IRPP STUDY
February 2022 | No. 86

Finding the Right Job: A Skills-Based Approach to Career Planning

Matthias Oschinski and Thanh Nguyen

THE FUTURE OF SKILLS AND ADULT LEARNING

ABOUT THIS STUDY

This study was published as part of The Future of Skills and Adult Learning research program, under the direction of Natalia Mishagina. The manuscript was copy-edited by Rosanna Tamburri, proofreading and editorial coordination was by Francesca Worrall, production was by Chantal Létourneau and art direction was by Anne Tremblay.

Matthias Oschinski is the founder and CEO of Belongnomics, and he is a member of the teaching faculty at the University of Toronto's Munk School of Global Affairs and Public Policy. He is an empirical economist with 20 years' experience in applied research, statistical analysis and policy consulting. His research focuses on inclusive growth, well-being and climate change.

Thanh Nguyen is an undergraduate student in computer science and engineering at MIT. His work focuses on data science, socio-economic data analysis, human-computer interactions, user interface/user experience (UI/UX) design and computer architecture. Part of his research aims to understand job mobility and the motivations behind occupational change.

To cite this document:
Oschinski, Matthias, and Thanh Nguyen. 2022. *Finding the Right Job: A Skills-Based Approach to Career Planning*. IRPP Study 86. Montreal: Institute for Research on Public Policy.

IRPP Study is a refereed monographic series that is published irregularly throughout the year. Each study is subject to rigorous internal and external peer review for academic soundness and policy relevance.

If you have questions about our publications, please contact irpp@irpp.org. If you would like to subscribe to our newsletter, *IRPP News*, please go to our website, at irpp.org.

Photo: Shutterstock.com

ISSN 1920-9436 (Online) ISSN 1920-9428 (Print)

CONTENTS

SUMMARY

Disruptions to labour markets caused by the COVID-19 pandemic, with some sectors of the economy shedding jobs and others frantically searching for workers, made one thing clear. Workers' ability to quickly identify and take advantage of emerging employment opportunities will determine their resilience, over the short and long terms. To help Canadians make the best career and training choices, we need to develop and implement more effective information tools.

In this study, Matthias Oschinski and Thanh Nguyen propose a two-pronged approach to career guidance – one that is primarily focused on skills. Their method consists of first determining suitable employment opportunities based on overlaps between the competencies, work activities and interests in a person's current or most recent occupation and those in alternative occupations, then identifying the skills gaps that must be addressed to make these job transitions possible. The employment alternatives the authors propose are also selected based on whether they have growth prospects as well as wages that are at least as high as those the worker currently earns or recently earned.

To illustrate their method, the authors look at employment alternatives for retail salespersons, cashiers and administrative assistants – three occupations that are at high risk of automation and viral transmission, and that also happen to be among the most affected by the pandemic. Workers in these three occupations are predominantly women, youth and racialized Canadians. They also tend to be low paid and less educated. The authors find that cashiers, for example, could become demonstrators and product promoters, as this occupation has similar features and requirements. To make this transition, however, workers currently employed as cashiers would need additional training to sharpen some skills – for example, technology design – that are used more intensively by demonstrators and product promoters.

Determining viable occupation alternatives and skills gaps is only one component of career guidance, however. Workers would also need information on available job opportunities and relevant training options in order to pursue and qualify for these jobs. Hence, for their framework to be most effective, the authors recommend that it be integrated into a comprehensive career guidance system.

As the world of work constantly evolves, under a wide range of pressures – be it changing demographics or new technologies – the ability to effectively navigate employment and training options is becoming increasingly important for working-age adults. For some workers, such as those currently employed in the energy sector, the need to find good job alternatives will likely become more acute, given Canada's expected transition to a net-zero economy. To avoid the harmful effects of economic restructuring experienced in the past, policy-makers and individuals should be equipped with the necessary evidence-based career guidance tools so they can trace possible employment paths and identify the skills upgrades needed to make those paths viable. The approach Oschinski and Nguyen develop in this study is the first step toward making these career guidance tools a reality.

RÉSUMÉ

La pandémie a causé de nombreuses perturbations sur le marché du travail. Alors que certains secteurs économiques multiplient les licenciements, d'autres tentent d'endiguer une pénurie de main-d'œuvre. Ces perturbations ont clairement établi que la capacité des travailleurs de cibler et de saisir rapidement de nouvelles occasions d'emploi déterminera leur résilience à court et à long terme. Et pour faire les meilleurs choix en termes d'emploi et de formation, il leur faut des outils plus efficaces pour s'informer sur les parcours de carrière possibles.

Matthias Oschinski et Thanh Nguyen proposent dans cette étude une approche à deux volets principalement axée sur les compétences. En évaluant les compétences, les tâches et les intérêts du poste récent ou actuel d'un travailleur par rapport à ceux d'autres emplois, les auteurs sont, d'une part, en mesure de cerner d'autres types d'emplois qui leur conviendraient et, d'autre part, capables de déterminer les écarts de compétences à combler pour leur permettre d'effectuer la transition. De plus, dans le choix de nouveaux métiers à proposer, ils s'en tiennent à ceux dont les perspectives de croissance et la rémunération sont au moins équivalentes à celles du poste récent ou actuel du travailleur.

Pour illustrer leur approche, ils examinent les nouveaux métiers qui conviendraient aux commis-vendeurs, aux caissiers et aux adjoints administratifs, soit trois types d'emploi exposés à de forts risques d'automatisation et de transmission virale, qui comptent d'ailleurs parmi les plus touchés par la pandémie. Ces emplois sont aussi principalement occupés par des femmes, des jeunes et des personnes racisées. Les auteurs montrent, par exemple, que les caissiers pourraient se tourner vers la démonstration ou la promotion de produits, des domaines dont les fonctions et les exigences s'apparentent à celles de leur poste actuel. Pour réussir leur transition, il leur faudrait toutefois suivre une formation pour perfectionner certaines compétences nécessaires aux démonstrateurs et aux promoteurs de produits, notamment en conception technologique.

Soulignons toutefois que repérer les possibilités d'emploi et les écarts de compétences n'est qu'une seule facette de l'orientation professionnelle. Pour se qualifier et décrocher un poste, les travailleurs ont aussi besoin d'informations sur les emplois disponibles et sur les possibilités de formation pertinentes. Afin d'optimiser l'efficacité de leur approche, les auteurs recommandent donc d'intégrer ces informations à un système global d'orientation professionnelle.

Face à l'évolution constante d'un marché du travail soumis à de nombreuses pressions, de la transition démographique aux nouvelles technologies, il est de plus en plus essentiel que les adultes en âge de travailler sachent naviguer entre les possibilités d'emploi et de formation. Étant donné que le Canada vise une économie à zéro émission nette dans un avenir rapproché, il deviendra d'autant plus important pour certains, comme les travailleurs du secteur énergétique, de trouver de bons emplois de rechanges. Pour éviter les effets néfastes des précédentes restructurations économiques, décideurs et citoyens doivent posséder des outils d'orientation professionnelle fondés sur des données probantes pour tracer d'intéressants parcours de carrière et cerner les compétences nécessaires pour s'y engager. L'approche proposée par les auteurs se veut une première étape vers la concrétisation de ces outils.

