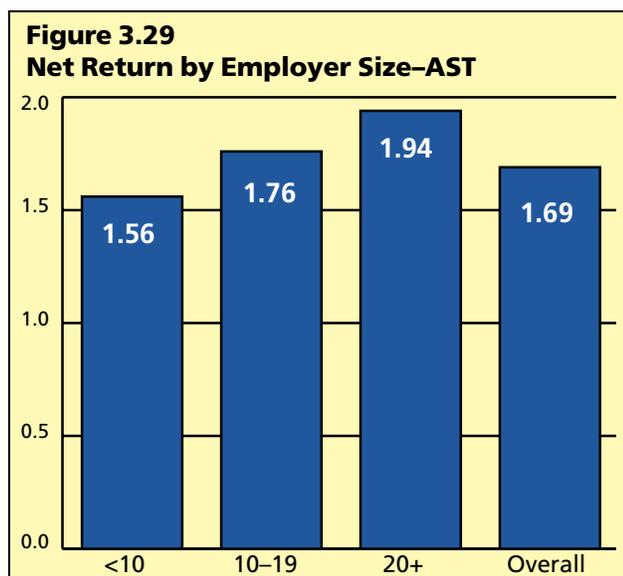


Figure 3.29 shows the benefit-cost ratio/net return by different employer sizes.

Large businesses have the highest net return and small businesses have lowest net return when analyzing returns on the basis of employer size. This finding was corroborated by the validation session where employers reported that larger dealerships had a higher profit rate on service work than smaller, independent automotive service employers.

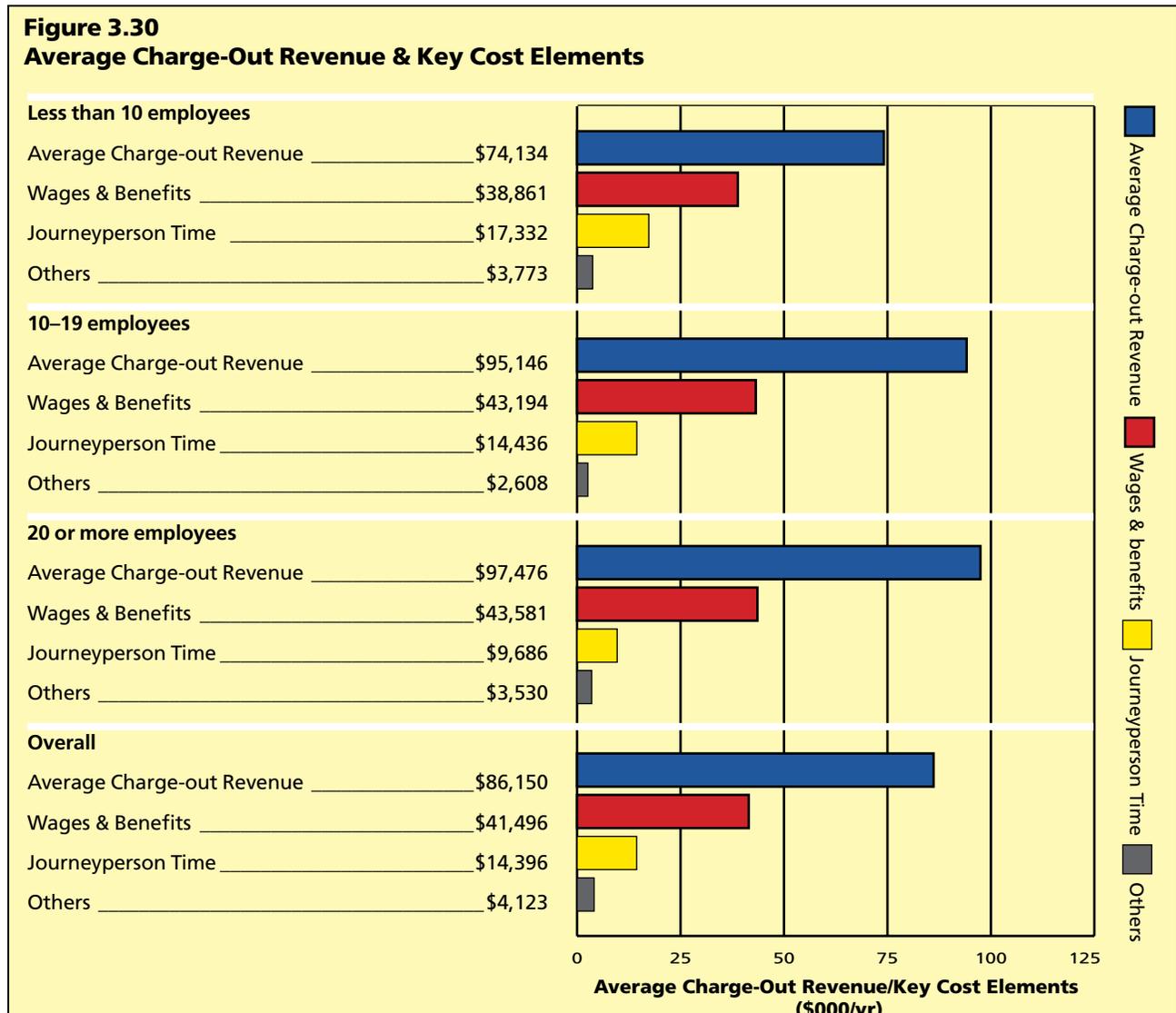


### Refrigeration & Air Conditioning Mechanic

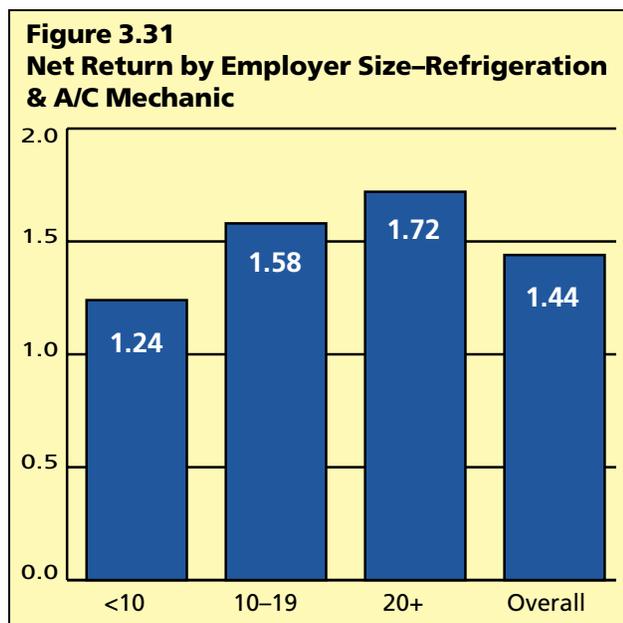
For the Refrigeration & Air Conditioning Mechanic trade, there were 62 small businesses, 24 medium-sized businesses, and 32 large businesses. The total was 118 employers.

Figure 3.30 shows the average charge-out revenue and the average key costs associated with the wages and benefits, journeyperson with the wages and benefits, journeyperson

time and other costs, including wastage, disbursements and administration costs. Large businesses have higher average charge-out revenue. Small businesses are likely to have the lowest average charge-out revenue. It is interesting to note that smaller establishments incur greater costs in terms of journey-person time than do those establishments that have 10 or more employees.



The benefit-cost ratio/net return by different company sizes are represented in Figure 3.31. In contrast to the Automotive Service Technician trade, it appears that there is a greater variance in the net return on the basis of employer size for the Refrigeration and Air Conditioning Mechanic trade. Smaller employer returns were 16% below the trade average, and employers who employed 20 or more employees had a net return that was 19% above the trade average.



### Construction Electrician

There were 166 employers in total for the Construction Electrician trade. There were 87 small employers, 32 medium-sized employers, and 47 large employers.

Figure 3.32 shows the average charge-out revenue and the average key costs associated with the wages and benefits, journeyperson time and other costs, including wastage,

disbursements and administration costs. In contrast to the trade areas of Automotive Service Technician and Refrigeration & Air Conditioning Mechanic, medium-sized employers are likely to have the highest average charge-out revenue. Large businesses have the highest average key costs associated with the use of journeyperson time, disbursements, and administration.

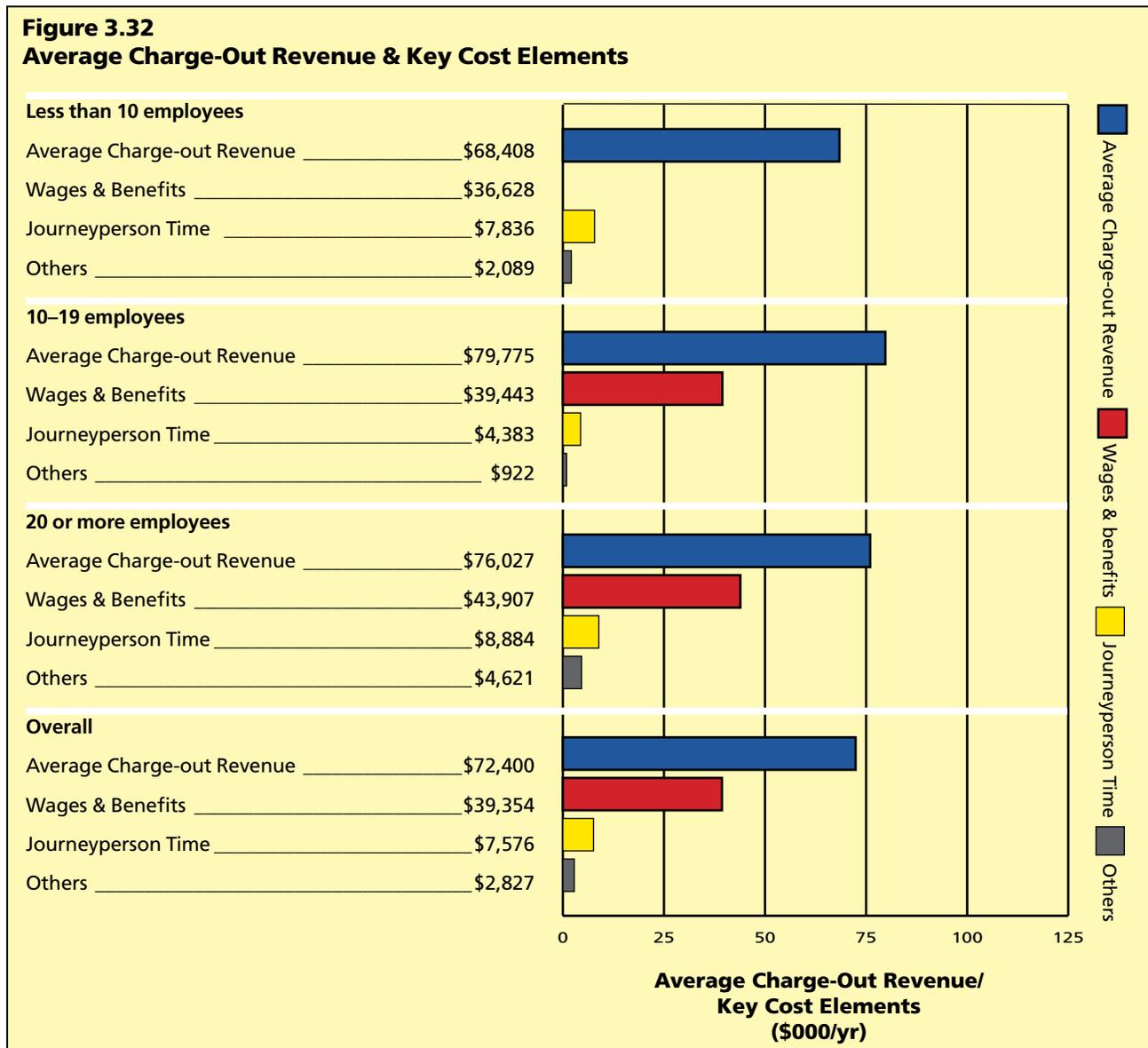
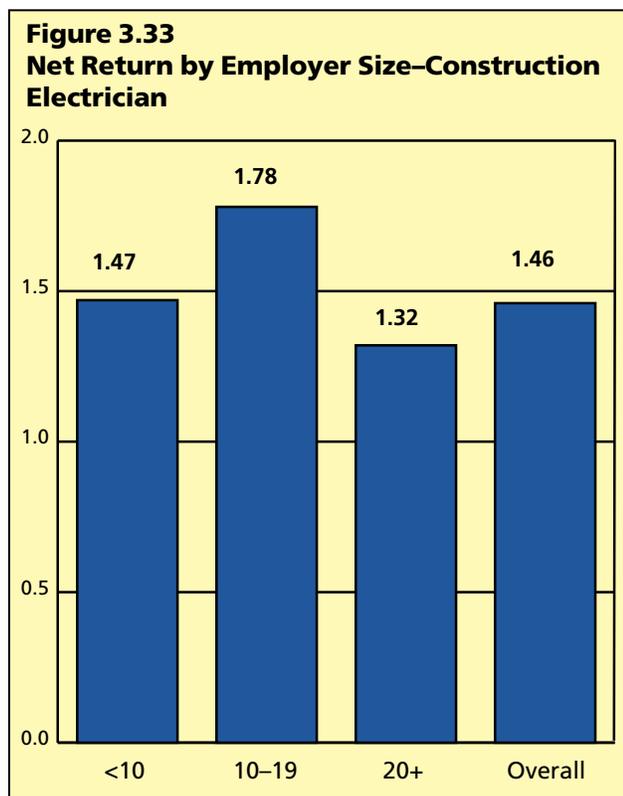


Figure 3.33 indicates the benefit-cost ratio/net return by different company sizes.

