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# SPECIAL REPORT

## TD Economics



December 12, 2013

## CANADA'S LITERACY AND NUMERACY CHALLENGE WORSENS

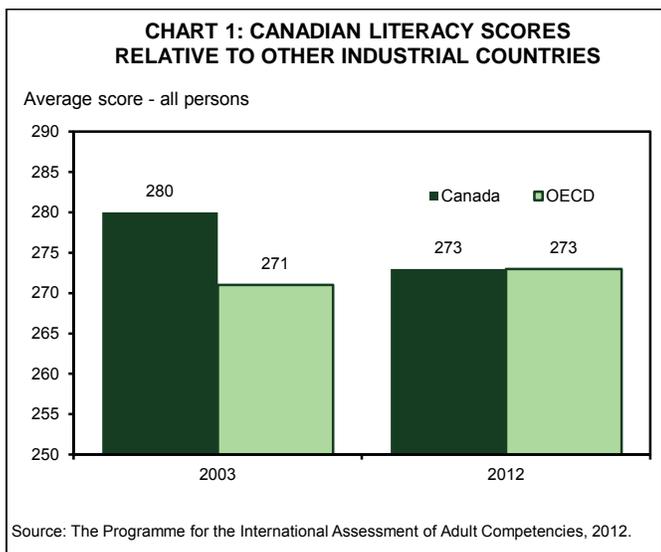
### Highlights

- Canada's performance in literacy and numeracy in the recent OECD survey of essential skills (PIAAC) was depressing. Canada scored average amongst OECD nations in literacy and below average in numeracy, with youth (aged 16-24) underperforming relative to other OECD nations. What's more, Canada's scores in both proficiencies declined from those recorded almost 10 years earlier. The results from a separate OECD survey (PISA) that assessed the skills of 15-year olds in high school confirmed the trend of declining performance in mathematics amongst youth.
- Specific socioeconomic groups continue to underperform. Performance by both immigrant and Aboriginal populations continue to trail their Canadian counterparts. Worryingly, established immigrants are not functioning at a higher competency level than recent immigrants.
- The need to tackle Canada's productivity challenge highlights the urgency in addressing the essential skills gap. Although there is little evidence of widespread skills shortages in Canada today – the poor essential skills results point to a risk of imbalances in the future.

Canada has an essential skills problem, and the latest international benchmark survey demonstrates this reality. Recently, the OECD released the results from the Programme for the International Assessment of Adult Competencies (PIAAC) survey. The survey is a large scale assessment of essential skills of adults aged 16-65 in 24 countries and sub-regions<sup>1</sup>. The release marks an almost 10-year wait since the previous survey in 2003<sup>2</sup>. Educators and policymakers were eagerly anticipating the results to see how Canada fared against other countries and previous surveys.

Canada's results in literacy and numeracy were depressing. Although Canada has a modern knowledge-based economy, with well developed provincial primary and secondary education systems, Canada's score in literacy was only the average of other industrialized countries. While this is a mediocre result, the more depressing development is that the 2012 performance was lower than when compared to the 2003 results (see Chart 1)<sup>3</sup>. Canada's numeracy results were even worse, as they also fell back from their 2003 showing, and came in below the average score across other advanced countries in 2012. There was one area, however, where Canada did outperform. This year there was a new assessment regarding problem solving in a technology-rich environment. Canada recorded a larger share of its population at the highest levels proficiency in this category compared with the OECD average.

In order for Canada to remain competitive in the global economy, it is imperative that the Canadian workforce has the necessary skills – both today and tomorrow. Our recent report [Jobs in Canada](#) highlighted that although there is some evidence of a skills mismatch in Canada across certain occupations and regions, there is no widespread skills shortage as had widely been believed. That said, one still deeply worries about having only average or below average results in core skills like literacy and numeracy and the implications for Canada's future workforce. Indeed, without getting the basics right,



one cannot build the more advanced skills that the economy and labour force require.

The release of the PIAAC results was accompanied by an OECD Skills Outlook report that examined the results from an international perspective. The Canadian results were analyzed in greater detail in a publication prepared jointly by Statistics Canada, Employment and Social Development Canada and the Council of Ministers of Education, Canada (CMEC). Both the OECD and CMEC have committed to each providing six additional research reports that will dive deeper into the PIAAC results. We look forward to reviewing these reports in order to gain a better understanding of Canada’s essential skills challenge.

