Future Ready

The Manufacturing Workforce: Trends & Opportunities

DATAANGEL POLICY RESEARCH
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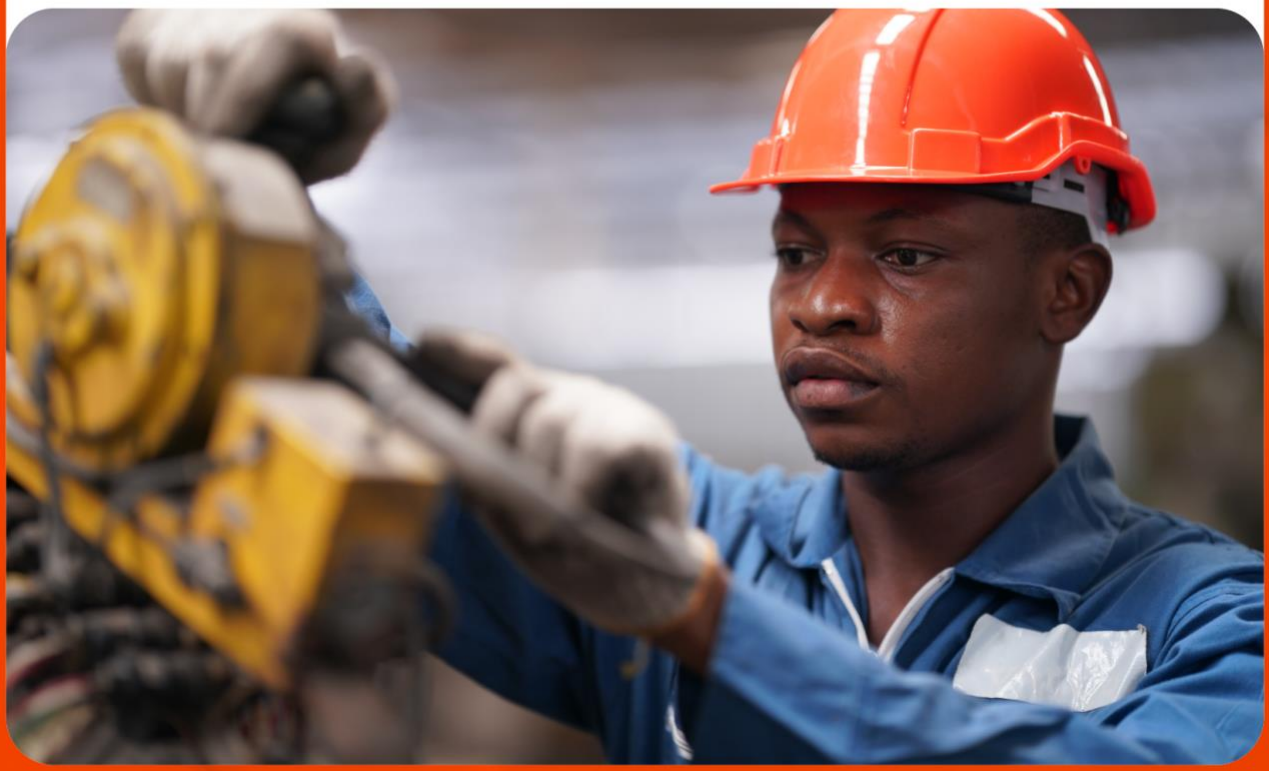

About Future Ready

The Future Ready program is a $19 million program funded in part by Employment and Social Development Canada's Sectoral Workforce Solutions Program to support companies in onboarding new and diverse workers to Canadian manufacturing. The initiative will also aid Canadian manufacturers in identifying their critical skills gaps to support the future profitability and growth of their organization through NGen's highly regarded Transformation Leadership Program. Through these approaches, the program aims to provide demand-driven solutions for the manufacturing sector, one of the sectors hardest hit by the pandemic, and a key to the recovery of the Canadian economy.

This project is funded in part by the Government of Canada's Sectoral Workforce Solutions Program

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Executive Overview

Manufacturing output has played a significant role in the economic development of Canada and is expected to play an important role in maintaining our standard of living over the coming decades.

The future contribution of the sector to the Canadian economy will depend critically on the ability of manufacturers to recruit and retain a sufficient number of workers with the skills needed to compete globally.

Technical advance, a rising global supply of economically productive skills, the globalization of markets for key inputs and for goods and services are driving a rapid shift towards more knowledge and skill intense jobs.

Employers in all sectors, including manufacturing, can respond to this trend in several ways.

It might be that their current workforce has all of the needed skill set.

More likely, skill gaps precipitated by knowledge intensification of jobs will need to be filled through a combination of:

- Skill-targeted recruitment,
- Skill-targeted promotion,
- Re-allocation of tasks to workers that have the needed skills,
- Selective increases in hours for workers with in-demand skills, and,
- Selective task outsourcing,
- Focused skill upgrading.

The rate at which the economy is becoming more knowledge and skill intense is also likely to precipitate skill-based wage inflation where the required supply of key skills is not able to satisfy rising demand.

Each company will have to develop and implement a talent acquisition and application strategy that reflects their unique mix of needs.

This report summarises an in-depth analysis of the trends in employment in the manufacturing sector and where employers might find workers need to maintain their competitiveness in what have become fiercely competitive global markets.

The analysis profiles recent skill demand trends in occupations that are of importance to manufacturing and compares them to manufacturing employer's skill demand projections. The analysis documents a trend towards jobs that are more knowledge and skill intense.

Related analysis explores whether there is any evidence of skill shortages in hours worked trends, wages paid and/or aggregate demand trends. These analyses attempt to shed light on a fundamentally important policy question:

Will manufacturers be able to acquire a sufficient number of workers with the skills that they need to sustain growth?

The analysis yielded 30 key findings that suggest the answer to this question is an emphatic “NO”.

Key findings revealed by the analysis are listed below:

Key finding #1: Manufacturers were asked to project future levels of skill demand for a range of skill dimensions to 2030 and 2040. Company evaluations suggest that firms will need to adapt to a rapidly changing skills mix, something that implies a need to change how they recruit and select their workers.

Among other things, training and/or selecting for elevated levels of Digital Literacy (and the closely related Knowledge of Emerging Trends and Technologies) will serve all of it’s constituents. While those with high levels of education (such as engineers) are likely to have a relatively stable job profile, those working as technologists, technicians, labourers, and within trades will likely need significant Knowledge and Skills upgrading to meet the projected demands of the next two decades.

Key finding #2: The analysis reveals an unexpectedly high amount of variation in the marginal wage returns across skill dimensions in 2022. Several skill dimensions attract significant hourly wage premia, a finding that suggests that they are critically important determinants of productivity.

Key finding # 3: When estimated over the 7-year reference period, wage premia to unit increases in proficiency are significantly smaller, a finding that suggests that much of the change in skill demand that is occurring within, rather than between jobs. An open question for employers, educators and policy makers is whether or not workers have the skills needed to adapt rapidly enough to remain competitive.

Key finding # 4: The analysis reveals significant variation in the marginal wage return across skill dimensions in 2022. Skill dimensions with high marginal wage returns are in high demand and/or of higher value to employers. These include cognitive skills such as problem solving, literacy and numeracy and social emotional skills such as communication and collaboration.

Key finding # 5: When estimated over the 7-year reference period, 2016 – 2022, wage premia are significantly smaller, a finding that reinforces key finding 3, that much of the change in skill demand is occurring within, rather than between, occupations.

Key finding #6: Over all industries, paid employment in the targeted occupations increased significantly over the 7-year reference period. The observed growth in employment levels reflects the growth of the economy.

Key finding #7: Over all industries, significant shifts have occurred in the occupational distribution of employment over the 7-year reference period. The overall trend is towards more knowledge and skill intense jobs that demand skill levels beyond the levels possessed by many workers.

Key finding #8: The level of paid employment in the targeted occupations in the manufacturing industry increased very slightly over the 7-year reference period. The

fact that the manufacturing sector did not grow at the same rate as the overall economy should be of concern to company owners, workers and policy makers.

Key finding #9: Significant shifts have occurred in the occupational distribution of paid employment in manufacturing over the 7-year reference period, something that has increased labour costs by an average of 17%.

Key finding #10: Average usual hours worked per week varied significantly by occupation in manufacturing, from a high of 40.6 to a low of 33.0. Occupations with lower weekly hours represent unused capacity.

Key finding #11: Average hourly wage rates varied significantly by manufacturing occupation in the 7-year reference period, 2016 – 2022. Economic theory suggests that much of this variation is skill-based.

Key finding #12: Those manufacturing occupations experiencing the largest increase in average hours also experienced the most rapid gain in hourly wage rates, a sign of rising skill demand is outstripping the available supply of key skills.

Key finding #13: However, the growth in employment in manufacturing occupations is only weakly related to change in usual hours worked per week, a finding suggests that shifting patterns of skill demand have yet to create skill shortages in manufacturing.

Key finding #14: Manufacturing experienced the lowest growth in average weekly hours worked among industrial sectors.

Key finding #15: Manufacturing has experienced a 17% increase in hours worked across manufacturing occupations, a rate that places them in the middle of the range of percentage increases by industry.

Key finding #16: At $4 per hour, the manufacturing industry experienced among the lowest growth in average wages of any industry.

Key finding #17: At 17%, growth in wage rates in manufacturing falls in the middle of the distribution of wage rate increases by industry.

Key finding #18: The knowledge and skill intensity of employment in manufacturing occupations across all industries has remained stable over the reference period.

Key finding #19: The knowledge and skill intensity of employment in manufacturing occupations in manufacturing spiked up in 2022, a finding that might be expected to precipitate productivity growth.

Key finding #20: An annual time series of aggregate estimates of skill demand were generated by multiplying employment levels by hours worked for each month in the reference period 2016 -2022. The analysis provides evidence of a massive shift in aggregate skill demand by occupation over the reference period, a finding that raises the question as to whether skill supply can handle such a rapid skill demand shock.

Key finding #21: The index of knowledge and skill intensity is highly correlated with occupational differences in wages in manufacturing occupations, a finding that confirms that employers are able to recognize and reward skill.

Key finding #22: The index of knowledge and skill intensity is slightly less correlated with changes in aggregate skill demands than with wage rates in manufacturing occupations.

Key finding #23: At 11% and 2%, the rate of growth of aggregate skill demand in the two manufacturing sub-sectors is comparatively low.

Key finding #24: At 465, the level of knowledge and skill intensity in manufacturing is close to the average for all industries and well below the level demanded by several industries. Higher levels of knowledge and skill intensity are critically important to generating higher levels of productivity growth.

Key finding #25: Roughly half the occupations in manufacturing saw increases in aggregate skill demand with the other half experiencing decreases in aggregate skill demand. The amount of change observed for a 7-year period is very high.

Key finding #26: Both increases and decreases in the aggregate demand for skill in the manufacturing sector have been concentrated in more knowledge- and skill-intense jobs i.e. occupations with a skill intensity index above 457.

Key finding #27: Averaging 7% of total employment in the sector, the flows into and out of manufacturing are large enough to provide employers with a means to adjust to changing skill demands rapidly provided they know what skills are needed.

Key finding #28: Permanent layoffs account for a large, but falling, proportion of all job losses in the sector.

Key finding #29: As of 2023, net flows into and out of manufacturing are vanishingly small. This finding suggests that employers in the sector will continue to have difficulty finding workers.

Key finding #30: Significant numbers of occupationally-experienced workers in key occupations are unemployed. Whether these workers have the skill set needed by the sector is an open question.

Key finding #31: Interestingly, the percentage of workers in manufacturing occupations with higher underutilization rates have a slight negative correlation to employment growth rates, a finding that suggests that it is unlikely that rapid growth is outstripping the available skill supply.

Key Finding # 32: A very large number workers in manufacturing occupations, work in other industries, so represent a promising source of new labour supply with limited training needs.

Key Finding # 33: Workers in manufacturing occupations working in other industries earn an average of 29% more than their peers in manufacturing, so attracting them into manufacturing will be expensive.

Key Finding # 34: 621,250 occupationally-experienced workers are not in the labour force, a potential source of new manufacturing labour supply.

Key finding #35: However, the numbers of retired workers with experience in a manufacturing job is shrinking rapidly.

Taken together, the analysis summarized above suggests that manufacturers will be

unable to rely on traditional sources of new labour and skill supply to satisfy their growth. The only way to remain competitive will be to continue to adopt advanced production technologies that are much more knowledge and skill intense but that require fewer, more highly skilled, workers. To secure the workers and skill sets that they need, firms will have to adopt competency-based recruitment, selection, promotion and training approaches and will, where needed, need to invest in focussed competency-based training.

1. Introduction

This report explores the competitiveness of the Canadian manufacturing sector with a focus on whether employers in the sector have a clear enough understanding of the skill requirements of the future to maintain their competitiveness in what have become fiercely competitive global markets. Manufacturing output has played a significant role in the economic development of Canada and is expected to play an important role in maintaining our standard of living over the coming decades. The contribution of the sector to the Canadian economy will critically depend on the ability of manufacturers to recruit and retain a sufficient number of workers with the skills needed to compete globally. The analysis presented in this report profiles the skills demanded by Canadian manufacturers and how demand has evolved in response to technical change and the emergence of global markets. Comparison of these demand trends to Canada's manufacturing employer's skill demand projections provides a sense of the degree to which employers in the sector appreciate the central importance of skill and skill development to their future success. The analysis presented spans 2016 to 2022, a period of rapid structural change in the economy and COVID-related disruption.

Report Objectives

The analysis intends to address an ordered set of policy questions related to the health of the manufacturing sector, including:

- Canada needs a vibrant manufacturing sector to maintain our standard of living and tax base. How have employment levels evolved over the period? Are we seeing the needed increases in employment levels?
- Skill-biased technical change, the rapid emergence of globalized markets for production inputs and goods and services and a rapidly rising global skill supply are all predicted to precipitate a shift to higher skilled production. How has the occupational distribution of employment in the sector changed? Are we seeing a shift to higher levels of skill intensity?
- Rapidly rising skill demand in the manufacturing sector might induce skill shortages. In turn, skill shortages might be large enough to drive down unemployment levels, to increase average hours of work and to drive up wage rates. What evidence does the analysis provide of shortage-induced drops in unemployment rates, spikes in wage rates or rapid increases in hours worked?
- Where might the sector turn for additional workers? Are there enough unemployed manufacturing workers to satisfy likely demand? If not, which other sectors might be tapped for occupationally experienced workers?
- Do employer's projections of skill demand fit observed trends?

Report Organization

The report is structured in chapters. This chapter, chapter 1 introduces the report and its objectives.

CHAPTER 2:

Provides background on the policy concerns that motivated the research and their tactical and strategic implications for firms. Canadian manufacturers find themselves in a time of rapid technical change, rising competition, high interest rates and significant demographic change. Collectively, these forces oblige employers to pay more attention to talent management i.e. who they hire and promote and how they use the skills of their workers productively.

CHAPTER 3:

Provides a summary of manufacturing employer's mid-term projections of future skill demand in key occupations. Their projections are then compared to recent trends in the underlying dimensions of skill, comparisons that reveal the degree to which anticipated skill demand matches observed trends. The chapter documents a rapid increase in the occupational distribution of employment in the industry, one that is associated with a rapid increase in labour costs that have yet to yield any productivity, one that is associated with a rapid increase in labour costs that have yet to yield any productivity growth.

CHAPTER 4:

Profiles changes in the distribution of employment in manufacturing occupations in both the manufacturing industry and other industries. The analysis also explores associated trends in wage rates and hour worked with a view to seeing if there is any evidence of shortage-induced wage and hours inflation. The chapter also plots trends in the aggregate demand for skills and competencies and their relationship to employment and wage growth. Based on a linkage to Employment and Social Development Canada's (ESDC) Occupational Skills and Competencies Information System (OaSIS) to 72 months of estimates of employment by occupation, hours worked and wage rates extracted from Statistics Canada's Labour Force Survey (LFS), these data provide a detailed profile of where rising demand for specific skills might outstrip the available supply.

CHAPTER 5:

Explores potential new sources of labour supply for the sector including workers employed in manufacturing occupations in other industries, the unemployed and those not in the labour force.

CHAPTER 6:

Summarizes the report's findings, their implications for policy and suggestions for additional research.

The report is supported by two annexes. Annex A provides references to research cited in the body of the report. Annex B provides data tables for each of the charts included in the body of the report.

The underlying data in the form of excel spreadsheets are available from NGen upon request.

2. Background

The success of the manufacturing sector in Canada will depend critically on the ability of firms to attract and retain a sufficient number of workers to support growth and to replace workers being lost to retirement and to other sectors. It will also become increasing important that workers who are hired into the sector have the skill levels needed to meet rapid increases in skill demand being driven by skill-biased technical change, the globalization of markets and rising global supply of economically productive skills.

The market for manufacturing labour is divided into two segments – an internal labour market in which existing employees are promoted into new roles and an external labour market in which new employees are recruited into the company. The relative importance of these two markets varies over time. The volume of transactions on Internal markets largely reflects the need to replace workers lost to quits and retirement whereas the volume of transactions on external markets are associated with a need to recruit additional to support company growth and to acquire skills that cannot be easily sourced within the company. According to Statistics Canada, 80% of firms in the manufacturing sector never grow, so most of the observed demand is being driven by the need to replace workers lost to quits and/or retirement and by the need to acquire the skills needed to apply new, more skill demanding technologies of production rather than by organic growth.

The demographics of the manufacturing workforce mirror the Canadian population, something that means that an estimated half of the current workforce will retire over the next decade. Retiring workers will leave with a wealth of knowledge and experience that will be difficult to replace. Falling birth rates and rising immigration levels mean that 100% of net labour force growth will be from immigration. This fact will oblige employers to find ways to reliably assess the Canadian value of foreign credentials and experience. Given that fully qualified workers are likely to be in short supply, employers in the sector will also have to invest in filling skill gaps that may impair their business performance/competitiveness.

Firms tend to rely heavily on formal credentials and related experience as the primary screening mechanisms to reduce external applicant pools to a manageable size. Unfortunately, credentials and experience are relatively unreliable indicators of true skills, with the result that employers make a significant number of hiring errors if they rely too heavily on these signals. In some cases, the error is that they fail to hire a fully competent candidate who lacks the requisite credentials or experience. In other cases, the error involves hiring candidates who appear to be fully competent but who are, in fact, incapable of meeting the demands of the job. In a recent article in Forbes, Ryan Craig attributes these errors to the criteria applied

by recruiters to reduce applicant pools.[1] Employers face a particularly acute problem in judging the adequacy of the skills of immigrants to Canada. Employers have few ways to benchmark the curricular standards applied by foreign education and training providers to Canadian standards, nor do they apply approaches to recruitment and selection that allow them to reliably rank immigrant candidates on what they actually know and can do. Even when they are able to discern that an immigrant candidate has the technical skills and knowledge needed to meet the demands of the job, they rarely apply approaches that allows them to evaluate the adequacy of candidates cognitive and social-emotional skills. Viewed from the employer's perspective the associated uncertainty translates into a significant risk of making a bad hire. Until employers adopt more reliable means of assessing the relative strengths and weaknesses of candidates, the easiest way to attenuate this risk is to systematically discount immigrant skills to the point that they rarely get hired.

Both types of hiring errors cost employers dearly. In the former case, they deprive them of the benefits of getting a fully competent worker. Less than fully competent new hires are less productive, are more expensive to train, require more supervision, experience more workplace illness and accidents, commit more errors, waste more material and, ironically, induce higher recruitment costs because they are more likely to quit.

Competency-based recruitment and selection systems allow one to reliably and efficiently rank candidates based on the fit between the skill demands of the job and their actual skills and knowledge. The same systems also provide a means of filling identified skill gaps in an efficient way.

Transactions in the internal labour market are more commonly used to promote frontline workers into supervisory roles. Conventional labour market theory suggests that internal labour markets are more efficient because firms have had an opportunity to observe workers skills directly. The available evidence suggests, however, that employers have few ways to reliably rank job applicants on their actual skill sets for the target job. More pointedly, the available evidence suggests that often hire the best of their frontline workers assuming, erroneously, that they have the right skills to perform the management and supervisory tasks demanded of them in their new roles. Adopting competence-based recruitment and selection, promotion and career development processes would improve the efficiency, reliability and equity of these processes.

Using competency-based systems has the added benefit of having both recruitment and career development transactions turn into transparent processes that disappear into the warp and weft of day-to-day work.

It is important to note that firms find themselves in a period of rapid and sustained

[1] Craig, R. (2023) Stop Ranking Skills, Forbes Magazine, NYC.

change. The most important feature of the change underway is an increase in the skill levels needed to maintain competitiveness.

The key driving force underlying the increase in skill demand is skill-biased technical change. The diffusion of digital technologies throughout the economy is reducing the number of jobs that only demand workers perform routine procedural tasks and greatly increasing the demand for workers who have the cognitive and social-emotional skills needed to solve non-routine problems fluidly in culturally heterogenous, geographically diverse teams. Thus, it is assumed that the demand for literacy, numeracy, communication and collaboration skills is growing at a pace that will far outstrip the skill levels of the current manufacturing workforce, the skill possessed by the non-manufacturing workforce and an estimated 40% of graduates leaving the post-secondary system. Skill-biased technical change is likely to be driving up skill demand in all occupations so firms in the manufacturing sector will face unprecedented competition for high skilled workers, unfortunately at a time when real wage rates for workers with advanced cognitive rose 16% between 1994 and 2015 compared to 1% for workers in jobs demanding low levels of cognitive skills.[2] Research suggests that Canadian manufacturing firms have invested less than their American competitors in advanced production technology, something that has reduced the rates at which skill demand and productivity growth have been increasing.

The level of skill demand is also rising because of the globalization of markets for key production inputs – capital, advanced production technologies, raw materials and Research & Development – something that eliminates any cost advantage previously enjoyed by Canadian producers for these inputs. Markets for goods and services have also globalized, something that affords the possibility of huge economies of scale to the subset of producers who can access the requisite skill set. The active management of human capital will emerge as the only way to achieve comparative advantage in savagely competitive global markets.

Finally, the rapid expansion of education attainment around the globe has increased the global supply of key skills significantly. Much of this increase has occurred in developing countries that have significantly lower wage rates than those facing Canadian producers. Labour costs account for a significant proportion – 70% – of the total costs of production, so this translates into a significant comparative advantage to foreign producers having lower wage rates.

It is worth noting in passing that the demand for digital skills is nowhere near the level implied in the popular press. The skills needed to interact with most modern software platforms are straightforward and easily acquired. The relative difficulty of advanced digital tasks is largely related to the cognitive demand of the tasks that the software is being used to solve the problems at hand and, increasingly, the social-

[2] Murray, T.S. (2019) Literacy Markets in Alberta: A Segmentation Analysis, Ottawa.

emotional skills needed to work in culturally-diverse, geographically dispersed inter-disciplinary teams. So, it is singularly important that workers in the manufacturing sector have advanced literacy, numeracy, communication, collaboration and problem solving skill needed to apply digital technologies in large, geographically distributed, culturally diverse teams. Those without the full skill set will become a liability as they will have great difficulty generating enough value to justify their job.

These Trends Carry Important Implications for How the Manufacturing Sector Manages its Workforce. More Specifically, Company Managers Will Have to:

1. Decide how much to invest in productivity-enhancing advanced production technologies
2. Familiarize themselves with how the emerging skill sets differ from their current skill set
3. Develop competency profiles for key jobs
4. Include the skills identified in their profiles in external job postings and actively screen applicants for skills
5. Assess the skills of their current workforce to identify which employees do, and which do not, possess the requisite skill set(s) for their current job and possible future jobs. Competence assessment dramatically tightens the fit between the skills they need and the workers that they hire, something that yields material benefits in improved productivity, reduced errors and lower costs.
6. Develop a plan for how to deal with any and all identified skill gaps. Options include re-assigning tasks to workers who have the skills, adjusting production processes to reduce skill demands, outsourcing production to subcontractors who have the requisite skills, adding extra supervision to reduce the risks of error and/or developing learning plans to fill any identified skill gaps among current workers and that allow workers to acquire and/or document their skills for possible promotion or work in related occupations. Internal hires are more reliable than external hires and active development of skills in the internal labour pool cheaper than buying on an external market. Competence assessment provides a way to focus skill upgrading solely on identified gaps, something that has been shown to cut the cost of training in half.
7. Actively target experienced workers in manufacturing occupations, both employed by other firms, unemployed and experienced but not in the labour force. This requires using information about the size of each of these three groups and their average wage rates to see where best to focus recruitment.
8. Actively target workers with no manufacturing experience. This requires using information about the size of occupations that share common skill demands, their average wage rates and demographic characteristics.

These trends also carry important for government policy.

Research suggests that Canadian policy makers have been slow to adjust to increases

in the demand for skill. More specifically, they have failed to induce improvements in the skills of students leaving the K – 12 and post-secondary education systems.

Governments in Canada have also been overly reliant on low-skilled immigration as a source of new labour supply and upon passive subsidies to firms that do little induce higher levels of investment in advanced production machinery and equipment or in workforce skill development. Among other things, a case can be made that government policy should do more to:

1. Ensure that higher proportions of school leavers have the skill set needed to compete
2. Induce higher and more rapid levels of investment in the workforce skill development needed to maintain competitiveness on global markets.
3. Induce higher and more rapid levels of investment in advanced production technology
4. Work with firms to help them adjust to the new terms of trade more rapidly, including implementing measures that help them understand and respond to changes in skill demand.

3. Employer Projections of Changing Skill Levels in Manufacturing

Canada's Advanced Manufacturing Global Innovation Cluster (NGen) conducted a survey of Canadian manufacturers, one in which they were asked to identify the current level of proficiency demanded in five skill domains in five occupations believed to be important to their ability to compete. This information corrects for a weakness in the OaSIS system associated with the fact that it identifies a proficiency level for most skill domains, one that obscures significant inter-employer variation in actual skill demand. Some employers demand significantly lower proficiency than indicated in the OaSIS system and some significantly higher, differences that reflect underlying differences in business strategy, production technology and how work is organized and supervised. Firms were then asked to predict the likely proficiency levels of key skills demanded by the selected jobs in 2030 and 2040.

This chapter provides a summary of reported skill profiles for 2023, 2030 and 2040. The 2023 profiles for each selected occupation are compared to the benchmark levels identified for the occupations in Employment and Social Development Canada's OaSIS system. Results are reported by NAIC's sub-sector.

The chapter also summarizes the size and direction of changes in the proficiency levels demanded by these occupations in 2030 and 2040 and how these trends compare to actual skill demand trends observed between 2016 and 2022.

3.1 Comparison of Occupational Proficiency Levels Reported by Employers to the Benchmark Levels Reported in OaSIS

The proficiency levels reported for each dimension of skill identified in the OaSIS are, by definition, averages that obscure significant variation in actual skill demands among employers. This inter-employer variation in skill demand is the joint product of differences among employer choices of production technology, in how they organize and supervise work and differences in business strategy. All of these employer choices are conditioned by the state of their local labour market i.e. the numbers and skill levels of workers available for work and their wage and working condition expectations.

A self-selected sample of employers in the manufacturing were asked to identify five occupations thought to be important to their competitiveness.

Indeed, the number of ratings available for reporting proficiency levels for each occupation in the OaSIS system is large. This taxonomy, which streamlines terminology of hundreds of occupational descriptors used in the labour market, currently contains 349 entries (309 descriptors, plus 40 higher-order dimensions), though the OaSIS database has only 291 entries (251 descriptors, plus 40

higher-order dimensions) made available to the public. The Taxonomy was constructed based on ESDC's internal products (e.g., Career Handbook, Skills and Knowledge Checklist, and Essential Skills profiles), the American O*NET system, and a variety of national and international competency-based frameworks. Notably, ESDC continues to consult with internal and external stakeholders to validate and improve its content. There are plans also to include new entries (e.g., additional descriptors, values, and a category under Work Environment, called Tools and Technology). The broad alignment of these constructs is best documented in Figure 3.1 that follows.

Figure 3.1 The higher-order structure of the OaSIS system

Worker Requirements		Worker Characteristics				Worker Environment		
Skills	**Knowledge**	**Abilities**	**Personal Attributes**	**Personal Attributes**	**Abilities**	**Work Context**	**Work Context**	**Work Technology**
Foundational	Administration + Management	Cognitive	Social Traits	Holland/ RIASEC -Realistic -Investigative -Artistic -Social -Enterprising - Conventional	Cognitive	Structural Job Characteristic	Information Oriented	Building + Construction Machinery + Accessories
Analytical	Communication	Physical	Self-Improvement		Physical	Physical Work Environment	Physically Oriented	Electronc Component + Supplies
Technical	Education	Psychomotor	Results-Based Attributes		Psychomotor	Physical Demands	Mental Process Oriented	Onformatio Technology Broadcasting + Telecoms
Resource Management	Health + Wellbeing	Sensory	Professional Conscientious-Ness		Sensory	Interpersonal Relations	People Oriented	Medical Eequipment + Accessories + Supplies
Interpersonal	Law, Government + Safety		Dynamic Thinking					Service Industry Machinery + Equipment + Supplies
	Logistics, Design + Evaluation							Etc.
	Natural Resources							
	Physical Sciences							
	Socioeconomic Systems							
	Technology, Electrical, Material + Mechanical							

Source: *ESDCs "A04 2A71-PRT-OaSISProject--20210117-V03-LS.pptx"*

Any analysis could thus be conducted with all 251 descriptors, 33 higher-order dimensions (e.g., Foundational, Mental Process-Orientated), or at the highest order, that is Knowledge, Skills, Abilities, Personal Attributes, and so forth. There are three good reasons to focus the ensuing analysis on the highest order:

1. It provides a parsimonious representation of key findings.
2. Adopting such an approach is consistent with an established way of examining occupations from the perspective of human resource consultants, industrial-organizational psychologists, and policy

makers – the so-called Knowledge, Skills, Abilities, and Other (KSAO) model.

3. Arguably somewhat surprisingly, the average intercorrelations between the components under these higher-order skills generally exceeds 0.90 (one can treat skill ratings as items and conduct a reliability analysis, these hover around 0.95). That is, we can go down deep into the 251 descriptors, but for the most part the signal they give can be captured by the higher order components, at least for the analysis that follows.

The key components of the KSAO model that are the focus of the ensuing analysis are a somewhat reduced subset of the 251 abilities in OaSIS.

Figure 3.2 41 skills identified by NGEN as key requirements across the many jobs represented in the Manufacturing sector aligned to the KSAO framework (Soft Skills and Work Activities constitute "Other")

NGEN41 in KSAO Framework

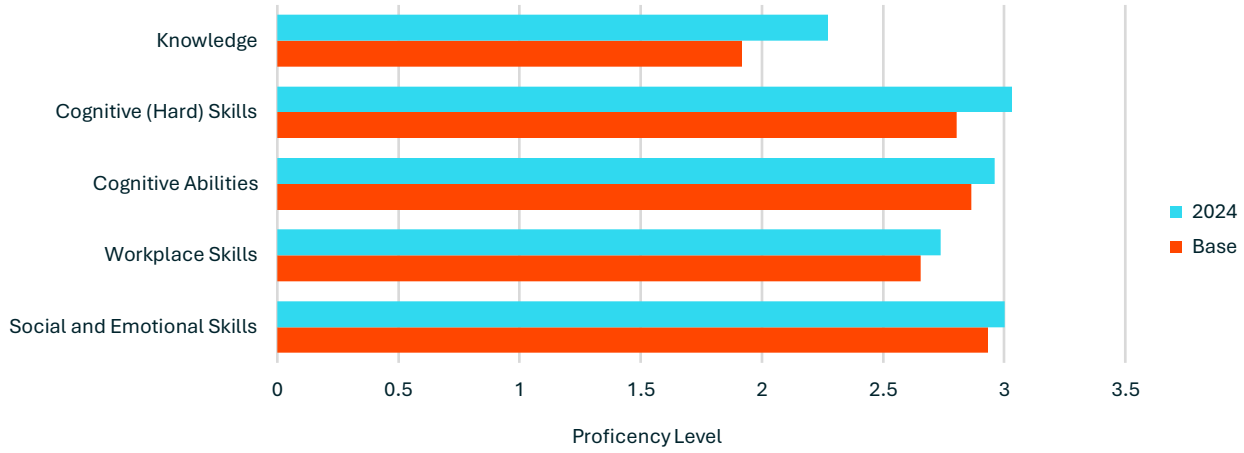
Knowledge	Skills	Abilities	Soft Skills	Work Activities
Knowledge of Emerging Trends and Technologies	Writing Skill	Cognitive Abilities	Teamwork and Collaboration	Skill to Use the Tools Necessaryfor the Job
New Relevant Knowledge	Technical Skill	Sensory Abilities	Team Building Skills	Skill Needed to Support Supplier Development
	Skill to Identify Problems	Physical Abilities	Social Responsibility	Skill Needed to Understand Business Principles
	Skill to Design Experiments	Psychomotor Abilities	Professional Composure	Skill Needed to Judge Quality
	Reading Skill		Leadership Skills	Skill to Conduct Work Design
	Numeracy		Interpersonal Skills	Skill to Formulate Alternative Solutions
	Problem Solving		Initiative	Skill Needed to Evaluate Alternatives
	Digital Literacy		Independence	Skill to Identify, Formulate, and Solve Problems
	Decision Making Skill		Entrepreneurial Skill	Project Management Skill
	Critical Thinking Skills		Commitment to Lifelong Learning	Skill to Design a System
	Creativity and Innovation		Attention to Detail	Skill to Plan a Program
	Communication Skill		Adaptability	

Source: *Custom crosswalk of NGen Skill Projection Survey data to KSAOs.*

METHOD

A self-selected sample of employers in the manufacturing sector (i.e., subject matter experts [SMEs]) were asked to identify occupations thought to be important to their competitiveness. Their first task was to adjust the proficiency levels associated with the occupation in OaSIS to reflect their actual levels of skill demand. Figure 3.3 documents the adjustments that employers across manufacturing made to the benchmark OaSIS proficiency levels for the key KSAOs across all occupations.

Figure 3.3 Proficiency ratings per the base given by OaSIS and adjustments to 2024 made by SMEs averaged across all the manufacturing occupations



Source: *Custom analysis of NGen Skill Projection Survey data*.

These average differences are, by and large, trivially small. The SMEs generally agreed with the OaSIS system proficiency levels, such that the base rate correlated between 0.76 (Knowledge) and 0.84 (Workplace Skills) with the ratings given for 2024 across all jobs in manufacturing. If one drills down to the individual skills, however, two components have rather large differences in the base rates: Digital Literacy, where there is a difference equal to 0.45 between the base and 2024 rankings; and Knowledge of Emerging Trends and Technologies (where the difference between base and 2024 is equal to 0.54). It is noteworthy that these ratings were being made during considerable publicity around the advent of Open AI and it impact on the future of work. Whether this is a confound or raises serious policy questions around a component of knowledge and a foundational skill is worth exploring further.

These results mask however a wide range of opinion regarding many of the changes between the base and the 2024 ratings of proficiency levels for each KSAO. Figure 3.4 below gives means, standard deviations, minimum and maximum differences between the rankings, and the percentage of SMEs suggesting the base is too high, correct, or too low. Two constructs standing out as having particularly large differences between base and 2024 ratings are also included in this table: Knowledge of Emerging Trends and Technologies and Digital Literacy.

Figure 3.4 Descriptive statistics representing differences between KSAO ratings for the OaSIS base and adjusted 2024 ratings made by SMEs for occupations in the manufacturing sector

Descriptive	Knowledge	Cognitive (Hard) Skill	Cognitive Ability	Workplace Skills	Social and Emotional Skills	Knowledge Emerging Trends	Digital Literacy
Mean	.3543	.2270	.0978	.0830	.0677	.5403	.4527
S.D.	.75928	.63922	.57134	.57695	.48955	1.05156	1.00950
Range	5.38	4.92	4.60	4.76	5.25	7.25	8.25
Minimum	-1.63	-2.28	-2.32	-2.08	-2.55	-2.50	-4.00
Maximum	3.75	2.64	2.28	2.68	2.71	4.75	4.25
Too High	11.4%	24.5%	10.6%	28.7%	30.3%	4.8%	12.0%
Correct	45.8%	15.7%	73.5%	26.5%	28.7%	62.5%	57.2%
Too Low	42.8%	59.8%	15.9%	44.8%	41.0%	32.7%	30.8%

Source: *Custom analysis of NGen Skill Projection Survey data*.

To consider the above features in a little more detail, we considered how occupations were being rated during the exercise. (For this series of analyses, we exclude cognitive ability because it clearly has little variability: Base and 2024 ratings are well calibrated for all but a few of the SMEs). Although the 502 ratings made by the subject matter experts appears a large database, the amount of data across 115 + occupations end up being very sparse. Most occupations had but a single rating, a not insignificant number two, with diminishing numbers thereafter. But there are 20 occupations within the database that had eight or more ratings. These are given in Figure 3.5 along with the NOC code associated with it, and the shorthand notation sometimes used to represent these occupations in resulting analysis (and in a final column, the associated TEER code, least this be of relevance).

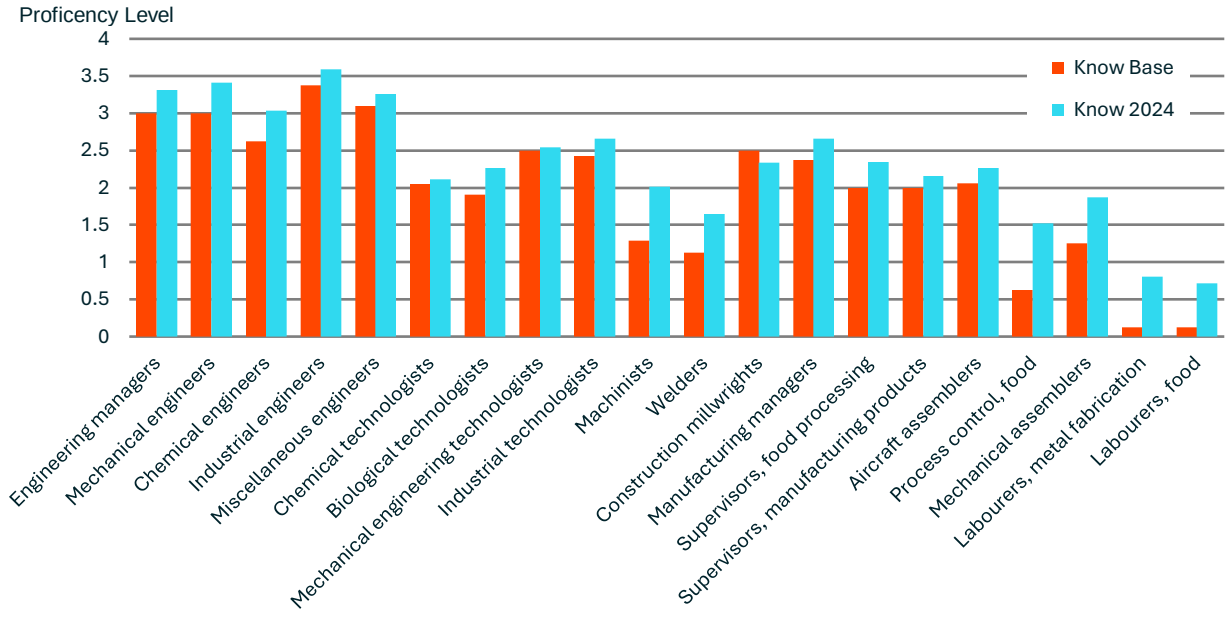
Figure 3.5 Occupations having sufficient sample size to disaggregate and provide information on each of the KSAOs

NOC Code	Job Title	Notation in Analysis	TEER Code
20010.00	Engineering managers	Engineering managers	0
21301.00	Mechanical engineer's	Mechanical engineers	1
21320.00	Chemical engineer's	Chemical engineers	1
21321.00	Industrial and manufacturing engineer's	Industrial engineers	1
21399.00	Other professional engineer's	Miscellaneous engineers	1
22100.00	Chemical technologists and technician's	Chemical technologists	2
22110.01	Biological technologists and technician's	Chemical technologists	2
22301.00	Mechanical engineering technologists and technician's	Mechanical engineering technologists	2
22302.00	Industrial engineering and manufacturing		
	technologists and technician's	Industrial technologists	2
72100.00	Machinists and machining and		
	tooling inspectors	Machinists	2
72106.00	Welders and related machine operators	Welders	2
72400.00	Construction millwrights and industrial		
	mechanics	Construction millwrights	2
90010.00	Manufacturing managers	Manufacturing managers	0
92012.00	Supervisors, food and beverage processing	Supervisors, food processing	2
92024.00	Supervisors, other products manufacturing and assembly	Supervisors, manufacturing products	0
93200.00	Aircraft assemblers and aircraft assembly inspectors	Aircraft assemblers	3
94140.00	Process control and machine operators, food and beverage processing	Process control, food	4
94204.00	Mechanical assembler's	Mechanical assemblers	4
95101.00	Labourers in metal fabrication	Labourers, metal fabrication	4
95106.00	Labourers in food and beverage processing	Labourers, food	4

Source: *Custom analysis of NGen Skill Projection Survey data.*

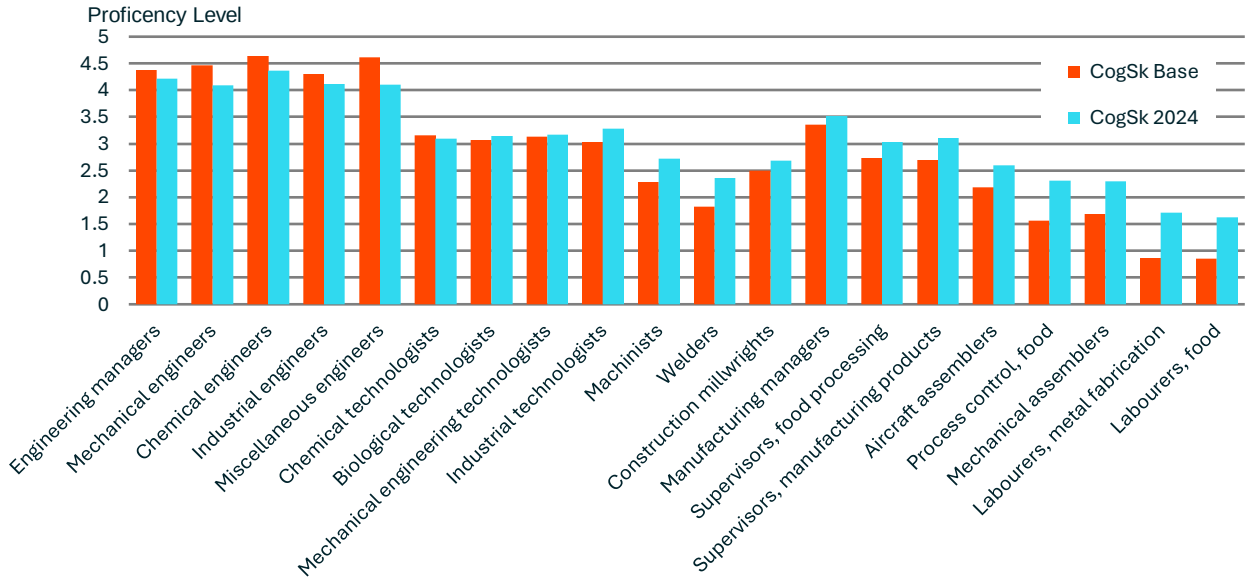
In the analyses that follow, we consider base compared to ratings for 2024. The question posed to SMEs generally took the form "with respect to <the construct to be rated, for example., Digtal Literacy>, what skill level would you think is appropriate for each job listed". Figure 3.6 to 3.9 provide a graphical representation of these two data points for knowledge, cognitive (hard) skills, soft skills, and workplace skills.

Figure 3.6 A comparison of SME's ratings of Knowledge in 2024 compared to the OaSIS base for 20 manufacturing occupations



Source: *Custom analysis of NGen Skill Projection Survey data.*

Figure 3.7 A comparison of SME's ratings of Cognitive (Hard) Skills in 2024 compared to the OaSIS base for 20 manufacturing occupations



Source: *Custom analysis of NGen Skill Projection Survey data.*

Figure 3.8 A comparison of SME's ratings of Soft (Social and Emotional Skills) in 2024 compared to the OaSIS base for 20 manufacturing occupations

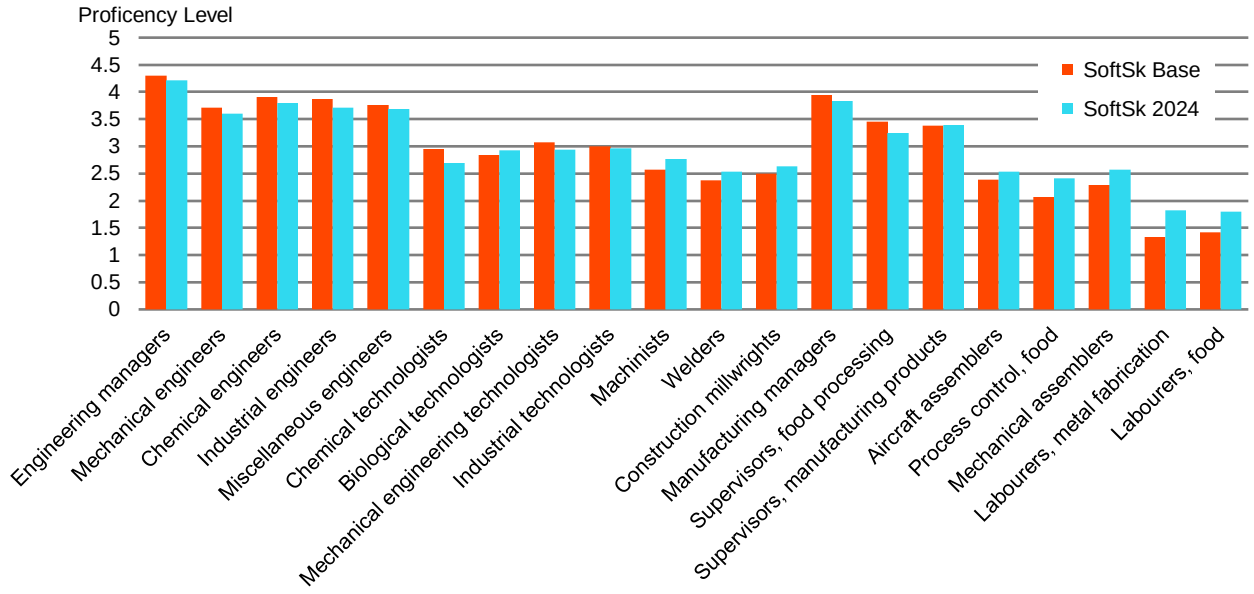
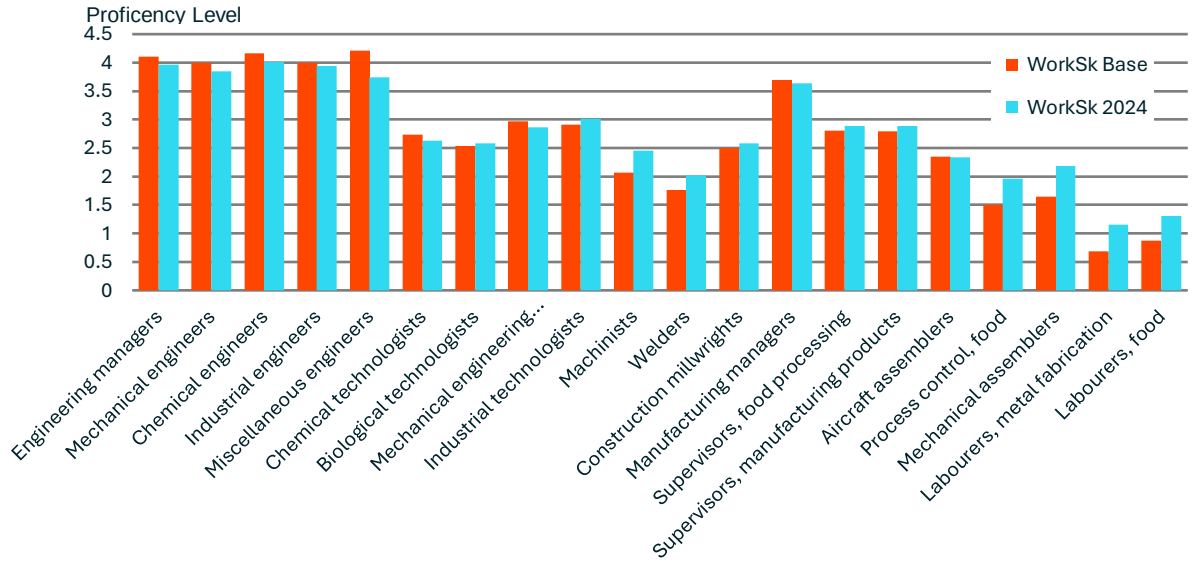


Figure 3.9 A comparison of SME's ratings of Workplace Skills in 2024 compared to the OaSIS base for 20 manufacturing occupations



Source: *Custom analysis of NGen Skill Projection Survey data*.

With respect to Knowledge (which incorporates both Knowledge of Emerging Trends and Technologies and New Relevant Knowledge) SME ratings indicate this should be higher than the current OaSIS base for all jobs (except Construction Millwrights). The consistent trend so far seen in the data becomes more complex for Cognitive Skills. In this instance it appears the OaSIS base exceeds SME ratings specifically for engineering professions, which usually require a formal higher education degree. All other occupations show the base is considered inaccurate and should be extended up for Cognitive Skill. These findings for Cognitive Skill also hold true for Soft (social and emotional skills), but with the addition of two groups likely requiring high soft skills -- Managers and Supervisors – having the base exceed SME ratings. Workplace Skills findings are closer to Cognitive Skills.

Further disaggregation of these data is possible but is unlikely to bring as much clarity to the issues as occurs with linkage to the occupation. Consider for example, presenting the data by NAICS code. This approach would bring together numerous occupations as is the case with the first analysis of this section (the data were actually analyzed in this fashion to confirm this hypothesis). Similarly, one could analyze data by organization and the result would be the same: Broad brush strokes with little of the granularity seen in this latest analysis. It is also clearly the case that it is only through the job title that this data can be linked back to the OaSIS system and additional information that this linkage provides (e.g., TEER code).

Obviously, this current analysis by occupation title, while informative should be replicated and extended upon with the procurement of additional data. One would be advised in this instance to direct SMEs to specific job titles they would have familiarity with and fill out the requisite information. Filling up the 115+ occupation titles would indeed provide the manufacturing sector an invaluable data base for policy analysis. With only 20 titles covered in this (and soon to be discussed analyses) some of the conclusions should be treated with suitable caution and attendant qualifiers and caveats.

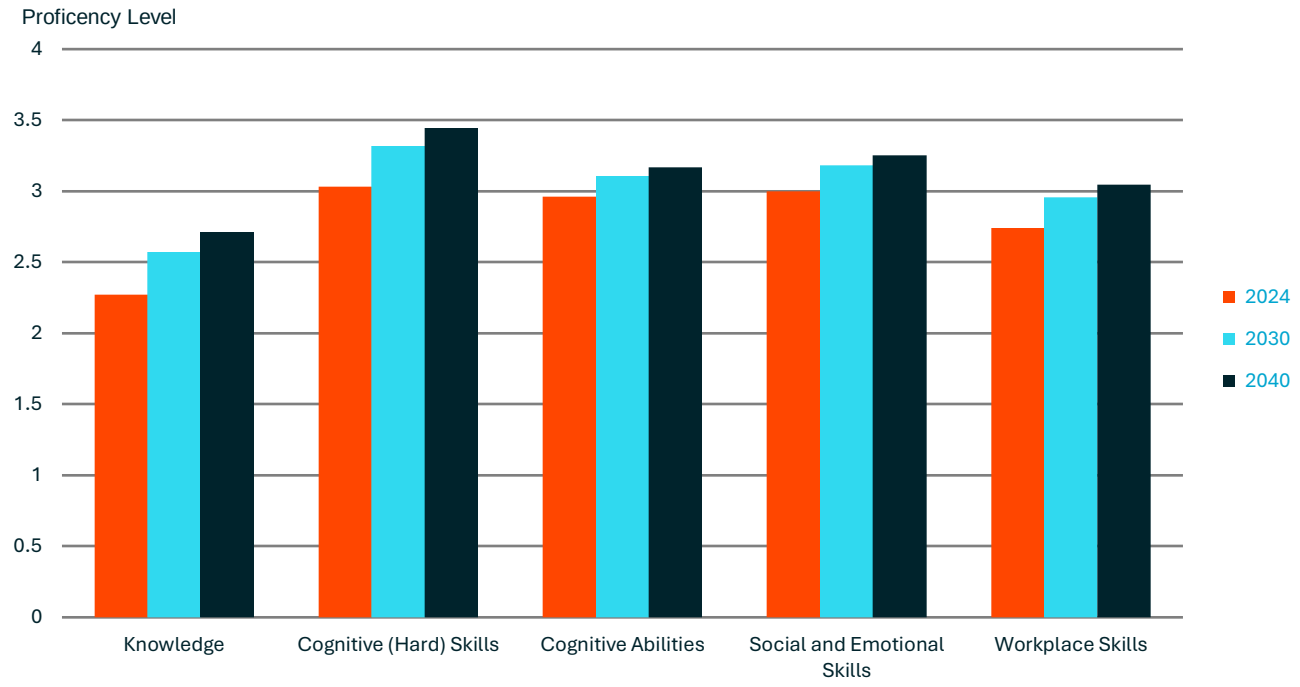
Key finding 1

In a study examining Knowledge, Skills, Ability, and Other Characteristic projections there are some meaningful differences between base rates and 2024 SME ratings, the most telling of which appear to be for Digital Literacy and Knowledge of Emerging Trends and Technologies.

Collectively, the results of the skill benchmarking exercise reiterate the need for employers to explicitly identify their actual skill demands and then to employ methods for recruitment, promotion and in service training that ensure that workers have the requisite skill set.

The second and third stages of the skill benchmarking exercise asked employers to project proficiency levels they expect to see in 2030 and 2040. Figure 3.10 summarize the results of this process across the entire manufacturing global innovation cluster.