As highlighted in Figure 3.33, there is negative relationship between the net returns and size of employer. Again, some of the information obtained from the validation session could provide context to this result. In the validation session, it was pointed out that for small jobs or projects, employers would typically use a “charge-out” rate when quoting the cost for small projects. However, large employers noted that when bidding on large projects, they utilized a “blended labour rate” that included an average rate for apprentices and journeymen. The lower return for the large employers in this trade area could reflect the heightened competition when bidding on large projects, and, hence, the lower charge-out revenues reported for this employer group.

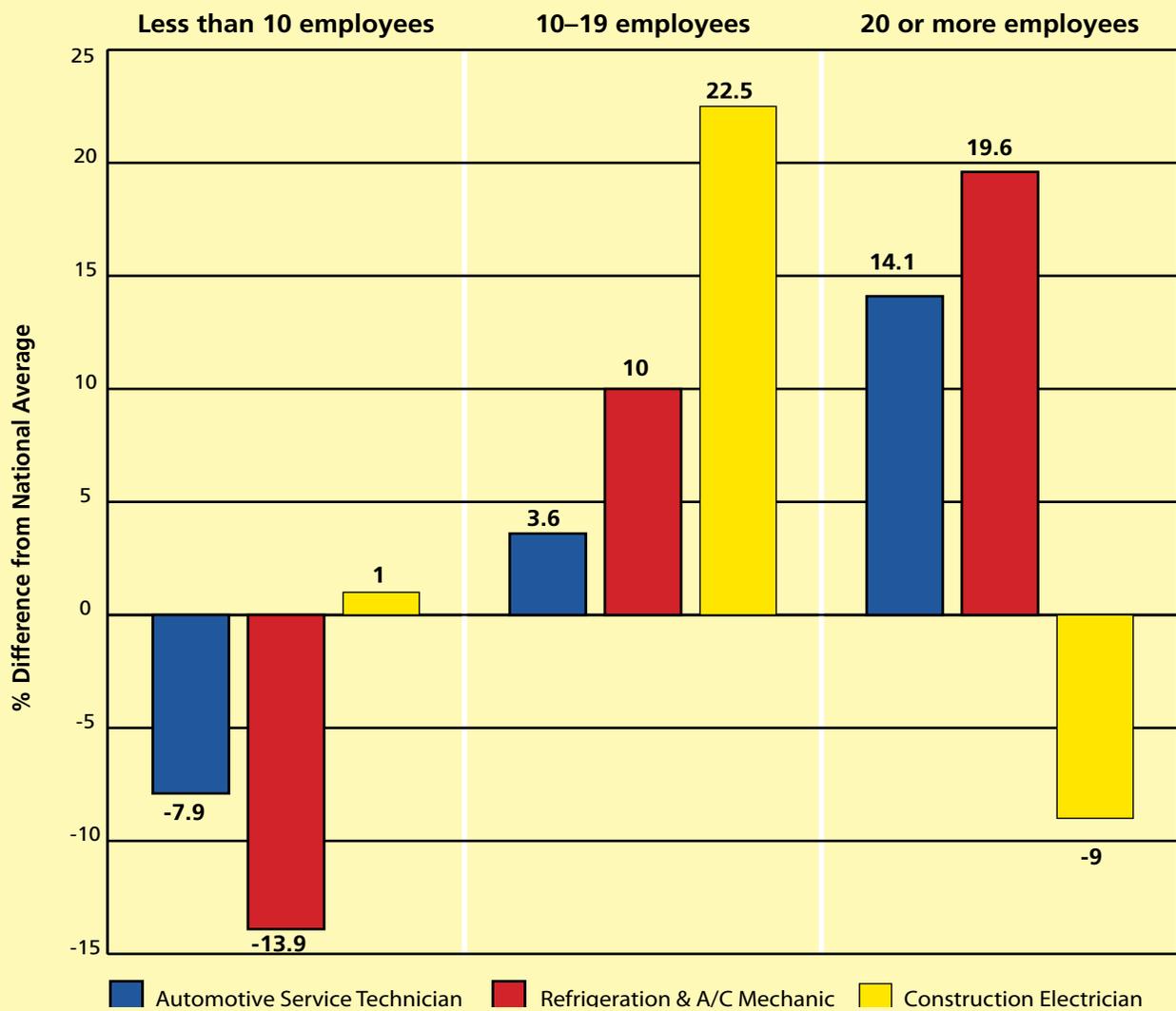


### 3.6.4 Summary of Net Return by Employer Size

Depicted in Figure 3.34 are the net returns by size of employer. As shown in the chart, for two of three trades, the net returns increase on the basis of the size of establishment. Large establishments generally are able to obtain higher charge-out rates and, hence,

witness greater returns than establishments that employed fewer than 20 employees. However, this trend was not universal across all trade groups, as larger establishments in the Construction Electrician trade witnessed lower net returns when compared to those establishments who had fewer than 20 employees.

**Figure 3.34**  
**% Difference from National Average (Basis of Employer size)**



The net returns on apprenticeship have more variation when examined on the basis of size of employer rather than on the basis of the location of the employer.

Highlighted in Figure 3.35 is a summary of the difference in net benefits (% difference from the national average) for the three trades which analysis could be completed on the basis of region and size of employer (number of employees).

**Figure 3.35**  
**Analysis of Differences in Net Return on the Basis of Region and Size of Employer**  
**Selected Trades**

<b>Characteristic</b> <b>% Difference from National</b> <b>Average</b>	<b>AST</b>	<b>Refrigeration &amp;</b> <b>A/C</b> <b>Mechanic</b>	<b>Construction</b> <b>Electrician</b>	<b>Average-</b> <b>Three</b> <b>Trades</b>
<b>Region</b>				
Atlantic	n/a <sup>1</sup>	-2.8%	+30.4%	-0.3%
Quebec	+12.4%	+16.0%	+12.1%	+13.5%
Ontario	-4.7%	-11.8%	-2.0%	-6.2%
West	-7.1%	+9.7%	-0.6%	+0.7%
<b>Size of Employer</b>				
< 10 employees	-7.9%	-13.9%	+1.0%	-10.4%
10-19 employees	+3.69%	+10.0%	+22.5%	+12.0%
20+ employees	+14.1%	+19.6%	-9.0%	+8.2%

1 Insufficient Sample Size

## Part 4: Survey Results

This section summarizes employers’ responses related to the qualitative benefits of apprenticeship training, the perceived productive value of an apprentice, and the poaching risk. This section also details the perceptions of employers who do not employ apprentices.<sup>1</sup> Employers answered these questions based on their experiences.

<sup>1</sup> The sample sizes reported in this section refer to the valid n meaning only those employers who provided a response have been included in the analysis.

### 4.1 Qualitative Benefits of Apprenticeship Training

The survey included a series of questions designed to measure the importance of several qualitative benefits of apprenticeship training. These include:

- The benefit of apprenticeship training to journeypersons; and
- The advantages of employing a “homegrown” journeyperson. A “homegrown” journeyperson refers to an employee trained as an apprentice who remains working at the employer’s company after their apprenticeship training is over.

**Figure 4.1**  
**Comparison of Employer Opinion**  
2006 vs. 2008

Trends	2006	2008	Conclusion
Benefits of Apprenticeship Training to Journeypersons	67.6%	81.3%	Employers continue to strongly believe that their journeypersons benefit from training apprentices
Advantages of Employing a “homegrown” Journeyperson More productive	65.3%	61.3%	Persistent perception among employers that “homegrown” journeypersons are more productive
Most significant benefit	Better fit with the organization (rating 8.5 out of 10)	Better fit with the organization (rating 8.5 out of 10)	Agreement among employers about the most significant benefit of apprenticeship training
Poaching	Average of 5.1 on a scale from 1 (not at all serious) to 10 (very serious)	½ (approx) 1 to 5 ½ (approx) 6 to 10	Some concern over poaching

### **Benefit of Apprenticeship Training to Journeypersons**

Employers were asked whether there was a benefit to their journeypersons when providing training to apprentices. The majority of employers (81.3%) indicated that their journeypersons derive a benefit from training an apprentice.<sup>2</sup> This is a significant increase from the 67.6% of employers in the 2006 study who voiced a similar opinion.

<sup>2</sup> Apprenticeship Survey (Q10, n=752)

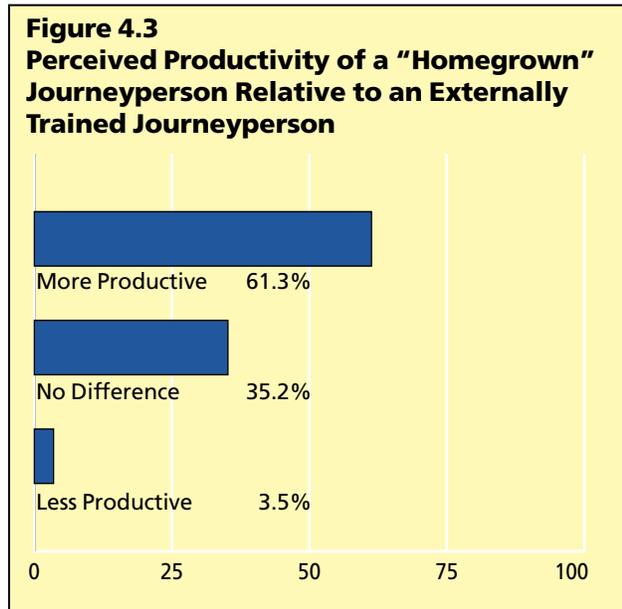


### **Advantages of Employing a "Homegrown" Journeyperson**

In the study, "Apprenticeship Building a Skilled Workforce for a Strong Bottom Line, Return on Apprenticeship Training Investment for Employers, A Study of 15 Trades, June 2006," employers reported several benefits to training their own journeypersons. The results from the current study confirm that employers value training their workers "in-house." Employers' perceptions of the benefits of apprenticeship did not vary significantly between 2006 and 2008. Interestingly, "better health and safety performance" was accorded greater importance in 2008 than in 2006. Overall, employers rated "better fit with the organization" as the most significant benefit of employing a journeyperson who was trained as an apprentice. Other benefits were noted:

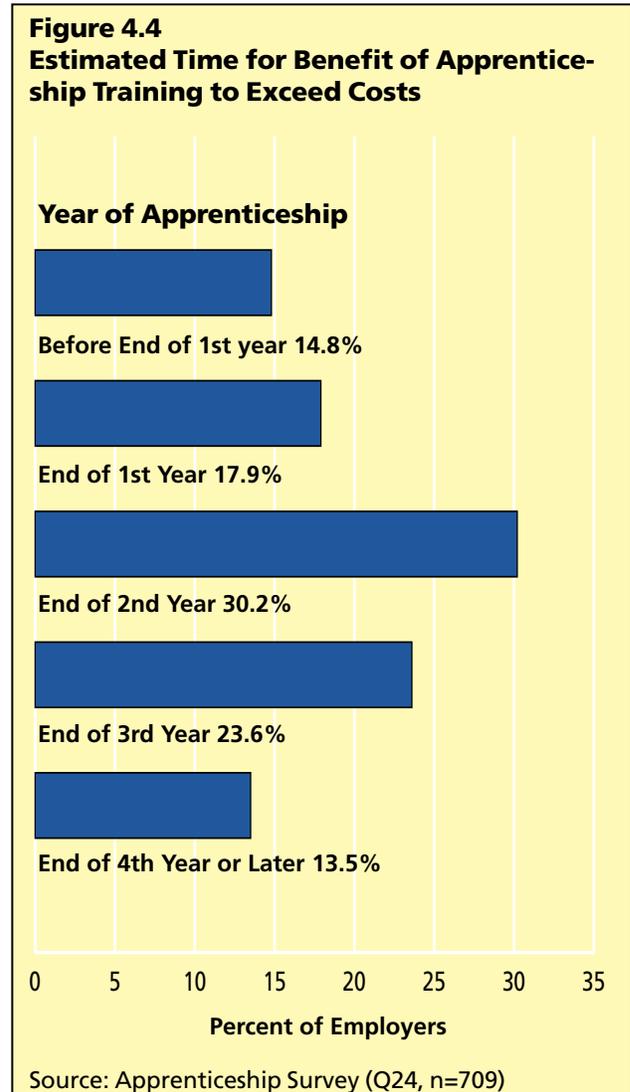
- better fit with the organization;
- avoids risk of skill shortages;
- greater overall productivity;
- potential for career advancement in the company;
- better relations with customers;
- fewer mistakes; and
- better health and safety performance.

Figure 4.3 presents the results related to employers' assessments of the productivity of a "homegrown" journeyman relative to an externally trained journeyman. Over sixty percent (61.3%) of surveyed employers consider a journeyman they trained as an apprentice to be more productive relative to an external journeyman, with only 3.5% indicating that "homegrown" journeymen are less productive. Slightly more than thirty-five per cent of employers (35.2%) indicated that there is no difference in productivity between a "homegrown" and an external journeyman. Overall, employers estimated, based on their experience, that a "homegrown" journeyman is 29.0% more productive, on average, when compared to an externally trained journeyman.



