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CANADA AS A LEARNING ECONOMY: EDUCATION AND TRAINING IN AN AGE OF MACHINES: POLICY CHALLENGES AND POLICY RESPONSES

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Canada as a Learning Economy:
Education & Training in an Age of Intelligent Machines

Policy Challenges & Policy Responses

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EXECUTIVE SUMMARY

This knowledge synthesis report is a response to the call from Social Sciences and Humanities Research Council (SSHRC) in September 2020 for proposals to synthesize knowledge related to several themes, among them: *Education and Training: Skills, Competences and Lifelong Learning*. Literature analyzed here is intended to illuminate the nature of adult education, learning and skills development and forms of work organization as factors in Canada's innovation performance.

In the World Economic Forum's 2017-18 *Global Competitiveness Survey* Canada ranked 23rd on its 'capacity for innovation' metric. If this country is to have a prosperous, innovative economy then the skills and ingenuity of its people matter. Skills development opportunities for Canadians beyond formal pre-career education systems are inadequate to meet the demands of a rapidly digitizing economy. It is becoming increasingly clear that Canada's fragmented approach to adult education is an impediment to labour market flexibility and social mobility on which the digital economy depends.

Canada's labour market institutions were developed to meet the needs of an industrial economy. The moment has arrived to re-imagine them to support Canada as a *learning economy*. This report examines the remarkable success of the Danish innovation system. It urges Canadian policymakers to make development of human resources a higher priority by reinvigorating labour market governance arrangements and realigning incentives to meet the needs of a digital economy.

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It is available as a working paper on the Innovation Policy Lab website:
https://munkschool.utoronto.ca/ipl/publications/type/working-paper-series/

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1. BACKGROUND

In the late 1990s the Federal Government of Canada initiated two public consultation processes that aimed to "examine the issues pertaining to the changing nature of work and the workplace" (HRDC 1997). Together, the *Round Table on the Changing Workplace* (1996) and the *National Forum on the Information Highway and Workplace Issues* (1997) reflected on "a tidal wave that is sweeping away the traditional approach to work" (HRDC 1997: v & viii).

For many Canadians the tidal wave is now a tsunami as the prospect of having a single career, or even a single job, from high school graduation to retirement diminishes. As the *Round Table's* final report correctly observed: "The world of work is a human construction, and its organization should satisfy human needs at all stages of the life cycle," (HRDC 1997: 14). Therefore, "there is no trade-off between greater equity and more rapid economic growth" (HRDC 1997: 148).

This knowledge synthesis report explores how digital automation continues to reconfigure organizations, work, and jobs. However, it develops an alternate policy approach based on the concept of *learning economies* that is relatively unknown in the North American context.

Research by the Innovation Policy Lab aims to corroborate international evidence suggesting that the organization of work and opportunities to learn on the job are factors influencing national innovation performance (OECD 2020a; Lorenz et al 2016). It challenges the assumption that an exclusive focus on research and development policy is sufficient to enhance long-run economic prosperity. Thus, the insights presented here have implications for innovation policy.

Canada faces a double challenge from both digital automation and the transition to a carbon-neutral economy. Unlike earlier periods of rapid technological change, automation is occurring across *all* sectors, organizations, and occupations simultaneously (Wolfe 2018). This broad scope renders the current transition fundamentally different from historical precedents, making it likely that changes ahead could match or even exceed the scale of historical shifts out of agriculture and manufacturing (Manyika 2017a: 4; Bonen 2020).

The report explores the question of how to balance the need for innovation to support the productivity and economic prosperity in the long-term with the short-term disruption that technological change often causes. There are no straightforward answers. The international literature related to this area is extensive, complex, and often inconsistent.

In Canada, as across advanced economies, workforces have bifurcated over the past three decades. Numerous studies indicate that the wage premium enjoyed by workers without post-secondary education during the industrial era has diminished while returns to highly skilled

workers have increased (OECD 2020a: 14; Autor 2015; 2019; Munro et al 2018; Muro 2019; Acemoglu & Restrepo 2017).

To remain employable and socially engaged in an age of intelligent machines, a flexible labour market in which Canadians have opportunities to retrain and up-skill throughout their working lives is a necessity. Indeed, quality of opportunity for lifelong learning is a priority highlighted in *Canada a Learning Nation* (2020) – the recent report by the federal Future Skills Council.[1] Certainly, the employment impact of the COVID-19 pandemic has demonstrated how policies and programs developed to meet the needs of an industrial economy are failing to keep pace with the economic realities experienced by contemporary workers.

Despite Canada's rapid pivot to respond to the pandemic, an extensive literature documents the historical limitations of labour market policy in this country (Banting & Myles 2013; Banting & Medow 2012; Bramwell 2011; Wood & Klassen 2011; Vosko 2000; 2006; Sharpe & Haddow 1997: Betcherman & Lowe 1997; Premier's Council 1990). As the pandemic revealed, not only are the majority of workers ineligible for income support provided by the Employment Insurance (EI) program, but they are also excluded from active labour market programs provided through its administrative architecture (Lundy 2021; FLMM 2016: 3; Banting & Medow 2012). The pandemic also drew attention to policy shortcomings related to new forms of non-standard or 'gig' work and self-employment.

Industrial era labour market policies were designed to overcome supply side disruption by assisting unemployed workers. Turning Canada into a *learning nation* as recommended in the *Future Skills Council 2020* report requires a new approach to skills development because existing systems, predicated on pre-career education and skill formation, are insufficient to meet the demands of the digital economy. Policy must focus on demand-side solutions taking a long-term view of economic growth and conceptualizing innovation policy broadly to include human skills and learning.

This knowledge synthesis report contributes to this policy debate by adopting a human-centered approach to innovation founded on the competence of people and firms. It demonstrates that Canada's lackluster innovation performance is rooted in underinvestment in human capital representing a significant lost opportunity. To support the transition to a digital economy the link between high performance work practices (HPWP) and innovation capacity must be better understood and supported (OECD 2020a: 62).

[1] The Future Skills Council report can be found at: https://www.canada.ca/en/employment-social-development/programs/future-skills/report-learning-nation.html

2. OBJECTIVES

Canadian innovation scholars are questioning assumptions that research and development-led or mission-oriented innovation models used by countries at the technological frontier are the right policy approach for this country. Nicholson (2018) argues that Canada has settled into a "low-innovation equilibrium" that has relied on an ample labour supply, a favourable exchange rate and proximity to American markets. Denney, Southin and Wolfe (2021) argue this innovation predicament is evident from underwhelming scale-up performance and persistent skill and talent challenges that Canada faces.

The primary objective of this knowledge synthesis report is to critically assess the state of knowledge related to skills development in Canada and abroad to develop an alternative approach to innovation policy centered on human and organizational competence. Labour market reforms must pay attention to the behaviour of firms by shaping incentives in ways that balance private and social needs (Lam & Lundvall 2006: 113; Nicholson 2018: 29; Schwanen 2017). At the same time, firms must foster the capacity to learn and develop knowledge as a source of competitive advantage (Lam & Lundvall 2006:110; Bonen & Oschinski 2021; Munro 2019; Cotsman & Hall 2018).

An extensive literature documents how Canada lags its global peers in both public and private spending and the delivery of skills training and education aimed at working age adults, which is frequently defined as 'lifelong learning' in both the policy and academic literature (OECD 2020a: 21). A recent study argues that Canada is a "middling performer in terms of opportunities offered to Canadian workers to improve their skills" compared to its OECD peers (Munro 2019: 15 & 17). Of utmost concern, Canada underperforms in '*inclusiveness*' meaning workers who most need skills development do not get it (OECD 2020a; OECD 2020b; Bonen & Oschinski 2021; Munro 2019; Cotsman & Hall 2018; Alexander 2016). As disruption to labour markets from new technologies increases, the risk in leaving mid-career workers behind is the entrenchment of a K-shaped economy described by Poloz (2020) and Chetty et al (2020).[2]

Given these circumstances, a secondary objective of the report is to urge policymakers to look beyond the technological frontier countries, particularly the United States, to middle-income peers for inspiration. Work ahead examines promising policies and practices from abroad. Danish labour market policy offers an intriguing comparative case study. Denmark provides a

[2] According to former Governor of the Bank of Canada, Stephen Poloz (2020), the concept of a 'K-shaped recovery' refers to the idea that the COVID-19 pandemic is having significant adverse economic effects on some parts of the economy (the bottom part of the K) and having very little effect on others (the top part of the K).

model of industrial sophistication predicated on a demand-led innovation policy framework that puts the competence of people and organizations at its core. Institutional arrangements of the training system and the labour market support high mobility and networking of firms (Lam & Lundvall 2006: 113-114).

Denmark ranks first on the World Economic Forum's *Global Social Mobility Index* and consistently ranks among the top ten countries on measures of competitiveness and innovation (WEF 2020; WEF 2019).[3] Danish policy supports skill development by combining high levels of employment flexibility with social protections featuring a robust system for continuous adult education designed to promote labour mobility known as *flexicurity*.

The value of the Danish example is to recognize that skills development is more than simply a problem of unemployment. Denmark is the OECD leader in adult education, learning and skills development. Current OECD data show that Denmark spent 2.87 per cent of GDP on labour market programs whereas Canada spent 0.7 per cent (OECD 2021).[4] While Canada performs well in overall educational attainment, indeed Canada has among the highest share of tertiary-educated workers in the OECD (OECD 2020a:16), adult education and learning have suffered as numerous studies show that mid-career skills development is a neglected part of the broader education system (Munro 2019; Bonen & Oschinski 2021).

A third objective of the report is to adopt a place-based lens to understand how the risk of automation impacts labour markets at a community level. In his analysis of the United Kingdom's Brexit vote, Rodríguez-Pose (2018) attributes the populist wave to a "revenge of places that don't matter". This is not an isolated conclusion. In an extensive study of U.S. labour markets, Muro, Maxim and Whiton (2019) find technology-induced disruption in local labour markets is feeding a growing urban-rural divide that played a role the election of Donald Trump in 2016.

Research by Loewen and Stevens (2020) shows that Canada is not immune from these trends. A survey of automation anxiety and populism finds links between the fear of job loss, populism, and nativism among Canadians (2020:7). OECD research highlights several regional labour market characteristics that increase place-based vulnerabilities including exposure to goods-producing sectors and lower shares of working-age population (OECD 2020b:14 & 38)., A key objective of this report is to highlight strengths and gaps in knowledge related to labour market polarization in Canada.

[3] Global Social Mobility Index 2020, World Economic Forum: https://www.weforum.org/reports/global-social-mobility-index-2020-why-economies-benefit-from-fixing-inequality; Global Innovation Index: https://www.globalinnovationindex.org/gii-2019-report.

[4] OECD 2021 Public Spending on Labour Markets https://data.oecd.org/socialexp/public-spending-on-labour-markets.htm

3. METHODOLOGY & DEFINITIONS

This knowledge synthesis report is part of a broader research program underway at the University of Toronto's Innovation Policy Lab that seeks to understand innovation as the product of a *learning economy*. This perspective conceives knowledge not as a static stock but as a dynamic process of creation and destruction (Lundvall & Johnson 1994; Lorenz & Lundvall 2006; Lam & Lundvall 2006). It recognizes that human skills and organizational forms are subject to high rates of change because of rapid information diffusion and use. As a result, policy approaches designed to support the circumstances of an industrial economy may not afford the most appropriate solutions for a digital economy.