**Overview of PIAAC measures of proficiency**

The PIAAC survey assessed country proficiency across three essential skills – literacy, numeracy and problem solving in a technology-rich environment (PS TRE). For literacy and numeracy, a 500 point scoring system is used and is categorized into six levels, defined by a specific score

range. The ranges are defined as follows:

- Level 5: score equal to 376 or higher
- Level 4: score equal to 326 to less than 376
- Level 3: score equal to 276 to less than 326
- Level 2: score equal to 226 to less than 276
- Level 1: score equal to 176 to less than 226
- Below Level 1: score below 176

The OECD reports the results focusing on average scores as a point of comparison across countries; making it clear that the proficiency levels have a descriptive purpose only and should not be viewed as a benchmark. This is a departure from previous reporting practices, when the proportion of population above or below level 3 proficiency (identified as the desired level of literacy) was reported and used for inference.

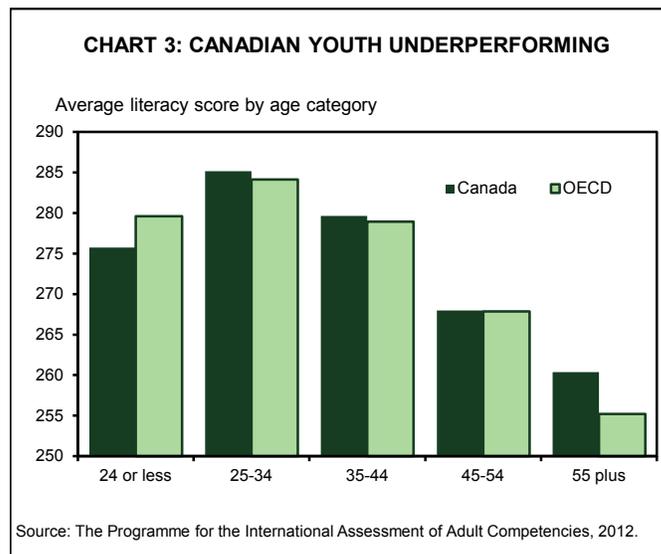
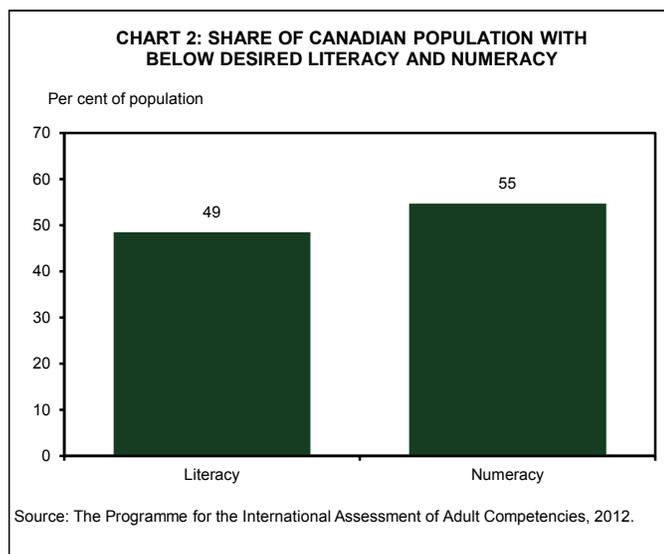
For the purposes of this report – and in order to provide a broad sense of comparison with the 2003 results, we still refer to level 3 as a benchmark level of performance in literacy and numeracy. For a better sense of what level 3 proficiency entails, the table below provides a detailed example of the characteristics of tasks associated at that level.