INTRODUCTION

The COVID pandemic fundamentally disrupted the economy, leading to high levels of unemployment and an economic contraction not seen since the Second World War (BDC 2021). By May 2020, Canada's unemployment rate had jumped to 13.7 percent, from 5.7 percent in February 2020. Around 1.7 million full-time and 1 million part-time workers lost their jobs (Statistics Canada 2021). By December 2021, labour markets in Canada had largely recovered, although it remained unclear what effect the spread of the Omicron variant and the closure of restaurants and other venues in some provinces will have on future employment levels. In addition, while the employment gains in late 2021 were driven by service-sector industries, in some of these industries – such as accommodation and food services, and business, building and support services – employment remained well below pre-pandemic levels.[1] Moreover, employment declines in sales and services occupations were the largest among all major occupational groups over the period from 2019 to 2021, signifying a change in the occupational composition of the country's labour force (Statistics Canada 2022).

The pandemic has also resulted in a shift in economic activity, creating new employment opportunities in health, education and construction for those workers who may be looking to leave sectors in decline. Automation and digitization trends were already contributing to structural change in Canada's labour market before the pandemic, and there is some indication that the outbreak of COVID-19 has accelerated these trends (Frenette and Frank 2020; Lane 2021).

To support unemployed workers transitioning back to work and underemployed workers seeking to change jobs, public policy efforts would greatly benefit from having more effective career-planning information tools using a skills-based approach, such as the one we propose. Rather than relying on an individual's degrees, certificates or most recent job title, a skills-based approach would determine suitable job opportunities by identifying overlaps in competencies, work activities and interests between a person's current or most recent occupation and alternative options, possibly in a different industry. This would broaden the range of employment pathways individuals could consider and likely result in better job matches. But identifying possible job options is not enough. A skills-based approach to career planning should also identify the skills gaps individuals must address to make a job transition possible. This would not only enable better targeting of retraining efforts, it would also increase participation in training programs and completion rates, as well as improve the likelihood of finding and keeping a job once training is completed. As the need for lifelong learning and continuous skills upgrading becomes a reality for most workers, a skills-based approach to career planning can be an invaluable tool for individuals and policy-makers alike.

Recent research by the Labour Market Information Council (LMIC) suggests that jobseekers and employment-assistance organizations struggle to find relevant labour

[1] Statistics Canada, "Labour force characteristics by industry, monthly, unadjusted for seasonality" (formerly CANSIM), Table 14-10-0022-01. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410002201

market information that adequately addresses individual needs. Among the most sought after data are those on skills requirements for specific occupations (LMIC and Future Skills Centre 2021). This is echoed by Sareena Hopkins, executive director of the Canadian Career Development Foundation, who points out that organizations offering career services require evidence-based tools that provide labour market information on skills requirements to identify opportunities for job transferability, as well as information on existing, new and emerging training opportunities (Hopkins 2020).

In this paper we present a new methodology for a skills-based approach to career planning consisting of two algorithms. The first identifies the most suitable career alternatives based on the similarities between an individual's current or recent occupation and other occupations, according to the skills sets involved and other characteristics. The second identifies the gap in the required skills between the occupation in question and a target occupation – an essential feature that is necessary to establish tailored training recommendations.

In recent years, there have been notable efforts to develop skills-based information tools to advise individuals about labour market opportunities. One Canadian example is the Royal Bank of Canada's Upskill, an online tool powered by artificial intelligence to help young people explore career opportunities. Another example is a system developed in Australia that identifies possible job pathways based on occupational skills profiles (Dawson, Williams, and Rizou 2021). Most of these tools, however, focus only on recommending occupations, and do not identify skills gaps and ways to bridge them.

We argue that retraining and upskilling frameworks cannot be implemented on a one-size-fits-all basis. For this reason, a career-advice information tool that uses a skills-based approach should contain three elements: 1) informing individuals about viable job transitions; 2) determining the skills gap between their original occupation and a target occupation; and 3) providing recommendations on available employment opportunities and training options to address the skills gaps. The methodology we propose contains the first two elements. We suggest that it will be most effective if used together with a service providing real-time data on job openings in a region, such as ZipRecruiter or Indeed, as well as an information service on training opportunities to address specific skills gaps, like the one outlined by Bonen and Oschinski (2021).

The growing attention being paid to skills-based labour market information tools raises another important issue. The results they produce largely depend on the skills classifications used, which often lack sufficient transparency, mainly for proprietary reasons (such as those used by Burning Glass Technologies or Textkernel). We argue that an integrated skills-based approach should ideally be based on a classification system that is widely used and transparent, to facilitate the development of other tools that can easily communicate with and be integrated into established labour market tools. The skills-based approach we propose uses a publicly available classification system that is widely used by labour market researchers and practitioners.[2]

[2] That said, the approach should ideally be based on a specific Canadian classification like OaSiS, which is currently being developed by Statistics Canada, LMIC and ESDC (Labour Market Information Council 2021).

To illustrate our methodology, we apply it to jobs in occupations that are at high risk of viral transmission and automation and have been profoundly impacted by the pandemic. However, it can be applied to any occupation. The methodology presented here can be used in the development of labour market tools to assist policy-makers, employment-assistance organizations, education providers and labour market professionals in enabling a swift economic recovery.

COVID-19 AND THE CHANGING NATURE OF WORK

Even prior to the COVID-19 pandemic, Canada's labour market faced challenges fuelled by demographic changes, a commitment to meeting climate-change goals, and automation and digitization. Regarding demographic changes, Statistics Canada forecasts a decrease in the country's labour market participation rate from around 66 percent in 2017 to 63 percent in 2036 (Martel 2019). As a result, the ratio of people in the labour force to those who are not (and who are 65 years of age and older) will decrease from four-to-one to less than three-to-one. An aging workforce, coupled with a longer life expectancy, affects Canada's labour market in several ways. First, investment in labour-replacing and productivity-enhancing technologies will need to increase to compensate for potential labour shortages, as is already the case in Japan and other Asian countries (Cross 2021). Second, lifelong learning and continuous education will play a more important role, as workers might have to work longer and retire at a later age (Côté and White 2020). Finally, demographic changes will likely be accompanied by a demand shift away from durable goods toward services such as health care, which people tend to consume more of as they age. This is expected to induce a reallocation of labour across sectors and industries. Taken together, these trends are impacting skills demand, and research suggests that they are increasing the demand for higher skills (OECD 2020).

A second trend impacting labour markets and skills demand arises from Canada's commitment to meeting its climate-change goals and, more broadly, to fighting the effects of climate change. A recent study by Marin and Vona (2019) examines the association between climate policies and workforce skills in 14 European countries and 15 industrial sectors. The authors find that climate-change policies have skills-biased effects similar to those associated with globalization and automation, in that the demand for middle-skill occupations tends to decline and demand for high-skill occupations increases. Recent studies by the World Economic Forum (2018) and the International Labour Organization (2021) come to similar conclusions.

Lastly, automation and digitization have been contributing to a change in skills demand. For instance, empirical findings from a study of 37 countries on the impact of robot adoption on skills indicate that it affects lower- and middle-skill occupations negatively while favouring higher-skill jobs — a phenomenon dubbed "skills-biased technological change" by economists (de Vries et al. 2020). As Speer and Bezu (2021) report, low- and middle-skill jobs have been declining in Canada over the past three decades, while the share of high-skill jobs have increased, though this job polarization was less pronounced in Canada than in other OECD countries (OECD 2020; Frank

and Frenette 2021). Similar evidence exists regarding digitization (Arntz, Gregory and Zierahn 2019). Prior to the pandemic, the OECD estimated that around 29 percent of occupations in Canada were likely to be significantly impacted by digital technologies, and it emphasized the need for retraining and upskilling (OECD 2019).