The report employs a multi-method research strategy organized in two ways. First, is a descriptive analysis of academic and other literature including national and international quantitative data. Sources are drawn from provincial, national, international agencies such as Statistics Canada, the Organization for Economic Cooperation and Development (OECD) and sources such as sectoral councils, industry and professional associations.

Second, is a cross-jurisdictional limited case comparison of Canada and Denmark. The two countries share several characteristics: both are small, open economies; both are technology *takers* rather than technology *makers* in the global production system; both are characterized by a relative absence of innovation leading *frontier* firms; and both rely substantially on foreign direct investment. Above all Canada and Denmark depend on small- and medium-sized enterprises to produce a significant proportion of economic output. Critically, this cross-national investigation shows how unique national labour market institutions produce variation in policy and programs related to adult education and skills development, which directly influences innovation capacity.

Definitional and data collection difficulties pervade the field of adult education. Research and policymaking are complicated by definitional disagreement rooted in a philosophical divide among researchers, practitioners, and policymakers that pits educationalists against economists (OECD 2019a: 7; 2016 & 2001; Wood & Klassen 2011; Bagnall 2010; Betcherman & Lowe 1997). Since the 1970s, global policy discourse has alternated between a humanistic-democratic vision of education and an economistic view of human skill as a form of capital (Milana 2012: 104; Rubenson 2009: 415-15; Jarvis 2009: 16 & 11; Becker 1964).

To complicate the situation further, as Bagnall (2010) and Billett (2010) observe, the concept of 'lifelong learning' widely used in both the academic literature and policy discourse frequently conflates practice and policymaking. It is not unusual to find the term '*lifelong learning'* used to refer both to learning as a practical endeavor and to education as it pertains to politics and public

policymaking (Bagnall 2010:450). Distinguishing between these fundamentally different endeavors is critical.

To promote clarity, this report eschews the term lifelong learning and instead adopts the terms *adult education* and *learning*. The term "adult education" pertains to factors enabling or constraining an individual's participation in the workforce, while the term "learning" is understood as a social dynamic producing discovery, invention and innovation on which the digital economy depends.

In the context of this report the concepts of adult education and learning refer to public policy activities as distinguished from pedagogical activities. The focus here is on forms of skill development acquired after completion of state supported secondary and post-secondary education delivered to children and youth prior to entering the labour market.

These conceptual nuances are critical to explain policy patterns and offer insights to illuminate future policy directions since access to education and skills development opportunities represents a significant social differentiator that creates advantages for some Canadians while disadvantaging others. Research discussed in the report shows how this distinction is manifested in deeply polarized labour markets as automation accelerates.

4. RESULTS: REVIEW OF THE LITERATURE

Growing evidence indicates that investments in digital automation have accelerated during the pandemic generating a wave of structural adjustment in labour markets. This situation raises the spectre of a jobless recovery repeating the experience following earlier economic downturns (Jaimovich & Siu 2018; Hershbein & Kahn 2018; Lamb 2020; OECD 2020b: 26).[5] In their research on employment recovery following recessions, Jaimovich and Siu (2018) find 88 per cent of job losses in the United States occurred in routine-task occupations within a 12-month window following recessions in 1991, 2001 and 2008-09.

This research suggests the nature of labour market adjustment is misunderstood. The prevailing consensus views routine-biased technological change as a gradual process, but Hershbein and Kahn (2018) suggest adjustment is episodic arising from a shift in the cost ratio between capital and labour during economic downturns. This work provides compelling evidence to explain the jobless recoveries following recent recessions (Hershbein and Kahn 2018:1737-38; Jaimovich & Siu 2018:2). Jaimovich and Siu (2018) also link the phenomenon of job polarization to technological change that substitutes capital for labour particularly in the performance of routine tasks.

Canadian researchers and policymakers were grappling with of the impact of automation on labour markets well before COVID-19 struck. While automation increases productivity over time, the short-term costs are often distributed unequally, generating painful social disruption. OECD estimates suggest that one in seven jobs in Canada representing 15 per cent of total employment are at high risk of automation; while 30.6 per cent are at significant risk (2020b: 35). Likewise, Frenette and Frank (2020) find 10 per cent of Canadian workers face a high risk of job transformation due to automation with a further 30 per cent of workers facing a 50-70 per cent risk (2020: 2 & 11).

4.1 Automation Risk and Places Left Behind

The literature related to automation risk is complex and often contradictory. However, an emerging consensus argues that task-biased technological change is bifurcating labour market by skewing employment at the ends of the skill-wage distribution while hollowing out the middle (Autor, Levy and Murnane 2003; Autor, Katz & Kearney 2006; Goos & Manning 2007; Acemoglu & Restrepo 2017; Autor & Solomons 2018). OECD research shows the risk of

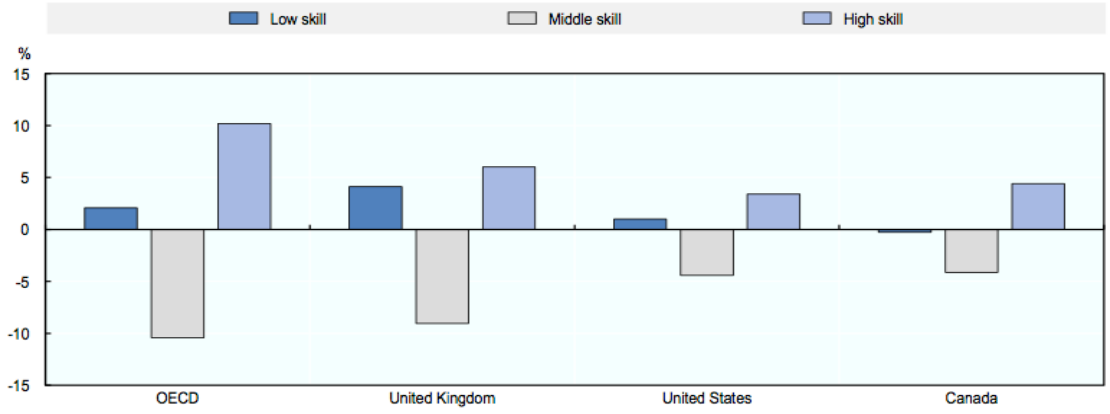
[5] Jaimovich & Siu (2018) define a jobless recovery as "the slow rebound in aggregate employment following recent recessions, despite recoveries in aggregate output" (Jaimovich & Siu 2018:2).

automation declines with education, skill (measured by numeracy and literacy), and wage levels (Nedelkoska & Quintini 2018: 115).[6]

Employing a task-based analytical approach explains how technology changes the nature of activities or *tasks* within jobs rather than leading to wholesale occupational losses as early studies of automation risk predicted. Taking this approach is useful because: "task-based models provide a prism for viewing the comparative advantage of man and machine, which compete based on the overall cost and effectiveness of completing tasks" (Muro et al 2019: 14).

Economist such as Autor and his collaborators consistently find both the structure of work and wages in industrialized countries have become more polarized with concentrations in high-skilled, high-wage occupations and low-skilled, low-wage occupations at the expense of those in the middle (Autor, Levy & Murnane 2003; Autor, Katz & Kearney 2006; Autor 2015; 2019). Similar research on employment trends in the United Kingdom finds falling relative demand for jobs requiring routine manual and cognitive skills (Goos & Manning 2007:118). Figure 1 shows job polarization by skill level in Canada compared to the U.S., U.K. and the OECD average.

Figure 1: Percentage change in share of total employment 1998-2018



Note: High-skill occupations include jobs classified under the ISCO-88 major groups 1, 2, and 3. That is, legislators, senior officials, and managers (group 1), professionals (group 2), and technicians and associate professionals (group 3). Middle-skill occupations include jobs classified under the ISCO-88 major groups 4, 7, and 8. That is, clerks (group 4), craft and related trades workers (group 7), and plant and machine operators and assemblers (group 8). Low-skill occupations include jobs classified under major groups 5 and 9. That is, service workers and shop and market sales workers (group 5), and elementary occupations (group 9). Skilled agricultural and fisheries workers were excluded from this analysis.
Source: Updated from OECD (2017[4]), *OECD Employment Outlook 2017*, https://dx.doi.org/10.1787/empl_outlook-2017-en.

Source: (OECD 2020a:14). *Workforce Innovation to Foster Positive Learning Environments in Canada*. (Paris: OECD Publishing).

[6] Automation is defined as the codification of skills and knowledge used in work routines and its commodification by means of mechanization or computerization (Holm et al 2017).

Research conducted by Muro, Maxim and Whiton (2019) refines task-based analysis by using a methodology that combines occupational codes and commuting zones to analyze local labour markets. Results of this work identify the interaction of geography and automation to reveal the impacts of automation on the spatial organization of employment.[7] It shows how uneven patterns of technology-induced disruption in local labour markets exacerbate the urban-rural divide in the United States. The study finds automation "risks vary with the local industry, task and skill mix, which in turn determines local susceptibility to task change" (2019: 37).

Surveying data for the period 1980-2016, Muro and his colleagues estimate "approximately 25 per cent of U.S. employment (36 million jobs in 2016) face high exposure to automation in the coming decades with greater than 70 per cent of current task content at risk of substitution." Notably, these threats are unevenly distributed. It is the lowest wage jobs in office administration, production, transportation and food preparation – jobs characterized by routine tasks – that face the greatest exposure to automation (Muro et al 2019:32-33; Muro et al 2020).

Box 1: Distinguishing Skills, Tasks, and Occupations

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Skill: an ability, whether learned or inherent, that facilitates the learning, acquisition and application of knowledge. Certain skills require learned procedures; others are abstract. Skills that can be acquired through learned procedure are easier to automate, as human procedures can be translated into computational ones.

Task: the application of skill and knowledge to complete a goal. If a task requires only skills that are procedural, the task is routine. If a task requires skills that are abstract, the task is non-routine, as the procedure varies in some abstract way to complete the goal.

Occupation: a set of tasks that can be performed either by a human or by technology or (in almost all cases) a combination of both. An occupation can be automated only if substantively all of the tasks required to perform it can be completed without a human. Automating technologies can only perform tasks that consist of skills that sufficiently procedural as to be facilitated by computers, robots or tools.

Source: Oschinski & Wyonch (2017:3)

In their study, Chetty et al (2020) disaggregate economic activity further by focusing on economic activity at the neighbourhood level using ZIP codes in the United States. Their methodology combines multiple public and private sources, including business revenue, consumer spending (credit and debit card data), job postings and employment, to examine

[7] The "spatial organization of employment" was investigated by the *Round Table on the Changing Workplace* (1996). Its final report noted: "Much employment that used to be tied to a particular location is now 'footloose' and could be anywhere. Since Canada's regions compete for jobs, and it is not yet clear which regions will end up as net losers or winners, (or, indeed, whether some jobs will even remain in Canada), the process generates considerable anxiety" (HRDC 1997:8).

economic activity within cities. The analysis reveals significant variation among population subgroups within metropolitan areas. Similarly, Holmes and Berube (2016) examine income inequality within American cities. Both studies find levels of income inequality is high and rising – a trend they attribute to economic forces rooted in geographic location.