The PS TRE proficiency is unique to the PIAAC survey and measures a person’s ability to use “digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks”<sup>4</sup>. It is also measured using a 500 point scale but is categorized into four levels. The ranges are defined as follows:

- Level 3: score equal to or higher than 341 points
- Level 2: score equal to 291 to less than 341 points
- Level 1: score equal to 241 to less than 291 points

Items that Exemplify Pertinent Features of Proficiency Level 3 in Literacy and Numeracy Score: 276-325	
<b>Literacy: Library Search Difficulty Score (289)</b>	The stimulus displays results from a bibliographic search from a simulated library website. The test-taker is asked to identify the name of the author of a book called Ecomyth. To complete the task, the test-taker has to scroll through a list of bibliographic entries and find the name of the author specified under the book title. In addition to scrolling, the test-taker must be able to access the second page where Ecomyth is located by either clicking the page number (2) or the word “next”. There is considerable irrelevant information in each entry to this particular task, which adds to the complexity of the task.
<b>Numeracy: Package Difficulty Score (315)</b>	The stimulus for this item consists of an illustration of a box constructed from folded cardboard. The dimensions of the cardboard base are identified. The test-taker is asked to identify which plan best represents the assembled box out of four plans presented in the stimulus.

Source: OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, Chapter 2, October 2013.



- Below Level 1: score below 241 points

The technical aspect of the PS TRE demands that users are able to complete the computer-based version of the PIAAC (referred to as the computer based assessments or CBAs). Those who do not complete the CBA are referred to as PS TRE non-respondents.

### A breakdown of Canada's performance by essential skills

#### *Literacy: no improvement since the 2003 survey*

As expressed in an earlier TD report on the 2003 survey, "Literacy Matters: A Call for Action", although the majority of Canadians have adequate literacy skills – too many simply don't. Little has changed in nearly 10 years. Not only has the average score for adults fallen from its 2003 level, but the share of the population who scored below the desired level (level 3) has increased to 49% – from 41% in 2003 (see Chart 2). This result is worrying as it implies that fewer Canadians have the skills needed to succeed in a modern knowledge-based economy.

#### *Literacy by age and gender*

A breakdown by age also casts a cloud on Canada's literacy outcomes. Youth (aged 16-24) are underperforming relative to their OECD counterparts (see Chart 3). Canada makes up for this gap in all other age categories but this should still be interpreted as another red flag. Evidence suggests that literacy skills deteriorate with time<sup>5</sup>, as such, poor literacy scores among our youth point to generational challenges in Canada's labour market in years to come.

Differences by gender are only marginal. Males do score very slightly higher (average score of 275) compared to females (average score of 273) but both are operating at or above the OECD average.

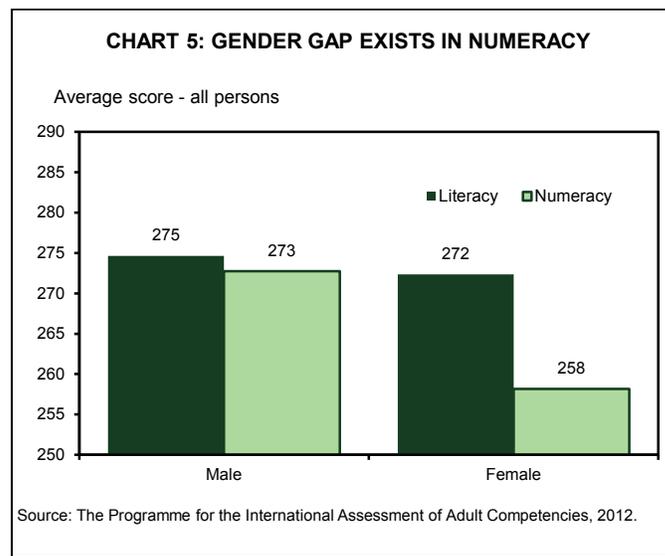
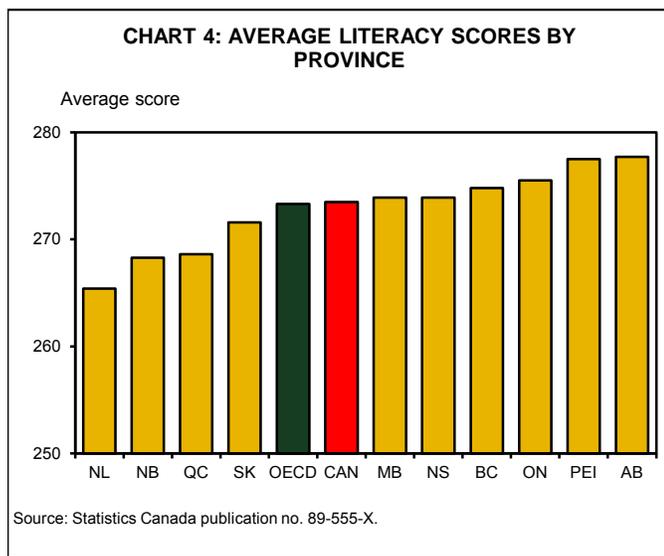
#### *Literacy by Region*