Evidence on whether the COVID-19 pandemic has accelerated the trend toward automation and digitization in Canada appears to be mixed. A recent study by Alexopoulos and Lyons (2021) suggests that business investment in digital technologies declined during the pandemic. In contrast, Lane reports that the pandemic increased the momentum of Canada's digital-technology sector (Lane 2021).

Irrespective of whether the COVID-19 pandemic is accelerating digital-technology adoption, there is agreement that the digital transformation will continue and likely accelerate in a post-pandemic economy, with implications for changes in skills demand and skills requirements. For policy-makers, it will be imperative to assist those unable to return to or stay in their occupations. We must learn from previous mistakes. As Caranci and Fong (2021) and Autor (2021) point out, the current situation is comparable with that of the 1990s, when globalization and skills-biased technological change led to widespread displacement of middle-skilled, middle-income workers in North America's manufacturing sector. As Robinson (2018) has shown, workers displaced by plant closures often take ill-suited jobs (i.e., occupations with a relatively small skills overlap with their previous occupation), resulting in reduced earnings and a loss of skills.

Hence, among a variety of measures that policy-makers can take to help these workers get back on their feet, finding viable employment alternatives may be key to providing long-term solutions. And in doing so, we believe it is best to focus on skills rather than degrees or diplomas (Kumar and George 2020). In the next section, we outline our methodology for identifying viable job transitions based on individuals' competencies, work activities and interests, as well as for determining skills gaps between their original occupations and their target occupations.

SKILLS-BASED METHODOLOGY

Our methodology consists of two algorithms. The first, which we call the "proximity algorithm," identifies occupations that have features similar to those of an individual's current occupation. The algorithm determines the degree to which the skills, knowledge, abilities, general work activities and interests required for alternative occupations overlap with those required for a person's current occupation.

The second algorithm, the "skills-gap algorithm," determines skills differences between the two occupations. It establishes which skills are crucial for a target occupation and evaluates to what extent they differ from the original occupation. This allows us to determine significant skills gaps between a person's current occupation and a desired one, and thus can inform recommendations for retraining and upskilling options.

Determining the characteristics of occupations

Skills, knowledge and abilities are commonly viewed as competencies applied in the performance or completion of a task (LMIC 2019).[3] Research suggests that an alignment between an individual's competencies with those required by their job has a high influence on job satisfaction and job performance (Bayona, Caballer and Peiro 2020). Hence, our proximity algorithm relies on these three domains to determine the degree of similarity (or proximity) between two occupations. In addition to identifying similarities in required competencies, our proximity algorithm considers whether occupations involve similar work activities, the fourth characteristic we consider. Finally, we account for an individual's interests (i.e., preferences for specific work environments), as they should be taken into consideration when recommending alternative occupations.

To determine how these five domains relate to various jobs, we use the Occupational Information Network (O*NET), a detailed inventory of 1,012 occupations that was established in 1998 by the US Department of Labor. Thanks to its level of disaggregation and the potential to use its data for quantitative analyses, O*NET has been widely used by researchers, policy-makers and employment-assistance organizations within and outside the US (Handel 2016).

O*NET organizes the characteristics of occupations into nine domains: abilities, knowledge, skills, interests, work activities, work context, work styles, work values and job zone. Each of these domains contains more specific elements with ratings that indicate the level and the importance of each element in the domain to the occupation in question. For example, the domain "work styles" contains the element "co-operation." The associated values for the importance of co-operation are 57 for economists, 94 for dental assistants and 100 for actors — indicating a higher importance of co-operation in the latter two occupations compared with that of an economist.

For some of the domains, O*NET also contains data about the degree of complexity of a skill or an ability required to properly perform in an occupation (called "level"). For example, the skill "using mathematics to solve problems" is important for both physicists and actuaries. Yet the degree of complexity — that is, the level of mathematics — is higher for physicists than for actuaries. Hence, O*NET assigns a higher value for the level of mathematics required for physicists than actuaries, even though the value of the importance of mathematics is the same for both occupations.

Having identified the different domains as well as data values for each domain, we then compute a weighted distance between the values associated with each domain for an individual's current occupation and the corresponding values for alternative occupations to measure the degree of proximity between the two.[4] The weights we use for each domain reflect its relative importance based on actual job transitions that have occurred between the occupations in question. The lower the resulting value, the

[3] Skills are defined as the capabilities needed to complete a task. Knowledge is defined as a body of facts, principles and theories that are related to a field of work.
[4] See the appendix for details.

closer the proximity between the two occupations and the larger the overlap between the competencies, work activities and interests involved.

Determining skills gaps

The proximity algorithm is an important first step in determining viable employment alternatives. Yet this is only one component in providing sufficient evidence to help workers make an informed decision regarding their employment options. As mentioned above, the current wave of digitization and automation is significantly changing the nature of work, which ultimately results in a change in skills requirements. Consequently, in addition to obtaining information on potential employment pathways, workers facing disruption also need to know which skills they should focus on when considering a change in occupation. This will not only assist them in determining the effort involved in making a change, it will also be vital for their choice of an appropriate retraining course or program.

Hence, our second algorithm focuses on determining the skills gap between an individual's current occupation and a target occupation. To do this, we follow Alabdulkareem et al. (2018) and apply the concept of revealed comparative advantage (RCA). RCA is commonly used in international economics to determine a country's comparative advantage in the production and export of specific goods or services. It represents a ratio of the share of a country's exports of a specific good or service to the share of the global export of that good or service. A value of RCA greater than 1 indicates that the country has a comparative advantage in the production of that commodity or service.

In the context of occupations and skills, the concept of RCA can be applied to ascertain which skills are more intensively used in an occupation. RCA greater than 1 would indicate that a certain skill is used more intensively in a given occupation than in all occupations taken together.

EMPLOYMENT PATHWAYS FOR WORKERS IN HIGH-RISK OCCUPATIONS

Having presented the occupational proximity and the skills-gap algorithms, we illustrate their use by generating viable employment pathways for a sample of occupations at high risk of both viral transmission and technological disruption. These occupations are of interest for two reasons. First, workers in these occupations were among those most affected by the pandemic and tend to belong to vulnerable groups most likely to experience negative labour market outcomes. Second, because the pandemic has the potential to accelerate the impact of technological change on skills demand, Canadians in these occupations may soon have the most urgent need to find alternative employment.

To identify these occupations, we adopt the approach conceived of by Chernoff and Warman (2020), who developed risk indices for viral transmission and automation at

the occupational level using O*NET. The risk of viral transmission is determined by the physical proximity to other people while performing ones' job, and the risk of automation is determined by measuring the intensity of routine activities performed in an occupation. The authors then estimate a joint risk indicator for automation and viral transmission, and group occupations into low-, medium- and high-risk categories.

To illustrate our method, we focus on three high-risk occupations: retail salespersons, cashiers, and secretaries and administrative assistants. According to the 2016 Census, retail salespersons make up the largest group, with total employment of 626,780 (or 3.6 percent of the employed workforce); cashiers number around 376,760 employees (1.8 percent); and administrative assistants total 240,795 (1.4 percent).