In an analysis of the United Kingdom's Brexit vote, Rodríguez-Pose (2018) attributed the populist wave in that country to a "revenge of places that don't matter" (2018: 189). Using a place-based lens he argues as economic dynamism has concentrated in metropolitan areas, people in places considered to have no future use the ballot box to revolt against the status quo (2018: 190). These "geographies of discontent" represent a "challenge to the economic system that come[s] from a neglected source of inequality [that is] territorial not interpersonal" (2018: 196 & 201).

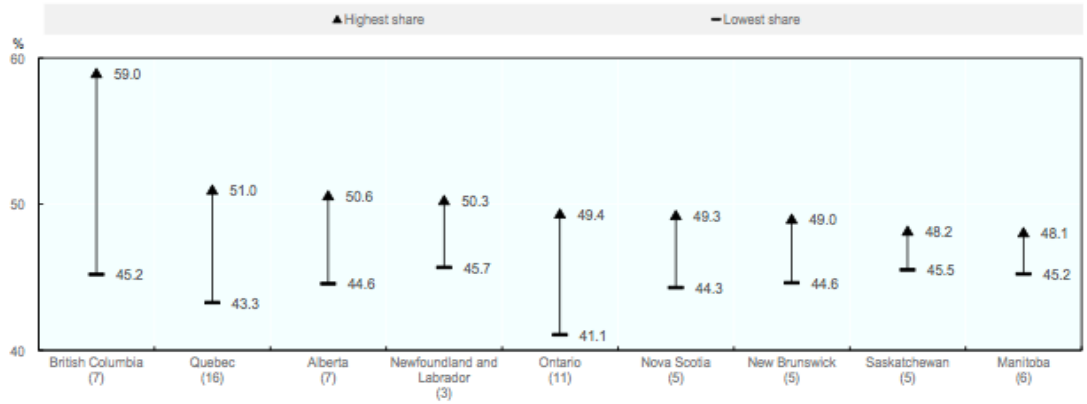
Research tracking automation risk and inequality using a place-based lens remains nascent in Canada. However, long-standing evidence shows these trends are also underway in this country (HRDC 1997:146). As Figure 1 shows Canada experienced similar labour market polarization trends as the U.S. and U.K. with concentrations in the share of low- and high-skill jobs combined with a decreased share of middle-skill jobs. One notable difference is that Canada also experienced a relative decline in low-skill jobs (OECD 2020b: 75 & 80).

Two recent Statistics Canada studies find a steady divergence in jobs characterized by non-routine, cognitive tasks and those characterized by routine, manual tasks since the 1990s (Frank, Yang & Frenette 2021:10; Frank & Frenette 2021:12). Over this period, the share of Canadians working in management, professional and technical occupations increased by 31.4 per cent while the share of workers employed in craft, repair and operative occupations decreased by 25.3 per cent (Frank, Yang & Frenette 2021:10).

In an analysis of provincial labour markets Wyonch (2018) develops a risk-readiness framework to measure adaptability to technological change based on education levels, including measures of basic core skills (literacy and numeracy), automation potential and economic diversification. Results reveal unequal risk exposure among the provinces based on patterns of local industry, the level of employment in automatable occupations and the geographic distribution of skills (2018:8). In their study of sectoral automation trends in Ontario, Munro et al. (2018) find evidence of skill-biased technological change particularly affecting cities and towns "once considered Canada's industrial heartland" (2018: 38).

These findings are corroborated by recent OECD research. Figure 2 below shows automation risk is most pronounced in British Columbia, Quebec and Ontario (OECD 2020b:39).

Figure 2: Jobs at Risk of Automation – Region at Highest and Lowest Risk Within each Province



Note: The number of economic regions in each province is included in parenthesis.
Source: OECD calculations on Labour Force Surveys.

Source: OECD (2020b:39). *Preparing for the Future of Work in Canada*. (Paris: OECD Publishing).

In summary, these studies suggest that geography matters due to the growing concentration of job creation and the reliability of employment in Canada, as elsewhere. As digital automation accelerates, the burden of adjustment is falling on workers employed in jobs characterized by routine tasks and marginalized communities located in *both* rural and urban areas.

4.2 Narrowing the Analytical Lens: The Interaction of Demographics and Location

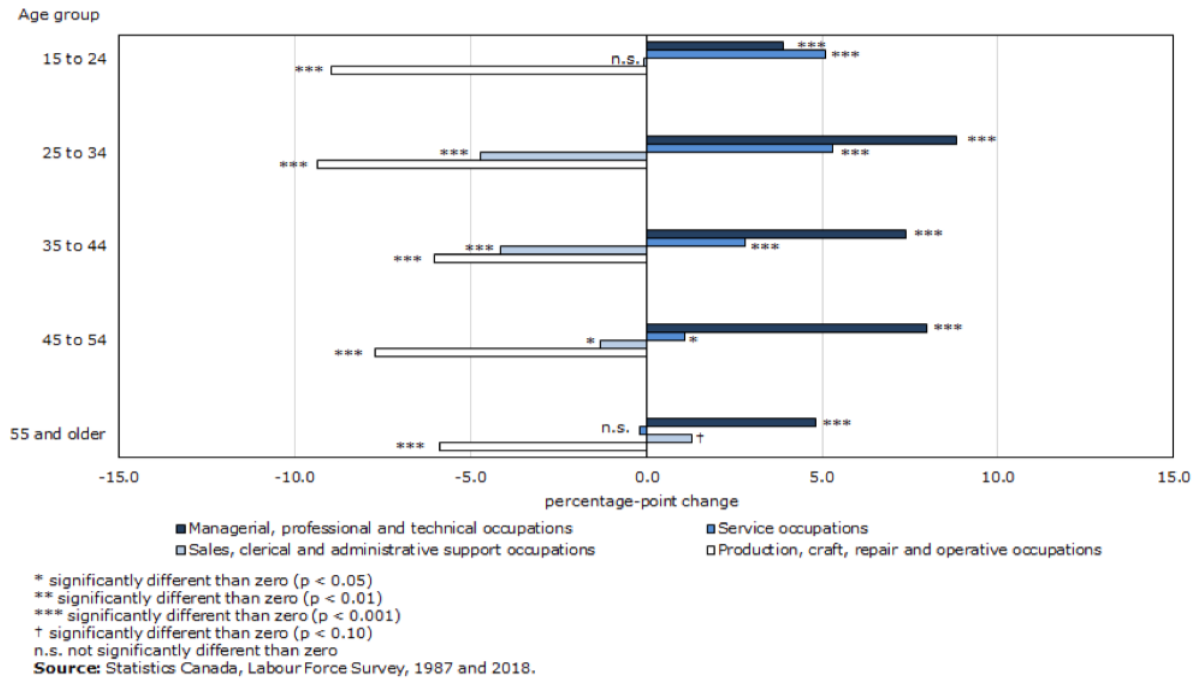
Adoption of new technologies is contingent on a variety of factors beyond mere efficiency calculations. Research indicates that technical feasibility and commercial viability are frequently associated with socio-demographic factors, in particular, age and education level (Autor & Dorn 2009; Nedelkoska & Quintini 2018:110; Kis 2020; Frenette & Frank 2020).

Narrowing the analytical lens illuminates demographic trends at the local level, revealing a more nuanced view of the impacts of digital automation. Speer and Weseem (2020), for example, use Statistics Canada's census subdivisions (CSDs) to examine patterns of employment based on age distribution and educational attainment of local populations (2020: 17-18). Frenette and Frank (2020) also find age and education among the risk factors for job transformation due to automation (2020:11). These studies corroborate the OECD evidence, which indicates that demographic factors, such as age and education, interact with location to elevate automation risk (OECD 2019b).

In a cross-national study of robotics adoption Acemoglu and Restrepo (2021) report that workforce ageing accounts for 35 per cent of variation among countries. This research confirms that demographic change is associated with adoption of industrial automation technologies. An ageing workforce accelerates automation as employers react to shortages of skilled middle-aged workers specializing in manual production tasks (Acemoglu & Restrepo 2021: 1-2). Indeed, Canadian research shows that manufacturing regions in Ontario facing increased automation risk tend to have a lower share of working age population (OECD 2020b:44; Munro et al 2018).

The interaction of age and skill levels in local populations needs further study in Canada. An extensive international literature suggests the least educated face the greatest automation risk, as well as widening gaps in skill requirements (Autor, Mindell & Reynolds 2019: 13; OECD 2020b; Lund et al 2021: 1; Manyika 2017b). Figure 3 offers some early insight into Canadian labour market trends by showing the percentage change in employment shares of workers by occupational task group and age.

Figure 3: Employment shares of Canadians by occupational task group and age 1987-2018



Source: Frank, Yang & Frenette (2021:15).

4.3 Adult Education and Learning as Drivers of Innovation

When information and communication technologies (ICT) began to automate work in the 1980s some observers predicted a need for higher levels of education and transferable skills enabling workers to adapt to new technologies as they were introduced in the workplace (Betcherman & Lowe 1997; McMullen 1996; Wolfe 1989). In response, governments increased enrollments in post-secondary education and focused on increasing secondary level graduation rates.

Canada's achievements in these meeting goals are outstanding when compared to peer countries. In 2018 Canada had "the highest share of tertiary-educated workers across the OECD" at 58 per cent of adults aged 25-64 compared to an average of 36.9 per cent among peer economies (OECD 2020a: 16; OECD 2020b: 83). These results are supported by Statistics Canada's Labour Force Survey that reports just over 1 in 8 paid workers had a university degree in 1990 (13.1 per cent), but nearly 3 in 10 (29.1 per cent) attained this level of education in 2018 (Frank & Frenette 2021: 17).

Canadians consistently support post-secondary education. A survey by EKOS for Colleges and Universities Canada found 87 per cent of respondents agree that: "the purpose of post-secondary education is to help people to get and keep good jobs" (2019: 3). Yet Canada's achievement in the provision of foundational education conceals structural weaknesses that have the potential to undermine our innovation capacity. This country's focus on pre-career skills development has produced an education system biased towards academic and professional training that leaves working adults behind (Charest & Critoph 2010: 64; Future Skills Canada 2020).

Although EKOS found 98 per cent of survey respondents believe "access to lifelong learning, upgrading [and] re-skilling at all ages is important" the opportunities for mid-life education and training constitute a "messy middle" in this country's education and labour market ecosystems (EKOS 2019: 3; Munro 2019: 11). As the nature of work evolves Munro (2019) suggests: "Gaps in our education and training systems will contribute to long-term challenges for workers, firms, the economy and society more broadly" (2019:13). This gap in adult education and training is a source of concern because evidence from a cross-national study of automation risk, skills use and training indicates that "re-qualification is an important mechanism to aid the transition from more to less automatable jobs" (Nedelkoska & Quintini 2018:37 & 115).

Box 2 below distinguishes among learning modes. These definitional nuances clarify current policy debates in which the distinction between skills and credentials is becoming increasingly contentious. In the digital economy skills, that facilitate interpersonal relations, creativity and emotional intelligence are growing in importance alongside a general education.

Box 2: Typology of adult learning modes

Defining adult learning

This report focuses on the population of potential adult learners aged 25-64. Adults in this age group have generally completed initial education and have begun their working lives. Adult learning can be classified as formal education, non-formal education or informal learning.