Figure 3.10 Average projected changes in KSAOs between 2024 and 2040 for 114 manufacturing occupations

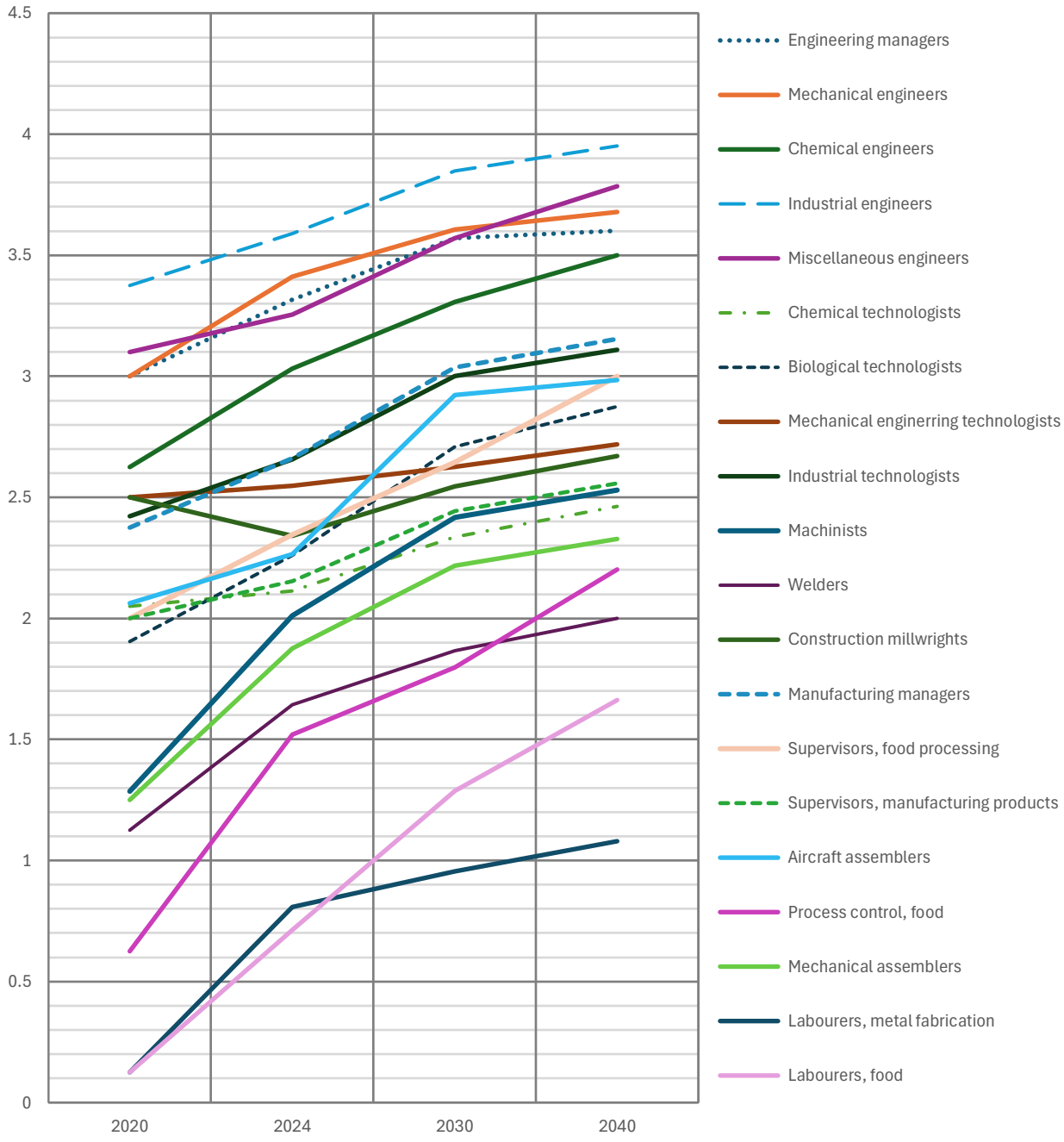


Source: *Analysis of NGen skill projections RAD Science.*

The data presented in the Figure above suggests that across all manufacturing occupations SME's believe employees will need to gain about a half a unit of proficiency level in each KSAO. That number is likely not insignificant. Moreover, as noted previously, these results mask what may be important differences with each occupation. To this end, we conducted analyses of each of the 20 occupation titles having sufficient data on the KSAOs.

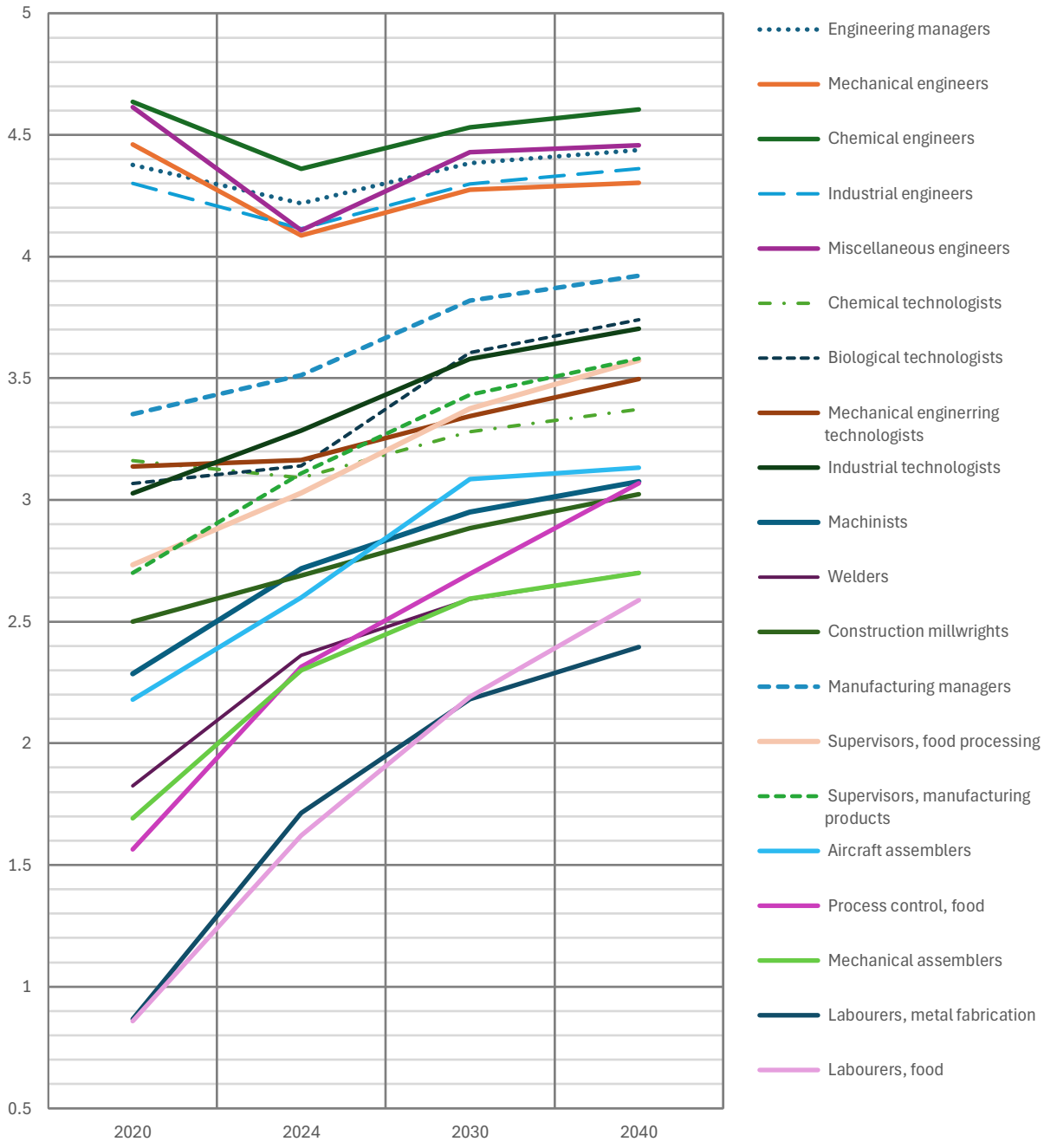
For these analyses we treat the base as representing 2020, though these data were likely acquired even earlier than this date. This does not change the shape of the functions per se, and it arguably is actually a more accurate representation of this data point temporally. The results for the various KSAOs are presented in Figures 3.11to 3.20. Also presented in these set of Figures are the results for Knowledge of Emerging Trends and Technology, Digital Literacy, and three ability constructs not considered previously: Sensory Abilities, Psychomotor Abilities, and Physical Abilities.

Figure 3.11 Trends for projected growth in Knowledge over 18 years for 20 manufacturing occupations



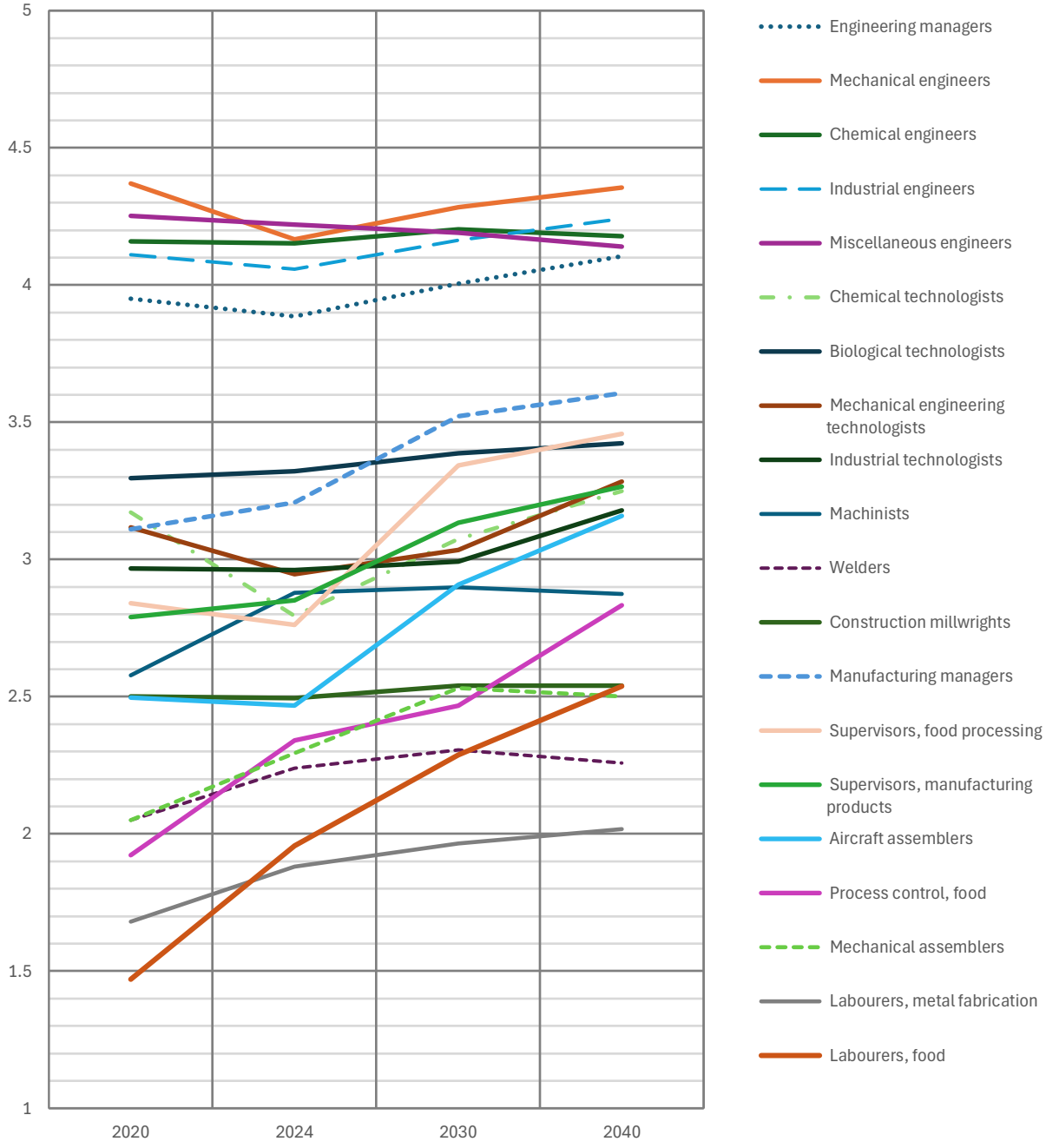
Source: *NGen Skill Projection Survey trends.*

Figure 3.12 Trends for projected growth in Cognitive (Hard) Skills over 18 years for 20 manufacturing occupations



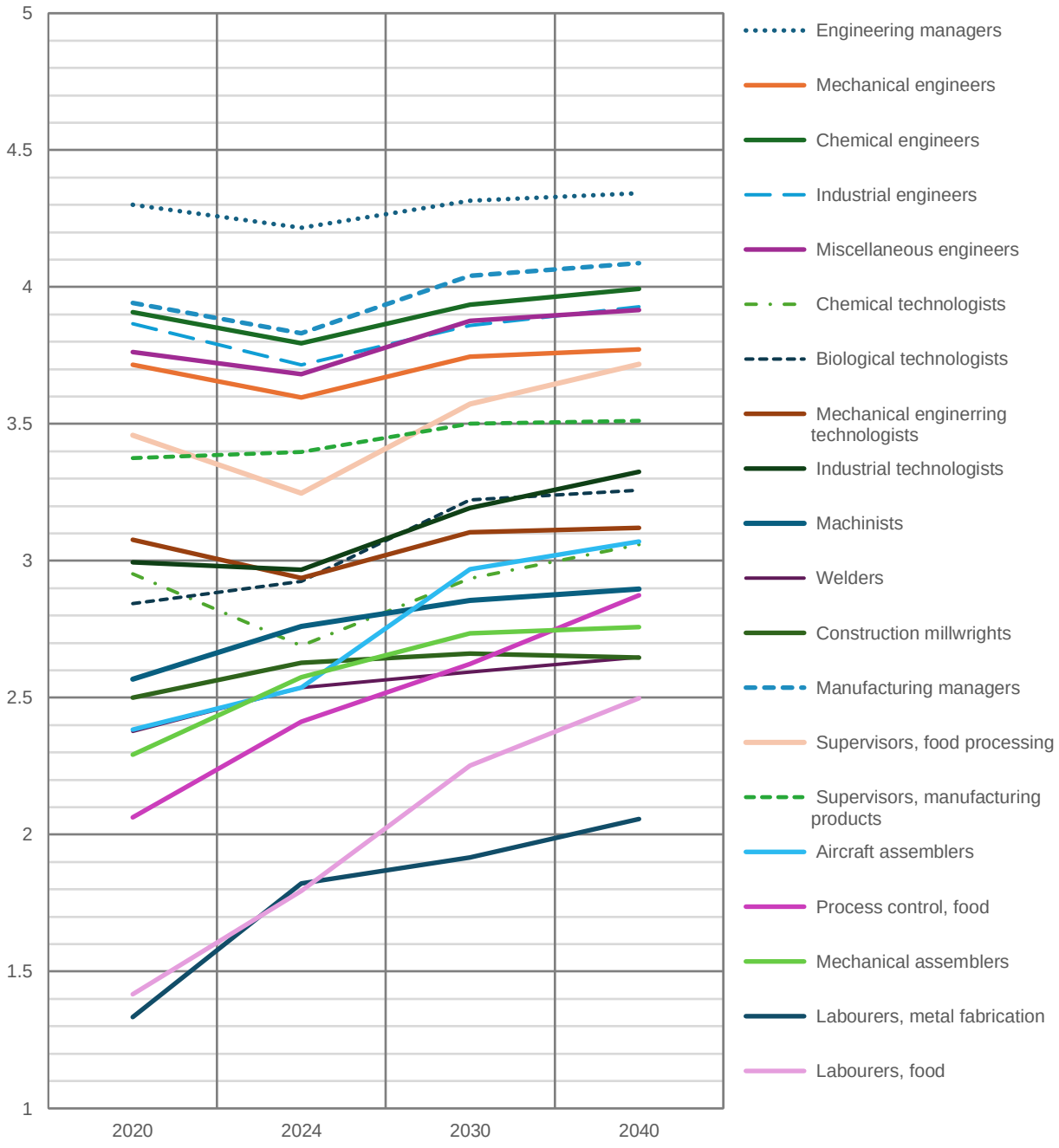
Source: *NGen Skill Projection Survey trends*

Figure 3.13 Trends for projected growth in Cognitive Abilities over 18 years for 20 manufacturing occupations



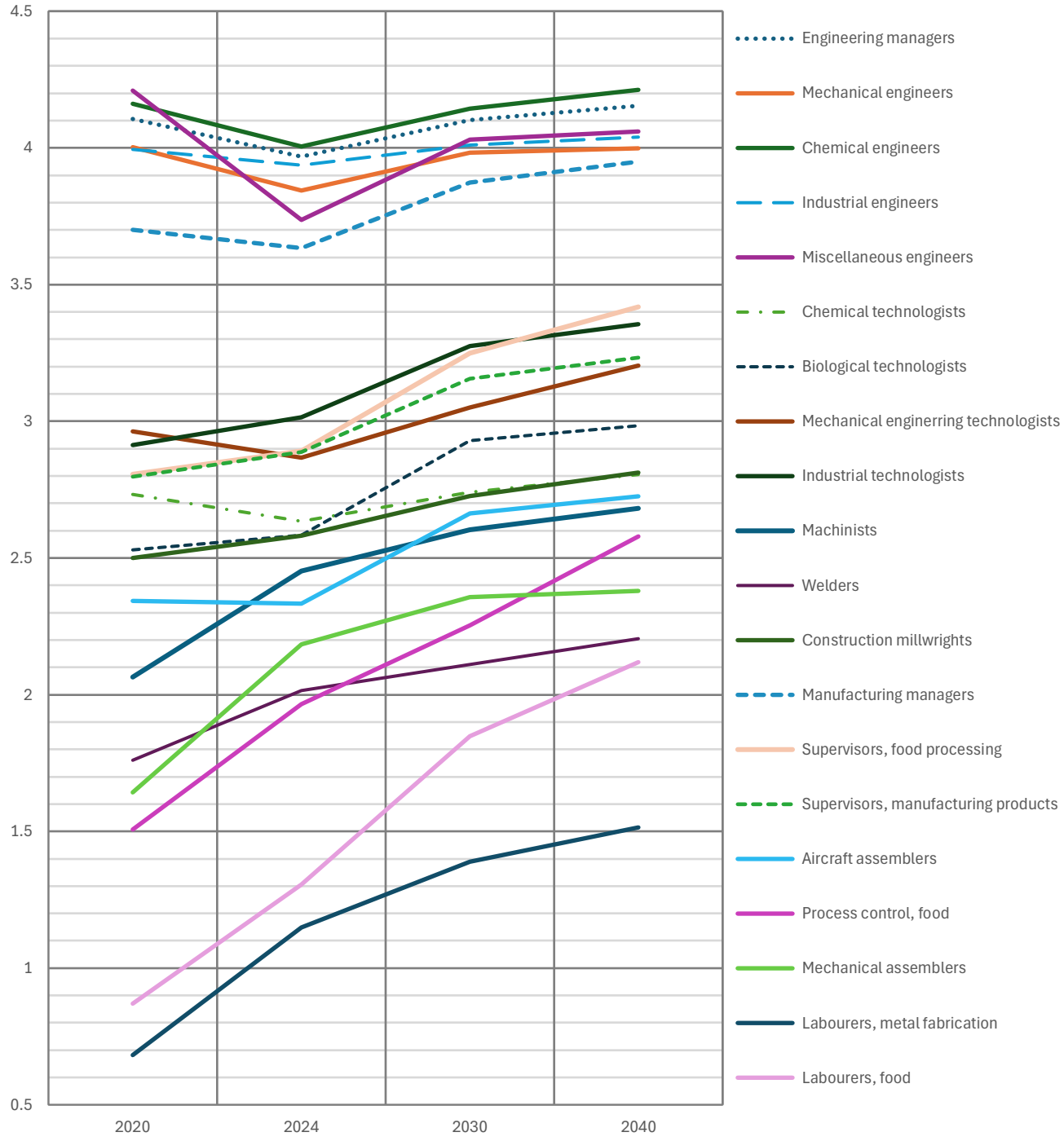
Source: *NGen Skill Projection Survey trends.*

Figure 3.14 Trends for projected growth in Soft (Social and Emotional) Skills over 18 years for 20 manufacturing occupations



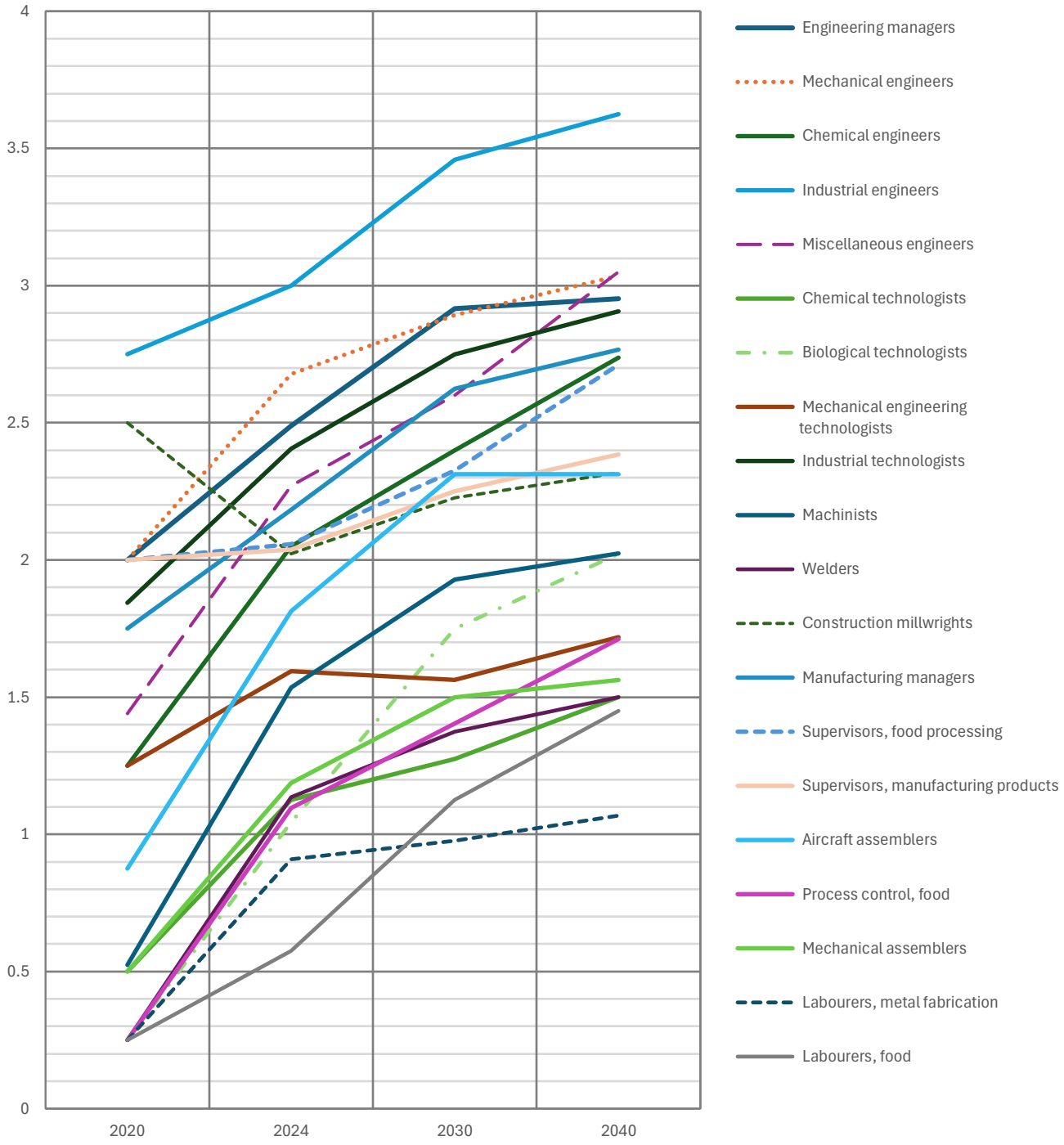
Source: *NGen Skill Projection Survey trends.*

Figure 3.15 Trends for projected growth in Workplace Skills over 18 years for 20 manufacturing occupations



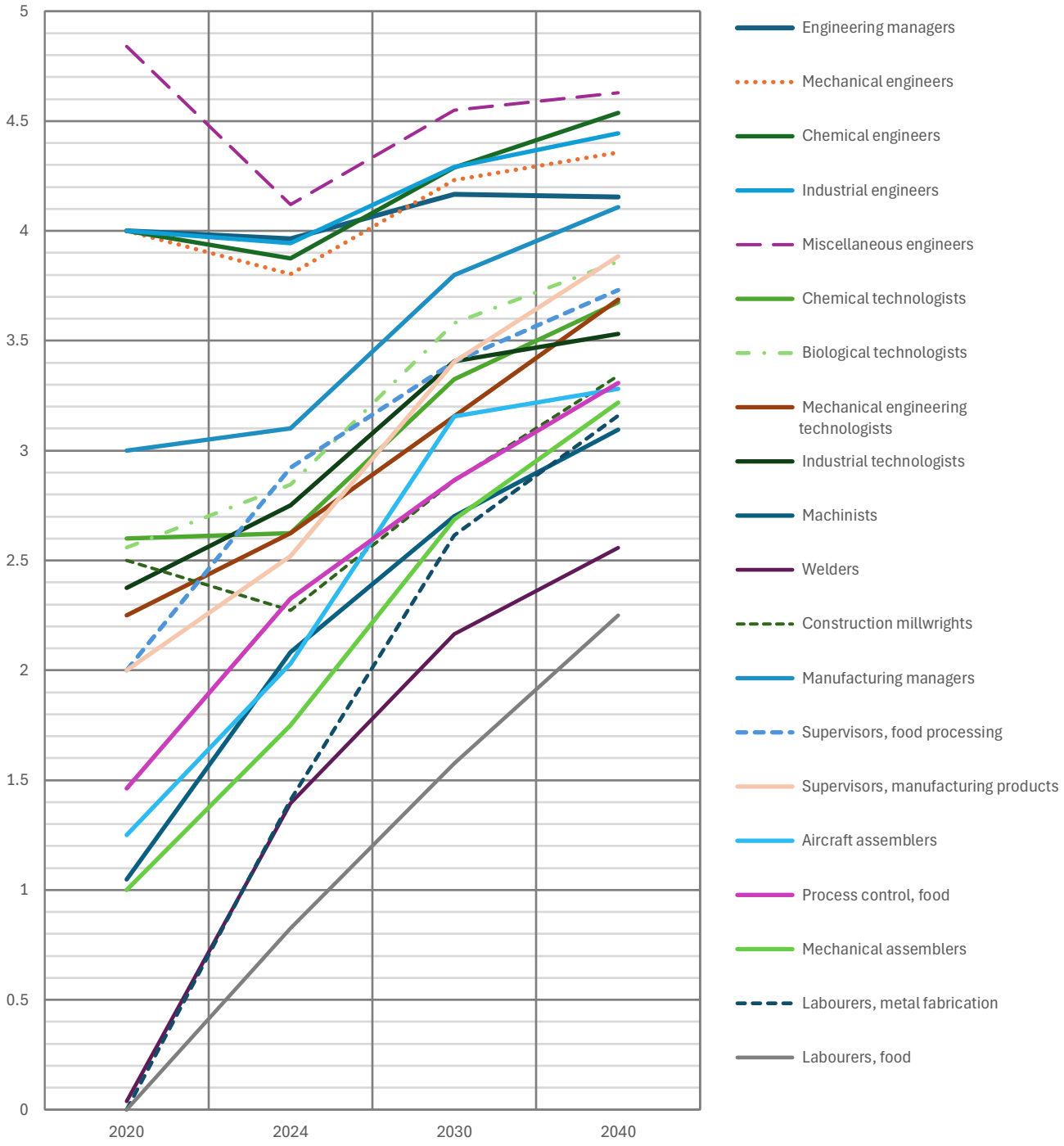
Source: *NGen Skill Projection Survey trends.*

Figure 3.16 Trends for projected growth in Knowledge of Emerging Trends and Technology over 18 years for 20 manufacturing occupations



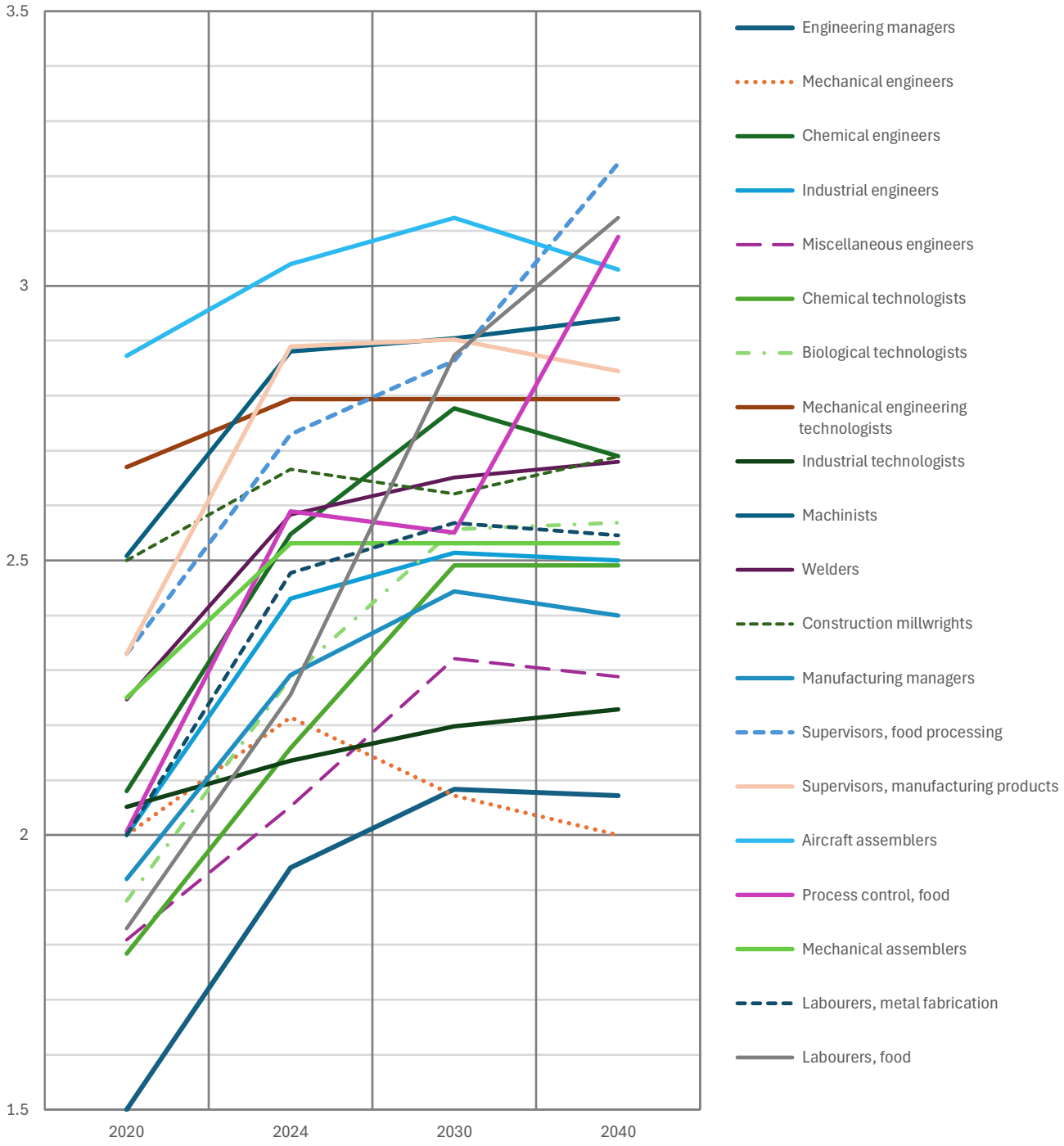
Source: *NGen Skill Projection Survey trends*.

Figure 3.17 Trends for projected growth in Digital Literacy over 18 years for 20 manufacturing occupations



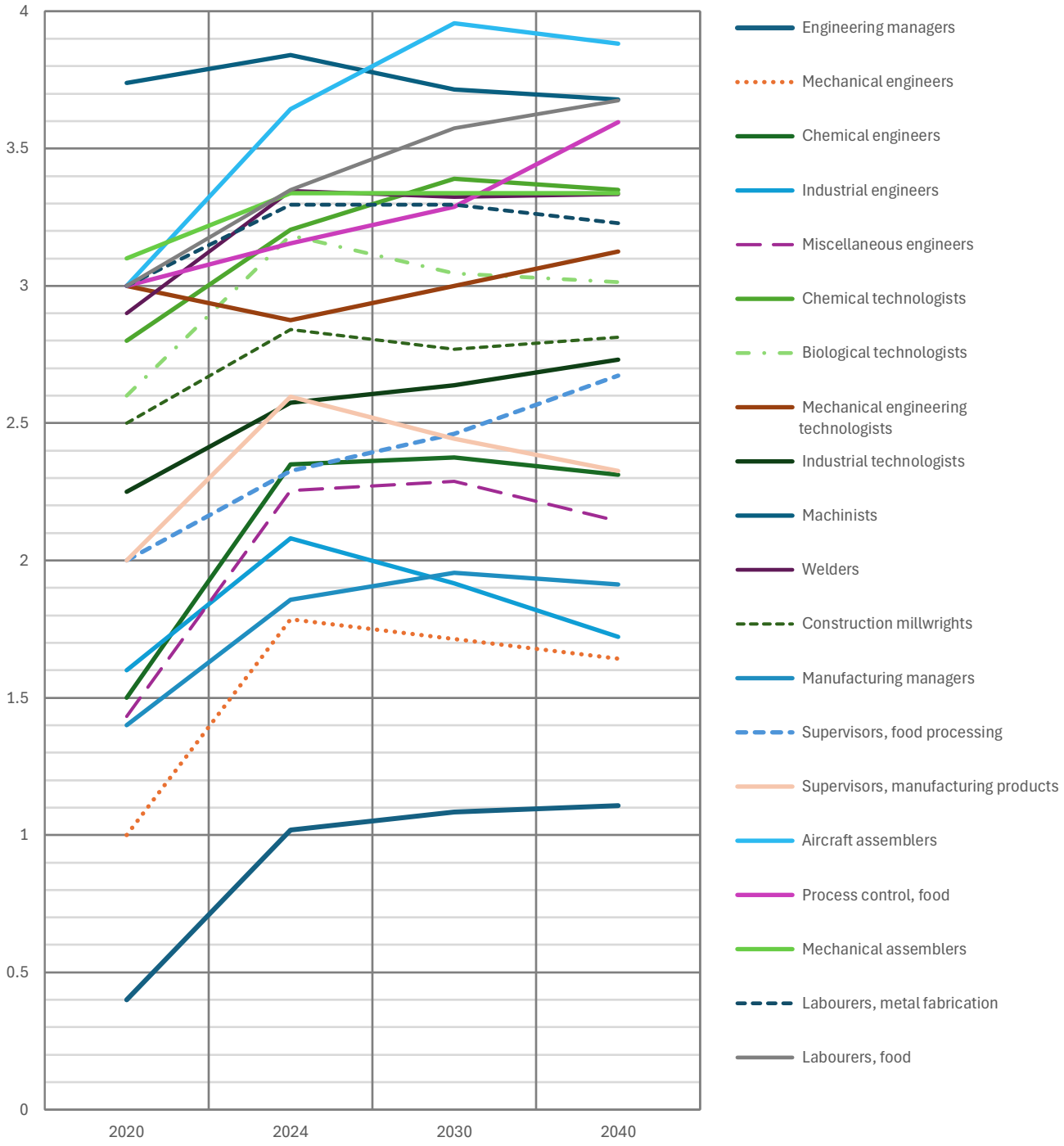
Source: *NGen Skill Projection Survey trends*.

Figure 3.18 Trends for projected growth in Sensory Abilities over 18 years for 20 manufacturing occupations



Source: *NGen Skill Projection Survey trends*.

Figure 3.19 Trends for projected growth in Psychomotor Abilities over 18 years for 20 manufacturing occupations



Source: *NGen Skill Projection Survey trends*.

Figure 3.20 Trends for projected growth in Physical Abilities over 18 years for 20 manufacturing occupations

Source: *NGen Skill Projection Survey trends*.

There are several important assumptions that we articulate before interpreting these set of data:

- The SMEs are well-credentialled and have similar levels of expertise, and a non-superficial understanding of the jobs for which they provided a set of relative projections.
- Our relatively small sampling of job titles extrapolates to many others.
- Biases created by the media, along with a potentially significant technological turning point (i.e., the emergence of Open AI) may have influenced at least some of these ratings.
- Some of the findings (whether for skills set very high or very low) may represent regression towards the mean rather than true effects.

The OaSIS system has anomalies within it that may impact the base rate data, and perhaps some of the judgments made by the SMEs. For example, soft skills are ranked only by importance in OaSIS, while the survey asked SMEs to make judgments about proficiency. Note, this may not have a major impact on this study: In the O*Net system importance and proficiency level tend to be highly correlated across its large sampling of the world of work.

With these assumptions set, one could argue that the relatively systematic results presented across these Figures could be construed as a future shock moment for the manufacturing sector: Aside from those who are well-educated, the anticipated levels of proficiency for KSAOs within the manufacturing sector often approaches a full standard deviation (i.e., a change from a level 2 to level 3 proficiency).

Key finding 2

If SME evaluations are to be taken at face value, the Canadian manufacturing sector will need to address a changing landscape of KSAOs. Training and/or selecting for elevated levels of Digital Literacy (and the closely related Knowledge of Emerging Trends and Technologies) will serve all of its constituents. While those with high levels of education (such as engineers) are likely to have a relatively stable job profile, those working as technologists, technicians, labourers, and within trades will likely need significant KSAO upgrading to meet the projected demands of the next two decades.

The results suggest that employers in most/all manufacturing industry sub-sectors expect to face some increases in skill demand across multiple skill domains.

The reliability of employer projections of near-term skill demand is unknown.

In an effort to better understand the reliability of employer proficiency projections of changes in skill demand, projections were compared to the rates of skill demand implied in the shifts in the occupational distribution of employment observed between 2016 and 2022.

Readers should note, however, that it is not necessary that the projected and observed changes in skill demand match. As noted earlier in this report, much of the change in skill demand occurs within, rather than between, occupations. Skill demand change

occurring within occupations remains unobserved when demand is analyzed using occupation as the primary unit of analysis.

Additionally, employers may have knowledge about skill-disruptive technology that is on the horizon but not yet broadly adopted.

At a minimum, identifying cases where projected skill demands differ from recent trends inferred from shifts in the occupational distribution of employment can be used to focus employer attention on their skill development efforts.

In order to better understand where employers in the manufacturing sector should focus their talent management a second analysis was undertaken, one that was designed to identify which skill domains attract the highest wage premia for a one proficiency level increase.

The analysis is based upon an analysis of increases in hourly wage rates observed for employed paid workers in monthly estimates of employment and wage rates extracted from Statistic's Canada monthly Labour Force Survey for the reference years 2016 – 2022. These data are linked to proficiency levels for 240 dimensions of skill identified for each occupation in Employment and Social Development Canada's Occupational and Skills Information System (OaSIS). The analysis provides an estimate of the wage premia (or penalty) accruing to a one level increase in proficiency for each dimension of skill.

Figure 3.21 provides estimates of the hourly increment in wage rate that was associated with an increase of one level of proficiency in 2022.

Figure 3.21 Hourly wage premia to a unit increase in proficiency level, Canada, 2022

Hourly wage premia to an increase of a proficiency level, 2022	
Dollar	**Skill domain**
8.13	Problem Solving
8.12	Making Decisions
8.02	Judging Quality
7.99	Critical Thinking
7.97	Decision Making
7.96	Identifying Objects Actions and Events
7.91	Monitoring
7.88	Coordinating
7.82	Systems Analysis
7.81	Memorizing
7.71	Information Ordering
7.68	Degree of Impact of Decisions
7.64	Problem Identification

Hourly wage premia to an increase of a proficiency level, 2022	
7.63	Oral Communication Oral Comprehension
7.59	Evaluation
7.43	Oral Communication Oral Expression
7.40	Writing
7.38	Inductive Reasoning
7.36	Communicating with Coworkers
7.35	Degree- Freedom of Decisions
7.35	Getting Information
7.32	Categorization - Flexibility
7.28	Estimating the Quantifiable Characteristics of Products, Events, or Information
7.27	Reading Comprehension
7.24	Using New Relevant Knowledge
7.17	Pattern Organization Speed
7.15	Deductive Reasoning
7.10	Time Management
7.10	Management of Personnel Resources
7.04	Providing Consultation and Advice
7.03	Analyzing Data or Information
7.02	Written Expression
7.02	Verbal Ability
6.95	Numerical Ability
6.91	Written Comprehension
6.90	Persuading
6.86	Leadership
6.81	Numeracy
6.81	Processing Information
6.81	Oral Communication Active Listening
6.79	Planning and Organizing
6.79	Frequency of Decision Making
6.73	Analytical Thinking
6.73	Interpreting the Meaning of Information for Others
6.73	Negotiating
6.70	Evaluating Information to Determine Compliance
6.66	Team Building
6.63	Coaching and Developing Others
6.61	Pattern Identification

Hourly wage premia to an increase of a proficiency level, 2022	
6.53	Managing Resources
6.53	Mathematical Reasoning
6.52	Learning and Teaching Strategies
6.52	Coordinating the Work and Activities of Others
6.52	Degree of Work Autonomy
6.43	Management of Financial Resources
6.35	Monitoring Processes Materials or Surroundings
6.34	Fluency of Ideas
6.33	Resolving Conflicts and Negotiating with Others
6.31	Active Learning
6.30	Instructing
6.29	Developing Objectives and Strategies
6.07	Stress Tolerance
6.04	Independence
6.00	Training and Teaching
5.98	Frequent Time Pressure
5.92	Speech Clarity
5.85	Importance of Leading
5.84	Establishing and Maintaining Interpersonal Relationships
5.83	Digital Literacy
5.73	Communicating with Persons Outside Organization
5.66	Scheduling Work and Activities
5.66	Clerical Activities
5.66	Staffing
5.60	Interacting with Computers
5.57	Degree of Consequence of Error
5.49	Near Vision
5.33	Developing Technical Instructions
5.28	Degree of Responsibility for Others
5.28	Frequent Group Work
5.27	Supervising Subordinates
5.25	Selective Attention
5.22	Social Perceptiveness
5.19	Perceptual Speed
5.10	Management of Material Resources
5.05	Product Design

Hourly wage premia to an increase of a proficiency level, 2022	
5.04	Frequent Phone Work
5.03	Collaboration
4.90	Thinking Creatively
4.90	Frequent Written Work
4.88	Adaptability
4.88	Frequent Email
4.68	Degree of Competition
4.64	Innovation
4.57	Importance of Precision
4.46	Selling or Influencing Others
4.39	Attention to Detail
4.23	Operation Monitoring of Machinery and Equipment
3.83	Frequent Aggressive People
3.73	Service Orientation
3.66	Arm, Hand Steadiness
3.63	Speech Recognition
3.43	Spatial Visualization
3.26	Quality Control Testing
3.26	Inspecting Equipment Structures or Material
3.25	Operation and Control
3.19	Duration of Sitting
3.04	Frequent Face-to-Face Discussions
3.03	Digital Production
3.00	Night Vision
2.87	Creativity
2.78	Duration of Contact with Others
2.77	Explosive Strength
2.71	Controlling Machines and Processes
2.56	Preventative Maintenance
2.55	Importance, Customers
2.35	Frequent Conflict
2.27	Sound Localization
2.21	Concern for Others
2.19	Frequency, Angry People
2.14	Performing for or Working Directly with the Public
2.12	Frequenting Biological Agents

Hourly wage premia to an increase of a proficiency level, 2022	
2.01	Assisting and Caring for Others
1.92	Frequent High Places
1.86	Distance - Proximity to Others
1.79	Duration of Control Indoor
1.76	Social Orientation
1.71	Setting Up
1.70	Repairing
1.68	Frequent Public Speaking
1.43	Equipment and Tool Selection
1.35	Manual Dexterity
1.24	Spatial Orientation
1.23	Glare Tolerance
1.10	Frequent Hazard Conditions
1.05	Peripheral Vision
0.93	Multi Signal Response
0.88	Far Vision
0.83	Auditory Attention
0.81	Finger Dexterity
0.67	Control of Settings
0.64	Electronic Maintenance
0.46	Hearing Sensitivity
0.32	Reaction Time
0.29	Finger Hand Wrist Motion
0.15	Troubleshooting
0.09	Duration_ Covered Outside
-0.03	Frequent Extreme Temps
-0.18	Mechanical Maintenance
-0.32	Rate Control
0.57	Operating Vehicles Mechanized Devices or Equipment
0.46	Gross Body Equilibrium
-0.35	Speed of Limb Movement
-0.48	Depth Perception
-0.67	Frequent Hazard Tools
-0.76	Colour Perception
-0.77	Frequent Danger, Chemicals
-1.14	Duration of Outside Exposure

Hourly wage premia to an increase of a proficiency level, 2022	
-1.15	Duration, Enclosed Vehicle
-1.23	Gross Body Coordination
-1.24	Duration, Balance
-1.30	Dynamic Strength
-1.33	Static Strength
-1.38	Stamina
-1.45	Frequent Special Safety Equipment
-1.46	Frequent Standard Safety Equipment
-1.48	Multi Limb Coordination
-1.65	Frequent Skin Injury
-1.73	Multitasking
-1.84	Duration, Open Vehicle
-1.85	Performing General Physical Activities
-2.01	Handling and Moving Objects
-2.18	Duration, Noise
-2.19	Duration, Random Indoor
-2.29	Trunk Strength
-2.75	Importance, Equipment Pace
-2.81	Body Flexibility
-3.19	Duration, Twisted Body
-3.78	Importance of Task Repetition
-3.84	Duration, Manual Materials
-4.80	Duration, Repetitive Movement
-5.01	Duration, Standing

Source: *NGen By_ Skill_Level_V1 unit returns.*

Key finding 3

The analysis reveals significant variation in the marginal wage return across skill dimensions in 2022. As predicted by the theory of skill-biased technical change, wage premia are highest for cognitive and social emotional skills.

Clearly, not all dimensions of skill are equally important in the emerging information and knowledge economy.

Employers should take these data into account when allocating tasks to jobs and when setting wage rate for their job roles.

The table reveals significant variation in the wage premia accruing to different dimensions of skill, including:

- At $8.13, problem solving attracted the highest premium in 2022
- Problem solving followed closely by several cognitive dimensions of skill linked to literacy and numeracy, all of which attracted significant wage premia
- Digital literacy added $5.83 per hour
- Three of the skill dimensions added to the SFS framework attracted intermediate level wage premia. A unit increase in collaboration added $5.03 per hour, thinking creatively $4.90 per hour and innovation $4.64 per hour
- Creativity only added $2.87 per hour, a sign that this dimension of skill is not yet highly valued in the Canadian labour market
- Several physical skills attracted either very small positive returns or negative returns. For example, Duration standing attracted a wage penalty of $5.01 per hour for an increment of frequency.

Figure 3.22 provides estimates of the wage premia associated with the same dimensions of skill but estimated from average slopes observed over the 7 year reference period, 2016 – 2022.

Figure 3.22 Wage Premia and Penalties to Unit Increases in Proficiency by Skill Domain, Employed Paid Workers, Canada, 2016 – 2022

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
Dollar	**Skill domain**
1.98	Arm, Hand Steadiness
1.59	Near Vision
1.50	Manual Dexterity
1.21	Oral Communication Active Listening
1.16	Degree of Freedom of Decisions
1.11	Finger Dexterity
1.04	Degree of Consequence of Error
0.96	Identifying Objects Actions and Events
0.93	Performing for or Working Directly with the Public
0.91	Inductive Reasoning
0.90	Instructing
0.87	Making Decisions
0.86	Decision Making
0.85	Memorizing
0.84	Frequent Decision Making
0.84	Persuading
0.82	Oral Communication Oral Comprehension
0.81	Oral Communication Oral Expression

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
0.79	Evaluating Information to Determine Compliance
0.77	Critical Thinking
0.76	Creativity
0.76	Degree_ Impact Decisions
0.75	Social Perceptiveness
0.75	Frequent Aggressive People
0.74	Thinking Creatively
0.73	Deductive Reasoning
0.73	Time Management
0.73	Judging Quality
0.71	Problem Solving
0.71	Assisting and Caring for Others
0.70	Problem Identification
0.69	Independence
0.68	Perceptual Speed
0.68	Selling or Influencing Others
0.67	Concern for Others
0.67	Resolving Conflicts and Negotiating with Others
0.67	Analyzing Data or Information
0.67	Reading Comprehension
0.66	Monitoring
0.65	Establishing and Maintaining Interpersonal Relationships
0.65	Frequent Conflict
0.64	Coordinating
0.62	Leadership
0.62	Stress Tolerance
0.60	Importance of Customers
0.59	Control of Settings
0.59	Selective Attention
0.58	Negotiating
0.58	Systems Analysis
0.57	Training and Teaching
0.57	Supervising Subordinates
0.57	Verbal Ability
0.57	Developing Objectives and Strategies

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
0.57	Innovation
0.56	Management of Personnel Resources
0.56	Providing Consultation and Advice
0.56	Service Orientation
0.56	Frequent Biological Agents
0.56	Management of Material Resources
0.55	Adaptability
0.55	Using New Relevant Knowledge
0.54	Finger Hand Wrist Motion
0.53	Digital Literacy
0.53	Staffing
0.52	Spatial Visualization
0.52	Management of Financial Resources
0.52	Evaluation
0.52	Frequent Public Speaking
0.51	Communicating with Coworkers
0.50	Digital Production
0.50	Interacting with Computers
0.49	Importance of Leading
0.49	Coord innating the Work and Activities of Others
0.49	Team Building
0.48	Communicating with Persons Outside Organization
0.48	Pattern Organization Speed
0.47	Frequent Email
0.47	Frequent Angry People
0.46	Getting Information
0.46	Monitoring Processes Materials or Surroundings
0.46	Degree_ Competition
0.46	Written Comprehension
0.46	Duration_ Sitting
0.45	Frequent P hone
0.45	Coaching and Developing Others
0.45	Analytical Thinking
0.45	Fluency of Ideas
0.44	Scheduling Work and Activities

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
0.43	Interpreting the Meaning of Information for Others
0.43	Categorization_ Flexibility
0.42	Written Expression
0.42	Product Design
0.42	Distance_Proximity2Others
0.41	Pattern Identification
0.41	Degree_ Work Autonomy
0.40	Planning and Organizing
0.40	Frequent High Places
0.40	Writing
0.39	Learning and Teaching Strategies
0.38	Frequent Group Work
0.37	Clerical Activities
0.37	Processing Information
0.37	Managing Resources
0.36	Operation Monitoring of Machinery and Equipment
0.36	Explosive Strength
0.35	Degree of Responsibility for Others
0.34	Collaboration
0.34	Speech Clarity
0.33	Frequent Face-to-Face Discussion
0.31	Social Orientation
0.27	Duration, Control Indoor
0.26	Attention to Detail
0.26	Information Ordering
0.24	Numeracy
0.23	Numerical Ability
0.23	Mathematical Reasoning
0.22	Sound Localization
0.21	Estimating the Quantifiable Characteristics of Products, Events, or Information
0.20	Developing Technical Instructions
0.18	Night Vision
0.17	Frequent Time Pressure
0.15	Peripheral Vision
0.12	Importance of Precision

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
0.09	Frequent Hazard Condition
0.08	Auditory Attention
0.08	Frequent Written Work
0.07	Operation and Control
0.06	Hearing Sensitivity
0.05	Dynamic Strength
0.02	Speech Recognition
0.00	Colour Perception
-0.01	Controlling Machines and Processes
-0.02	Stamina
-0.03	Duration of Contact with Others
-0.04	Troubleshooting
-0.04	Frequent Special Safety Equipment
-0.07	Frequent Skin Injury
-0.08	Rate Control
-0.08	Equipment and Tool Selection
-0.09	Multi Signal Response
-0.10	Gross Body Equilibrium
-0.11	Frequent Extreme Temperatures
-0.13	Duration, Random Indoor
-0.15	Inspecting Equipment Structures or Material
-0.15	Reaction Time
-0.15	Duration, Exposed Outside
-0.16	Body Flexibility
-0.18	Performing General Physical Activities
-0.18	Preventative Maintenance
-0.20	Trunk Strength
-0.20	Active Learning
-0.21	Duration, Enclosed Vehicle
-0.21	Multi Limb Coordination
-0.21	Multitasking
-0.22	Electronic Maintenance
-0.22	Frequent Hazardous Tools
-0.23	Gross Body Coordination
-0.23	Repairing

Hourly wage premia to an increase of a proficiency level, 2016 – 2022	
-0.24	Spatial Orientation
-0.24	Importance of Task Repetition
-0.25	Operating Vehicles Mechanized Devices or Equipment
-0.25	Static Strength
-0.26	Frequent Danger, Chemicals
-0.26	Handling and Moving Objects
-0.27	Far Vision
-0.28	Duration, Covered Outside
-0.28	Speed of Limb Movement
-0.30	Frequent Standard Safety Equipment
-0.32	Importance of Equipment Pace
-0.36	Duration, Manual Materials
-0.36	Quality Control Testing
-0.42	Setting Up
-0.43	Glare Tolerance
-0.45	Depth Perception
-0.47	Duration, Twisted Body
-0.47	Duration, Standing
-0.47	Duration, Balance
-0.50	Mechanical Maintenance
-0.52	Duration, Repetitive Movement
-0.60	Duration, Noise
-0.94	Duration, Open Vehicle

Source: *NGen By_ Skill_Level_V1 unit returns.*

Key finding 4

When estimated over the 7 year reference period wage premia are significantly smaller, a finding that suggests that much of the change in skill demand is occurring within, rather than between, jobs.