As shown by Statistics Canada (2020), women, youth and racialized Canadians were most affected by the pandemic in terms of employment loss. Looking at the composition of workers in these three high-risk occupations, we find that these groups together also appear to have the highest risk of viral transmission and automation. Women are over-represented in all three occupations, accounting for 95.6 percent of administrative assistants, 82 percent of cashiers and 58 percent of retail salespeople, while their overall employment share stands at 48.3 percent. Similarly, the employment share of racialized Canadians is higher among cashiers (27 percent) and retail salespeople (23 percent) than in all occupations (21 percent). Youth (those 15 to 24 years of age) are also over-represented in these occupations, accounting for almost 55 percent of cashiers and 37 percent of retail salespeople, compared with 13.5 percent of the employed workforce.

Workers in these high-risk occupations also tend to be relatively low paid and less educated. Median annual wages are $10,054 for cashiers, $15,732 for retail salespeople and $36,220 for administrative assistants, all below the overall median wage of $37,231.

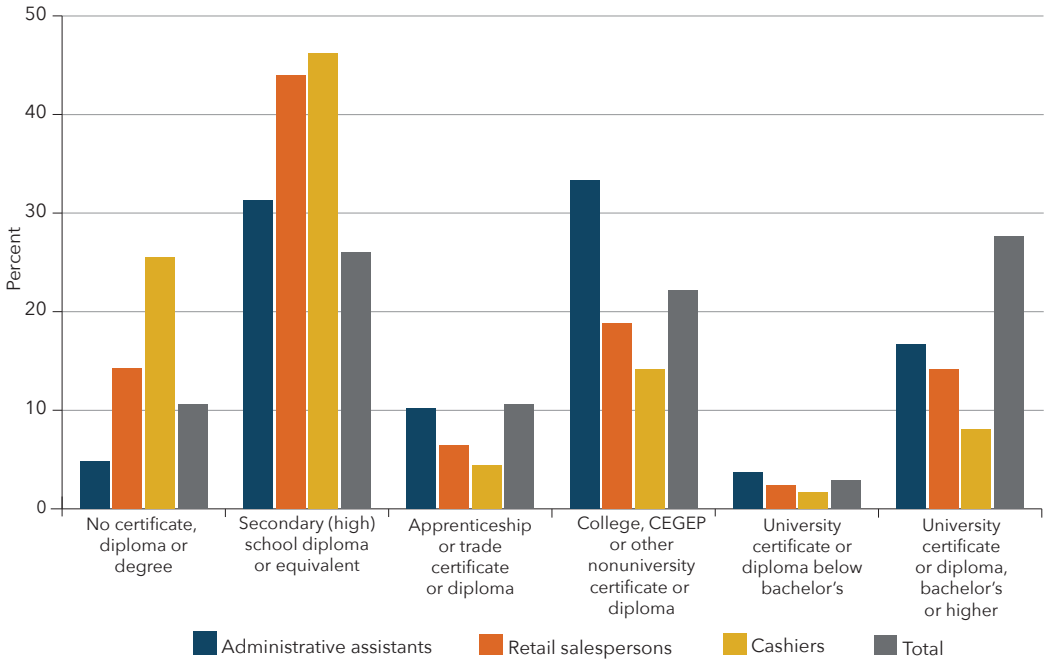
Autor and Reynolds (2020) point out that the negative impact of automation on a large proportion of low-wage jobs could exacerbate the economic plight of lower-skilled workers. If low- and middle-skill occupations come under pressure from increased automation, lower-skilled workers might be less likely to find alternative employment opportunities matching their skills sets. Viable alternative employment might not be easily available — especially if workers lack the training or experience required for those occupations. In addition, competition for the lower-wage jobs that remain could increase, putting more downward pressure on wages in these occupations. Overall, these effects might exacerbate income inequality.

The comparatively low pay in these occupations suggests that their skills requirements are relatively low. Indeed, all three occupational groups have a disproportionately lower share of workers with a university credential at a bachelor's level or higher (see figure 1). Among cashiers and retail salespeople, there is a disproportionately larger share of workers with no certificate, diploma or degree or high school education or equivalent as the highest credential earned. Among administrative assistants, there is a relatively higher share of workers with a high school diploma, nonuniversity certificate, and university credential

below a bachelor's level. These findings suggest that the retraining efforts required might be higher for those employed as cashiers who are predominantly low skilled.

That said, people also gain skills through learning on the job, and skills gained through work experience can compensate for the lack of a credential, thus opening employment opportunities not available to them otherwise (Bessen 2015; Blair et al. 2020). For this reason, more-experienced employees without a post-secondary credential might be able to transition into occupations requiring a bachelor's degree, while less- experienced, and arguably younger, employees might require more formal training. Hence, a person's age and job tenure are likely going to matter in identifying alternative occupations.

Figure 1. Educational attainment by occupation, Canada, 2016



Source: Statistics Canada, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm

The socio-demographic characteristics we have presented highlight a few key points. First, there is no one-size-fits-all approach when designing employment pathways and assisting workers at high risk from automation and digitization and viral transmission. Differences in age and educational attainment between occupational groups suggest that it is important to identify tailored solutions. Second, younger workers with lower educational attainment, for example cashiers, might require more retraining than workers with more work experience or higher educational attainment, but they arguably have a greater opportunity for longer-term formal retraining. In contrast, employees and workers who are older will likely require faster transitions, necessitating different types of training. In the context of our analysis, this is likely to be the case for many administrative assistants.

Employment options for workers at high risk

In this section, we present employment opportunities generated by our algorithms for each of the three high-risk occupational groups. Note that we include two additional conditions when applying our algorithm. First, we only include those close-proximity occupations for which the median wage is at least as high as that for their most recent occupation. Second, we only include occupations with a positive job-growth outlook. We do so to avoid recommending employment options that would result in a pay cut or that would likely have declining job opportunities over the medium term.

Table 1 displays the top five results produced by our proximity algorithm for each occupation. As the results show, the closest occupations to administrative assistant jobs are loan interviewers and clerks as well as paralegals and legal assistants. Loan officers, human resources specialists and insurance sales agents are other viable options. For cashiers, counter and rental clerks and bartenders have the largest overlap, and for retail salespeople, the closest occupations are demonstrators and product promoters as well as counter and rental clerks.

Having identified the target occupations with most overlap in competencies, general work activities and interests, we can now determine the skills gaps between the original occupation and a target occupation.

As we have seen in table 1, cashiers have close occupational proximity with demonstrators and product promoters. Figure 2 compares skills intensities between the two occupations, focusing on five skills that vary in importance for cashiers and demonstrators and product promoters.

