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Bad Fits: The Causes, Extent and Costs of Job Skills Mismatch in Canada

Are you over-skilled or under-skilled for your job? For about 13 percent of Canadian employees the answer is yes. Policymakers should be concerned: this has negative consequences for employee morale, firm productivity and Canada's economic performance.

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A handwritten signature in black ink, reading 'Daniel Schwanen'.

Daniel Schwanen
Vice President, Research

THE STUDY IN BRIEF

About 13 percent of Canadian workers have skills mismatched to their jobs. Although this is somewhat in line with an average of around 10 percent among OECD countries in an international survey, Canadian policymakers have two reasons for concern.

Firstly, there is significant variation across socioeconomic groups. While workers with higher educational attainment are more likely to be over-skilled, women, immigrants, and older workers are more likely to be under-skilled for their jobs. In the case of immigrants, the under-skilled problem entirely disappears with time spent in Canada, highlighting the importance of settlement policies that provide rigorous and accessible skills training, language programs, and job-search workshops for newcomers.

Secondly, these results could worsen in the years ahead in the face of technological development and demographic aging that are occurring in the labour market at the same time as the role of newcomers in Canada's labour force is growing. As it is, the majority of workers across occupations need to use cognitive skills such as literacy, numeracy, and problem solving at least once a week at work. More importantly, there is no occupation where these skills are not required at all.

This study's results highlight the importance of providing more opportunities for skills development and lifelong learning for all workers and better addressing individual training needs, particularly, among under-skilled people such as older workers and new immigrants.

Businesses – in addition to providing training opportunities for under-skilled workers – can reduce mismatches within their organizations by appropriately reassigning tasks, providing relocation assistance and finding innovative ways to use workers' skills in order to optimize productivity.

Governments can help reduce skills mismatch with policies that enhance labour market flexibility, ease labour mobility, and more importantly, increase participation in lifelong learning.

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When the skills of employees match the requirements of their jobs, good things happen. Skills are essential for individual success in the labour market; properly matched with job requirements, they improve employee morale, firm productivity and, on a broader scale, economic performance. Poorly matched and they have the opposite effects.

A highly skilled workforce can adjust more quickly to changes in the labour market. And high levels of cognitive skills – such as literacy, numeracy, and problem solving – are important to the economic success of developed countries (OECD 2012, 2013a). However, the effective allocation of skills in an economy is necessary in order to achieve these laudable outcomes. When workers' skills are higher or lower than the skills required to perform their jobs, skills mismatch exists between supply and demand.¹ Adalet McGowan and Andrews (2015a) find higher levels of skills mismatch, particularly in the form of “over-skilling”, are associated with lower labour productivity. Overall, over-skilled workers are under-utilized since they are unable to use their full potential at work. Conversely, under-skilled workers are over-utilized since their skill deficits make it difficult to fulfill the requirements of their job.

Economic conditions, technology, demographics, and the policy environment can all contribute to the skills mismatch problem. From an economist's perspective, wage rigidities, imperfect information about workers' skills, and labour immobility are factors that can lead to skills imbalances in the labour market (Quintini 2011b). Changes in the

structure of the Canadian labour market caused by demographic and technological shifts can also intensify discrepancies between the supply of and demand for skills (Miner 2014).

Although such imbalances are to some extent, normal, a widespread mismatching of skills to jobs could have potentially serious consequences on workers' performance and productivity (Allen, Levels, and Van Der Velden 2013). Further, it may have negative impacts on social welfare and overall economic productivity (OECD 2015; OECD and Statistics Canada 2011). Extensive skills mismatching can also contribute to skills shortages in pockets of the economy.

This *Commentary* summarizes approaches to measuring skills mismatch and provides evidence on its extent among employed Canadians, in terms of literacy, numeracy, and problem-solving, and its potential underlying factors. These core cognitive skills are fundamental to all learning and commonly required in workplaces (Figure 1). My analysis is based on the Canadian data from a survey by the Programme for the International Assessment of Adult Competencies (PIAAC), an international assessment of adult skills.

The author thanks Rosalie Wyonch, Rob Rosenfeld, Munir Sheikh, members of the C.D. Howe Institute's Human Capital Policy Council and anonymous reviewers for comments on an earlier draft. The author also thanks to John Calhoun for providing the data used in this study. She retains responsibility for any errors and the views expressed.

1 See LMIC (2018) to learn more about differences between various forms of skills imbalances such as skills mismatch and skills shortage in the labour market.

OVERVIEW:

There are two general approaches to measuring skills mismatches: (i) a self-reported approach that uses self-assessment questionnaires; and (ii) a direct approach that uses skills assessments. The direct measure, however, is more reliable for estimating mismatches in numeracy, literacy and problem-solving skills since it is not subject to any self-evaluation biases.

According to the direct measure used in this study, about 13 percent of Canadian workers have skills mismatched to their jobs. Although this is somewhat in line with an average of around 10 percent among OECD countries in the PIAAC survey (Mauriès 2016),² Canadian policymakers have reason for concern for two reasons.

Firstly, there is significant variation across socio-economic groups. While workers with higher educational attainment are more likely to be over-skilled, women, immigrants, and older workers are more likely to be under-skilled for their jobs. In the case of immigrants, the under-skilled problem entirely disappears with time spent in Canada, highlighting the importance of settlement policies that provide rigorous and accessible skills training, language programs, and job-search workshops for newcomers.

Secondly, these results could worsen in the years ahead in the face of technological development and demographic aging that are occurring in the labour market at the same time as the role of newcomers in Canada's labour force is growing. As it is, the majority of workers across occupations need to use cognitive skills such as literacy, numeracy, and problem solving at least once a week at work (Figure 1). More importantly, there is no occupation where these skills are not required at all.

Of course, the labour market skills needed in today's economy are not limited to specific cognitive skills such as literacy, numeracy, and problem solving. Other skills such as social and interpersonal skills also matter. In that regard, the self-reported approach, which likely includes a broader set of skills, shows that only 8 percent of workers in Canada feel that they have the skill set that matches their job, although a majority consider themselves as being over-skilled, as discussed below.