4. A Profile of the Current Manufacturing Workforce

This chapter presents the results of a detailed analysis of the manufacturing workforce and how it has changed over the past 7 years. The analyses presented offer some insight into whether employers are anticipating current trends to continue or expect different patterns to emerge. For the purpose of this analysis, the manufacturing sector is defined by the following entries in the North American Industry Classification (NAIC's):

Figure 4.1 Industry Codes and Descriptions, Canada, 2023

ISIC/NAICS Revision 4 Code	Skill domain
A0311*	Marine fishing
B0893*	Extraction of salt
C1010*	Processing and preserving of meat
C1020	Processing and preserving of fish, crustaceans and molluscs
C1030*	Processing and preserving of fruit and vegetables
C1040*	Manufacture of vegetable and animal oils and fats
C1050*	Manufacture of dairy products
C1061*	Manufacture of grain mill products
C1062*	Manufacture of starches and starch products
C1071*	Manufacture of bakery products
C1072*	Manufacture of sugar
C1073*	Manufacture of cocoa, chocolate and sugar confectionery
C1074*	Manufacture of macaroni, noodles, couscous and similar farinaceous products
C1075*	Manufacture of prepared meals and dishes
C1079*	Manufacture of other food products n.e.c.
C1080*	Manufacture of prepared animal feeds
C1101*	Distilling, rectifying and blending of spirits
C1102	Manufacture of wines
C1103*	Manufacture of malt liquors and malt
C1104	Manufacture of soft drinks; production of mineral waters and other bottled waters
C1200*	Manufacture of tobacco products
C1311*	Preparation and spinning of textile fibres

ISIC/NAICS Revision 4 Code	Skill domain
C1312	Weaving of textiles
C1313*	Finishing of textiles
C1391	Manufacture of knitted and crocheted fabrics
C1392*	Manufacture of made-up textile articles, except apparel
C1393*	Manufacture of carpets and rugs
C1394	Manufacture of cordage, rope, twine and netting
C1399*	Manufacture of other textiles n.e.c.
C1410*	Manufacture of wearing apparel, except fur apparel
C1420*	Manufacture of articles of fur
C1430*	Manufacture of knitted and crocheted apparel
C1511	Tanning and dressing of leather; dressing and dyeing of fur
C1512*	Manufacture of luggage, handbags and the like, saddlery and harness
C1520*	Manufacture of footwear
C1610*	Sawmilling and planing of wood
C1610*	Sawmilling and planing of wood
C1621*	Manufacture of veneer sheets and wood-based panels
C1622*	Manufacture of builders' carpentry and joinery
C1623*	Manufacture of wooden containers
C1629*	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
C1701*	Manufacture of pulp, paper and paperboard
C1702*	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
C1709*	Manufacture of other articles of paper and paperboard
C1811*	Printing
C1812	Service activities related to printing
C1820	Reproduction of recorded media
C1910*	Manufacture of coke oven products
C1920*	Manufacture of refined petroleum products
C2011*	Manufacture of basic chemicals
C2012*	Manufacture of fertilizers and nitrogen compounds
C2013*	Manufacture of plastics and synthetic rubber in primary forms
C2021*	Manufacture of pesticides and other agrochemical products
C2022*	Manufacture of paints, varnishes and similar coatings, printing ink and mastics

ISIC/NAICS Revision 4 Code	Skill domain
C2023*	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
C2029*	Manufacture of other chemical products n.e.c.
C2030	Manufacture of man-made fibres
C2100*	Manufacturing of pharamceuticals, medicinal chemical and botanical products
C2211	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
C2219*	Manufacture of other rubber products
C2220*	Manufacture of plastics products
C2310*	Manufacture of glass and glass products
C2391	Manufacture of refractory products
C2392*	Manufacture of clay building materials
C2393	Manufacture of other porcelain and ceramic products
C2394*	Manufacture of cement, lime and plaster
C2395*	Manufacture of articles of concrete, cement and plaster
C2396*	Cutting, shaping and finishing of stone
C2399*	Manufacture of other non-metallic mineral products n.e.c.
C2410*	Manufacture of basic iron and steel
C2420*	Manufacture of basic precious and other non-ferrous metals
C2431*	Casting of iron and steel
C2432*	Casting of non-ferrous metals
C2511*	Manufacture of structural metal products
C2512*	Manufacture of tanks, reservoirs and containers of metal
C2513*	Manufacture of steam generators, except central heating hot water boilers
C2520	Manufacture of weapons and ammunition
C2591*	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
C2592*	Treatment and coating of metals; machining
C2593*	Manufacture of cutlery, hand tools and general hardware
C2599*	Manufacture of other fabricated metal products n.e.c.
C2610	Manufacture of electronic components and boards
C2620	Manufacture of computers and peripheral equipment
C2630*	Manufacture of communication equipment
C2640*	Manufacture of consumer electronics
C2651*	Manufacture of measuring, testing, navigating and control equipment
C2652	Manufacture of watches and clocks

ISIC/NAICS Revision 4 Code	Skill domain
C2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment
C2670*	Manufacture of optical instruments and photographic equipment
C2680	Manufacture of magnetic and optical media
C2710*	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
C2720*	Manufacture of batteries and accumulators
C2731	Manufacture of fibre optic cables
C2732*	Manufacture of other electronic and electric wires and cables
C2733	Manufacture of wiring devices
C2740*	Manufacture of electric lighting equipment
C2750*	Manufacture of domestic appliances
C2790*	Manufacture of other electrical equipment
C2811*	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
C2812*	Manufacture of fluid power equipment
C2813*	Manufacture of other pumps, compressors, taps and valves
C2814*	Manufacture of bearings, gears, gearing and driving elements
C2815*	Manufacture of ovens, furnaces and furnace burners
C2816*	Manufacture of lifting and handling equipment
C2817*	Manufacture of office machinery and equipment (except computers and peripheral equipment)
C2818*	Manufacture of power-driven hand tools
C2819*	Manufacture of other general-purpose machinery
C2821*	Manufacture of agricultural and forestry machinery
C2822*	Manufacture of metal-forming machinery and machine tools
C2823*	Manufacture of machinery for metallurgy
C2824*	Manufacture of machinery for mining, quarrying and construction
C2825*	Manufacture of machinery for food, beverage and tobacco processing
C2826*	Manufacture of machinery for textile, apparel and leather production
C2829*	Manufacture of other special-purpose machinery
C2910*	Manufacture of motor vehicles
C2920*	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
C2930*	Manufacture of parts and accessories for motor vehicles
C3011*	Building of ships and floating structures

ISIC/NAICS Revision 4 Code	Skill domain
C3012*	Building of pleasure and sporting boats
C3020*	Manufacture of railway locomotives and rolling stock
C3030*	Manufacture of air and spacecraft and related machinery
C3040	Manufacture of military fighting vehicles
C3091*	Manufacture of motorcycles
C3092*	Manufacture of bicycles and invalid carriages
C3099*	Manufacture of other transport equipment n.e.c.
C3100*	Manufacture of furniture
C3211*	Manufacture of jewellery and related articles
C3212	Manufacture of imitation jewellery and related articles
C3220*	Manufacture of musical instruments
C3230*	Manufacture of sports goods
C3240*	Manufacture of games and toys
C3250*	Manufacture of medical and dental instruments and supplies
C3290*	Other manufacturing n.e.c
C3315*	Repair of transport equipment, except motor vehicles
D3530*	Steam and air conditioning supply
N8219*	Photocopying, document preparation and other specialized office support activities
N8292*	Packaging activities
A0311*	Marine fishing
B0893*	Extraction of salt
C1010*	Processing and preserving of meat
C1020	Processing and preserving of fish, crustaceans and molluscs
C1030*	Processing and preserving of fruit and vegetables
C1040*	Manufacture of vegetable and animal oils and fats
C1050*	Manufacture of dairy products
C1061*	Manufacture of grain mill products
C1062*	Manufacture of starches and starch products
C1071*	Manufacture of bakery products
C1072*	Manufacture of sugar
C1073*	Manufacture of cocoa, chocolate and sugar confectionery
C1074*	Manufacture of macaroni, noodles, couscous and similar farinaceous products
C1075*	Manufacture of prepared meals and dishes

ISIC/NAICS Revision 4 Code	Skill domain
C1079*	Manufacture of other food products n.e.c.
C1080*	Manufacture of prepared animal feeds
C1101*	Distilling, rectifying and blending of spirits
C1102	Manufacture of wines
C1103*	Manufacture of malt liquors and malt
C1104	Manufacture of soft drinks; production of mineral waters and other bottled waters
C1200*	Manufacture of tobacco products
C1311*	Preparation and spinning of textile fibres
C1312	Weaving of textiles
C1313*	Finishing of textiles
C1391	Manufacture of knitted and crocheted fabrics
C1392*	Manufacture of made-up textile articles, except apparel
C1393*	Manufacture of carpets and rugs
C1394	Manufacture of cordage, rope, twine and netting
C1399*	Manufacture of other textiles n.e.c.
C1410*	Manufacture of wearing apparel, except fur apparel
C1420*	Manufacture of articles of fur
C1430*	Manufacture of knitted and crocheted apparel
C1511	Tanning and dressing of leather; dressing and dyeing of fur
C1512*	Manufacture of luggage, handbags and the like, saddlery and harness
C1520*	Manufacture of footwear
C1610*	Sawmilling and planing of wood
C1610*	Sawmilling and planing of wood
C1621*	Manufacture of veneer sheets and wood-based panels
C1622*	Manufacture of builders' carpentry and joinery
C1623*	Manufacture of wooden containers
C1629*	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
C1701*	Manufacture of pulp, paper and paperboard
C1702*	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
C1709*	Manufacture of other articles of paper and paperboard
C1811*	Printing

ISIC/NAICS Revision 4 Code	Skill domain
C1812	Service activities related to printing
C1820	Reproduction of recorded media
C1910*	Manufacture of coke oven products
C1920*	Manufacture of refined petroleum products
C2011*	Manufacture of basic chemicals
C2012*	Manufacture of fertilizers and nitrogen compounds
C2013*	Manufacture of plastics and synthetic rubber in primary forms
C2021*	Manufacture of pesticides and other agrochemical products
C2022*	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
C2023*	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
C2029*	Manufacture of other chemical products n.e.c.
C2030	Manufacture of man-made fibres
C2100*	Manufacturing of pharamceuticals, medicinal chemical and botanical products
C2211	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
C2219*	Manufacture of other rubber products
C2220*	Manufacture of plastics products
C2310*	Manufacture of glass and glass products
C2391	Manufacture of refractory products
C2392*	Manufacture of clay building materials
C2393	Manufacture of other porcelain and ceramic products
C2394*	Manufacture of cement, lime and plaster
C2395*	Manufacture of articles of concrete, cement and plaster
C2396*	Cutting, shaping and finishing of stone
C2399*	Manufacture of other non-metallic mineral products n.e.c.
C2410*	Manufacture of basic iron and steel
C2420*	Manufacture of basic precious and other non-ferrous metals
C2431*	Casting of iron and steel
C2432*	Casting of non-ferrous metals
C2511*	Manufacture of structural metal products
C2512*	Manufacture of tanks, reservoirs and containers of metal
C2513*	Manufacture of steam generators, except central heating hot water boilers
C2520	Manufacture of weapons and ammunition
C2591*	Forging, pressing, stamping and roll-forming of metal; powder metallurgy

ISIC/NAICS Revision 4 Code	Skill domain
C2592*	Treatment and coating of metals; machining
C2593*	Manufacture of cutlery, hand tools and general hardware
C2599*	Manufacture of other fabricated metal products n.e.c.
C2610	Manufacture of electronic components and boards
C2620	Manufacture of computers and peripheral equipment
C2630*	Manufacture of communication equipment
C2640*	Manufacture of consumer electronics
C2651*	Manufacture of measuring, testing, navigating and control equipment
C2652	Manufacture of watches and clocks
C2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment
C2670*	Manufacture of optical instruments and photographic equipment
C2680	Manufacture of magnetic and optical media
C2710*	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
C2720*	Manufacture of batteries and accumulators
C2731	Manufacture of fibre optic cables
C2732*	Manufacture of other electronic and electric wires and cables
C2733	Manufacture of wiring devices
C2740*	Manufacture of electric lighting equipment
C2750*	Manufacture of domestic appliances
C2790*	Manufacture of other electrical equipment
C2811*	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
C2812*	Manufacture of fluid power equipment
C2813*	Manufacture of other pumps, compressors, taps and valves
C2814*	Manufacture of bearings, gears, gearing and driving elements
C2815*	Manufacture of ovens, furnaces and furnace burners
C2816*	Manufacture of lifting and handling equipment
C2817*	Manufacture of office machinery and equipment (except computers and peripheral equipment)
C2818*	Manufacture of power-driven hand tools
C2819*	Manufacture of other general-purpose machinery
C2821*	Manufacture of agricultural and forestry machinery
C2822*	Manufacture of metal-forming machinery and machine tools
C2823*	Manufacture of machinery for metallurgy

ISIC/NAICS Revision 4 Code	Skill domain
C2824*	Manufacture of machinery for mining, quarrying and construction
C2825*	Manufacture of machinery for food, beverage and tobacco processing
C2826*	Manufacture of machinery for textile, apparel and leather production
C2829*	Manufacture of other special-purpose machinery
C2910*	Manufacture of motor vehicles
C2920*	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
C2930*	Manufacture of parts and accessories for motor vehicles
C3011*	Building of ships and floating structures
C3012*	Building of pleasure and sporting boats
C3020*	Manufacture of railway locomotives and rolling stock
C3030*	Manufacture of air and spacecraft and related machinery
C3040	Manufacture of military fighting vehicles
C3091*	Manufacture of motorcycles
C3092*	Manufacture of bicycles and invalid carriages
C3099*	Manufacture of other transport equipment n.e.c.
C3100*	Manufacture of furniture
C3211*	Manufacture of jewellery and related articles
C3212	Manufacture of imitation jewellery and related articles
C3220*	Manufacture of musical instruments
C3230*	Manufacture of sports goods
C3240*	Manufacture of games and toys
C3250*	Manufacture of medical and dental instruments and supplies
C3290*	Other manufacturing n.e.c
C3315*	Repair of transport equipment, except motor vehicles
D3530*	Steam and air conditioning supply
N8219*	Photocopying, document preparation and other specialized office support activities
N8292*	Packaging activities

Source: *Statistics Canada North American Industry Classification.*

For some of the analyses presented unit industry codes are grouped into industry sub-sectors as illustrated below.

Given these set of assumptions, several things stand out from the analyses represented by these collective set of figures, including:

The individuals with the highest education (e.g., engineers working within the manufacturing sector) will have less work to do to remain viable once they have passed this hurdle. Like everyone else working within the manufacturing sector, if the SME ratings are efficacious, they (and colleagues across the manufacturing sector) would benefit considerably from having them upgrade the skills comprising Digital Literacy and related components (like Knowledge of Emerging Trends and Technology).

Individuals with low levels of education (i.e., TEER greater than 3, inclusive of labourers and production-line workers across many NACIS codes) will need to have skill upgrading. And not just across hard skills like Reading, but a variety of soft skills represented in the lower-level attributes contained within each composite (e.g., Adaptability).

Several abilities that AI might impact (i.e., Psychomotor, Physical) do not appear to change over the period of SME projections, likely representing an unknown impact of this technology on these constructs. Indeed, it is thought sensory abilities may well need to be increased by 2040 in most professions.

The dataset could be very much improved by focusing future recruitment efforts on SMEs judging occupations that would fill out this matrix. A powerful database for policy decisions would likely accrue. In its present state, any conclusions drawn from the present analysis should be somewhat guarded.

The analysis summarized in this chapter focuses on 73 occupations that have reportable employment in manufacturing over the reference period.

Figure 4.2 National Occupation Codes and Occupational Titles, Paid Workers in Canada

Occupation Code	Occupation Title
12013	Supervisors, supply chain, tracking and scheduling coordination occupations
12113	Statistical officers and related research support occupations
14402	Production logistics workers
20010	Engineering managers
21109	Other professional occupations in physical sciences
21300	Civil engineers
21301	Mechanical engineers
21310	Electrical and electronics engineers
21311	Computer engineers (except software engineers and designers)
21320	Chemical engineers
21321	Industrial and manufacturing engineers
21322	Metallurgical and materials engineers
21330	Mining engineers
21331	Geological engineers

Occupation Code	Occupation Title
21332	Petroleum engineers
21399	Other professional engineers
22100	Chemical technologists and technicians
22101	Geological and mineral technologists and technicians
22110	Biological technologists and technicians
22211	Industrial designers
22230	Non-destructive testers and inspectors
22231	Engineering inspectors and regulatory officers
22233	Construction inspectors
22300	Civil engineering technologists and technicians
22301	Mechanical engineering technologists and technicians
22302	Industrial engineering and manufacturing technologists and technicians
22310	Electrical and electronics engineering technologists and technicians
22311	Electronic service technicians (household and business equipment)
22312	Industrial instrument technicians and mechanics
32129	Other medical technologists and technicians
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations
72011	Contractors and supervisors, electrical trades and telecommunications occupations
72020	Contractors and supervisors, mechanic trades
72100	Machinists and machining and tooling inspectors
72101	Tool and die makers
72106	Welders and related machine operators
72200	Electricians (except industrial and power system)
72201	Industrial electricians
72401	Heavy-duty equipment mechanics
72402	Heating, refrigeration and air conditioning mechanics
72404	Aircraft mechanics and aircraft inspectors
72405	Machine fitters
72406	Elevator constructors and mechanics
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers
72420	Oil and solid fuel heating mechanics
72421	Appliance servicers and repairers
72422	Electrical mechanics
72423	Motorcycle, all-terrain vehicle and other related mechanics
72500	Crane operators
72600	Air pilots, flight engineers and flying instructors

Occupation Code	Occupation Title
72603	Engineer officers, water transport
72999	Other technical trades and related occupations
73209	Other repairers and servicers
73310	Railway and yard locomotive engineers
73401	Printing press operators
73402	Drillers and blasters – surface mining, quarrying and construction
74201	Water transport deck and engine room crew
74205	Public works maintenance equipment operators and related workers
75110	Construction trades helpers and labourers
75119	Other trades helpers and labourers
75211	Railway and motor transport labourers
83100	Underground production and development miners
85110	Mine labourers
85120	Logging and forestry labourers
92010	Supervisors, mineral and metal processing
92011	Supervisors, petroleum, gas and chemical processing and utilities
92012	Supervisors, food and beverage processing
92013	Supervisors, plastic and rubber products manufacturing
92014	Supervisors, forest products processing
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing
92022	Supervisors, furniture and fixtures manufacturing
92023	Supervisors, other mechanical and metal products manufacturing
92024	Supervisors, other products manufacturing and assembly
92100	Power engineers and power systems operators
92101	Water and waste treatment plant operators
93100	Central control and process operators, mineral and metal processing
93101	Central control and process operators, petroleum, gas and chemical processing
93102	Pulping, papermaking and coating control operators
94100	Machine operators, mineral and metal processing
94103	Concrete, clay and stone forming operators
94104	Inspectors and testers, mineral and metal processing
94105	Metalworking and forging machine operators
94106	Machining tool operators
94107	Machine operators of other metal products
94110	Chemical plant machine operators
94111	Plastics processing machine operators
94123	Lumber graders and other wood processing inspectors and graders

Occupation Code	Occupation Title
94124	Woodworking machine operators
94129	Other wood processing machine operators
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers
94131	Weavers, knitters and other fabric making occupations
94132	Industrial sewing machine operators
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing
94140	Process control and machine operators, food and beverage processing
94143	Testers and graders, food and beverage processing
94150	Plate-less printing equipment operators
94151	Camera, platemaking and other prepress occupations
94152	Binding and finishing machine operators
94153	Photographic and film processors
94200	Motor vehicle assemblers, inspectors and testers
94201	Electronics assemblers, fabricators, inspectors and testers
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers
94205	Machine operators and inspectors, electrical apparatus manufacturing
94211	Assemblers and inspectors of other wood products
94212	Plastic products assemblers, finishers and inspectors
94213	Industrial painters, coaters and metal finishing process operators
94219	Other products assemblers, finishers and inspectors
95100	Labourers in mineral and metal processing
95101	Labourers in metal fabrication
95102	Labourers in chemical products processing and utilities
95103	Labourers in wood, pulp and paper processing
95104	Labourers in rubber and plastic products manufacturing
95106	Labourers in food and beverage processing
95107	Labourers in fish and seafood processing
95109	Other labourers in processing, manufacturing and utilities

Source: *Statistics Canada North American Industry Classification.*

The analysis draws on 72 months of data from Statistics Canada's monthly Labour Force Survey to provide estimates of the number of paid workers in each of the manufacturing occupations identified in Canada's National Occupation Classification as listed above.

The resulting time series document increases (or decreases) in the demand for each of the OaSIS skills adjusted for differences in hour worked and the level at which the skills need to be applied. Comparison of the aggregate demand trends to changes in the real wages provides some insight into where rising demand might be outpacing supply and

where falling demand might be reducing the relative wage rates of workers in particular occupations.

Monthly estimates of employment, unemployment and the experienced labour force are summed to provide annual averages for the last 7 years, estimates that are used to identify differences in the level and 7 year trend in employment in each manufacturing occupation, in their average hours worked and in their wage rates.

Employers can use the data on the number of workers employed to benchmark their own wages and working conditions to other manufacturers in their local labour market and to judge how easy it would be to poach workers from other manufacturing employers given prevailing wage rates.

Employers can use the unemployment data to identify workers in each manufacturing occupation who are actively seeking work and what they earned at their last manufacturing job.

Employers can use these data to identify pools of workers who are occupationally experienced in manufacturing who might be induced back into the labour market if the wages and working conditions are right. These data can be used to focus recruitment efforts.

Employers can use the data on workers who are out of the labour force but whose last job was in manufacturing to target groups of workers who might be induced back into work if the wages and working conditions are attractive enough.

The underlying dataset also identifies the number of workers working in manufacturing occupations in industries other than manufacturing. Employers can use these data to identify groups of workers who are already working in occupationally experienced jobs who might be induced into the manufacturing sector if the wages and working conditions are right. Training costs for such workers would be low.

The underlying dataset includes estimates of workers non-manufacturing occupations that share the most in common in terms of the skill set demanded. Employers can use these data to focus recruitment efforts in non-traditional areas that might yield workers with low training needs.

As a second step, employment and unemployment data for each of the 73 manufacturing occupations were linked to the competence and skill profiles in Employment and Social Development Canada's (ESDC) Occupational and Skills Information System (OaSIS). The linked data are then used to generate 7-year trend data for each of the skills and competencies identified in the taxonomy and to document the extent to which employment gains have been concentrated in occupations that demand higher levels of skill and knowledge as predicted by the theory of skill-biased technical change. These data are also used to document how the wage returns to each dimension of skill are evolving. More specifically, the report presents an analysis of the wage premia (or penalty) associated with a one level proficiency level increment over the reference period. Skill domains attracting the highest wage premia are important to employers because they are likely to be of

increasing importance to maintaining competitiveness. It might be that rising wage premia also indicate emerging skill shortages, something that employers can use to focus their hiring and skill development efforts.

4.1 Employment in the Manufacturing Sector

This section of the report documents changes in the levels of employment by occupation in the manufacturing sector.

The manufacturing sector is economically important in Canada. As of 2022, the most recent period for which full year data is available, an estimated average of 2,744,167 paid workers worked in a manufacturing sector. This level of employment is 135,056 lower than observed in 2016 at the start of the reference period.

This result is unexpected given that Canada's population grew by 5.2% between 2016 and 2021.

One might expect that manufacturing employment might rise just as a product of natural growth in the adult population. Between 2018 and 2022, labour productivity, as measured by chained dollars per hour, actually fell from 63.5 to 63.3 in the manufacturing industry in a period when, overall, all industries, labour productivity grew from 60 to 60.1. [3]

An alternative explanation for falling employment might be that the diffusion of digital technologies throughout the economy is driving up skill demand and reducing the number of workers needed to produce the same level of output. Known as the theory of skill-biased technical change, the diffusion of digital technologies throughout the value chain predicts that firms are shifting to produce more output with fewer, but more skilled and expensive, workers as digital technologies displace workers doing routine procedural work. One would expect that skill-biased technical change would also drive-up productivity growth but, as noted above, productivity growth in the sector actually fell. At the same time, increased competition from foreign producers with lower labour costs is likely to have limited the ability of Canadian producers to pass along their higher labour costs to their customers or it may simply be too soon for firms to have adjusted their production processes and work organizations to take full advantage of their new production technologies.

Figure 4.3 lists changes in the levels of employment by occupation in all industries over the reference period 2016 – 2022.

[3] Statistics Canada

Figure 4.3 Percentage Growth in Number of Employed Paid Workers, All Industries, for Occupations with Employment in Manufacturing, Canada, 2016 – 2022

Occupation Code	Rate of paid employment growth, Canada, 2016 – 2022	Percentage
12113	Statistical officers and related research support occupations	175
93102	Pulping, papermaking and coating control operators	94
21330	Mining engineers	82
21321	Industrial and manufacturing engineers	80
20010	Engineering managers	74
92012	Supervisors, food and beverage processing	65
22100	Chemical technologists and technicians	62
72404	Aircraft mechanics and aircraft inspectors	59
95102	Labourers in chemical products processing and utilities	46
72999	Other technical trades and related occupations	46
72402	Heating, refrigeration and air conditioning mechanics	44
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	43
94140	Process control and machine operators, food and beverage processing	41
94143	Testers and graders, food and beverage processing	40
72405	Machine fitters	40
21109	Other professional occupations in physical sciences	35
21399	Other professional engineers	33
94201	Electronics assemblers, fabricators, inspectors and testers	32
21300	Civil engineers	30
74201	Water transport deck and engine room crew	30
72200	Electricians (except industrial and power system)	29
72201	Industrial electricians	29
94219	Other products assemblers, finishers and inspectors	29
72423	Motorcycle, all-terrain vehicle and other related mechanics	28
94105	Metalworking and forging machine operators	27
72603	Engineer officers, water transport	27
21301	Mechanical engineers	24
21332	Petroleum engineers	23
21311	Computer engineers (except software engineers and designers)	21
94129	Other wood processing machine operators	20
72422	Electrical mechanics	20
94111	Plastics processing machine operators	20
74205	Public works maintenance equipment operators and related workers	19
94123	Lumber graders and other wood processing inspectors and graders	16

Occupation Code	Rate of paid employment growth, Canada, 2016 – 2022	Percentage
94205	Machine operators and inspectors, electrical apparatus manufacturing	16
94106	Machining tool operators	16
94110	Chemical plant machine operators	15
94200	Motor vehicle assemblers, inspectors and testers	13
22233	Construction inspectors	12
94100	Machine operators, mineral and metal processing	12
21320	Chemical engineers	12
21310	Electrical and electronics engineers	11
22211	Industrial designers	11
72101	Tool and die makers	11
94103	Concrete, clay and stone forming operators	11
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	10
21331	Geological engineers	10
83100	Underground production and development miners	9
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	9
73209	Other repairers and servicers	9
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	8
73310	Railway and yard locomotive engineers	7
92022	Supervisors, furniture and fixtures manufacturing	6
22101	Geological and mineral technologists and technicians	6
94213	Industrial painters, coaters and metal finishing process operators	5
22301	Mechanical engineering technologists and technicians	5
72020	Contractors and supervisors, mechanic trades	5
92100	Power engineers and power systems operators	3
75110	Construction trades helpers and labourers	3
94152	Binding and finishing machine operators	2
72011	Contractors and supervisors, electrical trades and telecommunications occupations	2
72100	Machinists and machining and tooling inspectors	1
72106	Welders and related machine operators	1
92013	Supervisors, plastic and rubber products manufacturing	0
22300	Civil engineering technologists and technicians	-2
22310	Electrical and electronics engineering technologists and technicians	-3
72401	Heavy-duty equipment mechanics	-5
93100	Central control and process operators, mineral and metal processing	-6

Occupation Code	Rate of paid employment growth, Canada, 2016 – 2022	Percentage
92023	Supervisors, other mechanical and metal products manufacturing	-6
92101	Water and waste treatment plant operators	-7
72600	Air pilots, flight engineers and flying instructors	-7
72500	Crane operators	-7
85110	Mine labourers	-8
73401	Printing press operators	-8
94104	Inspectors and testers, mineral and metal processing	-10
22311	Electronic service technicians (household and business equipment)	-10
95107	Labourers in fish and seafood processing	-12
94124	Woodworking machine operators	-12
92010	Supervisors, mineral and metal processing	-12
32129	Other medical technologists and technicians	-12
85120	Logging and forestry labourers	-13
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	-14
94132	Industrial sewing machine operators	-15
92014	Supervisors, forest products processing	-16
92011	Supervisors, petroleum, gas and chemical processing and utilities	-16
95106	Labourers in food and beverage processing	-16
22230	Non-destructive testers and inspectors	-16
73402	Drillers and blasters – surface mining, quarrying and construction	-18
95103	Labourers in wood, pulp and paper processing	-18
95101	Labourers in metal fabrication	-19
93101	Central control and process operators, petroleum, gas and chemical processing	-22
94211	Assemblers and inspectors of other wood products	-23
22312	Industrial instrument technicians and mechanics	-24
72406	Elevator constructors and mechanics	-26
95104	Labourers in rubber and plastic products manufacturing	-27
92024	Supervisors, other products manufacturing and assembly	-27
94212	Plastic products assemblers, finishers and inspectors	-28
22231	Engineering inspectors and regulatory officers	-29
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	-32
22110	Biological technologists and technicians	-34
72420	Oil and solid fuel heating mechanics	-37
95100	Labourers in mineral and metal processing	-39

Occupation Code	Rate of paid employment growth, Canada, 2016 – 2022	Percentage
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	-40
72421	Appliance servicers and repairers	-41
22302	Industrial engineering and manufacturing technologists and technicians	-42
14402	Production logistics workers	-42
94131	Weavers, knitters and other fabric making occupations	-42
21322	Metallurgical and materials engineers	-49
94107	Machine operators of other metal products	-51
75211	Railway and motor transport labourers	-52
75119	Other trades helpers and labourers	-59
94150	Plate-less printing equipment operators	-63
94153	Photographic and film processors	-79
94151	Camera, platemaking and other prepress occupations	-83

Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key Finding 5

Paid employment in the targeted occupations increased significantly over the 5-year reference period.

Key Finding 6

Significant shifts have occurred in the occupational distribution of employment over the 7-year reference period.

The chart, and the associated table in the statistical annex, provide two important insights.

First, that paid employment in the targeted occupations increased significantly over the 7 year reference period, 2016 – 2022.

Second, the chart documents significant shifts in the occupational distribution of employment in the part of the Canadian economy covered by the targeted occupations.

Employment levels rose in 63 occupations and fell in 73 occupations. At -83%, the largest loss of employment was experienced in “Camera, platemaking and other prepress operations”. The biggest gain, 175%, occurred in “Statistical Officers and related research supports”.

The magnitude of the observed shifts in the occupational distribution of employment raise several important questions for both firm managers and government policy makers. Increases in employment seems to be highly skewed towards more knowledge and skill intense occupations, a trend that fits with the predictions of skill-biased technical change and that should precipitate concomitant increases in productivity growth

in the sector. This trend is explored in depth later in this chapter.

The fact that the expected productivity gains have yet to emerge suggests that employers are facing one or more barriers to capturing the productivity potential of these shifts, or that it is too soon for employers to have figured out how best to capture the productivity potential of the new occupational mix. As noted above, increased competition from foreign producers with lower labour costs might be limiting the ability of Canadian producers to pass along their higher labour costs to their customers, it may simply be too soon for firms to have adjusted their production processes and work organizations to take full advantage of their new production technologies and skill set or firms are diverting the benefits to increase their returns to capital.

Another possibility is that the workers occupying the more knowledge and skill intense jobs don't actually have the requisite skill set or the workers have the skills but the way in work is organized and supervised does not allow workers to apply their skills fully.

Analysis of data from Canada's adult skill assessments – the 1994 International Adult Literacy Survey (IALS), the 2003 Adult Literacy and Life Skills Survey (IALSS) and the 2011 Program for the International Assessment of Adult Competencies (PIAAC) reveals evidence of a highly inefficient market for skills, one in which 40% of job incumbents have literacy skill levels below the proficiency level associated with their occupation. Related analysis shows that employers are able to recognize these skill shortages and adjust wage rates down to reflect the associated loss of productivity. Workers in literacy skill below the level demanded by their occupation earn $61 less per year per literacy point than their peers with the requisite skill level. Given that these workers are an average of 26 points below the minimum level needed, at $1561, the loss of annual earnings per worker is material. More problematically, the same research suggests that a significant proportion of employers may be reducing the levels of skill use demanded by their jobs as a way of avoiding having to pay the rapidly rising wage rates demanded by workers with advanced literacy skill levels and/or are having difficulty hiring workers with the requisite skill sets at prevailing wage rates. Whatever the mix of causes, the associated loss of skill is material and reduces aggregate output significantly.

This is an important result in the current context. The theory of skill-biased technical change suggests that manufacturers will need to employ workers with advanced levels of both cognitive skills – literacy, numeracy, problem solving – and advanced levels of the social emotional skills – communication, innovation, creativity and adaptability – that are needed to apply cognitive skills fully productively in geographically distributed, culturally diverse teams. Research suggests that the productive application of social emotional skills depends critically upon workers having advanced literacy and numeracy levels. Given that 40% of the current workforce lack the literacy skills demanded by routine procedural work, a large percentage of the current workforce will be unable to apply their social emotional skills fully productively even if they have them. Very little is known about the

distribution of social-emotional skills of Canadian adults and how skills relate to individual, firm and macro -outcomes. Given the predicted importance of skills to the future success of the manufacturing sector in Canada, getting reliable estimates of Canada's supply of social emotional skills and how Canada's markets use them is critically important.

Figure 4.4 provides the same data on average increase in employment levels but restricts the analysis to manufacturing occupations over the reference period, 2016 – 2022.

Figure 4.4 Percentage Growth in Paid Employment in Manufacturing by Occupation, Canada, 2016 – 2022

Occupation Code	Paid employment in manufacturing by occupation	Percentage increase/decrease in employment levels
95107	Labourers in fish and seafood processing	44
95102	Labourers in chemical products processing and utilities	9
94143	Testers and graders, food and beverage processing	9
94200	Motor vehicle assemblers, inspectors and testers	9
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	9
94219	Other products assemblers, finishers and inspectors	9
95101	Labourers in metal fabrication	9
94103	Concrete, clay and stone forming operators	8
94211	Assemblers and inspectors of other wood products	8
95103	Labourers in wood, pulp and paper processing	8
94129	Other wood processing machine operators	8
94107	Machine operators of other metal products	7
95100	Labourers in mineral and metal processing	7
94212	Plastic products assemblers, finishers and inspectors	7
95106	Labourers in food and beverage processing	7
21399	Other professional engineers	7
94213	Industrial painters, coaters and metal finishing process operators	6
94132	Industrial sewing machine operators	6
94131	Weavers, knitters and other fabric making occupations	6
94150	Plate-less printing equipment operators	6
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	6
72106	Welders and related machine operators	6
94105	Metalworking and forging machine operators	5
94152	Binding and finishing machine operators	5
94124	Woodworking machine operators	5

Occupation Code	Paid employment in manufacturing by occupation	Percentage increase/decrease in employment levels
14402	Production logistics workers	5
95104	Labourers in rubber and plastic products manufacturing	5
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	5
73401	Printing press operators	5
94110	Chemical plant machine operators	5
94140	Process control and machine operators, food and beverage processing	5
72500	Crane operators	5
22100	Chemical technologists and technicians	5
94123	Lumber graders and other wood processing inspectors and graders	5
94106	Machining tool operators	4
94111	Plastics processing machine operators	4
94201	Electronics assemblers, fabricators, inspectors and testers	4
92012	Supervisors, food and beverage processing	4
72201	Industrial electricians	4
72100	Machinists and machining and tooling inspectors	4
22301	Mechanical engineering technologists and technicians	3
94100	Machine operators, mineral and metal processing	3
22302	Industrial engineering and manufacturing technologists and technicians	3
72010	Contractors and supervisors, machining, metal forming, shaping and erecting	
	trades and related occupations	3
22110	Biological technologists and technicians	3
22211	Industrial designers	3
72422	Electrical mechanics	3
92013	Supervisors, plastic and rubber products manufacturing	3
93101	Central control and process operators, petroleum, gas and chemical processing	3
21321	Industrial and manufacturing engineers	3
92014	Supervisors, forest products processing	3
92023	Supervisors, other mechanical and metal products manufacturing	2
92024	Supervisors, other products manufacturing and assembly	2
22310	Electrical and electronics engineering technologists and technicians	2
92011	Supervisors, petroleum, gas and chemical processing and utilities	2
72401	Heavy-duty equipment mechanics	2

Occupation Code	Paid employment in manufacturing by occupation	Percentage increase/decrease in employment levels
72020	Contractors and supervisors, mechanic trades	2
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	2
92010	Supervisors, mineral and metal processing	2
21301	Mechanical engineers	2
72101	Tool and die makers	2
21320	Chemical engineers	2
22312	Industrial instrument technicians and mechanics	2
92100	Power engineers and power systems operators	1
21310	Electrical and electronics engineers	1

Key finding 7

Paid employment in the targeted occupations in the manufacturing industry increased slightly over the 7-year reference period.

Key finding 8

Significant shifts have occurred in the occupational distribution of paid employment in manufacturing over the 7-year reference period, something that is bound to have an impact on the labour costs faced by manufacturers.

The chart provides two important insights:

- First, that paid employment in the targeted occupations increased ever so slightly over the 7-year reference period in manufacturing.
- Second, the chart documents significant variation in the rates at which paid employment has grown in the targeted occupations in manufacturing over the 5-year reference period. Rates varied from a high of 44% for labourers in fish and seafood processing to a low of 1% for electrical and electronic engineers.

As predicted by the theory of skill biased technical change, variation in the rates of employment growth observed in the manufacturing sector differ significantly from the pattern observed for the same occupations in all industries. Most manufacturing occupations are dominated by the application of routine procedural knowledge, tasks that are highly likely to be displaced by digital technologies. This implies a need for employers in the manufacturing sector to focus on their subset of occupations rather than those in the broader economy.

Selectively increasing average hours worked is perhaps the easiest way for firms to respond to increases in skill demand. Figure 4.5 plots average hours worked over the reference period, 2016 – 2022, by occupations in manufacturing.

Figure 4.5 Usual Average Hours Worked Per Week, Employed Paid Workers in Manufacturing, Canada, 2016 – 2022

Occupation Code	Occupation Title	Average hour worked per week
72401	Heavy-duty equipment mechanics	40.6
20010	Engineering managers	40.1
92010	Supervisors, mineral and metal processing	39.3
92023	Supervisors, other mechanical and metal products manufacturing	39.3
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	39.3
72020	Contractors and supervisors, mechanic trades	39.1
75110	Construction trades helpers and labourers	39.0
92014	Supervisors, forest products processing	38.9
72201	Industrial electricians	38.9
93100	Central control and process operators, mineral and metal processing	38.9
92100	Power engineers and power systems operators	38.6
72500	Crane operators	38.4
73209	Other repairers and servicers	38.4
92013	Supervisors, plastic and rubber products manufacturing	38.3
94123	Lumber graders and other wood processing inspectors and graders	38.1
93102	Pulping, papermaking and coating control operators	38.1
92022	Supervisors, furniture and fixtures manufacturing	38.1
21311	Computer engineers (except software engineers and designers)	38.1
22230	Non-destructive testers and inspectors	38.0
92012	Supervisors, food and beverage processing	38.0
21310	Electrical and electronics engineers	38.0
92024	Supervisors, other products manufacturing and assembly	38.0
21321	Industrial and manufacturing engineers	38.0
94103	Concrete, clay and stone forming operators	38.0
72405	Machine fitters	37.9
94205	Machine operators and inspectors, electrical apparatus manufacturing	37.9
72011	Contractors and supervisors, electrical trades and telecommunications occupations	37.9
21301	Mechanical engineers	37.9
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	37.7
94100	Machine operators, mineral and metal processing	37.6
94106	Machining tool operators	37.6

Occupation Code	Occupation Title	Average hour worked per week
93101	Central control and process operators, petroleum, gas and chemical processing	37.4
72101	Tool and die makers	37.4
21320	Chemical engineers	37.4
94129	Other wood processing machine operators	37.4
22211	Industrial designers	37.3
21399	Other professional engineers	37.3
72106	Welders and related machine operators	37.3
72999	Other technical trades and related occupations	37.1
92011	Supervisors, petroleum, gas and chemical processing and utilities	37.1
94104	Inspectors and testers, mineral and metal processing	37.1
72100	Machinists and machining and tooling inspectors	37.0
72422	Electrical mechanics	37.0
22302	Industrial engineering and manufacturing technologists and technicians	37.0
22310	Electrical and electronics engineering technologists and technicians	36.9
94105	Metalworking and forging machine operators	36.9
22301	Mechanical engineering technologists and technicians	36.7
22312	Industrial instrument technicians and mechanics	36.7
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	36.7
95107	Labourers in fish and seafood processing	36.6
94213	Industrial painters, coaters and metal finishing process operators	36.4
22300	Civil engineering technologists and technicians	36.4
21300	Civil engineers	36.4
95100	Labourers in mineral and metal processing	36.3
22311	Electronic service technicians (household and business equipment)	36.1
72404	Aircraft mechanics and aircraft inspectors	36.0
94111	Plastics processing machine operators	36.0
94201	Electronics assemblers, fabricators, inspectors and testers	36.0
72402	Heating, refrigeration and air conditioning mechanics	35.9
94107	Machine operators of other metal products	35.7
94152	Binding and finishing machine operators	35.7
95101	Labourers in metal fabrication	35.7
22100	Chemical technologists and technicians	35.7
94110	Chemical plant machine operators	35.6
94151	Camera, platemaking and other prepress occupations	35.6
94219	Other products assemblers, finishers and inspectors	35.6

Occupation Code	Occupation Title	Average hour worked per week
14402	Production logistics workers	35.4
94211	Assemblers and inspectors of other wood products	35.4
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	35.3
94124	Woodworking machine operators	35.3
94143	Testers and graders, food and beverage processing	35.3
94200	Motor vehicle assemblers, inspectors and testers	34.9
21322	Metallurgical and materials engineers	34.9
94140	Process control and machine operators, food and beverage processing	34.9
94150	Plate-less printing equipment operators	34.9
95103	Labourers in wood, pulp and paper processing	34.7
94212	Plastic products assemblers, finishers and inspectors	34.7
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	34.7
95104	Labourers in rubber and plastic products manufacturing	34.4
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	34.4
22101	Geological and mineral technologists and technicians	34.4
95102	Labourers in chemical products processing and utilities	34.3
94132	Industrial sewing machine operators	33.7
22110	Biological technologists and technicians	33.4
94131	Weavers, knitters and other fabric making occupations	33.3
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	33.3
73401	Printing press operators	33.3
95106	Labourers in food and beverage processing	33.0

Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 9

Average usual hours worked per week varied significantly by occupation in manufacturing from a high of 40.6 to a low of 33.

The chart documents significant variation in average hours worked per week over the reference period, from a high of 40.6 hours for heavy-duty equipment mechanics to a low of 33 hours for labourers in food and beverage processing. Employers might confront rising skill demand in occupations in which workers work fewer hours per week by demanding workers work more hours.

Differences in average wage rates among occupations reflect differences in the instrinsic economic value of the skills held by workers. In some cases, shortages of specific skills drive up wage rates for particular

occupations. In other cases, skill surpluses reduce average wage rates accruing to particular skill sets and the occupations that demand them.

Figure 4.6 provides average wage rates earned by paid workers in manufacturing occupations over the reference period 2016 – 2022.

Figure 4.6 Average Hourly Wage Rates by Occupation, Employed Paid Workers in Manufacturing, Canada, 2016 – 2022

Occupation Code	Occupation Title	Dollars
20010	Engineering managers	57
21311	Computer engineers (except software engineers and designers)	48
21399	Other professional engineers	44
21322	Metallurgical and materials engineers	44
21320	Chemical engineers	44
21310	Electrical and electronics engineers	43
72011	Contractors and supervisors, electrical trades and telecommunications occupations	42
21301	Mechanical engineers	42
22312	Industrial instrument technicians and mechanics	41
21321	Industrial and manufacturing engineers	41
93101	Central control and process operators, petroleum, gas and chemical processing	40
22101	Geological and mineral technologists and technicians	39
21300	Civil engineers	39
72020	Contractors and supervisors, mechanic trades	39
92100	Power engineers and power systems operators	38
92011	Supervisors, petroleum, gas and chemical processing and utilities	37
72201	Industrial electricians	35
92010	Supervisors, mineral and metal processing	34
92014	Supervisors, forest products processing	34
93100	Central control and process operators, mineral and metal processing	34
72401	Heavy-duty equipment mechanics	33
92023	Supervisors, other mechanical and metal products manufacturing	33
93102	Pulping, papermaking and coating control operators	33
22230	Non-destructive testers and inspectors	32
72404	Aircraft mechanics and aircraft inspectors	32
72402	Heating, refrigeration and air conditioning mechanics	31
22301	Mechanical engineering technologists and technicians	31
22310	Electrical and electronics engineering technologists and technicians	31

Occupation Code	Occupation Title	Dollars
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	31
94100	Machine operators, mineral and metal processing	31
14402	Production logistics workers	30
92024	Supervisors, other products manufacturing and assembly	30
72500	Crane operators	30
22300	Civil engineering technologists and technicians	29
22211	Industrial designers	29
72999	Other technical trades and related occupations	29
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	29
92013	Supervisors, plastic and rubber products manufacturing	29
22302	Industrial engineering and manufacturing technologists and technicians	28
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	28
72405	Machine fitters	28
72101	Tool and die makers	28
22100	Chemical technologists and technicians	28
94200	Motor vehicle assemblers, inspectors and testers	27
22311	Electronic service technicians (household and business equipment)	27
92012	Supervisors, food and beverage processing	27
72100	Machinists and machining and tooling inspectors	27
72422	Electrical mechanics	27
94104	Inspectors and testers, mineral and metal processing	27
92022	Supervisors, furniture and fixtures manufacturing	27
22110	Biological technologists and technicians	26
72106	Welders and related machine operators	26
75110	Construction trades helpers and labourers	25
73209	Other repairers and servicers	25
94110	Chemical plant machine operators	24
94123	Lumber graders and other wood processing inspectors and graders	24
94151	Camera, platemaking and other prepress occupations	24
94106	Machining tool operators	24
73401	Printing press operators	24
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	23
94129	Other wood processing machine operators	23
94213	Industrial painters, coaters and metal finishing process operators	23
94103	Concrete, clay and stone forming operators	23

Occupation Code	Occupation Title	Dollars
94143	Testers and graders, food and beverage processing	23
95100	Labourers in mineral and metal processing	22
95103	Labourers in wood, pulp and paper processing	22
94105	Metalworking and forging machine operators	21
94107	Machine operators of other metal products	21
94150	Plate-less printing equipment operators	21
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	21
94124	Woodworking machine operators	21
94111	Plastics processing machine operators	20
94201	Electronics assemblers, fabricators, inspectors and testers	20
94205	Machine operators and inspectors, electrical apparatus manufacturing	20
94152	Binding and finishing machine operators	20
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	20
94219	Other products assemblers, finishers and inspectors	20
94140	Process control and machine operators, food and beverage processing	20
95101	Labourers in metal fabrication	19
94212	Plastic products assemblers, finishers and inspectors	19
94211	Assemblers and inspectors of other wood products	19
95102	Labourers in chemical products processing and utilities	19
95104	Labourers in rubber and plastic products manufacturing	18
95106	Labourers in food and beverage processing	18
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	18
94131	Weavers, knitters and other fabric making occupations	17
95107	Labourers in fish and seafood processing	16
94132	Industrial sewing machine operators	15

Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 10

Average hourly wage rates varied significantly by manufacturing occupation in the 7-year reference period, 2016 – 2022

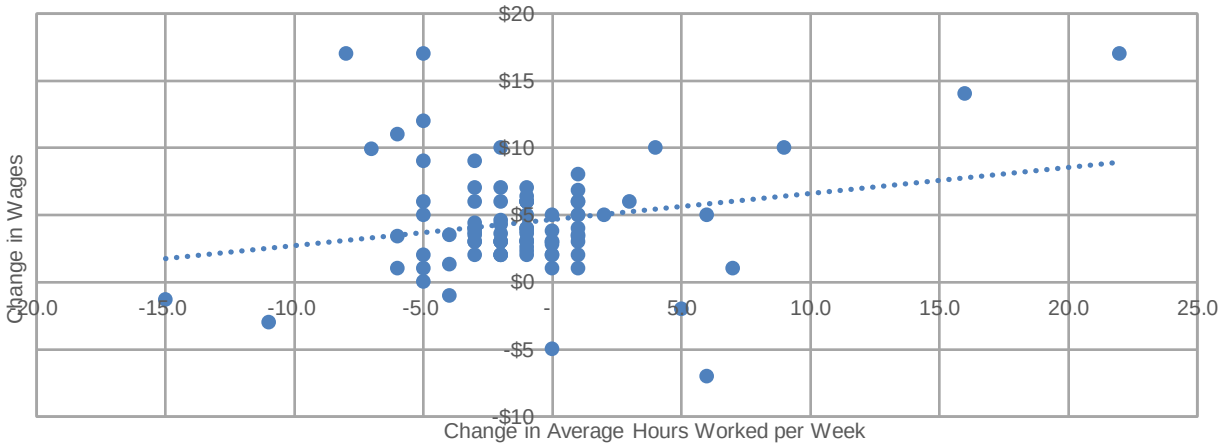
The chart reveals significant variation in the hourly rates of pay of employed paid workers among manufacturing occupations averaged over the period. At $57 per hour engineering managers made the most, industrial sewing machine operators, at $15 per hour, the least.

Figure 4.7 explores the relationship between the change in usual hours worked per week observed over the 7-year reference period and the change in hourly wage rates for manufacturing occupations.

The theory of skill-biased technical change predicts that rapidly rising skill demand

should drive rapid increases in both hours and wages for workers with the required skills sets. One might expect to see a strong correlation between the two as skill intensification drives up both the hours and wage rates of more skilled workers.

Figure 4.7 Change in Average Hour Worked Per Week by Change in Hourly Wage Rate by Occupation, Employed Paid Workers, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 11

Those manufacturing occupations experiencing the largest increase in average hours also experienced the most rapid gain in hourly wage rates, a sign of rising demand and/or emerging skill shortages.

The slope of the regression line in the chart indicates a relatively strong relationship between changes in hours and changes in wage rates over the reference period, one in which those occupations experiencing the largest increase in average hours also experienced the most rapid gain in hourly wage rates.

Despite the strength of the relationship between the growth in average hours worked and growth in average wage rates the figure also reveals several outliers. For example, workers classified as "non-destructive testers and inspectors" experienced an increase of 22 hours in their usual hours worked and an increase of $17 in their average hourly wage rate. In contrast workers who are classified as "Other repairers and servicers" experienced an increase in their usual hours of work of 6 hours and a decrease of $7 in their average hourly wage rate.

Figure 4.8 plots the relationship between employment growth observed over the reference period and wage growth. The theory of skill-biased technical change, and the globalization of markets for skill, production inputs and products and services, predict that there is a high probability that rising skill demand is likely to outstrip the available supply of key skills, something that will precipitate higher levels of wage growth in the manufacturing occupations that are experiencing the most rapid employment growth.

Figure 4.8 Change in Employment by Change in Average Wage Rates by Occupation, Employed Paid Worker, Canada, 2016 – 2022

Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 12

The growth in employment is very weakly related to change in usual hours worked per week, a finding suggests that shifting patterns of skill demand have yet to create skill shortages in manufacturing.

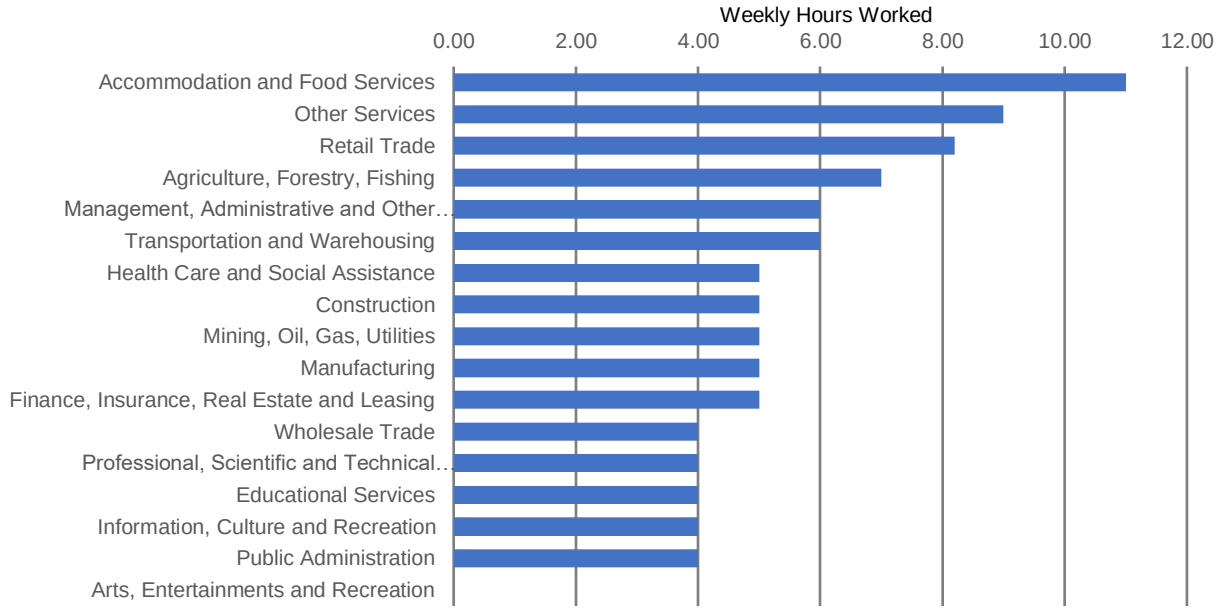
The chart belies the result predicted by the theory of skill biased technical change. Specifically, it reveals virtually no relationship between employment growth and wage growth. This finding suggests that shifting patterns of skill demand have yet to create skill shortages.

Despite little evidence of wage growth within manufacturing occupations, it is possible that the shifting distribution in employment by occupation within manufacturing has had a significant impact on the aggregate labour costs of firms in the sector.

The following four charts reveal that the observed shift to high knowledge and skill intensity occupations has driven up the aggregate labour costs of firms in the sector.

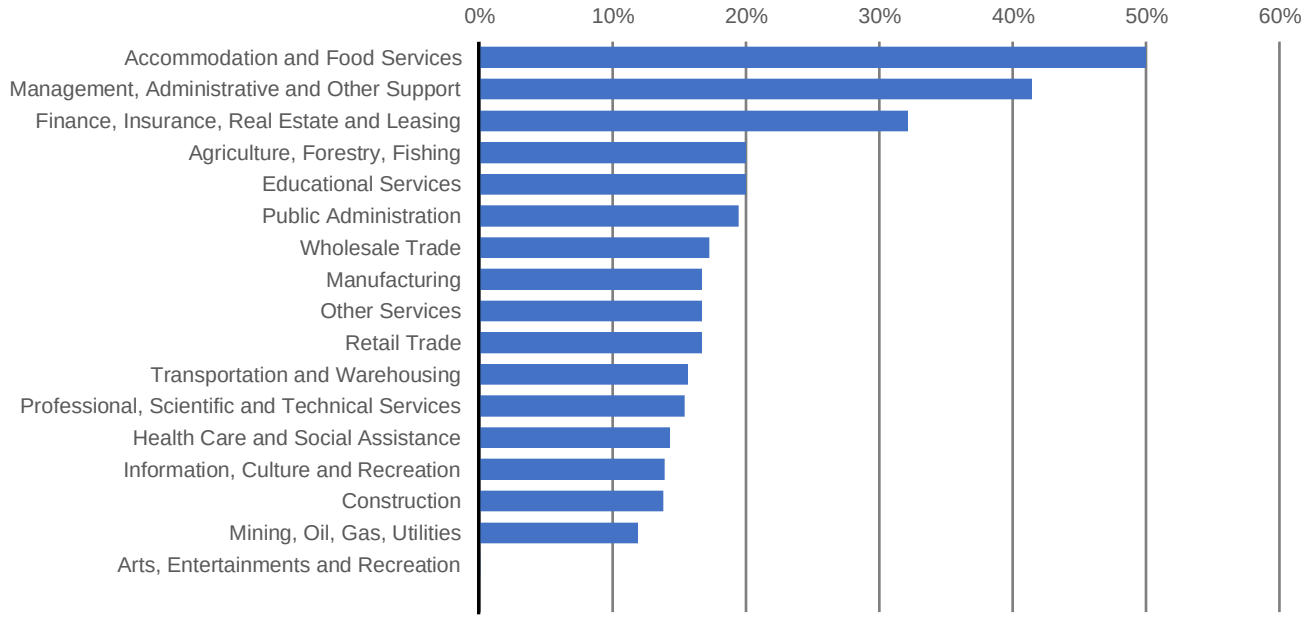
The first pair of charts plot the increase in absolute and percentage terms in average hours worked per week by paid workers in each industry over the reference period. Estimates are based on the subset of occupations with reportable employment in manufacturing.