Regionally, outcomes do vary by province (see Chart 4). The provinces of Newfoundland and Labrador, New Brunswick, Québec and Saskatchewan all recorded literacy scores below the national average; while Alberta and Prince Edward Island were the two leading regions in Canada. Most provinces recorded lower average scores compared to their results in 2003. That said, the western provinces of Saskatchewan, British Columbia, and Alberta saw the steepest declines in average score over the past decade<sup>6</sup>.

#### *Numeracy decline a cause for significant concern*

The numeracy results are abysmal. Not only has Canada's average score (265) retreated from its 2003 estimated level (272), but it is now sitting below the OECD average (269). Furthermore, almost six-in-ten Canadians do not have the desired level of numeracy skills; and, almost 25% of Canada's population are functioning at a numeracy level of 1 or below. This is unacceptable and has serious implications for financial literacy outcomes. It also raises concern about the ability to build technical skills.

The results from the OECD Programme for International Student Assessment (PISA) survey also shed light on this issue. Although Canada scored above the OECD average in mathematics, its average score declined from its 2003 showing.



### Numeracy by Age and Gender

Interestingly, the poor numeracy outcome for Canada is attributable to a gender performance gap (see Chart 5). The average female score (258) came in almost 15 points below that of males (272) – who on their own outperformed the OECD average. The numeracy gender gap likely reflects obstacles females – especially youth – face in regards to mathematics. Dated stereotypical beliefs held by parents and societal views of math not aligning with femininity are examples of such challenges. It is also clear that this issue needs to be addressed early in the education system. Recent research identifies that boys exhibit more confidence in math and demonstrate higher participation rates in non-mandatory high school courses and university degree programs in math relative to girls<sup>7</sup>. This implies that promoting effective ways in developing numeracy skills and confidence in girls at an early age is important as the effects become magnified as they move through the education system.

Combined, all age categories recorded scores below the OECD average in numeracy.

### Numeracy by Region

Across provinces, Alberta, B.C. and Ontario posted scores above the national average with Alberta the only province to match the OECD average. Newfoundland and Labrador, New Brunswick and Saskatchewan found themselves at the bottom of the ladder again – with Nova Scotia also registering a weak showing. Similar to the literacy readings, the western provinces posted the biggest drop-offs from their 2003 results, with Saskatchewan posting the steepest decline.

### PS TRE: the one essential skill where Canada outperforms

Given the digital component of this foundational skill set, the determination of whether a respondent was even able or willing to complete the survey was necessary. A large proportion of the Canadian population (81%) completed the CBA – higher than most OECD nations which averaged 74%. This result is encouraging given the increasing role technology plays in our everyday lives.

In terms of the actual problem solving capabilities, Canada scored very well. As this proficiency level is categorized into four levels, and 37% of Canadians surveyed recorded scores in the highest categories (level 2/3) comfortably above the OECD average of 34% (see Chart 6).