Formal education: institutionalized learning activities (e.g. seminars, courses, on-the-job training, open and distance education) of a minimum of one semester that are recognized as programs by relevant education or equivalent authorities.

Non-formal education: institutionalized learning activities that are either of short duration (less than one semester or full-time equivalent) or are not recognized by relevant education or equivalent authorities.

Informal learning: non-institutionalized learning activities that are unstructured (e.g. no student/teacher interaction) and can take place anywhere, e.g. learning while doing.

Source: OECD (2020a:19). *Workforce Innovation to Foster Positive Learning Environments in Canada*. (Paris: OECD Publishing).

The need to up-skill and re-skill the Canadian workforce is not a revelation. Numerous studies have documented Canada's poor performance in adult education and skills development (Bonen & Oschinski 2021; Munro 2019; Bramwell 2011; Charest & Critoph 2010; Cruikshank 2002; McMullen 1996; Wolfe 1989). As many of these reports observe there is no pan-Canadian approach to adult learning; instead, provision varies by provincial jurisdiction. Fragmented policy responses and programs are a result of federal-provincial jurisdictional overlap (Wood & Klassen 2009; 2011; 2017). The situation leads Bramwell (2011) to describe active labour market policy in this country as "perniciously resistant to national policy efforts due to the political tensions inherent in governing them" (2011: 2).

Incoherent governance is compounded by limited investment in training by Canadian employers (Cotsman & Hall 2018; Munro 2019: 17; Charest & Critoph 2010: 70). This is a long-standing problem. A 1997 study of skills development found: "The large majority of firms in Canada do not take a systematic, forward-looking approach to training" (Betcherman et al 1997: 6). Most workplace training is informal with formal training provided mainly by larger employers "where high-performance human resources management practices have been introduced; and where the management philosophy is people-oriented." The most frequent forms of training were managerial and professional, with basic skills training less frequent (Betcherman et al 1997: viii).

The situation is largely unchanged today. *The Conference Board of Canada's* most recent survey of learning and development (L&D) reports employers spent an average of 1.39 per cent of their annual payroll on learning and development in 2016-17. The report is optimistic: "Organizations that invest in employee learning and development understand the importance of maintaining a

strong knowledge-based workforce." L&D investments remain low by historical standards given expenditure of 1.5 per cent in 2008 and 1.75 per cent in 2005 (Cotsman & Hall 2018: 19 & 22).

The dilemma was acknowledged at a Mitacs consultation process in June 2020.[8] Participants attributed low levels of private investment to a "low tolerance for long-term investment among small- and medium-sized companies, which make up the majority of Canadian employers". The situation is aggravated by disagreement among employers about the types of skills that are needed (Mitacs 2020). Evidence suggests: "the gap in training participation between SMEs and large firm employees is larger in Canada than on average across the OECD" (OECD 2020b: 21). As *Future Skills Canada* observes, the training challenges faced by SMEs are of particular concern because: "Of Canada's 1.18 million businesses, 98% employ fewer than 100 people and almost three quarters have fewer than nine people" (2020: 39).

Substantial skill upgrading also occurs on-the-job meaning technological adaption happens informally through changes in job-task content and learning-by-doing as defined in Box 2 (Autor, Levy & Murnane 2003; Bessen 2015; Lundvall & Rasmussen 2016). International research shows: "Participation in on-the-job training is the highest among employees in jobs with low automatability but declines slowly up to a risk of automation of about 30 per cent, after which the decline in the likelihood of on-the-job training accelerates" (Nedelkoska & Quintini 2018:110). Education level and age are factors determining access to employer-supported training, indicating that employers are less likely to offer training to workers at highest risk from automation even though educational upgrading is identified as a mechanism to move away from routine manual and cognitive tasks (Nedelkoska & Quintini 2018:37).

Researchers in Canada have long noted that responsibility for skills development falls largely on workers themselves meaning: "the haves get more, and the have-nots don't get any" (Charest & Critoph 2010: 71; Munro 2019: 20; Betcherman & Lowe 1997: 5; HRDC 1997: 134). Challenges faced by mid-career workers are further complicated by fragmented labour market information. The situation leads Bonen and Oschinski (2021) to observe: "Without a unified source of information linking training programs to skills, Canadians have little choice but to muddle through by poking around online and relying on word-of-mouth advice" (2021: 3).

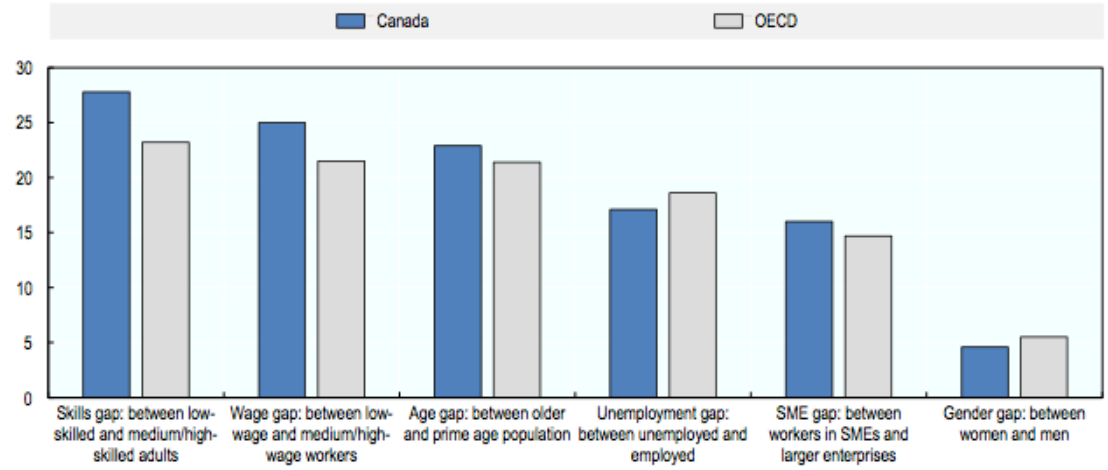
In an era of *Linkedln* and *TurboHire* labour market information has become a highly dynamic enterprise. Recent public policy steps aim to address these labour market information gaps. In response to research by Canada's *Labour Market Information Council* (LMIC) the federal government announced funding to support development of front-line career-planning and guidance tools to assist Canadians entering the job market, mid-career workers and those looking

[8] Mitacs is a national, not-for-profit research and training organization dedicated to advancing collaborations between industry, academia and government in Canada. See more at: https://www.mitacs.ca/en/newsroom/media-kit/about-mitacs

to change career paths. A pilot project in partnership with the *Future Skills Centre* aims to create a cloud-based data repository to "help Canadians navigate the changing world of work" and gather system-wide lessons (Future Skills Centre 2020).

Despite this initiative, data from the OECD show approximately 52 per cent of Canadian adults participate in learning and development: "Canada displays one of the largest gaps in participation rates between high/medium-skilled workers and low-skilled workers" (OECD 2020a: 38 & 22). Furthermore, training opportunities are less inclusive with low-skilled and older workers, the unemployed, and those working in SMEs, among the least likely to participate in training as Figure 4 demonstrates.

Figure 4: Percentage point differences in training participation rates among social groups in Canada 2012



Source: OECD (2020a:23). *Workforce Innovation to Foster Positive Learning Environments in Canada*. (Paris: OECD Publishing).

As the next chapter explores, a growing consensus suggests that success in the digital economy will depend on the availability of a highly skilled, adaptable workforce capable, of learning and unlearning as new technologies are introduced. Crucially, workers must have the skill and autonomy to identify opportunities for future innovation (Lundvall & Rasmussen 2016; Holm et al. 2018; Future Skills Canada 2020; Autor, Mindell & Reynolds 2020).

The connection between skills, learning and innovative capacity is the focus of ongoing IPL research. Dystopian visions of technological unemployment in which human labour is de-coupled from work or eliminated entirely are unlikely to materialize because: "You can't innovate in a lights out factory" (Autor, Mindell & Reynolds 2019:30).

5. IMPLICATIONS

5.1 Why Adult Education and Skills Development Fall Short in Canada

Historically, Canada's prosperity has depended on commodity exports and a branch-plant industrial ecosystem that benefited from proximity to American consumer markets. However, the reality of a globally fragmented production system means old truths about how innovation translates into productivity and economic growth, where it occurs and who benefits, no longer hold (Breznitz, Munro & Ornston 2021; Breznitz 2014). Digital automation represents an open-ended, systemic transformation that puts inexorable pressure on industrial era socio-economic bargains once considered unassailable. No individual, occupation or organization is immune to the changes underway.[9] Greater alignment of adult education and learning with labour markets will not only support economic transition but offers a means to strengthen innovation capacity.

Making Canada into a learning nation requires that we overcome some unique governance challenges. In this country adult education and skills development are sub-sets of active labour market policy (Haddow & Klassen 2006: 65). Policy complexity arises from the constitutional division of powers that gives the federal government responsibility for the macro economy while responsibility for education and social programs lies with the provinces. Given the importance of skills development to economic prosperity the federal government has been "heavily involved in training" (DiGiacomo 2001: 1).

An extensive literature documents the contentious nature of active labour market policy in this country.[10] Canada experimented with progressive labour market policy in the past with mixed results. Analysis here focuses on Canada's experimentation with Labour Force Development Boards and extends to the subsequent devolution of primary responsibility for labour market policy to the provinces.

Labour Force Development Boards (LFDBs) established in the late 1980s and early 1990s at the national and provincial levels were a response to "a long-standing perception that public labour market programs in Canada were inadequate to assist Canadian workers to obtain job-relevant skills" (Haddow & Sharpe 1997: 4). LFDBs incorporating Nordic style tripartite decision-making represented a major shift in Canadian labour market policy. Boards established in

[9] For example, the prospect of automation led the Chartered Professional Accountants of Canada to undertake a national consultation of its members called *Foresight* that seeks to "re-imagine the profession". Recognizing current systems were designed for the industrial era, CPA Canada is reviewing topics including: "employment opportunities and skill sets needed for CPAs to remain industry leaders" (CPA Canada 2020). Another example detailing Alberta's construction industry is described in Box 4 below.

[10] Broadly, active policy is understood as any measure designed to increase the quality of labour supply whereas passive policies focus on income replacement (Haddow & Klassen 2006:81).

Ontario, Québec and British Columbia emerged almost exclusively as the product of their respective provincial governments. They ultimately foundered due to partisan politics and institutional constraints (Bradford 1998: 541).

For example, the *Ontario Training and Adjustment Board* (OTAB) in operation from 1993 to 1996 was hailed as "one of North America's leading associative democratic laboratories" (Bradford 1998: 541). The Board assigned major responsibility for labour market policy in the province to the key labour market partners — business, labour and social equity partners. Motivated by a collective sense of urgency arising from accelerated corporate restructuring in the wake of the North American free trade agreements, the Board's mandate to address underinvestment in workplace training was ambitious (Wolfe 1997). Although participants had high hopes that OTAB would provide novel and timely solutions, ultimately, much of its activity "was spent absorbed in questions of its own internal governance and the relations among its constituent groups" (Wolfe 1997:156).