Figure 4.9 Average Change in Usual Weekly Hours Worked by Industry, Employed Paid Workers, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016-2022.*

Figure 4.10 Percentage Change in Usual Weekly Hours Worked by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 13

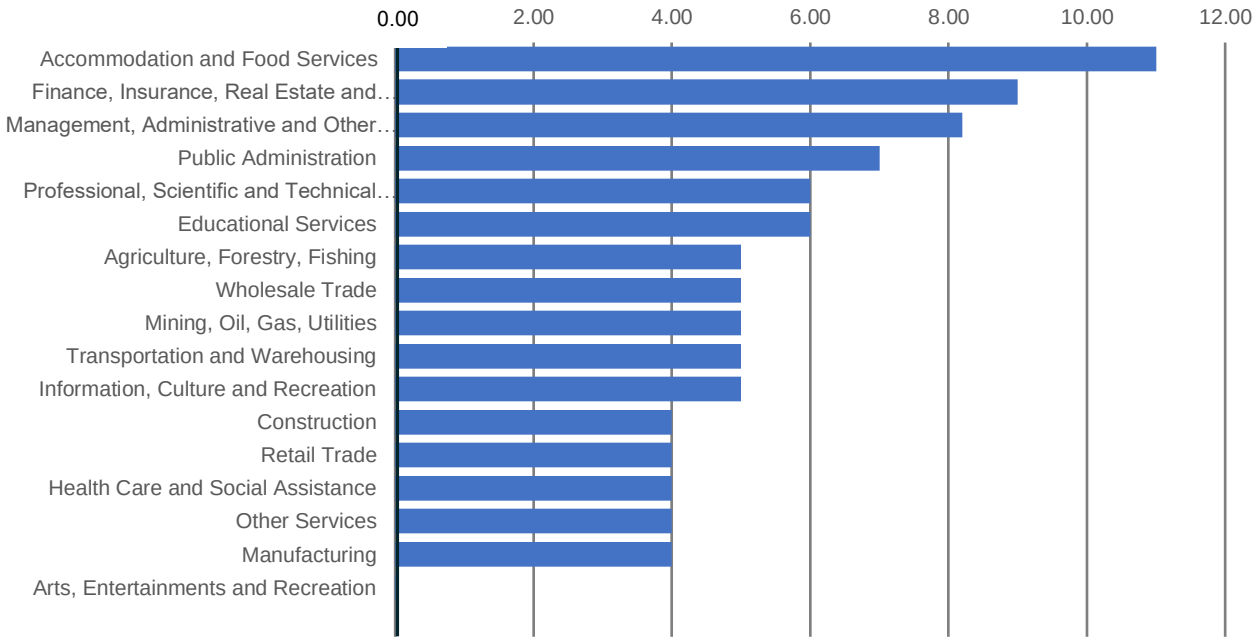
Manufacturing has experienced a 17% increase in hours worked across manufacturing occupations, a rate that places them in the middle of the range of percentage increases by industry.

The first chart reveals that, at 4 hours per week, manufacturing experienced the lowest growth in average weekly hours worked among industrial sectors.

The second chart reveals that, expressed as a percentage, manufacturing has experienced a 17% increase in hours worked across manufacturing occupations, a rate that places them in the middle of the range of percentage increases. By way of comparison, accommodation and food service experienced a 50% increase in their average weekly hours over the reference period.

The next pair of charts document changes in average wage rates in absolute and percentage terms over the reference period.

Chart 4.11 Change in Hourly Wage Rate by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada, 2016 – 2022



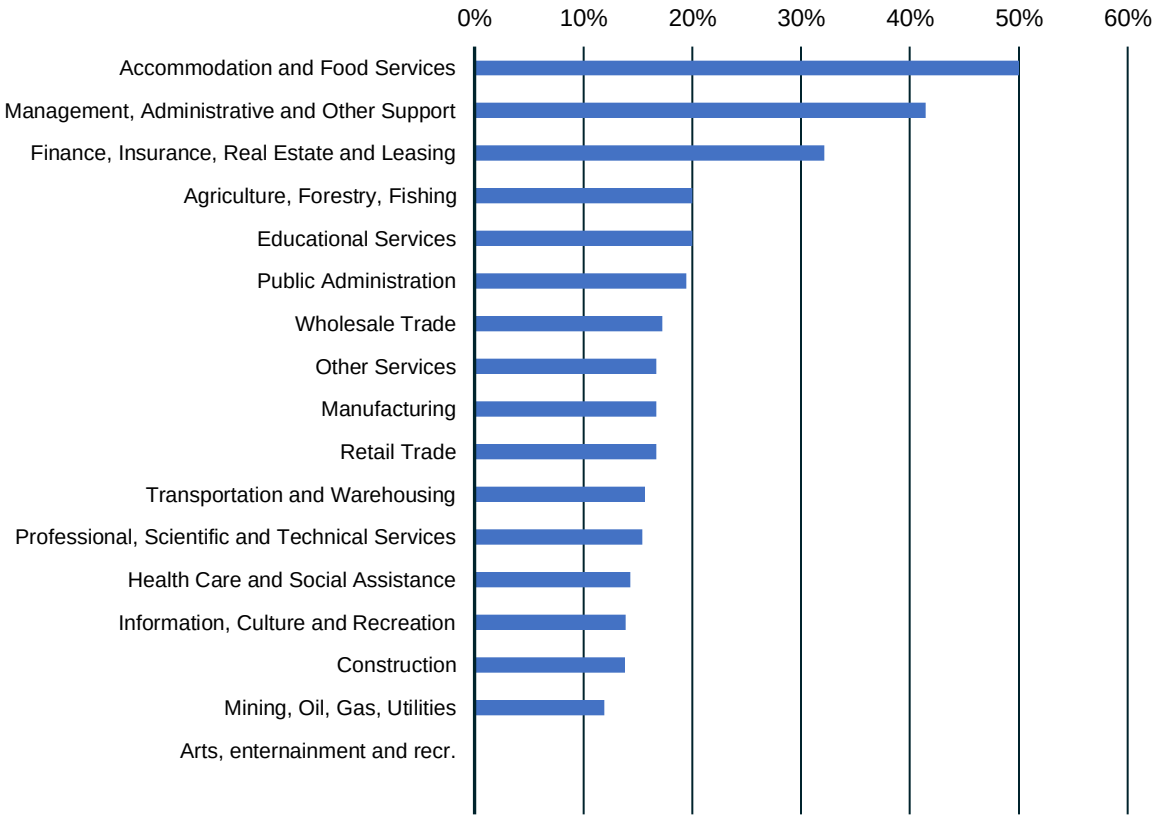
Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 14

At $4 per hour, the manufacturing industry experienced among the lowest growth in average wages of any industry.

The first chart reveals that manufacturing, at $4 per hour, experienced among the lowest growth in average wages across the reference period 2016 – 2022.

Figure 4.12. Percentage Change in Hourly Wage Rate by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 15

At 17%, growth in wage rates in manufacturing falls in the middle of the distribution of increase by industry.

The second chart shows that, expressed as a percentage, the 17% growth in labour costs in manufacturing falls in the middle of the distribution. As was the case with average hours worked accommodation and food service experienced the highest level of aggregate wage growth, 50%.

By way of summary, occupations with meaningful levels of employment in the manufacturing sector experienced relatively little growth in total employment levels, average hours worked or hourly wage rates within occupation.

The changes in the occupational distribution of employment documented in Chapter 4 are, however, of a large enough magnitude to suggest massive shifts in the underlying demand for skills and competencies. In order to determine whether shifts in aggregate skill demand, as reflected in changes in the distribution of employment and hours worked by occupation, are related to the knowledge and skill intensity of jobs we created a summary index of knowledge and skill intensity for each occupation. Created by summing the proficiency levels and importance ratings across the 240 skill dimensions identified in the OaSIS taxonomy, this index provides a means to explore trends in the aggregate demand for a subset of the skills identified in Employment and Social Development's (ESCD) Occupational and Skills Information System (OaSIS) between 2016 and 2022 for the selected manufacturing occupations profiled in Chapter 4.

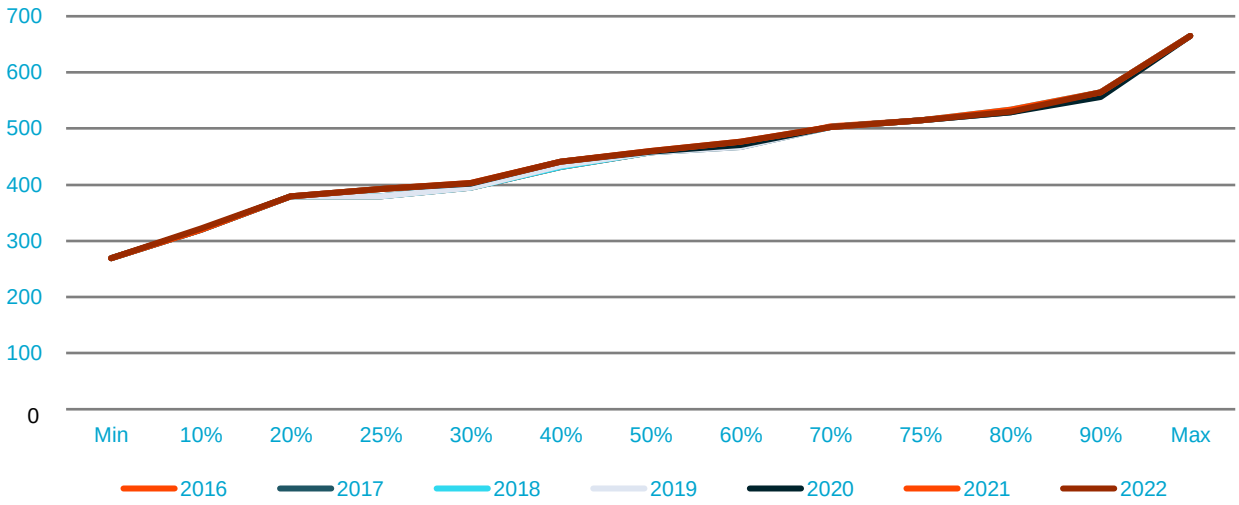
The aggregate estimates for each reference year were derived by multiplying the number of paid workers employed in all manufacturing and non-manufacturing occupations by their usual hours of work and by the sum of the 240 proficiency levels demanded by each occupation. Summing the proficiency levels demanded by each occupation yields an index of the knowledge and skill intensity. Weighting this index by employment in each occupation and usual hours worked provides a summary measure of aggregate skill demand that can be used to compare demand trends over time by industry and occupation. Index values range from a low of 269 to 665, with a mean of 457.

The resulting time series provide a means to document increases (or decreases) in the demand for each of the OaSIS skills adjusted for differences in hours worked and the level at which the skills need to be applied. Comparison of the aggregate demand trends to changes in the real wages paid to workers provides some insight into where rising demand might be outpacing supply and where falling demand might be reducing the relative wage rates of workers in particular occupations.

Summing aggregate demand over occupations across industries provides a way to explore differences in the rates at which industries are becoming more (or less) knowledge and skill intense and what impact any observed differences are related to changes in wage rates.

Figure 4.13 displays the percentile distribution of the knowledge and skill intensity index for each reference year for the targeted occupations.

Figure 4.13 Percentile Distribution of the Knowledge and Skill Intensity Index, Occupations that have Reportable Employment in Manufacturing, All Industries, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.*

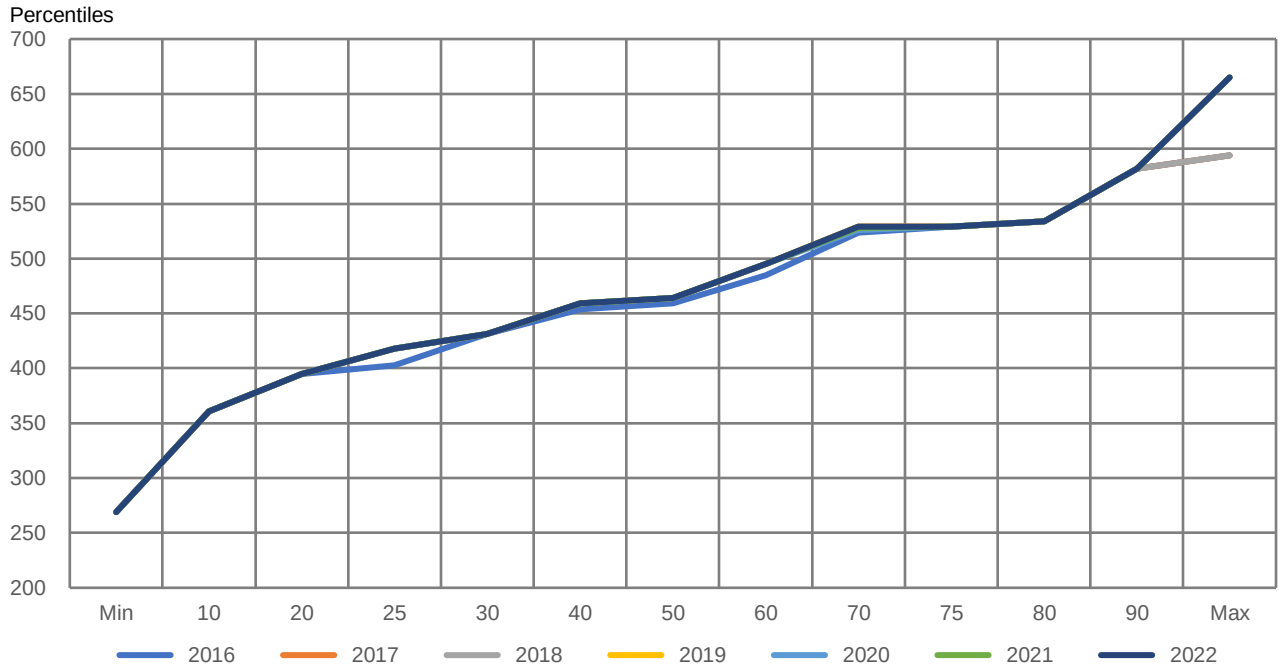
Surprisingly, the chart suggests that the knowledge and skill intensity of employment across industries has remained stable over the reference period.

Figure 4.14 plots the same percentile distribution of knowledge and skill intensity for just the manufacturing sector.

Key finding 16

The knowledge and skill intensity of employment in manufacturing occupations across all industries has remained stable over the reference period.

Figure 4.14 Percentile Distribution of the Knowledge and Skill Intensity index, Occupations that have Reportable Employment in Manufacturing, Manufacturing, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.*

Key finding 17

The knowledge and skill intensity of employment in manufacturing occupations in manufacturing spiked up in 2022.

The chart reveals an important finding. In contrast to the percentile distribution of knowledge and skill intensity for all industries, the chart documents a significant increase in the knowledge and skill intensity of employment in manufacturing in 2022. It would appear that the increase is entirely attributable to an increase in the most knowledge and skill intense jobs i.e. those with an aggregate score of greater than 582 on the 665 point scale.

It is highly likely that this finding explains why there is no evidence of productivity growth in the manufacturing industry. Too little time has passed for employers to have adjusted their technologies of production, work organization or work processes to capture the productivity benefits associated with more knowledge and skill intense occupational mix that emerged in 2022. It is likely that any associated productivity growth will emerge only in 2023 or 2024.

It is worth reiterating a point made in Chapter 2 of this volume i.e. that these estimates of knowledge and skill intensity are best thought of as indicators of average, rather than actual skill demand.

Much of the change in skill demand over time occurs within, rather than between, occupations. Estimates of skill demand that are based on OaSIS proficiency levels remain fixed over the reference period. The proficiency levels presented in OaSIS only get updated on a 10-year cycle, so are, on average, 5 years out of date. Thus, they should not be interpreted as leading indicators of skill demand, but rather as lagging indicators that fail to capture significant variation in skill demand among employers.

Research suggests that OaSIS skill profiles do not capture significant inter-employer variation in actual skill demand within occupations, nor do they capture significant inter-individual variation in actual skill for workers who have what appears to be identical qualifications and experience. More directly, it is only when one compares skill demand estimates to reliable estimates of the distribution of individual skill within an occupation, such as those provided by the OECD PIAAC, that one can draw inferences about possible skill surpluses and shortages and their impact on wages and productivity. For example, analysis of the 2011 PIAAC individual skill data by occupation against the Essential Skills Profiles for the same occupations provides evidence of significant skill surpluses and shortages within each occupation. For example, fully 40% of workers have literacy skills below the proficiency level notionally demanded by their occupation and 40% have literacy skills above the level notionally demanded by their occupation.

The fact that the number of literacy points workers are above and below the minimum score notionally needed to meet the demands of their occupation are associated with material differences in their wage rates suggests that markets for skill are quite efficient in that they adjust market returns to skill to match actual skill. Workers with literacy skills above the required level earn $61 per point of literacy more per year that they are above the notional level demanded by their occupation, a finding that suggests that literacy is a fundamental determinant of productivity.

Related research confirms that literacy skill differences among both countries and provinces are associated with material differences in the long -term growth rates of GDP and productivity.

Figure 4.15 plots the trend in aggregate occupational demand for skill for the entire labour force.

Figure 4.15 Trends in Aggregate Occupational Skill Demand for, Employed paid Workers in Manufacturing Occupations, All Industries, Canada, 2016 – 2023

Occupational Title	Percentage change in aggregate skill demand
Statistical officers and related research support occupations	213
Records management technicians	121
Producers, directors, choreographers and related occupations	88
Nursery and greenhouse labourers	80
Authors and writers (except technical)	77
Agricultural representatives, consultants and specialists	75
Biologists and related scientists	69
Contractors and supervisors, pipefitting trades	68
Social policy researchers, consultants and program officers	67
Human resources managers	63
Supervisors, food and beverage processing	61
Other professional occupations in physical sciences	60
Chemical technologists and technicians	60
Graphic arts technicians	57
Silviculture and forestry workers	57
Dental assistants and dental laboratory assistants	55
Other service support occupations	53
Conductors, composers and arrangers	51
Ground and water transport ticket agents, cargo service representatives and related clerks	49
Natural and applied science policy researchers, consultants and program officers	49
Transportation route and crew schedulers	48
Oil and gas well drillers, servicers, testers and related workers	46
Geoscientists and oceanographers	43
Translators, terminologists and interpreters	43
Insurance underwriters	38
Logging and forestry labourers	37
Supervisors, mining and quarrying	35
Foundry workers	35
Conservation and fishery officers	34
Financial sales representatives	33
Accounting technicians and bookkeepers	33
Customs, ship and other brokers	33

Occupational Title	Percentage change in aggregate skill demand
Medical sonographers	32
Medical radiation technologists	32
Other administrative services managers	31
Electricians (except industrial and power system)	30
Paralegals and related occupations	30
Operators and attendants in amusement, recreation and sport	29
Industrial electricians	29
Financial managers	29
Motorcycle, all-terrain vehicle and other related mechanics	28
Web developers and programmers	27
Gas fitters	27
Economists and economic policy researchers and analysts	27
Health policy researchers, consultants and program officers	27
Contractors and supervisors, carpentry trades	26
Metalworking and forging machine operators	25
Electrical power line and cable workers	25
Other assisting occupations in support of health services	24
Program officers unique to government	24
Railway conductors and brakemen/women	23
Education policy researchers, consultants and program officers	23
Health information management occupations	23
Electrical mechanics	23
College and other vocational instructors	20
Pharmacy technicians	20
Supervisors, logging and forestry	20
Automotive and heavy truck and equipment parts installers and servicers	20
Forestry technologists and technicians	19
Pharmacy technical assistants and pharmacy assistants	19
Post-secondary teaching and research assistants	19
Dental technologists and technicians	19
Musicians and singers	19
Carpenters	18
Plastics processing machine operators	18
Assessors, business valuators and appraisers	18
Other technical occupations in therapy and assessment	17

Occupational Title	Percentage change in aggregate skill demand
Therapists in counselling and related specialized therapies	17
Underground production and development miners	17
Other professional occupations in social science	16
Agricultural service contractors and farm supervisors	15
Social workers	15
Construction inspectors	15
Personnel clerks	15
Journalists	15
Machining tool operators	14
Librarians	14
Landscape and horticulture technicians and specialists	14
Bricklayers	14
Harvesting labourers	13
Lumber graders and other wood processing inspectors and graders	13
Insurance adjusters and claims examiners	13
Specialized members of the Canadian Armed Forces	12
Automotive service technicians, truck and bus mechanics and mechanical repairers	12
Specialized livestock workers and farm machinery operators	12
Forestry professionals	12
Social and community service workers	12
Other trades helpers and labourers	11
Geological and mineral technologists and technicians	10
Web designers	10
Machine operators, mineral and metal processing	10
Residential and commercial installers and servicers	10
Retail sales supervisors	9
Supervisors, furniture and fixtures manufacturing	9
Concrete, clay and stone forming operators	8
Correspondence, publication and regulatory clerks	8
Chemists	8
Contractors and supervisors, oil and gas drilling and services	7
Graphic designers and illustrators	7
Steamfitters, pipefitters and sprinkler system installers	7
Career development practitioners and career counsellors (except education)	7
University professors and lecturers	7

Occupational Title	Percentage change in aggregate skill demand
Outdoor sport and recreational guides	7
Tool and die makers	6
Contractors and supervisors, other construction trades, installers, repairers and servicers	6
Accounting and related clerks	6
Interior designers and interior decorators	6
Pulp mill, papermaking and finishing machine operators	5
Secondary school teachers	5
Chemical plant machine operators	5
Mechanical engineering technologists and technicians	5
Railway and yard locomotive engineers	5
Banking, insurance and other financial clerks	4
Recreation, sports and fitness policy researchers, consultants and program officers	4
Construction trades helpers and labourers	4
Textile fibre and yarn, hide and pelt processing machine operators and workers	3
Estheticians, electrologists and related occupations	2
Program leaders and instructors in recreation, sport and fitness	2
Other small engine and small equipment repairers	1
Welders and related machine operators	1
Supervisors, plastic and rubber products manufacturing	1
Sawmill machine operators	0
Supervisors, motor vehicle assembling	0
By-law enforcement and other regulatory officers	0
Technical sales specialists – wholesale trade	0
Contractors and supervisors, electrical trades and telecommunications occupations	-1
Airline ticket and service agents	-1
Central control and process operators, mineral and metal processing	-1
Purchasing and inventory control workers	-1
Civil engineering technologists and technicians	-2
Shippers and receivers	-2
Livestock labourers	-2
Chain saw and skidder operators	-2
Editors	-2
Boilermakers	-3
Plumbers	-3
Elementary school and kindergarten teachers	-3

Occupational Title	Percentage change in aggregate skill demand
Supervisors, other products manufacturing and assembly	-4
Light duty cleaners	-4
Other technical and coordinating occupations in motion pictures, broadcasting and the performing arts	-4
Railway and motor transport labourers	-4
Machinists and machining and tooling inspectors	-4
Theatre, fashion, exhibit and other creative designers	-5
Sales and account representatives – wholesale trade (non-technical)	-5
Sheet metal workers	-6
Data entry clerks	-6
Telecommunications equipment installation and cable television service technicians	-6
Food counter attendants, kitchen helpers and related support occupations	-6
Tour and travel guide	-7
Telecommunications line and cable installers and repairers	-7
Woodworking machine operators	-8
Underground mine service and support workers	-9
Supervisors, other mechanical and metal products manufacturing	-9
Labourers in textile processing and cutting	-10
Supervisors, petroleum, gas and chemical processing and utilities	-10
Oil and gas drilling, servicing and related labourers	-10
Supervisors, mineral and metal processing	-11
Labourers in fish and seafood processing	-12
General office support workers	-13
Receptionists	-13
Rubber processing machine operators and related workers	-14
Supervisors, forest products processing	-14
Power system electricians	-14
Dispatchers	-15
Auto body collision, refinishing and glass technicians and damage repair estimators	-16
Customer services representatives – financial institutions	-17
Court clerks and related court services occupations	-17
Inspectors and testers, mineral and metal processing	-18
Cardiology technologists and electrophysiological diagnostic technologists	-18
Labourers in food and beverage processing	-18
Maîtres d'hôtel and hosts/hostesses	-18

Occupational Title	Percentage change in aggregate skill demand
Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	-19
Library assistants and clerks	-19
Supervisors, electronics and electrical products manufacturing	-20
Specialized cleaners	-20
Collection clerks	-20
Business development officers and market researchers and analysts	-20
Cooks	-21
Water and waste treatment plant operators	-22
Other medical technologists and technicians	-22
Production and transportation logistics coordinators	-22
Bartenders	-24
Archivists	-24
Other sales related occupations	-24
Elevator constructors and mechanics	-24
Ironworkers	-24
Janitors, caretakers and heavy-duty cleaners	-24
Audio and video recording technicians	-25
Film and video camera operators	-27
Sports officials and referees	-29
Meteorologists and climatologists	-31
Hotel front desk clerks	-34
Supervisors, textile, fabric, fur and leather products processing and manufacturing	-34
Appliance servicers and repairers	-35
Oil and gas well drilling and related workers and services operators	-35
Biological technologists and technicians	-35
Other labourers in processing, manufacturing and utilities	-36
Oil and solid fuel heating mechanics	-40
Glass forming and finishing machine operators and glass cutters	-41
Cabinetmakers	-43
Retail salespersons and visual merchandisers	-44
Production logistics workers	-47
Broadcast technicians	-48
Agricultural and fish products inspectors	-48
Conservators and curators	-50
Machine operators of other metal products	-52

Occupational Title	Percentage change in aggregate skill demand
Support occupations in accommodation, travel and facilities set-up services	-60
Structural metal and platework fabricators and fitters	-62
Desktop publishing operators and related occupations	-67
Physicists and astronomers	-69

Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

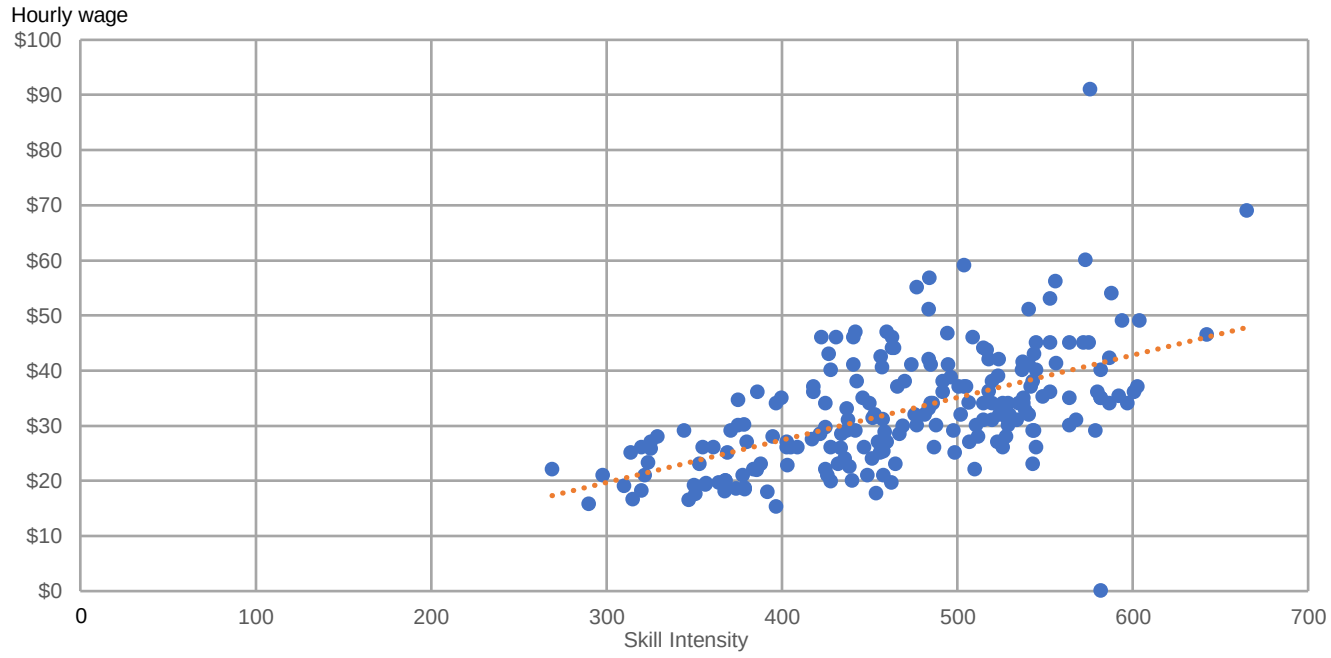
Key finding 18

The analysis provides evidence of a massive shift in aggregate skill demand by occupation over the reference period, a finding that raises the question as to whether skill supply can handle such a rapid skill demand shock.

The chart reveals evidence of significant shifts in aggregate demand by occupation.

The skill and knowledge index used in this analysis makes the somewhat unlikely assumption that all of the skill dimensions are equally important. Related theory suggests that there are hierarchies of skill acquisition and application that make some skills more important to productivity, and, hence, wages. Nevertheless, as shown in the following graph, the resultant index captures significant variation in wage rates.

Figure 4.16 Knowledge and Skill Intensity Index for Selected Occupations by Average Hourly Wage Rate, Canada, 2022



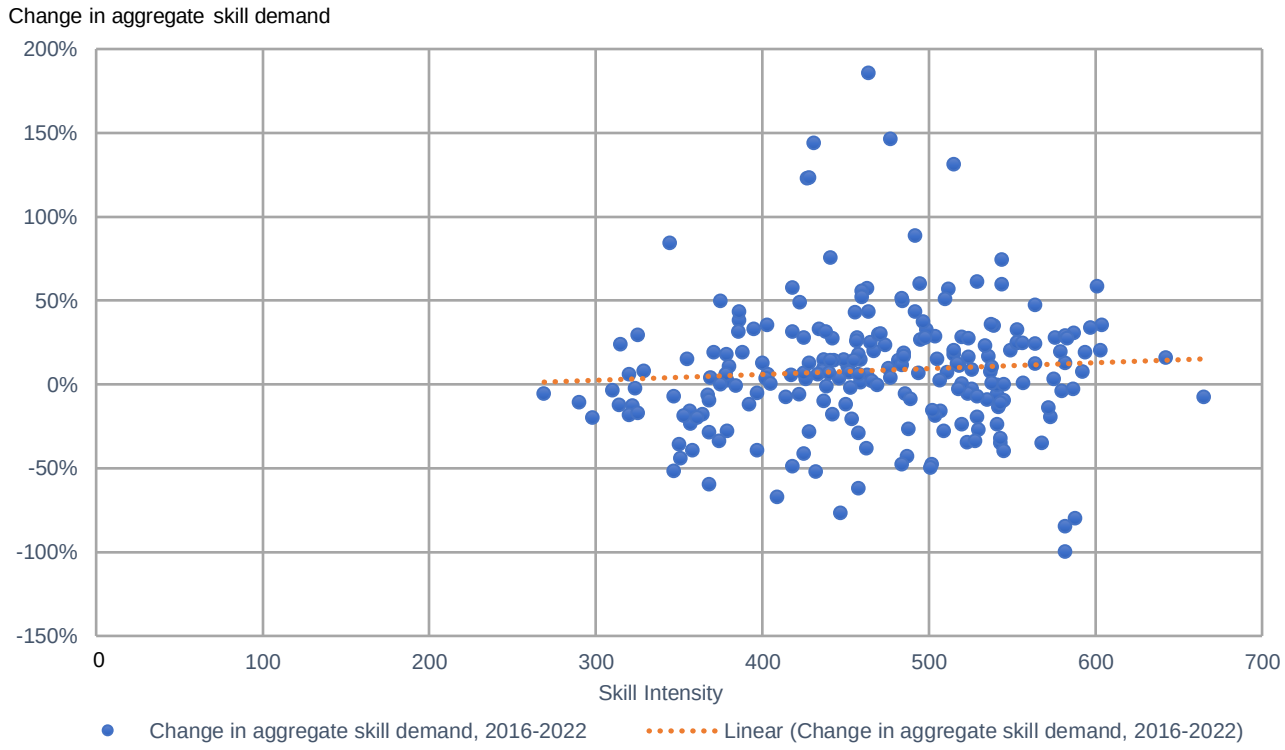
Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

Key finding 19

The index of knowledge and skill intensity is highly correlated with occupational differences in wages in manufacturing occupations.

Figure 4.17 shows the relationship between the index of knowledge and skill intensity and changes in aggregate skill demand over the reference period.

Figure 4.17 Change in Aggregate Skill Demand by Index of Knowledge and Skill Intensity of the Occupation, Employed Paid Workers, Canada, 2016 – 2023



Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

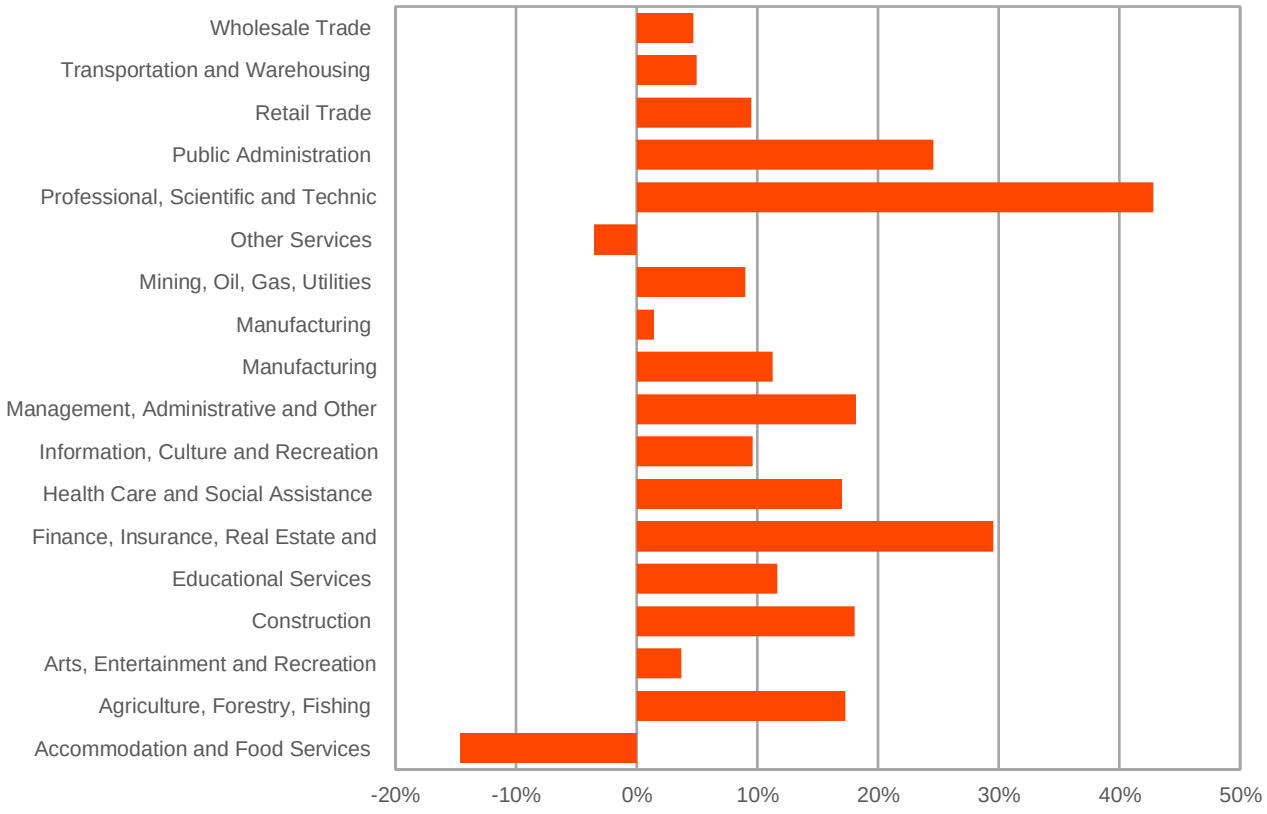
Key finding 20

The index of knowledge and skill intensity is slightly less correlated with changes in aggregate skill demands than with wage rates in manufacturing occupations.

The chart reveals that change in aggregate skill demand is slightly biased toward jobs with high knowledge and skill intensity. The strength of the association is not, however, large, a finding that suggests that other factors are mediating the behaviour of firms.

Figure 4.18 compares the trends in aggregate occupational demand for skill across industries.

Figure 4.18 Percentage Change in Aggregate Skill Demand by Industry, Employed Paid Workers, Canada, 2016 – 2022



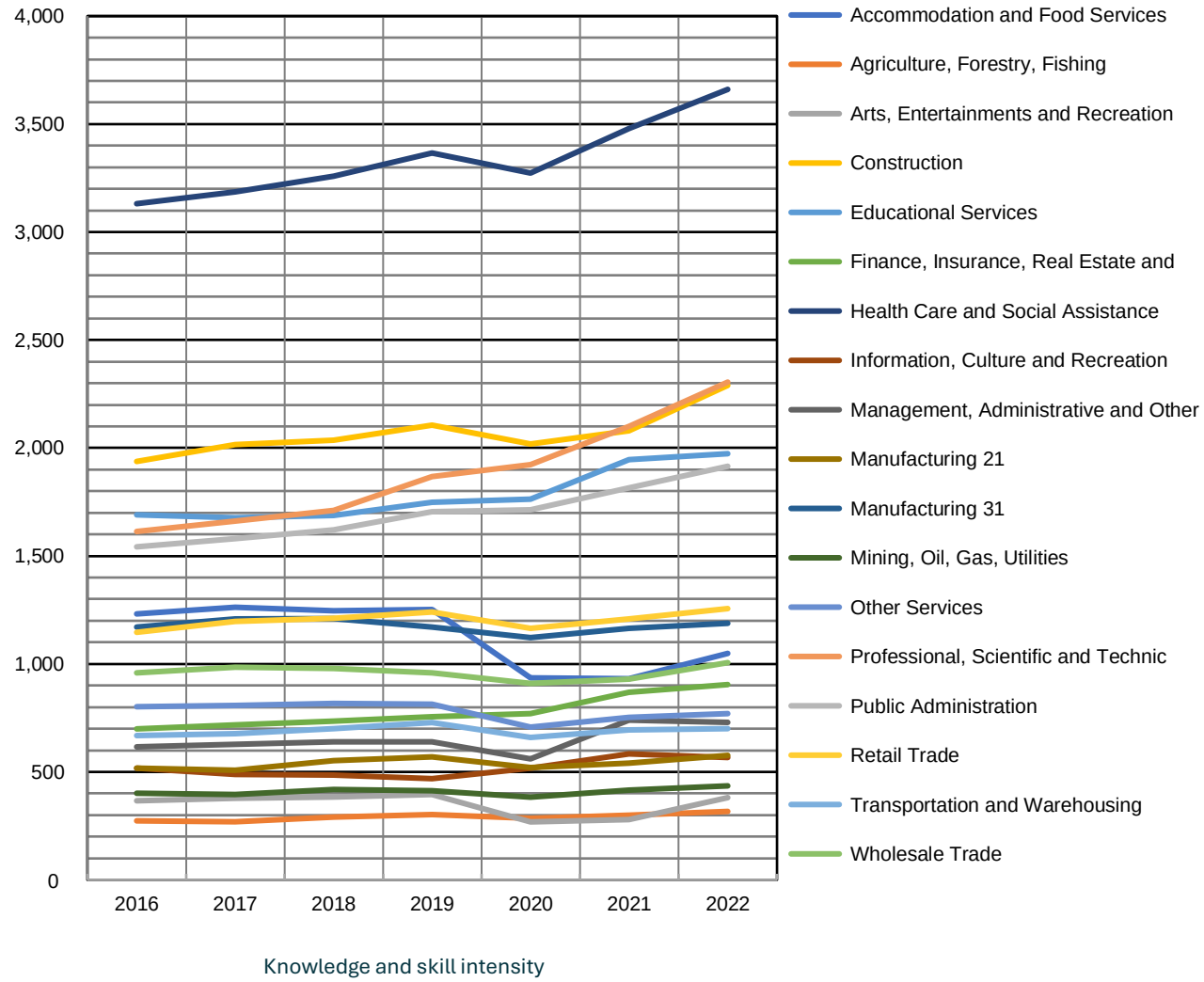
Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.*

The chart reveals that:

- The knowledge and skill intensity of employment is rising in most, but not all, industries.
- The rate of knowledge and skill intensification varies significantly by industry from a high of +43% in Finance, Insurance, and Real estate to -5% in Accommodation and Food Service
- At 11% and 2%, the rate of growth of aggregate skill demand in the two manufacturing sub-sectors is comparatively low.

Figure 4.19 plots the trends in aggregate skill demand by industry.

Figure 4.19 Trend in Aggregate Skill Demand by Industry, Employed Paid Workers, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

Key finding 21

At 465 the level of knowledge and skill intensity in manufacturing is close to the average for all industries and well below the level demanded by several industries.

The chart reveals large differences in both the level and trend of knowledge and skill intensity by industry.

At 465, average skill intensity for manufacturing occupations in the two manufacturing industry sub-sectors are just above the average of 457.

Three outliers include:

1. The agriculture, forestry and fishing industry that experienced a 18% increase in aggregate skill demand in an industry with a low knowledge and skill intensity index of 458.
2. The transportation and warehousing industry that experienced a 5% increase in aggregate skill demand in an industry with low knowledge and skill intensity index of 461.
3. The professional, scientific and technical industry with a 43% increase in aggregate skill demand in an industry with a knowledge and skill intensity index of 466.

Figure 4.20 plots the percentage change in aggregate skill demand in selected occupations in the manufacturing sector.

Figure 4.20 Percentage Change in Aggregate Skill Demand, Selected Occupations in Manufacturing, Employed Paid Workers, Canada, 2016 – 2022

Occupational Title	Percentage change in aggregate skill demand, 2016 – 2023
Statistical officers and related research support occupations	213
Transportation route and crew schedulers	71
Supervisors, food and beverage processing	61
Other professional occupations in physical sciences	60
Chemical technologists and technicians	60
Electricians (except industrial and power system)	30
Industrial electricians	29
Motorcycle, all-terrain vehicle and other related mechanics	28
Web developers and programmers	27
Metalworking and forging machine operators	25
Electrical mechanics	23
Plastics processing machine operators	18
Bricklayers	17

Occupational Title	Percentage change in aggregate skill demand, 2016 – 2023
Underground production and development miners	17
Automotive and heavy truck and equipment parts installers and servicers	16
Machining tool operators	14
Lumber graders and other wood processing inspectors and graders	13
Automotive service technicians, truck and bus mechanics and mechanical repairers	12
Harvesting labourers	11
Geological and mineral technologists and technicians	10
Machine operators, mineral and metal processing	10
Supervisors, furniture and fixtures manufacturing	9
Concrete, clay and stone forming operators	8
Other administrative services managers	7
Tool and die makers	6
Chemical plant machine operators	5
Other small engine and small equipment repairers	5
Mechanical engineering technologists and technicians	5
Railway and yard locomotive engineers	5
Contractors and supervisors, other construction trades, installers, repairers and servicers	4
Construction trades helpers and labourers	4
Textile fibre and yarn, hide and pelt processing machine operators and workers	3
Welders and related machine operators	1
Supervisors, plastic and rubber products manufacturing	1
Landscape and horticulture technicians and specialists	0
Contractors and supervisors, electrical trades and telecommunications occupations	-1
Central control and process operators, mineral and metal processing	-1
Civil engineering technologists and technicians	-2
Supervisors, other products manufacturing and assembly	-4
Residential and commercial installers and servicers	-4
Machinists and machining and tooling inspectors	-4
Woodworking machine operators	-8
Supervisors, other mechanical and metal products manufacturing	-9
Supervisors, petroleum, gas and chemical processing and utilities	-10
Supervisors, mineral and metal processing	-11
Labourers in fish and seafood processing	-12
Supervisors, forest products processing	-14
Logging and forestry labourers	-14

Occupational Title	Percentage change in aggregate skill demand, 2016 – 2023
Water and waste treatment plant operators	-17
Inspectors and testers, mineral and metal processing	-18
Labourers in food and beverage processing	-18
Construction inspectors	-18
Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	-19
Other medical technologists and technicians	-22
Elevator constructors and mechanics	-24
Supervisors, textile, fabric, fur and leather products processing and manufacturing	-34
Appliance servicers and repairers	-35
Biological technologists and technicians	-35
Other labourers in processing, manufacturing and utilities	-36
Oil and solid fuel heating mechanics	-40
Production logistics workers	-47
Railway and motor transport labourers	-51
Machine operators of other metal products	-52
Other trades helpers and labourers	-65

Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

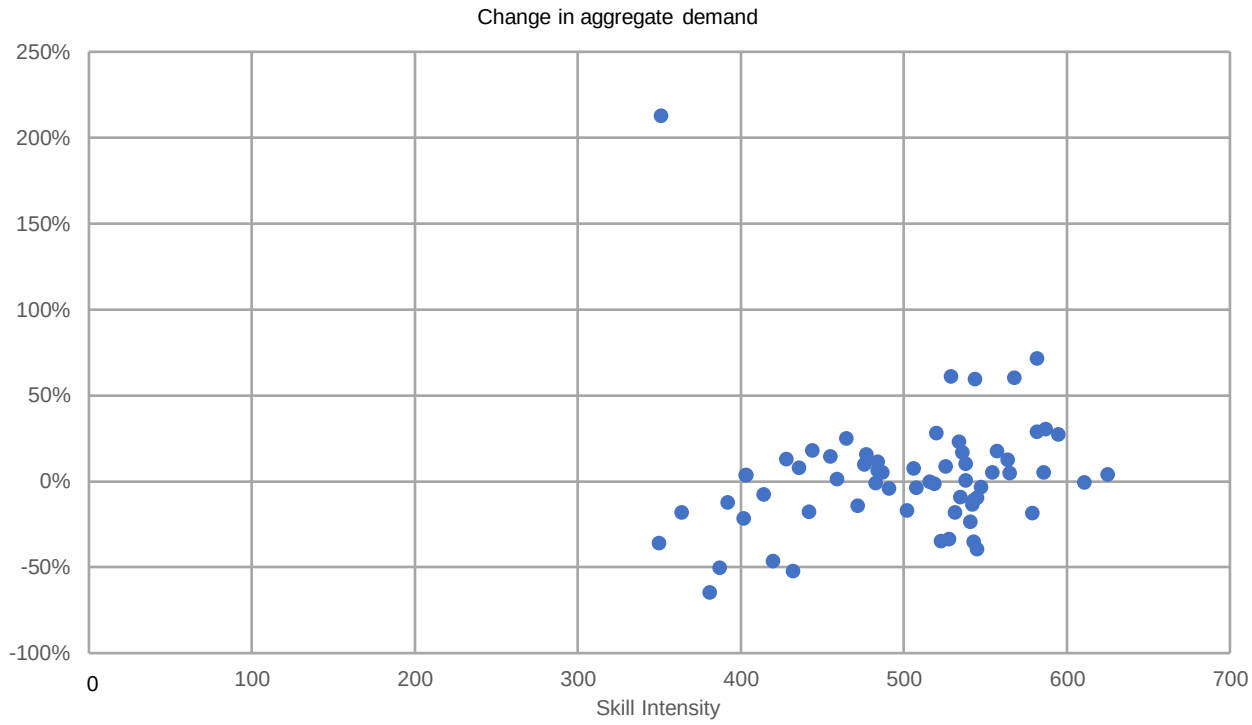
Key finding 22

Roughly half the occupations in manufacturing saw increases in aggregate skill demand with the other half experiencing decreases in aggregate skill demand. The amount of change observed for a 7-year period is extraordinary.

The chart documents significant differences in the rate of change in aggregate demand by occupations in the manufacturing sector with about half the occupations seeing increases in aggregate skill demand and the other half experiencing decreases in aggregate skill demand. As expected, the pattern of change observed in manufacturing differs from that observed in other industries for the same occupations.

Figure 4.21 plots the rate of change in aggregate skill demand by the knowledge and skill intensity of the job for manufacturing occupations.

Figure 4.21 Percentage Change in Aggregate Skill Demand by the Knowledge and Skill Intensity of the Job for Manufacturing Occupations, Employed Paid Workers, Canada, 2016 – 2023



Source: *Special tabulation of monthly Labour Force Survey, 2016-2022 linked to OaSIS skill demand profiles.*

Key finding 23

Both increases and decreases in the aggregate demand for skill in the manufacturing sector have been concentrated in more knowledge and skill intense jobs i.e. occupations with a skill intensity index above 457.

The chart reveals that both increases and decreases in the aggregate demand for skill in the manufacturing sector have been concentrated in more knowledge and skill intense jobs i.e. occupations with a skill intensity index above 457.

A notable outlier:

- Other administrative service officers who experienced a 213% increase in aggregates skill demand

It remains an open question as to whether the workers in these manufacturing occupations have the skills identified in the profile for their jobs or whether their employers will adjust their work organizations, technologies of production and processes to take full advantage of their employees higher skill levels.

Viewed at the highest level these results suggest that skill-biased technical change appears to be driving rapid shifts in the

occupational distribution of employment by occupation. Both increases and decreases in the demand for skills are concentrated in more knowledge and skill intense occupations.

As we shall see later in this report, the analysis presented confirms a rapid shift in the occupational distribution of employment in the manufacturing sector, one that involves more than a shift towards higher paying, more knowledge and skill intense occupations. The loss of significant aggregate skill demand in knowledge and skill intense jobs suggests that the impact of skill-biased technical change is more complex than assumed.

Whatever the underlying determinants of these changes, the observed shifts are associated with a 17% increase in labour costs per hour worked between 2016 and 2022. While not the highest increase observed, this percentage is high enough to place cost pressure on firms in the sector, particularly at a time when competition is likely to be limiting a firm's ability to pass cost increases on to clients.

The fact that the dramatic shifts in skill mix in the manufacturing sector observed over the reference period are not yet associated with a concomitant increase is productivity growth is troubling and warrants the focussed attention of policy makers to understand, particularly since US manufactures registered strong productivity growth in the reference period.

This finding does not refute the theory of skill-biased technical change but, rather, suggests that other factors are limiting the ability of firms to raise wage rates.

It might be that low-cost foreign competitors are placing enough downward pressure on Canadian producers to limit their ability to pass cost increases on to their customers or to pay higher wages.

Alternately, too little time may have passed for firms to adjust their work organization and production processes to take full advantage of the productivity enhancing potential of digital technologies.

Another possibility is that companies are choosing to direct more of the productivity benefits to higher returns to capital.

Whatever the mix of underlying causes, the lack of productivity growth, aggregate employment levels and wage growth has to remain a central preoccupation for policy makers.

5. Sources of New Labour Supply for Manufacturing

Faced with what appears to be a demographically-induced absolute shortage of workers and rapid shifts in the mix of skills needed to maintain competitiveness manufacturers will be obliged to tap new sources of labour and skill supply. This chapter explores several possible sources of new labour and skill supply that employers in manufacturing might target.

5.1 Flows into and Out of Manufacturing

The first and most obvious source of new workers might be to re-purpose manufacturing workers freed up in manufacturing occupations where employment levels have been shrinking.

Figures 5.1 and 5.2 present data from an analysis of Statistics Canada's Labour Force Survey files. This analysis provides estimates of the month to month flows into and out of the manufacturing sector for March 2013 – June 2023.

The charts provide a sense of how dynamic the manufacturing workforce actually is. The data are obtained by doing month to month comparisons of labour force status and industry of employment status. Results are presented as 6 month moving averages in order to smooth out seasonal variation and random fluctuations.

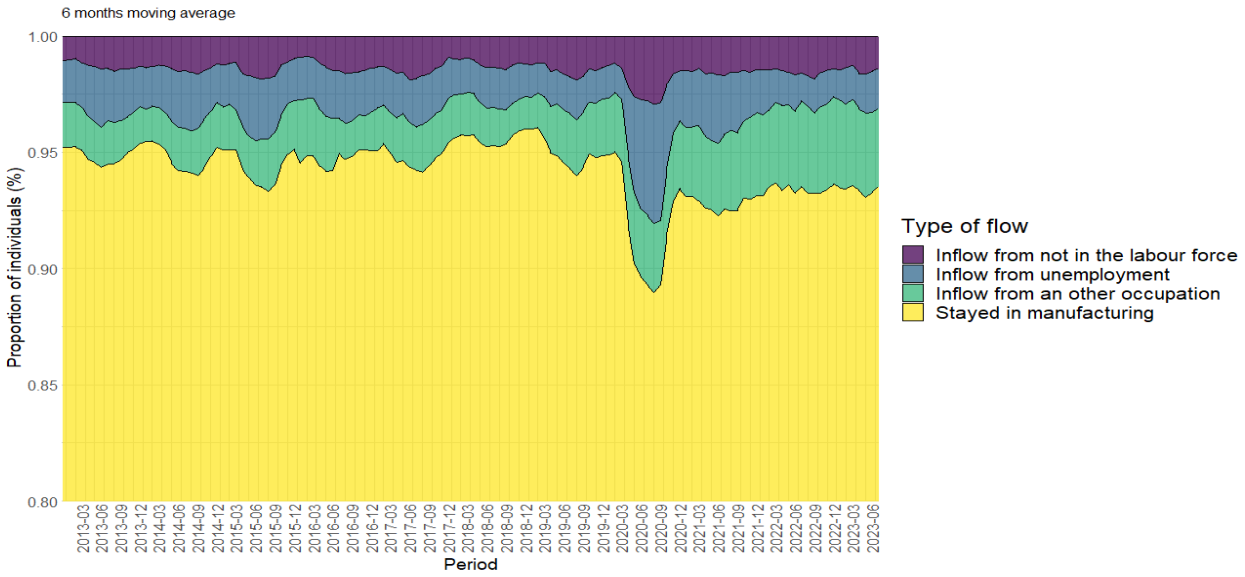
Inflow Categories: Among People who are Employed in Manufacturing Occupations in the Reference Month, the Proportion Who Last Month:

1. Worked in manufacturing occupations
2. Worked in an occupation other than manufacturing
3. Were unemployed
4. Were not in the labour force

Outflow Categories: Among Individuals Who Were Employed in Manufacturing Occupations in the Previous Month, the Proportion Who, in the Reference Month:

1. Remained employed in manufacturing
2. Worked in an occupation other than manufacturing
3. Were unemployed
4. Were not in the labour force

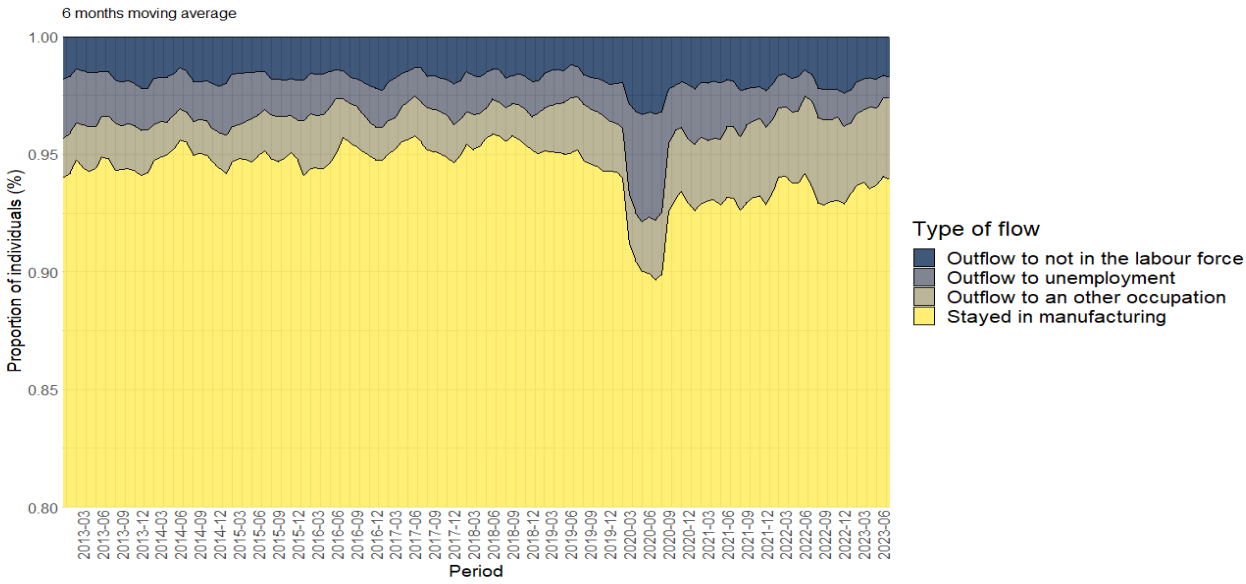
Chart 5.1 Manufacturing and Utilities Inflows Into Manufacturing, 6 Month Moving Averages, Canada, March 2013 – June 2023



Source: *Statistics Canada Labour Force Survey month to month status flow matrix.*

Figure 5.2 plots the rates of worker outflow from manufacturing from March 2013 to June, 2023, again using 6 month moving average rates.