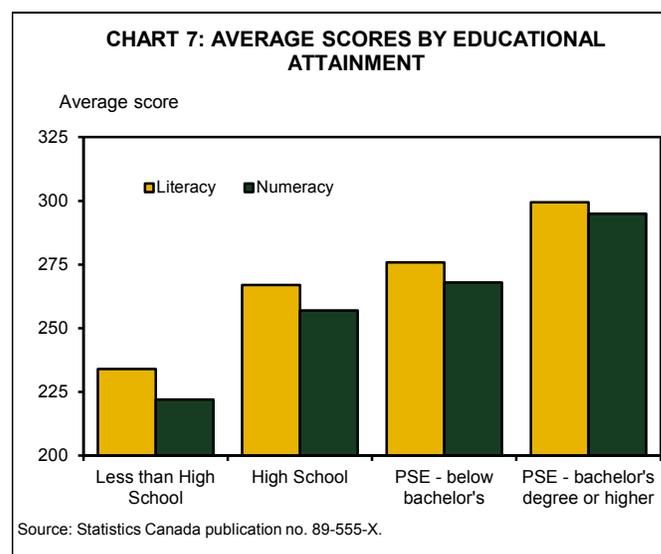
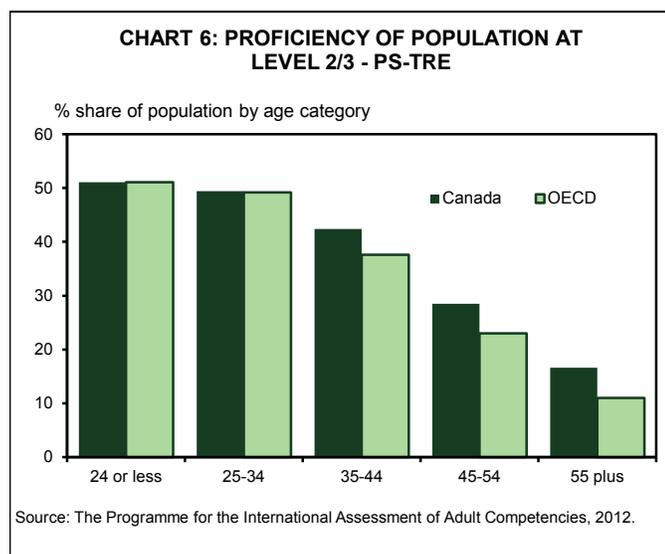
### PS TRE by Age, Gender and Region

Canada outshines the OECD average in all age categories 35 and up, with the performance in the 16-34 age bracket in line with the OECD average. Across age categories, Canada’s relative strength is in its older age groups. Overall, no gender differences were recorded at the national level.

Alberta, B.C., Ontario and Nova Scotia were the top performing provinces in Canada; all four had a higher share of their populations at level 2/3 proficiency relative to the Canadian average. The proportion of populations at level 2/3 proficiency in Newfoundland, New Brunswick, P.E.I., Québec and Saskatchewan all came in below the OECD average.

### The connection between education and essential skills

Those that have higher levels of education, score better in



both literacy and numeracy (see Chart 7). What's more, the proportion of the population with proficiency scores higher than level 3 increases steadily as educational attainment increases. The Canadian report<sup>8</sup> that followed the release of the PIAAC survey, categorized the population into four groups: (1) Canadians with less than high school, (2) high school diploma, (3) post secondary degree (below a bachelor's degree)<sup>9</sup> and (4) post secondary degree (bachelor's degree or higher). In terms of literacy, 73% of the adult population with a postsecondary degree or higher scored at level 3 or above. This compares to 22% for those without a high school diploma, 45% for those with a high school diploma and 53% for those with postsecondary education (below a bachelor's degree) (see Chart 7). The same pattern holds for the numeracy and PS TRE scores (share of population at level 2/3).

When compared to our international peers, Canada benefits from having a higher proportion of its population with higher levels of education. Across the populations surveyed in OECD nations, almost two-thirds do not have postsecondary education. In contrast, 40% of Canada's population is in the same category. Interestingly, Canadian average scores across the four defined education levels are lower than the OECD average in every category in literacy and numeracy. The difference in literacy scores is marginal for those with a postsecondary degree or higher or those with a high school diploma. However, the underperformance is more magnified in the numeracy field, with the difference in average scores at near double digits across the bottom three educational groupings. On the literacy front, the weaker outcome may reflect more students operating in a