## 4.2 Perceived Productive Value vs. Training Costs

Employers estimated when an apprentice's productive value to their organization begins to exceed the training costs. As illustrated in Figure 4.4, more than one-quarter (30.2%) of surveyed employers indicated that the benefit of training the apprentice exceeds the costs by the end of the second year of the apprenticeship. In other words, the employer perceives a net benefit of apprenticeship training at the mid-point of the apprenticeship period, which averages four years. More than one-third (32.7%) of employers perceive a net benefit to

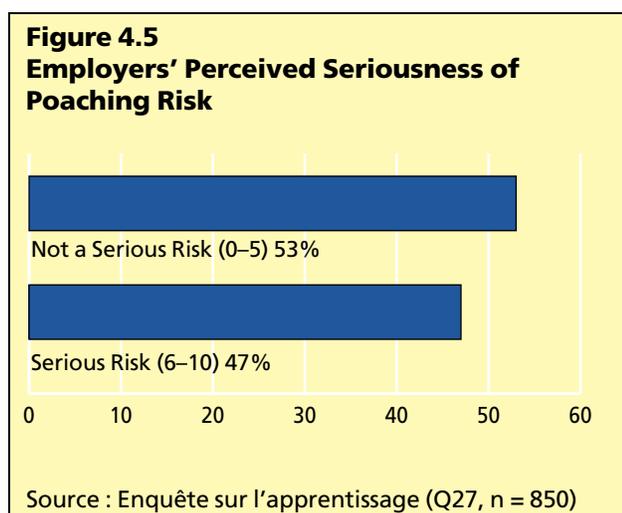


apprenticeship training by the end of the first year or earlier. The data supports this perception. In many trades there is a return in the first year.

### 4.3 Poaching Risk

The survey included a section related to poaching risk. Poaching refers to the situation where competitors hire recently qualified journeypersons that an employer trained as apprentices. This can occur if there are not enough skilled trades workers available to meet demand. Poaching can undermine employers' desire to train apprentices. For the purposes of this study, employers were asked to rate the seriousness of the poaching risk from competitors and other industries. It should be kept in mind that for some employers it may be hard to estimate the extent to which poaching occurs.

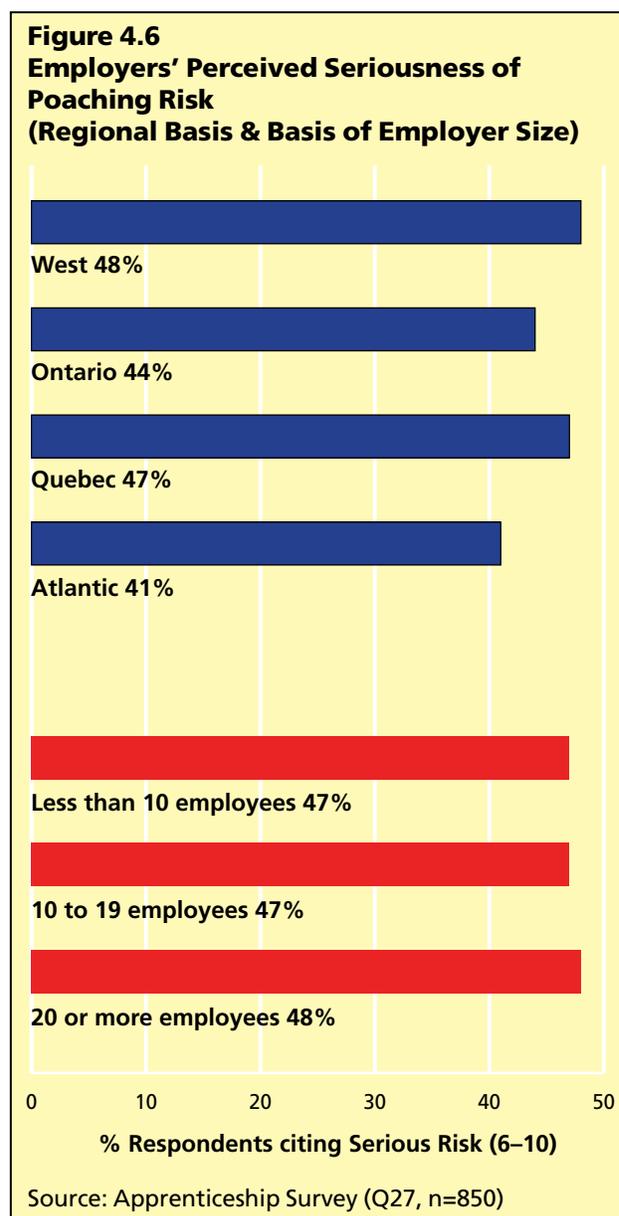
As shown in Figure 4.5, it appears that employers are evenly split in terms of whether they view the poaching risk from other employers to be a very serious issue. Fifty-three per cent of employers gave poaching a "not very serious" risk value of 1 to 5. Forty-



seven per cent gave the 6 to 10 rating identifying the risk as "serious." These results indicate that there is some concern with respect to poaching.

As highlighted in Figure 4.6, while there are some differences in employers' assessments of the poaching risk on the basis of region, the issue of poaching did not differ much on the basis of employer size.<sup>3</sup>

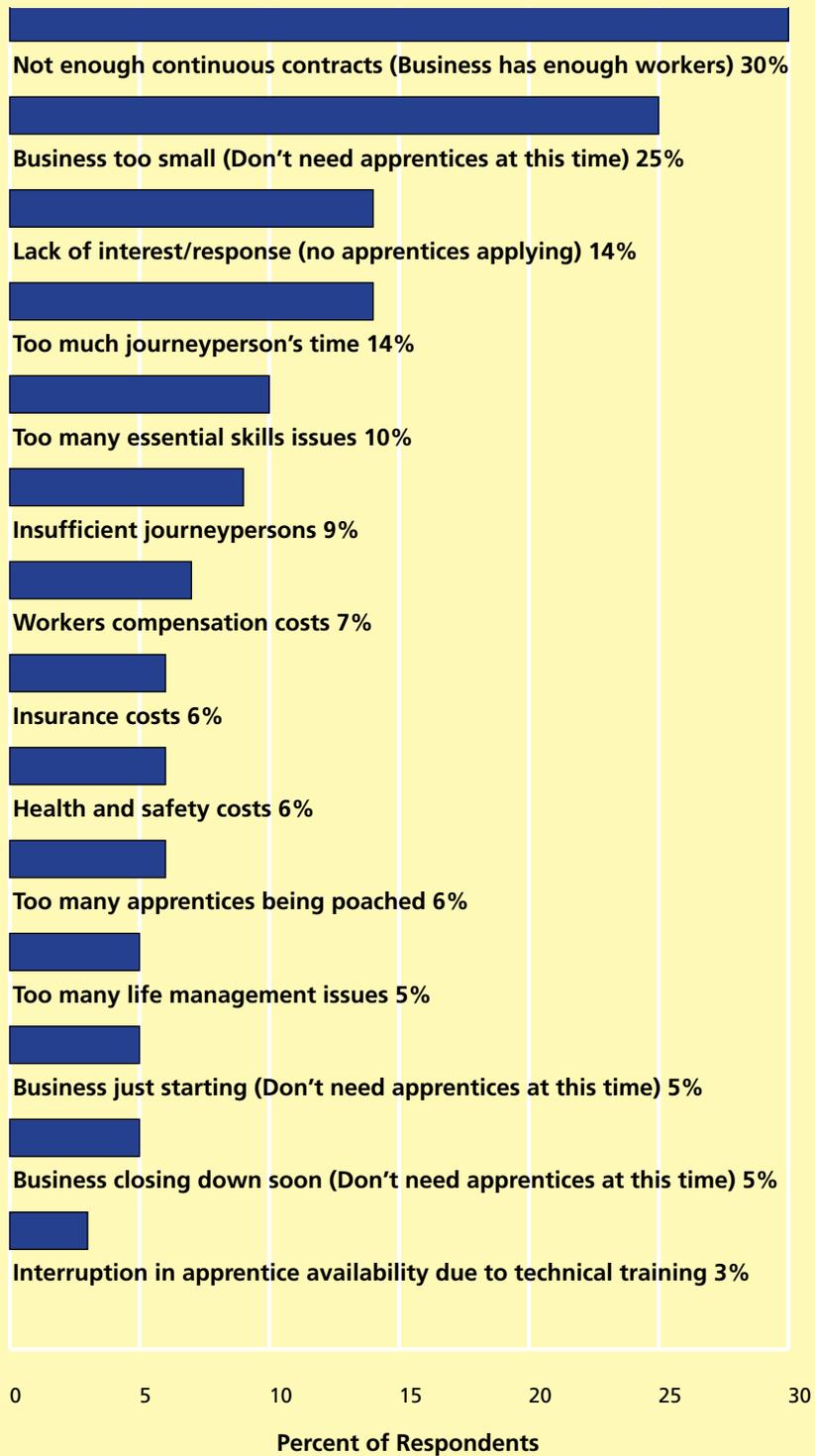
<sup>3</sup> Based on number of employees.



### 4.4 Employers without Apprentices

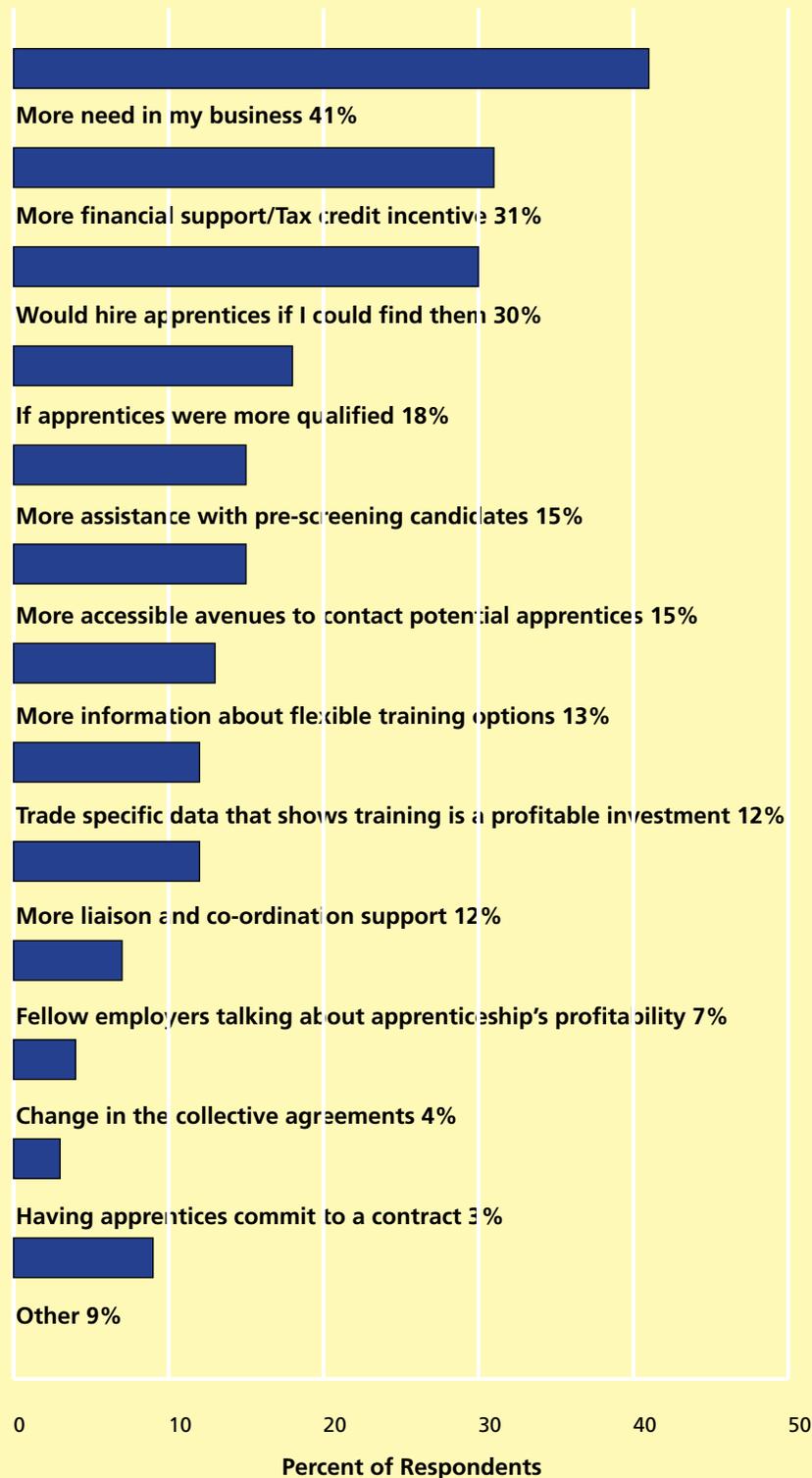
Employers hiring journey-persons in one of the 16 trades who did not employ apprentices were asked to complete a short survey concerning the reasons that they did not invest in apprenticeship. The most common reason reported by employers was that their business did not have enough continuous contracts to support hiring an apprentice (30%). Another common reason for not investing in apprenticeship was that the business was too small and there was no reported need for additional workers (25%). Of great interest, however, is the 14% of employers who indicated that they would be willing to hire an apprentice, except that there were few or no apprentices applying to their organization.