Figure 5.2 Rates of Worker Outflow from Manufacturing from March 2013 to June, 2023, 3 Month Moving Average rates



Source: *Statistics Canada Labour Force Survey month to month status flow matrix.*

Key finding 24

Averaging 7% of total employment in the sector, the flows into and out of manufacturing are large enough to provide employers with a means to adjust to changing skill demands rapidly provided they know what skills are needed.

The charts reveal two distinct patterns of results. Pre-COVID roughly 95% of paid employees in manufacturing stayed in manufacturing month over month. Post-COVID roughly 93% of paid employees in manufacturing remained in manufacturing from month to month.

Post-COVID the proportion of workers entering manufacturing grew, to the point that it was about double the other sources of inflow. Roughly half as many workers began working in manufacturing from unemployment and from being classified as not in the labour force i.e. neither looking for work nor available for work.

On average, 93.5% of individuals remained in occupations in manufacturing and utilities in 2023. This proportion had declined 1.7 percentage points compared with the average proportion observed in 2018 and 2019 (95.2%). Much of the change was due to an offsetting increase in the proportions of those who remained employed but flowing into or out of other occupations.

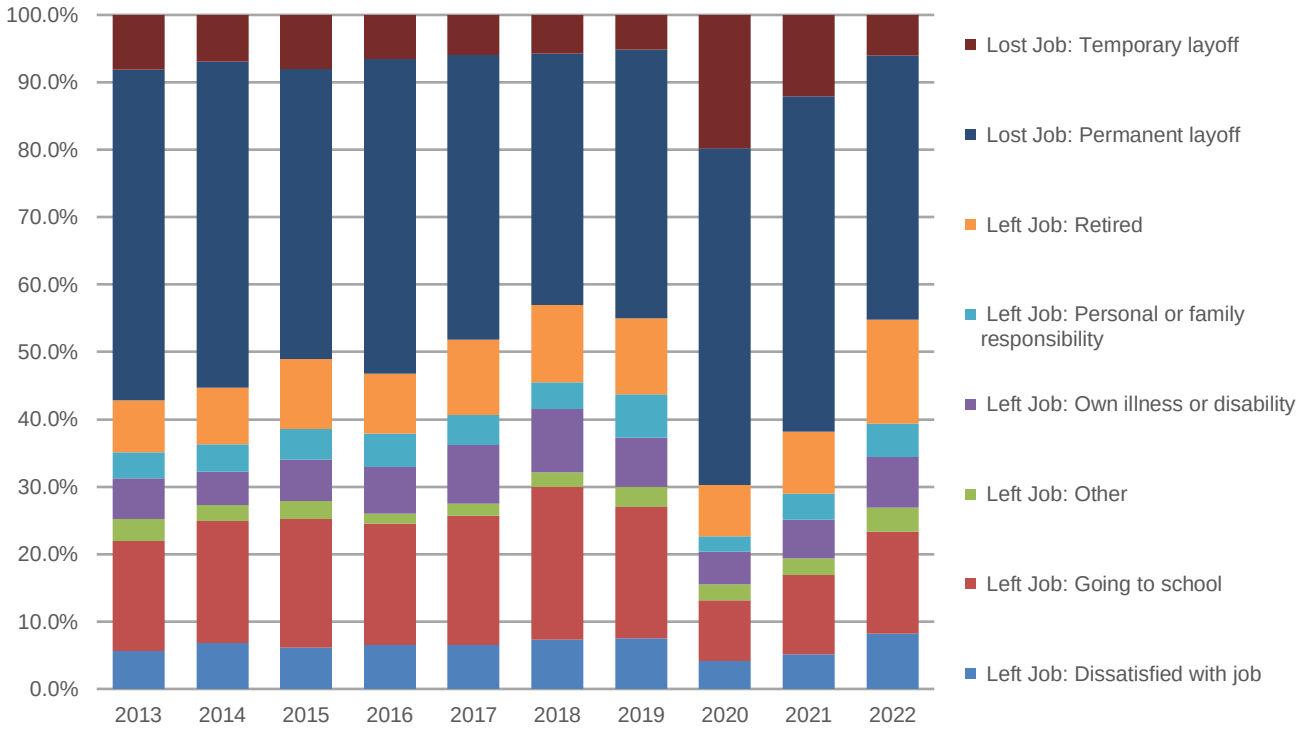
The two charts provide several important insights, including that:

- The monthly flows into the manufacturing sector are relatively small when compared to the numbers of workers employed in the sector.
- The monthly flows out of the manufacturing sector are also relatively small when compared to the number of workers employed in the sector.
- On balance, inflows of workers into the sector roughly balance average outflows.
- The flows are significant enough to be both a problem and an opportunity.
- On the one hand, the flows are large enough to imply that manufacturing firms are having to invest significant amounts in recruitment, selection and on-boarding costs.
- On the other hand, provided that employers have a clear idea of what skills they are after, the flows are big enough to provide employers in the sector with a way to adjust the skill set of their workforce quite rapidly.

Figures 5.3 and 5.4 explore trends in the reasons for which workers in manufacturing leave their jobs using data from Statistics Canada Labour Force Survey for 2013 – 2023.

Figure 5.3 plots trends in the reasons for leaving a manufacturing job from 2013 – 2023.

Figure 5.3 Trends in the Reasons for Leaving or Losing a Job, Workers in Manufacturing and Utilities, Canada, 2013 – 2023



Source: *Special tabulation of Labour Force Survey data, Canada, 2013 – 2022.*

Key finding 25

Permanent layoffs account for a large but falling proportion of all job losses in the sector.

The chart documents significant shifts in the reasons for leaving or losing a job in manufacturing over the reference period.

In the post-COVID reference years the percentage of manufacturing workers being temporarily laid off fell rapidly, from 19.8% in 2020 to 6% in 2022.

The percentage of manufacturing workers being permanently laid off also fell during this period from 49.9% in 2020 to 32% in 2022. These laid off workers likely lack the skill set demanded by the new occupational mix.

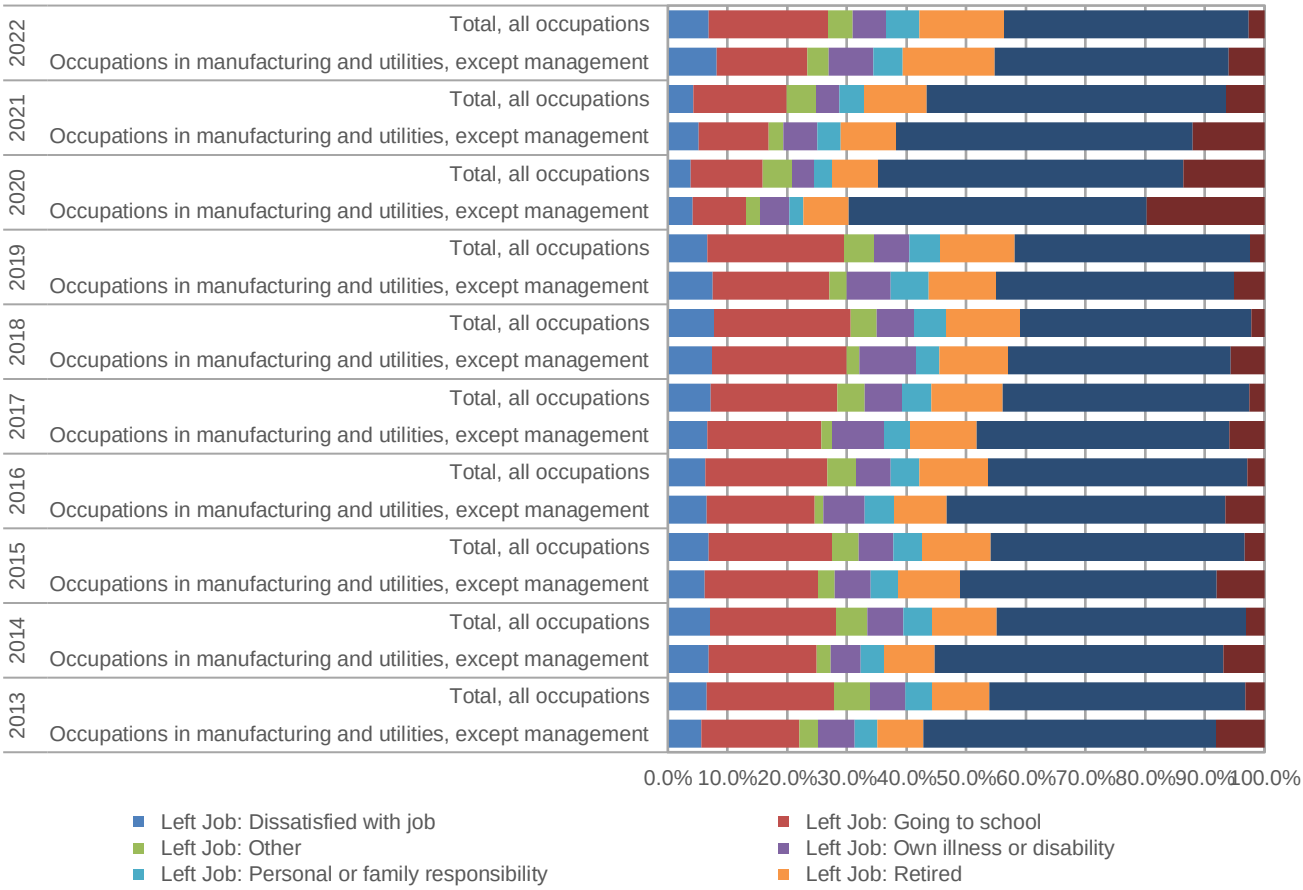
The percentage of manufacturing workers leaving their job due to retirement rose during this period from 7.6% in 2020 to 15.4% in 2022.

An increasing percentage of manufacturing workers left their jobs to go to school, from 8.9% in 2020 to 15.1% in 2022. It remains an open question as to whether this return to education is upskilling to return to a manufacturing job or to get a better or different job.

Finally, a small but growing percentage of manufacturing workers left their job because they were dissatisfied with it, from 4.2% in 2020 to 8.2% in 2022.

Figure 5.4 compares trends in leaving or losing a job in manufacturing compared to leaving or losing a job in other industries.

Figure 5.4 Trends in the Reasons for Leaving or Losing a Job for Workers in Manufacturing and Utilities Compared to Other Industries, Canada, 2013 – 2023

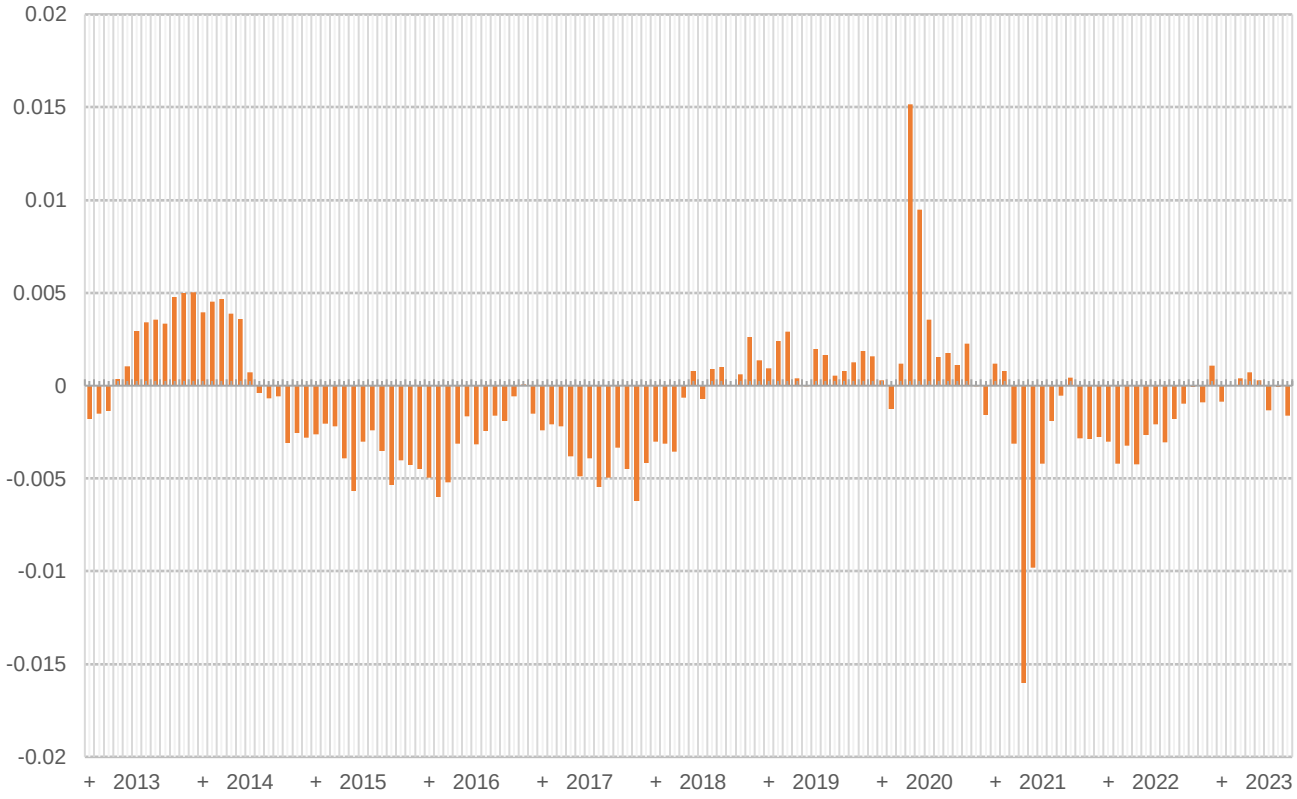


Source: *Special tabulation of monthly Labour Force Survey data, 2016 – 2023.*

The chart reveals that manufacturing workers were more likely than workers in other industries to leave or lose their job due to a permanent layoff in 2020 – 2022. Manufacturing workers are also less likely to lose or have left their job for reasons other than layoff during this same period.

Figure 5.5 presents the same data in a different way that highlights the size of the net flows into and out of manufacturing jobs.

Figure 5.5 Net Flows Into and out of Manufacturing Jobs, Paid Workers, Canada, 2013 – 2023



Source: *Special tabulation of Labour Force Survey data, Canada, 2013 – 2023.*

Key finding 26

As of 2023, net flows into and out of manufacturing are vanishingly small.

The chart reveals a complex pattern of net flows, including:

- Manufacturing gained workers in 2013 and part of 2014, a net flow of roughly ½% of total employment in the sector.
- 2015, 2016 and 2017 saw negative net flows averaging roughly -1/2% of total employment in the sector.
- Net inflow spiked in 2020 at up to 1.5% of total employment in the sector.
- The net flow turned negative in 2021 as the COVID pandemic forced manufacturers to shed workers.
- Net flows remained negative throughout 2022, albeit at a level of roughly 0.5% of total employment in the sector.
- In 2023 net flows were almost zero.

This pattern suggests that flows into and out of manufacturing are relatively small that they are unlikely, at current levels, to help confront rapidly rising skill demand.

5.2 Sources of New Manufacturing Labour Supply: Unemployed Workers Whose Last Job was in Manufacturing

The second source of new labour supply might be unemployed workers whose last job was in a manufacturing occupation.

It is reasonable to assume that these workers are familiar with work in the sector and are likely to possess many, or all, of the skills demanded. It is worth noting, however, that in 2016, the base reference year for this analysis, an average of 7% of the manufacturing labour force of 2,951,500 were unemployed. By 2022, the most recent reference year for which data is available, an average of 3% to the total manufacturing labour force of 2,879, 222 were unemployed. The underlying increase in utilization of the available supply suggests that manufacturing employers will have to look to other sources to supply the labour needed to grow.

It is reasonable to wonder what impact such significant flows have had on utilization rates. Figure 5.6 provides the percentage of unutilized manufacturing labour supply by manufacturing occupation.

Figure 5.6 Unemployed Paid Workers by Industry as a Percentage of Employment in Occupations with Employment in Manufacturing, Canada, 2016 – 2022

Occupation Code	Occupation Title	Percentage of experienced workforce unutilized
95107	Labourers in fish and seafood processing	45
85120	Logging and forestry labourers	34
75110	Construction trades helpers and labourers	20
75211	Railway and motor transport labourers	17
75119	Other trades helpers and labourers	14
85110	Mine labourers	12
73402	Drillers and blasters - surface mining, quarrying and construction	11
22230	Non-destructive testers and inspectors	10
74201	Water transport deck and engine room crew	10
94219	Other products assemblers, finishers and inspectors	10
72200	Electricians (except industrial and power system)	10
94143	Testers and graders, food and beverage processing	9
94200	Motor vehicle assemblers, inspectors and testers	9
95102	Labourers in chemical products processing and utilities	9
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	9
95101	Labourers in metal fabrication	9
22101	Geological and mineral technologists and technicians	8

Occupation Code	Occupation Title	Percentage of experienced workforce unutilized
95103	Labourers in wood, pulp and paper processing	8
74205	Public works maintenance equipment operators and related workers	8
94211	Assemblers and inspectors of other wood products	8
94103	Concrete, clay and stone forming operators	8
72420	Oil and solid fuel heating mechanics	8
72106	Welders and related machine operators	8
94153	Photographic and film processors	8
94129	Other wood processing machine operators	8
95106	Labourers in food and beverage processing	8
94107	Machine operators of other metal products	7
94212	Plastic products assemblers, finishers and inspectors	7
95100	Labourers in mineral and metal processing	7
72500	Crane operators	7
83100	Underground production and development miners	7
22110	Biological technologists and technicians	7
94152	Binding and finishing machine operators	7
94132	Industrial sewing machine operators	7
94213	Industrial painters, coaters and metal finishing process operators	6
72999	Other technical trades and related occupations	6
72603	Engineer officers, water transport	6
94131	Weavers, knitters and other fabric making occupations	6
94110	Chemical plant machine operators	6
73401	Printing press operators	6
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	6
95104	Labourers in rubber and plastic products manufacturing	5
94105	Metalworking and forging machine operators	5
94150	Plate-less printing equipment operators	5
94124	Woodworking machine operators	5
73209	Other repairers and servicers	5
22311	Electronic service technicians (household and business equipment)	5
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	5
22300	Civil engineering technologists and technicians	5
22233	Construction inspectors	5

Occupation Code	Occupation Title	Percentage of experienced workforce unutilized
94140	Process control and machine operators, food and beverage processing	5
12113	Statistical officers and related research support occupations	5
94201	Electronics assemblers, fabricators, inspectors and testers	5
72423	Motorcycle, all-terrain vehicle and other related mechanics	5
22100	Chemical technologists and technicians	5
94123	Lumber graders and other wood processing inspectors and graders	5
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	4
94106	Machining tool operators	4
72201	Industrial electricians	4
94111	Plastics processing machine operators	4
22312	Industrial instrument technicians and mechanics	4
72421	Appliance servicers and repairers	4
21332	Petroleum engineers	4
72401	Heavy-duty equipment mechanics	4
14402	Production logistics workers	4
22211	Industrial designers	4
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	4
92012	Supervisors, food and beverage processing	4
72100	Machinists and machining and tooling inspectors	4
72402	Heating, refrigeration and air conditioning mechanics	4
22301	Mechanical engineering technologists and technicians	3
94100	Machine operators, mineral and metal processing	3
72404	Aircraft mechanics and aircraft inspectors	3
72020	Contractors and supervisors, mechanic trades	3
72600	Air pilots, flight engineers and flying instructors	3
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	3
22310	Electrical and electronics engineering technologists and technicians	3
72011	Contractors and supervisors, electrical trades and telecommunications occupations	3
22231	Engineering inspectors and regulatory officers	3
22302	Industrial engineering and manufacturing technologists and technicians	3
92101	Water and waste treatment plant operators	3

Occupation Code	Occupation Title	Percentage of experienced workforce unutilized
21399	Other professional engineers	3
94151	Camera, platemaking and other prepress occupations	3
92013	Supervisors, plastic and rubber products manufacturing	3
21301	Mechanical engineers	3
21321	Industrial and manufacturing engineers	3
93101	Central control and process operators, petroleum, gas and chemical processing	3
92014	Supervisors, forest products processing	3
92100	Power engineers and power systems operators	2
92023	Supervisors, other mechanical and metal products manufacturing	2
92024	Supervisors, other products manufacturing and assembly	2
21330	Mining engineers	2
72422	Electrical mechanics	2
32129	Other medical technologists and technicians	2
21310	Electrical and electronics engineers	2
21300	Civil engineers	2
21320	Chemical engineers	2
92011	Supervisors, petroleum, gas and chemical processing and utilities	2
73310	Railway and yard locomotive engineers	2
21311	Computer engineers (except software engineers and designers)	2
92010	Supervisors, mineral and metal processing	2
93100	Central control and process operators, mineral and metal processing	2
72406	Elevator constructors and mechanics	2
20010	Engineering managers	2
72101	Tool and die makers	2

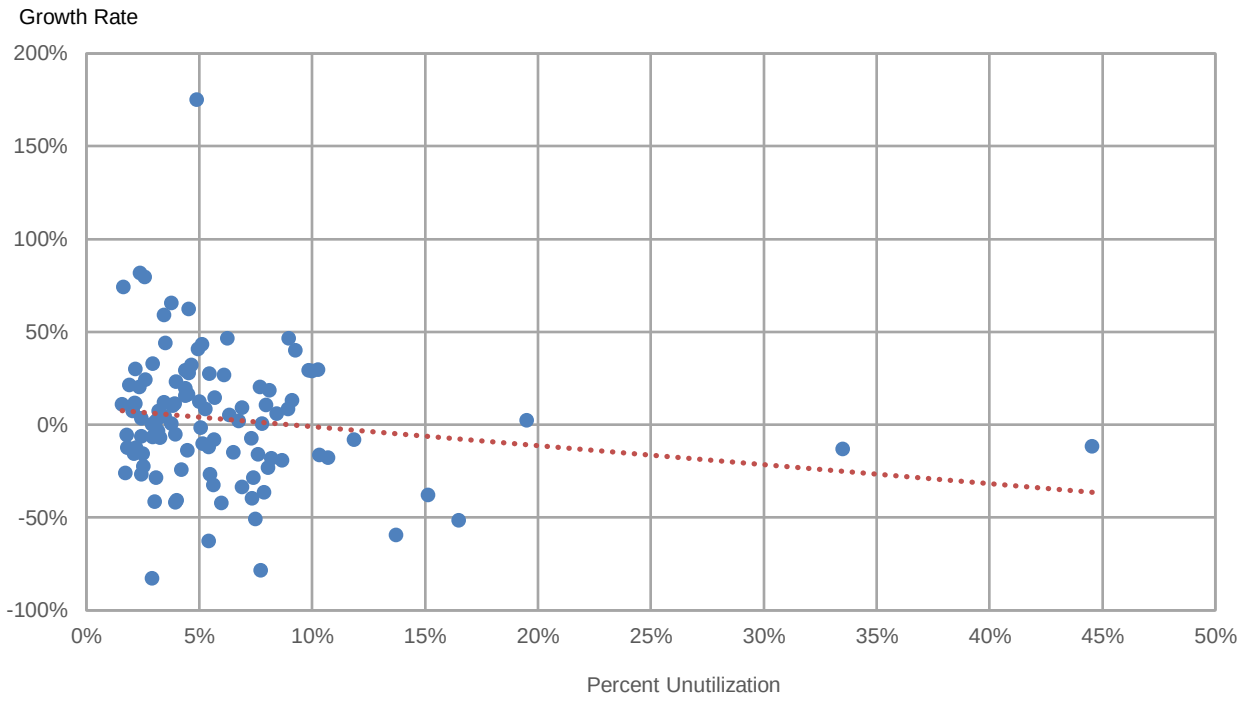
Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 27

Significant pools of occupationally-experienced workers in key occupations are unemployed.

5.7 plots the percentage of unutilized workers by occupation in manufacturing occupations by the growth rate of employment in the occupation over the reference period.

Figure 5.7 Percentages of Unutilized Paid Workers by Occupation in Manufacturing Occupations by Growth in Employment, Canada, 2016 – 2022



Source: *Special tabulation of monthly Labour Force Survey, 2016 – 2022.*

Key finding 28

Interestingly, the percentage of workers in manufacturing occupations with higher underutilization rates have a slight negative correlation to employment growth rates, a finding that suggests that it is unlikely that rapid growth is outstripping the available supply.

The chart reveals that the unemployed represent less than 10% of the total occupationally experienced labour supply in the overwhelming majority of occupations.

Interestingly, the underutilization rate appears to be unrelated to the growth rate of employment by occupation. More specifically, the chart reveals that the percentage of workers in manufacturing occupations with higher underutilization rates have a slight negative correlation to employment growth rates, a finding that suggests that it is unlikely that rapid growth is outstripping the available supply. More likely is that the skill set demanded by these occupations has evolved to the point that many of these workers can no longer satisfy the skill demands of the occupation.

5.3 Sources of New Manufacturing Labour Supply: Employed Workers Whose Job is in a Manufacturing Occupation in Another Industry

A second potential source of new manufacturing labour supply is workers employed in a manufacturing occupation outside the manufacturing sector. To the extent that occupational skill profiles are stable across sectors, workers in these occupations should possess many, if not all, of the skill set needed to grow the manufacturing workforce.

Figure 5.8 presents data on the numbers of employed workers working in the occupations identified in the manufacturing sector who are working in other industries. These workers represent a potential source of large numbers of new workers.

Figure 5.8 Numbers of Employed Paid Workers Working in Occupations with Employment in the Manufacturing Sector, by Occupation, Canada, 2016 – 2022

Occupation Code	Occupation Title	Share of employment outside of manufacturing industries percentage
21332	Petroleum engineers	100
72200	Electricians (except industrial and power system)	100
75110	Construction trades helpers and labourers	100
72402	Heating, refrigeration and air conditioning mechanics	100
74201	Water transport deck and engine room crew	100
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	99
85110	Mine labourers	99
72421	Appliance servicers and repairers	99
22300	Civil engineering technologists and technicians	99
75119	Other trades helpers and labourers	99
72423	Motorcycle, all-terrain vehicle and other related mechanics	98
21300	Civil engineers	98
72011	Contractors and supervisors, electrical trades and telecommunications occupations	97
21330	Mining engineers	97
22231	Engineering inspectors and regulatory officers	97
72600	Air pilots, flight engineers and flying instructors	97
12113	Statistical officers and related research support occupations	97
72406	Elevator constructors and mechanics	97
73209	Other repairers and servicers	96
22311	Electronic service technicians (household and business equipment)	96
21399	Other professional engineers	96

Occupation Code	Occupation Title	Share of employment outside of manufacturing industries percentage
72603	Engineer officers, water transport	96
32129	Other medical technologists and technicians	95
72420	Oil and solid fuel heating mechanics	95
72401	Heavy-duty equipment mechanics	95
21331	Geological engineers	93
20010	Engineering managers	91
21311	Computer engineers (except software engineers and designers)	90
72404	Aircraft mechanics and aircraft inspectors	89
22110	Biological technologists and technicians	88
22230	Non-destructive testers and inspectors	88
22101	Geological and mineral technologists and technicians	88
21109	Other professional occupations in physical sciences	88
72999	Other technical trades and related occupations	82
72020	Contractors and supervisors, mechanic trades	81
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	78
21310	Electrical and electronics engineers	77
92100	Power engineers and power systems operators	73
72500	Crane operators	72
22310	Electrical and electronics engineering technologists and technicians	71
22312	Industrial instrument technicians and mechanics	67
92011	Supervisors, petroleum, gas and chemical processing and utilities	61
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	59
21301	Mechanical engineers	59
93101	Central control and process operators, petroleum, gas and chemical processing	58
72201	Industrial electricians	57
21320	Chemical engineers	54
72106	Welders and related machine operators	53
22301	Mechanical engineering technologists and technicians	52
21322	Metallurgical and materials engineers	49
22100	Chemical technologists and technicians	42
72422	Electrical mechanics	37
22211	Industrial designers	28
95102	Labourers in chemical products processing and utilities	25

Occupation Code	Occupation Title	Share of employment outside of manufacturing industries percentage
14402	Production logistics workers	25
93100	Central control and process operators, mineral and metal processing	24
94151	Camera, platemaking and other prepress occupations	23
21321	Industrial and manufacturing engineers	18
22302	Industrial engineering and manufacturing technologists and technicians	17
72405	Machine fitters	14
95109	Other labourers in processing, manufacturing and utilities	13
72100	Machinists and machining and tooling inspectors	11
73401	Printing press operators	9
94150	Plate-less printing equipment operators	8
94152	Binding and finishing machine operators	5
94213	Industrial painters, coaters and metal finishing process operators	4
72101	Tool and die makers	4
94219	Other products assemblers, finishers and inspectors	4
95100	Labourers in mineral and metal processing	3
94211	Assemblers and inspectors of other wood products	3
94124	Woodworking machine operators	2
94110	Chemical plant machine operators	1
94105	Metalworking and forging machine operators	1
94107	Machine operators of other metal products	1
94132	Industrial sewing machine operators	1
94111	Plastics processing machine operators	1
95104	Labourers in rubber and plastic products manufacturing	1
92023	Supervisors, other mechanical and metal products manufacturing	1
94200	Motor vehicle assemblers, inspectors and testers	1
95106	Labourers in food and beverage processing	1
94212	Plastic products assemblers, finishers and inspectors	1
94100	Machine operators, mineral and metal processing	1
95107	Labourers in fish and seafood processing	1
95101	Labourers in metal fabrication	0
94106	Machining tool operators	0
94140	Process control and machine operators, food and beverage processing	0
95103	Labourers in wood, pulp and paper processing	0

Occupation Code	Occupation Title	Share of employment outside of manufacturing industries percentage
92012	Supervisors, food and beverage processing	0
94123	Lumber graders and other wood processing inspectors and graders	0
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	0
92014	Supervisors, forest products processing	0
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	0
92013	Supervisors, plastic and rubber products manufacturing	0
94143	Testers and graders, food and beverage processing	0
92010	Supervisors, mineral and metal processing	0
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	0
92022	Supervisors, furniture and fixtures manufacturing	0
94104	Inspectors and testers, mineral and metal processing	0
92024	Supervisors, other products manufacturing and assembly	0
94131	Weavers, knitters and other fabric making occupations	0
94129	Other wood processing machine operators	0
94201	Electronics assemblers, fabricators, inspectors and testers	0
94205	Machine operators and inspectors, electrical apparatus manufacturing	0
94103	Concrete, clay and stone forming operators	0
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	0
93102	Pulping, papermaking and coating control operators	0

Source: Special tabulation of LFS employment by occupation data in manufacturing occupations outside manufacturing

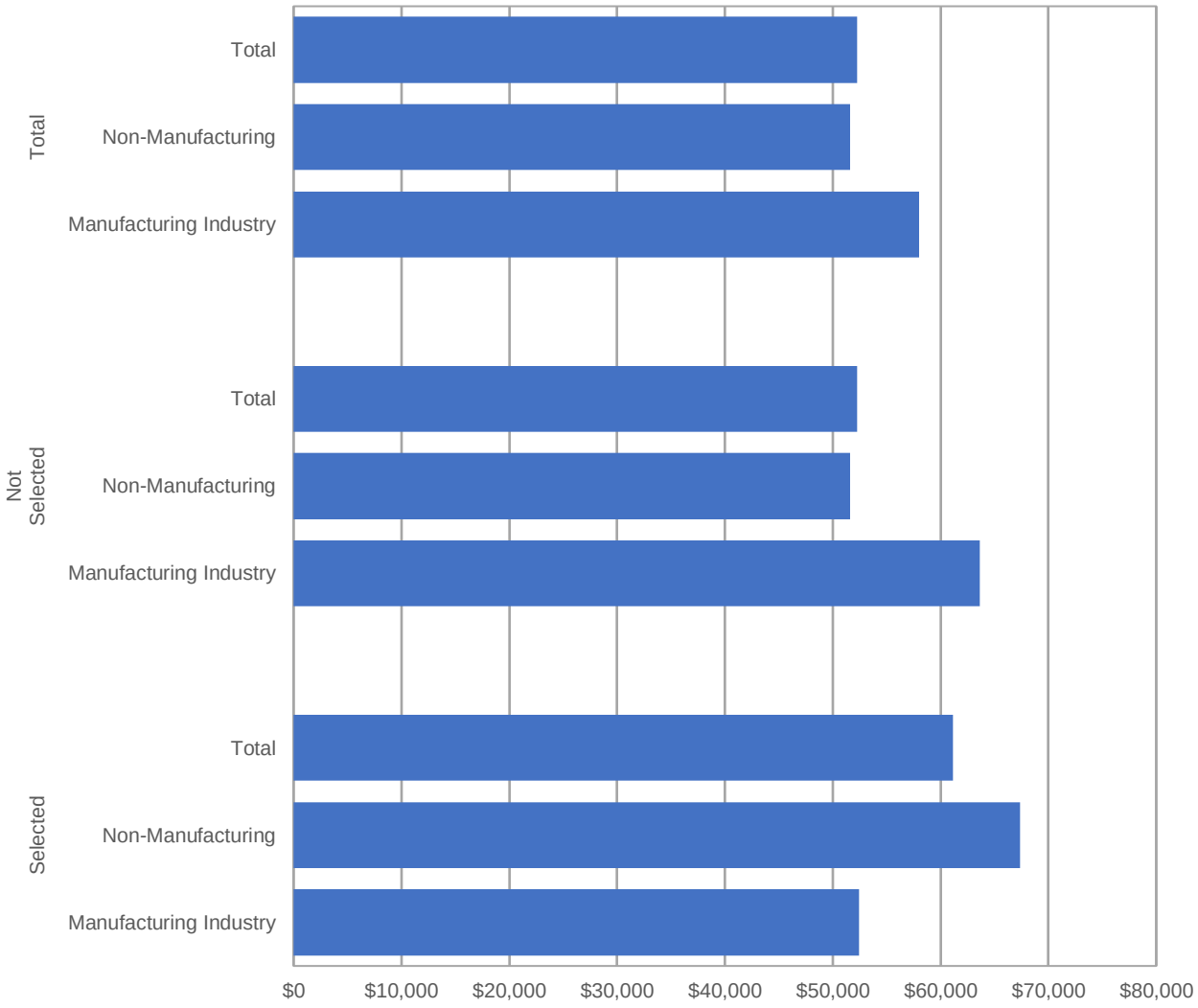
Key finding 29

Very large number workers in manufacturing workers work in other industries, so represent a promising source of new labour supply with limited training needs.

The chart reveals that a relatively large number of workers are employed in these other sectors in occupations common in the manufacturing sector.

Figure 5.9 compares wages paid to workers in occupations in the manufacturing sector to those paid to workers in the same occupations in other industries.

Figure 5.9 Average Annual Earnings of Workers in Manufacturing Occupations to Average Annual Earnings of Workers in the Same Occupations in Other Industries, Canada, 2022



Source: *Special tabulation of monthly Labour Force Survey, 2022.*

Key finding 30

Workers in manufacturing occupations working in other industries earn 29% more than their peers in manufacturing, so attracting them into manufacturing will be expensive.

The chart shows that workers in manufacturing occupations in other industries earn considerably more on average than workers in the same occupations in manufacturing, 29% more in 2022. This finding suggests that manufacturing firms would have to increase their wage offers significantly to attract these workers.

5.4 Sources of New Manufacturing Labour Supply: Workers not in the Labour Force with Experience in a Manufacturing Occupation

The analysis presented in Figures 5.8 and 5.9 above reveal that workers who are currently working in manufacturing occupations in other industries are a ready source of new labour supply provided that manufacturing employers can match the higher wage rates being paid by non-manufacturing employers. A third potential source of new labour supply are workers who are not currently looking for work, nor who are available for work, but who last worked in a manufacturing occupation.

Figure 5.10 plots the size of the pool of occupationally experienced manufacturing workers who are currently not in the labour force.

Figure 5.10 Number of Workers Who are not in the Labour Force Whose Last Job was in a Manufacturing Occupation, by Occupation, Canada, 2022

Occupation Code	Occupation Title	Number of occupational experienced workers who are not in the labour force, 2022
	Total f occupational experienced workers not in labour force, 2022	621,250
95106	Labourers in food and beverage processing	67,250
94140	Process control and machine operators, food and beverage processing	46,000
94219	Other products assemblers, finishers and inspectors	36,000
72106	Welders and related machine operators	25,750
95101	Labourers in metal fabrication	22,750
94201	Electronics assemblers, fabricators, inspectors and testers	22,500
95107	Labourers in fish and seafood processing	22,250
95109	Other labourers in processing, manufacturing and utilities	21,750
95103	Labourers in wood, pulp and paper processing	18,000
95104	Labourers in rubber and plastic products manufacturing	15,750
22100	Chemical technologists and technicians	15,000
92012	Supervisors, food and beverage processing	14,500
94132	Industrial sewing machine operators	14,000
94200	Motor vehicle assemblers, inspectors and testers	13,750
22211	Industrial designers	13,250
94107	Machine operators of other metal products	13,250
72201	Industrial electricians	13,250
94212	Plastic products assemblers, finishers and inspectors	13,000
94105	Metalworking and forging machine operators	12,250
94100	Machine operators, mineral and metal processing	11,750

Occupation Code	Occupation Title	Number of occupational experienced workers who are not in the labour force, 2022
72100	Machinists and machining and tooling inspectors	11,000
94211	Assemblers and inspectors of other wood products	10,750
73401	Printing press operators	10,500
94213	Industrial painters, coaters and metal finishing process operators	10,500
95100	Labourers in mineral and metal processing	9,500
22302	Industrial engineering and manufacturing technologists and technicians	8,500
21301	Mechanical engineers	8,250
21321	Industrial and manufacturing engineers	6,750
95102	Labourers in chemical products processing and utilities	6,000
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	5,500
94110	Chemical plant machine operators	5,250
94124	Woodworking machine operators	5,250
92014	Supervisors, forest products processing	5,250
94143	Testers and graders, food and beverage processing	5,000
92100	Power engineers and power systems operators	5,000
94129	Other wood processing machine operators	5,000
92010	Supervisors, mineral and metal processing	4,000
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	4,000
94111	Plastics processing machine operators	4,000
22310	Electrical and electronics engineering technologists and technicians	3,750
92023	Supervisors, other mechanical and metal products manufacturing	3,750
93102	Pulping, papermaking and coating control operators	3,500
22301	Mechanical engineering technologists and technicians	3,500
94123	Lumber graders and other wood processing inspectors and graders	3,500
94106	Machining tool operators	3,000
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	3,000
72500	Crane operators	2,750
94104	Inspectors and testers, mineral and metal processing	2,500
72101	Tool and die makers	2,500
20010	Engineering managers	2,500

Occupation Code	Occupation Title	Number of occupational experienced workers who are not in the labour force, 2022
92013	Supervisors, plastic and rubber products manufacturing	2,250
92011	Supervisors, petroleum, gas and chemical processing and utilities	2,250
14402	Production logistics workers	1,750
72020	Contractors and supervisors, mechanic trades	1,750
94131	Weavers, knitters and other fabric making occupations	1,500
93101	Central control and process operators, petroleum, gas and chemical processing	1,500
94150	Plate-less printing equipment operators	1,500
94152	Binding and finishing machine operators	1,250
73209	Other repairers and servicers	1,250
92024	Supervisors, other products manufacturing and assembly	1,000
94103	Concrete, clay and stone forming operators	1,000
92022	Supervisors, furniture and fixtures manufacturing	1,000
72422	Electrical mechanics	750
94151	Camera, platemaking and other prepress occupations	750
21320	Chemical engineers	750
72011	Contractors and supervisors, electrical trades and telecommunications occupations	750
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	500
94153	Photographic and film processors	500
72402	Heating, refrigeration and air conditioning mechanics	500
94205	Machine operators and inspectors, electrical apparatus manufacturing	500
21310	Electrical and electronics engineers	250
75110	Construction trades helpers and labourers	250
22110	Biological technologists and technicians	250
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	250
72404	Aircraft mechanics and aircraft inspectors	250
22311	Electronic service technicians (household and business equipment)	250
22230	Non-destructive testers and inspectors	250
72600	Air pilots, flight engineers and flying instructors	250
85120	Logging and forestry labourers	-
73310	Railway and yard locomotive engineers	-

Occupation Code	Occupation Title	Number of occupational experienced workers who are not in the labour force, 2022
72420	Oil and solid fuel heating mechanics	-
21109	Other professional occupations in physical sciences	-
73402	Drillers and blasters - surface mining, quarrying and construction	-
21331	Geological engineers	-
22300	Civil engineering technologists and technicians	-
72406	Elevator constructors and mechanics	-
21399	Other professional engineers	-
85110	Mine labourers	-
72603	Engineer officers, water transport	-
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	-
22101	Geological and mineral technologists and technicians	-
21330	Mining engineers	-
93100	Central control and process operators, mineral and metal processing	-
92101	Water and waste treatment plant operators	-
21322	Metallurgical and materials engineers	-
12113	Statistical officers and related research support occupations	-
74201	Water transport deck and engine room crew	-
21311	Computer engineers (except software engineers and designers)	-
75119	Other trades helpers and labourers	-
21332	Petroleum engineers	-
22231	Engineering inspectors and regulatory officers	-
32129	Other medical technologists and technicians	-
72401	Heavy-duty equipment mechanics	-
75211	Railway and motor transport labourers	-
83100	Underground production and development miners	-
72405	Machine fitters	-
21300	Civil engineers	-
72999	Other technical trades and related occupations	-
72421	Appliance servicers and repairers	-
72423	Motorcycle, all-terrain vehicle and other related mechanics	-
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	-
74205	Public works maintenance equipment operators and related workers	-

Occupation Code	Occupation Title	Number of occupational experienced workers who are not in the labour force, 2022
22233	Construction inspectors	-
72200	Electricians (except industrial and power system)	-
22312	Industrial instrument technicians and mechanics	-

Source: *Special tabulation of monthly Labour Force Survey, 2022.*

Key finding 31

621,250 occupationally-experienced workers workers are not in the labour force, a potential source of new manufacturing labour supply.

The chart reveals relatively large pools of experienced workers in several key manufacturing occupations who are out of the labour force.

Figure 5.11 plots the trends in the size of the potential workforce for the reference period 2016 – 2022.

Figure 5.11 Trend in the Number of Workers Who are not in the Labour Force whose last Job was in a Manufacturing Occupation by Occupation, Canada, 2016 – 2022

Occupation Code	Occupation Title	Number of occupational experienced who are not in the labour force
22211	Industrial designers	10,750
94201	Electronics assemblers, fabricators, inspectors and testers	10,250
73401	Printing press operators	8,000
95101	Labourers in metal fabrication	8,000
92012	Supervisors, food and beverage processing	7,750
72106	Welders and related machine operators	6,500
72201	Industrial electricians	6,250
94100	Machine operators, mineral and metal processing	6,250
95104	Labourers in rubber and plastic products manufacturing	6,000
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	5,500
21321	Industrial and manufacturing engineers	4,250
92014	Supervisors, forest products processing	3,000
22100	Chemical technologists and technicians	3,000
94200	Motor vehicle assemblers, inspectors and testers	2,750
94129	Other wood processing machine operators	2,500
93102	Pulping, papermaking and coating control operators	2,500
20010	Engineering managers	2,500
94213	Industrial painters, coaters and metal finishing process operators	2,250
94219	Other products assemblers, finishers and inspectors	2,000
72500	Crane operators	2,000
95102	Labourers in chemical products processing and utilities	1,750
94123	Lumber graders and other wood processing inspectors and graders	1,500
72101	Tool and die makers	1,500
21301	Mechanical engineers	1,250
73209	Other repairers and servicers	1,250
94131	Weavers, knitters and other fabric making occupations	1,000
95106	Labourers in food and beverage processing	1,000
94143	Testers and graders, food and beverage processing	750
72011	Contractors and supervisors, electrical trades and telecommunications occupations	750
92013	Supervisors, plastic and rubber products manufacturing	750

Occupation Code	Occupation Title	Number of occupational experienced who are not in the labour force
72422	Electrical mechanics	750
12113	Statistical officers and related research support occupations	N/A
94151	Camera, platemaking and other prepress occupations	750
94104	Inspectors and testers, mineral and metal processing	500
92100	Power engineers and power systems operators	500
94205	Machine operators and inspectors, electrical apparatus manufacturing	500
94153	Photographic and film processors	500
21320	Chemical engineers	500
72600	Air pilots, flight engineers and flying instructors	250
22311	Electronic service technicians (household and business equipment)	-250
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades	
	and related occupations	-250
93100	Central control and process operators, mineral and metal processing	-250
72603	Engineer officers, water transport	-250
75110	Construction trades helpers and labourers	-250
22101	Geological and mineral technologists and technicians	-250
94211	Assemblers and inspectors of other wood products	-250
74201	Water transport deck and engine room crew	-250
21399	Other professional engineers	-500
72404	Aircraft mechanics and aircraft inspectors	-500
75119	Other trades helpers and labourers	-500
22230	Non-destructive testers and inspectors	-500
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	-500
22110	Biological technologists and technicians	-750
95100	Labourers in mineral and metal processing	-750
94150	Plate-less printing equipment operators	-750
21300	Civil engineers	-1,250
94212	Plastic products assemblers, finishers and inspectors	-2,000
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	-2,000
21310	Electrical and electronics engineers	-2,250
72100	Machinists and machining and tooling inspectors	-2,250

Occupation Code	Occupation Title	Number of occupational experienced who are not in the labour force
14402	Production logistics workers	-2,250
92023	Supervisors, other mechanical and metal products manufacturing	-2,250
22312	Industrial instrument technicians and mechanics	-2,250
94106	Machining tool operators	-2,250
22300	Civil engineering technologists and technicians	-2,500
94124	Woodworking machine operators	-2,500
94152	Binding and finishing machine operators	-2,750
72020	Contractors and supervisors, mechanic trades	-3,000
92011	Supervisors, petroleum, gas and chemical processing and utilities	-4,250
92022	Supervisors, furniture and fixtures manufacturing	-4,500
22301	Mechanical engineering technologists and technicians	-4,750
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	-5,500
92010	Supervisors, mineral and metal processing	-5,750
94111	Plastics processing machine operators	-6,000
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	-6,250
92024	Supervisors, other products manufacturing and assembly	-6,750
94110	Chemical plant machine operators	-7,750
94103	Concrete, clay and stone forming operators	-11,000
22302	Industrial engineering and manufacturing technologists and technicians	-11,250
95107	Labourers in fish and seafood processing	-15,250
94132	Industrial sewing machine operators	-15,500
95103	Labourers in wood, pulp and paper processing	-17,500
94107	Machine operators of other metal products	-23,500
95109	Other labourers in processing, manufacturing and utilities	-34,000

Source: Special tabulation of monthly Labour Force Survey, 2022.

The chart shows that the size of the available pool workers who are currently neither working, looking for work nor available for work has declined over the period, from 718,500 to 621,250.

6. Summary and Implications for Research and Policy

This report profiles trends in the composition of the Canadian manufacturing workforce and in the aggregate demand for skill.

Analysis of 6 years of employment, wage rate and hours data by occupation revealed several important findings including:

- The number of paid manufacturing workers was virtually unchanged over the 6-year reference period 2016 – 2021.
- The usual number of hours worked per week by paid workers in the sector increased slightly over the period.
- Average wage rates paid to paid workers in the sector have barely increased over the reference period.
- Despite not growing in number, the distribution of paid employment by occupation in the sector has shifted dramatically over the reference period both shedding and adding large numbers of more knowledge and skill intense jobs. These jobs pay enough more to have increased manufacturing labour costs by 17% over the reference period.
- Growth in the sector might be realized in two ways i.e.
  - By increasing the productivity of the sector
  - By increasing the number of workers employed in the sector

The analysis presented suggests that that the sector will have difficulty attracting additional workers as:

- The unemployment rate of workers whose last job was in manufacturing has fallen from 7% to 3%.
- Paid workers working in other industries in occupations shared with manufacturing are paid significantly more per hour than they currently are in manufacturing firms. Attracting them into manufacturing will require firms to pay more, something that is only possible if ways are found to drive up productivity i.e. output per hour worked. Firms in the sector would be well advised to begin actively screening job applicants to ensure that they have the skill set needed to generate more output per worker.
- The analysis of flows of workers in and out of manufacturing suggests that manufacturing firms have been relatively successful in coaxing workers who are out of the labour force back into employment. Manufacturing firms should also begin actively screening these job applicants to ensure that they have the skill set needed to generate more output per worker.

The sector has generated little productivity growth over the reference period. We judge this to be an odd result given the move towards higher wage, more knowledge and

skill intense occupations. Either the workers lack the requisite skill set or employers have yet to adjust their work organizations, technologies of production and production processes to capture the productivity potential of a more skilled workforce.

The analysis of aggregate demand reveals what appears to be a rapid and broadly-based increase in the demand for a subset of skills predicted by the theory of skill-biased technical change i.e.:

- Literacy
- Numeracy
- Problem solving
- Communication
- Collaboration

The same analysis reveals a rapid decline in the demand for several skills associated with the application of routine procedural knowledge, including physical skills.

Interestingly, the aggregate analysis finds no evidence of rapidly rising demand for innovation and creativity.

At the highest level, the analysis makes it clear that both workers and the firms that employ them are in a period of rapid change, one that will demand them to adapt to profound change in the nature of work and in the skill set needed for success.

Current data does not exist to determine the relative importance of these two possibilities a priori so targeted research is warranted that identifies and fills gaps in key skills and that identifies the management practices of firms in each manufacturing subsector that are generating above average performance once skill gaps have been filled. Data on worker skill needs to be collected on a large enough sample of firms and their human capital management practices to provide a representative understanding of what underlies high levels of productivity growth.

A large body of research suggests, however, that skill-biased technical change, freer trade and the globalization of markets underlie the observed knowledge and skill intensification of work in the manufacturing sector. Digital technologies are taking on most routine procedural tasks and replacing them with non-routine problem solving that require workers to have much higher levels of cognitive and social emotional skills to reach the production frontier. Related longitudinal work in the US confirms, however, that simply creating the requisite skill set through upgrading is a necessary but insufficient step towards generating higher productivity. Firms also need to adjust their work organizations, processes and technologies of production to extract full value out of a higher skilled workforce.

One simple strategy for increasing productivity would be for firms to invest in creating competence profiles for each of their key roles and then to begin assessing the skills of their workers against them[4]. Use of such systems would provide firms with a

[4] Software, such as Vametric's VALID-8 platform, are commercially available to support these processes. Research in the UK indicates that the use of the VALID-8 system: Reduces training costs by 50%, reduces skill-based errors and material wastage, reduces workplace illnesses, significantly improves productivity, and significantly reduces turnover and associated recruitment and training costs

reliable and fair way to identify and fill skill gaps in a focussed and efficient way.

Use of competency-based recruitment and skill upgrading approaches becomes even more important given that immigrants are predicted to represent 100% of net labour and skill supply growth over the coming decade. Immigrants have huge potential to meet the skill needs of the manufacturing sector but employers perceive hiring immigrants to be risky because traditional, credential-based recruitment provides unreliable signals about what immigrant candidates actually know and can do. The risk of poor immigrant hires is compounded by the fact that many immigrant applicants have weak skills in the language of work so have difficulty communicating what they know and can do. Competency-based recruitment and selection systems overcome these issues by providing employers with a fair and reliable way to rank all candidates on what they actually know and can do.

One under-appreciated advantage of using competency-based recruitment tools is that skill-biased technical change is blurring the boundaries between occupations as occupation specific technical and procedural knowledge is displaced by general-purpose problem solving knowledge that depends upon workers having advanced levels of cognitive and social emotional skills i.e. communication (oral and written), literacy, numeracy, collaboration and adaptability skills. Adopting competency-based approaches would allow manufacturing firms to look beyond their traditional recruitment pools to find the workers that they need.

7. Data Tables Supporting Figures

Note that Table numbers correspond directly to Figure numbers in body of the report.