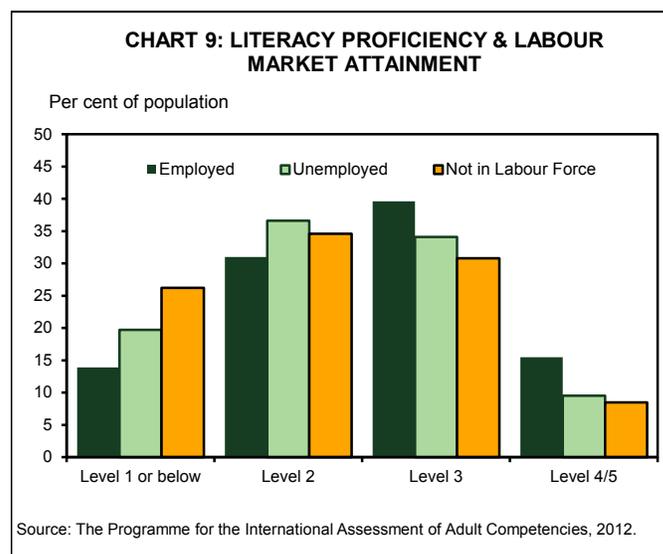
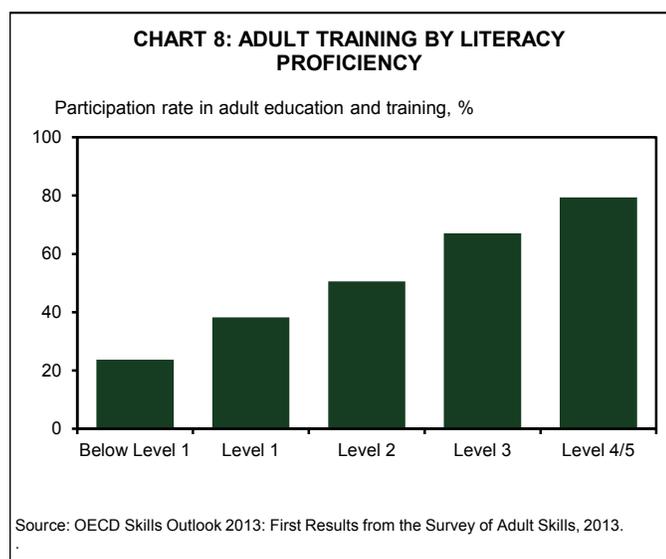
second language. However, the result is concerning because it could also reflect shortcomings in the educational system in establishing solid essential skills.

Not only does proficiency increase with educational attainment, but educational attainment or training is shown to have a positive relationship with literacy outcomes. Indeed, the participation rate in adult education increases dramatically as literacy skills develop (see Chart 8). Those with level 4/5 literacy proficiency exhibit an adult education participation rate of 79% - compared to 38% in Level 1.

### The connection between essential skills and labour market outcomes

Essential skills proficiency is strongly linked to positive outcomes in labour markets. As highlighted by the OECD, after controlling for the effects of education – an increase by about 50 points (or one level) in one's literacy proficiency is associated with a 20% increase in the probability of participating in the labour market, 10% increase in the probability of being employed as opposed to unemployed, and an 8% increase in hourly wages (on average across all countries)<sup>10</sup>.

Relative to our international peers, Canada's average literacy score for its employed matched the OECD at 278. In line with our overall performance, Canada's average numeracy score (272) amongst its employed population was close to the OECD average (275). As one would expect, proficiency scores for those unemployed or not in the labour force are lower (see Chart 9). The employment gap in Canada is generally on par with the OECD average – with a 13 point average literacy score gap between the employed and unemployed. The OECD notes that this gap is relatively small and partially reflects the higher incidence of unem-



ployed amongst youth who record relatively higher levels of proficiency. When taking into account the long-term unemployed, the difference widens considerably.

Earnings potential is also tied to literacy proficiency. The OECD estimates that a 50 point literacy score increase translates to a 9% increase in hourly wages in Canada<sup>11</sup>. This puts Canada near the top of the leader board, trailing only the Slovak Republic (+9%), U.S. (+12%) and the United Kingdom (+14%). This implies that there is a huge opportunity for income growth within the Canadian labour force through increased literacy proficiency. The OECD does note that part of the literacy effect on wages reflects the type of tasks workers perform in their job and that controlling for these effects reduces the returns by about one-third, on average<sup>12</sup>.

Further, when one looks at the return to proficiency on wages when taking the level of education into account, those with postsecondary education are estimated to show the strongest returns to hourly wages based on a 50-point literacy score increase.

### Immigrant and Aboriginal performance a lingering concern

The survey allows for a deep dive into certain socioeconomic groups' performances which are particularly relevant for Canada's purposes.