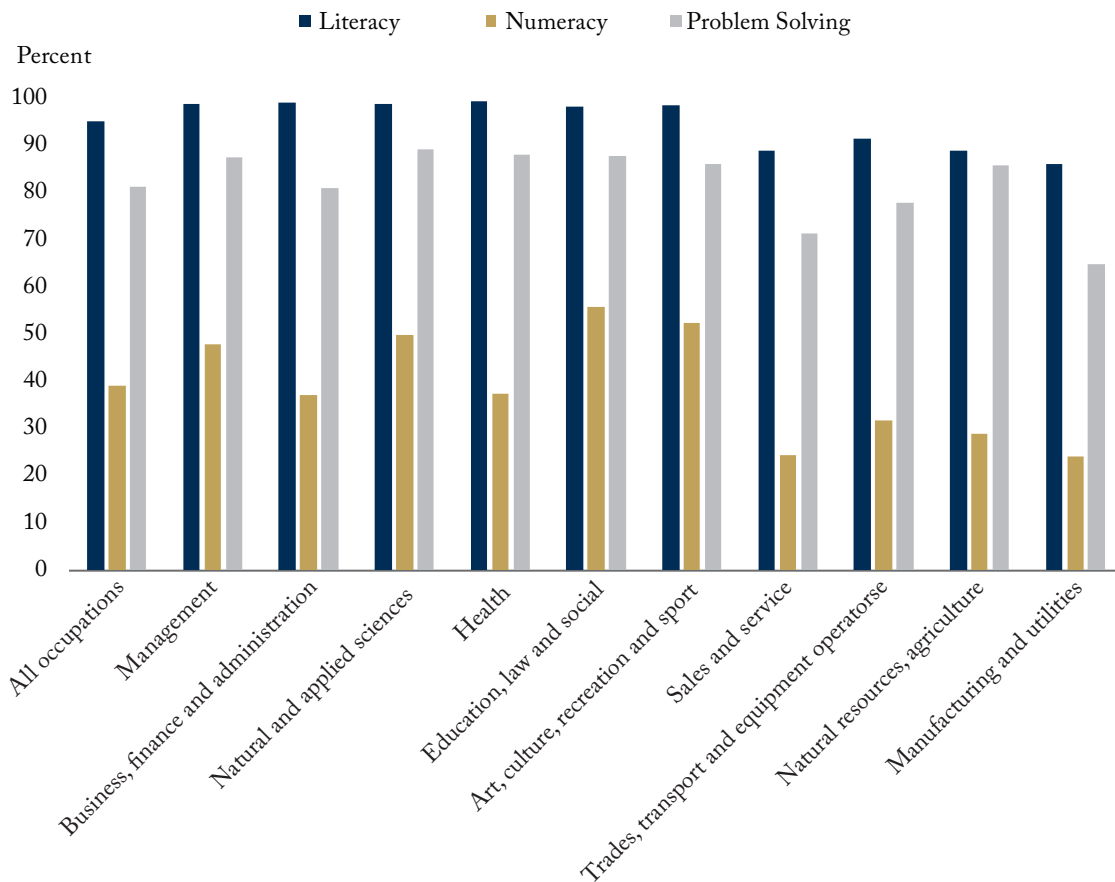
Although both over-skilling and under-skilling have consequences, they do not necessarily pose similar challenges or require identical policy approaches.

An important approach to tackle under-skilling is to encourage lifelong learning and increase participation in adult learning opportunities, which requires support from businesses and governments alike. This important step not only helps address the current under-skilling issue but also prepares individuals for future skill requirements. The federal and provincial governments should also closely monitor the uptake of their training programs, particularly among targeted populations such as older workers and newcomers, and make adjustments if necessary.

While language training programs can greatly reduce under-skilling in literacy, numeracy, and problem solving among new immigrants, lifelong learning for all individuals, either immigrant or non-immigrants, should not be limited to these areas. In addition to providing training opportunities for under-skilled workers, businesses can reduce mismatches within their organizations by appropriately reassigning tasks, providing relocation assistance and finding innovative ways to use workers' skills in order to optimize productivity.

2 These countries are: Belgium, Czech Republic, Germany, Denmark, Spain, France, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Russia, Slovakia, Sweden, United Kingdom and United States of America. Mauriès (2016) excludes Austria, Canada, Estonia and Finland due to absence of the 2-digit occupation level in the PIAAC public-use data.

Figure 1: Frequently Used Skills of Full-time Workers, by Occupation



Note: Frequently used skills shows the percentage of full-time workers who use cognitive skills at least once a week in their job. The remaining workers use these skills less than once week.

Source: Author's calculations using the 2012 PIAAC.

Both the over-skilled and under-skilled problems can be addressed by policies that reduce labour market rigidities and facilitate labour mobility. For example, removing barriers for certified and licenced workers can help reduce over-skilling.

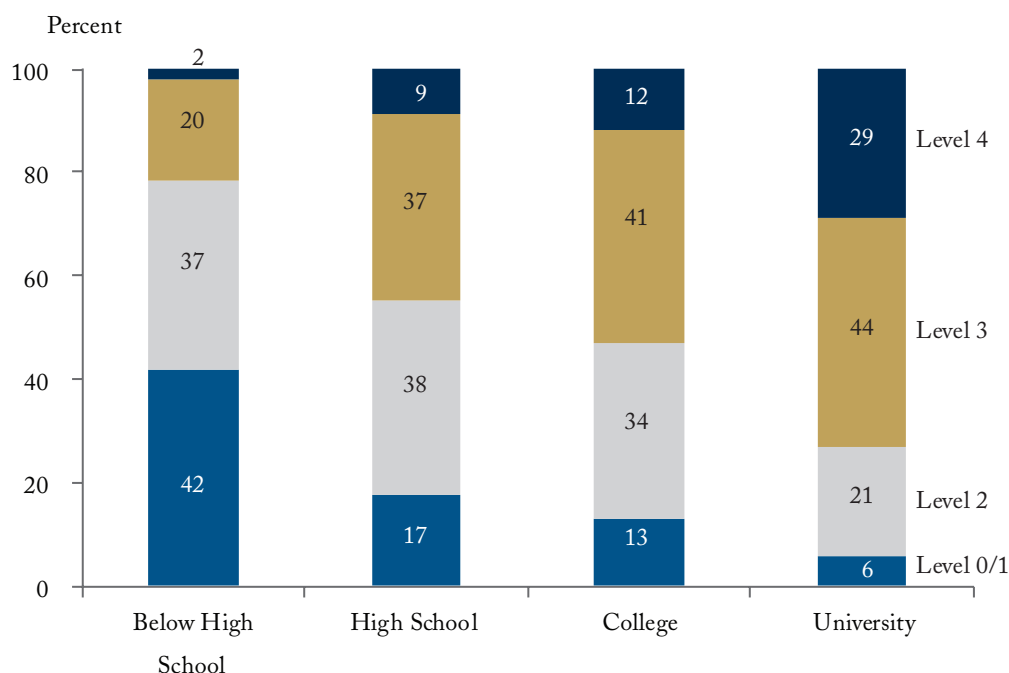
DISTINGUISHING BETWEEN AN EDUCATIONAL MISMATCH AND A SKILLS MISMATCH

While a skills mismatch is a discrepancy between the required and provided skills, an educational

mismatch is the gap between the educational attainment of workers and the typical educational requirement for their jobs.