Both occupations score similarly in terms of skills intensity for writing and active learning, whereas the skills intensity of operations analysis, technology design and

Table 1. Closest employment alternatives for occupations at high risk of automation and viral transmission, according to proximity algorithm

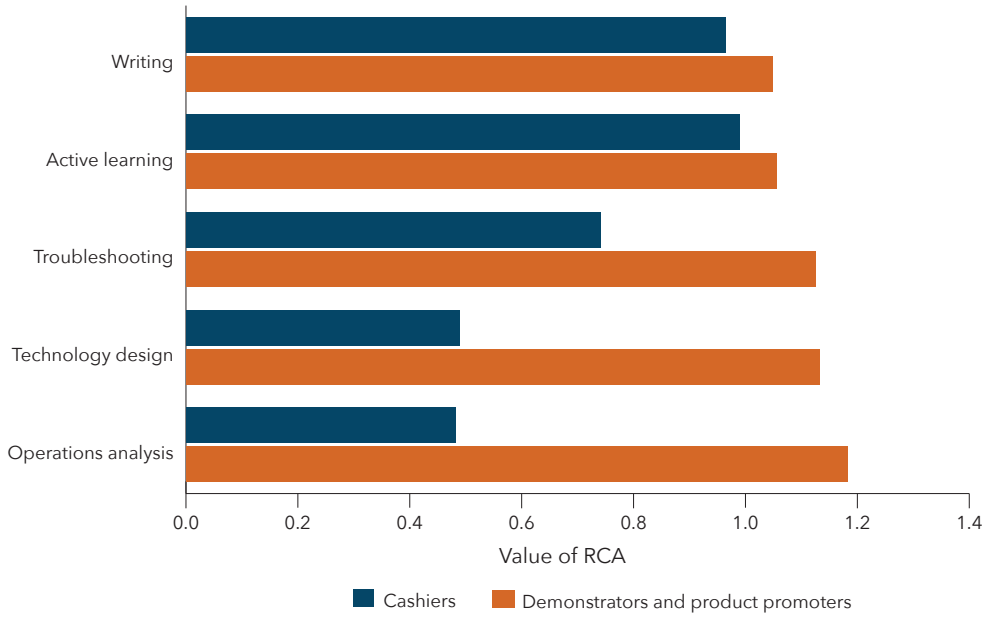
	Occupations at risk		
Rank	Administrative assistants	Cashiers	Retail salespersons
1	Loan interviewers and clerks	Counter and rental clerks	Demonstrators and product promoters
2	Paralegals and legal assistants	Bartenders	Counter and rental clerks
3	Loan officers	Receptionists and information clerks	Sales representatives, wholesale and manufacturing sectors (excludes technical and scientific products)
4	Human resources specialists	Demonstrators and product promoters	Insurance sales agents
5	Insurance sales agents	Food servers, nonrestaurant	Sales representatives, wholesale and manufacturing sectors, technical and scientific products

Source: Calculations by the authors.

troubleshooting is substantially higher for demonstrators and product promoters than it is for cashiers, for whom this would represent important skills gaps. All three of these skills are deemed technical skills in O*NET, while writing and active learning are categorized as basic skills. Hence, our algorithm demonstrates that a person who wants to transition from being a cashier to a demonstrator and product promoter should mainly focus on training for technical skills – specifically the three mentioned above.

Another example is the skills gaps between administrative assistants and human resources specialists (see table 1). Figure 3 presents selected skills for which the skills intensity between the two occupations diverges. As the results suggest, a person aiming to transition from administrative assistant to human resources specialist should mainly focus on learning strategies, which is a basic skill in O*NET, as well as systems evaluation and systems analysis,[5] and two social skills – instructing and persuasion.

Figure 2. Example of skills comparisons for cashiers and demonstrators and product promoters

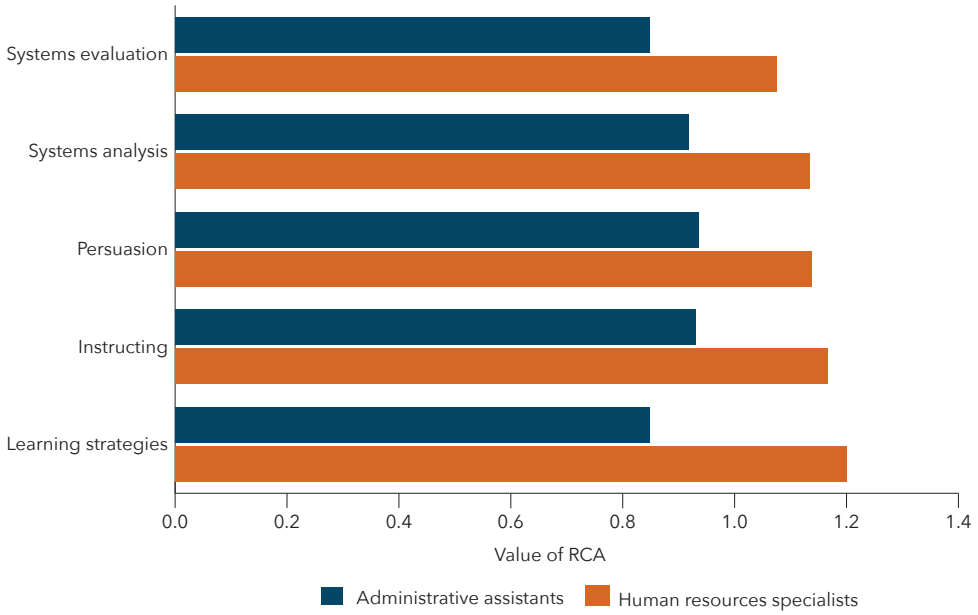


Source: Calculated by the authors based on O*NET data. https://www.onetonline.org/
RCA = revealed comparative advantage
Note: RCA represents the intensity of an occupation's requirement for a skill relative to that of other occupations. RCA greater than 1 would indicate that a certain skill is used more intensively in a given occupation than in all occupations taken together. In using RCA, we follow Alabdulkareem et al. (2018).

Before turning to the main takeaways from our analysis, it is important to highlight one additional potential application of our skills-gap algorithm. While the focus of this paper is on illustrating those transition pathways that require only a limited amount of retraining or upskilling, our two algorithms can also be applied to inform

[5] These skills are part of O*NET's "system skills" – capacities applied to comprehend, monitor and improve socio-technical systems. Other examples of system skills include judgment and decision-making.

Figure 3. Example of skills comparisons for administrative assistants and human resources specialists



Source: Calculated by the authors based on O*NET, https://www.onetonline.org/
RCA = revealed comparative advantage
Note: RCA represents the intensity of an occupation's requirement for a skill relative to that of other occupations. RCA greater than 1 would indicate that a certain skill is used more intensively in a given occupation than in all occupations taken together. In using RCA, we follow Alabdulkareem et al. (2018).

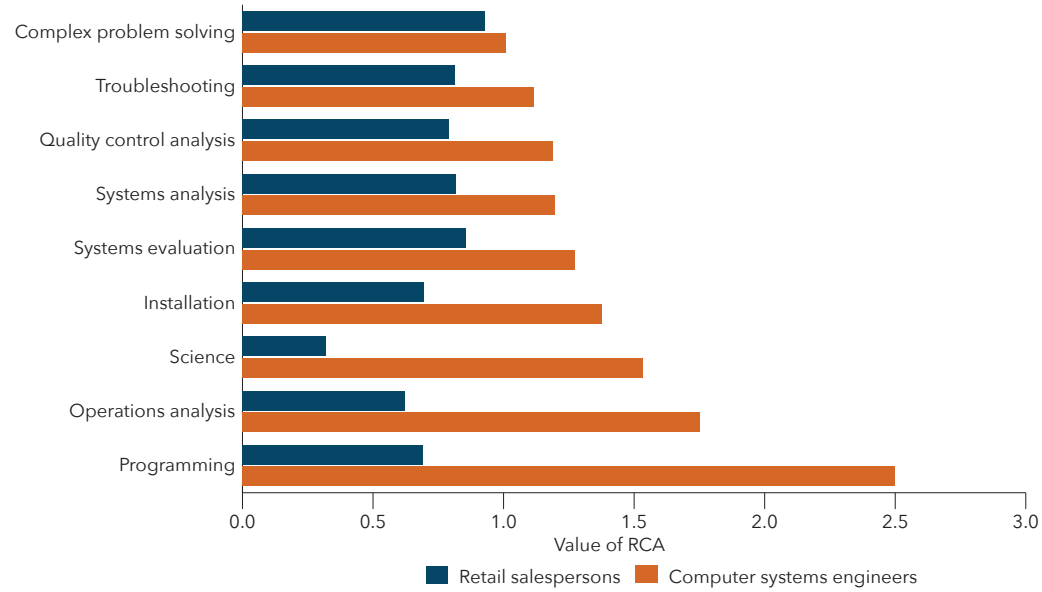
individuals about transitions between occupations that are further apart in competencies, work activities and interests.