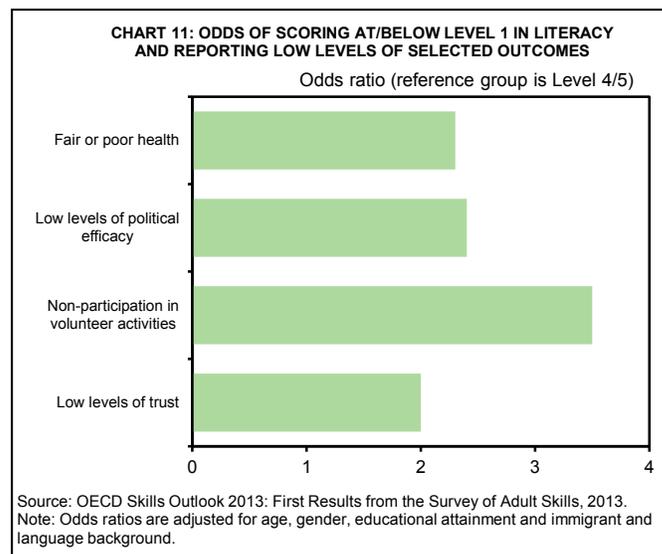
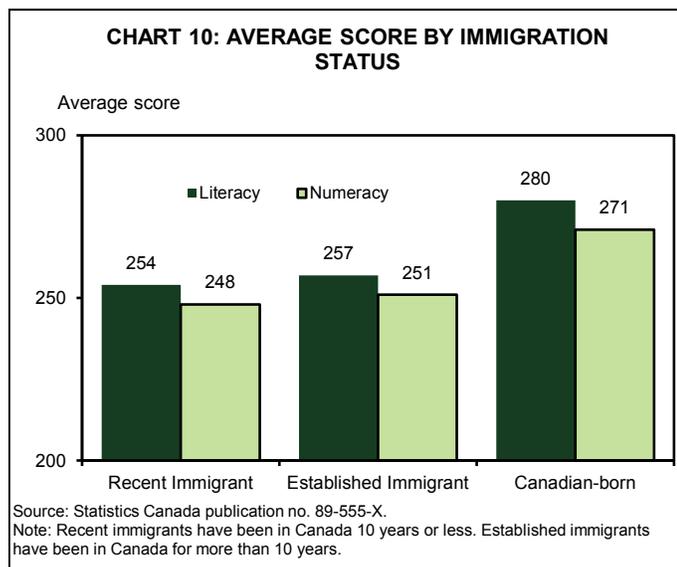
The performance of Canada's immigrant and Aboriginal population was highlighted as a weak spot in Canada's literacy and numeracy surveys in the past and there has been no improvement with the 2012 results. It should be noted that the PIAAC survey was administered in Canada's two

official languages: English and French. Given the make-up of Canada's immigrant population, an increasing number do not have a mother tongue in these languages. The same bias applies for the Aboriginal population. Aboriginal languages are structured differently than English and French<sup>13</sup>. Nevertheless, it is proficiency in English and French, as well as numeracy, that impacts economic outcomes in Canada.

It is worth noting that Canada's performance in literacy of its foreign born population is stronger than the OECD average and that immigrants account for a larger share of the population in Canada compared to its peers. That said, the fact remains that more than 60% of immigrants – whether established or not – have literacy skills below the level 3 category. Established immigrants (those that have been in the country for more than 10 years) have only a slightly smaller proportion of its population in the lower categories (60%) compared to recent immigrants (63%). Similar numbers hold true for the numeracy readings. The PS TRE results are not anymore encouraging, with immigrants trailing their Canadian-born counterparts in terms of proficiency and completion.

Given Canada's reliance on immigration as a major source of population growth, the weak performance across all competencies is a concern. The fact that established immigrants are not functioning at a significantly higher competency level than recent immigrants is troubling and points to gaps in integrating immigrants, as well as raising questions regarding social and economic exclusion.