Due to lack of a direct measures of skill, researchers have traditionally used educational attainment as a proxy for individuals' supply of skills. Although education can be an indication of a potential set of skills, an educational mismatch does not necessarily reflect a skills mismatch (Allen and van der Velden 2001; Allen and de Weert 2007; Levels, Allen, and van der Velden 2014). Green and McIntosh (2007), in particular,

Figure 2: Distribution of Literacy Skills across Education



Source: PIAAC 2012 and author's calculations.

find a weak correlation between over-skilling and over-education and Flisi et al. (2017) find that the majority of mismatched individuals are either skills or education mismatched, but not both, implying that education and skills mismatch measure different phenomenon. They also find that at the country level, education mismatches and skills mismatches move in opposite direction, based on a analysis of 17 European countries.

Education alone is an insufficient measure of skills for several reasons. First, it ignores the diversity of skills at each education level. Although skills, on average, increase with education, there is substantial variation in skill levels among individuals with the same level of education. As shown in Figure 2, the proportion of Canadians with strong literacy skills (level 4) increases from 2 percent among the least-educated individuals to

29 percent among those with a university degree. However, at any level of education there exist both high achievers and low achievers in literacy skills, reflecting variation in the quality of skills obtained.

Second, credentials reflect only the skills acquired from formal training while learning skills is an ongoing process. Individuals may advance their existing skills or learn new skills through their work experience or investment in adult education and training. Finally, skills deteriorate with age if they are not used (Krahn and Lowe 1998; Quintini 2011a; Mahboubi 2017b). While similarly educated individuals may start their working life with comparable skill levels, those levels may depreciate at different paces, depending on job requirements.

Therefore, skills mismatch and educational mismatch are two different concepts and it is important to measure skills mismatch using

available measure of skills rather than a proxy like education.³

THE LABOUR MARKET IMPACTS OF MISMATCHES

Skills mismatches have an impact on wages, job satisfaction and turnover (Allen and van der Velder 2001; Mavromaras et al. 2015, 2009; Quintini 2011b). Firms that employ mismatched workers may also face some engagement concerns since a highly engaged workforce is more productive and efficient.

At the labour market level, skills mismatch has a negative impact on productivity since it can lead to an inefficient allocation of resources. For example, more productive firms may have difficulty hiring skilled employees who are already employed by less productive companies (Adalet McGowan and Andrews 2015a).

In the literature, over-skilling has received more attention than under-skilling. Generally, the incidence of over-skilling is higher than under-skilling across developed countries (Adalet McGowan and Andrews 2015b) and over-skilling is associated with negative labour market outcomes such as wages at the individual level (McGuinness et al. 2018). However, Nyström (2018) shows that under-skilled employees face a higher risk of being job displaced – an involuntary job loss due to economic downturns or structural change – while the opposite is true for over-skilled workers.

As for educational mismatches, previous studies have shown that there are also wage effects

associated with them, such as in the case of highly educated individuals who earn less than their counterparts due to working in jobs that require lower education levels (Hartog 2000; Mavromaras, McGuinness and Fok 2009; Mavromaras et al. 2013; Quintini, 2011b).⁴ However, the wage impact of skills mismatch generally is less severe than that of educational mismatch (Allen et al. 2013; Perry et al., 2014). A potential explanation is that skills mismatch is often measured in the literature based on proficiency in literacy and numeracy, which does not capture mismatches related to occupation-specific skills (Quintini, 2014).

Yet, studies on both educational and skills mismatch show that over-educated and over-skilled individuals tend to be paid less than their matched counterparts, and tend to be less satisfied with their jobs, impacting their productivity.⁵ Conversely, under-educated and under-skilled workers tend to receive higher wages compared to their matched counterparts. Evidence from Australian data shows that the wage effects of over-skilling on workers are more severe than under-skilling (Mavromaras et al. 2013). Pouliakas and Russo (2015) show that under-skilled workers are more likely to be concentrated in high-skilled occupations.

Finally, Zira (2016) shows that skill mismatches in numeracy have a strong negative impact on productivity, based on a cross-country analysis of OECD economies including Canada.

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- 3 However, there is no consensus in the literature on how to measure skills mismatch mainly because of either statistical reasons or data limitations. Furthermore, not all approaches measure mismatch for similar types of skills. Depending on the measure, the extent and economic impact of skills mismatch can vary.
 - 4 The wage penalties, however, can be partially explained by skills levels of those employees (Allen & van der Velden, 2001; Chevalier, 2003; Levels et al., 2014; Mavromaras et al., 2013; McGuinness, 2006; Quintini, 2011a, b).
 - 5 Despite wage penalties for overeducated individuals, their job satisfaction may not be affected adversely under some circumstances. This case can apply to overeducated individuals who have low ability for their level of education, meaning that they are not necessarily over-skilled. Furthermore, some over-educated and over-skilled individuals may have high job satisfaction if their job offers benefits such as less stress or a shorter commute to work.

Box 1: The PIAAC Survey

The OECD Initiated the Program for International Assessment of Adult Competencies to measure the level, distribution, and utilization of various types of skills such as literacy (reading and writing), numeracy, problem solving, ICT (information and communications technology), interpersonal, decision-making and physical skills among the adult population in 24 countries, including Canada in 2012 (PIAAC 2015). The survey's complex sampling methods allow comparisons between and within countries. This international survey provides a direct assessment of proficiencies in literacy, numeracy and problem solving, and a background questionnaire that covers socio-economic information such as income, labour force activity, occupation, educational attainment, immigrant status, gender and age. The background questionnaire also include measures of skill usage in everyday life and in the workplace.

The literacy, numeracy, and problem-solving measures provided in PIAAC are considered to be essential information-processing skills for the following reasons as noted by Calhoun (2015):

- “1. They are necessary for integrating and participating in the labour market, education and training, and social and civic life;
2. They are highly transferable in various social and professional contexts; and
3. They are “learnable,” which can help guide policy development (OECD, 2013c).”

MEASURES OF SKILLS MISMATCH

As discussed above, there are two approaches to measuring skills mismatch: self-reported measures asking workers to compare their skill level to the skills required at their workplace; and direct measures using formal assessments of cognitive skills such as literacy and numeracy (Perry et al. 2014). Each approach has its own advantages and disadvantages. While direct measures quantify mismatches in specific skills such as literacy and numeracy, they fail to provide broader information on the overall incidence of skills mismatch. Conversely, self-reported measures inform us only about the perceived overall skills mismatch (Quintini 2011b), without identifying the type of skills. Further, self-reporting measures can be compromised by social desirability bias and overconfidence bias.