**Figure 4.7**  
Reasons that Employers Without Apprentices Did not Hire an Apprentice



Source: Apprenticeship Survey – Survey of Employers without Apprentices (Q2, n=1,163)

**Figure 4.8**  
**What Would Change Employers' Decisions About Hiring an Apprentice**



Source: Apprenticeship Survey – Survey of Employers without Apprentices (Q3, n=627)

Employers were also asked if anything would change their mind about hiring an apprentice. About half of the employers said “yes” something would change their minds. Over 40% of employers indicated that they would hire an apprentice if there was a need in their business. Nearly one-third (31%) of respondents indicated that they would hire an apprentice if there was more financial support for employers doing so, such as tax credit incentives. Importantly, 30% of respondents indicated that they would hire apprentices if they could find them, suggesting that a number of employers may be having difficulty getting access to apprentices.

---

## Part 5: Conclusions

Highlighted below are the key findings of this research. The results show employers get a return when they invest in apprentices. On average, for every \$1 spent on apprenticeship training, an employer receives a benefit, on average, of a \$1.47 or a net return of \$0.47. Additional benefits to hiring apprentices include:

- better fit with the organization,
- avoids risk of skills shortages,
- greater overall productivity,
- potential for career advancement in the company,
- better relations with customers,
- fewer mistakes, and
- better health and safety performance.

*The Research confirms that there are net positive returns to apprenticeship.*

This study substantiates the findings from the 2006 pilot that in most trades there are financial benefits to hiring apprentices.

*Increasing charge-out rates have contributed to an increase in net returns since 2006.*

The period between 2006 and 2008 represented a period of economic expansion in almost every region and sector of Canada's economy. With a heightened demand for tradespersons at all levels, employers were able to significantly increase the charge out rates for apprentices. In fact, it appears that charge out rates increased by 23% during the two year period. Offsetting, the revenue gains, however, were increased wages (+ 9%) as well as the increased costs associated with the use of journeyman time to supervise apprentices (+14%).

Combining the data across all trades and all employers suggests that the net return increased from 1.38 in 2006 to 1.47 in 2008. This is up 9 cents from the 2006 pilot study.

*The majority of trade areas have a positive return over the term of the apprentice.*

Fourteen of the 16 trades studied had a net positive return over the period of apprenticeship. In fact, for most trades studied, employers witness a positive return in the first year of apprenticeship.

There were two trade areas that had returns that were below the investment of the employers. The Hairstylist trade had a return of only 55 cents for each one dollar invested by the employer. This low return can be explained by the very limited ability of employers to earn significant revenues on

1st or 2nd year apprentices. Unlike the other trades, the shorter training program may not enable the employers to recoup their costs. The other trade that had a net return of below one dollar was the Electrical Power Line and Cable Worker trade with a return of 0.95. This trade experienced a below average return primarily on the basis of the high wages of apprentices. A first year apprentice could have wages/salaries and benefits of almost \$50,000. Due to the safety issues associated with this trade, journeypersons also need to spend a lot of time training and monitoring 1st and 2nd year apprentices.

*There were variations in the net return on the basis of region and size of the employer.*

There were three trades in which a sufficient number of completions were obtained to facilitate a more detailed analysis: Automotive Service Technician, Refrigeration and Air Conditioning Mechanic, and Construction Electrician.

Overall, at the regional level, the results suggest that employers in Quebec have slightly higher returns than employers in other regions of Canada. Although Quebec employers generally reported charge-out rates lower than that of employers in Western Canada, Quebec employers typically had lower cost structures, in that they paid their apprentices less, and reported less use of journeyperson time to supervise apprentices. In contrast, employers in Ontario generally experienced net returns that were below the national average.

Employers in Quebec may experience higher returns than elsewhere in the country due to the educational system. Apprentices in Quebec typically complete their technical training prior to registering with an employer for an apprenticeship. In this context, there may be less journeyperson time required and lower costs associated with disbursements and/or program administration.

Analysis of the net return on the basis of employer size<sup>1</sup> suggests that, in general, the larger the employer, the greater the ability to obtain higher charge-out rates for apprentices. However, this trend was not universal across the three trades studied, as the larger employers of Construction Electrician apprentices reported lower net returns than did medium-sized employers.

Analysis of the data suggests that there was greater variation in the net return on apprenticeship on the basis of the size of the employer rather than on the basis of the region in which the employer operated.

This study allows industry and other apprenticeship stakeholders to gain a more accurate understanding of the financial costs and benefits of apprenticeship training for 16 trades. This information is valuable in dispelling myths that investing in apprentices reaps little financial benefit. Ongoing dialogue with industry about the value of apprenticeship and continued support for employers will be essential to ensure Canadians have the opportunities to train and to gain skills.

<sup>1</sup> Based on number of employees.

---

## Appendix A: Survey Administration

A screening process was required to identify employers who hire and train apprentices in the trades selected for the study. A mixed-mode survey approach was used whereby employers were mailed, faxed, or e-mailed a copy of the survey questionnaire. In addition, employers were given the option to complete part or all of the survey by phone or online.

Overall, the majority of employers indicated that completing the survey was a challenge, not only because of the length of time required to complete the survey, one to two hours was average, but also the level of detail of the information requested. As a result,

extensive follow-up with employers was necessary in order to verify the accuracy of the information provided. Given the limited availability of employers to complete the survey, several attempts were required to contact a single employer to clarify his/her responses.

R.A. Malatest & Associates Ltd. contacted a total of 21,020 employers and 4,148 employer surveys were sent to qualified employers. A total of 784 surveys were completed. A total of 1,013 useable surveys were obtained from the 2006 and 2008 surveys. Figure A.1 details the number of qualifiers, completions, and response rates by trade.

**Figure A.1**  
**Number of Qualifying Employers and Survey Completions by Trade**

Trade	No. of Qualifiers	Phase 2 Completed Surveys	Pilot Surveys	Total Useable Sample <sup>1</sup>	Response Rate (%) <sup>2</sup>
Automotive Service Technician	719	131	45	159	18.2%
Motor Vehicle Body Repairer	307	41	21	62	13.4%
Cook	227	31	21	52	13.7%
Refrigeration & Air Conditioning Mechanic	378	85	40	118	22.5%
Heavy-Duty Equipment Technician	142	32	37	66	22.5%
Construction Millwright and Industrial Mechanic	98	18	23	30	18.4%
Electrician (construction)	566	119	52	166	21.0%
Bricklayer	172	40	21	53	23.3%
Machinist	146	18	33	48	12.3%
Sheet Metal Worker	237	33	28	51	13.9%
Cabinetmaker	230	57	-	48	24.8%
Partsperson	103	21	-	15	20.4%
Boilermaker	43	5	-	5	11.6%
Plumber	520	83	-	75	16.0%
Electrical Power Line and Cable Worker	69	33	-	27	47.8%
Hairstylist	188	38	-	38	20.2%
<b>Total</b>	<b>4,145</b>	<b>784</b>	<b>321<sup>3</sup></b>	<b>1,013</b>	<b>18.9%</b>

1 A small number of surveys were unusable due to incomplete data

2 Phase 2 Completions / Qualifiers Excludes 112 surveys that were received as part of the Pilot survey which were in trades not covered by Phase II

3 Excludes 112 surveys that were received as part of the Pilot survey which were in trades not covered by Phase II

## Appendix B: Follow-up with Respondents to the Pilot Study

### Number of Employers Responding to both the 2006 and 2008 Surveys

Employers from the 10 trades areas in the pilot study were contacted as part of the current study to inform and/or validate assumptions made regarding increases from 2005/2006 values to present day 2008 values regarding costs and/or benefits (e.g., charge out rates) provided in the first survey. One

hundred and six of the 321 employers who completed a survey in the 2006 updated their information in 2008. This updated information was used to assess consistency between the previous study and present day costs/charge out rates.

The following table presents the number of employers who originally completed a survey in 2006, as well as the number of employers who completed a follow-up survey in 2008.

### Comparison of Survey and Follow-up Completions 2006 vs. 2008 (10 trades)

Trade	NOC	Employed (2006 Census)*	Pilot Surveys	2008 Follow-up Survey
Automotive Service Technician	7321	149,995	45	14
Motor Vehicle Body Repairer	7322	31,250	21	8
Cook	6242	203,690	21	5
Refrigeration & Air Conditioning Mechanic	7313	22,240	40	12
Heavy-Duty Equipment Technician	7312	39,140	37	10
Construction Millwright and Industrial Mechanic	7311	75,900	23	5
Electrician (construction)	7241	72,390	52	27
Bricklayer	7281	18,885	21	4
Machinist	7231	52,075	33	13
Sheet Metal Worker	7261	21,320	28	8
<b>TOTAL</b>			<b>321</b>	<b>106</b>

## Trends in Work Hours

Data relating to work hours was compared for organizations that completed both the 2006 and 2008 ROTI surveys. The following table presents the average number of work hours

in 2006 and 2008 for those who responded to both surveys.

Because the changes reported are small, no change was imputed to respondents who completed a survey in 2006, but not in 2008.

Question	Variable	2006 Average	2008 Average	% Change 2006 to 2008
5a	Weekly Hours apprentices	41	41	0.00%
5b	Weekly Hours journeypersons	41	41	0.00%
6a	Days Worked per week apprentices	5	5	0.00%
6b	Days Worked per week journeypersons	5	5	0.00%
7a	Holiday weeks apprentices	2	2	0.00%
7b	Training weeks apprentices	7	7	0.00%
7c	Other reasons apprentices	1	0	-100.00%
7d	Holiday weeks journeypersons	3	3	0.00%
7e	Training weeks journeypersons	1	1	0.00%
7f	Other reasons journeypersons	1	0	-100.00%

## Trends in Benefits

Data relating to benefits was compared for organizations that completed both the 2006 and 2008 ROTI surveys. The following table presents the averages for questions dealing with benefits in 2006 and 2008 for

responders to both surveys.

Although charge-out hours have only slightly increased in some trades, charge-out rates in other trades have increased substantially from just under 14% to just under 19%.

Question	Variable	2006 Average	2008 Average	% Change 2006 to 2008
AQ9B2JP	Journeyperson weekly charge out hours	38	38	0.00%
AQ9B21APP	1st year apprentice weekly charge out hours	28	31	10.71%
AQ9B22APP	2nd year apprentice weekly charge out hours	30	32	6.67%
AQ9B23APP	3rd year apprentice weekly charge out hours	33	35	6.06%
AQ9B24APP	4th year apprentice weekly charge out hours	35	36	2.86%
AQ9B3JP	Journeyperson charge out rate	\$63.67	\$73.76	15.85%
AQ9B31APP	1st year apprentice charge out rate	\$50.60	\$59.98	18.54%
AQ9B32APP	2nd year apprentice charge out rate	\$53.14	\$61.71	16.13%
AQ9B33APP	3rd year apprentice charge out rate	\$55.88	\$63.7	13.99%
AQ9B34APP	4th year apprentice charge out rate	\$58.71	\$67.73	15.36%

## Trends in Costs

Data relating to costs was compared for organizations that completed both the 2006 and 2008 ROTI surveys. The following table presents the averages for questions dealing with costs in 2006 and 2008 for responders to both surveys.

Wages have increased, but not as dramatically as the charge-out rates. With respect to

opportunity costs, use of journeypersons' time supervising apprentices has remained fairly consistent with slightly less supervisory time for first and second year apprentices. Apprentice use of chargeable time has decreased since 2006, on average, particularly for second and third-year apprentices. Wastage costs have gone up since 2006. Finally, disbursements have increased since 2006, particularly for equipment and other cash.