Figure 4 presents differences in skills intensities between retail salespeople and computer systems engineers. As shown, and not particularly surprising, an individual aiming to transition between these two occupations would need to focus largely on training in technical and systems skills. The significant difference in the dominant skills between these two occupations indicates that a transition from retail sales to computer systems engineering would require a substantial amount of retraining and upskilling.

MAIN TAKEAWAYS AND POLICY LESSONS

Automation, digitization, demographic changes and a shift toward a more sustainable economy are impacting Canada's labour market over the medium and long terms. While the structural changes involved are poised to boost productivity across economic sectors – especially when the adoption of digital technology solutions picks up pace – they will also affect skills requirements and skills demand in Canada's labour market, not unlike the impact automation and globalization had on North America's manufacturing sector between the 1980s and the early 2000s.

Figure 4. Example of skills comparisons for retail salespersons and computer systems engineers



Source: Calculated by the authors based on O*NET. https://www.onetonline.org/
RCA = revealed comparative advantage
Note: RCA represents the intensity of an occupation's requirement for a skill relative to that of other occupations. RCA greater than 1 would indicate that a certain skill is used more intensively in a given occupation than in all occupations taken together. In using RCA, we follow Alabdulkareem et al. (2018).

Although increased productivity and a shift toward a carbon-neutral economy are to be welcomed, it is important to ensure that economic transitions occur in an inclusive fashion. In other words, social and labour market policies should aim to enable all Canadians to participate in and profit from these transitions. The skills-based approach to career planning outlined in this paper would support this goal by offering tailored employment options for workers looking for re-employment or new employment opportunities, as well as by informing them about the skills gaps they would need to address to make these job transitions a reality.

In the short-term, skills-based labour-market information tools should be part of the policy toolkit used to support Canadians in occupations with a high risk of automation and viral transmission, as workers in these occupations are among the most vulnerable population groups, including women, racialized Canadians and youth.

Our algorithm is flexible enough to select only those employment alternatives that minimize retraining requirements, thus making transitions faster, or those that offer better pay and employment prospects than workers' current jobs. Offering a variety of employment pathways would allow individuals to explore possible alternatives and choose the one that suits them best.

Another important point of our paper is the idea that skills-based algorithms such as those we propose should be integrated with other labour market information tools. Ideally, an integrated approach should encompass three main features: 1) identification of employment alternatives (as we do with the proximity algorithm); 2) determination of the skills gap (our second algorithm); and 3) referral to appropriate employment and training options (as outlined in Bonen and Oschinski 2021).

Last but not least, career-information tools must rely on occupational and skills classifications that allow disaggregation at a skills level. For our analysis, we applied O*NET's classification, as it is a well-established and widely used framework. That said, it is encouraging that Employment and Social Development Canada, Statistics Canada and the Labour Market Information Council are currently developing the Occupational Skills and Information System, also known as OaSIS. Establishing a classification that focuses on the needs and requirements of the Canadian labour market would greatly improve the creation of tailored employment pathways applicable in the Canadian context. It will, however, be imperative to ensure a broad adoption and application of this taxonomy. Currently, there appear to be too many fragmented solutions that, in some cases, even differ in their definitions of skills and competencies (LMIC 2020; World Economic Council 2021). In cases such as ours where researchers resort to O*NET, the results can differ depending on what concordance table is applied to map Canada's National Occupational Classification system to the US Standard Occupational Classification system.

As our analysis aims to demonstrate, building data-driven labour market tools is feasible given an appropriate skills classification system. The algorithms we developed can be applied in digital tools to help workers facing disruption transition to alternative jobs.

Better data availability and a broader variety of data-visualization software will increasingly allow for the evolution of digital labour market tools. Yet these tools will only be useful if they are designed with the needs and requirements of the target audience in mind. Involving potential users such as employment-assistance organizations and individual job-seekers in the initial development stages would help ensure that these tools are effective and lead to better training and career transitions.

APPENDIX

Proximity algorithm

To determine the value of each domain for a given pair of occupations, we combine values for each component of the domain from O*NET by calculating the Euclidean distance, as shown in the formula below:

$$D_{Domain} = \sqrt{(X_a - Y_a)^2 + (X_b - Y_b)^2 + \cdots + (X_z - Y_z)^2}, \quad (1)$$

where
X and *Y* refer to the two occupations in question, and *a*, *b* and *z* represent individual elements of a specific domain (e.g., "Arithmetic reasoning" and "Originality" in the "Abilities" domain).

Doing this for all nine O*NET domains then provides us with distance measures for each domain (i.e., D_{Skills}, $D_{Knowledge}$, $D_{Abilities}$, D_{GWA}, $D_{Interest}$, $D_{WorkStyles}$, $D_{WorkValues}$, $D_{WorkContext}$, $D_{JobZone}$) between each selected occupation and all other occupations listed in O*NET.

We next establish the importance of each domain for a transition between two occupations and determine to what degree a domain factors into an employment transition by assigning a weight to each domain in our algorithm. To achieve this, we apply a mix of quantitative and qualitative methods.

First, we merge data from actual employment transitions provided by the US Current Population Survey (CPS) with all O*NET descriptors[1] and include the following data points from the CPS database:

- The percentage of individuals who transitioned from the original to the target occupation
- The projected growth of the target occupation over a 10-year period
- The change in wages when moving from the original to the target occupation

An example is provided in table A1, where the column labelled "Original occupation" represents the occupation people transitioned from and the column labelled "Target occupation" lists the occupation they transitioned to in 2019. The column labelled "Transitions" is the percent of people who transitioned from the original to the target occupation, out of all people who left the original occupation. For instance, of all nuclear engineers who changed jobs in 2019, around 90 percent transitioned to jobs as chemical engineers. The column labelled "Employment growth" presents the expected percentage growth in the target occupation over a 10-year period (in our case from 2019 to 2029). The column "Wage change" contains the percentage

[1] We use 2019 CPS data (the latest available at the start of our project) as they neatly map to O*NET's taxonomy. One caveat with regard to the Canadian context might be that workforce transitions in Canada differ from those in the US for some sectors. This caveat, however, can be overcome if data on occupational mobility in Canada become available.