By contrast, Québec's efforts have proved more successful. Although its labour force board was also disbanded, successive provincial governments remained committed to a decentralized associative governance model to administer training policy. Uniquely in Canada, employers in Québec contribute to workforce training by way of a 1 per cent payroll tax designed to provide flexibility to invest in direct employee training or general programs. Notably, programs are developed as a collaboration of employers, unions and the education sector (Oschinski & Wyonch 2017: 16).

Successive Liberal and Conservative federal governments have made efforts to reform labour market policy over the past three decades. In a major reform undertaken in the wake of the Québec referendum, the Chrétien government devolved responsibility for training and skills development to the provinces under the *Employment Insurance Act* of 1996 (Bramwell 2011: 4; Wood & Klassen 2011: 8). This action coincided with a restructuring of the unemployment insurance system, which was reconceived as 'employment insurance' or more popularly 'EI' (Wood & Klassen 2009: 256).

These reforms were negotiated with the provinces on a bilateral basis via *Labour Market Development Agreements* (LMDAs) – the first one concluded with Alberta in 1996 and the last with Ontario in 2005 (EDSC 2017). As a result of these agreements, the federal government transferred substantial monetary and human resources to the provinces. Crucially, because program funding came from the Employment Insurance account, training benefits were restricted to EI-eligible unemployed workers. Given only a fraction of Canadian workers are covered by employment insurance, this created a situation in which marginalized communities, 'gig' workers and those at greatest risk from automation were structurally excluded from opportunities

to up-skill or re-skill (Wood & Klassen 2009: 256-57; Wood & Klassen 2017: 11; Vosko 2000; 2006).

In 2007 the Harper government introduced a new architecture that recognized the provinces as best placed to design and deliver labour market services (Wood & Klassen 2017: 13). To avoid revisiting existing funding formulas a new set of bilateral arrangements known as *Labour Market Transfer Agreements* (LMTAs) were negotiated. This time funds were allocated from consolidated revenues enabling the extension of services to non-EI clients. Subsequent changes in 2013 introduced the *Canada Job Grant* (CJG) to engage employers in training provision (Government of Canada 2013).

Federal actions to devolve labour market policy have sought to enhance "flexibility to tailor employment and training programs and services that are responsive to provincial and local labour market conditions and political directions" (Wood & Klassen 2009: 261). Today, federal government funding to provinces and territories is extended via four bilateral transfer agreements referred to collectively as Labour Market Transfer Agreements (LMTAs). The goal of the LMTAs is to provide employment services and skills training driven by local "labour market demand and employer needs" (FLMM).

As a result of these reforms the provinces are responsible for the design and delivery of over three-quarters of Canada's labour market programming funded by the EI program, general revenues from Ottawa, and provincial sources (Wood & Klassen 2017: 13). However, as Wood (2017) points out: "the EI account is still the primary source of funding for the provincial-territorial employment services programming." There is no defined process for the provinces and territories to influence the size of funding allocations. Thus, despite the prior devolution to the provinces, these institutional characteristics mean the federal government maintains a high degree of influence over labour market policy (Wood 2010:28).

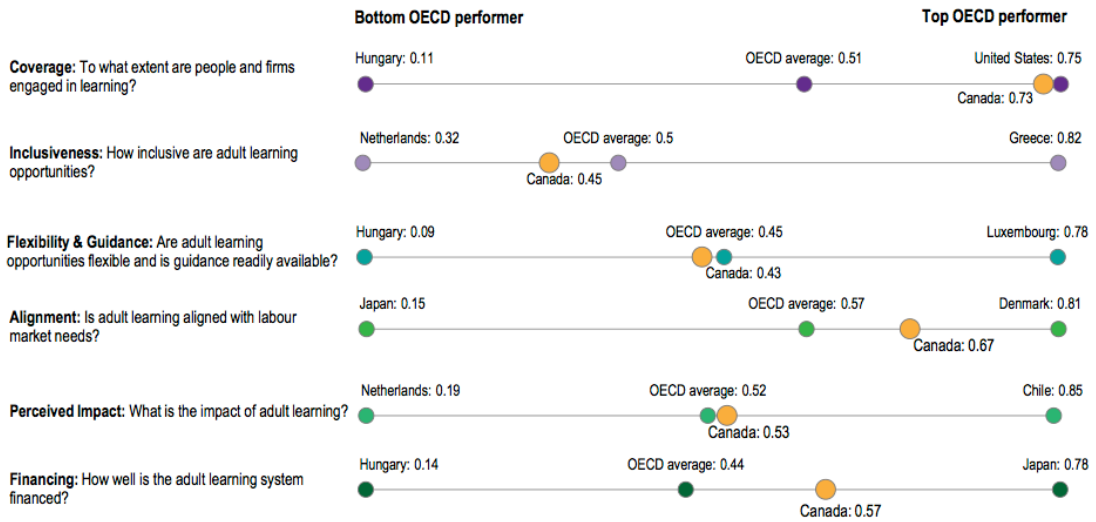
A pan-Canadian policy architecture is lacking because the bilateral arrangements "were not negotiated as part of a larger national vision or framework" nor were key stakeholders or the public involved (Wood & Klassen 2009: 265; DiGiacomo 2001: 24). Bramwell (2011) argues that while the bilateral agreements "solved a constitutional impasse in the short run, they have done little to lend coherence to larger national labour market strategies" (2011: 5).

Consequently, devolution created "greater degrees of asymmetrical federalism than had previously been the case" (Wood & Klassen 2009: 256). This asymmetry underlies "a continuing tug of war between a vision of a more decentralized federation in which provincial autonomy is intact but with less commitment to national sharing, and more centralization in which the federal government develops and determines national norms and redistributes income" (Brown 2005:3).

As the Canadian economy enters a period of technological restructuring, institutional and policy incoherence are socially and economically unsustainable. Uneven access to of adult education and learning resources across the country has the potential to exacerbate the geographic inequality discussed above and undermine Canada's efforts to develop a highly skilled, flexible, and inclusive workforce (Wood & Klassen 2009: 267). In broader economic terms it may also weaken innovative capacity.

A report entitled: *Workforce Innovation to Foster Positive Learning Environments in Canada*, suggests that: "Canada needs to take a critical look at its current adult learning system" (OECD 2020a: 25). The OECD's *Future-Ready Adult Learning Framework* offers a means to assess adult education systems based on five dimensions shown in Figure 5. While Canada performs well on training metrics such as 'alignment of training with labour market needs' and 'coverage', it performs poorly on 'inclusiveness'. Furthermore, rates of training participation "are low among low-skilled, low-wage and older workers, the unemployed, those working in small- and medium-sized enterprises and those with non-standard work arrangements" (OECD 2020a: 21-22).

Figure 5: Priorities for Adult Learning Dashboard, Canada & OECD Average



Source: Priorities for Adult Learning dashboard, http://www.oecd.org/employment/skills-and-work/adult-learning/dashboard.htm.

Source: OECD (2020a:21). *Workforce Innovation to Foster Positive Learning Environments in Canada*. (Paris: OECD Publishing).

Since devolution, the absence of a pan-Canadian institutional mechanism to bring governments together is a persistent difficulty (DiGiacomo 2001: 24). To many observers the 1996 decision to devolve administrative control of EI expenditures to the provinces prevents the federal government from undertaking coherent pan-Canadian policy approaches to adult education

(Haddow 1998; DiGiacomo 2001). Another line of argument contends: "Federalism *per se* is not necessarily a serious impediment to pan-Canadian approaches within any policy sector" (Wood & Klassen 2009:267). Rather, the variety and depth of both bilateral and multilateral governance arrangements mean there is considerable room for asymmetrical federalism in this country. Moreover, developments in Canadian politics, related to the impact of globalization, cultural diversity and growing tolerance for asymmetry point to increasing pressure for more "flexible federalism" (Brown 2005:3 & 6). The challenge for policymakers "is to find innovative ties that bind" (Wood & Klassen 2009:265).

Historically, two fora have been involved in workforce development issues (Wood & Klassen 2009:263). First, the Canadian Council of Directors of Apprenticeship (CCDA) is a voluntary intergovernmental partnership among the provinces, territories, and the federal government. Its purpose is to provide a forum for inter-jurisdictional collaboration on trades and apprenticeship. The CCDA consists of 15 members including one official from each province and territory, and two federal government representatives from the department of Employment and Social Development Canada (ESDC)[11]

The CCDA is responsible for facilitating labour mobility in trade occupations across Canada and administers the *Red Seal Program* described in Box 3. The success of this pan-Canadian certification program demonstrates the value of a governance approach capable of coordinating activity among three levels of government and interested stakeholders.

Second, is the *Forum of Labour Market Ministers*, established in 1983. It operates as "a platform for collaboration and partnership to address shared labour market issues" (FLMM). The FLMM is co-chaired by the federal government (via ESDC) and a lead province or territory on a rotating basis. The Government of the Northwest Territories currently leads the FLMM and hosts its Secretariat. Over the past decade, however, it has met sporadically with few meetings of the broader forum and limited ministerial engagement (Wood & Klassen 2011: 9). The Forum met most recently in October 2017 (FLMM 2017).

Box 3: The Red Seal Program – A Canadian Success Story

The Red Seal Program, formally known as the Interprovincial Standards Red Seal Program, is a program that sets common standards to assess the skills of trades people across Canada. Industry is heavily involved in developing the national standard for each trade. It is a partnership between the federal government and provinces and territories, which are responsible for apprenticeship training and trade certification in their jurisdictions.

Tradespersons who have successfully passed the Red Seal examination receive a Red Seal endorsement on their provincial/territorial trade certificate and are eligible for employment in all jurisdictions across Canada.

Source: www.red-seal.ca

[11] Canadian Council of Directors of Apprenticeship (CCDA): http://www.red-seal.ca/about/ccd.1-eng.html

Critics of the FLMM claim: "…without a more robust multilateral intergovernmental process to bridge the two orders of government, workforce development policy in Canada will remain inadequate" (Wood & Klassen 2009: 249). Suggestions for reform include renewal and expansion of the FLMM's mandate; establishment of a permanent secretariat; regular ministerial meetings; greater integration with the Council of Education Ministers of Canada and immigration ministers; and more transparent reporting. As Wood and Klassen observe to date there has been little evidence of political will or leadership necessary to make the body as effective as it might be (2011: 20).

Since coming to power in 2015 the Liberal government has been active in the labour market policy domain initiating several changes to address the shortcomings of earlier reforms. *Future Skills Canada* is part of an *Innovation and Skills Plan* announced in the 2017 federal budget. Notably, provincial, and territorial governments were closely involved in the design and implementation of *Future Skills* through the Forum of Labour Market Ministers (OECD 2020a: 31). The initiative was designed to address the need for new approaches to address skills gaps and support lifelong learning. According to ESDC programming developed under the auspices of *Future Skills* "will help Canadians to prepare for, get and keep jobs as innovation and technology continue to place new demands on workers' skills and training" (2018b).

Recent initiatives include the *Labour Market Information Council*, which started operations in 2017 as an "independent not-for-profit organization with a mandate to improve the timeliness, reliability, and accessibility of labour market information in Canada" (LMIC). The Council's aim is to overcome fragmented labour market information identified as a barrier to labour market mobility (Bonen & Oschinski 2021). The *Future Skills Centre* and *Future Skills Council* followed in 2018 as experimental mechanisms to explore innovative approaches to skills development focusing on under-represented and vulnerable groups. Finally, the *Canada Training Benefit,* composed of a non-taxable training credit and income support for time away from work to train through the EI program, was launched in 2019 (ESDC 2019; Department of Finance 2019; Parkin et al 2017).