To measure skills mismatching in Canada, the Programme for the International Assessment of Adult Competencies (PIAAC) – a large-scale international assessment – allows using both approaches since it includes a direct assessment

of proficiencies as well as self-reporting using a background questionnaire (see Box 1 for more information about PIAAC).

Self-reported Skills Mismatch

In PIAAC, respondents are required to answer two questions in the background questionnaire, which constitute a measure of self-reported skills mismatch when the questions are combined. These two questions are:

1. “Do you feel that you have the skills to cope with more demanding duties than those you are required to perform in your current job?” (Over-skilled in Table 1.)
2. “Do you feel that you need further training in order to cope well with your present duties?” (Under-skilled in Table 1) (OECD 2013b.)

The first question identifies over-skilled individuals when the answer is yes. The second question identifies under-skilled individuals when the answer is yes. Consequently, skills-matched individuals are those who answered no to both questions.

Therefore, combining the responses together essentially reveals three types of individuals: over-skilled, under-skilled, and skills-matched. However, about 23 percent of respondents answered yes to both questions, implying that some individuals consider themselves simultaneously over-skilled and under-skilled (Table 1). This can occur when these workers possess some skills that are not required by the employer but they are unable to meet other skill needs at work.

According to the self-reported measure, the incidence of over-skilling (66 percent) is considerably higher than the incidence of under-skilling (3 percent) and being skill matched (8 percent). The latter outcome is particularly unreliable since most individuals should be skill-matched with their jobs.⁶ These results confirm that the self-reported skills mismatch measure is prone to biases probably due to variations in interpreting the questions. For example, respondents could have considered different skills while answering each question (Perry et al. 2014). In particular, prior to responding to the skills mismatch questions, respondents in PIAAC were required to identify the frequency of use of various skills such as literacy, numeracy, problem solving, ICT, interpersonal, decision-making and physical skills in their workplace. While workers may need no further training in some types of skills, they may need to advance other skills to excel in their career. However, skills mismatch questions do not refer to specific type of skills. Therefore, the self-reported measure is not an adequate method to identify skills mismatch (ibid).

Table 1: Self-reported Skills Mismatch

Over-skilled	Under-skilled	
	Yes	No
Yes	23	66
No	3	8

Note: Sample is restricted to Canadian employees that work at least 30 hours per week, that are non-apprentices, and are non-students.

Source: Table 3.1 in Calhoun (2015) based on PIAAC data for Canada.

The Direct Measure of Skills Mismatch

The direct measure of skills mismatch is based on proficiencies in three domains of foundational skills: literacy, numeracy, and problem solving in technology-rich environments. However, there is no consensus on how to define skill mismatch using a direct measure. While an earlier method uses self-reported information to combine data on skill levels and skill use (Allen et al. 2013),⁷ the most recent method (Perry method), introduced by Perry et al. (2014), utilizes occupation-specific skill levels and avoids using any self-reported information to overcome biases. According to the Perry method, individuals are over-skilled or under-skilled when their skills are at least 1.5 standard deviations, correspondingly, above or below the average score, relative to others in the same occupational group.

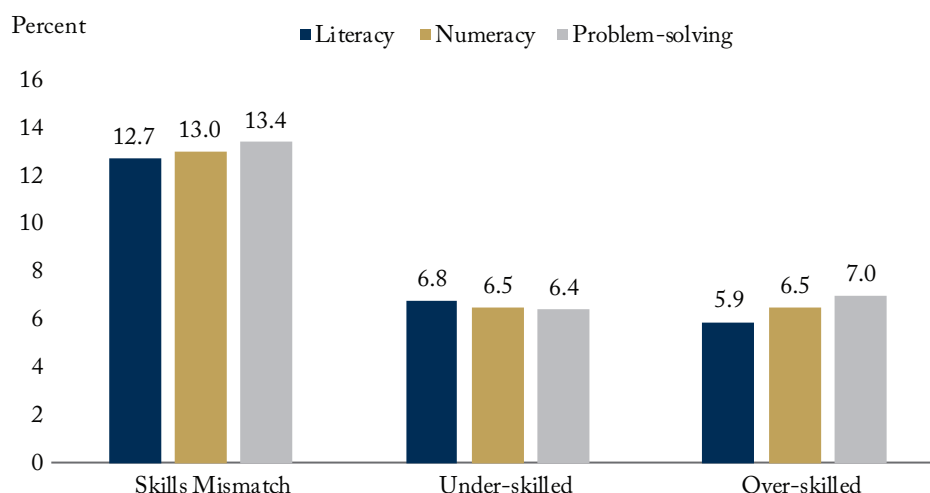
Consistent with the literature (e.g., Allen et al. 2013; Perry et al. 2014; Flisi et al. 2017), the direct measure of skills mismatch in this paper is also based on 1.5 standard deviations⁸ above (over-

6 Using the 2013 National Graduate Survey (NGS) also yields somehow similar self-reported skills mismatch results among employed graduates from Canadian post-secondary institutions of whom 69 percent, 4 percent, and 8 percent were over-skilled, under-skilled and skills-matched accordingly.

7 Perry et al. (2014) criticize this measure and highlight its shortcomings.

8 A standard deviation indicates the range above or below the average score. Although there is no strong theoretical justification for using 1.5 standard deviations as a cut-off in the literature relating to skills mismatch (Zira 2016), there is an overall consensus that higher or lower standard deviations (e.g. 1.0 or 2.0 standard deviations) are too lenient or too strict (Calhoun 2015).

Figure 3: Skills Mismatch in Canada by Skills Type



Note: Sample is restricted to employees that work at least 30 hours per week, that are non-apprentices, and are non-students. Skill-matched represents individuals that fall within ± 1.5 standard deviations from the mean proficiency score within each occupational group. Under-skilled represents individuals that are less than -1.5 standard deviations from the mean proficiency score within each occupational group. Over-skilled represents individuals that are greater than 1.5 standard deviations from the mean proficiency score within each occupational group.

Source: Table 3.2 in Calhoun (2015).