Table A1. Example of data used for the proximity algorithm

Original occupation	Target occupation	Work context	Knowledge	Skills	General work activities	Job zones	Work value	Interests	Abilities	Work setting	Transitions (%)[1]	Employment growth (%)	Wage change (%)
Nuclear engineers	Chemical engineers	−2.155	−2.342	−1.668	−2.028	0.724	−0.940	−2.188	−1.795	−0.533	90.690	4.4	−4.125
Tool grinders, filers, and sharpeners	Construction labourers	−0.660	−1.377	−1.060	−0.669	−1.282	−0.882	−2.255	−0.822	0.349	68.529	5.4	−6.293
Title examiners, abstractors, and searchers	Paralegals and legal assistants	−1.818	−1.800	−2.104	−1.891	−1.282	−1.008	−0.730	−1.901	−1.652	67.993	10.5	7.337
Occupational therapists	Registered nurses	−1.706	−2.337	−1.565	−1.890	−1.282	−1.196	−1.539	−1.321	−1.296	66.265	7.2	−13.712
First-line supervisors, landscaping, lawn service, and groundskeeping workers	First-line supervisors, housekeeping and janitorial workers	−0.332	−1.895	−1.790	−1.484	−0.279	−1.181	−2.326	−1.236	−0.765	60.632	8.4	−17.362

Source: Estimated by the authors based on O*NET, https://www.onetonline.org; and "Current Population Survey," U.S. Census Bureau and U.S. Bureau of Labor Statistics, https://www.census.gov/programs-surveys/cps.html

[1] The percentage of people who transitioned from the original to the target occupation, out of all the people who left the original occupation.

difference in median hourly earnings between the original and the target occupations. For example, occupational therapists who transitioned to jobs as registered nurses experienced a decline in median hourly wages of around 14 percent. The remaining columns contain information on the nine O*NET domains, as well as indications of statistical significance (z-scores) of the Euclidean distance between the original and the target occupations.

Next, we use this merged dataset to run a logit regression to determine which O*NET descriptors are relevant in a job transition. Based on the regression results, we find that knowledge, skills, abilities and general work activities (GWA) appear to play an important role.

One potential drawback of using only past job transitions to determine a recommendation algorithm is that some of these transitions might have occurred involuntarily (e.g., as a result of a plant closure). Since we want to ensure that job recommendations are aligned with people's actual preferences, we include the O*NET domain "Interests" in our final algorithm. To determine what weight to attribute to each domain in producing a transition recommendation, we supplement our quantitative method with an iterative approach and focus only on those job transitions that lead to jobs with a positive outlook and higher wages.

By training our algorithm on the data we just described, we arrive at the following formula:

$$OCC_{change} = 1.2 * Z(D_{Skills}) + 1.3 * Z(D_{Knowledge}) + Z(D_{Abilities}) + Z(D_{GWA}) + Z(D_{Interest}) \quad (2)$$

For each occupational change (OCC_{change}) the domain "Skills" has an associated weight of 1.2, "Knowledge" has an associated weight of 1.3, and the remaining domains, "Abilities," "General work activities" and "Interests," each have a weight of 1.

Skills-gap algorithm

The concept of revealed comparative advantage (RCA) is commonly used in international economics to assess a country's export potential. RCA is measured as a product's share of a country's total exports in relation to that product's share of world trade. Calculated in this way, RCA can take values between 0 and +∞. An RCA value above 1 indicates that a country has a comparative advantage in exporting a specific commodity. A value of less than 1 is interpreted as the country having a comparative disadvantage in producing and exporting that commodity.

In applying the definition of RCA in the context of occupations and skills, we can say that an occupation (*O)* has a relatively high intensity – a revealed comparative advantage so to speak – in a specific skill (*s)* when the ratio of the occupation's requirement for that skill to the total skills requirement (*S)* exceeds the same ratio for total occupations (*T)*. Mathematically, we can express this as follows:

$$RCA_{sO} = \frac{X_{Os} / \sum_{s \in S} X_{Os}}{X_{Ts} / \sum_{s \in S} X_{Ts,}} \quad (3)$$

where
S = the set of all skills
s = a specific skill
X_{Os} = the use of skill s in occupation O
X_{Ts} = the use of skill s in all occupations
$\sum_{s \in S} X_{Os}$ = the use of all skills S in occupation O
$\sum_{s \in S} X_{Ts}$ = the use of all skills S in total occupations T.

To measure the use of a particular skill in an occupation (X_{Os}), we calculate the average of the values for level and importance of each skill for each occupation, both of which are reported in O*NET.

As O*NET breaks down its "Skills" domain into six subcategories, we can be more specific regarding the nature of skills an individual should be focusing on when making a particular occupational transition.

Specifically, O*NET divides skills into the following categories:[2]

- Basic skills: Aptitudes that enable rapid knowledge acquisition; for example, mathematics, reading comprehension and active listening
- Social skills: Capacities required to work with people to achieve specific goals
- Complex problem-solving skills: Aptitudes that facilitate the solution of ill-defined problems in complex, real-world settings
- Technical skills: Capacities applied to design, set-up, operate and correct malfunctions with regard to machines or technological systems; for example, programming and equipment maintenance
- Systems skills: Capacities applied to comprehend, monitor and improve socio-technical systems; for example, judgment and decision-making
- Resource-management skills: Capacities applied to allocate resources efficient

Doing this for all occupations and skills allows us to determine which skills are most important for a particular occupation and then compare occupations by their respective skills intensities. This way we can establish which skills job-seekers should be focusing on when transitioning to a new occupation and which skills they may be lacking (skills gaps).

[2] See O*NET's skills descriptors, https://www.onetonline.org/find/descriptor/browse/Skills/

REFERENCES

Alabdulkareem, A., M. R. Frank, L. Sun, B. AlShebli, C. Hidalgo, and I. Rahwan. 2018. "Unpacking the polarization of workplace skills." *Science Advances* 4 (7). https://www.science.org/doi/10.1126/sciadv.aao6030

Alexopoulos, M. and K. Lyons. 2021. *Evaluating the Future of Skills, Jobs, and Policies for the Post COVID Digital Economy*. Future Jobs Canada, University of Toronto. https://futurejobscanada.economics.utoronto.ca/final-report/.

Arntz, M., T. Gregory, and U. Zierahn. 2019. *Digitalization and the Future of Work: Macroeconomic Consequences*. IZA Discussion Paper Series No. 12428. Bonn, Germany: Institute of Labor Economics.

Autor, D. 2021. "Why Was the 'China Shock' So Shocking – and What Does This Mean for Policy?" In *Combating Inequality: Rethinking Government's Role*, edited by O. Blanchard and D. Rodrik. Cambridge, MA: MIT Press. 109-116

Autor, D. and E. Reynolds. 2020. *The Nature of Work after the COVID Crisis: Too Few Low-Wage Jobs.* The Hamilton Project, essay 14. Washington, DC: Brookings.

Bayona, J. , A. Caballer, and J. Peiro. 2020. "The Relationship between Knowledge Characteristics' Fit and Job Satisfaction and Job Performance: The Mediating Role of Work Engagement." *Sustainability* 12 (6): 2336; https://doi.org/10.3390/su12062336.

Bessen, J. 2015. *Learning by Doing: The Real Connection Between Innovation, Wages, and Wealth.* New Haven: Yale University Press.

Blair, P. Q., T. G. Castagnino, E. L. Groshen, P. Debroy, B. Auguste, S. Ahmed, F. G. Diaz, and C. Bonavida. 2020. "Searching for STARS: Work Experience as a Job Market Signal for Workers Without Bachelor's Degrees." NBER Working Paper Series, no. 26844, March. Cambridge, MA: National Bureau of Economic Research.

Bonen, T. and M. Oschinski. 2021. *Mapping Canada's Training Ecosystem: Much Needed and Long Overdue.* IRPP Insight no. 34, Montreal: Institute for Research on Public Policy.