The economic crisis caused by the COVID pandemic accelerated the Trudeau government's activities. The 2021 federal budget contains several initiatives of interest here including a proposed investment of $298 million to address literacy, numeracy and digital skill gaps in which 45 per cent of Canadians are deficient. A new *Sectoral Workforce Solutions Program* with funding of $960 million aims to "connect up to 90,000 Canadians with the training they need to access good jobs in sectors where employers are looking for skilled workers." Its focus on small- and medium-sized businesses is notable (Department of Finance 2021). This action is particularly significant because it restores funding to sector councils that was cut in 2013.

5.2 Canada's Sector Councils – An Underappreciated Asset

In its 2016 report *Getting Skills Right*, the OECD defines skills councils as: "employer-led or tripartite organizations involving representatives from employers, workers and government or educational institutions…[that] provide recommendations on education and labour market policy" (2016:75). Canada's experience with sector councils began in the 1980s as a response to the twin economic challenges of globalization, particularly the North American free trade agreements and technological change. At the time, they represented a new form of labour-management cooperation offering "a uniquely Canadian solution to the traditional problem of under-investment in workplace-based training" (Wolfe & Martin 1998: 101).

Sector councils, which received support from business and labour groups, aimed to address human resource challenges. including upgrading the skills of employed workers and recruitment of qualified new entrants to prevent skill shortages. Indeed, the *Conference Board of Canada* hailed sector councils as a competitive advantage describing them as "a primary tool for the government to work with business to build human capital specifically to meet the needs of industry" (Bloom et al 2005).[12] Their main tasks were to monitor the labour market in a specific sector and forecast skill requirements and provide skills portability through national occupational standards; a set of services many continue to provide today.

The *Canadian Steel Trade and Employment Conference*, established in 1985, was the first national sector council. Remarkably, it was initiated by business and labour with government "playing the role of observer and providing financial support." It is a notable example in which organized labour played an active role (Gunderson & Sharpe 1998:7 & 10). Sector councils in a variety of industries followed including electrical and electronics manufacturing, transportation, plastics and software.

The Government of Canada began investing in sector councils in 1992. For a time, they became an important component of federal and provincial human resource and economic adjustment strategies (Gunderson & Sharpe 1998: 9). However, the variable nature of federal involvement reveals a complicated history. Over the past three decades sectoral initiatives have materialized in four forms: the *Sectoral Partnership Initiative* (1992-2006), the *Sector Council Program* (2007-2013), the *Sectoral Initiatives Program* (2013-2021) and the new *Sectoral Workforce Solutions Program*.

The most current ESDC evaluation shows the federal *Sectoral Initiatives Program* provided approximately $20 million in funds per fiscal year for sector-based programs implemented by

[12] According to the *Conference Board of Canada* a "sector-based approach to skills and learning recognizes that the performance of individual companies is embedded in a much broader sectoral and networked system" (Bloom et al 2005:2).

recipient organizations over the period 2013-2017 (2018a: 3). This amount represented a significant funding reduction from its predecessor – the *Sector Council Program* – that had a budget approximately three times larger (ESDC 2018a: 14).[13] Funding of $960 million announced in the 2021 federal budget therefore represents a significant increase.

Currently, sector skills councils operate at the national, provincial-territorial levels and include organizations serving groups such as Indigenous people and youth. For example, *Buildforce Canada* (described in Box 4) is a national organization committed to the development of a skilled construction workforce. The *Association of Industry Councils* is an umbrella organization in Nova Scotia comprised of fourteen industries such as: construction, fisheries, manufacturing, forestry, boat builders and ocean technology. *Indigenous Works* provides skills training and employment opportunities directed to Indigenous communities.

Box 4: Upskilling Alberta's Construction Workforce

Construction is the third largest employer in Alberta employing 240,000 people and contributing $27 billion to provincial GDP. New technologies like prefabrication, 3D printing and semi-autonomous machines are changing the skills required by the industry. Projects in the future may require less traditional building trades and more people skilled in programming.

Recognizing up to 50% of construction jobs face automation, *Buildforce* worked with partners in Alberta in 2020 to develop a coordinated strategy to meet the human resource challenges of technological change.

BuildForce Canada is a national organization committed to the development of a highly skilled construction workforce.

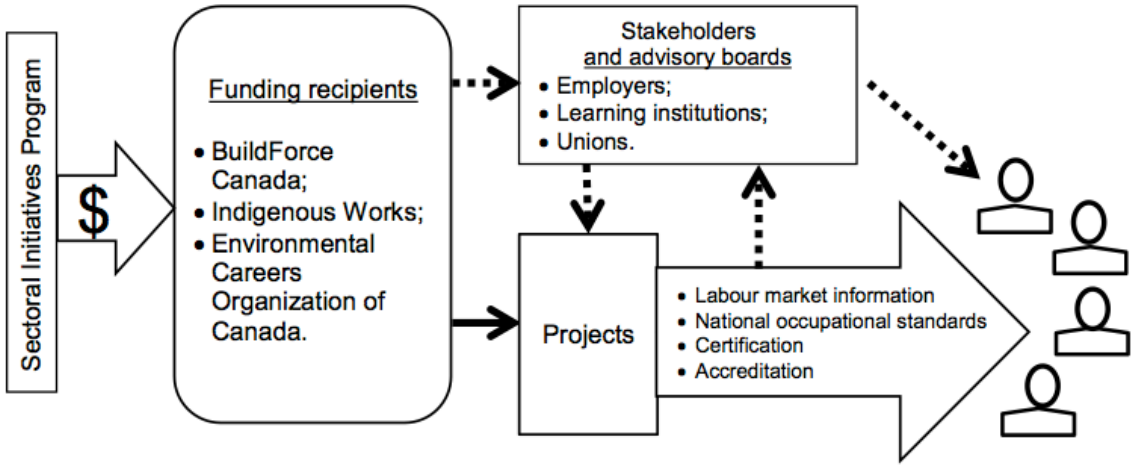
Source: https://www.buildforce.ca/en

To ensure high levels of stakeholder engagement these initiatives are designed to work through third parties with funding from consolidated revenues and the Employment Insurance program (ESDC 2018a: 3, 13 & 24). Project funds have been provided through contribution agreements related to four areas: sector specific labour market information, national occupational standards, skills certification and training accreditation systems. Funding recipients are often non-profits but also include for-profit organizations, Indigenous organizations, unions, educational institutions and other levels of government (ESDC 2018a: 11-12).

Figure 6 shows the functional operation of the *Sectoral Initiatives Program* and its relationship with stakeholders.

[13] An evaluation of the *Sector Council Program* in 2010 shows funding amortized over large numbers of workers. In 2003-2004 the total number of workers covered was estimated at 6,750,400 with a budget of $63.1 million meaning $9.35 was allocated per covered worker. A contemporaneous international comparative review noted the Canadian program was "greatly under-funded relative to their objectives and the importance of skills [to the] country" (HRSDC 2010:34).

Figure 6: Sectoral Initiatives Program – Interactions Between Key Players



Source: Employment & Social Development Canada (2018a: 12). *Evaluation of the Sectoral Initiatives Program*.

Sector councils offer decentralized, cooperative solutions involving active adjustment assistance, as opposed to passive income maintenance, that appeal to governments seeking to reduce spending (1998: 6). Numerous evaluations of the performance of Canada's sector skills councils demonstrate that they are successful in creating value for stakeholders (HRSDC 2010; ESDC 2018a; Bloom 2005: 3; Wolfe & Martin 1998: 125). The logic of the sectoral initiatives program is shown in Appendix 1.

In its 2018 program evaluation, ESDC found evidence of high stakeholder engagement and progress in addressing sector-specific human resources challenges, such as reduction in skills gaps, facilitating collaboration and network connections that indicate an overall continuing need for program support (2018a: 16 & 43).[14] It is noteworthy that at the same time that Canada is rediscovering the value of enhanced public support for the sectoral approach to training, other countries, particularly the US are increasingly experimenting with a bottom-up approach to building sectoral training initiatives (Lowe 2021).

Notwithstanding our record of success with the approach, several factors identified in the literature document the challenges faced by Canada's sector councils. Gunderson and Sharpe (1998) suggest that industry support for sector councils was not widespread. They observe: "Business support comes easier when the industry is concentrated both geographically and in terms of the market share of the top firms" (1998: 15). Wolfe and Martin (1998) argue skills

[14] Data from the 2018 evaluation report show sector councils engaged with a total of 12,923 stakeholders in fiscal year 2015-16 including: employers, learning institutions, unions, municipalities, non-governmental organizations and international governments or agencies (ESDC 2018a:26).

training can seem to offer a way out of a structural impasse as governments, employers and workers often "view training as a way to facilitate labour adjustment, as well as to increase the productivity and competitiveness of industry" (1998: 100-101).

Atkinson and Pervin (1998) contend: "sector councils are neo-corporatist bodies whose emergence represents the replacement of market and hierarchy with networks and associations as the dominant governance mechanisms." This puts them at odds with the dominant liberal market orientation of Canadian institutions and so makes them unlikely "to satisfy political and economic elites or to gather support among critical constituent groups" (1998:271).

A revealing assessment by the *Conference Board of Canada* in 2005 remains valid today: "the competitive human resource strategy of many employers is based on a low-cost/low-added value approach – which perpetuates a low-skill/low-wage equilibrium in which neither employees nor employers demand higher levels of skills" (Watt & Gagnon 2005: 10).

5.3 The link between learning and innovation performance

Canada's uneven record with active labour market policy and skills development stands in sharp contrast to a growing emphasis in the innovation literature on the link between learning processes and innovation performance. This literature argues that *learning* is a critical factor in the economic performance of knowledge-based economies (Lorenz & Lundvall 2006; OECD 2020a; OECD 2001; Lundvall & Johnson 1994).

In a *learning economy* "knowledge is the most fundamental resource and learning is the most important process." Innovation arises dynamically from "interactive learning and new combinations of knowledge" that depend on the capability of workers to collaborate and share information without friction (Lundvall & Johnson 1994: 23-24 & 27; Archibugi & Lundvall 2000: 5).[15]

As information and communication technologies (ICT) accelerate the rate of knowledge creation and destruction, it is the *rate of change* that matters most (Lam and Lundvall 2006: 110). In learning economies speed in the innovation process gives learning greater importance in economic performance because "[c]hange and learning are two sides of the same coin" (Arundel et al 2007: 1176; Lundvall & Rasmussen 2016: 450). While this dynamic makes information

[15] Archibugi & Lundvall (2000) distinguish the concept of a *learning economy* from the more commonly employed term *knowledge-based economy* in order to capture the dynamic state of contemporary ICT-driven economic activity. Today, "what constitutes success is not so much having access to a stock of specialized knowledge [but rather] the key to success is rapid learning and forgetting (when old ways of doing things get in the way of learning new ways)" (Archibugi & Lundvall 2000:1).

easily accessible it also makes knowledge, skills, and competences obsolete at a faster rate. For business it means shorter product life cycles and intensified competition; for individuals it means a constant need to renew skills to remain employable; for policymakers the task is to establish and promote resources to support continuous learning (Lundvall & Rasmussen 2016: 450). The logic of a learning economy requires a systemic perspective of economic performance that looks beyond production activities to include education, training and labour markets as key institutions that influence "different types of knowledge, patterns of learning, and innovation" (Lam & Lundvall 2006: 115-117). In this context tacit knowledge and labour mobility constitute the "most important source of learning and sustainable competitive advantage."[16]

Crucially, institutions and organizations that generate interactive learning are "more likely to produce strong innovative capabilities" (Lam and Lundvall 2006: 110). As a result: "the learning capability of firms located in the domestic economy becomes a major concern for national governments" at the same time "the national infrastructure supporting knowledge creation, diffusion and use becomes a concern for management and employees" (Lam and Lundvall 2006: 109). This requires business and government to focus on the ways in which institutions, such as schools, universities and research institutes, shape patterns of learning and innovation (Lam and Lundvall 2006: 109-110).