Question	Variable	2006 Average	2008 Average	% Change 2006 to 2008
<b>Hourly Wage Costs</b>				
AQ8A_JP_D	Journeyperson hourly wage	\$25.29	29.84	17.99%
AQ8A_1APP_D	1st year apprentice hourly wage	\$13.23	14.22	7.48%
AQ8A_2APP_D	2nd year apprentice hourly wage	\$15.76	17.21	9.20%
AQ8A_3APP_D	3rd year apprentice hourly wage	\$18.37	20.44	11.27%
AQ8A_4APP_D	4th year apprentice hourly wage	\$21.06	24.44	16.05%
<b>Opportunity Costs</b>				
AQ12A_1APP	1st year apprentice use of journeyperson time	29.10	25.21	-13.37%
AQ12A_2APP	2nd year apprentice use of journeyperson time	21.32	20.35	-4.55%
AQ12A_3APP	3rd year apprentice use of journeyperson time	14.71	15.22	3.47%
AQ12A_4APP	4th year apprentice use of journeyperson time	9.60	9.84	2.50%
Q12B_1APP	1st year apprentice use of chargeable time	36.24	35.16	-2.98%
Q12B_2APP	2nd year apprentice use of chargeable time	41.23	33.62	-18.46%
Q12B_3APP	3rd year apprentice use of chargeable time	49.50	46.30	-6.46%
Q12B_4APP	4th year apprentice use of chargeable time	42.70	45.65	6.91%
<b>Lost Productivity From Major Assets (Per cent saying "Yes" must be at least 40 per cent for inclusion)</b>				
Q14A	Does the organization use major assets with apprentices	24.70%	13.08%	na

Question	Variable	2006 Average	2008 Average	% Change 2006 to 2008
<b>Wastage</b>				
Q15A	Do apprentices waste material that cannot be charged	64%	64.5%	0.78%
AQ15B_1APP	1st year apprentice uncharged material wastage	\$4,143.77	\$6,460.05	55.90%
AQ15B_2APP	2nd year apprentice uncharged material wastage	\$3,851.57	\$4,242.31	10.14%
AQ15B_3APP	3rd year apprentice uncharged material wastage	\$2,342.20	\$4,392.86	87.55%
AQ15B_4APP	4th year apprentice uncharged material wastage	\$1,300.25	\$2,070.00	59.20%
<b>Disbursements</b>				
AQ17A	Registration	\$268.72	\$265.03	-1.37%
AQ17B	Top up EI	\$626.34	\$658.79	5.18%
AQ17C	Health	\$424.48	\$270.30	-36.32%
AQ17D	Wages while in school	\$4,878.29	\$3,420.05	-29.89%
AQ17E	Tuition	\$551.93	\$543.47	-1.53%
AQ17F	Tools	\$394.06	\$447.02	13.44%
AQ17G	Scholarships			
AQ17H	Equipment	\$711.33	\$1,907.61	168.18%
AQ17I	Vehicle	\$475.30	\$592.02	24.56%
AQ17J	Continuing ed	\$621.55	\$969.94	56.05%
AQ17K	Skills competitions	\$956.14	\$1,623.72	69.82%
AQ17L	Other cash	\$971.94	\$2,351.88	141.98%
computed	Total disbursements	\$10,880.09	\$13,049.82	19.94%
<b>Operating Costs</b>				
AQ21	Total staff costs	\$615.94	\$830.68	34.86%

## Appendix C: Cost-Benefit Methodology

This appendix presents a detailed description of the model methodology that is the basis for the cost-benefit analysis for each trade.

### Overall Approach

To the maximum extent possible, the results of the model are meant to be an accurate reflection of the survey findings for each trade. The model is intended to produce results of a “typical firm” based on the survey findings. A cash flow model was used where a typical firm hires one apprentice in each year and generates a net benefit or cost for each apprentice year.

These calculations are based on survey responses by firms who presently employ apprentices in each trade area. The mean (or average) values for variables are calculated and used in subsequent calculations.

The model is organized on a trade-by-trade and year-by-year basis. The covered years for each trade are based on the average responses to the question “How long does it usually take for an apprentice to actually complete his or her apprenticeship?” For 15 of the 16 trades the answer to this question rounded to four years. For hairstylist, the answer was two years.

**Figure C.1  
Model Calculations for Costs and Benefits**

	Calculation	Hypothesized Relationship to apprentice years
<b>BENEFITS</b>		
Attributed Revenue	Charge out rate x charge out hours	Charge out rates and hours increase by year of apprenticeship
<b>COSTS</b>		
Wages and benefits	Wage x mark-up for statutory benefits	Wages increase by year of apprenticeship
Journeyman time	Per cent of time that is not chargeable to the customer x journeyman charge out revenue	Journeyman time declines as year of apprenticeship increases
Wastage	Total wastage allocated over year of apprenticeship	Wastage costs decrease by year of apprenticeship
Disbursements	Cash disbursements to support training and other benefits allocated across the years	No theoretical relationship specified
Administration	Staff costs for entire sample/ number of apprentices in sample	Constant costs per apprenticeship

For each year, the following net benefit calculations were made:

**Benefit = Charge out rate x Charge out hours**

**Cost = Wages and benefits + Opportunity costs + Disbursements + Administration costs**

**Opportunity costs = Journeyperson time + Wastage**

**Net benefit = Benefit – Cost**

Figure C.1 reviews the specific calculations that were undertaken and the hypothesized relationships to apprentice years for the benefit and cost components.

## Data Issues

### *Alternative Methods to Use of Means*

As an apprentice accumulates human capital over time, this accumulation will be reflected in higher productivity, which, in turn, generates more revenue and higher wages. This hypothesis was tested and verified for the entire data set and within specific cases. Yet in a few cases, the mean values did not reflect this. Therefore, alternative measures were used to preserve the integrity of the findings and to ensure that they were reflective of a typical firm.

Although individual cases may be logically consistent with a human capital approach, the averages may not reflect that pattern. The main reason is that the logic was not maintained in that the number of responses for each apprentice year varies between the cases. For instance, there were 53 responses from firms who employ Bricklayers. The breakdown

of the number of apprentices employed for each year of the apprenticeship is as follows:

- 1st year 64
- 2nd year 54
- 3rd year 44
- 4th year 18

This pattern is fairly typical and is associated with the fact that the completion rates for apprentices approaches only 50 per cent. The implication is that there are different samples for each year, each with its own distribution.

The point of the modeling exercise is simply to provide a picture of a “typical firm”. Inasmuch as the theoretical relationship was maintained for the entire sample and within specific cases, a model result that did not maintain these relationships would not be “typical”.

In these cases, therefore, the hypothesized relationship was imposed on the data through one of three methods:

- **Mode:** the most frequent number of responses was used if it followed the expected pattern.
- **Median:** the mid-point of the distribution was used if the mode was inadequate.
- **Interpolation:** if neither the mode nor median produced the hypothesized result, a data point was interpolated as the mid-point between the prior apprentice year and the forthcoming apprentice year. For example, a 2nd year interpolation would be the mid point between the 1st year apprentice value and the 3rd year apprentice value.

---

### *Thresholds for Inclusion*

A second data issue was simply a matter of setting minimum thresholds for responses prior to including a variable. Once again, the objective was to present a “typical firm”. A lack of data on any one element of the model is an indication that the element is not typical of firms that hire apprentices. These thresholds affected the inclusion of various costs.

A minimum threshold of 40 per cent of responses was established for including journeyperson time, lost productive time of major assets, and wastage costs. Using this threshold, the measure of journeyperson time was included for all trades and the wastage measure was used in all except cases for Boilermaker, Partsperson, and Electrical Power Line & Cable Worker. However, the number of responses for each trade related to the lost productive time of major assets was insufficient to meet the 40 per cent threshold for inclusion.

With respect to disbursements, the survey provided respondents with a list of 13 different cost items. Only those disbursements where a minimum of 5 respondents indicated that they provided disbursements in those areas were included. Clearly, there is an element of arbitrariness in these rules, but imposing no rules would not lead to an accurate depiction of the common practices of apprentice hiring firms.

### *Pricing to Market*

The model was intended to demonstrate the actual cash flow cost and benefit to apprentice hiring firms. As such, it was important that the apprentice was priced to the market based on responses around average charge out rates and charge out hours for each year of apprenticeship. In the vast majority of cases, respondents indicated how they priced apprentices and journeypersons to the market, except trades for Cook, and Partsperson in which a 100% mark-up rate used.

### *Administration*

The survey questioned employers about their costs to administer their apprenticeship program. These costs varied considerably and the survey did not ask how the costs varied per year. As such, the reported administration costs were totaled and divided by the total number of apprentices for each trade. This value was allocated as a fixed per apprentice cost of administration

## An Illustrative Example: Automotive Service Technician

For illustrative purposes, the following table presents the calculations that were undertaken for the Automotive Service Technician trade. The total number of responses was 159 and these companies employ 433 apprentices.

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**

Notes:

In cases where means produce counterintuitive results, either the median (code 1), mode (code 2) or interpolation (code 3) was used.

Bold represents those numbers that are transferred to Exhibit 3.1 in Section 3.

### WORK HOURS

#### Step 1 Establish Parameters for Hours Worked Every Year

Line	Question	Variable	Computation	Value	Code
1	5a	Weekly Hours apprentices	Mean	40	
2	5b	Weekly Hours journeypersons	Mean	40	
3	6a	Days Worked per week apprentices	Mean	5	
4	6b	Days Worked per week journeypersons	Mean	5	
5	7a	Holiday weeks apprentices	Mean	2	
6	7c	Training weeks apprentices	Mean	6	
7	7e	Other reasons apprentices	Mean	0	
8	7b	Holiday weeks journeypersons	Mean	3	
9	7d	Training weeks journeypersons	Mean	0	
10	7f	Other reasons journeypersons	Mean	0	
11	Computed	Yearly weeks apprentices	52 - (Line 5 + Line 6 + Line 7)	44	
12	Computed	Yearly weeks journeypersons	52 - (Line 8 + Line 9 + Line 10)	49	

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**  
*(Continued)*

<b>BENEFITS</b>					
<b>Step 2 Financial Benefit Per Apprentice Based on Charge Out Responses</b>					
<b>Line</b>	<b>Question</b>	<b>Variable</b>	<b>Computation</b>	<b>Value</b>	<b>Code</b>
13	9b2jp	Journeyman weekly charge out hours	Mean	39	
14		Tradesperson weekly charge out hours	Mean	na	
15	9b21app	1st year apprentice weekly charge out hours	Mean	25	
16	9b22app	2nd year apprentice weekly charge out hours	Mean	29	
17	9b23app	3rd year apprentice weekly charge out hours	Mean	34	
18	9b24app	4th year apprentice weekly charge	Mean	37	3
19		5th year apprentice weekly charge out hours	Mean	na	
20	9b3jp	Journeyman charge out rate	Mean	\$82.46	1
21		Tradesperson weekly charge out rate	Mean	na	1
22	9b31app	1st year apprentice charge out rate	Mean	\$74.78	
23	9b32app	2nd year apprentice charge out rate	Mean	\$75.92	
24	9b33app	3rd year apprentice charge out rate	Mean	\$77.63	1
25	9b34app	4th year apprentice charge out rate	Mean	\$79.95	1
26		5th year apprentice charge out rate	Mean	na	
27	Computed	Journeyman weekly charge out revenue	Line 13 x Line 20	\$3,218.91	
28	Computed	Tradesperson weekly charge out revenue	Line 14 x Line 21	na	
29	Computed	1st year apprentice weekly charge out revenue	Line 15 x Line 22	\$1,869.92	
30	Computed	2nd year apprentice weekly charge out revenue	Line 16 x Line 23	\$2,191.77	
31	Computed	3rd year apprentice weekly charge out revenue	Line 17 x Line 24	\$2,645.25	
32	Computed	4th year apprentice weekly charge out revenue	Line 18 x Line 25	\$2,950.76	
33	Computed	5th year apprentice weekly charge out revenue	Line 19 x Line 26	na	
34	Computed	Journeyman yearly charge out revenue	Line 27 x Line 12	\$156,268.62	
35	Computed	Tradesperson yearly charge out revenue	Line 28 x Line 12	na	
36	Computed	1st year apprentice yearly charge out revenue	Line 29 x Line 11	\$81,927.82	
37	Computed	2nd year apprentice yearly charge out revenue	Line 30 x Line 11	\$96,029.04	
38	Computed	3rd year apprentice yearly charge out revenue	Line 31 x Line 11	\$115,897.79	
39	Computed	4th year apprentice yearly charge out revenue	Line 32 x Line 11	\$129,283.39	
40	Computed	5th year apprentice yearly charge out revenue	Line 33 x Line 11	na	

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**  
 (Continued)

<b>COSTS</b>					
<b>Step 3 Hourly Wage Rates</b>					
<b>Line</b>	<b>Question</b>	<b>Variable</b>	<b>Computation</b>	<b>Value</b>	<b>Code</b>
41	8a_jp	Journeyman hourly wage	Mean	\$26.33	
42		Tradesperson hourly wage	Mean	na	3
43	8a_1app	1st year apprentice hourly wage	Mean	\$13.03	
44	8a_2app	2nd year apprentice hourly wage	Mean	\$15.21	
45	8a_3app	3rd year apprentice hourly wage	Mean	\$18.05	
46	8a_4app	4th year apprentice hourly wage	Mean	\$21.33	
47		5th year apprentice hourly wage	Mean	na	
48	8a_per_jp	Journeyman markup statutory benefits %	Mean per cent	14.4	
49		Tradesperson markup statutory benefits %	Mean per cent	na	
50	8a_per_1app	1st year apprentice markup statutory benefits %	Mean per cent	13.9	
51	8a_per_2app	2nd year apprentice markup statutory benefits %	Mean per cent	14.0	
52	8a_per_3app	3rd year apprentice markup statutory benefits %	Mean per cent	14.1	
53	8a_per_4app	4th year apprentice markup statutory benefits %	Mean per cent	14.2	
54		5th year apprentice markup statutory benefits %	Mean per cent	na	
55	Computed	Journeyman marked up hourly wage	Line 41 x (1.Line 48)	\$30.12	
56	Computed	Tradesperson marked up hourly wage	Line 42 x (1.Line 49)	na	
57	Computed	1st year apprentice marked up hourly wage	Line 43 x (1.Line 50)	\$14.84	
58	Computed	2nd year apprentice marked up hourly wage	Line 44 x (1.Line 51)	\$17.34	
59	Computed	3rd year apprentice marked up hourly wage	Line 45 x (1.Line 52)	\$20.61	
60	Computed	4th year apprentice marked up hourly wage	Line 46 x (1.Line 53)	\$24.37	
61	Computed	5th year apprentice marked up hourly wage	Line 47 x (1.Line 54)	na	
<b>Step 4 Yearly Wage Costs Per Apprentice</b>					
<b>Line</b>	<b>Question</b>	<b>Variable</b>	<b>Computation</b>	<b>Value</b>	<b>Code</b>
62	Computed	1st year apprentice yearly wage cost	Line 1 x Line 11 x Line 57	\$26,264.79	
63	Computed	2nd year apprentice yearly wage cost	Line 1 x Line 11 x Line 58	\$30,698.28	
64	Computed	3rd year apprentice yearly wage cost	Line 1 x Line 11 x Line 59	\$36,480.73	
65	Computed	4th year apprentice yearly wage cost	Line 1 x Line 11 x Line 60	\$43,136.37	
66	Computed	5th year apprentice yearly wage cost	Line 1 x Line 11 x Line 61	na	