Chapter 3

Table 3.3 Proficiency ratings per the base given by OaSIS and adjustments to 2024 made by SMEs averaged across all the manufacturing occupations

	Social and Emotional Skills	Workplace Skills	Cognitive Abilities	Cognitive (Hard) Skills	Knowledge
Base	2.9335	2.6559	2.864003984	2.8051	1.9173
2024	3.0013	2.7388	2.9618	3.0321	2.2717

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.6 A comparison of SME's ratings of Knowledge in 2024 compared to the OaSIS base for 20 manufacturing occupations

	Know Base	Know 2024
Engineering managers	3	3.3155
Mechanical engineers	3	3.4107
Chemical engineers	2.625	3.0313
Industrial engineers	3.375	3.5903
Miscellaneous engineers	3.1	3.255
Chemical technologists	2.05	2.1125
Biological technologists	1.9044	2.261
Mechanical engineering technologists	2.5	2.5469
Industrial technologists	2.4219	2.6563
Machinists	1.2857	2.0119
Welders	1.125	1.6442
Construction millwrights	2.5	2.3409
Manufacturing managers	2.375	2.6625
Supervisors, food processing	2	2.3462
Supervisors, manufacturing products	2	2.1538
Aircraft assemblers	2.0625	2.2656
Process control, food	0.625	1.5192
Mechanical assemblers	1.25	1.875
Labourers, metal fabrication	0.125	0.8068
Labourers, food	0.125	0.7125

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.7 A comparison of SME's ratings of Cognitive (Hard) Skills in 2024 compared to the OaSIS base for 20 manufacturing occupations

	CogSk Base	CogSk_2024
Engineering managers	4.3775	4.2185
Mechanical engineers	4.4608	4.0866
Chemical engineers	4.6358	4.3605
Industrial engineers	4.3	4.1146
Miscellaneous engineers	4.6139	4.1078
Chemical technologists	3.1617	3.0908
Biological technologists	3.0676	3.1392
Mechanical engineering technologists	3.1375	3.1635
Industrial technologists	3.0271	3.2859
Machinists	2.2857	2.7187
Welders	1.825	2.3617
Construction millwrights	2.5	2.6886
Manufacturing managers	3.3525	3.5121
Supervisors, food processing	2.7333	3.0276
Supervisors, manufacturing products	2.7	3.109
Aircraft assemblers	2.1794	2.5983
Process control, food	1.5641	2.3138
Mechanical assemblers	1.6917	2.301
Labourers, metal fabrication	0.8667	1.7136
Labourers, food	0.8583	1.6212

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.8 A comparison of SME's ratings of Soft (Social and Emotional Skills) in 2024 compared to the OaSIS base for 20 manufacturing occupations

	SoftSk Base	SoftSk 2024
Engineering managers	4.3	4.2163
Mechanical engineers	3.7167	3.5964
Chemical engineers	3.9083	3.7944
Industrial engineers	3.8667	3.7155
Miscellaneous engineers	3.7627	3.6815
Chemical technologists	2.9517	2.6896
Biological technologists	2.8436	2.9256
Mechanical engineering technologists	3.0771	2.937
Industrial technologists	2.9948	2.9672
Machinists	2.5675	2.7613
Welders	2.3769	2.5369
Construction millwrights	2.5	2.6269
Manufacturing managers	3.9417	3.831
Supervisors, food processing	3.4583	3.2468
Supervisors, manufacturing products	3.375	3.3974
Aircraft assemblers	2.3833	2.5365
Process control, food	2.0628	2.4131
Mechanical assemblers	2.2917	2.5755
Labourers, metal fabrication	1.3333	1.822
Labourers, food	1.4167	1.7938

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.9 A comparison of SME's ratings of Workplace Skills in 2024 compared to the OaSIS base for 20 manufacturing occupations

	Work Sk Base	Work Sk 2024
Engineering managers	4.1064	3.9681
Mechanical engineers	4.0027	3.8441
Chemical engineers	4.1609	4.0052
Industrial engineers	3.9936	3.9368
Miscellaneous engineers	4.2096	3.7366
Chemical technologists	2.7325	2.6343
Biological technologists	2.5297	2.584
Mechanical engineering technologists	2.9632	2.867
Industrial technologists	2.9131	3.014
Machinists	2.0645	2.4525
Welders	1.7603	2.015
Construction millwrights	2.5	2.5806
Manufacturing managers	3.7	3.6335
Supervisors, food processing	2.8064	2.8907
Supervisors, manufacturing products	2.7973	2.887
Aircraft assemblers	2.3436	2.3331
Process control, food	1.5069	1.9664
Mechanical assemblers	1.6427	2.1839
Labourers, metal fabrication	0.6818	1.1488
Labourers, food	0.87	1.3059

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.10 Average projected changes in KSAOs between 2024 and 2040 for 114 manufacturing occupations

	Knowledge Emotional Skills	Cognitive (Hard) Skills	Cognitive Abilities	Social and Emotional Skills	Workplace Skills
2024	2.2717	3.0321	2.9618	3.0013	2.7388
2030	2.573	3.3178	3.1069	3.1835	2.9549
2040	2.7124	3.4447	3.166	3.2507	3.0456

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.11 Trends for projected growth in Knowledge over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	3	3.3155	3.5714	3.6012
Mechanical engineers	3	3.4107	3.6071	3.6786
Chemical engineers	2.625	3.0313	3.3063	3.5
Industrial engineers	3.375	3.5903	3.8472	3.9514
Miscellaneous engineers	3.1	3.255	3.57	3.785
Chemical technologists	2.05	2.1125	2.3375	2.4625
Biological technologists	1.9044	2.261	2.7096	2.875
Mechanical engineering technologists	2.5	2.5469	2.625	2.7188
Industrial technologists	2.4219	2.6563	3	3.1094
Machinists	1.2857	2.0119	2.4167	2.5298
Welders	1.125	1.6442	1.8654	2
Construction millwrights	2.5	2.3409	2.5455	2.6705
Manufacturing managers	2.375	2.6625	3.0375	3.1542
Supervisors, food processing	2	2.3462	2.6442	3
Supervisors, manufacturing products	2	2.1538	2.4423	2.5577
Aircraft assemblers	2.0625	2.2656	2.9219	2.9844
Process control, food	0.625	1.5192	1.7981	2.2019
Mechanical assemblers	1.25	1.875	2.2188	2.3281
Labourers, metal fabrication	0.125	0.8068	0.9545	1.0795
Labourers, food	0.125	0.7125	1.2875	1.6625

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.12 Trends for projected growth in Cognitive (Hard) Skills over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	4.3775	4.2185	4.3847	4.4377
Mechanical engineers	4.4608	4.0866	4.2744	4.3042
Chemical engineers	4.6358	4.3605	4.5317	4.6036
Industrial engineers	4.3	4.1146	4.2991	4.3613
Miscellaneous engineers	4.6139	4.1078	4.4278	4.458
Chemical technologists	3.1617	3.0908	3.2808	3.3725
Biological technologists	3.0676	3.1392	3.6058	3.7404
Mechanical engineering technologists	3.1375	3.1635	3.3448	3.4969
Industrial technologists	3.0271	3.2859	3.5786	3.7036
Machinists	2.2857	2.7187	2.9514	3.0754
Welders	1.825	2.3617	2.591	2.7013
Construction millwrights	2.5	2.6886	2.8845	3.0235
Manufacturing managers	3.3525	3.5121	3.8179	3.9213
Supervisors, food processing	2.7333	3.0276	3.376	3.5734
Supervisors, manufacturing products	2.7	3.109	3.4314	3.5811
Aircraft assemblers	2.1794	2.5983	3.0846	3.1325
Process control, food	1.5641	2.3138	2.6974	3.0686
Mechanical assemblers	1.6917	2.301	2.5943	2.7
Labourers, metal fabrication	0.8667	1.7136	2.1807	2.3955
Labourers, food	0.8583	1.6212	2.19	2.5883

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.13 Trends for projected growth in Cognitive Abilities over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	3.95	3.8857	4.0048	4.1048
Mechanical engineers	4.37	4.1664	4.2829	4.3543
Chemical engineers	4.16	4.152	4.203	4.178
Industrial engineers	4.11	4.0578	4.1628	4.2417
Miscellaneous engineers	4.252	4.2196	4.1904	4.14
Chemical technologists	3.172	2.794	3.074	3.249
Biological technologists	3.2961765	3.3212	3.3874	3.4232
Mechanical engineering technologists	3.1175	2.9463	3.0337	3.2838
Industrial technologists	2.96625	2.9613	2.9925	3.1788
Machinists	2.577619	2.8786	2.8986	2.8748
Welders	2.05	2.2385	2.3058	2.2577
Construction millwrights	2.5	2.4945	2.54	2.54
Manufacturing managers	3.11	3.2067	3.5227	3.606
Supervisors, food processing	2.84	2.7615	3.3423	3.4577
Supervisors, manufacturing products	2.79	2.8515	3.1338	3.2654
Aircraft assemblers	2.4975	2.4675	2.9088	3.1588
Process control, food	1.9223077	2.34	2.4677	2.8331
Mechanical assemblers	2.05	2.2938	2.5312	2.5
Labourers, metal fabrication	1.68	1.8809	1.9655	2.0173
Labourers, food	1.47	1.957	2.288	2.538

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.14 Trends for projected growth in Soft (Social and Emotional) Skills over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	4.3	4.2163	4.3147	4.3425
Mechanical engineers	3.7167	3.5964	3.7452	3.772
Chemical engineers	3.9083	3.7944	3.9346	3.9933
Industrial engineers	3.8667	3.7155	3.859	3.9278
Miscellaneous engineers	3.7627	3.6815	3.876	3.916
Chemical technologists	2.9517	2.6896	2.9363	3.0592
Biological technologists	2.8436	2.9256	3.2229	3.2577
Mechanical engineering technologists	3.0771	2.937	3.1047	3.1203
Industrial technologists	2.9948	2.9672	3.1922	3.325
Machinists	2.5675	2.7613	2.8544	2.8968
Welders	2.3769	2.5369	2.5936	2.6478
Construction millwrights	2.5	2.6269	2.661	2.6458
Manufacturing managers	3.9417	3.831	4.0401	4.0871
Supervisors, food processing	3.4583	3.2468	3.5721	3.7179
Supervisors, manufacturing products	3.375	3.3974	3.5016	3.5112
Aircraft assemblers	2.3833	2.5365	2.9688	3.0703
Process control, food	2.0628	2.4131	2.6231	2.874
Mechanical assemblers	2.2917	2.5755	2.7344	2.7578
Labourers, metal fabrication	1.3333	1.822	1.9167	2.0568
Labourers, food	1.4167	1.7938	2.2521	2.4979

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.15 Trends for projected growth in Workplace Skills over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	4.1064	3.9681	4.1016	4.1542
Mechanical engineers	4.0027	3.8441	3.9816	3.9979
Chemical engineers	4.1609	4.0052	4.1435	4.2124
Industrial engineers	3.9936	3.9368	4.0102	4.0396
Miscellaneous engineers	4.2096	3.7366	4.031	4.0608
Chemical technologists	2.7325	2.6343	2.7414	2.8054
Biological technologists	2.5297	2.584	2.93	2.9839
Mechanical engineering technologists	2.9632	2.867	3.0498	3.2038
Industrial technologists	2.9131	3.014	3.2758	3.3553
Machinists	2.0645	2.4525	2.6034	2.6817
Welders	1.7603	2.015	2.1113	2.2049
Construction millwrights	2.5	2.5806	2.7256	2.8124
Manufacturing managers	3.7	3.6335	3.8738	3.9498
Supervisors, food processing	2.8064	2.8907	3.25	3.4184
Supervisors, manufacturing products	2.7973	2.887	3.1551	3.2329
Aircraft assemblers	2.3436	2.3331	2.6639	2.7257
Process control, food	1.5069	1.9664	2.2532	2.579
Mechanical assemblers	1.6427	2.1839	2.3569	2.3797
Labourers, metal fabrication	0.6818	1.1488	1.3884	1.5145
Labourers, food	0.87	1.3059	1.8485	2.119

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.16 Trends for projected growth in Knowledge of Emerging Trends and Technology over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	2	2.4881	2.9167	2.9524
Mechanical engineers	2	2.6786	2.8929	3.0357
Chemical engineers	1.25	2.05	2.4	2.7375
Industrial engineers	2.75	3	3.4583	3.625
Miscellaneous engineers	1.44	2.27	2.6	3.05
Chemical technologists	0.5	1.125	1.275	1.5
Biological technologists	0.25	1.0441	1.75	2.0221
Mechanical engineering technologists	1.25	1.5938	1.5625	1.7188
Industrial technologists	1.8438	2.4063	2.75	2.9063
Machinists	0.5238	1.5357	1.9286	2.0238
Welders	0.25	1.1346	1.375	1.5
Construction millwrights	2.5	2.0227	2.2273	2.3182
Manufacturing managers	1.75	2.1833	2.625	2.7667
Supervisors, food processing	2	2.0577	2.3269	2.7115
Supervisors, manufacturing products	2	2.0385	2.25	2.3846
Aircraft assemblers	0.875	1.8125	2.3125	2.3125
Process control, food	0.25	1.0962	1.4038	1.7115
Mechanical assemblers	0.5	1.1875	1.5	1.5625
Labourers, metal fabrication	0.25	0.9091	0.9773	1.0682
Labourers, food	0.25	0.575	1.125	1.45

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.17 Trends for projected growth in Digital Literacy over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	4	3.9643	4.1667	4.1548
Mechanical engineers	4	3.8036	4.2321	4.3571
Chemical engineers	4	3.875	4.2875	4.5375
Industrial engineers	4	3.9444	4.2917	4.4444
Miscellaneous engineers	4.84	4.12	4.55	4.63
Chemical technologists	2.6	2.625	3.325	3.675
Biological technologists	2.559	2.8456	3.5809	3.8603
Mechanical engineering technologists	2.25	2.625	3.1563	3.6875
Industrial technologists	2.375	2.75	3.4062	3.5313
Machinists	1.048	2.0833	2.7024	3.0952
Welders	0.038	1.3942	2.1635	2.5577
Construction millwrights	2.5	2.2727	2.8636	3.3409
Manufacturing managers	3	3.1	3.8	4.1083
Supervisors, food processing	2	2.9231	3.4038	3.7308
Supervisors, manufacturing products	2	2.5192	3.4038	3.8846
Aircraft assemblers	1.25	2.0313	3.1563	3.2813
Process control, food	1.462	2.3269	2.8654	3.3077
Mechanical assemblers	1	1.75	2.6875	3.2188
Labourers, metal fabrication	0	1.4091	2.6136	3.1591
Labourers, food	0	0.825	1.575	2.25

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.18 Trends for projected growth in Sensory Abilities over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	1.5	1.9405	2.0833	2.0714
Mechanical engineers	2	2.2143	2.0714	2
Chemical engineers	2.08	2.5475	2.777	2.6895
Industrial engineers	2	2.4306	2.5139	2.5
Miscellaneous engineers	1.8092	2.0516	2.3212	2.288
Chemical technologists	1.784	2.158	2.491	2.491
Biological technologists	1.8803	2.2871	2.5565	2.5688
Mechanical engineering technologists	2.67	2.7937	2.7937	2.7937
Industrial technologists	2.0513	2.135	2.1975	2.2288
Machinists	2.5081	2.881	2.9048	2.9405
Welders	2.2469	2.5835	2.6508	2.6796
Construction millwrights	2.5	2.6664	2.6209	2.6891
Manufacturing managers	1.92	2.2913	2.4437	2.3993
Supervisors, food processing	2.33	2.7292	2.8638	3.2231
Supervisors, manufacturing products	2.33	2.8892	2.9023	2.8446
Aircraft assemblers	2.8725	3.04	3.1238	3.03
Process control, food	2.0062	2.5892	2.5508	3.0892
Mechanical assemblers	2.25	2.5313	2.5313	2.5313
Labourers, metal fabrication	2	2.4773	2.5682	2.5455
Labourers, food	1.83	2.256	2.874	3.124

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.19 Trends for projected growth in Psychomotor Abilities over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	0.4	1.019	1.0833	1.1071
Mechanical engineers	1	1.7857	1.7143	1.6429
Chemical engineers	1.5	2.35	2.375	2.3125
Industrial engineers	1.6	2.0806	1.9167	1.7222
Miscellaneous engineers	1.432	2.254	2.288	2.144
Chemical technologists	2.8	3.205	3.39	3.35
Biological technologists	2.6	3.1838	3.0456	3.0132
Mechanical engineering technologists	3	2.875	3	3.125
Industrial technologists	2.25	2.575	2.6375	2.7312
Machinists	3.738	3.8405	3.7143	3.6786
Welders	2.9	3.3462	3.3231	3.3327
Construction millwrights	2.5	2.8409	2.7682	2.8136
Manufacturing managers	1.4	1.8567	1.955	1.9133
Supervisors, food processing	2	2.3269	2.4615	2.6731
Supervisors, manufacturing products	2	2.5962	2.4423	2.3269
Aircraft assemblers	3	3.6438	3.9563	3.8813
Process control, food	3	3.1538	3.2885	3.5962
Mechanical assemblers	3.1	3.3375	3.3375	3.3375
Labourers, metal fabrication	3	3.2955	3.2955	3.2273
Labourers, food	3	3.35	3.575	3.675

Source: Custom analysis of NGen Skill Projection Survey data.

Table 3.20 Trends for projected growth in Physical Abilities over 18 years for 20 manufacturing occupations

	2020	2024	2030	2040
Engineering managers	0	0.5119	0.5238	0.5595
Mechanical engineers	0.13	0.655	0.7264	0.7086
Chemical engineers	0.38	1.44	1.365	1.24
Industrial engineers	0.63	0.8856	0.9272	0.955
Miscellaneous engineers	0.4592	1.2472	1.2472	1.1576
Chemical technologists	1.25	1.925	1.925	1.975
Biological technologists	1.5	2.125	2.0735	2.0662
Mechanical engineering technologists	2.1575	2.22	2.22	2.22
Industrial technologists	0.65625	1.4063	1.4688	1.5313
Machinists	2.8738095	2.9748	2.8314	2.7957
Welders	3.0146154	3.2454	3.1396	3.1396
Construction millwrights	2.5	2.8755	2.8073	2.83
Manufacturing managers	0.25	0.975	0.9583	0.9
Supervisors, food processing	1.5	1.8462	1.9231	2.2308
Supervisors, manufacturing products	1.5	2.3077	2.1154	2.1154
Aircraft assemblers	3.5	3.625	3.7813	3.6563
Process control, food	2.2692308	2.75	2.75	3.1346
Mechanical assemblers	2.5	2.75	2.75	2.75
Labourers, metal fabrication	3.5	3.6591	3.6364	3.6136
Labourers, food	3.5	3.75	3.8	3.675

Source: Custom analysis of NGen Skill Projection Survey data.

Chapter 4

Table 4.7 Change in Average Hour Worked Per Week by Change in Hourly Wage Rate by Occupation, Employed Paid Workers, Canada, 2016 – 2022

wage Code	Occupation code and title	Change in average hours worked	Change in hourly rate ($)
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	-	2
12113	Statistical officers and related research support occupations	N/A	N/A
14402	Production logistics workers	-2.0	3
20010	Engineering managers	-5.0	12
21109	Other professional occupations in physical sciences	N/A	N/A
21300	Civil engineers	-6.0	11
21301	Mechanical engineers	1.0	8
21310	Electrical and electronics engineers	-2.0	6
21311	Computer engineers (except software engineers and designers)	-	-5
21320	Chemical engineers	-1.0	6
21321	Industrial and manufacturing engineers	-3.0	4
21322	Metallurgical and materials engineers	-5.0	17
21330	Mining engineer's	N/A	N/A
21331	Geological engineer's	N/A	N/A

21332	Petroleum engineer's	N/A	N/A
21399	Other professional engineers	16.0	14
22100	Chemical technologists and technicians	-2.0	2
22101	Geological and mineral technologists and technicians	-8.0	17
22110	Biological technologists and technicians	9.0	10
22211	Industrial designers	-1.0	4
22230	Non-destructive testers and inspectors	22.0	17
22231	Engineering inspectors and regulatory officer's	N/A	N/A
22233	Construction inspector's	N/A	N/A
22300	Civil engineering technologists and technicians	-6.0	1
22301	Mechanical engineering technologists and technicians	-2.0	3
22302	Industrial engineering and manufacturing technologists and technicians	-1.0	4
22310	Electrical and electronics engineering technologists and technicians	2.0	5
22311	Electronic service technicians (household and business equipment)	1.0	2
22312	Industrial instrument technicians and mechanics	-5.0	9
32129	Other medical technologists and technician's	N/A	N/A
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	1.0	5
72011	Contractors and supervisors, electrical trades and telecommunications occupations	-1.0	6
72020	Contractors and supervisors, mechanic trades	-2.0	3
72100	Machinists and machining and tooling inspectors	-3.0	6
72101	Tool and die makers	-	3
72106	Welders and related machine operators	-3.0	3
72200	Electricians (except industrial and power system)	N/A	N/A
72201	Industrial electricians	-2.0	7
72401	Heavy-duty equipment mechanics	-	5
72402	Heating, refrigeration and air conditioning mechanics	-11.0	-3
72404	Aircraft mechanics and aircraft inspectors	-4.0	-1
72405	Machine fitters	-3.0	2
72406	Elevator constructors and mechanics	N/A	N/A
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	6.0	5
72420	Oil and solid fuel heating mechanics	N/A	N/A
72421	Appliance servicers and repairer's	N/A	N/A
72422	Electrical mechanics	-1.0	6
72423	Motorcycle, all-terrain vehicle and other related mechanics	N/A	N/A
72500	Crane operators	-5.0	2
72600	Air pilots, flight engineers and flying instructor's	N/A	N/A
72603	Engineer officers, water transport	N/A	N/A
72999	Other technical trades and related occupations	-3.0	7
73209	Other repairers and servicers	6.0	-7
73310	Railway and yard locomotive engineer's	N/A	N/A
73401	Printing press operators	1.0	5
73402	Drillers and blasters – surface mining, quarrying and construction	N/A	N/A
74201	Water transport deck and engine room crew	N/A	N/A
74205	Public works maintenance equipment operators and related workers	N/A	N/A
75110	Construction trades helpers and labourers	5.0	-2
75119	Other trades helpers and labourer's	N/A	N/A
75211	Railway and motor transport labourer's	N/A	N/A
83100	Underground production and development miner's	N/A	N/A

85110	Mine labourer's	N/A	N/A
85120	Logging and forestry labourer's	N/A	N/A
92010	Supervisors, mineral and metal processing	-1.0	5
92011	Supervisors, petroleum, gas and chemical processing and utilities	-5.0	6
92012	Supervisors, food and beverage processing	1.0	4
92013	Supervisors, plastic and rubber products manufacturing	-3.0	9
92014	Supervisors, forest products processing	-1.0	7
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	-7.0	10
92022	Supervisors, furniture and fixtures manufacturing	-	2
92023	Supervisors, other mechanical and metal products manufacturing	-2.0	2
92024	Supervisors, other products manufacturing and assembly	-1.0	3
92100	Power engineers and power systems operators	1.0	6
92101	Water and waste treatment plant operator's	N/A	N/A
93100	Central control and process operators, mineral and metal processing	-2.0	10
93101	Central control and process operators, petroleum, gas and chemical processing	4.0	10
93102	Pulping, papermaking and coating control operators	1.0	6
94100	Machine operators, mineral and metal processing	1.0	1
94103	Concrete, clay and stone forming operators	-5.0	1
94104	Inspectors and testers, mineral and metal processing	3.0	6
94105	Metalworking and forging machine operators	-1.0	3
94106	Machining tool operators	-	3
94107	Machine operators of other metal products	-2.0	4
94110	Chemical plant machine operators	-3.0	4
94111	Plastics processing machine operators	-1.0	6
94123	Lumber graders and other wood processing inspectors and graders	-1.0	3
94124	Woodworking machine operators	-6.0	3
94129	Other wood processing machine operators	-3.0	3
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	-15.0	-1
94131	Weavers, knitters and other fabric making occupations	-4.0	1
94132	Industrial sewing machine operators	-2.0	4
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	-	3
94140	Process control and machine operators, food and beverage processing	-	4
94143	Testers and graders, food and beverage processing	-4.0	4
94150	Plate-less printing equipment operators	7.0	1
94151	Camera, platemaking and other prepress occupations	-5.0	0
94152	Binding and finishing machine operators	-	1
94153	Photographic and film processors	N/A	N/A
94200	Motor vehicle assemblers, inspectors and testers	-1.0	2
94201	Electronics assemblers, fabricators, inspectors and testers	-2.0	2
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	1.0	7
94205	Machine operators and inspectors, electrical apparatus manufacturing	-1.0	6
94211	Assemblers and inspectors of other wood products	1.0	3
94212	Plastic products assemblers, finishers and inspectors	-3.0	4
94213	Industrial painters, coaters and metal finishing process operators	1.0	3
94219	Other products assemblers, finishers and inspectors	-2.0	5
95100	Labourers in mineral and metal processing	-5.0	5
95101	Labourers in metal fabrication	-3.0	4
95102	Labourers in chemical products processing and utilities	-1.0	2
95103	Labourers in wood, pulp and paper processing	1.0	4

95104	Labourers in rubber and plastic products manufacturing	-3.0	4
95106	Labourers in food and beverage processing	-1.0	4
95107	Labourers in fish and seafood processing	-1.0	4
95109	Other labourers in processing, manufacturing and utilities	-1.0	3

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022.

Table 4.8 Change in Employment by Change in Average Wage Rates by Occupation, Employed Paid Worker, Canada, 2016 – 2022.

wage Code	Occupation code and title	Change in paid employment (%)	Change in hourly rate ($)
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	2	2
12113	Statistical officers and related research support occupations	N/A	N/A
14402	Production logistics workers	2	3
20010	Engineering managers	-2	12
21109	Other professional occupations in physical sciences	-4	N/A
21300	Civil engineers	3	11
21301	Mechanical engineers	1	8
21310	Electrical and electronics engineers	-1	6
21311	Computer engineers (except software engineers and designers)	2	-5
21320	Chemical engineers	-1	6
21321	Industrial and manufacturing engineers	7	4
21322	Metallurgical and materials engineers	-5	17
21330	Mining engineers	60	N/A
21331	Geological engineers	3	N/A
21332	Petroleum engineers	-8	N/A
21399	Other professional engineers	-2	14
22100	Chemical technologists and technicians	13	2
22101	Geological and mineral technologists and technicians	4	17
22110	Biological technologists and technicians	-5	10
22211	Industrial designers	1	4
22230	Non-destructive testers and inspectors	-5	17
22231	Engineering inspectors and regulatory officers	60	N/A
22233	Construction inspector’s	N/A	N/A
22300	Civil engineering technologists and technicians	-6	1
22301	Mechanical engineering technologists and technicians	1	3
22302	Industrial engineering and manufacturing technologists and technicians	-3	4
22310	Electrical and electronics engineering technologists and technicians	3	5
22311	Electronic service technicians (household and business equipment)	-3	2
22312	Industrial instrument technicians and mechanics	0	9
32129	Other medical technologists and technician’s	N/A	N/A
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	-3	5
72011	Contractors and supervisors, electrical trades and telecommunications occupations	-4	6
72020	Contractors and supervisors, mechanic trades	-1	3
72100	Machinists and machining and tooling inspectors	0	6

72101	Tool and die makers	2	3
72106	Welders and related machine operators	-1	3
72200	Electricians (except industrial and power system)	N/A	N/A
72201	Industrial electricians	1	7
72401	Heavy-duty equipment mechanics	1	5
72402	Heating, refrigeration and air conditioning mechanics	-8	-3
72404	Aircraft mechanics and aircraft inspectors	12	-1
72405	Machine fitters	2	2
72406	Elevator constructors and mechanics	N/A	N/A
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	-2	5
72420	Oil and solid fuel heating mechanics	N/A	N/A
72421	Appliance servicers and repairer's	N/A	N/A
72422	Electrical mechanics	3	6
72423	Motorcycle, all-terrain vehicle and other related mechanics	-8	N/A
72500	Crane operators	-1	2
72600	Air pilots, flight engineers and flying instructors	210	N/A
72603	Engineer officers, water transport	-1	N/A
72999	Other technical trades and related occupations	13	7
73209	Other repairers and servicers	-1	-7
73310	Railway and yard locomotive engineers	-10	N/A
73401	Printing press operators	0	5
73402	Drillers and blasters – surface mining, quarrying and construction	-10	N/A
74201	Water transport deck and engine room crew	N/A	N/A
74205	Public works maintenance equipment operators and related workers	N/A	N/A
75110	Construction trades helpers and labourers	-5	-2
75119	Other trades helpers and labourers	-9	N/A
75211	Railway and motor transport labourer's	N/A	N/A
83100	Underground production and development miner's	N/A	N/A
85110	Mine labourer's	N/A	N/A
85120	Logging and forestry labourer's	N/A	N/A
92010	Supervisors, mineral and metal processing	-1	5
92011	Supervisors, petroleum, gas and chemical processing and utilities	-3	6
92012	Supervisors, food and beverage processing	7	4
92013	Supervisors, plastic and rubber products manufacturing	0	9
92014	Supervisors, forest products processing	-2	7
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	-4	10
92022	Supervisors, furniture and fixtures manufacturing	1	2
92023	Supervisors, other mechanical and metal products manufacturing	-1	2
92024	Supervisors, other products manufacturing and assembly	-3	3
92100	Power engineers and power systems operators	0	6
92101	Water and waste treatment plant operators	-10	N/A
93100	Central control and process operators, mineral and metal processing	-1	10
93101	Central control and process operators, petroleum, gas and chemical processing	-1	10
93102	Pulping, papermaking and coating control operators	12	6
94100	Machine operators, mineral and metal processing	1	1
94103	Concrete, clay and stone forming operators	1	1
94104	Inspectors and testers, mineral and metal processing	-1	6
94105	Metalworking and forging machine operators	3	3
94106	Machining tool operators	2	3

94107	Machine operators of other metal products	-5	4
94110	Chemical plant machine operators	1	4
94111	Plastics processing machine operators	2	6
94123	Lumber graders and other wood processing inspectors and graders	2	3
94124	Woodworking machine operators	-1	3
94129	Other wood processing machine operators	2	3
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	-3	-1
94131	Weavers, knitters and other fabric making occupations	-4	1
94132	Industrial sewing machine operators	-2	4
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	1	3
94140	Process control and machine operators, food and beverage processing	4	4
94143	Testers and graders, food and beverage processing	4	4
94150	Plate-less printing equipment operators	-4	1
94151	Camera, platemaking and other prepress occupations	-8	0
94152	Binding and finishing machine operators	1	1
94153	Photographic and film processors	N/A	N/A
94200	Motor vehicle assemblers, inspectors and testers	2	2
94201	Electronics assemblers, fabricators, inspectors and testers	3	2
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	4	7
94205	Machine operators and inspectors, electrical apparatus manufacturing	1	6
94211	Assemblers and inspectors of other wood products	-2	3
94212	Plastic products assemblers, finishers and inspectors	-3	4
94213	Industrial painters, coaters and metal finishing process operators	1	3
94219	Other products assemblers, finishers and inspectors	3	5
95100	Labourers in mineral and metal processing	-4	5
95101	Labourers in metal fabrication	-2	4
95102	Labourers in chemical products processing and utilities	4	2
95103	Labourers in wood, pulp and paper processing	-2	4
95104	Labourers in rubber and plastic products manufacturing	-3	4
95106	Labourers in food and beverage processing	-1	4
95107	Labourers in fish and seafood processing	-1	4
95109	Other labourers in processing, manufacturing and utilities	-2	3

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022

Table 4.9 and 4.10 Average Change in Usual Weekly Hours Worked by Industry, Employed Paid Workers, Canada, 2016 – 2022

Occupational title	Absolute change	Percentage change
Accommodation and Food Services	3.03	8
Other Services	1.85	5
Retail Trade	1.67	4
Agriculture, Forestry, Fishing	1.40	3
Management, Administrative and Other Support	1.26	3
Transportation and Warehousing	0.44	1
Health Care and Social Assistance	0.40	1
Construction	0.30	1
Mining, Oil, Gas, Utilities	0.17	0
Manufacturing	0.12	0
Finance, Insurance, Real Estate and Leasing	0.09	0
Wholesale Trade	0.05	0
Professional, Scientific and Technical Services	-0.05	0
Educational Services	-0.44	-1
Information, Culture and Recreation	-0.56	-1
Public Administration	-0.57	-2
Arts, Entertainment and Recreation	-1.15	-3

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022

Table 4.10 Change in Usual Weekly Hours Worked by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada, 2016 – 2022

	Percentage Change
Accommodation and Food Services	50
Management, Administrative and Other Support	41
Finance, Insurance, Real Estate and Leasing	32
Educational Services	20
Agriculture, Forestry, Fishing	20
Public Administration	19
Wholesale Trade	17
Other Services	17
Retail Trade	17
Manufacturing	17
Transportation and Warehousing	16
Professional, Scientific and Technical Services	15
Health Care and Social Assistance	14
Information, Culture and Recreation	14
Construction 14	
Mining, Oil, Gas, Utilities	12
Arts, Entertainments and Recreation	0

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022.

Table 4.11 Change in Hourly Wage Rate by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada, 2016 – 2022

Industry	Absolute change in hourly wage rate 2016-2022 ($)	Percentage change in hourly wage rate (%)
Manufacturing	4	17
Accommodation and Food Services	11	50
Agriculture, Forestry, Fishing	5	20
Arts, Entertainments and Recreation	0	0
Construction	4	14
Educational Services	6	20
Finance, Insurance, Real Estate and Leasing	9	32
Health Care and Social Assistance	4	14
Information, Culture and Recreation	5	14
Management, Administrative and Other Support	8	41
Mining, Oil, Gas, Utilities	5	12
Other Services	4	17
Professional, Scientific and Technical Services	6	15
Public Administration	7	19
Retail Trade	4	17
Transportation and Warehousing	5	16
Wholesale Trade	5	17
Total	**5**	**18**

: Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022

Table 4.12 Percentage Change in Hourly Wage rate by Industry, Employed Paid Workers for Occupations with Employment in Manufacturing, Canada, 2016 – 2022 Included in Table 4.11

Table 4.13 Percentile Distribution of the Knowledge and Skill Intensity Index, Occupations that Have Reportable Employment in Manufacturing, all industries, Canada, 2016 – 2022

Percentile Score	2016	2017	2018	2019	2020	2021	2022
Min	269	269	269	269	269	269	269
10	320	320	320	320	320	320	322
20	379	379	379	379	379	379	379
25	379	379	379	379	392	392	392
30	395	395	395	395	402	403	403
40	431	431	431	434	441	441	441
50	457	457	457	458	459	460	460
60	470	467	469	467	471	477	477
70	504	502	502	502	502	502	502
75	515	515	515	515	515	515	515
80	530	529	534	530	529	534	530
90	564	564	564	564	557	564	564
Max	665	665	665	665	665	665	665

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.

Table 4.14 Percentile Distribution of the Knowledge and Skill Intensity Index, Occupations that Have Reportable Employment in Manufacturing, Manufacturing, Canada, 2016 – 2022

Percentile score	2016	2017	2018	2019	2020	2021	2022
Min	269	269	269	269	269	269	269
10	361	361	361	361	361	361	361
20	395	395	395	395	395	395	395
25	403	418	418	418	418	418	418
30	431	431	431	431	431	431	431
40	454	459	459	459	459	459	459
50	459	464	464	464	464	464	464
60	485	495	495	495	495	495	495
70	524	529	529	529	526	528	529
75	529	529	529	529	529	529	529
80	534	534	534	534	534	534	534
90	582	582	582	582	582	582	582
Max	594	594	594	665	665	665	665

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.

Table 4.16 Knowledge and Skill intensity Index for Selected Occupations by Average Hourly Wage Rate, Canada, 2022

	Average of Aggregated Demand		Average of Skill Intensity			
Row Labels	2016	2022	2016	2022	Skill intensity	Change in aggregate skill demand, 2016 – 2022 (%)
Technical sales specialists – wholesale trade	295,916	302,411	379	379	379	2
Elementary school and kindergarten teachers	153,550	182,138	485	485	485	19
Sales and account representatives – wholesale trade (non-technical)	170,084	160,793	397	397	397	-5
Information systems specialists	117,793	184,904	463	463	463	57
Cooks	148,352	117,169	454	454	454	-21
Automotive service technicians, truck and bus mechanics and mechanical repairers	122,452	137,586	564	564	564	12
Carpenters	108,939	128,383	515	515	515	18
Estheticians, electrologists and related occupations	124,205	110,842	290	290	290	-11
Electricians (except industrial and power system)	91,955	119,809	587	587	587	30
Construction millwrights and industrial mechanics	97,374	109,556	582	582	582	13
Construction trades helpers and labourers	98,364	101,956	403	403	403	4
Store shelf stockers, clerks and order fillers	88,432	109,404	315	315	315	24
Software developers and programmers	68,376	119,861	441	441	441	75
Accounting and related clerks	82,021	86,911	320	320	320	6
Food counter attendants, kitchen helpers and related support occupations	86,736	81,124	368	368	368	-6
Light duty cleaners	84,186	81,076	310	310	310	-4
College and other vocational instructors	74,686	89,840	515	515	515	20
Accounting technicians and bookkeepers	68,806	91,420	395	395	395	33
Secondary school teachers	77,279	81,440	463	463	463	5
Welders and related machine operators	78,353	79,316	459	459	459	1
Software engineers and designers	43,534	107,204	477	477	477	146
Police officers (except commissioned)	69,550	80,447	643	643	643	16
Receptionists	80,012	69,836	322	322	322	-13
Security guards and related security service occupations	72,367	74,528	426	426	426	3
General office support workers	75,479	66,006	314	314	314	-13
Heavy-duty equipment mechanics	69,227	66,352	580	580	580	-4
Financial managers	56,216	72,314	504	504	504	29
University professors and lecturers	60,826	64,928	494	494	494	7
Social workers	55,089	63,360	505	505	505	15
Telecommunication carrier's managers	51,845	66,173	457	457	457	28
Assessors, business valuators and appraisers	53,940	63,438	379	379	379	18
Retail sales supervisors	49,826	55,183	452	452	452	11
Other services supervisors	45,277	48,214	425	425	425	6
Plumbers	46,550	45,150	526	526	526	-3
Other sales related occupations	50,453	38,447	357	357	357	-24
Database analysts and data administrators	27,061	60,251	427	427	427	123
Senior managers – financial, communications and other business services	36,040	46,019	576	576	576	28
Police investigators and other investigative occupations	36,089	45,355	457	457	457	26
Human resources and recruitment officers	35,139	46,157	418	418	418	31
Automotive and heavy truck and equipment parts installers and servicers	36,273	43,408	467	467	467	20
Industrial electricians	34,691	44,644	582	582	582	29

Kinesiologists and other professional occupations in therapy and assessment	35,732	42,981	549	549	549	20
Program leaders and instructors in recreation, sport and fitness	38,924	39,670	466	466	466	2
Student monitors, crossing guards and related occupations	39,729	38,663	324	324	324	-3
Post-secondary teaching and research assistants	35,561	42,259	371	371	371	19
Residential and commercial installers and servicers	32,351	42,851	499	499	499	32
Other repairers and servicers	36,622	36,398	469	469	469	-1
Pharmacists	31,183	41,297	553	553	553	32
Heating, refrigeration and air conditioning mechanics	29,035	42,685	564	564	564	47
Logging and forestry labourers	29,994	41,180	497	497	497	37
Specialized members of the Canadian Armed Forces	32,697	37,418	459	459	459	14
Labourers in food and beverage processing	37,342	30,599	364	364	364	-18
Power engineers and power systems operators	32,767	33,697	575	575	575	3
Underground production and development miners	29,836	34,782	536	536	536	17
Therapists in counselling and related specialized therapies	25,799	36,950	464	464	464	43
Executive assistants	26,899	34,292	425	425	425	27
Dental assistants and dental laboratory assistants	23,186	36,047	460	460	460	55
Other technical occupations in therapy and assessment	27,080	31,858	458	458	458	18
Chefs	28,119	30,132	452	452	452	7
Human resources managers	23,086	34,554	484	484	484	50
Health policy researchers, consultants and program officers	25,270	31,980	495	495	495	27
Chemical technologists and technicians	20,737	33,077	544	544	544	60
Auto body collision, refinishing and glass technicians and damage repair estimators	28,836	24,203	507	507	507	-16
Machine operators of other metal products	35,354	16,901	432	432	432	-52
Steamfitters, pipefitters and sprinkler system installers	25,187	27,016	537	537	537	7
Insurance adjusters and claims examiners	24,387	27,449	400	400	400	13
Telecommunications equipment installation and cable television service technicians	26,503	24,903	541	541	541	-6
Janitors, caretakers and heavy-duty cleaners	23,700	26,321	518	518	518	11
Metalworking and forging machine operators	21,621	27,014	465	465	465	25
Maîtres d'hôtel and hosts/hostesses	25,768	21,025	320	320	320	-18
Data scientists	18,811	27,980	423	423	423	49
Bakers	27,139	19,552	379	379	379	-28
Pharmacy technical assistants and pharmacy assistants	20,927	24,924	388	388	388	19
Ironworkers	25,908	19,725	520	520	520	-24
Supervisors, food and beverage processing	17,202	27,693	529	529	529	61
Medical laboratory technologists	19,819	24,658	553	553	553	24
Web developers and programmers	19,538	24,879	583	583	583	27
Banking, insurance and other financial clerks	21,299	22,148	369	369	369	4
Information systems testing technicians	21,624	21,777	557	557	557	1
Landscape and horticulture technicians and specialists	19,867	22,643	482	482	482	14
Supervisors, other mechanical and metal products manufacturing	22,014	19,989	535	535	535	-9
Operations members of the Canadian Armed Forces	26,768	16,506	419	463	463	-38
Aircraft mechanics and aircraft inspectors	15,235	24,142	601	601	601	58
Specialized cleaners	21,795	17,432	298	298	298	-20
Announcers and other broadcasters	18,760	19,429	446	446	446	4
Hairstylists and barbers	20,142	16,909	357	357	357	-16
Conference and event planners	17,852	19,120	511	511	511	7
Survey interviewers and statistical clerks	17,064	19,807	524	524	524	16
Supervisors, petroleum, gas and chemical processing and utilities	19,290	17,385	545	545	545	-10
Bartenders	21,377	15,215	368	368	368	-29
Electrical power line and cable workers	16,079	20,057	553	553	553	25
Other labourers in processing, manufacturing and utilities	21,526	13,763	350	350	350	-36

Education policy researchers, consultants and program officers	15,682	19,318	474	474	474	23
Producers, directors, choreographers and related occupations	12,089	22,767	492	492	492	88
Other assisting occupations in support of health services	15,187	18,892	556	556	556	24
Specialized livestock workers and farm machinery operators	15,728	18,003	449	449	449	14
Physiotherapists	16,865	16,788	541	541	541	0
Religious leaders	16,945	15,953	524	524	524	-6
Economists and economic policy researchers and analysts	14,193	18,036	442	442	442	27
Occupational therapists	11,711	20,389	544	544	544	74
Data entry clerks	16,425	15,473	269	269	269	-6
Public works and maintenance labourers	14,673	16,237	380	380	380	11
Business systems specialists	7,994	22,816	464	464	464	185
Sheet metal workers	15,701	14,825	486	486	486	-6
Probation and parole officers	13,044	16,934	470	470	470	30
Contractors and supervisors, oil and gas drilling and services	14,354	15,423	592	592	592	7
Supervisors, mining and quarrying	12,380	16,740	604	604	604	35
Other trades helpers and labourers	13,823	14,639	403	403	403	6
Hotel front desk clerks	16,820	11,138	374	374	374	-34
Chemical plant machine operators	13,519	14,288	458	458	458	6
Supervisors, forest products processing	14,578	12,572	542	542	542	-14
Fishing vessel deckhands	13,383	13,191	439	439	439	-1
Customs, ship and other brokers	11,354	15,068	434	434	434	33
Telecommunications line and cable installers and repairers	13,175	12,217	529	529	529	-7
Machining tool operators	11,712	13,379	455	455	455	14
Insurance underwriters	10,397	14,343	386	386	386	38
Electrical mechanics	11,017	13,537	534	534	534	23
Correspondence, publication and regulatory clerks	11,527	12,412	329	329	329	8
Agricultural service contractors and farm supervisors	9,914	13,380	539	539	539	35
Machine operators, mineral and metal processing	10,767	11,798	476	476	476	10
Bricklayers	12,288	9,991	504	504	504	-19
Supervisors, mineral and metal processing	11,626	10,334	543	543	543	-11
Operators and attendants in amusement, recreation and sport	9,583	12,377	325	325	325	29
Supervisors, motor vehicle assembling	10,922	10,929	520	520	520	0
Textile fibre and yarn, hide and pelt processing machine operators and workers	10,213	10,556	402	402	402	3
Recreation, sports and fitness policy researchers, consultants and program officers	10,015	10,382	477	477	477	4
Biological technologists and technicians	11,901	7,708	543	543	543	-35
Mathematicians, statisticians and actuaries	7,614	11,553	460	460	460	52
Airline ticket and service agents	9,580	9,479	384	384	384	-1
Collection clerks	10,332	8,262	361	361	361	-20
Geological and mineral technologists and technicians	8,812	9,694	538	538	538	10
Butchers – retail and wholesale	10,594	7,589	428	428	428	-28
Other small engine and small equipment repairers	8,866	9,079	507	507	507	2
Travel counsellors	10,995	6,646	358	358	358	-40
Water and waste treatment plant operators	9,511	8,027	502	502	502	-16
Supervisors, plastic and rubber products manufacturing	8,660	8,706	538	538	538	1
Web designers	8,243	9,040	437	437	437	10
Other administrative services managers	6,027	11,095	344	344	344	84
Oil and gas well drilling and related workers and services operators	10,133	6,591	568	568	568	-35
Cybersecurity specialists	4,791	11,668	431	431	431	144
Harvesting labourers	6,919	9,084	386	386	386	31
Motorcycle, all-terrain vehicle and other related mechanics	7,003	8,960	520	520	520	28
Pursers and flight attendants	7,451	8,493	443	443	443	14
Graphic arts technicians	5,975	9,406	418	418	418	57

Elevator constructors and mechanics	8,526	6,491	541	541	541	-24
Journalists	6,912	7,925	437	437	437	15
Senior government managers and officials	7,993	6,408	573	573	573	-20
Audio and video recording technicians	8,279	6,066	488	488	488	-27
Sawmill machine operators	7,156	7,170	405	405	40	0
Optometrists	6,000	8,139	538	538	538	36
Supervisors, other products manufacturing and assembly	8,182	5,943	530	530	530	-27
Gas fitters	6,196	7,888	524	524	524	27
Supervisors, electronics and electrical products manufacturing	7,782	6,258	529	529	529	-20
Engineering inspectors and regulatory officers	7,837	5,656	509	509	509	-28
Railway and motor transport labourers	6,788	6,596	587	587	587	-3
Pulp mill, papermaking and finishing machine operators	6,507	6,865	418	418	418	5
Supervisors, motor transport and other ground transit operators	7,095	6,228	450	450	450	-12
Service station attendants	8,297	5,010	397	397	397	-40
Air transport ramp attendants	6,409	6,785	378	378	378	6
Translators, terminologists and interpreters	5,237	7,491	386	386	386	43
Woodworking machine operators	6,542	6,028	414	414	414	-8
Audiologists and speech-language pathologists	5,868	6,572	517	517	517	12
Program officers unique to government	5,455	6,779	564	564	564	24
Supervisors, furniture and fixtures manufacturing	5,862	6,362	526	526	526	9
Librarians	5,657	6,454	441	441	441	14
Personnel clerks	5,559	6,380	355	355	355	15
Oil and gas drilling, servicing and related labourers	6,107	5,499	437	437	437	-10
Structural metal and platework fabricators and fitters	8,296	3,135	458	458	458	-62
Concrete, clay and stone forming operators	5,403	5,819	436	436	436	8
Library assistants and clerks	6,135	4,984	353	353	35	-19
Coaches	6,538	4,413	543	543	543	-33
Forestry technologists and technicians	4,900	5,848	579	579	579	19
Conservation and fishery officers	4,375	5,849	597	597	597	34
Editors	5,060	5,053	375	375	375	0
By-law enforcement and other regulatory officers	3,883	6,200	495	495	495	60
Power system electricians	5,220	4,486	572	572	572	-14
Court clerks and related court services occupations	5,148	4,252	326	326	326	-17
Underground mine service and support workers	4,805	4,377	489	489	489	-9
Supervisors, logging and forestry	4,110	4,939	603	603	603	20
Fishermen/women	3,815	4,874	498	498	498	28
Interior designers and interior decorators	4,178	4,427	434	434	434	6
Legislators	3,874	4,607	594	594	594	19
Theatre, fashion, exhibit and other creative designers	3,687	4,794	471	471	471	30
Mine labourers	3,404	3,790	484	484	484	11
Cabinetmakers	4,524	2,583	487	487	487	-43
Appliance servicers and repairers	4,266	2,784	523	523	523	-35
Agricultural and fish products inspectors	4,588	2,394	502	502	502	-48
Railway carmen/women	2,075	4,798	515	515	515	131
Labourers in fish and seafood processing	3,652	3,204	392	392	392	-12
Silviculture and forestry workers	2,596	4,071	512	512	512	57
Chain saw and skidder operators	3,362	3,288	453	453	453	-2
Other professional occupations in social science	2,656	3,803	492	492	492	43
Boilermakers	3,233	3,137	518	518	518	-3
Library and public archive technicians	3,250	3,045	422	422	422	-6
Lumber graders and other wood processing inspectors and graders	2,947	3,320	428	428	428	13
Retail salespersons and visual merchandisers	3,849	2,147	351	351	351	-44
Dentists	3,092	2,856	665	665	665	-8
Upholsterers	3,736	1,907	418	418	418	-49

Labourers in textile processing and cutting	2,892	2,611	368	368	368	-10
Tour and travel guide	2,846	2,641	347	347	347	-7
Musicians and singers	2,280	2,995	438	438	438	31
Supervisors, textile, fabric, fur and leather products processing and manufacturing	3,075	2,034	528	528	528	-34
Pest controllers and fumigators	2,092	2,986	456	456	456	43
Inspectors and testers, mineral and metal processing	2,777	2,279	442	442	442	-18
Oil and solid fuel heating mechanics	2,955	1,781	545	545	545	-40
Glass forming and finishing machine operators and glass cutters	2,887	1,694	425	425	425	-41
Ground and water transport ticket agents, cargo service representatives and related clerks	1,834	2,741	375	375	375	49
Conservators and curators	2,995	1,505	501	501	501	-50
Foundry workers	1,618	2,185	403	403	403	35
Support occupations in accommodation, travel and facilities set-up services	2,331	939	368	368	368	-60
Outdoor sport and recreational guides	1,441	1,537	440	440	440	7
Broadcast technicians	1,431	749	484	484	484	-48
Patternmakers – textile, leather and fur products	1,643	378	447	447	447	-77
Sports officials and referees	1,172	832	458	458	458	-29
Athletes	766	1,155	510	51	510	51
Conductors, composers and arrangers	707	1,067	484	484	484	51
Archivists	494	1,102	428	428	428	123
Senior managers – construction, transportation, production and utilities	1,121	224	588	588	588	-80
Machine fitters	504	588	485	485	485	17
Desktop publishing operators and related occupations	667	219	409	409	409	-67
Senior managers – trade, broadcasting and other services	847	-	582	582	582	-100
Senior managers – health, education, social and community services and membership organizations	623	96	582	582	582	-85
Shoe repairers and shoemakers	457	220	347	347	347	-52
Primary combat members of the Canadian Armed Forces	-	113	545	545	545	DIV/0!
Total	**-**	**-**	**50**	**-**	**-**	**DIV/0!**

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.

Table 4.17 Change in Aggregate Skill Demand by Index of Knowledge and Skill Intensity of the Occupation, Employed Paid Workers, Canada, 2016 – 2023

Row labels	2016	2017	2018	2019	2020	2021	2022	(%)
Accommodation and Food Services	1,231	1,262	1,247	1,252	936	932	1,049	-15
Agriculture, Forestry, Fishing	274	269	291	301	284	299	317	16
Arts, Entertainments and Recreation	366	377	382	395	268	281	380	4
Construction	1,938	2,017	2,037	2,106	2,018	2,081	2,290	18
Educational Services	1,691	1,677	1,687	1,748	1,762	1,945	1,973	17
Finance, Insurance, Real Estate and Leasing	699	717	736	754	770	867	904	29
Health Care and Social Assistance	3,131	3,185	3,259	3,366	3,273	3,479	3,661	17
Information, Culture and Recreation	519	489	486	469	519	583	566	9
Management, Administrative and Other	616	628	638	639	560	740	729	18
Manufacturing 21	518	508	551	569	520	540	576	11
Manufacturing 31	1,170	1,208	1,210	1,170	1,122	1,163	1,189	2
Mining, Oil, Gas and Utilities	400	395	420	414	383	417	435	9
Other Services	801	807	817	814	707	754	769	-4

Professional, Scientific and Technic	1,613	1,662	1,711	1,868	1,923	2,100	2,305	43
Public Administration	1,542	1,581	1,622	1,706	1,715	1,816	1,915	24
Retail Trade	1,146	1,198	1,212	1,240	1,163	1,209	1,256	10
Transportation and Warehousing	667	676	701	728	660	695	701	5
Wholesale Trade	959	986	980	959	910	930	1,006	5

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.

Table 4.18 Percentage Change in Aggregate Skill Demand by Industry, Employed Paid Workers, Canada, 2016 – 2022

2022 Occupational title	Skill intensity	Change 2016-(%)
Automotive service technicians, truck and bus mechanics and mechanical repairers	564	12
Electricians (except industrial and power system)	587	30
Construction trades helpers and labourers	403	4
Other administrative services managers	506	7
Welders and related machine operators	459	1
Contractors and supervisors, other construction trades, installers, repairers and servicers	625	4
Industrial electricians	582	29
Labourers in food and beverage processing	364	-18
Underground production and development miners	536	17
Contractors and supervisors, electrical trades and telecommunications occupations	611	-1
Machinists and machining and tooling inspectors	491	-4
Bricklayers	558	17
Automotive and heavy truck and equipment parts installers and servicers	477	16
Chemical technologists and technicians	544	60
Construction inspectors	532	-18
Machine operators of other metal products	432	-52
Transportation route and crew schedulers	582	71
Civil engineering technologists and technicians	519	-2
Metalworking and forging machine operators	465	25
Mechanical engineering technologists and technicians	586	5
Web developers and programmers	595	27
Supervisors, food and beverage processing	529	61
Supervisors, other mechanical and metal products manufacturing	535	-9
Supervisors, petroleum, gas and chemical processing and utilities	545	-10
Chemical plant machine operators	487	5
Other labourers in processing, manufacturing and utilities	350	-36
Supervisors, other products manufacturing and assembly	547	-4
Plastics processing machine operators	444	18
Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	579	-19
Supervisors, forest products processing	542	-14
Machining tool operators	455	14
Electrical mechanics	534	23
Machine operators, mineral and metal processing	476	10
Other small engine and small equipment repairers	555	5

Supervisors, mineral and metal processing	543	-11
Textile fibre and yarn, hide and pelt processing machine operators and workers	404	3
Biological technologists and technicians	543	-35
Landscape and horticulture technicians and specialists	516	0
Water and waste treatment plant operators	502	-17
Geological and mineral technologists and technicians	538	10
Tool and die makers	484	6
Railway and yard locomotive engineers	565	5
Supervisors, plastic and rubber products manufacturing	538	1
Motorcycle, all-terrain vehicle and other related mechanics	520	28
Elevator constructors and mechanics	541	-24
Residential and commercial installers and servicers	508	-4
Other trades helpers and labourers	381	-65
Woodworking machine operators	414	-8
Supervisors, furniture and fixtures manufacturing	526	9
Concrete, clay and stone forming operators	436	8
Other medical technologists and technicians	402	-22
Production logistics workers	420	-47
Railway and motor transport labourers	387	-51
Logging and forestry labourers	472	-14
Central control and process operators, mineral and metal processing	483	-1
Harvesting labourers	484	11
Appliance servicers and repairers	523	-35
Labourers in fish and seafood processing	392	-12
Other professional occupations in physical sciences	568	60
Lumber graders and other wood processing inspectors and graders	428	13
Supervisors, textile, fabric, fur and leather products processing and manufacturing	528	-34
Inspectors and testers, mineral and metal processing	442	-18
Oil and solid fuel heating mechanics	545	-40
Statistical officers and related research support occupations	351	213

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022 linked to OaSIS skill demand profiles.

Canada, 2016 – 2023.