Making a "distinction between intentional learning (education, training, R&D, market research) and learning as a by-product of routine economic activities (learning-by-doing, by-using and by-interacting in relation to normal production and marketing activities by firms)" is critical in a learning economy (Lundvall & Johnson 1994: 32). Hence, the ways in which knowledge is generated and used by firms to create value conditions the pace (fast or slow) and style (incremental or radical) of innovation in a national economy (Lorenz & Lundvall 2006: 7).

Patterns of learning, knowledge creation and the organization of work determine innovative capacity, ultimately producing comparative advantage in different industrial sectors (Lam & Lundvall 2006: 126; Holm et al. 2021). Arundel et al. (2007) show that how firms organize production and distribute responsibilities among workers affects learning and innovation capacity (2007: 1176). This research suggests that national differences in innovation performance result, in part, from differences in work organization.

In a study of the effects of artificial intelligence, machine learning and robotics on work organization and skills development, Holm et al. (2021) find that worker autonomy and the presence or absence of discretionary forms of learning influence innovation performance (2021:

[16] Tacit knowledge is also referred to as 'know-how' or skills. It is uncodified and normally involves social interaction. Codification is generally more suited to capture procedures than skills and competences. Tacit and codified knowledge are often complementary (Johnson et al 2002:248, 254 & 256).

18). The implication of these studies suggests discretionary learning and the frequency at which firms introduce "new-to-market innovation" are linked (Arundel et al 2007:1194).[17]

Yet, in a study of Danish firms, Gjerding et al. (2020) found between 40-60 per cent of workers are "challenged by future needs for up-skilling". Further, studies by Gjerding (2020) and Holm (2021) identify peer learning as the dominant form of up-skilling as well as an important avenue of knowledge exchange. Both argue that greater focus on continuous learning and strategic human resource development are needed to respond to new technologies (Gjerding et al 2020: 23 & 26; Holm et al 2021:17).

Box 5: Economically valuable knowledge can be classified into four categories:

Know-what – refers to knowledge about 'facts' or information. Easily codified.

Know-why – refers to scientific knowledge of principles and laws of nature, in the human mind and in society. Codification is normally incomplete.

Know-how – refers to skills meaning the capability to do things on a practical level. Called *tacit* because it is not written down, learned by *doing* in a social context. Often only partly codifiable.

Know-who – refers to specific and selective relations, the ability to cooperate and communicate with different kinds of people and experts. Highly context dependent and difficult to codify.

Sources: Lundvall & Johnson (1994:27-28); Johnson et al (2002:250-51); OECD (2001:18-19); Bessen (2015:15).

The Danish studies are corroborated by OECD research that shows: "The way work is organized, and people are managed matters for turning a workplace into a learning organization" (2020a: 8). Focus is on High Performance Work Practices (HPWP) characterized by "an emphasis on employee participation and discretionary effort at all levels of the organization, and full use and development of employees' skills." Examples of HPWPs include teamwork, autonomy, task discretion, mentoring, job rotation and applying new learning (OECD 2020a: 55).[18]

In the logic of a learning economy: "people make up the most fundamental element of the innovation system" (Lundvall 2002: 152). Proponents have long argued that studies of innovation give "too little emphasis to the subsystem related to human resource development" (Lundvall et al. 2002: 224). Making the transition to a learning economy requires recognition that the production and efficient use of intellectual capital (i.e. knowledge) is fundamentally dependent on social capital therefore economic strategies that focus only on production capital are not sustainable (Lundvall et al 2002: 228).

It is disconcerting to note that 25 years ago the *Round Table on the Changing Workplace* (1996) recognized the economic value of tacit knowledge and decision-making autonomy (HRDC 1997: 133). More recently, Canada's poor productivity performance led the OECD to suggest:

[17] *Discretionary learning* refers to jobs where responsibility is allocated to the employee who expected to solve problems on his or her own. By contrast, in lean production models where problems are narrowly defined "work is highly constrained and it is often repetitive and monotonous" providing lower levels of problem solving discretion and learning (Arundel et al 2007:1184-1188).

[18] The OECD defines the term 'high performance work practices' (HPWP) as "a set of human resources practices that are shown to be associated with greater skills use and informal learning " (OECD 2020a:55).

"Dedicated efforts are needed to understand and improve skills use in the Canadian workplace" because a highly credentialed workforce "does not guarantee actual skills usage" (2020a: 25).[19]

5.4 Building a learning economy: How people are fundamental to innovation in Denmark

Denmark is relevant for this discussion because it offer an alternative, human-centred innovation model of particular relevance to small, open economies. The Danish experience provides three lessons for Canadian policymakers: first, employment or more appropriately 'work' policy is prioritized highly in Denmark; second, employment policy is coordinated laterally with other policy areas and is delivered via a decentralized governance model; finally, Denmark is making substantial progress to develop a learning economy based on a new social contract in which inclusive access to educational resources is the outcome of deliberate policy choices.

A case comparison of Canada and Denmark is not intended to suggest that this country should or can emulate the Danish model of corporatist industrial relations. Achieving the same level of collaboration among social groups would be a tall order in the Canadian business and political contexts as the experience with provincial Labour Force Development Boards illustrates.

The Danish system of innovation and competence building has some unique characteristics that make it an interesting model for international policy learning. Denmark does not have a *radical* science-based approach to innovation; instead its approach is *incremental* focused on absorbing technology from abroad. Its pattern of industrial specialization provides an example that deviates from mission-oriented or research and development-led innovation models used in technological frontier economies such as the United States.

The value of Denmark's experience lies in its recognition that most innovations are minor and incremental rather than major and radical.[20] In this way of thinking, interactive learning matters because information exchange is a social activity that depends on trust and collaboration. Furthermore, the Danish labour market policy is oriented to support skills acquisition through a system of continuous adult education as an important mechanism to reduce labour market polarization, which is produced by skills-biased technological change.

[19] National systems of education vary according to the value they attach to different types of knowledge – whether formal academic or practical skills. In Canada, preoccupation with credentials rather than skills helps to explain the frequent disjuncture between business interests and educational institutions.

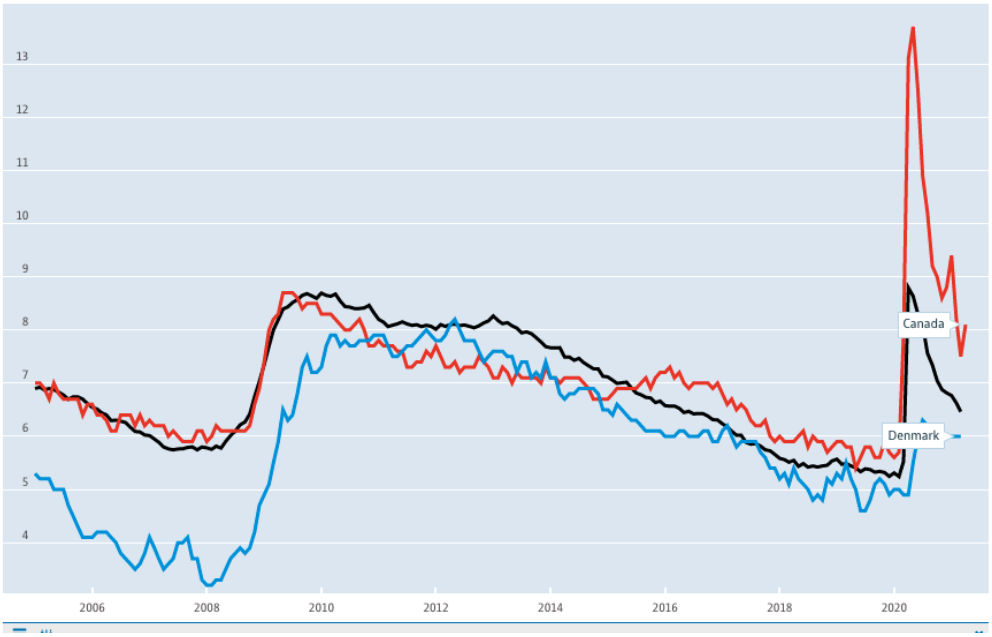
[20] A study by Berger et al (2020), as part of the *MIT Taskforce on the Work of the Future,* corroborates the Danish evidence. It shows patterns of technology acquisition among enterprises differ based on firm size, making it a critical determinant of automation rates. This research suggests: "smaller firms tend to automate incrementally" (Autor, Mindell & Reynolds 2020:48).

The Danish case is particularly relevant to small, open economies dominated by small- and medium-sized firms (Lundvall & Nielsen 1999: 75). In the global economy, countries like Denmark and Canada are technology *takers* meaning transformation pressures come predominantly from external sources. Consequently, national responses are frequently constrained by what is going on in the rest of the world. Denmark's policy efforts in the area of active labour market policy show how a coordinated approach that combines pro-business laissez faire policies with public investment in human resources ensures its workforce is able to meet the challenges of technological change (Ornston 2013: 314).

Danish firms benefit from a flexible labour market characterized by high levels of labour mobility. Public policy combines high levels of employment flexibility with generous social protections designed to promote labour mobility known as *flexicurity.* Thus, labour market policy has been re-oriented away from passive measures focused on income support toward continuous adult education and learning that prioritizes workforce participation (OECD 2011: 23).

The Economist (2021) recently reported that Denmark has one of the highest labour force participation rates. Moreover: "When Danish people lose a job, they find a new one faster than almost anyone in the world." As Figure 7 demonstrates Denmark's unemployment rate is consistently lower than its OECD peers (shown in black) and has remained low during the COVID-19 pandemic.