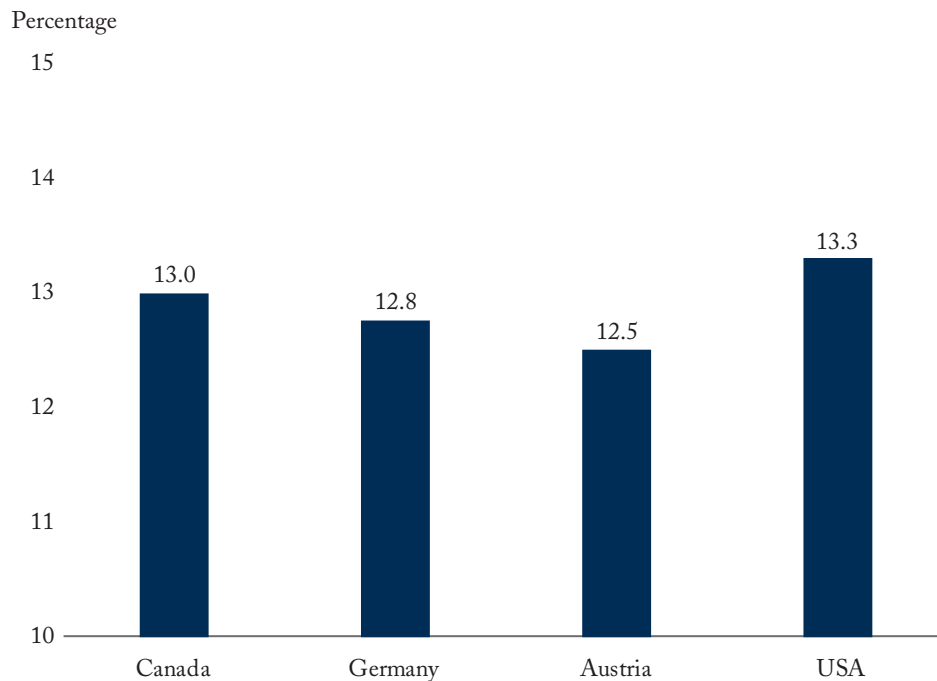
skilled) or below (under-skilled) the average test score of workers within each occupational group. Therefore, skill-matched individuals are those whose skills level falls within the cut-off points.

Using this method, Figure 2 shows that the skills level of about 13 percent of Canadians are employed in jobs that do not match their skills.⁹ This is significantly lower than the self-reported measure of skills mismatch likely because of the reasons explained earlier. Among mismatched persons, the incidence of over-skilling is similar to that of under-skilling in Canada (Figure 3),

but there are some variations. In particular, the incidence of over-skilling is marginally higher in problem solving, while under-skilling in literacy is slightly more common.

The size of skills mismatch is relatively in line with that of OECD countries such as Germany, Austria, and the US, based on the Perry method (Figure 4). However, there is some evidence showing that the prevalence and impact of skills mismatch significantly varies across countries (Adalet McGowan and Andrews 2015b).¹⁰ Allen et al. (2013) show that labour market characteristics

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- 9 Other direct measures based on different methodology generally result in higher skills mismatches in Canada, as shown in Calhoun (2015).
- 10 Although differences in the methodology to measure skills mismatch lead to cross-study variations in the pattern of mismatches across countries, Canada generally stands among countries with relatively lower levels of skills mismatch, regardless of the method.

Figure 4: Percentage of Mismatched Workers in Numeracy, Selected OECD Countries

Notes: Sample is restricted to employees that work at least 30 hours per week, that are non-apprentices, and are non-students. Skill-matched represents individuals that fall within ± 1.5 standard deviations from the mean proficiency score within each occupational group. For Canada, the occupational groups are based on two-digit NOC code while two-digit ISCO level is used for the rest of countries. The skills mismatch measure excludes workers in professions with less than 30 observations per country.

Source: Table 4 in Perry et. al (2014) and Figure 3.

and the economic structure within countries likely contribute to such cross-country differences. Education systems can also play an important role. Although Germany and Austria's labour market is characterized by rigidities that can lead to more skills mismatches, the top-notch vocational education system and apprenticeship training in these countries could greatly help to lower relative skills mismatch by facilitating the integration of young people into the labour market.

THE DETERMINANTS OF SKILLS MISMATCH

While building a skilled workforce in Canada is a priority for policymakers, an efficient allocation of skills is necessary to gain the positive impact of skills development for individuals, businesses and economy as a whole. In order to reduce skills mismatches, it is important to understand the underlying factors that shape them.¹¹ These factors fall into two categories: demographic and socioeconomic characteristics; and policy-

11 Since the size of a skills mismatch greatly depends on its type of measure, it is important to use the direct measure of skills mismatch to study the underlying factors.

related factors that affect labour mobility (Adalet McGowan and Andrews 2015b) and lifelong learning (Mauriès 2016).

Individual Characteristics

Several individual and job characteristics can influence skills mismatch, either over-skilling or under-skilling. These factors include migration status, age, and education level among others.¹²

Using the direct measure of skills mismatch, a comparison between skills-mismatched individuals with those who are appropriately skilled within occupational groups in a study by Calhoun (2015) shows that over-skilling is more prevalent among higher educated Canadians. The prevalence of over-skilling is substantially higher among university-educated workers, compared to those without a post-secondary education (Figure 6). Conversely, they are less likely to be under-skilled in their job in terms of literacy, numeracy and problem-solving skills (Figure 5). In other words, higher educated Canadians are less likely to fully leverage their skills in their work place, relative to less educated workers, possibly due to the misallocation of high-skilled labour or the inadequacy of employment opportunities that require higher skill levels.

In contrast, immigration status plays an important role in driving under-skilling, although immigrants are, on average, more educated than non-immigrants and more likely to be over-educated for their jobs (Mahboubi 2017a; Aleksynska and Tritah 2013; Chiswick and Miller 2009; Kler 2006). In particular, immigrants are more than eight times more likely to be under-skilled in literacy and, to a lesser extent, in numeracy and problem solving, compared to non-immigrants in Canada (Figure 4). They are also