Chapter 5

Table 5.1 Manufacturing and Utilities Inflows Into Manufacturing, 6 Month Moving Averages, Canada, March 2013 – June 2023

Year and Month	Year	(%)	(%)	(%)
2013-01	+	94.4	94.5	-0.2
2013-02		94.5	94.6	-0.2
2013-03		94.5	94.6	-0.1
2013-04		94.5	94.5	0.0
2013-05		94.5	94.4	0.1
2013-06	2013	94.8	94.5	0.3
2013-07		94.8	94.4	0.3
2013-08		94.8	94.5	0.4

2013-09		94.9	94.5	0.3
2013-10		94.9	94.4	0.5
2013-11		94.8	94.3	0.5
2013-12		94.9	94.3	0.5
2014-01	+	94.9	94.5	0.4
2014-02		95.0	94.5	0.5
2014-03		95.0	94.5	0.5
2014-04		95.0	94.6	0.4
2014-05		95.0	94.7	0.4
2014-06	2014	94.8	94.7	0.1
2014-07		94.8	94.8	0.0
2014-08		94.8	94.9	-0.1
2014-09		94.8	94.8	-0.1
2014-10		94.7	95.0	-0.3
2014-11		94.7	95.0	-0.3
2014-12		94.7	94.9	-0.3
2015-01	+	94.7	95.0	-0.3
2015-02		94.6	94.8	-0.2
2015-03		94.6	94.8	-0.2
2015-04		94.5	94.9	-0.4
2015-05		94.3	94.9	-0.6
2015-06	2015	94.4	94.7	-0.3
2015-07		94.4	94.7	-0.2
2015-08		94.3	94.7	-0.4
2015-09		94.2	94.7	-0.5
2015-10		94.3	94.7	-0.4
2015-11		94.4	94.8	-0.4
2015-12		94.4	94.9	-0.4
2016-01	+	94.4	94.9	-0.5
2016-02		94.0	94.6	-0.6
2016-03		94.1	94.6	-0.5
2016-04		94.2	94.5	-0.3
2016-05		94.4	94.6	-0.2
2016-06	2016	94.5	94.9	-0.3
2016-07		94.7	94.9	-0.2
2016-08		94.8	94.9	-0.2
2016-09		94.8	95.0	-0.2
2016-10		94.8	94.9	-0.1
2016-11		94.8	94.8	0.0
2016-12		94.6	94.8	-0.1
2017-01	+	94.6	94.9	-0.2
2017-02		95.0	95.2	-0.2
2017-03		95.0	95.3	-0.2
2017-04		94.9	95.3	-0.4
2017-05		94.8	95.3	-0.5
2017-06	2017	94.9	95.3	-0.4
2017-07		94.7	95.3	-0.5
2017-08		94.6	95.1	-0.5

2017-09		94.8	95.1	-0.3
2017-10		94.7	95.2	-0.5
2017-11		94.6	95.3	-0.6
2017-12		94.8	95.2	-0.4
2018-01	+	94.9	95.2	-0.3
2018-02		94.9	95.2	-0.3
2018-03		94.9	95.3	-0.4
2018-04		95.1	95.1	-0.1
2018-05		95.2	95.2	0.1
2018-06	2018	95.2	95.3	-0.1
2018-07		95.3	95.2	0.1
2018-08		95.5	95.4	0.1
2018-09		95.5	95.5	0.0
2018-10		95.5	95.5	0.1
2018-11		95.7	95.5	0.3
2018-12		95.7	95.5	0.1
2019-01	+	95.6	95.5	0.1
2019-02		95.6	95.4	0.2
2019-03		95.6	95.4	0.3
2019-04		95.5	95.4	0.0
2019-05		95.3	95.3	0.0
2019-06	2019	95.4	95.2	0.2
2019-07		95.3	95.1	0.2
2019-08		95.1	95.1	0.1
2019-09		95.0	94.9	0.1
2019-10		95.0	94.8	0.1
2019-11		95.0	94.8	0.2
2019-12		94.8	94.7	0.2
2020-01	+	94.7	94.7	0.0
2020-02		94.6	94.7	-0.1
2020-03		94.5	94.4	0.1
2020-04		94.5	93.0	1.5
2020-05		93.6	92.6	0.9
2020-06	2020	92.7	92.3	0.4
2020-07		92.5	92.3	0.2
2020-08		92.3	92.2	0.2
2020-09		92.2	92.1	0.1
2020-10		92.1	91.8	0.2
2020-11		91.7	91.7	0.0
2020-12		91.6	91.7	-0.2
2021-01	+	91.6	91.5	0.1
2021-02		91.3	91.2	0.1
2021-03		91.2	91.5	-0.3
2021-04		91.2	92.8	-1.6
2021-05		92.1	93.1	-1.0
2021-06	2021	92.7	93.1	-0.4
2021-07		92.9	93.0	-0.2
2021-08		92.8	92.9	-0.1

2021-09		92.8	92.8	0.0
2021-10		92.7	93.0	-0.3
2021-11		92.8	93.1	-0.3
2021-12		92.8	93.0	-0.3
2022-01	+	92.7	93.0	-0.3
2022-02		92.8	93.3	-0.4
2022-03		93.0	93.3	-0.3
2022-04		93.1	93.5	-0.4
2022-05		93.2	93.5	-0.3
2022-06	2022	93.3	93.5	-0.2
2022-07		93.2	93.5	-0.3
2022-08		93.3	93.5	-0.2
2022-09		93.4	93.5	-0.1
2022-10		93.5	93.5	0.0
2022-11		93.3	93.4	-0.1
2022-12		93.5	93.4	0.1
2023-01	+	93.4	93.5	-0.1
2023-02		93.5	93.5	0.0
2023-03		93.3	93.3	0.0
2023-04		93.4	93.3	0.1
2023-05		93.3	93.3	0.0
2023-06	2023	93.2	93.4	-0.1
2023-07		93.5	93.5	0.0
2023-08		93.5	93.7	-0.2

Source: Statistics Canada Labour Force Survey month to month status flow matrix.

Table 5.2 Rates of Worker Outflow from Manufacturing from March 2013 to June, 2023, 3 Month Moving Average Rates
Data included in Table 5.1.

Table 5.3 Trends in the Reasons for Leaving or Losing a Job, Workers in Manufacturing and Utilities, Canada, 2013 – 2023

Period	Previous occupation	Reason for leaving or losing job	Estimate (rounded)	Proportion of job leavers/ losers (%)	Coefficient of variation (%)	Standard error of estimate	Lower bound (95% CI) of estimate	Upper bound (95% CI) of estimate	Quality indicator
2013	Total, all occupations	Total, all reasons	2,239,700	100.0	0.8	17,200	2,205,300	2,275,600	
2013	Total, all occupations	Left Job: Other	135,900	6.1	2.9	3,900	128,400	143,600	
2013	Total, all occupations	Left Job: Own illness or disability	132,500	5.9	3.0	4,000	125,100	141,100	
2013	Total, all occupations	Left Job: Personal or family responsibility	99,900	4.5	3.2	3,200	93,800	106,300	
2013	Total, all occupations	Left Job: Going to school	477,800	21.3	1.7	7,900	463,300	492,900	
2013	Total, all occupations	Left Job: Dissatisfied with job	145,000	6.5	2.9	4,200	136,900	153,100	
2013	Total, all occupations	Left Job: Retired	216,500	9.7	2.6	5,700	205,700	228,400	
2013	Total, all occupations	Lost Job: Permanent layoff	959,200	42.8	1.1	10,600	938,400	979,600	
2013	Total, all occupations	Lost Job: Temporary layoff	72,800	3.3	2.6	1,900	69,200	76,600	
2013	Occupations in manufacturing and utilities, except management	Total, all reasons	120,700	100.0	3.1	3,800	113,400	128,300	
2013	Occupations in manufacturing and utilities, except management	Left Job: Other	3,900	3.2	15.0	600	2,800	5,100	
2013	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	7,300	6.0	12.0	900	5,600	9,000	
2013	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	4,600	3.8	15.0	700	3,300	6,000	
2013	Occupations in manufacturing and utilities, except management	Left Job: Going to school	19,700	16.3	7.9	1,600	16,800	23,000	
2013	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	6,800	5.6	11.4	800	5,400	8,400	
2013	Occupations in manufacturing and utilities, except management	Left Job: Retired	9,300	7.7	11.3	1,100	7,300	11,400	
2013	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	59,200	49.0	4.5	2,700	54,000	64,600	
2013	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	9,800	8.1	8.1	800	8,200	11,400	
2014	Total, all occupations	Total, all reasons	2,243,900	100.0	0.8	17,400	2,211,100	2,281,200	
2014	Total, all occupations	Left Job: Other	118,800	5.3	3.1	3,700	111,400	126,100	
2014	Total, all occupations	Left Job: Own illness or disability	135,100	6.0	3.1	4,200	127,300	143,800	
2014	Total, all occupations	Left Job: Personal or family responsibility	107,700	4.8	3.1	3,300	101,700	114,800	
2014	Total, all occupations	Left Job: Going to school	472,700	21.1	1.8	8,400	455,000	488,300	
2014	Total, all occupations	Left Job: Dissatisfied with job	158,900	7.1	2.7	4,200	150,700	167,500	
2014	Total, all occupations	Left Job: Retired	243,300	10.8	2.5	6,200	231,400	255,000	
2014	Total, all occupations	Lost Job: Permanent layoff	938,300	41.8	1.2	11,000	919,700	962,000	
2014	Total, all occupations	Lost Job: Temporary layoff	69,000	3.1	3.0	2,000	65,100	73,200	
2014	Occupations in manufacturing and utilities, except management	Total, all reasons	125,400	100.0	3.5	4,300	117,400	134,100	
2014	Occupations in manufacturing and utilities, except management	Left Job: Other	3,000	2.4	17.8	500	2,000	4,100	E
2014	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	6,200	4.9	12.8	800	4,700	7,900	
2014	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	5,000	4.0	18.0	900	3,400	6,900	E
2014	Occupations in manufacturing and utilities, except management	Left Job: Going to school	22,700	18.1	7.7	1,800	19,500	26,200	
2014	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	8,600	6.9	11.3	1,000	6,800	10,600	

2014	Occupations in manufacturing and utilities, except management	Left Job: Retired	10,600	8.5	12.0	1,300	8,400	13,600	
2014	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	60,700	48.4	4.8	2,900	55,000	66,500	
2014	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	8,700	6.9	8.1	700	7,300	10,100	
2015	Total, all occupations	Total, all reasons	2,268,500	100.0	0.8	17,700	2,235,600	2,303,500	
2015	Total, all occupations	Left Job: Other	100,000	4.4	3.4	3,400	92,800	106,700	
2015	Total, all occupations	Left Job: Own illness or disability	133,000	5.9	3.0	4,000	125,100	141,400	
2015	Total, all occupations	Left Job: Personal or family responsibility	108,900	4.8	3.4	3,700	102,100	116,500	
2015	Total, all occupations	Left Job: Going to school	470,100	20.7	1.8	8,300	453,000	486,500	
2015	Total, all occupations	Left Job: Dissatisfied with job	154,000	6.8	2.8	4,300	145,800	162,300	
2015	Total, all occupations	Left Job: Retired	260,300	11.5	2.7	6,900	246,700	274,100	
2015	Total, all occupations	Lost Job: Permanent layoff	966,700	42.6	1.2	11,200	945,500	989,200	
2015	Total, all occupations	Lost Job: Temporary layoff	75,500	3.3	2.8	2,100	71,400	79,500	
2015	Occupations in manufacturing and utilities, except management	Total, all reasons	117,200	100.0	3.5	4,100	109,200	125,200	
2015	Occupations in manufacturing and utilities, except management	Left Job: Other	3,200	2.7	19.4	600	2,100	4,600	E
2015	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	7,100	6.1	12.2	900	5,300	8,700	
2015	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	5,400	4.6	18.5	1,000	3,600	7,600	E
2015	Occupations in manufacturing and utilities, except management	Left Job: Going to school	22,300	19.0	7.8	1,700	19,000	25,700	
2015	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	7,200	6.1	12.8	900	5,500	9,200	
2015	Occupations in manufacturing and utilities, except management	Left Job: Retired	12,100	10.3	10.5	1,300	9,700	14,700	
2015	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	50,400	43.0	4.8	2,400	45,900	55,000	
2015	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	9,400	8.0	7.6	700	8,100	10,800	
2016	Total, all occupations	Total, all reasons	2,281,700	100.0	0.8	19,100	2,242,100	2,316,200	
2016	Total, all occupations	Left Job: Other	109,600	4.8	3.7	4,100	101,600	117,600	
2016	Total, all occupations	Left Job: Own illness or disability	133,700	5.9	3.1	4,100	125,900	142,100	
2016	Total, all occupations	Left Job: Personal or family responsibility	109,800	4.8	3.4	3,800	102,900	117,300	
2016	Total, all occupations	Left Job: Going to school	466,800	20.5	1.9	8,700	449,200	482,900	
2016	Total, all occupations	Left Job: Dissatisfied with job	142,800	6.3	2.9	4,100	134,400	150,600	
2016	Total, all occupations	Left Job: Retired	260,400	11.4	2.4	6,200	248,300	272,300	
2016	Total, all occupations	Lost Job: Permanent layoff	993,400	43.5	1.2	11,800	971,100	1,016,700	
2016	Total, all occupations	Lost Job: Temporary layoff	65,200	2.9	3.1	2,000	61,200	69,200	
2016	Occupations in manufacturing and utilities, except management	Total, all reasons	128,300	100.0	3.5	4,500	119,400	137,200	
2016	Occupations in manufacturing and utilities, except management	Left Job: Other	1,900	1.5	27.1	500	1,000	3,000	E
2016	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	8,900	6.9	10.5	900	7,200	10,900	
2016	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	6,300	4.9	15.2	1,000	4,500	8,400	
2016	Occupations in manufacturing and utilities, except management	Left Job: Going to school	23,100	18.0	8.3	1,900	19,300	26,900	
2016	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	8,400	6.5	12.6	1,100	6,400	10,400	
2016	Occupations in manufacturing and utilities, except management	Left Job: Retired	11,400	8.9	12.7	1,500	8,700	14,400	

2016	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	59,900	46.7	4.8	2,900	54,000	65,200	
2016	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	8,400	6.5	9.3	800	6,900	9,900	
2017	Total, all occupations	Total, all reasons	2,162,000	100.0	0.8	17,900	2,127,400	2,196,100	
2017	Total, all occupations	Left Job: Other	98,300	4.5	3.8	3,700	90,900	105,400	
2017	Total, all occupations	Left Job: Own illness or disability	136,200	6.3	3.1	4,200	128,000	144,600	
2017	Total, all occupations	Left Job: Personal or family responsibility	106,600	4.9	3.5	3,700	99,200	113,600	
2017	Total, all occupations	Left Job: Going to school	459,200	21.2	1.8	8,400	442,500	475,800	
2017	Total, all occupations	Left Job: Dissatisfied with job	155,300	7.2	3.0	4,600	146,500	164,400	
2017	Total, all occupations	Left Job: Retired	256,300	11.9	2.5	6,500	244,100	269,000	
2017	Total, all occupations	Lost Job: Permanent layoff	895,900	41.4	1.2	11,000	874,400	917,700	
2017	Total, all occupations	Lost Job: Temporary layoff	54,300	2.5	3.1	1,700	50,800	57,900	
2017	Occupations in manufacturing and utilities, except management	Total, all reasons	106,600	100.0	3.7	4,000	99,300	114,700	
2017	Occupations in manufacturing and utilities, except management	Left Job: Other	1,900	1.8	22.0	400	1,100	2,700	E
2017	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	9,300	8.7	14.5	1,400	6,700	12,100	
2017	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	4,700	4.4	16.0	800	3,300	6,300	
2017	Occupations in manufacturing and utilities, except management	Left Job: Going to school	20,400	19.1	8.8	1,800	17,000	23,900	
2017	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	7,000	6.6	14.2	1,000	5,100	9,000	
2017	Occupations in manufacturing and utilities, except management	Left Job: Retired	11,900	11.2	11.7	1,400	9,400	14,700	
2017	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	45,100	42.3	5.7	2,600	39,900	50,300	
2017	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	6,300	5.9	9.5	600	5,200	7,500	
2018	Total, all occupations	Total, all reasons	2,159,200	100.0	0.8	17,800	2,124,500	2,192,100	
2018	Total, all occupations	Left Job: Other	95,000	4.4	3.7	3,500	88,100	101,900	
2018	Total, all occupations	Left Job: Own illness or disability	134,600	6.2	3.2	4,300	126,500	143,000	
2018	Total, all occupations	Left Job: Personal or family responsibility	115,800	5.4	3.4	3,900	108,300	124,100	
2018	Total, all occupations	Left Job: Going to school	495,200	22.9	1.9	9,300	476,800	512,400	
2018	Total, all occupations	Left Job: Dissatisfied with job	166,300	7.7	2.8	4,700	157,200	175,900	
2018	Total, all occupations	Left Job: Retired	266,300	12.3	2.6	6,900	252,900	280,100	
2018	Total, all occupations	Lost Job: Permanent layoff	837,300	38.8	1.2	10,100	818,700	858,500	
2018	Total, all occupations	Lost Job: Temporary layoff	48,800	2.3	3.4	1,600	45,800	52,200	
2018	Occupations in manufacturing and utilities, except management	Total, all reasons	105,000	100.0	3.8	4,000	97,000	112,700	
2018	Occupations in manufacturing and utilities, except management	Left Job: Other	2,300	2.2	23.3	500	1,300	3,400	E
2018	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	9,900	9.4	13.3	1,300	7,400	12,600	
2018	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	4,100	3.9	15.6	600	3,000	5,400	
2018	Occupations in manufacturing and utilities, except management	Left Job: Going to school	23,700	22.6	8.3	2,000	19,800	27,600	
2018	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	7,700	7.3	12.9	1,000	5,800	9,700	
2018	Occupations in manufacturing and utilities, except management	Left Job: Retired	12,100	11.5	12.0	1,500	9,500	15,300	
2018	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	39,100	37.2	5.7	2,200	34,900	43,600	

2018	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	6,000	5.7	11.5	700	4,700	7,400	
2019	Total, all occupations	Total, all reasons	2,160,300	1000	0.8	18,100	2,124,900	2,194,900	
2019	Total, all occupations	Left Job: Other	108,200	5.0%	3.4	3,700	100,500	115,600	
2019	Total, all occupations	Left Job: Own illness or disability	129,600	6.0	3.0	3,900	121,900	137,200	
2019	Total, all occupations	Left Job: Personal or family responsibility	110,500	5.1	3.3	3,700	103,400	117,700	
2019	Total, all occupations	Left Job: Going to school	493,600	22.8	1.8	8,800	477,200	510,400	
2019	Total, all occupations	Left Job: Dissatisfied with job	143,900	6.7	2.8	4,100	136,500	152,200	
2019	Total, all occupations	Left Job: Retired	269,200	12.5	2.4	6,500	256,100	281,500	
2019	Total, all occupations	Lost Job: Permanent layoff	852,500	39.5	1.2	10,300	833,700	873,100	
2019	Total, all occupations	Lost Job: Temporary layoff	52,800	2.4	3.4	1,800	49,400	56,500	
2019	Occupations in manufacturing and utilities, except management	Total, all reasons	103,800	100.0	3.3	3,400	97,000	110,500	
2019	Occupations in manufacturing and utilities, except management	Left Job: Other	3,100	3.0	15.7	500	2,200	4,100	
2019	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	7,600	7.3	11.6	900	6,000	9,400	
2019	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	6,600	6.4	14.7	1,000	4,800	8,700	
2019	Occupations in manufacturing and utilities, except management	Left Job: Going to school	20,200	19.5	8.1	1,600	17,100	23,300	
2019	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	7,800	7.5	12.0	900	6,100	9,900	
2019	Occupations in manufacturing and utilities, except management	Left Job: Retired	11,700	11.3	11.0	1,300	9,200	14,300	
2019	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	41,400	39.9	4.9	2,000	37,200	45,400	
2019	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	5,300	5.1	9.2	500	4,400	6,300	
2020	Total, all occupations	Total, all reasons	3,301,700	100.0	0.7	24,200	3,256,100	3,347,900	
2020	Total, all occupations	Left Job: Other	162,900	4.9	3.0	4,900	153,500	172,700	
2020	Total, all occupations	Left Job: Own illness or disability	119,600	3.6	3.6	4,300	111,500	128,200	
2020	Total, all occupations	Left Job: Personal or family responsibility	98,600	3.0	3.7	3,600	91,100	105,500	
2020	Total, all occupations	Left Job: Going to school	399,100	12.1	2.0	8,000	382,500	414,400	
2020	Total, all occupations	Left Job: Dissatisfied with job	126,400	3.8	3.5	4,400	118,300	135,500	
2020	Total, all occupations	Left Job: Retired	257,400	7.8	2.6	6,700	243,900	270,900	
2020	Total, all occupations	Lost Job: Permanent layoff	1,686,800	51.1	1.0	17,600	1,652,900	1,721,400	
2020	Total, all occupations	Lost Job: Temporary layoff	450,800	13.7	1.7	7,700	436,500	465,600	
2020	Occupations in manufacturing and utilities, except management	Total, all reasons	143,400	100.0	3.3	4,700	134,600	152,500	
2020	Occupations in manufacturing and utilities, except management	Left Job: Other	3,400	2.4	19.6	700	2,200	4,800	E
2020	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	7,000	4.9	12.7	900	5,300	8,800	
2020	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	3,300	2.3	17.6	600	2,300	4,500	E
2020	Occupations in manufacturing and utilities, except management	Left Job: Going to school	12,800	8.9	9.4	1,200	10,500	15,200	
2020	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	6,000	4.2	13.9	800	4,400	7,600	
2020	Occupations in manufacturing and utilities, except management	Left Job: Retired	10,900	7.6	9.9	1,100	8,800	13,100	
2020	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	71,600	49.9	4.5	3,200	65,500	78,400	
2020	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	28,400	19.8	5.7	1,600	25,300	31,700	

2021	Total, all occupations	Total, all reasons	2,151,600	100.0	0.9	20,000	2,113,200	2,191,600	
2021	Total, all occupations	Left Job: Other	106,400	4.9	3.5	3,700	99,200	113,700	
2021	Total, all occupations	Left Job: Own illness or disability	84,900	3.9	3.7	3,200	79,500	91,900	
2021	Total, all occupations	Left Job: Personal or family responsibility	89,300	4.2	3.7	3,300	82,700	95,600	
2021	Total, all occupations	Left Job: Going to school	336,100	15.6	2.2	7,400	321,400	350,400	
2021	Total, all occupations	Left Job: Dissatisfied with job	91,100	4.2	3.7	3,400	84,300	97,900	
2021	Total, all occupations	Left Job: Retired	225,100	10.5	2.7	6,100	213,500	237,700	
2021	Total, all occupations	Lost Job: Permanent layoff	1,080,100	50.2	1.2	13,400	1,054,900	1,106,800	
2021	Total, all occupations	Lost Job: Temporary layoff	138,600	6.4	2.9	4,100	130,700	146,700	
2021	Occupations in manufacturing and utilities, except management	Total, all reasons	108,800	100.0	4.3	4,700	100,400	118,500	
2021	Occupations in manufacturing and utilities, except management	Left Job: Other	2,700	2.5	19.0	500	1,700	3,700	E
2021	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	6,200	5.7	13.7	800	4,500	7,900	
2021	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	4,200	3.9	17.1	700	2,800	5,700	E
2021	Occupations in manufacturing and utilities, except management	Left Job: Going to school	12,800	11.8	14.1	1,800	9,600	16,500	
2021	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	5,600	5.1	15.0	800	4,000	7,300	
2021	Occupations in manufacturing and utilities, except management	Left Job: Retired	10,100	9.3	9.3	900	8,400	12,200	
2021	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	54,200	49.8	5.7	3,100	48,500	60,300	
2021	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	13,100	12.0	9.4	1,200	10,900	15,600	
2022	Total, all occupations	Total, all reasons	2,004,100	100.0	0.8	16,100	1,972,400	2,034,600	
2022	Total, all occupations	Left Job: Other	84,500	4.2	3.5	2,900	78,700	90,300	
2022	Total, all occupations	Left Job: Own illness or disability	111,300	5.6	3.2	3,600	104,000	118,500	
2022	Total, all occupations	Left Job: Personal or family responsibility	112,700	5.6	3.0	3,400	106,300	119,600	
2022	Total, all occupations	Left Job: Going to school	400,200	20.0	1.8	7,100	386,900	413,900	
2022	Total, all occupations	Left Job: Dissatisfied with job	136,900	6.8	2.8	3,900	129,400	144,700	
2022	Total, all occupations	Left Job: Retired	282,200	14.1	2.3	6,500	269,200	295,100	
2022	Total, all occupations	Lost Job: Permanent layoff	823,700	41.1	1.1	9,300	805,600	842,300	
2022	Total, all occupations	Lost Job: Temporary layoff	52,700	2.6	3.7	2,000	48,800	56,700	
2022	Occupations in manufacturing and utilities, except management	Total, all reasons	91,400	100.0	3.4	3,100	85,600	97,500	
2022	Occupations in manufacturing and utilities, except management	Left Job: Other	3,300	3.6	13.0	400	2,500	4,200	
2022	Occupations in manufacturing and utilities, except management	Left Job: Own illness or disability	6,800	7.4	13.0	900	5,300	8,700	
2022	Occupations in manufacturing and utilities, except management	Left Job: Personal or family responsibility	4,500	4.9	12.7	600	3,400	5,600	
2022	Occupations in manufacturing and utilities, except management	Left Job: Going to school	13,800	15.1	7.7	1,100	11,900	16,100	
2022	Occupations in manufacturing and utilities, except management	Left Job: Dissatisfied with job	7,500	8.2	14.0	1,000	5,500	9,700	
2022	Occupations in manufacturing and utilities, except management	Left Job: Retired	14,100	15.4	8.5	1,200	11,800	16,600	
2022	Occupations in manufacturing and utilities, except management	Lost Job: Permanent layoff	35,800	39.2	5.3	1,900	32,100	39,600	
2022	Occupations in manufacturing and utilities, except management	Lost Job: Temporary layoff	5,500	6.0	10.4	600	4,400	6,600	

Source: Ngen LFS_Reasons for leaving manufacturing_2013_2022

Table 5.4 Trends in the Reasons for Leaving or Losing a Job for Workers in Manufacturing and Utilities Compared to Other Industries, Canada, 2013 – 2023
Data are included in Table 5.3.

Table 5.5 Net Flows into and Out of Manufacturing jobs, Paid Workers, Canada, 2013 – 2023
Data are included in Table 5.3.

Table 5.6 Unemployed Paid Workers by Industry as a Percentage of Employment in Occupations with Employment in Manufacturing, Canada, 2016 – 2022 (Part 1)

		Employed							
Code	Row labels	2016	2017	2018	2019	2020	2021	2022	Employed total
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	101,778	77,764	100,347	98,639	98,000	102,903	109,472	98,415
12113	Statistical officers and related research support occupations	1,556	1,333	2,167	2,139	2,972	4,222	4,278	2,667
14402	Production logistics workers	10,250	8,750	8,944	12,250	9,472	6,528	5,972	8,881
20010	Engineering managers	21,694	30,986	30,861	31,792	28,361	40,306	37,778	31,683
21109	Other professional occupations in physical sciences	3,181	722	3,028	3,250	5,472	7,111	4,306	3,867
21300	Civil engineers	61,028	55,472	60,750	70,389	68,292	80,389	79,389	67,958
21301	Mechanical engineers	44,861	52,514	46,181	45,597	48,847	56,958	55,694	50,093
21310	Electrical and electronics engineers	41,306	39,667	47,583	52,903	44,417	51,111	46,000	46,141
21311	Computer engineers (except software engineers and designers)	28,153	33,667	28,306	27,806	22,667	33,917	34,139	29,808
21320	Chemical engineers	11,333	11,306	9,556	11,417	10,111	10,528	12,667	10,988
21321	Industrial and manufacturing engineers	19,722	20,056	19,250	17,861	21,000	31,806	35,444	23,591
21322	Metallurgical and materials engineers	3,556	5,556	4,444	2,333	1,611	1,806	1,806	3,016
21330	Mining engineers	3,778	4,389	5,528	7,500	7,278	4,861	6,861	5,742
21331	Geological engineers	4,417	4,111	1,944	2,958	6,194	5,444	4,861	4,276
21332	Petroleum engineers	15,167	15,583	15,222	10,917	16,750	17,000	18,694	15,619
21399	Other professional engineers	28,639	24,194	25,444	28,861	29,083	31,014	38,111	29,335
22100	Chemical technologists and technicians	25,778	24,472	32,083	29,944	35,514	36,583	41,861	32,319
22101	Geological and mineral technologists and technicians	10,556	10,861	11,389	8,972	10,556	13,389	11,194	10,988
22110	Biological technologists and technicians	15,611	12,833	14,417	14,833	12,056	12,167	10,361	13,183
22211	Industrial designers	10,806	10,472	16,361	17,042	18,806	10,722	12,028	13,748
22230	Non-destructive testers and inspectors	7,472	9,972	6,472	9,722	5,333	7,472	6,250	7,528
22231	Engineering inspectors and regulatory officers	10,500	4,194	6,417	7,694	10,778	5,528	7,500	7,516
22233	Construction inspectors	22,861	22,722	27,222	26,333	29,111	27,917	25,694	25,980
22300	Civil engineering technologists and technicians	32,111	26,528	32,139	32,778	30,028	26,056	31,611	30,179

22301	Mechanical engineering technologists and technicians	26,833	24,472	25,694	23,472	28,069	27,389	28,083	26,288
22302	Industrial engineering and manufacturing technologists and technicians	36,861	27,500	26,611	30,944	30,222	23,681	21,528	28,192
22310	Electrical and electronics engineering technologists and technicians	41,153	46,639	37,028	46,778	45,375	46,083	39,806	43,266
22311	Electronic service technicians (household and business equipment)	61,806	63,514	63,847	47,944	46,236	39,167	55,528	54,006
22312	Industrial instrument technicians and mechanics	12,194	10,778	9,167	10,750	13,889	6,972	9,250	10,429
32129	Other medical technologists and technicians	10,014	10,764	8,222	7,083	8,306	9,250	8,778	8,917
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	17,500	15,792	15,972	17,167	16,778	14,361	15,111	16,097
72011	Contractors and supervisors, electrical trades and telecommunications occupations	33,500	26,056	31,833	33,250	25,889	33,153	34,139	31,117
72020	Contractors and supervisors, mechanic trades	59,111	53,056	47,083	49,681	60,333	57,083	61,847	55,456
72100	Machinists and machining and tooling inspectors	43,972	49,778	49,347	48,889	48,431	45,194	44,306	47,131
72101	Tool and die makers	11,667	13,833	12,806	14,639	10,917	15,833	12,944	13,234
72106	Welders and related machine operators	110,111	111,569	108,861	116,083	109,278	96,139	110,722	108,966
72200	Electricians (except industrial and power system)	101,472	107,958	112,833	120,333	108,806	119,167	131,361	114,562
72201	Industrial electricians	38,056	42,014	41,861	48,306	42,111	47,722	49,250	44,188
72401	Heavy-duty equipment mechanics	75,500	78,681	86,458	87,444	76,764	83,694	71,472	80,002
72402	Heating, refrigeration and air conditioning mechanics	34,528	37,722	34,167	36,861	39,500	55,611	49,694	41,155
72404	Aircraft mechanics and aircraft inspectors	16,583	18,639	13,514	22,083	17,694	21,639	26,417	19,510
72405	Machine fitters	694	944	1,472	111	417	1,194	972	829
72406	Elevator constructors and mechanics	10,306	5,472	10,306	7,028	6,667	8,833	7,611	8,032
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	142,528	142,903	153,083	163,222	142,361	156,111	157,319	151,075
72420	Oil and solid fuel heating mechanics	3,500	4,806	6,083	4,722	5,111	4,167	2,222	4,373
72421	Appliance servicers and repairers	5,806	3,528	5,028	3,722	4,194	6,444	3,444	4,595
72422	Electrical mechanics	13,444	13,194	13,222	12,861	13,306	15,528	16,167	13,960
72423	Motorcycle, all-terrain vehicle and other related mechanics	8,764	8,333	8,611	9,111	8,111	8,444	11,194	8,938
72500	Crane operators	19,833	18,667	20,278	15,819	18,222	19,528	18,361	18,673
72600	Air pilots, flight engineers and flying instructors	20,167	24,083	21,083	25,264	18,250	19,361	18,778	20,998
72603	Engineer officers, water transport	3,417	3,111	3,111	4,236	4,472	3,722	4,333	3,772
72999	Other technical trades and related occupations	8,014	10,333	8,278	10,028	10,000	13,444	11,736	10,262
73209	Other repairers and servicers	15,319	16,167	16,583	16,583	10,750	12,292	16,625	14,903
73310	Railway and yard locomotive engineers	8,694	5,639	8,750	8,931	9,889	10,500	9,333	8,819

73401	Printing press operators	16,694	16,639	17,472	19,472	15,778	12,639	15,333	16,290
73402	Drillers and blasters – surface mining, quarrying and construction	6,528	4,250	3,597	3,778	4,167	3,722	5,361	4,486
74201	Water transport deck and engine room crew	4,750	5,278	5,333	4,167	5,903	4,083	6,167	5,097
74205	Public works maintenance equipment operators and related workers	35,417	35,139	34,917	45,667	33,472	35,944	42,000	37,508
75110	Construction trades helpers and labourers	163,333	171,472	172,361	161,569	155,083	141,694	167,444	161,851
75119	Other trades helpers and labourers	17,444	13,333	10,389	8,222	13,361	8,528	7,083	11,194
75211	Railway and motor transport labourers	11,000	9,806	7,639	7,889	4,778	5,389	5,319	7,403
83100	Underground production and development miners	30,694	29,167	35,861	39,583	32,889	28,750	33,500	32,921
85110	Mine labourers	4,194	4,778	4,472	3,833	3,778	3,778	3,861	4,099
85120	Logging and forestry labourers	5,306	5,444	4,222	3,722	5,292	4,139	4,611	4,677
92010	Supervisors, mineral and metal processing	13,611	11,000	10,583	12,639	10,167	11,583	11,944	11,647
92011	Supervisors, petroleum, gas and chemical processing and utilities	24,361	25,139	30,333	21,194	25,306	19,500	20,528	23,766
92012	Supervisors, food and beverage processing	20,583	29,167	31,694	33,833	32,722	26,694	34,056	29,821
92013	Supervisors, plastic and rubber products manufacturing	10,611	12,472	12,000	9,472	9,139	8,917	10,639	10,464
92014	Supervisors, forest products processing	17,028	14,667	17,361	15,611	13,778	17,028	14,361	15,690
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	3,972	3,694	5,556	3,694	5,250	3,083	2,389	3,948
92022	Supervisors, furniture and fixtures manufacturing	7,222	7,722	4,194	6,611	8,167	4,806	7,667	6,627
92023	Supervisors, other mechanical and metal products manufacturing	25,861	31,944	32,611	31,417	24,667	26,667	24,250	28,202
92024	Supervisors, other products manufacturing and assembly	9,694	9,944	6,250	6,861	8,444	7,389	7,111	7,956
92100	Power engineers and power systems operators	36,278	34,639	34,861	40,556	31,972	42,000	37,500	36,829
92101	Water and waste treatment plant operators	15,194	11,750	10,167	9,361	10,028	12,139	14,167	11,829
93100	Central control and process operators, mineral and metal processing	4,472	4,861	4,167	3,667	6,694	2,611	4,222	4,385
93101	Central control and process operators, petroleum, gas and chemical processing	22,083	20,361	16,222	19,639	17,694	15,833	17,139	18,425
93102	Pulping, papermaking and coating control operators	972	1,611	4,306	3,889	2,306	1,222	1,889	2,313
94100	Machine operators, mineral and metal processing	14,139	17,056	15,750	16,500	14,611	16,778	15,833	15,810
94103	Concrete, clay and stone forming operators	7,806	8,028	4,972	6,250	8,917	4,194	8,639	6,972
94104	Inspectors and testers, mineral and metal processing	4,028	1,472	889	806	2,194	1,750	3,639	2,111
94105	Metalworking and forging machine operators	30,389	44,694	45,472	47,278	52,806	41,139	38,722	42,929
94106	Machining tool operators	17,000	11,861	12,500	8,458	9,778	14,028	19,667	13,327

94107	Machine operators of other metal products	54,250	43,806	38,278	33,083	32,500	33,667	26,667	37,464
94110	Chemical plant machine operators	23,444	21,597	24,917	20,944	29,944	23,000	26,861	24,387
94111	Plastics processing machine operators	21,333	39,333	26,639	29,472	26,583	29,361	25,500	28,317
94123	Lumber graders and other wood processing inspectors and graders	4,389	6,222	4,639	3,611	2,722	3,444	5,111	4,306
94124	Woodworking machine operators	14,056	10,333	12,639	7,917	7,917	15,056	12,389	11,472
94129	Other wood processing machines operators	6,417	9,000	7,333	10,306	7,361	8,778	7,722	8,131
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	1,972	3,778	4,056	3,417	3,250	2,444	1,333	2,893
94131	Weavers, knitters and other fabric making occupations	3,806	3,611	2,278	2,389	3,528	1,222	2,194	2,718
94132	Industrial sewing machines operators	26,806	19,583	28,250	22,167	21,944	27,111	22,833	24,099
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	2,250	2,444	1,472	1,778	2,167	1,417	2,444	1,996
94140	Process control and machine operators, food and beverage processing	66,111	70,944	77,194	85,444	73,833	86,333	93,056	78,988
94143	Testers and graders, food and beverage processing	7,667	7,528	8,222	7,583	8,472	9,361	10,750	8,512
94150	Plate-less printing equipment operators	8,750	7,833	12,417	5,819	5,028	4,861	3,278	6,855
94151	Camera, platemaking and other prepress occupations	3,528	3,028	2,278	2,222	1,750	2,750	611	2,310
94152	Binding and finishing machine operators	7,111	7,250	6,694	5,472	3,111	3,389	7,250	5,754
94153	Photographic and film processors	3,750	1,694	667	1,083	750	944	806	1,385
94200	Motor vehicle assemblers, inspectors and testers	31,500	39,833	36,194	34,583	31,306	30,250	35,611	34,183
94201	Electronics assemblers, fabricators, inspectors and testers	22,417	22,694	28,000	21,139	19,583	25,306	29,667	24,115
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	10,139	9,167	9,806	11,028	6,389	9,639	14,528	10,099
94205	Machine operators and inspectors, electrical apparatus manufacturing	1,694	1,472	611	2,139	2,083	1,694	1,972	1,667
94211	Assemblers and inspectors of other wood products	18,611	11,306	16,639	19,139	10,111	11,639	14,333	14,540
94212	Plastic products assemblers, finishers and inspectors	20,194	20,306	11,667	9,361	9,361	13,056	14,472	14,060
94213	Industrial painters, coaters and metal finishing process operators	20,861	15,611	13,389	21,750	15,528	14,639	21,972	17,679
94219	Other products assemblers, finishers and inspectors	40,917	39,944	45,500	48,319	40,194	38,278	52,694	43,692
95100	Labourers in mineral and metal processing	8,583	11,222	9,139	11,028	9,139	5,333	5,194	8,520
95101	Labourers in metal fabrication	36,083	36,139	32,083	28,083	19,389	27,083	29,111	29,710
95102	Labourers in chemical products processing and utilities	7,319	8,639	11,361	10,583	8,069	12,083	10,722	9,825
95103	Labourers in wood, pulp and paper processing	29,361	32,972	30,806	25,194	20,694	24,389	24,000	26,774

95104	Labourers in rubber and plastic products manufacturing	11,542	14,444	12,917	9,139	11,861	13,639	8,472	11,716
95106	Labourers in food and beverage processing	69,722	69,264	68,194	73,722	55,556	50,833	58,556	63,692
95107	Labourers in fish and seafood processing	6,194	6,861	6,306	6,250	5,611	7,000	5,472	6,242
95109	Other labourers in processing, manufacturing and utilities	45,583	45,319	37,472	36,917	31,514	28,111	28,403	36,188
	Total	**20,422,528**	**20,880,444**	**21,202,486**	**21,723,583**	**20,410,736**	**21,721,903**	**22,723,083**	**21,297,823**
	Occupation Not Selected	**17,678,417**	**18,135,917**	**18,421,056**	**18,899,694**	**17,761,528**	**18,982,556**	**19,843,833**	**18,531,857**

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022.

Table 5.6 Unemployed Paid Workers by Industry as a Percentage of Employment in Occupations with Employment in Manufacturing, Canada, 2016 – 2022 (Part 2)

		Unemployed							
Code	Row labels	2016	2017	2018	2019	2020	2021	2022	Unemployed total
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	4,306	2,139	3,167	1,528	5,514	3,389	2,167	3,173
12113	Statistical officers and related research support occupations	333	-	28	111	83	278	83	131
14402	Production logistics workers	417	389	250	639	444	292	28	351
20010	Engineering managers	500	444	556	389	1,222	361	167	520
21109	Other professional occupations in physical sciences	111	-	97	56	-	-	250	73
21300	Civil engineers	1,944	1,472	1,694	917	2,333	1,139	861	1,480
21301	Mechanical engineers	2,403	583	1,306	1,028	1,903	1,319	667	1,315
21310	Electrical and electronics engineers	1,681	1,222	222	972	1,444	1,472	83	1,014
21311	Computer engineers (except software engineers and designers)	806	361	222	556	1,611	-	444	571
21320	Chemical engineers	444	389	167	278	250	28	111	238
21321	Industrial and manufacturing engineers	194	333	333	417	2,000	417	583	611
21322	Metallurgical and materials engineers	167	-	-	56	194	-	83	71
21330	Mining engineers	250	97	139	83	111	194	83	137
21331	Geological engineers	389	-	-	28	361	139	-	131
21332	Petroleum engineers	1,000	417	667	83	1,750	444	-	623
21399	Other professional engineers	1,389	1,028	611	278	1,889	264	583	863
22100	Chemical technologists and technicians	1,514	722	2,278	1,556	2,056	931	1,222	1,468
22101	Geological and mineral technologists and technicians	1,278	861	1,389	972	917	667	417	929
22110	Biological technologists and technicians	1,083	722	778	389	1,833	833	722	909
22211	Industrial designers	750	167	278	83	806	1,111	583	540
22230	Non-destructive testers and inspectors	972	694	556	750	1,444	667	361	778
22231	Engineering inspectors and regulatory officers	83	28	306	375	667	28	139	232
22233	Construction inspectors	2,028	1,667	1,000	778	1,611	1,528	500	1,302
22300	Civil engineering technologists and technicians	1,278	1,472	1,153	1,472	2,444	1,722	1,167	1,530

22301	Mechanical engineering technologists and technicians	528	778	333	444	2,944	1,111	278	917
22302	Industrial engineering and manufacturing technologists and technicians	1,333	472	417	444	1,250	2,028	56	857
22310	Electrical and electronics engineering technologists and technicians	1,361	1,861	1,000	1,528	1,694	1,083	1,111	1,377
22311	Electronic service technicians (household and business equipment)	3,306	4,236	2,333	2,056	3,694	1,389	2,472	2,784
22312	Industrial instrument technicians and mechanics	528	694	569	542	333	306	111	440
32129	Other medical technologists and technicians	333	333	194	28	83	389	28	198
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	917	833	889	500	1,333	306	278	722
72011	Contractors and supervisors, electrical trades and telecommunications occupations	1,028	583	1,139	1,611	1,083	611	722	968
72020	Contractors and supervisors, mechanic trades	1,694	1,764	1,278	1,306	3,444	2,194	1,111	1,827
72100	Machinists and machining and tooling inspectors	2,500	1,333	528	806	3,861	3,028	389	1,778
72101	Tool and die makers	111	167	83	139	611	194	167	210
72106	Welders and related machine operators	13,833	7,972	7,222	8,444	12,236	5,250	4,583	8,506
72200	Electricians (except industrial and power system)	12,875	11,806	13,806	10,333	17,139	7,500	5,694	11,308
72201	Industrial electricians	2,944	1,528	944	1,917	4,417	1,444	417	1,944
72401	Heavy-duty equipment mechanics	3,056	3,694	2,417	1,792	5,250	3,639	2,333	3,169
72402	Heating, refrigeration and air conditioning mechanics	1,417	1,417	611	1,583	3,333	1,250	528	1,448
72404	Aircraft mechanics and aircraft inspectors	56	139	694	111	1,611	1,722	389	675
72405	Machine fitters -	-	-	-	56	444	-	71	
72406	Elevator constructors and mechanics	111	417	-	111	278	56	-	139
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	4,806	5,944	3,806	3,333	11,111	7,847	3,833	5,812
72420	Oil and solid fuel heating mechanics	389	361	556	250	750	28	83	345
72421	Appliance servicers and repairers 185		444	97	-	83	111	389	167
72422	Electrical mechanics	417	83	167	333	778	278	264	331
72423	Motorcycle, all-terrain vehicle and other related mechanics	597	417	278	389	444	583	139	407
72500	Crane operators	2,778	1,361	1,500	944	1,333	889	750	1,365
72600	Air pilots, flight engineers and flying instructors	306	139	250	333	1,778	1,806	194	687
72603	Engineer officers, water transport 230		139	111	194	83	361	306	417
72999	Other technical trades and related occupations	417	667	306	472	1,389	736	500	641
73209	Other repairers and servicers	1,139	1,000	583	611	833	556	778	786
73310	Railway and yard locomotive engineers	111	139	361	56	167	417	28	183
73401	Printing press operators	1,139	750	306	1,250	2,361	528	139	925
73402	Drillers and blasters – surface mining, quarrying and construction	750	639	56	194	639	444	639	480
74201	Water transport deck and engine room crew	333	556	861	222	833	472	389	524

74205	Public works maintenance equipment operators and related workers	3,472	2,333	3,611	3,625	3,000	2,736	2,556	3,048
75110	Construction trades helpers and labourers	39,111	34,444	31,500	33,514	36,056	24,306	22,278	31,601
75119	Other trades helpers and labourers	1,861	1,722	1,792	1,083	2,347	667	1,278	1,536
75211	Railway and motor transport labourers	1,583	1,056	972	1,167	1,611	806	1,361	1,222
83100	Underground production and development miners	2,333	1,611	1,833	2,333	4,583	2,250	944	2,270
85110	Mine labourers	403	611	417	472	806	250	444	486
85120	Logging and forestry labourers	1,806	1,222	1,500	1,639	1,611	1,722	1,472	1,567
92010	Supervisors, mineral and metal processing	472	222	361	278	83	56	28	214
92011	Supervisors, petroleum, gas and chemical processing and utilities	306	306	806	583	694	306	556	508
92012	Supervisors, food and beverage processing	1,611	1,194	1,111	1,194	694	528	1,556	1,127
92013	Supervisors, plastic and rubber products manufacturing	111	333	167	167	1,028	194	139	306
92014	Supervisors, forest products processing	444	472	167	417	694	56	500	393
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	306	250	111	-	111	-	-	111
92022	Supervisors, furniture and fixtures manufacturing	167	-	83	-	306	-	167	103
92023	Supervisors, other mechanical and metal products manufacturing	1,028	500	778	639	833	778	278	690
92024	Supervisors, other products manufacturing and assembly	28	111	361	444	167	194	56	194
92100	Power engineers and power systems operators	1,778	708	417	806	1,472	861	278	903
92101	Water and waste treatment plant operators	333	444	306	556	250	417	139	349
93100	Central control and process operators, mineral and metal processing	167	83	56	56	139	-	56	79
93101	Central control and process operators, petroleum, gas and chemical processing	222	194	806	250	1,222	389	194	468
93102	Pulping, papermaking and coating control operators	-	-	-	56	111	-	-	24
94100	Machine operators, mineral and metal processing	944	389	361	83	889	500	667	548
94103	Concrete, clay and stone forming operators	1,000	611	56	639	1,056	222	306	556
94104	Inspectors and testers, mineral and metal processing	-	-	28	56	-	83	278	63
94105	Metalworking and forging machine operators	833	1,444	1,528	2,028	6,833	2,444	1,278	2,341
94106	Machining tool operators	778	111	833	528	1,083	694	83	587
94107	Machine operators of other metal products	3,361	2,278	2,444	1,611	4,639	3,083	2,222	2,806
94110	Chemical plant machine operators	1,528	639	611	1,111	1,861	2,111	1,889	1,393
94111	Plastics processing machine operators	583	1,639	1,167	500	2,444	2,306	83	1,246
94123	Lumber graders and other wood processing inspectors and graders	83	56	139	333	222	417	111	194
94124	Woodworking machine operators 623		1,083	417	694	333	611	806	417
94129	Other wood processing machine operators	444	417	583	556	1,333	917	139	627
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	250	28	111	-	333	361	56	163
94131	Weavers, knitters and other fabric making occupations	167	28	167	111	194	472	-	163
94132	Industrial sewing machine operators	2,167	1,417	1,111	722	2,750	1,500	1,333	1,571

94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	56	-	278	56	333	333	194	179
94140	Process control and machine operators, food and beverage processing	4,028	2,528	4,694	4,194	4,111	3,556	4,389	3,929
94143	Testers and graders, food and beverage processing	889	444	417	722	1,417	611	1,028	790
94150	Plate-less printing equipment operators	444	250	472	167	306	917	56	373
94151	Camera, platemaking and other prepress occupations	83	167	111	-	56	56	-	67
94152	Binding and finishing machine operators	278	333	278	333	833	444	222	389
94153	Photographic and film processors 107		389	56	-	111	28	111	56
94200	Motor vehicle assemblers, inspectors and testers	1,222	2,361	2,361	1,167	5,056	5,611	4,056	3,119
94201	Electronics assemblers, fabricators, inspectors and testers	1,694	1,111	1,361	472	1,194	861	1,194	1,127
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	556	917	500	500	778	306	83	520
94205	Machine operators and inspectors, electrical apparatus manufacturing	-	28	83	-	-	83	28	32
94211	Assemblers and inspectors of other wood products	1,667	1,667	889	1,000	1,667	917	389	1,171
94212	Plastic products assemblers, finishers and inspectors	361	2,056	556	1,194	1,417	1,500	194	1,040
94213	Industrial painters, coaters and metal finishing process operators	2,250	556	1,306	1,250	1,528	694	264	1,121
94219	Other products assemblers, finishers and inspectors	5,611	4,125	3,167	2,611	6,278	4,861	3,917	4,367
95100	Labourers in mineral and metal processing	611	444	500	778	1,056	667	333	627
95101	Labourers in metal fabrication	5,333	2,861	1,417	1,417	2,806	3,167	1,028	2,575
95102	Labourers in chemical products processing and utilities	1,167	528	694	417	1,139	1,333	889	881
95103	Labourers in wood, pulp and paper processing	2,917	1,750	1,389	2,556	3,556	2,028	1,194	2,198
95104	Labourers in rubber and plastic products manufacturing	444	417	833	333	1,361	917	194	643
95106	Labourers in food and beverage processing	6,278	4,833	4,528	4,556	5,611	4,361	3,778	4,849
95107	Labourers in fish and seafood processing	3,889	3,861	2,556	2,139	2,500	2,639	1,889	2,782
95109	Other labourers in processing, manufacturing and utilities	9,472	5,111	3,972	6,139	6,500	4,000	3,167	5,480
	Total	**1,145,972**	**1,013,236**	**944,944**	**953,361**	**1,887,319**	**1,108,347**	**8,260,056**	**1,125,605**
	Occupation Not Selected	**938,681**	**852,111**	**7,940,847**	**8,070,528**	**1,635,403**	**949,417**	**714,139**	**956,018**

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022.