Figure 7: Comparative Unemployment Rates – Canada, Denmark & OECD Average

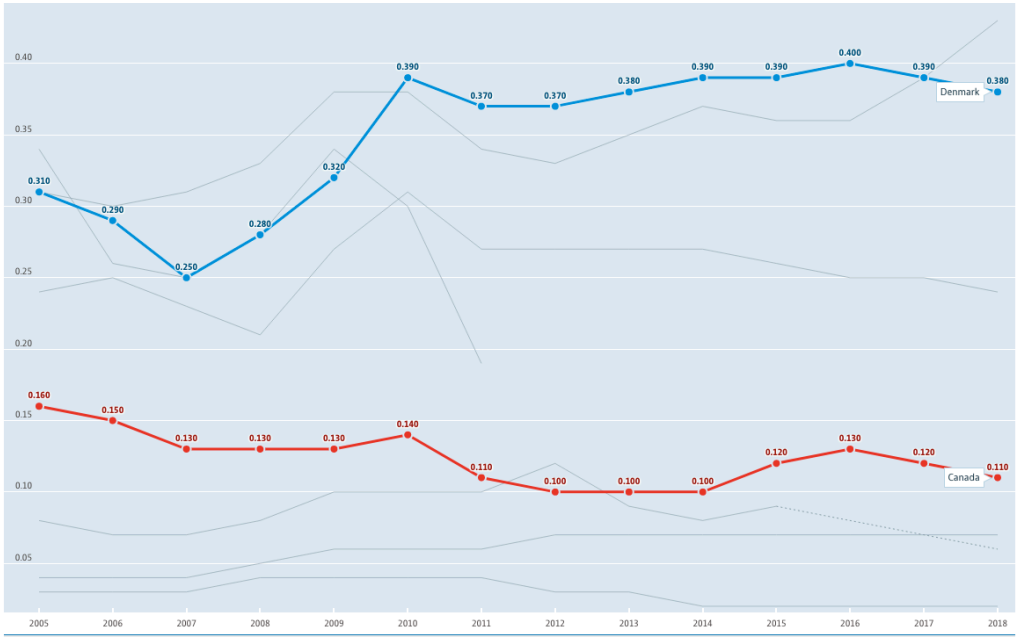


Source: OECD 2021 Comparative Unemployment Rates: https://data.oecd.org/unemp/unemployment-rate.htm

Paradoxically, Danish firms invest less in workforce training than firms in other countries, yet Danes receive higher levels of training than their counterparts in other advanced economies. Firms and individuals contribute financially to public training that is governed by "tripartite bodies representing labour, industry, and the public sector" – a unique feature of Danish society (Nielsen & Lundvall 2006: 164).[21] Funding for training (as well as other active labour market programs) comes from a well-developed public system that provides continuing education opportunities for adults alongside a highly regarded vocational training system (Nielsen & Lundvall 2006: 164; Lam & Lundvall 2006: 133).

Critically, no distinction is made between employment and unemployment in accessing training resources. Figure 8 shows spending on active labour market measures distinguishes Denmark from its OECD peers.

Figure 8: Public Spending on Labour Markets as share of GDP – Denmark, Canada & G7



In 2018 Denmark spent 2.87 per cent of GDP on active labour market measures including 0.39 per cent of GDP on training according to the OECD. This compares to 0.7 per cent and 0.06 per cent respectively in Canada.
Source: OECD 2021 Public Spending on Labour Markets https://data.oecd.org/socialexp/public-spending-on-labour-markets.htm

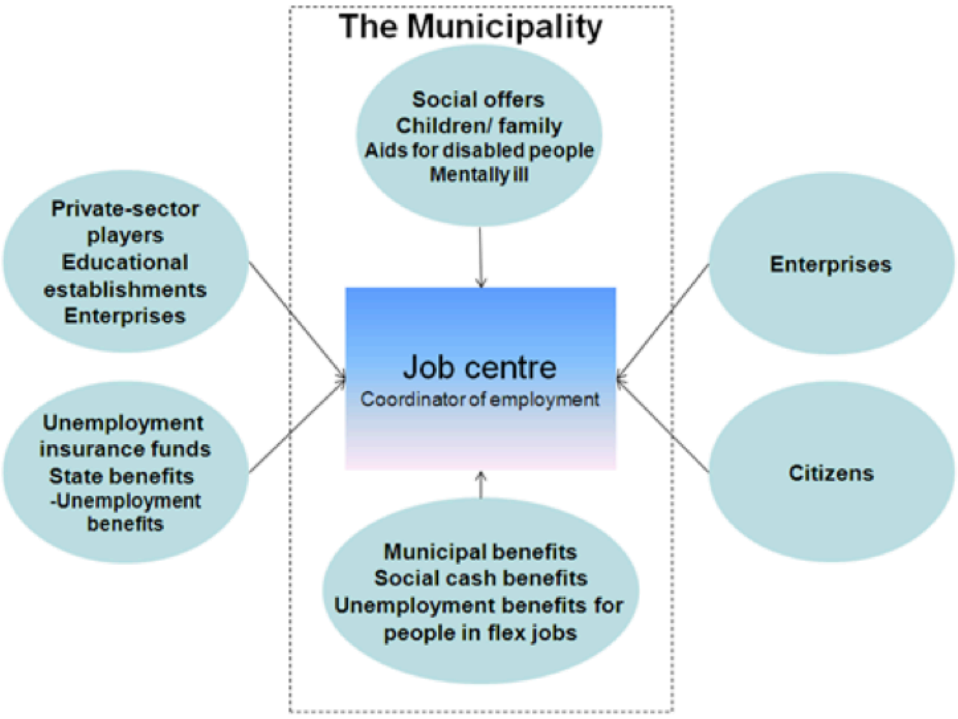
[21] Denmark has a unique social contract founded in collaboration among business, labour and government. "In Denmark, the Danish Confederation of Trade Unions (LO) plays a large role in promoting employee-driven innovation in private and public sector workplaces. …The Danish government concluded a tripartite agreement on adult and continuing training for the period 2018 to 2021, together with LO, and the Confederation of Danish Employers" (OECD 2020a:71).

Denmark's public sector is characterized by a high degree of decentralization. Danish employment policy is organized on three levels: the National Employment Council (BER); regional employment councils (RBR); and local employment councils (LBR). An advisory body is linked to each of the levels comprised of employer and labour representatives, as well as representatives from equity organizations (OECD 2012: 21).

In 2009 responsibility for active labour market policy was transferred from the national level to regional and municipal levels of government as part of a major structural reform (OECD 2011: 23; OECD 2012: 19). Much as in Canada, devolution of program responsibilities aimed "to reap synergy benefits and enhance cooperation of employment measures" aligned to local needs.

As a result, Denmark's municipal/regional level administers services related to business development, schools and adult education/training, social and employment policies corresponding to approximately two thirds of overall public expenditure (OECD 2012: 10). Figure 9 shows how local labour market policy is organized at the municipal level.

Figure 9: Municipal Level Organization of Danish Employment Policy



Source: OECD (2012:28). *Building Flexibility and Accountability into Local Employment Services: Country Report for Denmark.*

The advantage of Denmark's policy approach is that it mobilizes resources to strengthen human resources rather than industrial sectors or firms. National legislation sets out minimum service standards such as frequency of client contact and program access. Within these legal minimum requirements municipalities have flexibility to develop programs to target local economic needs or challenges and manage relationships with employers or other organizations independently (OECD 2011:30). Recent changes to this model are part of the broader field research project underway at the Innovation Policy Lab.

Nonetheless, evidence demonstrates that labour market flexibility is an important support to the Danish innovation system (Nielsen et al 2021; Gjerding et al 2020; Lundvall & Rasmussen 2016). These studies show how policy choices have "made it possible to combine a fluid and open labour market with a high level of trust and cooperation which promote the development of learning organizations" (Lam & Lundvall 2006:133). As one Danish employer observed: "We are only as valuable as our least skilled employee" (Ornston 2012:704).

6. Conclusion: Canada as a Learning Nation

Over the past 30 years Canada's broader economic policy framework has privileged investments in capital at the expense of those in skills development and continuing training with unintended consequences for human development and innovative capacity. This policy stance emerges from a limited economic perspective.

A short-term focus on profitability that did not require ongoing investments in the employed workforce has not only disadvantaged individual Canadian workers and the communities left behind, but it also poses a threat to our ability to adopt broad-based technological innovation to sustain this country's long-term prosperity. Indeed, a recent study by IPL scholars argues: "Canada's market-oriented approach to innovation policy has failed to break its private sector out of a low innovation equilibrium" (Denney, Southin and Wolfe 2021:4).

In response, this knowledge synthesis report employs the concept of *learning economies* to develop an alternative, human-centered policy approach aimed at enhancing innovation capacity. International research highlights the link between high performance work practices that provide opportunities to learn and develop skills and the capacity to innovate.

To facilitate the digital transition and mitigate the risk of skills and job displacement from automation a focus on adult continuing education and training must become a higher priority. As artificial intelligence, robotics, data analytics and cloud-based computing diffuse more broadly (Wolfe 2018), there is a need for new forms of education and training as well as changes to existing education systems to focus more on continuous learning (Gjerding et al 2020; Holm et al 2021; Nielsen et al 2021). In this context, strategic human resource management and informal forms of learning on the job are also critical (OECD 2020a: 62). Labour market programs and services must be demand-led reflecting local market demand and employer needs.

Furthermore, high quality human resources are critical to help local labour markets adjust to automation making flexibility in policy and program administration increasingly important (OECD 2011). Considerable authority for employment services is situated at the provincial-territorial level. Greater flexibility at the local and regional levels is important to advance local strategies for long-term economic growth and social inclusion. Denmark provides a potential model that demonstrates balance between accountability and flexibility in the management of employment programs is achievable, while Canada's experience with sectoral councils represents an example of underappreciated assets that facilitate collaborative problem solving at the local level.

During the decade and a half from the mid-1980s to the late 1990s, Canada underwent a period of experimentation and innovation in active labour market policy with the establishment of national, provincial, and local labour market boards and individual councils in a wide range of industry sectors. Unfortunately, much of the creative energy was dissipated in the succeeding decades as most of the labour market boards were disbanded and support for sectoral councils was substantially curtailed.

Making Canada a learning nation as envisioned by the *Future Skills Council* report (2020) requires greater coordination to link labour market policy with other economic policy areas. This means taking seriously recommendations to improve institutional governance, in particular the *Forum of Labour Market Ministers*, as a mechanism for wider democratic involvement in labour market transformation. Labour market policy remains overly centralized with a top-down character that reflects the dilemma of asymmetrical federalism.

A reorientation of innovation policy is also needed based on recognition that innovative capacity depends on individual and collective learning rather than on knowledge intensity or credentials. As the spread of the digital economy accelerates, economic value is increasingly derived from intangibles – software, entertainment and intellectual property – that embody human knowledge.

The Danish case demonstrates that to compete successfully small, open trading economies "must focus on specific sectors and niches" where national firms and industries have the potential to compete in global markets (Wolfe 2019a:7). Adopting a comprehensive approach to innovation requires a shift away from a narrow R&D-focused policy orientation (Wolfe 2019b).

By combining high labour mobility with the collective sharing of adjustment costs Denmark offers an example of how labour market flexibility can advance innovation and economic productivity. In Canada, differential access to training and education resources serves to reinforce labour market barriers that trap individuals in low-wage, low-skill jobs and firms in a low-innovation equilibrium.

As the *Round Table on the Changing Workplace* observed in 1996, without opportunities to up-skill or re-skill over the course of a career life cycle, many Canadian workers will be left behind with significant consequences for economic competitiveness and social cohesion. Adopting a demand-led policy approach requires renewed collaboration among stakeholders because governments cannot solve problems of an economy-wide digital restructuring alone.

The idea that efficiency and employment are competing policy goals is a false narrative that recent experience from the U.S. and U.K. shows serves only to produce isolated communities of workless and hopeless citizens excluded from the fruits of the digital economy.

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Appendix 1 – Sectoral Initiatives Program Logic 2016

(Source: ESDC 2018a:28)