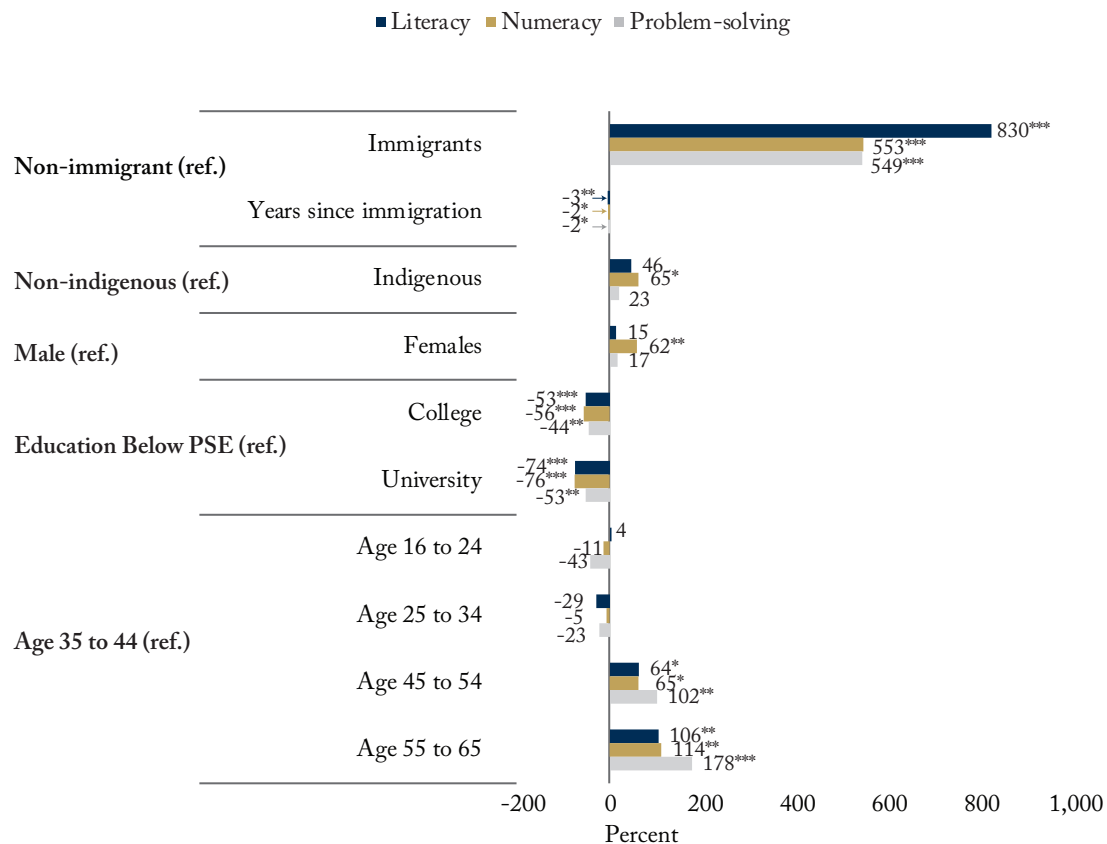
less likely to be over-skilled in the labour market (Figure 5). Under-skilling in literacy, numeracy, and problem solving among immigrants can be largely explained by their poor proficiency and competency in the English or French language, since language ability is the main contributor to the poor performance of immigrants in these skills (Mahboubi 2017a). However, the incidence of under-skilling significantly declines with length of residence and the disadvantage of under-skilling for immigrants disappears with time spent in Canada. This is because the longer immigrants live in Canada, their labour market outcomes improve and their job mobility increases along with higher integration into the society and the labour market (Godin 2008). Other factors that can influence skills mismatch among immigrants are the region of origin, place of acquisition of formal qualifications, the native language, work experience in the country of residence, and age at migration (Battu and Sloane 2004; OECD 2014a).

Aging is another important factor that shapes under-skilling (Figure 5). Senior workers aged 55 to 65 are about 1.8 times more likely to be under-skilled than those aged 45 to 54, likely because information-processing skills decline with age (Mahboubi 2017b). In addition, the skill requirements of a job may change over time, meaning that workers may become under-skilled if they do not maintain or improve their skills over the course of their careers. Therefore, younger workers matched to their jobs can become under-skilled for the same jobs as they age without participating in skills training.

Technological change is another possible explanation for the higher incidence of under-skilling among senior employees. Conversely, young workers, to a small degree, are more likely to be

12 The analysis in this section uses a multinomial logistic regression model to estimate the factors that predict under-skilling and over-skilling in employment (see Calhoun (2015) for more information about the methodology). The estimates show only the associations between individual's characteristics and mismatch but not the causality link.

Figure 5: The Relative Incidence of Under-skilling for Selected Socio-economic Characteristics



Note: Sample is restricted to employees that work at least 30 hours per week, that are non-apprentices, and are non-students. Numbers show the relative probability of being under-skilled rather than being skill-matched. Incidence of over-skilling for selected socio-economic characteristics are relative to their corresponding group referenced on the far-left side of vertical axis. * significant with 95 percent confidence; ** significant with 99 percent confidence; *** significant at 99.9 percent confidence.

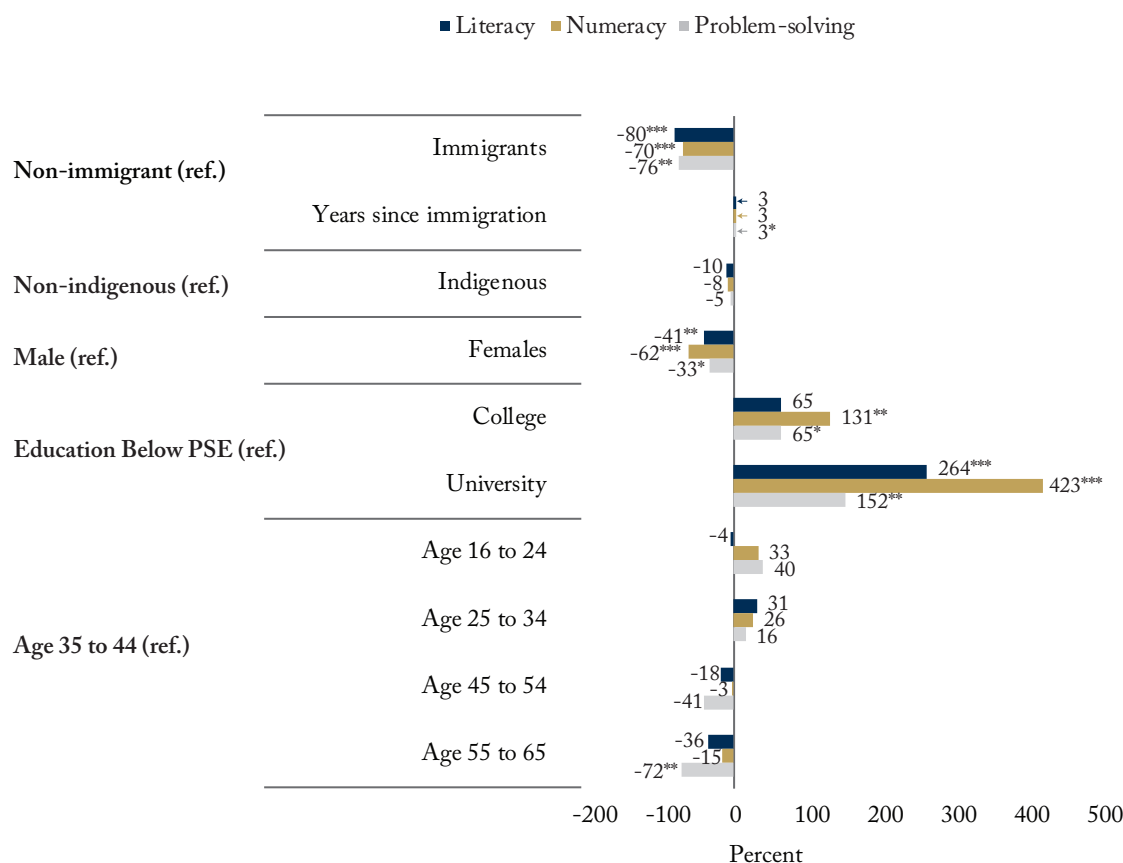
Source: Author's calculation using Tables 4.5, 4.6, and 4.7 in Calhoun (2015).