Table 5.6 Unemployed Paid Workers by Industry as a Percentage of Employment in Occupations with Employment in Manufacturing, Canada, 2016 – 2022 (Part 3)

Under Employed

Code	Row labels	2016	2017	2018	2019	2020	2021	2022	Employed rate
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	0.04	0.03	0.03	0.02	0.06	0.03	0.02	
12113	Statistical officers and related research support occupations	0.21	-	0.01	0.05	0.03	0.07	0.02	
14402	Production logistics workers	0.04	0.04	0.03	0.05	0.05	0.04	0	
20010	Engineering managers	0.02	0.01	0.02	0.01	0.04	0.01	0	
21109	Other professional occupations in physical sciences	0.03	-	0.03	0.02	-	-	0.06	
21300	Civil engineers	0.03	0.03	0.03	0.01	0.03	0.01	0.01	
21301	Mechanical engineers	0.05	0.01	0.03	0.02	0.04	0.02	0.01	
21310	Electrical and electronics engineers	0.04	0.03	0	0.02	0.03	0.03	0	
21311	Computer engineers (except software engineers and designers)	0.03	0.01	0.01	0.02	0.07	-	0.01	
21320	Chemical engineers	0.04	0.03	0.02	0.02	0.02	0	0.01	
21321	Industrial and manufacturing engineers	0.01	0.02	0.02	0.02	0.1	0.01	0.02	
21322	Metallurgical and materials engineers	0.05	-	-	0.02	0.12	-	0.05	
21330	Mining engineers	0.07	0.02	0.03	0.01	0.02	0.04	0.01	
21331	Geological engineers	0.09	-	-	0.01	0.06	0.03	-	
21332	Petroleum engineers	0.07	0.03	0.04	0.01	0.1	0.03	-	
21399	Other professional engineers	0.05	0.04	0.02	0.01	0.06	0.01	0.02	
22100	Chemical technologists and technicians	0.06	0.03	0.07	0.05	0.06	0.03	0.03	
22101	Geological and mineral technologists and technicians	0.12	0.08	0.12	0.11	0.09	0.05	0.04	
22110	Biological technologists and technicians	0.07	0.06	0.05	0.03	0.15	0.07	0.07	
22211	Industrial designers	0.07	0.02	0.02	0	0.04	0.1	0.05	
22230	Non-destructive testers and inspectors	0.13	0.07	0.09	0.08	0.27	0.09	0.06	
22231	Engineering inspectors and regulatory officers	0.01	0.01	0.05	0.05	0.06	0.01	0.02	
22233	Construction inspectors	0.09	0.07	0.04	0.03	0.06	0.05	0.02	
22300	Civil engineering technologists and technicians	0.04	0.06	0.04	0.04	0.08	0.07	0.04	
22301	Mechanical engineering technologists and technicians	2	3	0.01	0.02	0.1	0.04	0.01	
22302	Industrial engineering and manufacturing technologists and technicians	0.04	0.02	0.02	0.01	0.04	0.09	0	
22310	Electrical and electronics engineering technologists and technicians	0.03	0.04	0.03	0.03	0.04	0.02	0.03	
22311	Electronic service technicians (household and business equipment)	0.05	0.07	0.04	0.04	0.08	0.04	0.04	
22312	Industrial instrument technicians and mechanics	0.04	0.06	0.06	0.05	0.02	0.04	0.01	
32129	Other medical technologists and technicians	0.03	0.03	0.02	0	0.01	0.04	0	
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	0.05	0.05	0.06	0.03	0.08	0.02	0.02	
72011	Contractors and supervisors, electrical trades and telecommunications occupations	0.03	0.02	0.04	0.05	0.04	0.02	0.02	
72020	Contractors and supervisors, mechanic trades	0.03	0.03	0.03	0.03	0.06	0.04	0.02	
72100	Machinists and machining and tooling inspectors	0.06	0.03	0.01	0.02	0.08	0.07	0.01	

72101	Tool and die makers	0.01	0.01	0.01	0.01	0.06	0.01	0.01	
72106	Welders and related machine operators	0.13	0.07	0.07	0.07	0.11	0.05	0.04	
72200	Electricians (except industrial and power system)	0.13	0.11	0.12	0.09	0.16	0.06	0.04	
72201	Industrial electricians	0.08	0.04	0.02	0.04	0.1	0.03	0.01	
72401	Heavy-duty equipment mechanics	0.04	0.05	0.03	0.02	0.07	0.04	0.03	
72402	Heating, refrigeration and air conditioning mechanics	0.04	0.04	0.02	0.04	0.08	0.02	0.01	
72404	Aircraft mechanics and aircraft inspectors	0	0.01	0.05	0.01	0.09	0.08	0.01	
72405	Machine fitters	-	-	-	-	0.13	0.37	-	
72406	Elevator constructors and mechanics	0.01	0.08	-	0.02	0.04	0.01	-	
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	0.03	0.04	0.02	0.02	0.08	0.05	0.02	
72420	Oil and solid fuel heating mechanics	0.11	0.08	0.09	0.05	0.15	0.01	0.04	
72421	Appliance servicers and repairers		0.08	0.03	-	0.02	0.03	0.06	0.05
72422	Electrical mechanics	0.03	0.01	0.01	0.03	0.06	0.02	0.02	
72423	Motorcycle, all-terrain vehicle and other related mechanics	0.07	0.05	0.03	0.04	0.05	0.07	0.01	
72500	Crane operators	0.14	0.07	0.07	0.06	0.07	0.05	0.04	
72600	Air pilots, flight engineers and flying instructors	0.02	0.01	0.01	0.01	0.1	0.09	0.01	
72603	Engineer officers, water transport		0.04	0.04	0.06	0.02	0.08	0.08	0.1
72999	Other technical trades and related occupations	0.05	0.06	0.04	0.05	0.14	0.05	0.04	
73209	Other repairers and servicers	0.07	0.06	0.04	0.04	0.08	0.05	0.05	
73310	Railway and yard locomotive engineers	0.01	0.02	0.04	0.01	0.02	0.04	0	
73401	Printing press operators	0.07	0.05	0.02	0.06	0.15	0.04	0.01	
73402	Drillers and blasters – surface mining, quarrying and construction	0.11	0.15	0.02	0.05	0.15	0.12	0.12	
74201	Water transport deck and engine room crew	0.07	0.11	0.16	0.05	0.14	0.12	0.06	
74205	Public works maintenance equipment operators and related workers	0.1	0.07	0.1	0.08	0.09	0.08	0.06	
75110	Construction trades helpers and labourers	0.24	0.2	0.18	0.21	0.23	0.17	0.13	
75119	Other trades helpers and labourers	0.11	0.13	0.17	0.13	0.18	0.08	0.18	
75211	Railway and motor transport labourers	0.14	0.11	0.13	0.15	0.34	0.15	0.26	
83100	Underground production and development miners	0.08	0.06	0.05	0.06	0.14	0.08	0.03	
85110	Mine labourers	0.1	0.13	0.09	0.12	0.21	0.07	0.12	
85120	Logging and forestry labourers	0.34	0.22	0.36	0.44	0.3	0.42	0.32	
92010	Supervisors, mineral and metal processing	0.03	0.02	0.03	0.02	0.01	0	0	
92011	Supervisors, petroleum, gas and chemical processing and utilities	0.01	0.01	0.03	0.03	0.03	0.02	0.03	
92012	Supervisors, food and beverage processing	0.08	0.04	0.04	0.04	0.02	0.02	0.05	
92013	Supervisors, plastic and rubber products manufacturing	0.01	0.03	0.01	0.02	0.11	0.02	0.01	
92014	Supervisors, forest products processing	0.03	0.03	0.01	0.03	0.05	0	0.03	
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	0.08	0.07	0.02	-	0.02	-	-	
92022	Supervisors, furniture and fixtures manufacturing	0.02	-	0.02	-	0.04	-	0.02	
92023	Supervisors, other mechanical and metal products manufacturing	0.04	0.02	0.02	0.02	0.03	0.03	0.01	
92024	Supervisors, other products manufacturing and assembly	0	0.01	0.06	0.06	0.02	0.03	0.01	

92100	Power engineers and power systems operators	0.05	0.02	0.01	0.02	0.05	0.02	0.01	
92101	Water and waste treatment plant operators	0.02	0.04	0.03	0.06	0.02	0.03	0.01	
93100	Central control and process operators, mineral and metal processing	0.04	0.02	0.01	0.02	0.02	-	0.01	
93101	Central control and process operators, petroleum, gas and chemical processing	0.01	0.01	0.05	0.01	0.07	0.02	0.01	
93102	Pulping, papermaking and coating control operators	-	-	-	0.01	0.05	-	-	
94100	Machine operators, mineral and metal processing	0.07	0.02	0.02	0.01	0.06	0.03	0.04	
94103	Concrete, clay and stone forming operators	0.13	0.08	0.01	0.1	0.12	0.05	0.04	
94104	Inspectors and testers, mineral and metal processing	-	-	0.03	0.07	-	0.05	0.08	
94105	Metalworking and forging machine operators	0.03	0.03	0.03	0.04	0.13	0.06	0.03	
94106	Machining tool operators	0.05	0.01	0.07	0.06	0.11	0.05	0	
94107	Machine operators of other metal products	0.06	0.05	0.06	0.05	0.14	0.09	0.08	
94110	Chemical plant machine operators	7	3	2	5	6	9	0.07	
94111	Plastics processing machine operators	0.03	0.04	0.04	0.02	0.09	0.08	0	
94123	Lumber graders and other wood processing inspectors and graders	0.02	0.01	0.03	0.09	0.08	0.12	0.02	
94124	Woodworking machine operators		0.08	0.04	0.05	0.04	0.08	0.05	0.03
94129	Other wood processing machine operators	0.07	0.05	0.08	0.05	0.18	0.1	0.02	
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	0.13	0.01	0.03	-	0.1	0.15	0.04	
94131	Weavers, knitters and other fabric making occupations	0.04	0.01	0.07	0.05	0.06	0.39	-	
94132	Industrial sewing machine operators	0.08	0.07	0.04	0.03	0.13	0.06	0.06	
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	0.02	-	0.19	0.03	0.15	0.24	0.08	
94140	Process control and machine operators, food and beverage processing	0.06	0.04	0.06	0.05	0.06	0.04	0.05	
94143	Testers and graders, food and beverage processing	0.12	0.06	0.05	0.1	0.17	0.07	0.1	
94150	Plate-less printing equipment operators	0.05	0.03	0.04	0.03	0.06	0.19	0.02	
94151	Camera, platemaking and other prepress occupations	0.02	0.06	0.05	-	0.03	0.02	-	
94152	Binding and finishing machine operators	0.04	0.05	0.04	0.06	0.27	0.13	0.03	
94153	Photographic and film processors		0.1	0.03	-	0.1	0.04	0.12	0.07
94200	Motor vehicle assemblers, inspectors and testers	0.04	0.06	0.07	0.03	0.16	0.19	0.11	
94201	Electronics assemblers, fabricators, inspectors and testers	0.08	0.05	0.05	0.02	0.06	0.03	0.04	
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	0.05	0.1	0.05	0.05	0.12	0.03	0.01	
94205	Machine operators and inspectors, electrical apparatus manufacturing	-	0.02	0.14	-	-	0.05	0.01	
94211	Assemblers and inspectors of other wood products	0.09	0.15	0.05	0.05	0.16	0.08	0.03	
94212	Plastic products assemblers, finishers and inspectors	0.02	0.1	0.05	0.13	0.15	0.11	0.01	
94213	Industrial painters, coaters and metal finishing process operators	0.11	0.04	0.1	0.06	0.1	0.05	0.01	
94219	Other products assemblers, finishers and inspectors	0.14	0.1	0.07	0.05	0.16	0.13	0.07	
95100	Labourers in mineral and metal processing	0.07	0.04	0.05	0.07	0.12	0.13	0.06	

95101	Labourers in metal fabrication	0.15	0.08	0.04	0.05	0.14	0.12	0.04
95102	Labourers in chemical products processing and utilities	0.16	0.06	0.06	0.04	0.14	0.11	0.08
95103	Labourers in wood, pulp and paper processing	0.1	0.05	0.05	0.1	0.17	0.08	0.05
95104	Labourers in rubber and plastic products manufacturing	0.04	0.03	0.06	0.04	0.11	0.07	0.02
95106	Labourers in food and beverage processing	0.09	0.07	0.07	0.06	0.1	0.09	0.06
95107	Labourers in fish and seafood processing	0.63	0.56	0.41	0.34	0.45	0.38	0.35
95109	Other labourers in processing, manufacturing and utilities	0.21	0.11	0.11	0.17	0.21	0.14	0.11
	Total	**0.06**	**0.05**	**0.04**	**0.04**	**0.09**	**0.05**	**0.04**
	Occupation Not Selected	**0.05**	**0.05**	**0.04**	**0.04**	**0.09**	**0.05**	**0.04**

Source: Special tabulation of monthly Labour Force Survey, 2016 – 2022.

Table 5.7 Percentages of Unutilized Paid Workers by Occupation in Manufacturing Occupations
by Growth in Employment, Canada, 2016 – 2022
Text table.

Table 5.8 Numbers of Employed Paid Workers Working in Occupations with Employment in the Manufacturing Sector, by Occupation, Canada, 2016 – 2022.

Code	Row labels	2016	2017	2018	2019	2020	2021	2022	Percent unutilized (%)
	Employed	**349,106**	**356,932**	**362,436**	**371,344**	**348,90**	**3371,317**	**388,429**	
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	101,778	77,764	100,347	98,639	98,000	102,903	109,472	3
12113	Statistical officers and related research support occupations	1,556	1,333	2,167	2,139	2,972	4,222	4,278	5
14402	Production logistics workers	10,250	8,750	8,944	12,250	9,472	6,528	5,972	4
20010	Engineering managers	21,694	30,986	30,861	31,792	28,361	40,306	37,778	2
21109	Other professional occupations in physical sciences	3,181	722	3,028	3,250	5,472	7,111	4,306	N/A
21300	Civil engineers	61,028	55,472	60,750	70,389	68,292	80,389	79,389	2%
21301	Mechanical engineers	44,861	52,514	46,181	45,597	48,847	56,958	55,694	3%
21310	Electrical and electronics engineers	41,306	39,667	47,583	52,903	44,417	51,111	46,000	2%
21311	Computer engineers (except software engineers and designers)	28,153	33,667	28,306	27,806	22,667	33,917	34,139	2%
21320	Chemical engineers	11,333	11,306	9,556	11,417	10,111	10,528	12,667	2%
21321	Industrial and manufacturing engineers	19,722	20,056	19,250	17,861	21,000	31,806	35,444	3%
21322	Metallurgical and materials engineers	3,556	5,556	4,444	2,333	1,611	1,806	1,806	N/A
21330	Mining engineers	3,778	4,389	5,528	7,500	7,278	4,861	6,861	2%
21331	Geological engineers	4,417	4,111	1,944	2,958	6,194	5,444	4,861	N/A
21332	Petroleum engineers	15,167	15,583	15,222	10,917	16,750	17,000	18,694	4

21399	Other professional engineers	28,639	24,194	25,444	28,861	29,083	31,014	38,111	3
22100	Chemical technologists and technicians	25,778	24,472	32,083	29,944	35,514	36,583	41,861	5
22101	Geological and mineral technologists and technicians	10,556	10,861	11,389	8,972	10,556	13,389	11,194	8
22110	Biological technologists and technicians	15,611	12,833	14,417	14,833	12,056	12,167	10,361	7
22211	Industrial designers	10,806	10,472	16,361	17,042	18,806	10,722	12,028	4
22230	Non-destructive testers and inspectors	7,472	9,972	6,472	9,722	5,333	7,472	6,250	10
22231	Engineering inspectors and regulatory officers	10,500	4,194	6,417	7,694	10,778	5,528	7,500	3
22233	Construction inspectors	22,861	22,722	27,222	26,333	29,111	27,917	25,694	5
22300	Civil engineering technologists and technicians	32,111	26,528	32,139	32,778	30,028	26,056	31,611	5
22301	Mechanical engineering technologists and technicians	26,833	24,472	25,694	23,472	28,069	27,389	28,083	3
22302	Industrial engineering and manufacturing technologists and technicians	36,861	27,500	26,611	30,944	30,222	23,681	21,528	3
22310	Electrical and electronics engineering technologists and technicians	41,153	46,639	37,028	46,778	45,375	46,083	39,806	3
22311	Electronic service technicians (household and business equipment)	61,806	63,514	63,847	47,944	46,236	39,167	55,528	5
22312	Industrial instrument technicians and mechanics	12,194	10,778	9,167	10,750	13,889	6,972	9,250	4
32129	Other medical technologists and technicians	10,014	10,764	8,222	7,083	8,306	9,250	8,778	2
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	17,500	15,792	15,972	17,167	16,778	14,361	15,111	4
72011	Contractors and supervisors, electrical trades and telecommunications occupations	33,500	26,056	31,833	33,250	25,889	33,153	34,139	3
72020	Contractors and supervisors, mechanic trades	59,111	53,056	47,083	49,681	60,333	57,083	61,847	3
72100	Machinists and machining and tooling inspectors	43,972	49,778	49,347	48,889	48,431	45,194	44,306	4
72101	Tool and die makers	11,667	13,833	12,806	14,639	10,917	15,833	12,944	2
72106	Welders and related machine operators	110,111	111,569	108,861	116,083	109,278	96,139	110,722	8
72200	Electricians (except industrial and power system)	101,472	107,958	112,833	120,333	108,806	119,167	131,361	10
72201	Industrial electricians	38,056	42,014	41,861	48,306	42,111	47,722	49,250	4
72401	Heavy-duty equipment mechanics	75,500	78,681	86,458	87,444	76,764	83,694	71,472	4
72402	Heating, refrigeration and air conditioning mechanics	34,528	37,722	34,167	36,861	39,500	55,611	49,694	4
72404	Aircraft mechanics and aircraft inspectors	16,583	18,639	13,514	22,083	17,694	21,639	26,417	3
72405	Machine fitters	694	944	1,472	111	417	1,194	972	N/A

72406	Elevator constructors and mechanics	10,306	5,472	10,306	7,028	6,667	8,833	7,611	2
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	142,528	142,903	153,083	163,222	142,361	156,111	157,319	4
72420	Oil and solid fuel heating mechanics	3,500	4,806	6,083	4,722	5,111	4,167	2,222	8
72421	Appliance servicers and repairers	5,806	3,528	5,028	3,722	4,194	6,444	3,444	4
72422	Electrical mechanics	13,444	13,194	13,222	12,861	13,306	15,528	16,167	2
72423	Motorcycle, all-terrain vehicle and other related mechanics	8,764	8,333	8,611	9,111	8,111	8,444	11,194	5
72500	Crane operators	19,833	18,667	20,278	15,819	18,222	19,528	18,361	7
72600	Air pilots, flight engineers and flying instructors	20,167	24,083	21,083	25,264	18,250	19,361	18,778	3
72603	Engineer officers, water transport	3,417	3,111	3,111	4,236	4,472	3,722	4,333	6
72999	Other technical trades and related occupations	8,014	10,333	8,278	10,028	10,000	13,444	11,736	6
73209	Other repairers and servicers	15,319	16,167	16,583	16,583	10,750	12,292	16,625	5
73310	Railway and yard locomotive engineers	8,694	5,639	8,750	8,931	9,889	10,500	9,333	2
73401	Printing press operators	16,694	16,639	17,472	19,472	15,778	12,639	15,333	6
73402	Drillers and blasters – surface mining, quarrying and construction	6,528	4,250	3,597	3,778	4,167	3,722	5,361	11
74201	Water transport deck and engine room crew	4,750	5,278	5,333	4,167	5,903	4,083	6,167	10
74205	Public works maintenance equipment operators and related workers	35,417	35,139	34,917	45,667	33,472	35,944	42,000	8
75110	Construction trades helpers and labourers	163,333	171,472	172,361	161,569	155,083	141,694	167,444	20
75119	Other trades helpers and labourers	17,444	13,333	10,389	8,222	13,361	8,528	7,083	14
75211	Railway and motor transport labourers	11,000	9,806	7,639	7,889	4,778	5,389	5,319	17
83100	Underground production and development miners	30,694	29,167	35,861	39,583	32,889	28,750	33,500	7
85110	Mine labourers	4,194	4,778	4,472	3,833	3,778	3,778	3,861	12
85120	Logging and forestry labourers	5,306	5,444	4,222	3,722	5,292	4,139	4,611	34
92010	Supervisors, mineral and metal processing	13,611	11,000	10,583	12,639	10,167	11,583	11,944	2
92011	Supervisors, petroleum, gas and chemical processing and utilities	24,361	25,139	30,333	21,194	25,306	19,500	20,528	2
92012	Supervisors, food and beverage processing	20,583	29,167	31,694	33,833	32,722	26,694	34,056	4
92013	Supervisors, plastic and rubber products manufacturing	10,611	12,472	12,000	9,472	9,139	8,917	10,639	3
92014	Supervisors, forest products processing	17,028	14,667	17,361	15,611	13,778	17,028	14,361	3
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	3,972	3,694	5,556	3,694	5,250	3,083	2,389	N/A
92022	Supervisors, furniture and fixtures manufacturing	7,222	7,722	4,194	6,611	8,167	4,806	7,667	N/A

92023	Supervisors, other mechanical and metal products manufacturing	25,861	31,944	32,611	31,417	24,667	26,667	24,250	2
92024	Supervisors, other products manufacturing and assembly	9,694	9,944	6,250	6,861	8,444	7,389	7,111	2
92100	Power engineers and power systems operators	36,278	34,639	34,861	40,556	31,972	42,000	37,500	2
92101	Water and waste treatment plant operators	15,194	11,750	10,167	9,361	10,028	12,139	14,167	3
93100	Central control and process operators, mineral and metal processing	4,472	4,861	4,167	3,667	6,694	2,611	4,222	2
93101	Central control and process operators, petroleum, gas and chemical processing	22,083	20,361	16,222	19,639	17,694	15,833	17,139	3
93102	Pulping, papermaking and coating control operators	972	1,611	4,306	3,889	2,306	1,222	1,889	N/A
94100	Machine operators, mineral and metal processing	14,139	17,056	15,750	16,500	14,611	16,778	15,833	3
94103	Concrete, clay and stone forming operators	7,806	8,028	4,972	6,250	8,917	4,194	8,639	8
94104	Inspectors and testers, mineral and metal processing	4,028	1,472	889	806	2,194	1,750	3,639	N/A
94105	Metalworking and forging machine operators	30,389	44,694	45,472	47,278	52,806	41,139	38,722	5
94106	Machining tool operators	17,000	11,861	12,500	8,458	9,778	14,028	19,667	4
94107	Machine operators of other metal products	54,250	43,806	38,278	33,083	32,500	33,667	26,667	7
94110	Chemical plant machines operators	23,444	21,597	24,917	20,944	29,944	23,000	26,861	6
94111	Plastics processing machine operators	21,333	39,333	26,639	29,472	26,583	29,361	25,500	4
94123	Lumber graders and other wood processing inspectors and graders	4,389	6,222	4,639	3,611	2,722	3,444	5,111	5
94124	Woodworking machine operators	14,056	10,333	12,639	7,917	7,917	15,056	12,389	5
94129	Other wood processing machines operators	6,417	9,000	7,333	10,306	7,361	8,778	7,722	8
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	1,972	3,778	4,056	3,417	3,250	2,444	1,333	6
94131	Weavers, knitters and other fabric making occupations	3,806	3,611	2,278	2,389	3,528	1,222	2,194	6
94132	Industrial sewing machines operators	26,806	19,583	28,250	22,167	21,944	27,111	22,833	7
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	2,250	2,444	1,472	1,778	2,167	1,417	2,444	9
94140	Process control and machine operators, food and beverage processing	66,111	70,944	77,194	85,444	73,833	86,333	93,056	5
94143	Testers and graders, food and beverage processing	7,667	7,528	8,222	7,583	8,472	9,361	10,750	9
94150	Plate-less printing equipment operators	8,750	7,833	12,417	5,819	5,028	4,861	3,278	5
94151	Camera, platemaking and other prepress occupations	3,528	3,028	2,278	2,222	1,750	2,750	611	3

94152	Binding and finishing machine operators	7,111	7,250	6,694	5,472	3,111	3,389	7,250	7
94153	Photographic and film processors	3,750	1,694	667	1,083	750	944	806	8
94200	Motor vehicle assemblers, inspectors and testers	31,500	39,833	36,194	34,583	31,306	30,250	35,611	9
94201	Electronics assemblers, fabricators, inspectors and testers	22,417	22,694	28,000	21,139	19,583	25,306	29,667	5
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	10,139	9,167	9,806	11,028	6,389	9,639	14,528	5
94205	Machine operators and inspectors, electrical apparatus manufacturing	1,694	1,472	611	2,139	2,083	1,694	1,972	N/A
94211	Assemblers and inspectors of other wood products	18,611	11,306	16,639	19,139	10,111	11,639	14,333	8
94212	Plastic products assemblers, finishers and inspectors	20,194	20,306	11,667	9,361	9,361	13,056	14,472	7
94213	Industrial painters, coaters and metal finishing process operators	20,861	15,611	13,389	21,750	15,528	14,639	21,972	6
94219	Other products assemblers, finishers and inspectors	40,917	39,944	45,500	48,319	40,194	38,278	52,694	10
95100	Labourers in mineral and metal processing	8,583	11,222	9,139	11,028	9,139	5,333	5,194	7
95101	Labourers in metal fabrication	36,083	36,139	32,083	28,083	19,389	27,083	29,111	9
95102	Labourers in chemical products processing and utilities	7,319	8,639	11,361	10,583	8,069	12,083	10,722	9
95103	Labourers in wood, pulp and paper processing	29,361	32,972	30,806	25,194	20,694	24,389	24,000	8
95104	Labourers in rubber and plastic products manufacturing	11,542	14,444	12,917	9,139	11,861	13,639	8,472	5
95106	Labourers in food and beverage processing	69,722	69,264	68,194	73,722	55,556	50,833	58,556	8
95107	Labourers in fish and seafood processing	6,194	6,861	6,306	6,250	5,611	7,000	5,472	45
95109	Other labourers in processing, manufacturing and utilities	45,583	45,319	37,472	36,917	31,514	28,111	28,403	15
	Total	**20,422,528**	**20,880,444**	**21,202,486**	**21,723,583**	**20,410,736**	**21,721,903**	**22,723,083**	
	Occupation Not Selected	**17,678,417**	**18,135,917**	**18,421,056**	**18,899,694**	**17,761,528**	**18,982,556**	**19,843,833**	
	NILF	**28,483**	**28,255**	**29,531**	**29,339**	**38,571**	**27,057**	**28,665**	
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	3,597	3,694	1,889	1,972	5,056	4,278	3,722	
12113	Statistical officers and related research support occupations	500	1,000	139	194	1,139	1,222	556	
14402	Production logistics workers	750	444	917	389	83	250	306	
20010	Engineering managers	56	500	556	333	417	389	556	
21109	Other professional occupations in physical sciences	111	333	306	28	167	111	-	
21300	Civil engineers	1,306	2,972	2,000	2,083	2,583	2,278	2,111	
21301	Mechanical engineers	2,319	1,306	1,222	1,056	2,556	1,611	2,111	
21310	Electrical and electronics engineers	1,500	1,444	667	1,556	1,028	1,500	889	

21311	Computer engineers (except software engineers and designers)	1,472	1,833	1,417	472	917	917	833
21320	Chemical engineers	83	444	694	83	56	222	361
21321	Industrial and manufacturing engineers	333	417	889	278	778	528	778
21322	Metallurgical and materials engineers	28	278	222	222	250	306	28
21330	Mining engineers	-	194	528	306	83	167	83
21331	Geological engineers	111	417	222	111	167	111	-
21332	Petroleum engineers	417	222	722	1,472	417	528	167
21399	Other professional engineers	1,167	1,444	639	222	1,500	722	1,750
22100	Chemical technologists and technicians	3,264	2,583	2,667	2,167	3,250	3,944	3,972
22101	Geological and mineral technologists and technicians	2,083	2,028	1,750	2,083	1,222	1,056	667
22110	Biological technologists and technicians	1,944	2,361	1,972	1,556	917	1,861	1,806
22211	Industrial designers	667	56	-	417	861	417	1,556
22230	Non-destructive testers and inspectors	333	250	306	861	694	111	583
22231	Engineering inspectors and regulatory officers	306	139	722	194	694	278	472
22233	Construction inspectors	1,444	1,194	611	2,917	1,417	1,528	583
22300	Civil engineering technologists and technicians	3,028	3,389	4,222	5,972	4,583	3,389	3,111
22301	Mechanical engineering technologists and technicians	1,375	472	1,472	2,944	4,444	1,444	1,889
22302	Industrial engineering and manufacturing technologists and technicians	4,111	3,000	2,833	2,347	1,861	889	1,417
22310	Electrical and electronics engineering technologists and technicians	2,333	3,306	3,056	2,694	2,111	3,389	2,111
22311	Electronic service technicians (household and business equipment)	3,444	3,611	4,028	1,833	3,750	1,250	1,444
22312	Industrial instrument technicians and mechanics	861	417	722	1,222	639	222	333
32129	Other medical technologists and technicians	306	389	278	111	1,028	444	472
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	472	250	278	444	833	306	250
72011	Contractors and supervisors, electrical trades and telecommunications occupations	889	806	972	1,250	736	1,306	806
72020	Contractors and supervisors, mechanic trades	1,944	1,889	1,056	1,472	2,028	1,250	1,083
72100	Machinists and machining and tooling inspectors	1,778	1,639	1,000	1,889	2,083	1,389	1,333
72101	Tool and die makers	111	611	1,389	1,056	1,056	417	417
72106	Welders and related machine operators	5,222	4,500	3,889	5,722	8,556	3,861	5,944
72200	Electricians (except industrial and power system)	7,694	7,167	7,333	5,083	10,083	6,000	4,889

72201	Industrial electricians	2,333	1,319	1,056	1,944	1,056	2,139	2,500
72401	Heavy-duty equipment mechanics	2,306	2,236	3,889	3,111	3,250	3,389	2,500
72402	Heating, refrigeration and air conditioning mechanics	1,083	806	694	1,861	4,222	1,139	1,944
72404	Aircraft mechanics and aircraft inspectors	611	556	83	1,056	875	1,083	1,139
72405	Machine fitters	56	-	-	-	56	56	-
72406	Elevator constructors and mechanics	28	-	194	278	500	56	-
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	3,222	5,389	4,417	4,528	8,333	8,250	6,111
72420	Oil and solid fuel heating mechanics	472	222	861	111	778	111	28
72421	Appliance servicers and repairers	639	278	278	250	222	389	83
72422	Electrical mechanics	139	167	139	139	389	28	389
72423	Motorcycle, all-terrain vehicle and other related mechanics	972	778	56	278	444	583	556
72500	Crane operators	944	472	667	333	972	583	917
72600	Air pilots, flight engineers and flying instructors	83	444	194	583	2,444	1,361	1,167
72603	Engineer officers, water transport	389	139	83	194	361	278	694
72999	Other technical trades and related occupations	806	861	417	500	750	444	514
73209	Other repairers and servicers	1,306	1,222	1,444	1,278	1,167	931	1,611
73310	Railway and yard locomotive engineers	1,028	1,028	722	194	694	222	556
73401	Printing press operators	333	722	1,250	1,583	3,222	667	1,194
73402	Drillers and blasters – surface mining, quarrying and construction	56	111	28	139	278	139	306
74201	Water transport deck and engine room crew	611	972	639	306	694	722	778
74205	Public works maintenance equipment operators and related workers	4,056	2,431	2,250	3,458	2,833	4,389	3,611
75110	Construction trades helpers and labourers	40,653	34,972	38,944	34,611	40,250	28,444	29,639
75119	Other trades helpers and labourers	2,667	2,139	2,833	1,722	2,083	1,861	1,056
75211	Railway and motor transport labourers	1,417	917	639	2,306	833	722	1,389
83100	Underground production and development miners	833	1,139	1,833	1,528	1,611	1,444	1,583
85110	Mine labourers	1,083	1,653	444	472	750	333	611
85120	Logging and forestry labourers	1,806	2,250	2,000	2,694	1,889	1,667	2,361
92010	Supervisors, mineral and metal processing	1,056	222	556	472	306	417	417
92011	Supervisors, petroleum, gas and chemical processing and utilities	1,542	1,194	1,417	1,111	778	389	889
92012	Supervisors, food and beverage processing	750	444	944	1,000	1,389	1,694	1,694
92013	Supervisors, plastic and rubber products manufacturing	194	167	83	806	194	167	250

92014	Supervisors, forest products processing	278	278	500	889	611	472	583
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	111	444	28	56	139	-	56
92022	Supervisors, furniture and fixtures manufacturing	611	333	111	56	83	139	111
92023	Supervisors, other mechanical and metal products manufacturing	694	833	861	1,694	583	1,056	417
92024	Supervisors, other products manufacturing and assembly	889	-	56	194	250	83	111
92100	Power engineers and power systems operators	1,472	1,222	1,528	2,000	1,583	1,944	1,583
92101	Water and waste treatment plant operators	361	472	389	389	583	417	333
93100	Central control and process operators, mineral and metal processing	194	306	28	83	-	28	28
93101	Central control and process operators, petroleum, gas and chemical processing	194	1,069	889	417	750	361	333
93102	Pulping, papermaking and coating control operators	139	333	28	83	56	-	389
94100	Machine operators, mineral and metal processing	583	1,444	694	972	583	556	1,389
94103	Concrete, clay and stone forming operators	1,306	778	750	306	333	444	111
94104	Inspectors and testers, mineral and metal processing	222	28	28	222	-	139	250
94105	Metalworking and forging machine operators	1,528	1,806	1,528	2,972	3,667	1,222	1,361
94106	Machining tool operators	611	111	639	694	667	944	333
94107	Machine operators of other metal products	4,111	1,750	2,667	1,167	4,333	1,278	1,500
94110	Chemical plant machines operators	1,611	694	1,611	1,361	2,028	1,389	667
94111	Plastics processing machine operators	1,222	1,889	1,222	1,472	1,083	1,694	417
94123	Lumber graders and other wood processing inspectors and graders	222	278	944	778	472	861	417
94124	Woodworking machine operators	861	528	1,361	306	333	444	583
94129	Other wood processing machine operators	306	139	333	361	583	667	556
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	611	139	194	694	417	111	-
94131	Weavers, knitters and other fabric making occupations	111	194	583	56	167	83	167
94132	Industrial sewing machines operators	3,306	2,167	1,889	1,028	3,333	3,028	1,556
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	-	-	-	194	222	194	583
94140	Process control and machine operators, food and beverage processing	5,806	5,944	5,028	4,917	4,639	5,806	5,111

94143	Testers and graders, food and beverage processing	472	500	1,083	472	500	500	556
94150	Plate-less printing equipment operators	306	389	361	56	139	56	167
94151	Camera, platemaking and other prepress occupations	111	-	-	28	-	83	167
94152	Binding and finishing machine operators	694	667	139	528	1,903	333	444
94153	Photographic and film processors	83	278	28	83	28	56	167
94200	Motor vehicle assemblers, inspectors and testers	1,417	2,167	2,639	2,361	3,167	1,833	1,722
94201	Electronics assemblers, fabricators, inspectors and testers	1,361	1,528	861	1,056	1,500	917	2,528
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	528	639	333	194	528	917	333
94205	Machine operators and inspectors, electrical apparatus manufacturing	-	83	28	-	194	28	56
94211	Assemblers and inspectors of other wood products	1,222	1,500	1,694	1,611	1,556	1,000	1,194
94212	Plastic products assemblers, finishers and inspectors	1,667	1,306	903	1,361	1,167	444	1,417
94213	Industrial painters, coaters and metal finishing process operators	944	667	889	1,111	1,167	556	1,167
94219	Other products assemblers, finishers and inspectors	4,417	3,611	4,389	2,542	4,861	3,861	4,028
95100	Labourers in mineral and metal processing	1,139	1,167	556	1,500	917	889	1,083
95101	Labourers in metal fabrication	1,639	2,389	3,194	3,389	4,194	2,444	2,528
95102	Labourers in chemical products processing and utilities	528	1,056	1,319	556	1,250	2,444	778
95103	Labourers in wood, pulp and paper processing	3,944	3,278	2,944	3,806	2,250	2,611	1,972
95104	Labourers in rubber and plastic products manufacturing	1,500	667	2,083	500	2,278	1,056	1,778
95106	Labourers in food and beverage processing	7,472	8,583	7,250	11,806	9,694	4,889	7,806
95107	Labourers in fish and seafood processing	4,167	2,917	2,528	2,139	3,361	3,694	2,472
95109	Other labourers in processing, manufacturing and utilities	11,528	9,972	6,472	8,083	8,583	3,167	2,944
	Total	**1,666,278**	**1,652,889**	**1,727,528**	**1,716,236**	**2,256,278**	**1,582,778**	**1,676,847**
	Occupation Not Selected	**1,462,917**	**1,464,194**	**1,541,389**	**1,526,069**	**2,026,153**	**1,413,764**	**1,506,833**
	Total	**397,176**	**402,507**	**408,122**	**416,979**	**419,733**	**417,319**	**431,214**
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	109,708	83,611	105,444	102,139	108,528	110,639	115,361
12113	Statistical officers and related research support occupations	2,417	2,333	2,333	2,444	4,194	5,722	4,917
14402	Production logistics workers	11,417	9,597	10,111	13,278	9,986	7,083	6,306
20010	Engineering managers	22,250	31,931	31,972	32,514	30,000	41,028	38,500

21109	Other professional occupations in physical sciences	3,417	1,056	3,444	3,333	5,639	7,222	4,556
21300	Civil engineers	64,236	59,917	64,444	73,389	73,181	83,806	82,347
21301	Mechanical engineers	49,597	54,403	48,708	47,681	53,333	59,944	58,472
21310	Electrical and electronics engineers	44,500	42,306	48,444	55,417	46,875	54,083	46,972
21311	Computer engineers (except software engineers and designers)	30,444	35,806	29,944	28,806	25,194	34,833	35,417
21320	Chemical engineers	11,861	12,139	10,417	11,750	10,403	10,750	13,111
21321	Industrial and manufacturing engineers	20,250	20,806	20,472	18,556	23,778	32,750	36,806
21322	Metallurgical and materials engineers	3,750	5,833	4,667	2,611	2,056	2,111	1,917
21330	Mining engineers	4,028	4,694	6,194	7,889	7,472	5,222	7,028
21331	Geological engineers	4,917	4,528	2,167	3,111	6,722	5,694	4,861
21332	Petroleum engineers	16,569	16,222	16,611	12,472	18,917	17,972	18,861
21399	Other professional engineers	31,181	26,667	26,694	29,361	32,500	32,028	40,444
22100	Chemical technologists and technicians	30,556	27,750	37,028	33,667	40,819	41,472	47,014
22101	Geological and mineral technologists and technicians	13,903	13,750	14,556	12,028	12,694	15,111	12,278
22110	Biological technologists and technicians	18,639	15,917	17,194	16,778	14,861	14,861	12,861
22211	Industrial designers	12,167	10,694	16,639	17,528	20,444	12,222	14,167
22230	Non-destructive testers and inspectors	8,806	10,903	7,333	11,333	7,431	8,250	7,194
22231	Engineering inspectors and regulatory officers	10,861	4,361	7,431	8,278	12,167	5,833	8,111
22233	Construction inspectors	26,333	25,583	28,819	30,056	32,111	30,972	26,806
22300	Civil engineering technologists and technicians	36,403	31,389	37,528	40,222	37,056	31,167	35,875
22301	Mechanical engineering technologists and technicians	28,750	25,722	27,500	26,861	35,458	29,917	30,250
22302	Industrial engineering and manufacturing technologists and technicians	42,278	30,972	29,861	33,736	33,319	26,583	23,000
22310	Electrical and electronics engineering technologists and technicians	44,819	51,778	41,111	50,972	49,125	50,556	43,042
22311	Electronic service technicians (household and business equipment)	68,500	71,417	70,222	51,792	53,694	41,806	59,444
22312	Industrial instrument technicians and mechanics	13,583	11,917	10,500	12,514	14,806	7,500	9,694
32129	Other medical technologists and technicians	10,667	11,472	8,639	7,222	9,417	10,083	9,278
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	18,806	16,917	17,139	18,111	18,931	14,972	15,639
72011	Contractors and supervisors, electrical trades and telecommunications occupations	35,403	27,444	33,944	36,111	27,722	35,069	35,667
72020	Contractors and supervisors, mechanic trades	62,778	56,722	49,417	52,472	65,806	60,569	64,042

72100	Machinists and machining and tooling inspectors	48,250	52,736	50,875	51,583	54,375	49,583	46,028
72101	Tool and die makers	11,889	14,611	14,306	15,833	12,583	16,444	13,528
72106	Welders and related machine operators	129,139	124,028	119,972	130,278	130,111	105,250	121,194
72200	Electricians (except industrial and power system)	122,028	126,903	133,972	135,750	136,028	32,667	141,944
72201	Industrial electricians	43,333	44,875	43,861	52,167	47,542	51,306	52,139
72401	Heavy-duty equipment mechanics	80,861	84,625	92,806	92,333	85,250	90,681	76,306
72402	Heating, refrigeration and air conditioning mechanics	37,028	39,931	35,472	40,278	47,056	58,000	52,167
72404	Aircraft mechanics and aircraft inspectors	17,250	19,333	14,306	23,250	20,181	24,444	27,944
72405	Machine fitters	750	944	1,472	111	528	1,694	972
72406	Elevator constructors and mechanics	10,444	5,889	10,486	7,417	7,444	8,944	7,611
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	150,556	154,208	161,306	171,069	161,778	172,208	167,208
72420	Oil and solid fuel heating mechanics	4,361	5,389	7,500	5,083	6,639	4,306	2,333
72421	Appliance servicers and repairers	6,917	3,917	5,306	4,056	4,528	7,222	3,694
72422	Electrical mechanics	14,000	13,444	13,528	13,333	14,472	15,833	16,833
72423	Motorcycle, all-terrain vehicle and other related mechanics	10,347	9,528	8,944	9,750	9,042	9,611	11,889
72500	Crane operators	23,542	20,500	22,444	17,083	20,528	21,000	20,028
72600	Air pilots, flight engineers and flying instructors	20,556	24,667	21,514	26,194	22,472	22,528	20,139
72603	Engineer officers, water transport	3,917	3,361	3,375	4,528	5,167	4,306	5,444
72999	Other technical trades and related occupations	9,250	11,861	9,000	10,986	12,139	14,639	12,750
73209	Other repairers and servicers	17,778	18,403	18,597	18,472	12,694	13,750	19,028
73310	Railway and yard locomotive engineers	9,806	6,806	9,833	9,194	10,750	11,194	9,917
73401	Printing press operators	18,167	18,111	19,028	22,333	21,361	13,806	16,667
73402	Drillers and blasters – surface mining, quarrying and construction	7,333	5,000	3,681	4,111	5,083	4,306	6,306
74201	Water transport deck and engine room crew	5,694	6,778	6,833	4,722	7,444	5,278	7,333
74205	Public works maintenance equipment operators and related workers	42,917	39,889	40,778	52,750	39,278	43,097	48,194
75110	Construction trades helpers and labourers	243,083	240,889	242,833	229,694	231,403	194,403	219,347
75119	Other trades helpers and labourers	21,944	17,139	15,056	11,028	17,792	11,056	9,417
75211	Railway and motor transport labourers	14,000	11,778	9,250	11,333	7,208	6,917	8,083
83100	Underground production and development miners	33,861	31,889	39,472	43,444	39,083	32,444	36,000
85110	Mine labourers	5,667	7,056	5,333	4,778	5,333	4,361	4,889
85120	Logging and forestry labourers	8,917	8,903	7,722	8,056	8,806	7,528	8,431

92010	Supervisors, mineral and metal processing	15,139	11,444	11,500	13,389	10,556	12,056	12,389
92011	Supervisors, petroleum, gas and chemical processing and utilities	26,222	26,639	32,556	22,889	26,778	20,181	21,972
92012	Supervisors, food and beverage processing	22,944	30,806	33,750	36,028	34,806	28,917	37,306
92013	Supervisors, plastic and rubber products manufacturing	10,917	12,972	12,250	10,444	10,361	9,278	11,028
92014	Supervisors, forest products processing	17,750	15,417	18,028	16,917	15,083	17,556	15,444
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	4,389	4,389	5,694	3,750	5,500	3,083	2,444
92022	Supervisors, furniture and fixtures manufacturing	8,000	8,056	4,389	6,667	8,556	4,944	7,944
92023	Supervisors, other mechanical and metal products manufacturing	27,583	33,278	34,250	33,750	26,083	28,500	24,944
92024	Supervisors, other products manufacturing and assembly	10,611	10,056	6,667	7,500	8,861	7,694	7,278
92100	Power engineers and power systems operators	39,514	36,556	36,833	43,319	35,000	44,806	39,389
92101	Water and waste treatment plant operators	15,889	12,694	10,861	10,306	10,861	12,972	14,639
93100	Central control and process operators, mineral and metal processing	4,833	5,250	4,250	3,806	6,833	2,639	4,306
93101	Central control and process operators, petroleum, gas and chemical processing	22,500	21,639	17,917	20,278	19,639	16,611	17,694
93102	Pulping, papermaking and coating control operators	1,111	1,944	4,333	4,028	2,472	1,222	2,278
94100	Machine operators, mineral and metal processing	15,667	18,889	16,806	17,556	16,083	17,833	17,889
94103	Concrete, clay and stone forming operators	10,111	9,417	5,778	7,139	10,250	4,861	9,056
94104	Inspectors and testers, mineral and metal processing	4,250	1,500	944	1,083	2,194	1,972	4,167
94105	Metalworking and forging machine operators	32,750	47,972	48,528	52,278	63,306	44,806	41,361
94106	Machining tool operators	18,389	12,083	13,972	9,694	11,528	15,694	20,083
94107	Machine operators of other metal products	61,722	47,833	43,389	35,861	41,472	38,028	30,417
94110	Chemical plant machines operators	26,569	22,944	27,139	23,417	33,806	26,500	29,417
94111	Plastics processing machine operators	23,139	42,861	29,028	31,444	30,111	33,361	26,000
94123	Lumber graders and other wood processing inspectors and graders	4,694	6,556	5,722	4,722	3,417	4,722	5,639
94124	Woodworking machine operators	16,000	11,278	14,694	8,556	8,861	16,306	13,389
94129	Other wood processing machine operators	7,167	9,556	8,250	11,222	9,250	10,306	8,417
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	2,833	3,944	4,361	4,111	4,000	2,917	1,389

94131	Weavers, knitters and other fabric making occupations	4,083	3,833	3,028	2,556	3,889	1,806	2,361
94132	Industrial sewing machines operators	32,278	23,167	31,250	23,917	28,028	31,639	25,722
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	2,306	2,444	1,750	2,028	2,694	1,944	3,222
94140	Process control and machine operators, food and beverage processing	75,944	79,417	86,889	94,556	82,583	95,694	102,556
94143	Testers and graders, food and beverage processing	9,028	8,472	9,722	8,778	10,389	10,472	12,333
94150	Plate-less printing equipment operators	9,500	8,472	13,250	6,056	5,472	5,833	3,500
94151	Camera, platemaking and other prepress occupations	3,722	3,194	2,389	2,250	1,806	2,889	778
94152	Binding and finishing machine operators	8,083	8,250	7,111	6,333	5,861	4,167	7,917
94153	Photographic and film processors	4,222	2,028	694	1,278	806	1,139	1,028
94200	Motor vehicle assemblers, inspectors and testers	34,139	44,361	41,194	38,139	39,528	37,694	41,389
94201	Electronics assemblers, fabricators, inspectors and testers	25,472	25,333	30,222	22,667	22,278	27,083	33,389
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	11,222	10,722	10,639	11,722	7,722	10,861	14,944
94205	Machine operators and inspectors, electrical apparatus manufacturing	1,694	1,583	722	2,139	2,278	1,806	2,056
94211	Assemblers and inspectors of other wood products	21,500	14,472	19,222	21,750	13,333	13,556	15,917
94212	Plastic products assemblers, finishers and inspectors	22,222	23,667	13,139	11,917	11,917	15,000	16,083
94213	Industrial painters, coaters and metal finishing process operators	24,056	16,861	15,583	24,083	18,222	15,889	23,389
94219	Other products assemblers, finishers and inspectors	50,917	47,694	53,056	53,444	51,333	47,028	60,639
95100	Labourers in mineral and metal processing	10,333	12,833	10,194	13,306	11,111	6,889	6,611
95101	Labourers in metal fabrication	43,056	41,389	36,639	32,889	26,361	32,694	32,667
95102	Labourers in chemical products processing and utilities	9,028	10,222	13,389	11,556	10,472	15,861	12,361
95103	Labourers in wood, pulp and paper processing	36,222	38,000	35,139	31,556	26,500	29,028	27,167
95104	Labourers in rubber and plastic products manufacturing	13,500	15,528	15,833	9,972	15,500	15,611	10,444
95106	Labourers in food and beverage processing	83,472	82,681	79,972	90,083	70,861	60,083	70,139
95107	Labourers in fish and seafood processing	14,250	13,639	11,389	10,528	11,472	13,333	9,833
95109	Other labourers in processing, manufacturing and utilities	66,569	60,417	47,917	51,139	46,597	35,278	34,514

	Total	**23,234,750**	**23,546,569**	**23,874,972**	**24,393,153**	**24,554,389**	**24,412,972**	**25,226,000**
	Occupation Not Selected	**20,080,000**	**20,452,139**	**20,757,250**	**21,233,139**	**21,423,000**	**21,345,653**	**22,064,792**
	Unemployed	**19,590**	**17,321**	**16,154**	**16,299**	**32,263**	**18,945**	**14,121**
12013	Supervisors, supply chain, tracking and scheduling coordination occupations	4,306	2,139	3,167	1,528	5,514	3,389	2,167
12113	Statistical officers and related research support occupations	333	-	28	111	83	278	83
14402	Production logistics workers	417	389	250	639	444	292	28
20010	Engineering managers	500	444	556	389	1,222	361	167
21109	Other professional occupations in physical sciences	111	-	97	56	-	-	250
21300	Civil engineers	1,944	1,472	1,694	917	2,333	1,139	861
21301	Mechanical engineers	2,403	583	1,306	1,028	1,903	1,319	667
21310	Electrical and electronics engineers	1,681	1,222	222	972	1,444	1,472	83
21311	Computer engineers (except software engineers and designers)	806	361	222	556	1,611	-	444
21320	Chemical engineers	444	389	167	278	250	28	111
21321	Industrial and manufacturing engineers	194	333	333	417	2,000	417	583
21322	Metallurgical and materials engineers	167	-	-	56	194	-	83
21330	Mining engineers	250	97	139	83	111	194	83
21331	Geological engineers	389	-	-	28	361	139	-
21332	Petroleum engineers	1,000	417	667	83	1,750	444	-
21399	Other professional engineers	1,389	1,028	611	278	1,889	264	583
22100	Chemical technologists and technicians	1,514	722	2,278	1,556	2,056	931	1,222
22101	Geological and mineral technologists and technicians	1,278	861	1,389	972	917	667	417
22110	Biological technologists and technicians	1,083	722	778	389	1,833	833	722
22211	Industrial designers	750	167	278	83	806	1,111	583
22230	Non-destructive testers and inspectors	972	694	556	750	1,444	667	361
22231	Engineering inspectors and regulatory officers	83	28	306	375	667	28	139
22233	Construction inspectors	2,028	1,667	1,000	778	1,611	1,528	500
22300	Civil engineering technologists and technicians	1,278	1,472	1,153	1,472	2,444	1,722	1,167
22301	Mechanical engineering technologists and technicians	528	778	333	444	2,944	1,111	278
22302	Industrial engineering and manufacturing technologists and technicians	1,333	472	417	444	1,250	2,028	56
22310	Electrical and electronics engineering technologists and technicians	1,361	1,861	1,000	1,528	1,694	1,083	1,111
22311	Electronic service technicians (household and business equipment)	3,306	4,236	2,333	2,056	3,694	1,389	2,472
22312	Industrial instrument technicians and mechanics	528	694	569	542	333	306	111

32129	Other medical technologists and technicians	333	333	194	28	83	389	28
72010	Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations	917	833	889	500	1,333	306	278
72011	Contractors and supervisors, electrical trades and telecommunications occupations	1,028	583	1,139	1,611	1,083	611	722
72020	Contractors and supervisors, mechanic trades	1,694	1,764	1,278	1,306	3,444	2,194	1,111
72100	Machinists and machining and tooling inspectors	2,500	1,333	528	806	3,861	3,028	389
72101	Tool and die makers	111	167	83	139	611	194	167
72106	Welders and related machine operators	13,833	7,972	7,222	8,444	12,236	5,250	4,583
72200	Electricians (except industrial and power system)	12,875	11,806	13,806	10,333	17,139	7,500	5,694
72201	Industrial electricians	2,944	1,528	944	1,917	4,417	1,444	417
72401	Heavy-duty equipment mechanics	3,056	3,694	2,417	1,792	5,250	3,639	2,333
72402	Heating, refrigeration and air conditioning mechanics	1,417	1,417	611	1,583	3,333	1,250	528
72404	Aircraft mechanics and aircraft inspectors	56	139	694	111	1,611	1,722	389
72405	Machine fitters	-	-	-	-	56	444	-
72406	Elevator constructors and mechanics	111	417	-	111	278	56	-
72410	Automotive service technicians, truck and bus mechanics and mechanical repairers	4,806	5,944	3,806	3,333	11,111	7,847	3,833
72420	Oil and solid fuel heating mechanics	389	361	556	250	750	28	83
72421	Appliance servicers and repairers	444	97	-	83	111	389	167
72422	Electrical mechanics	417	83	167	333	778	278	264
72423	Motorcycle, all-terrain vehicle and other related mechanics	597	417	278	389	444	583	139
72500	Crane operators	2,778	1,361	1,500	944	1,333	889	750
72600	Air pilots, flight engineers and flying instructors	306	139	250	333	1,778	1,806	194
72603	Engineer officers, water transport	139	111	194	83	361	306	417
72999	Other technical trades and related occupations	417	667	306	472	1,389	736	500
73209	Other repairers and servicers	1,139	1,000	583	611	833	556	778
73310	Railway and yard locomotive engineers	111	139	361	56	167	417	28
73401	Printing press operators	1,139	750	306	1,250	2,361	528	139
73402	Drillers and blasters – surface mining, quarrying and construction	750	639	56	194	639	444	639
74201	Water transport deck and engine room crew	333	556	861	222	833	472	389
74205	Public works maintenance equipment operators and related workers	3,472	2,333	3,611	3,625	3,000	2,736	2,556
75110	Construction trades helpers and labourers	39,111	34,444	31,500	33,514	36,056	24,306	22,278

75119	Other trades helpers and labourers	1,861	1,722	1,792	1,083	2,347	667	1,278
75211	Railway and motor transport labourers	1,583	1,056	972	1,167	1,611	806	1,361
83100	Underground production and development miners	2,333	1,611	1,833	2,333	4,583	2,250	944
85110	Mine labourers	403	611	417	472	806	250	444
85120	Logging and forestry labourers	1,806	1,222	1,500	1,639	1,611	1,722	1,472
92010	Supervisors, mineral and metal processing	472	222	361	278	83	56	28
92011	Supervisors, petroleum, gas and chemical processing and utilities	306	306	806	583	694	306	556
92012	Supervisors, food and beverage processing	1,611	1,194	1,111	1,194	694	528	1,556
92013	Supervisors, plastic and rubber products manufacturing	111	333	167	167	1,028	194	139
92014	Supervisors, forest products processing	444	472	167	417	694	56	500
92015	Supervisors, textile, fabric, fur and leather products processing and manufacturing	306	250	111	-	111	-	-
92022	Supervisors, furniture and fixtures manufacturing	167	-	83	-	306	-	167
92023	Supervisors, other mechanical and metal products manufacturing	1,028	500	778	639	833	778	278
92024	Supervisors, other products manufacturing and assembly	28	111	361	444	167	194	56
92100	Power engineers and power systems operators	1,778	708	417	806	1,472	861	278
92101	Water and waste treatment plant operators	333	444	306	556	250	417	139
93100	Central control and process operators, mineral and metal processing	167	83	56	56	139	-	56
93101	Central control and process operators, petroleum, gas and chemical processing	222	194	806	250	1,222	389	194
93102	Pulping, papermaking and coating control operators	-	-	-	56	111	-	-
94100	Machine operators, mineral and metal processing	944	389	361	83	889	500	667
94103	Concrete, clay and stone forming operators	1,000	611	56	639	1,056	222	306
94104	Inspectors and testers, mineral and metal processing	-	-	28	56	-	83	278
94105	Metalworking and forging machine operators	833	1,444	1,528	2,028	6,833	2,444	1,278
94106	Machining tool operators	778	111	833	528	1,083	694	83
94107	Machine operators of other metal products	3,361	2,278	2,444	1,611	4,639	3,083	2,222
94110	Chemical plant machines operators	1,528	639	611	1,111	1,861	2,111	1,889
94111	Plastics processing machine operators	583	1,639	1,167	500	2,444	2,306	83

94123	Lumber graders and other wood processing inspectors and graders	83	56	139	333	222	417	111
94124	Woodworking machine operators	1,083	417	694	333	611	806	417
94129	Other wood processing machine operators	444	417	583	556	1,333	917	139
94130	Textile fibre and yarn, hide and pelt processing machine operators and workers	250	28	111	-	333	361	56
94131	Weavers, knitters and other fabric making occupations	167	28	167	111	194	472	-
94132	Industrial sewing machines operators	2,167	1,417	1,111	722	2,750	1,500	1,333
94133	Inspectors and graders, textile, fabric, fur and leather products manufacturing	56	-	278	56	333	333	194
94140	Process control and machine operators, food and beverage processing	4,028	2,528	4,694	4,194	4,111	3,556	4,389
94143	Testers and graders, food and beverage processing	889	444	417	722	1,417	611	1,028
94150	Plate less printing equipment operators	444	250	472	167	306	917	56
94151	Camera, platemaking and other prepress occupations	83	167	111	-	56	56	-
94152	Binding and finishing machine operators	278	333	278	333	833	444	222
94153	Photographic and film processors	389	56	-	111	28	111	56
94200	Motor vehicle assemblers, inspectors and testers	1,222	2,361	2,361	1,167	5,056	5,611	4,056
94201	Electronics assemblers, fabricators, inspectors and testers	1,694	1,111	1,361	472	1,194	861	1,194
94203	Assemblers, fabricators and inspectors, industrial electrical motors and transformers	556	917	500	500	778	306	83
94205	Machine operators and inspectors, electrical apparatus manufacturing	-	28	83	-	-	83	28
94211	Assemblers and inspectors of other wood products	1,667	1,667	889	1,000	1,667	917	389
94212	Plastic products assemblers, finishers and inspectors	361	2,056	556	1,194	1,417	1,500	194
94213	Industrial painters, coaters and metal finishing process operators	2,250	556	1,306	1,250	1,528	694	264
94219	Other products assemblers, finishers and inspectors	5,611	4,125	3,167	2,611	6,278	4,861	3,917
95100	Labourers in mineral and metal processing	611	444	500	778	1,056	667	333
95101	Labourers in metal fabrication	5,333	2,861	1,417	1,417	2,806	3,167	1,028
95102	Labourers in chemical products processing and utilities	1,167	528	694	417	1,139	1,333	889
95103	Labourers in wood, pulp and paper processing	2,917	1,750	1,389	2,556	3,556	2,028	1,194
95104	Labourers in rubber and plastic products manufacturing	444	417	833	333	1,361	917	194

95106	Labourers in food and beverage processing	6,278	4,833	4,528	4,556	5,611	4,361	3,778
95107	Labourers in fish and seafood processing	3,889	3,861	2,556	2,139	2,500	2,639	1,889
95109	Other labourers in processing, manufacturing and utilities	9,472	5,111	3,972	6,139	6,500	4,000	3,167
	Total	**1,145,972**	**1,013,236**	**944,944**	**953,361**	**1,887,319**	**1,108,347**	**826,056**
	Occupation Not Selected	**938,681**	**852,111**	**794,847**	**807,528**	**1,635,403**	**949,417**	**714,139**

Source: Special tabulation of LFS employment by occupation data in manufacturing occupations outside manufacturing

Table 5.9 Average Annual Earnings of Workers in Manufacturing Occupations to Average Annual Earnings of Workers in the Same Occupations in other Industries, Canada, 2022.

Occupations	Industry	Mean Annual Earnings ($)
	Manufacturing Industry	52,416
Selected	non-manufacturing	67,392
	Total	**61,157**
	Manufacturing Industry	63,648
Not Selected	Non-Manufacturing	51,584
	Total	**52,249**
	Manufacturing Industry	58,032
Total	non-manufacturing	51,584
	Total	**52,235**

Source: Special tabulation of monthly Labour Force Survey, 2022.