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**  
*(Continued)*

**OPPORTUNITY COSTS**

**Step 5    Journeyperson Time**

Line	Question	Variable	Computation	Value	Code
67	12a_1app	1st year apprentice use of journeyperson time	Mean per cent	27.10	
68	12a_2app	2nd year apprentice use of journeyperson time	Mean per cent	22.59	
69	12a_3app	3rd year apprentice use of journeyperson time	Mean per cent	16.90	
70	12a_4app	4th year apprentice use of journeyperson time	Mean per cent	11.99	
71		5th year apprentice use of journeyperson time	Mean per cent	na	
72	12b_1app	1st year apprentice use of chargeable time	Mean per cent	19.01	
73	12b_2app	2nd year apprentice use of chargeable time	Mean per cent	23.83	
74	12b_3app	3rd year apprentice use of chargeable time	Mean per cent	22.59	
75	12b_4app	4th year apprentice use of chargeable time	Mean per cent	31.03	
76		5th year apprentice use of chargeable time	Mean per cent	na	
77	Computed	1st year apprentice use of chargeable time	Line 34 x (Line 67% x (100%-Line 72%))	\$34,304.71	
78	Computed	2nd year apprentice use of chargeable time	Line 34 x (Line 68% x (100%-Line 73%))	\$26,890.31	
79	Computed	3rd year apprentice use of chargeable time	Line 34 x (Line 69% x (100%-Line 74%))	\$20,442.07	
80	Computed	4th year apprentice use of chargeable time	Line 34 x (Line 70% x (100%-Line 75%))	\$12,921.84	
81	Computed	5th year apprentice use of chargeable time	Line 34 x (Line 71% x (100%-Line 76%))	na	

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**  
 (Continued)

**OPPORTUNITY COSTS**

<b>Step 6 Lost Productivity From Major Assets</b> (Per cent responding “Yes” must be at least 40 per cent for inclusion)					
<b>Line</b>	<b>Question</b>	<b>Variable</b>	<b>Computation</b>	<b>Value</b>	<b>Code</b>
82	14a	Does the organization have major assets	Per cent responding yes	9.5%	
83	17a <sup>ii</sup>	Lease cost of asset 1	Mean	na	
84	17b <sup>ii</sup>	Lease cost of asset 2	Mean	na	
85	17c <sup>ii</sup>	Lease cost of asset 3	Mean	na	
86	17d <sup>ii</sup>	Lease cost of asset 4	Mean	na	
87	17e <sup>ii</sup>	Lease cost of asset 5	Mean	na	
88	17a <sup>iii</sup>	Percent used unproductively asset 1	Mean	na	
89	17b <sup>iii</sup>	Percent used unproductively asset 2	Mean	na	
90	17c <sup>iii</sup>	Percent used unproductively asset 3	Mean	na	
91	17d <sup>iii</sup>	Percent used unproductively asset 4	Mean	na	
92	17e <sup>iii</sup>	Percent used unproductively asset 5	Mean	na	
93	Computed	Lost productivity in asset 1	Line 83 x Line 88	na	
94	Computed	Lost productivity in asset 2	Line 84 x Line 89	na	
95	Computed	Lost productivity in asset 3	Line 85 x Line 90	na	
96	Computed	Lost productivity in asset 4	Line 86 x Line 91	na	
97	Computed	Lost productivity in asset 5	Line 87 x Line 92	na	
98	Computed	Total lost productivity	Sum(Line 93 to Line 97)	na	
<b>Step 7 Wastage</b> (Per cent responding “Yes” must be at least 40 per cent for inclusion)					
<b>Line</b>	<b>Question</b>	<b>Variable</b>	<b>Computation</b>	<b>Value</b>	<b>Code</b>
99	15a	Do apprentices waste material that cannot be charged	Per cent responding yes	54%	
100	15b_1 <sup>app</sup>	1st year apprentice uncharged material wastage	Mean	\$4,755.01	
101	15b_2 <sup>app</sup>	2nd year apprentice uncharged material wastage	Mean	\$3,102.86	
102	15b_3 <sup>app</sup>	3rd year apprentice uncharged material wastage	Mean	\$2,229.89	
103	15b_4 <sup>app</sup>	4th year apprentice uncharged material wastage	Mean	\$1,120.19	
104		5th year apprentice uncharged material wastage	Mean	na	

**Figure C.2**  
**Stepwise Calculation – Automotive Service Technician**  
*(Continued)*

**DISBURSEMENTS**

**Step 8 Disbursements** (Number responding “Yes” must be at least 5 for inclusion)

Line	Question	Variable	Computation	Value	Code
105	17a	Registration	Mean	\$259.64	
106	17b	Top up EI	Mean	\$433.03	
107	17c	Health	Mean	\$326.84	
108	17d	Wages while in school	Mean	\$1,465.27	
109	17e	Tuition	Mean	\$451.96	
110	17f	Tools	Mean	\$445.02	
111	17g	Scholarships	Mean		
112	17h	Equipment	Mean		
113	17i	Vehicle	Mean		
114	17j	Continuing ed	Mean	\$622.80	
115	17k	Skills competitions	Mean		
116	17l	Other cash	Mean	\$579.50	
117					
118	Computed	Total disbursements	Sum(Line 105 to Line 117)	\$4,584.07	
119	18_1app	1st year apprentice share of disbursements	Adjusted mean %, sum must = 100%	36.7%	
120	18_2app	2nd year apprentice share of disbursements	Adjusted mean %, sum must = 100%	23.3%	
121	18_3app	3rd year apprentice share of disbursements	Adjusted mean %, sum must = 100%	22.4%	
122	18_4app	4th year apprentice share of disbursements	Adjusted mean %, sum must = 100%	17.7%	
123		5th year apprentice share of disbursements	Adjusted mean %, sum must = 100%	na	
124	Computed	1st year apprentice dollar disbursement	Line 119 x Line 118	\$1,682.35	
125	Computed	2nd year apprentice dollar disbursement	Line 120 x Line 118	\$1,068.09	
126	Computed	3rd year apprentice dollar disbursement	Line 121 x Line 118	\$1,026.83	
127	Computed	4th year apprentice dollar disbursement	Line 122 x Line 118	\$811.38	
128	Computed	5th year apprentice dollar disbursement	Line 123 x Line 118	na	

**PROGRAM OPERATING COSTS**

**Step 9 Operating costs** (Number responding “Yes” must be at least 5 for inclusion)

Line	Question	Variable	Computation	Value	Code
129	21	Total staff costs	Sum for sample	\$237,670.21	
130	Computed	Per apprentice staff admin costs	Line 129/total apprentices	\$536.50	

## Appendix D: Detailed Cost-Benefit Results by Region

### Automotive Services Technician

**Figure D.1**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Automotive Service Technician – Overall (n=159)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 81,927.82	\$ 96,029.04	\$ 115,897.79	\$ 129,283.39	\$ 423,138.04
<b>Costs</b>					
Wages and Benefits	\$ 26,273.13	\$ 30,747.62	\$ 36,583.27	\$ 43,316.66	\$ 136,920.68
Journeyman Time	\$ 34,304.71	\$ 26,890.31	\$ 20,442.07	\$ 12,921.84	\$ 94,558.92
Wastage	\$ 4,755.01	\$ 3,102.86	\$ 2,229.89	\$ 1,120.19	\$ 11,207.95
Disbursements	\$ 1,682.35	\$ 1,068.09	\$ 1,026.83	\$ 811.38	\$ 4,588.65
Administration	\$ 684.93	\$ 684.93	\$ 684.93	\$ 684.93	\$ 2,739.71
Total	\$ 67,700.12	\$ 62,493.81	\$ 60,966.99	\$ 58,854.99	\$ 250,015.91
<b>Net Benefit</b>	<b>\$ 14,227.70</b>	<b>\$ 33,535.23</b>	<b>\$ 54,930.81</b>	<b>\$ 70,428.39</b>	<b>\$ 173,122.13</b>

**Figure D.2**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Automotive Service Technician – West (n=66)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 86,567.94	\$ 103,191.68	\$ 117,694.36	\$ 136,021.51	\$ 443,475.49
<b>Costs</b>					
Wages and Benefits	\$ 36,283.33	\$ 36,283.33	\$ 42,764.24	\$ 50,298.28	\$ 165,629.18
Journeyman Time	\$ 36,947.39	\$ 28,291.92	\$ 20,431.25	\$ 13,586.87	\$ 99,257.43
Wastage	\$ 5,598.50	\$ 3,623.38	\$ 2,486.92	\$ 1,201.12	\$ 12,909.92
Disbursements	\$ 1,491.05	\$ 913.86	\$ 787.60	\$ 577.19	\$ 3,769.71
Administration	\$ 378.63	\$ 378.63	\$ 378.63	\$ 378.63	\$ 1,514.53
Total	\$ 80,698.91	\$ 69,491.12	\$ 66,848.64	\$ 66,042.10	\$ 283,080.77
<b>Net Benefit</b>	<b>\$ 5,869.03</b>	<b>\$ 33,700.56</b>	<b>\$ 50,845.72</b>	<b>\$ 69,979.41</b>	<b>\$ 160,394.72</b>

**Figure D.3  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Automotive Service Technician – Ontario (n=43)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 72,143.01	\$ 95,667.48	\$ 116,312.30	\$ 133,923.20	\$ 418,046.00
<b>Costs</b>					
Wages and Benefits	\$ 24,872.22	\$ 29,079.16	\$ 35,588.72	\$ 43,321.11	\$ 132,861.21
Journeyman Time	\$ 41,867.39	\$ 30,582.52	\$ 25,091.88	\$ 11,635.24	\$ 109,177.03
Wastage	\$ 5,748.27	\$ 3,973.24	\$ 2,592.55	\$ 978.91	\$ 13,292.96
Disbursements	\$ 541.55	\$ 212.05	\$ 235.66	\$ 194.91	\$ 1,184.16
Administration	\$ 782.25	\$ 782.25	\$ 782.25	\$ 782.25	\$ 3,128.98
Total	\$ 73,811.68	\$ 64,629.21	\$ 64,291.05	\$ 56,912.41	\$ 259,644.35
<b>Net Benefit</b>	<b>\$ (1,668.67)</b>	<b>\$ 31,038.28</b>	<b>\$ 52,021.25</b>	<b>\$ 77,010.79</b>	<b>\$ 158,401.65</b>

**Figure D.4  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Automotive Service Technician – Quebec (n=48)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 81,115.80	\$ 90,934.63	\$ 110,215.40	\$ 122,828.88	\$ 405,094.71
<b>Costs</b>					
Wages and Benefits	\$ 23,251.02	\$ 26,787.02	\$ 31,484.86	\$ 36,621.90	\$ 118,144.79
Journeyman Time	\$ 26,634.82	\$ 23,462.59	\$ 18,618.76	\$ 13,753.87	\$ 82,470.04
Wastage	\$ 2,728.52	\$ 1,651.41	\$ 1,477.87	\$ 1,048.41	\$ 6,906.21
Disbursements	\$ 1,207.85	\$ 607.14	\$ 640.40	\$ 375.44	\$ 2,830.84
Administration	\$ 588.45	\$ 588.45	\$ 588.45	\$ 588.45	\$ 2,353.79
Total	\$ 54,410.66	\$ 53,096.61	\$ 52,810.33	\$ 52,388.06	\$ 212,705.67
<b>Net Benefit</b>	<b>\$ 26,705.13</b>	<b>\$ 37,838.02</b>	<b>\$ 57,405.07</b>	<b>\$ 70,440.82</b>	<b>\$ 192,389.04</b>

Because of the small sample size of employers in Atlantic Canada, the analysis of costs & benefits for Automotive Service Technician in this region was not performed and presented.