over-skilled in the labour market (Figure 6). Over-skilling among younger workers, however, decreases as they age since they gain more experience and relevant information about job market opportunities (Desjardins and Rubenson 2011; Alba-Ramirez 1993), before the aging effect begins. Improvement in youth over-skilling also depends on the degree that employers use information other than formal education to fill vacancies (OECD 2014b). For example, Li (2017) shows that the quality of education varies across countries and influences the

value of education for foreign-trained immigrants in Canada.

Given that Indigenous people face various barriers to skills development and educational attainment, they are, on average, less skilled than non-Indigenous people (Mahboubi and Busby 2017). It is not surprising to find that they are more likely to be under-skilled for their job. For example, the incidence of under-skilling in numeracy among Indigenous workers is higher by 65 percent, compared to non-Indigenous people.

Figure 6: The Relative Incidence of Over-skilling for Selected Socio-economic Characteristics



Note: Sample is restricted to employees that work at least 30 hours per week, that are non-apprentices, and are non-students. Numbers show the relative probability of being over-skilled rather than being skill-matched. Incidence of over-skilling for selected socio-economic characteristics are relative to their corresponding group referenced on the far-left side of vertical axis. * significant with 95 percent confidence; ** significant with 99 percent confidence; *** significant at 99.9 percent confidence.

Source: Author's calculation using Tables 4.5, 4.6, and 4.7 in Calhoun (2015).

The Indigenous gaps in literacy and problem solving, however, are lower and statistically insignificant. The relatively moderate outcomes for Indigenous individuals may be the result of their low employment rate or their types of occupations, which likely require lower skill levels. These results also imply that the poor labour market outcomes

for Indigenous workers compared to other Canadians are mainly due to the former's lower skill levels, since they are no more likely to be skills mismatched.

Gender disparity in over-skilling is minor, but women are 62 percent more likely to be under-skilled than men in numeracy.¹³ This is likely related

13 Men tend to be more over-skilled in all skill domains, compared to women (Calhoun 2015).

to gender differences in the use of numeracy skills at work, even within the same occupational group, with men having an advantage (Lindemann 2015). Furthermore, women have a higher tendency to work in jobs that do not align well with their skill-set (Calhoun 2015). While selection into occupation can be an important factor, another potential explanation for gender disparity in the numeracy skills mismatch is that men, on average, have higher numeracy skills than women, according to the PIAAC.

There are also some regional and occupational differences in the prevalence of skills mismatch in Canada. In particular, over-skilling is less common in occupations that require higher levels of literacy, numeracy and problem solving skills. For example, workers in management occupations, natural and applied science occupations, and education, law, community and government service occupations are less likely to be over-skilled than those in sales and services. Furthermore, workers in the Territories are much more likely to be under-skilled than other regions in Canada (Calhoun 2015).

Policy-related Factors

In addition to individuals' characteristics, policy factors can also play important roles in determining skills mismatch. This section summarizes evidence from studies that investigate the link between skills mismatch and potential policy factors across countries, including Canada.

OECD studies by Adalet, McGowan and Andrews (2015b and 2017) highlight how the policy environment can influence skills mismatch through its impact on allocative efficiency and labour mobility. They identify a number of policy areas that explain cross-country differences in skills

mismatch, such as: framework, labour market, housing, and educational policies.

Framework policies include employment protection legislation for workers, product market regulations, and the costs of closing a business. With well-designed framework policies, governments can reduce skills mismatch by facilitating better allocation of skills. For instance, stringent employment protection laws, either for permanent or temporary workers, increase the incidence of skills mismatch.¹⁴ This is because these protection laws increase labour market rigidities and reduce businesses' ability to meet their skill needs resulting from economic shocks and other circumstances. Furthermore, increasing barriers to firm entry through anti-competitive product market regulations and raising exit costs through strict bankruptcy legislation increase skills mismatch, particularly over-skilling. Pro-competitive product market regulations can lead to higher managerial quality, which itself, contributes to lower skills mismatch (Adalet McGowan and Andrews 2015b and 2017).

Housing market interventions that facilitate residential mobility increase the rates of worker reallocation (Caldera Sánchez and Andrews 2011) and job matching efficiency (Henley, 1998). Adalet McGowan and Andrews (2015b and 2017) show that the incidence of skills mismatch increases with higher transaction costs on buying property and stricter rental regulations by limiting labour mobility. Housing market policies that restrain housing supply, such as restrictive land use regulations and building costs, can also limit residential mobility (Caldera Sánchez and Johansson 2011) and increase skills mismatch (Mauriès 2016).

14 Mauriès (2016) finds that lenient regulations on the firing of only permanent employees are associated with lower skills mismatch across OECD countries.

Increasing flexibility in the labour market to reduce skills mismatch relates not only to labour mobility but also to wage bargaining. Rather than skills, wage decisions are more likely to be contingent on formal qualifications in countries with more centralized systems of wage setting (OECD, 2014a) and those with higher union density (Hanushek et al. 2014). Adalet McGowan and Andrews (2015b and 2017) show that a reduction in the percentage of workers covered by collective bargaining agreements is associated with lower skills mismatch.

Finally, policies that promote higher participation in lifelong learning can lead to a reduction in mismatches (Mauriès 2016). In particular, work-related training can reduce the gap between skills acquired at school and those required on the job (Arulampalam et al. 2004) and diminishes mismatch (van Smoorenburg and van der Velden 2000). Although under-skilled workers can benefit from employer-provided training (Messinis and Olekalns 2007), there is evidence that high-skilled workers are more likely to be involved in adult education and training (OECD 2013).

These results highlight the important role of governments in reducing skills mismatch in the labour market by adopting policies that promote efficient reallocation, facilitate labour mobility, and increase the participation of workers in life-long learning, particularly low-skilled workers. However, it is not clear the extent that policy-related factors may have contributed to the existing mismatch in Canada.

DISCUSSION

A number of factors contribute to the extent of skills mismatch in Canada, which can have important implications for policymakers. Overall, the prevalence of skills mismatch is higher among certain population groups. According to the PIAAC data, workers with higher educational attainment are more likely to be over-skilled for

their jobs in Canada, while the incidence of under-skilling is higher among women, immigrants, and older workers.