Cléroux, P. n.d. "2021 Economic outlook: Playing catch-up." In *BDC blog*, on the website of the Business Development Bank of Canada. bloghttps://www.bdc.ca/en/articles-tools/blog/2021-economic-outlook-canada

Caranci, B. and F. Fong. 2021. "Don't Let History Repeat: Canada's Energy Sector Transition and the Potential Impact on Workers." Toronto: TD Economics.

Chernoff, A. W. and C. Warman. 2020. *COVID-19 and Implications for Automation*. NBER Working Paper 272249, July.

Côté, A. and A. White. 2020. *Higher Education for Lifelong Learners: A Roadmap for Ontario Post-Secondary Leaders and Policymakers*. Ontario 360 Policy Papers. https://on360.ca/policy-papers/higher-education-for-lifelong-learners-a-roadmap-for-ontario-post-secondary-leaders-and-policymakers/.

Cross, P. 2021. "The Implications of Slowing Growth in Canada's Labour Force." Fraser Research Bulletin. Ottawa: Fraser Institute. https://www.fraserinstitute.org/studies/implications-of-slowing-growth-in-canadas-labour-force

Dawson, N., M.A. Williams, and M. A. Rizoiu. 2021. "Skill-Driven Recommendations for Job Transition Pathways." *PLoS ONE* 16 (8). ttp://dx.doi.org/10.1371/journal.pone.0254722

de Vries, G. J., E. Gentile, S. Miroudot, and K. M. Wacker. 2020. "The rise of robots and the fall of routine jobs," *Labour Economics* 66 (October). https://doi.org/10.1016/j.labeco.2020.101885.

Frank, K. and M. Frenette. 2021. *Are New Technologies Changing the Nature of Work? The Evidence So Far.* IRPP Study No. 81, Montreal: Institute for Research on Public Policy.

Frenette, M. and K. Frank. 2020. *The Demographics of Automation in Canada: Who Is at Risk?* IRPP Study 77. Montreal: Institute for Research on Public Policy. https://doi.org/10.26070/zq3j-j723

Handel, M. J. 2016. "The O*NET content model: strengths and limitations." *Journal for Labour Market Research* 49 (2): 157-76.

Hopkins, S. 2020. "Impact of COVID-19 on Career Development." LMIC Blog, on the website of the Labour Market Information Council. May 19. https://lmic-cimt.ca/impact-of-covid-19-on-career-development/.

International Labour Organization. 2021. *The Future of Work in the Automotive Industry: The need to invest in people's capabilities and decent and sustainable work*. Issues paper for the Technical Meeting on the Future of Work in the Automotive Industry, Geneva, Feb. 15-19. https://www.ilo.org/sector/Resources/publications/WCMS_741659/lang--en/index.htm

Kumar, R. S. and S. George. 2020. *Why skills — not degrees — will shape the future of work*. The Jobs Reset Summit. Geneva: World Economic Forum.

Labour Market Information Council (with Statistics Canada and Employment and Social Development Canada). 2021. *Searching for an OaSiS in the world of skills and occupation mapping*. LMI Insight Report no 43. https://lmic-cimt.ca/publications-all/lmi-insight-report-43/

LMIC. 2019. *Bridging the Gap between Skills and Occupations: A Concept Note to Identify the Skills Associated with NOC*. LMI Insights Report No. 16. Ottawa: Labour Market Information Council. https://lmic-cimt.ca/wp-content/uploads/2020/01/LMI-Insights-No-16.pdf

———. 2020. "Skills." https://lmic-cimt.ca/projects/work-words/skills/

LMIC and Future Skills Centre. 2021. *Building a Decision-based Framework to Understand LMI Needs*. Insight Report. https://lmic-cimt.ca/publications-all/lmi-insight-report-no-44/.

LMIC (Labour Market Information Council)

Lane, T. 2021. The digital transformation and Canada's economic resilience. Bank of Canada, Speeches and Appearances. https://www.bankofcanada.ca/2021/06/digital-transformation-canada-economic-resilience/.

Marin, G. and F. Vona. 2019. "Climate policies and skill-biased employment dynamics: Evidence from EU countries," *Journal of Environmental Economics and Management, Elsevier*. 98(C). DOI: 10.1016/j.jeem.2019.102253.

Martel, L. 2019. *The labour force in Canada and its regions: Projections to 2036*. *Statistics Canada*. Insights on Canadian Society, March 20. Ottawa: Statistics Canada. https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2019001/article/00004-eng.pdf?st=wQzqBucf

Organisation for Economic Co-operation and Development (OECD). 2019. *The Future of Work: OECD Employment Outlook 2019*. Paris: OECD Publishing. https://dx.doi.org/10.1787/9ee00155-en

OECD (Organisation for Economic Co-operation and Development)

———. 2020. *Workforce Innovation to Foster Positive Learning Environments in Canada*. Getting Skills Right. Paris: OECD Publishing. https://www.oecd-ilibrary.org/employment/workforce-innovation-to-foster-positive-learning-environments-in-canada_a92cf94d-en

Robinson, C. 2018. "Occupational Mobility, Occupation Distance, and Specific Human Capital." *Journal of Human Resources*. 53 (2): 513-51.

Speer, S. and S. Bezu. 2021. *Job Polarization in Canada*. Skills for the Post-Pandemic World. Ottawa: Public Policy Forum, April 15. https://ppforum.ca/publications/job-polarization-in-canada/

Statistics Canada. 2020. *The Social and Economic Impacts of COVID-19: A Six-Month Update*. September. Ottawa: Statistics Canada. https://www150.statcan.gc.ca/n1/en/pub/11-631-x/11-631-x2020004-eng.pdf?st=yP8WXTX1

———. 2021. *COVID-19 in Canada: A One-year Update on Social and Economic Impacts*. March 11. Accessed July 23, 2021. https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2021001-eng.htm.

———. 2022. "Labour Force Survey, December 2021." *The Daily*. Ottawa: Statistics Canada. https://www150.statcan.gc.ca/n1/daily-quotidien/220107/dq220107a-eng.htm

World Economic Forum. 2018. *The Future of Jobs. Centre for the New Economy and Society Insight Report*. Geneva

———. 2021. *Building a Common Language for Skills at Work: A Global Taxonomy*. Geneva, Switzerland: World Economic Forum. http://www3.weforum.org/docs/WEF_Skills_Taxonomy_2021.pdf

INSTITUT DE RECHERCHE EN POLITIQUES PUBLIQUES

INSTITUTE FOR RESEARCH ON PUBLIC POLICY

Founded in 1972, the Institute for Research on Public Policy is an independent, national, bilingual, not-for-profit organization. The IRPP seeks to improve public policy in Canada by generating research, providing insight and informing debate on current and emerging policy issues facing Canadians and their governments.

The Institute's independence is assured by an endowment fund, to which federal and provincial governments and the private sector contributed in the early 1970s.

Fondé en 1972, l'Institut de recherche en politiques publiques est un organisme canadien indépendant, bilingue et sans but lucratif. Sa mission consiste à améliorer les politiques publiques en produisant des recherches, en proposant de nouvelles idées et en éclairant les débats sur les grands enjeux publics auxquels font face les Canadiens et leurs gouvernements.

L'indépendance de l'Institut est assurée par un fonds de dotation établi au début des années 1970 grâce aux contributions des gouvernements fédéral et provinciaux ainsi que du secteur privé.

IRPP
1470 Peel Street, Suite 200
Montreal, Quebec H3A 1T1
Telephone: 514-985-2461
Fax: 514-985-2559
irpp@irpp.org