## Refrigeration & Air Conditioning Mechanic

**Figure D.5**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – Overall (n=118)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$65,018.57	\$ 83,084.99	\$ 91,520.04	\$ 104,977.74	\$ 344,601.34
<b>Costs</b>					
Wages and Benefits	\$30,048.87	\$ 36,929.08	\$ 44,994.05	\$ 54,012.59	\$ 165,984.60
Journeyman Time	\$24,079.34	\$ 18,351.46	\$ 9,603.29	\$ 5,549.45	\$ 57,583.55
Wastage	\$ 2,858.10	\$ 2,234.46	\$ 1,531.62	\$ 1,127.89	\$ 7,752.08
Disbursements	\$ 1,872.66	\$ 1,536.91	\$ 1,389.75	\$ 1,288.34	\$ 6,087.66
Administration	\$ 663.03	\$ 663.03	\$ 663.03	\$ 663.03	\$ 2,652.13
<b>Total</b>	<b>\$59,522.01</b>	<b>\$ 59,714.94</b>	<b>\$ 58,181.75</b>	<b>\$ 62,641.31</b>	<b>\$ 240,060.01</b>
<b>Net Benefit</b>	<b>\$ 5,496.56</b>	<b>\$ 23,370.04</b>	<b>\$ 33,338.30</b>	<b>\$ 42,336.43</b>	<b>\$ 104,541.33</b>

**Figure D.6**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – West (n=45)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$72,983.30	\$ 91,600.09	\$ 110,740.50	\$ 120,256.66	\$ 395,580.55
<b>Costs</b>					
Wages and Benefits	\$31,427.27	\$ 39,005.43	\$ 47,671.39	\$ 57,111.68	\$ 175,215.77
Journeyman Time	\$22,009.10	\$ 17,881.31	\$ 13,731.03	\$ 4,617.03	\$ 58,238.47
Wastage	\$ 3,017.54	\$ 2,376.66	\$ 1,722.93	\$ 1,330.61	\$ 8,447.74
Disbursements	\$ 1,439.28	\$ 1,073.53	\$ 1,498.60	\$ 1,340.43	\$ 5,351.85
Administration	\$ 756.38	\$ 756.38	\$ 756.38	\$ 756.38	\$ 3,025.51
<b>Total</b>	<b>\$58,649.57</b>	<b>\$ 61,093.32</b>	<b>\$ 65,380.32</b>	<b>\$ 65,156.13</b>	<b>\$ 250,279.34</b>
<b>Net Benefit</b>	<b>\$14,333.73</b>	<b>\$ 30,506.77</b>	<b>\$ 45,360.18</b>	<b>\$ 55,100.52</b>	<b>\$ 145,301.21</b>

**Figure D.7**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – Ontario (n=43)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$53,817.02	\$ 81,022.34	\$ 75,537.94	\$ 104,724.46	\$ 315,101.76
<b>Costs</b>					
Wages and Benefits	\$28,501.93	\$ 36,274.57	\$ 44,543.76	\$ 53,689.28	\$ 163,009.54
Journeyman Time	\$33,188.87	\$ 21,476.41	\$ 10,183.65	\$ 8,883.20	\$ 73,732.13
Wastage	\$ 2,066.36	\$ 1,615.26	\$ 1,117.29	\$ 789.53	\$ 5,588.44
Disbursements	\$ 1,561.99	\$ 1,306.53	\$ 886.83	\$ 547.43	\$ 4,302.78
Administration	\$ 587.73	\$ 587.73	\$ 587.73	\$ 587.73	\$ 2,350.92
Total	\$65,906.89	\$ 61,260.50	\$ 57,319.27	\$ 64,497.16	\$ 248,983.82
<b>Net Benefit</b>	<b>\$ (12,089.87)</b>	<b>\$ 19,761.84</b>	<b>\$ 18,218.67</b>	<b>\$ 40,227.30</b>	<b>\$ 66,117.95</b>

**Figure D.8**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – Quebec (n=13)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 68,973.54	\$ 75,720.25	\$ 98,129.48	\$ 98,931.06	\$ 341,754.33
<b>Costs</b>					
Wages and Benefits	\$ 31,885.16	\$ 39,885.55	\$ 48,774.84	\$ 56,720.86	\$ 177,266.41
Journeyman Time	\$ 10,160.04	\$ 12,119.53	\$ 2,546.57	\$ 2,347.89	\$ 27,174.04
Wastage					\$ -
Disbursements					\$ -
Administration	\$ 113.33	\$ 113.33	\$ 113.33	\$ 113.33	\$ 453.33
Total	\$ 42,158.53	\$ 52,118.42	\$ 51,434.74	\$ 59,182.09	\$ 204,893.78
<b>Net Benefit</b>	<b>\$ 26,815.01</b>	<b>\$ 23,601.84</b>	<b>\$ 46,694.73</b>	<b>\$ 39,748.97</b>	<b>\$ 136,860.55</b>

**Figure D.9**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – Atlantic (n=17)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 56,841.55	\$ 60,081.48	\$ 71,290.16	\$ 85,822.15	\$ 274,035.34
<b>Costs</b>					
Wages and Benefits	\$ 26,940.11	\$ 28,154.95	\$ 32,636.04	\$ 40,654.66	\$ 128,385.76
Journeyman Time	\$ 21,769.45	\$ 16,410.56	\$ 8,708.47	\$ 4,000.57	\$ 50,889.05
Wastage	\$ 4,777.16	\$ 3,646.29	\$ 2,183.33	\$ 1,447.88	\$ 12,054.66
Disbursements	\$ 428.34	\$ 327.04	\$ 327.19	\$ 278.20	\$ 1,360.77
Administration	\$ 881.52	\$ 881.52	\$ 881.52	\$ 881.52	\$ 3,526.09
Total	\$ 54,796.58	\$ 49,420.37	\$ 44,736.55	\$ 47,262.82	\$ 196,216.32
<b>Net Benefit</b>	<b>\$ 2,044.97</b>	<b>\$ 10,661.11</b>	<b>\$ 26,553.61</b>	<b>\$ 38,559.33</b>	<b>\$ 77,819.02</b>

## Construction Electrician

**Figure D.10**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – Overall (n=166)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 60,447.51	\$ 66,721.49	\$ 77,827.35	\$ 88,051.58	\$ 293,047.93
<b>Costs</b>					
Wages and Benefits	\$ 29,056.83	\$ 35,396.78	\$ 42,191.38	\$ 50,219.16	\$ 156,864.16
Journeyman Time	\$ 11,879.41	\$ 8,321.64	\$ 6,282.19	\$ 3,573.05	\$ 30,056.29
Wastage	\$ 2,492.91	\$ 1,345.44	\$ 925.57	\$ 819.03	\$ 5,582.94
Disbursements	\$ 987.91	\$ 704.12	\$ 693.39	\$ 701.23	\$ 3,086.66
Administration	\$ 305.14	\$ 305.14	\$ 305.14	\$ 305.14	\$ 1,220.58
Total	\$ 44,722.21	\$ 46,073.12	\$ 50,397.67	\$ 55,617.62	\$ 196,810.62
<b>Net Benefit</b>	<b>\$ 15,725.30</b>	<b>\$ 20,648.37</b>	<b>\$ 27,429.68</b>	<b>\$ 32,433.96</b>	<b>\$ 96,237.30</b>

**Figure D.11**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – West (n=67)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 56,384.24	\$67,145.80	\$79,298.64	\$ 91,036.35	\$ 293,865.03
<b>Costs</b>					
Wages and Benefits	\$ 31,402.23	\$37,994.37	\$44,874.04	\$ 52,456.38	\$ 166,727.02
Journeyman Time	\$ 10,415.00	\$ 7,025.79	\$ 4,730.58	\$ 2,176.40	\$ 24,347.77
Wastage	\$ 1,307.75	\$ 930.32	\$ 741.94	\$ 578.83	\$ 3,558.84
Disbursements	\$ 898.91	\$ 570.60	\$ 610.03	\$ 675.98	\$ 2,755.52
Administration	\$ 292.26	\$ 292.26	\$ 292.26	\$ 292.26	\$ 1,169.04
Total	\$ 44,316.16	\$46,813.35	\$51,248.84	\$ 56,179.84	\$ 198,558.18
<b>Net Benefit</b>	<b>\$ 12,068.09</b>	<b>\$20,332.45</b>	<b>\$28,049.81</b>	<b>\$ 34,856.51</b>	<b>\$ 95,306.85</b>

**Figure D.12**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – Ontario (n=50)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 61,790.73	\$66,233.50	\$75,489.03	\$ 84,994.46	\$ 288,507.72
<b>Costs</b>					
Wages and Benefits	\$ 27,132.87	\$33,758.97	\$41,005.83	\$ 49,405.73	\$ 151,303.41
Journeyman Time	\$ 14,786.49	\$10,976.00	\$ 7,448.02	\$ 4,826.51	\$ 38,037.02
Wastage	\$ 1,543.76	\$ 795.01	\$ 546.78	\$ 494.18	\$ 3,379.72
Disbursements	\$ 1,047.55	\$ 566.24	\$ 664.66	\$ 711.85	\$ 2,990.29
Administration	\$ 438.87	\$ 438.87	\$ 438.87	\$ 438.87	\$ 1,755.49
Total	\$ 44,949.54	\$46,535.09	\$50,104.16	\$ 55,877.13	\$ 197,465.93
<b>Net Benefit</b>	<b>\$ 16,841.19</b>	<b>\$19,698.40</b>	<b>\$25,384.87</b>	<b>\$ 29,117.32</b>	<b>\$ 91,041.79</b>

**Figure D.13**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – Quebec (n=20)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 78,669.08	\$79,896.10	\$99,873.07	\$ 109,201.24	\$ 367,639.48
<b>Costs</b>					
Wages and Benefits	\$ 33,299.70	\$40,310.48	\$47,885.14	\$ 57,562.60	\$ 179,057.92
Journeyman Time	\$ 11,962.62	\$ 9,656.02	\$11,538.03	\$ 7,334.28	\$ 40,490.96
Wastage					\$ -
Disbursements					\$ -
Administration	\$ 102.94	\$ 102.94	\$ 102.94	\$ 102.94	\$ 411.76
<b>Total</b>	<b>\$ 45,365.26</b>	<b>\$50,069.44</b>	<b>\$59,526.11</b>	<b>\$ 64,999.83</b>	<b>\$ 219,960.64</b>
<b>Net Benefit</b>	<b>\$ 33,303.82</b>	<b>\$29,826.65</b>	<b>\$40,346.96</b>	<b>\$ 44,201.41</b>	<b>\$ 147,678.84</b>

**Figure D.14**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – Atlantic (n=29)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 52,860.33	\$57,609.19	\$63,493.06	\$ 75,626.30	\$ 249,588.88
<b>Costs</b>					
Wages and Benefits	\$ 23,153.73	\$27,531.54	\$32,589.81	\$ 39,930.69	\$ 123,205.77
Journeyman Time	\$ 10,248.56	\$ 6,042.27	\$ 4,875.29	\$ 2,918.59	\$ 24,084.72
Wastage	\$ 6,735.92	\$ 3,339.86	\$ 2,054.36	\$ 1,935.09	\$ 14,065.23
Disbursements	\$ 65.25	\$ 68.97	\$ 66.74	\$ 52.10	\$ 253.07
Administration	\$ 149.99	\$ 149.99	\$ 149.99	\$ 149.99	\$ 599.97
<b>Total</b>	<b>\$ 40,353.45</b>	<b>\$37,132.64</b>	<b>\$39,736.19</b>	<b>\$ 44,986.47</b>	<b>\$ 162,208.76</b>
<b>Net Benefit</b>	<b>\$ 12,506.88</b>	<b>\$20,476.55</b>	<b>\$23,756.87</b>	<b>\$ 30,639.83</b>	<b>\$ 87,380.13</b>

## Appendix E: Detailed Cost-Benefit Results by Employer Size

### Automotive Services Technician

**Figure E.1**  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Automotive Service Technician – Overall (n=159)

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 81,927.82	\$ 96,029.04	\$ 115,897.79	\$ 129,283.39	\$ 423,138.04
<b>Costs</b>					
Wages and Benefits	\$ 26,273.13	\$ 30,747.62	\$ 36,583.27	\$ 43,316.66	\$ 136,920.68
Journeyman Time	\$ 34,304.71	\$ 26,890.31	\$ 20,442.07	\$ 12,921.84	\$ 94,558.92
Wastage	\$ 4,755.01	\$ 3,102.86	\$ 2,229.89	\$ 1,120.19	\$ 11,207.95
Disbursements	\$ 1,682.35	\$ 1,068.09	\$ 1,026.83	\$ 811.38	\$ 4,588.65
Administration	\$ 536.50	\$ 536.50	\$ 536.50	\$ 536.50	\$ 2,146.01
Total	\$ 67,551.70	\$ 62,345.38	\$ 60,818.56	\$ 58,706.57	\$ 249,422.20
<b>Net Benefit</b>	<b>\$ 14,376.12</b>	<b>\$ 33,683.66</b>	<b>\$ 55,079.23</b>	<b>\$ 70,576.82</b>	<b>\$ 173,715.83</b>

**Figure E.2**  
Per Apprentice Costs and Benefits by Year of Apprenticeship –  
Automotive Service Technician – <10 employees (n=81)

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 71,332.31	\$ 80,745.40	\$ 94,914.83	\$ 101,043.58	\$ 348,036.11
<b>Costs</b>					
Wages and Benefits	\$ 24,164.48	\$ 28,520.02	\$ 34,243.20	\$ 40,538.83	\$ 127,466.53
Journeyman Time	\$ 28,785.84	\$ 24,141.32	\$ 17,435.13	\$ 9,366.68	\$ 79,728.97
Wastage	\$ 4,837.39	\$ 3,087.85	\$ 2,239.83	\$ 1,165.76	\$ 11,330.83
Disbursements	\$ 1,059.80	\$ 359.95	\$ 373.14	\$ 180.07	\$ 1,972.96
Administration	\$ 573.02	\$ 573.02	\$ 573.02	\$ 573.02	\$ 2,292.07
Total	\$ 59,420.53	\$ 56,682.16	\$ 54,864.31	\$ 51,824.36	\$ 222,791.36
<b>Net Benefit</b>	<b>\$ 11,911.78</b>	<b>\$ 24,063.24</b>	<b>\$ 40,050.51</b>	<b>\$ 49,219.22</b>	<b>\$ 125,244.75</b>