There are reasons to believe that skills mismatch can be a temporary phenomenon at the individual level (Sicherman 1991; Robst 1995), particularly among younger workers and newcomers, due to imperfect information in the labour market that leads to job placements that do not optimize individuals' skillsets. In particular, the incidence of skills mismatch varies by age and among immigrants, for whom it also declines with time spent in Canada.

Generally, workers use their credentials as a means for displaying their abilities to employers while some jobs may require other skills beyond qualifications. As individuals find their way into jobs that match their skill level through occupational mobility and acquisition of human capital, skills imbalances in the labour market are expected to decline (Desjardins and Rubenson 2011; Robst 1995). Engagement in work-integrated learning opportunities before graduation can reduce skills mismatches among young workers as it can help educated individuals to gain job-related skills and also to obtain useful information about the gap in skills they acquired during formal education and those they need to use at work.

Skills mismatch may occur intentionally. For example, some employers may hire workers that are initially under-skilled for their jobs with the intention of training them to become adequately skilled. Some over-skilled workers may voluntarily remain employed in jobs that do not match their skills due to financial or personal circumstances, or simply choose not to deploy their skills on the job.

Other potential reasons that may force workers to stay in jobs that do not align with their skillset include lack of information about alternative job opportunities; barriers to labour mobility or investment in training; and employers' reluctance to train their staff; and lack of employment opportunities due to economic circumstances.

Although cyclical factors can lead to higher skills mismatch, their impact is likely temporary.

For example, during economic downturns when the unemployment rate is high, over-skilled workers may refuse to search for an employment opportunity that better fits their skills or unemployed individuals may accept a job offer that requires fewer skills. On the other hand, during economic booms when unemployment is low, employers who are facing a labour shortage may end up hiring job seekers with inadequate skills levels.

Skill-biased technological changes have also influenced demand for skills, which inevitably cause some inequality and skills imbalances in the labour market (Goldin and Katz 2008). With new technology, firms increase their demands for high-skilled workers while reducing their demand for middle-skilled workers (Acemoglu and Autor 2010). This is particularly relevant for Canada and other countries experiencing an aging workforce since older workers tend to be less skilled for their jobs.

These results highlight the importance of providing more opportunities for skills development and lifelong learning for all workers and better addressing individual training needs, particularly, among under-skilled people. For example, less-educated people not only have, on average, lower skills levels, but also they are more likely to be under-skilled for their job. Furthermore, skills decline with age and depreciates if they are not often put into use at work. The federal government has recently introduced a new job-training program, called the Canada Training Benefit, in its 2019 budget to provide financial support for skills development of employed individuals aged 25 to 64. While this program could help reduce mismatches in the labour market by providing under-skilled workers the resources to increase their skills, it is not clear whether the financial support would be enough to encourage high participation of

individuals who need training the most. The federal government should closely monitor the uptake of this training program among targeted populations and make adjustments, if necessary.

Furthermore, participation in work-integrated learning opportunities such as co-ops and apprenticeships can help tackle skills-mismatch among young workers. These types of opportunities are important in ensuring a successful transition of youth into the labour market after graduation. Evidence from the National Graduate Survey in Canada shows that participants in co-op programs are more likely to find employment related to their field of study.

In addition, previous studies show that government can influence skills mismatch, particularly among over-skilled workers, through policies that affect labour market flexibility and labour mobility.

Among participating countries in PIAAC, relatively low transaction costs on buying dwellings and relatively loose employment protection legislation are all associated with lower skills mismatch (Adalet, McGowan and Andrews 2015b and 2017 and Mauriès 2016). However, governments can further improve labour mobility and increase labour market flexibility in order to reduce skills mismatch by considering reforms to the best-practice level of other relevant policy factors discussed in this study. For example, Canada can reduce skills mismatch by reducing rent controls, lowering the cost of bankruptcy and easing product market regulations and tenant-landlord relations.¹⁵ More importantly, Canada should consider lowering the cost of obtaining a building permit: the number of days to obtain a building permit in Canada was 250 in 2014, which was the second highest, after the Slovak Republic (Adalet

15 Less rigid rent controls and tenant-landlord regulations facilitate labour mobility by increasing the supply of rental housing (Andrews, Sánchez and Johansson 2011).

McGowan and Andrews 2015b). In Ontario, for example, there was no time limit on processing building permits needed to go through zoning review (Dachis 2018).¹⁶

Finally, an important barrier to regional labour mobility is variation in certification and credential recognition across jurisdictions. In a partnership between Ottawa and the provinces and territories, qualified tradespersons in certain trades who successfully passed a national examination under the Red Seal Program are able to practice their trade in any province or territory. However, some occupations – such as lawyers and doctors – are still provincially regulated. Furthermore, Brydon and Dachis (2013) argue that strict provincial regulations on the Journey person–Apprentice ratio – the rate at which firms in specific trades can hire apprentices relative to the number of certified workers or journey persons – act as barriers to entry and limit apprenticeship opportunities. Removing barriers to labour mobility in regulated occupations would help reduce skills mismatch within those occupations.

While labour mobility policies can help reduce both the incidences of over- and under-skilling, governments and businesses can tackle under-skilling by supporting adult training programs. However, under-skilled workers may also need extra supports in terms of mental health and wellness that can have an impact on the ability of these individuals to successfully gain the skills they need.

CONCLUSION

Development of skills enhances productivity and help individuals to succeed in the labour market.

However, in order to achieve high levels of productivity necessary for growth, skills must ideally be applied effectively. In other words, workers' skills should not be under-utilized or over-utilized in the workplace. Skills mismatch in terms of either over-skilling or under-skilling can have serious consequences on the economy's performance and productivity. Although the incidence of skills mismatch might be temporary at the individual level in some cases, persistent skills mismatch that reflects inefficiency in the labour market can be costly for employers, workers and society, and needs to be addressed.

Based on information processing skills such as literacy, numeracy and problem solving in PIAAC, workers with higher educational attainment are more likely to be over-skilled for their jobs in Canada, while the incidence of under-skilling is higher among women, new immigrants, and older workers. Policies that help reduce skills mismatch are those that enhance labour market flexibility, ease labour mobility, and more importantly, increase participation in lifelong learning, particularly among the vulnerable populations such as older workers and new immigrants.

Businesses can also play an important role in reducing skills mismatch by providing training opportunities for workers under-skilled for their jobs, appropriately reassigning tasks, offering relocation assistance and finding innovative ways to use workers' skills in order to optimize their productivity.

16 Currently, Ontario's municipalities should review a complete permit application within a certain timeframe.

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