**Figure E.3**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Automotive Service Technician – 10 to 19 employees (n=32)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 83,158.21	\$ 95,944.23	\$ 130,796.68	\$ 166,082.50	\$ 475,981.62
<b>Costs</b>					
Wages and Benefits	\$ 30,951.04	\$ 36,122.43	\$ 42,458.84	\$ 50,688.51	\$ 160,220.81
Journeyman Time	\$ 25,158.81	\$ 27,533.98	\$ 21,024.96	\$ 14,885.70	\$ 88,603.44
Wastage	\$ 8,422.99	\$ 5,867.10	\$ 4,043.15	\$ 1,519.05	\$ 19,852.30
Disbursements	\$ 567.28	\$ 480.36	\$ 457.49	\$ 361.41	\$ 1,866.54
Administration	\$ 83.81	\$ 83.81	\$ 83.81	\$ 83.81	\$ 335.23
<b>Total</b>	<b>\$ 65,183.93</b>	<b>\$ 70,087.67</b>	<b>\$ 68,068.24</b>	<b>\$ 67,538.49</b>	<b>\$ 270,878.33</b>
<b>Net Benefit</b>	<b>\$ 17,974.28</b>	<b>\$ 25,856.55</b>	<b>\$ 62,728.44</b>	<b>\$ 98,544.02</b>	<b>\$ 205,103.29</b>

**Figure E.4**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Automotive Service Technician – 20+ employees (n=46)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 97,015.99	\$ 116,830.77	\$ 137,527.82	\$ 146,274.02	\$ 497,648.60
<b>Costs</b>					
Wages and Benefits	\$ 28,396.79	\$ 32,517.89	\$ 38,360.62	\$ 44,753.75	\$ 144,029.06
Journeyman Time	\$ 38,192.98	\$ 28,346.49	\$ 21,708.49	\$ 15,042.58	\$ 103,290.53
Wastage	\$ 1,397.84	\$ 810.07	\$ 665.01	\$ 676.61	\$ 3,549.53
Disbursements	\$ 908.42	\$ 742.83	\$ 649.38	\$ 579.59	\$ 2,880.22
Administration	\$ 851.19	\$ 851.19	\$ 851.19	\$ 851.19	\$ 3,404.77
<b>Total</b>	<b>\$ 69,747.22</b>	<b>\$ 63,268.47</b>	<b>\$ 62,234.70</b>	<b>\$ 61,903.72</b>	<b>\$ 257,154.11</b>
<b>Net Benefit</b>	<b>\$ 27,268.77</b>	<b>\$ 53,562.30</b>	<b>\$ 75,293.12</b>	<b>\$ 84,370.30</b>	<b>\$ 240,494.49</b>

## Refrigeration & Air Conditioning Mechanic

**Figure E.5**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – Overall (n=118)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 52,133.61	\$ 71,936.56	\$ 78,185.40	\$ 94,278.52	\$ 296,534.10
<b>Costs</b>					
Wages and Benefits	\$ 28,342.06	\$ 34,708.26	\$ 42,175.75	\$ 50,218.01	\$ 155,444.09
Journeyman Time	\$ 28,371.07	\$ 21,883.59	\$ 12,438.00	\$ 6,633.84	\$ 69,326.50
Wastage	\$ 3,109.39	\$ 2,519.03	\$ 1,605.48	\$ 1,147.97	\$ 8,381.88
Disbursements	\$ 1,190.78	\$ 1,208.83	\$ 757.58	\$ 577.76	\$ 3,734.95
Administration	\$ 744.11	\$ 744.11	\$ 744.11	\$ 744.11	\$ 2,976.46
Total	\$ 61,757.42	\$ 61,063.83	\$ 57,720.93	\$ 59,321.70	\$ 239,863.88
<b>Net Benefit</b>	<b>\$ (9,623.81)</b>	<b>\$ 10,872.73</b>	<b>\$ 20,464.47</b>	<b>\$ 34,956.83</b>	<b>\$ 56,670.22</b>

**Figure E.6**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – <10 (n=62)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 52,133.61	\$ 71,936.56	\$ 78,185.40	\$ 94,278.52	\$ 296,534.10
<b>Costs</b>					
Wages and Benefits	\$ 28,342.06	\$ 34,708.26	\$ 42,175.75	\$ 50,218.01	\$ 155,444.09
Journeyman Time	\$ 28,371.07	\$ 21,883.59	\$ 12,438.00	\$ 6,633.84	\$ 69,326.50
Wastage	\$ 3,109.39	\$ 2,519.03	\$ 1,605.48	\$ 1,147.97	\$ 8,381.88
Disbursements	\$ 1,190.78	\$ 1,208.83	\$ 757.58	\$ 577.76	\$ 3,734.95
Administration	\$ 744.11	\$ 744.11	\$ 744.11	\$ 744.11	\$ 2,976.46
Total	\$ 61,757.42	\$ 61,063.83	\$ 57,720.93	\$ 59,321.70	\$ 239,863.88
<b>Net Benefit</b>	<b>\$ (9,623.81)</b>	<b>\$ 10,872.73</b>	<b>\$ 20,464.47</b>	<b>\$ 34,956.83</b>	<b>\$ 56,670.22</b>

**Figure E.7**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – 10 to 19 employees (n=62)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 70,114.97	\$ 92,146.09	\$ 96,186.38	\$ 122,137.88	\$ 380,585.31
<b>Costs</b>					
Wages and Benefits	\$ 30,598.45	\$ 37,623.97	\$ 46,272.72	\$ 58,279.26	\$ 172,774.40
Journeyman Time	\$ 21,742.70	\$ 20,397.56	\$ 10,934.79	\$ 4,670.24	\$ 57,745.30
Wastage	\$ 2,066.36	\$ 1,615.26	\$ 1,117.29	\$ 789.53	\$ 5,588.44
Disbursements	\$ 891.22	\$ 271.90	\$ 362.53	\$ 385.19	\$ 1,910.83
Administration	\$ 732.74	\$ 732.74	\$ 732.74	\$ 732.74	\$ 2,930.96
Total	\$ 56,031.47	\$ 60,641.43	\$ 59,420.08	\$ 64,856.96	\$ 240,949.93
<b>Net Benefit</b>	<b>\$ 14,083.50</b>	<b>\$ 31,504.66</b>	<b>\$ 36,766.31</b>	<b>\$ 57,280.92</b>	<b>\$ 139,635.38</b>

**Figure E.8**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Refrigeration & Air Conditioning Mechanic – 20+ (n=32)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 85,071.16	\$ 91,546.81	\$ 100,491.75	\$ 112,793.90	\$ 389,903.63
<b>Costs</b>					
Wages and Benefits	\$ 33,190.40	\$ 33,190.40	\$ 49,644.90	\$ 58,298.99	\$ 174,324.68
Journeyman Time	\$ 15,621.46	\$ 12,776.07	\$ 5,362.96	\$ 4,981.69	\$ 38,742.19
Wastage	\$ 3,406.71	\$ 2,638.47	\$ 1,846.94	\$ 1,274.55	\$ 9,166.67
Disbursements	\$ 585.88	\$ 650.17	\$ 771.48	\$ 633.19	\$ 2,640.73
Administration	\$ 578.55	\$ 578.55	\$ 578.55	\$ 578.55	\$ 2,314.19
Total	\$ 53,383.00	\$ 49,833.65	\$ 58,204.82	\$ 65,766.97	\$ 227,188.45
<b>Net Benefit</b>	<b>\$ 31,688.16</b>	<b>\$ 41,713.16</b>	<b>\$ 42,286.93</b>	<b>\$ 47,026.93</b>	<b>\$ 162,715.18</b>

## Construction Electrician

**Figure E.9**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – Overall (n=166)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 60,447.51	\$ 65,794.80	\$ 76,682.83	\$ 86,675.77	\$289,600.91
<b>Costs</b>					
Wages and Benefits	\$ 29,164.61	\$ 35,524.03	\$ 42,334.22	\$ 50,393.98	\$157,416.83
Journeyman Time	\$ 12,064.64	\$ 8,358.17	\$ 6,299.26	\$ 3,583.10	\$ 30,305.17
Wastage	\$ 2,520.50	\$ 1,360.49	\$ 936.08	\$ 819.03	\$ 5,636.09
Disbursements	\$ 1,396.53	\$ 1,051.84	\$ 1,027.30	\$ 976.89	\$ 4,452.56
Administration	\$ 305.14	\$ 305.14	\$ 305.14	\$ 305.14	\$ 1,220.58
Total	\$ 45,451.42	\$ 46,599.67	\$ 50,902.01	\$ 56,078.13	\$199,031.23
<b>Net Benefit</b>	<b>\$ 14,996.09</b>	<b>\$ 19,195.13</b>	<b>\$ 25,780.82</b>	<b>\$ 30,597.64</b>	<b>\$ 90,569.68</b>

**Figure E.10**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – <10 (n=87)**

	Year 1	Year 2	Year 3	Year 4	Total
<b>Benefits</b>					
Attributed Revenue	\$ 53,943.16	\$ 60,386.42	\$ 73,417.98	\$ 85,882.65	\$273,630.21
<b>Costs</b>					
Wages and Benefits	\$ 26,814.14	\$ 32,913.46	\$ 39,463.62	\$ 47,320.46	\$146,511.67
Journeyman Time	\$ 13,330.70	\$ 8,604.54	\$ 6,475.17	\$ 2,933.38	\$ 31,343.80
Wastage	\$ 1,451.14	\$ 938.85	\$ 684.32	\$ 559.55	\$ 3,633.86
Disbursements	\$ 807.18	\$ 505.33	\$ 470.29	\$ 532.28	\$ 2,315.08
Administration	\$ 601.43	\$ 601.43	\$ 601.43	\$ 601.43	\$ 2,405.72
Total	\$ 43,004.59	\$ 43,563.60	\$ 47,694.84	\$ 51,947.10	\$186,210.14
<b>Net Benefit</b>	<b>\$ 10,938.57</b>	<b>\$ 16,822.82</b>	<b>\$ 25,723.14</b>	<b>\$ 33,935.55</b>	<b>\$ 87,420.07</b>

**Figure E.11**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – 10 to 19 (n=32)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 68,344.33	\$ 74,241.50	\$ 82,146.32	\$ 94,367.66	\$ 319,099.82
<b>Costs</b>					
Wages and Benefits	\$ 29,916.62	\$ 35,790.67	\$ 42,122.48	\$ 49,942.13	\$ 157,771.90
Journeyman Time	\$ 6,239.21	\$ 5,940.25	\$ 2,787.32	\$ 2,565.30	\$ 17,532.07
Wastage	\$ 753.22	\$ 444.30	\$ 263.67	\$ 298.04	\$ 1,759.23
Disbursements	\$ 411.97	\$ 281.24	\$ 278.41	\$ 247.32	\$ 1,218.95
Administration	\$ 177.04	\$ 177.04	\$ 177.04	\$ 177.04	\$ 708.16
<b>Total</b>	<b>\$ 37,498.05</b>	<b>\$ 42,633.50</b>	<b>\$ 45,628.93</b>	<b>\$ 53,229.83</b>	<b>\$ 178,990.31</b>
<b>Net Benefit</b>	<b>\$ 30,846.27</b>	<b>\$ 31,608.01</b>	<b>\$ 36,517.39</b>	<b>\$ 41,137.84</b>	<b>\$ 140,109.51</b>

**Figure E.12**  
**Per Apprentice Costs and Benefits by Year of Apprenticeship –**  
**Construction Electrician – 20+ (n=47)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total</b>
<b>Benefits</b>					
Attributed Revenue	\$ 66,293.66	\$ 70,921.33	\$ 80,692.74	\$ 86,199.07	\$ 304,106.81
<b>Costs</b>					
Wages and Benefits	\$ 32,705.67	\$ 39,788.79	\$ 47,344.93	\$ 55,788.93	\$ 175,628.33
Journeyman Time	\$ 13,061.41	\$ 9,799.92	\$ 7,913.06	\$ 4,762.15	\$ 35,536.54
Wastage	\$ 7,524.46	\$ 3,535.98	\$ 2,350.75	\$ 2,138.25	\$ 15,549.44
Disbursements	\$ 528.52	\$ 401.74	\$ 449.85	\$ 433.81	\$ 1,813.92
Administration	\$ 280.45	\$ 280.45	\$ 280.45	\$ 280.45	\$ 1,121.81
<b>Total</b>	<b>\$ 54,100.51</b>	<b>\$ 53,806.88</b>	<b>\$ 58,339.05</b>	<b>\$ 63,403.60</b>	<b>\$ 229,650.04</b>
<b>Net Benefit</b>	<b>\$ 12,193.15</b>	<b>\$ 17,114.45</b>	<b>\$ 22,353.70</b>	<b>\$ 22,795.47</b>	<b>\$ 74,456.76</b>