The Aboriginal population is also being looked upon as an important source of population growth in the future. The Aboriginal population is much younger than its non-



Aboriginal counterparts and was among the fastest growing populations in Canada over the 2006-11 period<sup>14</sup>. The performance of Aboriginals mirrors that of immigrants with 60% of the Aboriginal population with literacy proficiency levels under 3. This compares to the non-Aboriginal population share which stands at 48%. The numeracy results ring an even a louder warning bell. Compared to the non-Aboriginal population where 54% of the population is below level 3, 70% of the Aboriginal population has numeracy skills under the same skills target level. Also worryingly, the disparity in performance is widest among the younger cohorts. Keep in mind, that the Aboriginal results are likely inflated due to the exclusion of the First Nations population (Aboriginal peoples living on-reserve) from the survey sample. Given the high correlation between education and literacy proficiency, education system complexities and underfunding of First Nations schools relative to off-reserve schools leaves the on-reserve population at a disadvantage<sup>15</sup>. Indeed, when controlling for education levels – the Aboriginal and non-Aboriginal populations record similar levels of proficiency suggesting that education is a key factor in eliminating this gap<sup>16</sup>.

### Essential skills and social participation

From a social perspective, labour market participation and higher earnings are of importance, but so to are outcomes like social engagement and health. Essential skills play a role here as well. As with previous surveys, the PIAAC results point to improved outcomes in terms of health, political activism, and volunteer activities. In fact, someone who scores at level 1 or below in literacy is more than twice as likely to be in poor health as someone who

scores in the level 4/5 category (see Chart 11).

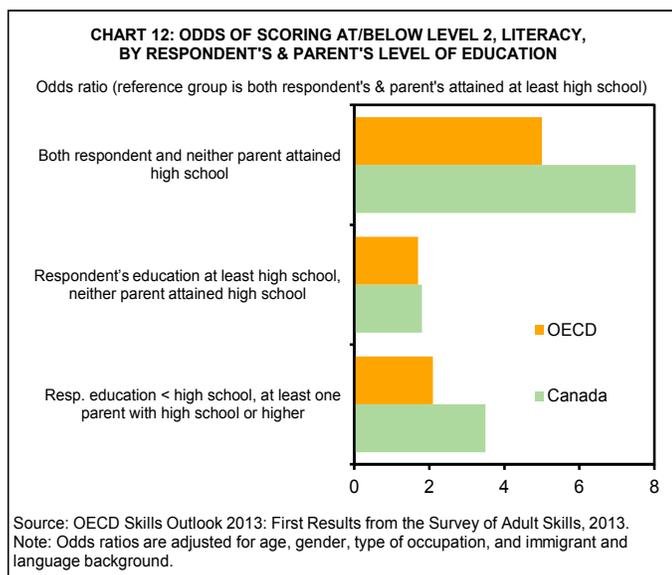
These findings suggest that essential skills are strongly linked to building strong communities and a well-functioning democracy. Conversely, poor literacy can lead to exclusion of certain groups. For example, youth crime rates can be associated with poor economic and social outcomes. The outcome of better health likely reflects that information regarding health issues are commonly communicated in print form<sup>17</sup>.

### Implications of PIAAC results for Canada

Canada has an essential skills problem. The implications from this are three fold: (1) addressing Canada's productivity challenge, (2) ensuring that the fastest growing segments of Canada's population begin to show improved proficiency and (3) the generational effects from the underperformance of youth.

The lack of improvement over the past ten years is a concern as essential skills provide the foundation from which other more complex skills are based. Although there is little evidence to suggest that there is currently a widespread skills shortage issue in Canada, the essential skills challenge we are seeing today points to a potential growing skill shortage issues in the future. The need to right this ship is more pressing than ever.

Despite Canada having one of the strongest recoveries from the 2008-09 recession across developed nations, productivity has lagged. What's more, structural shifts in the Canadian economy will increase the demand for a higher skilled workforce – as increased competitiveness due to globalization forces Canadian firms to continue to produce higher value-added goods or services. As such, an



towards specific groups. To the credit of both federal and provincial governments, essential skills development has remained at a high level of priority, even during the current era of fiscal restraint. That said, the numbers literally speak for themselves. Canada needs to channel its resources towards essential skills development more effectively. However, the onus should not all fall on government. Corporate Canada and parents have roles to play as well. From a corporate perspective, the incentive is clear – a better skilled workforce will lead to increased productivity that will support its bottom line. Also, essential skills development is tightly linked to parental outcomes, with the positive effects from higher levels of parental education larger in Canada relative to the OECD average (see Chart 12).

The underperformance of the youth in Canada relative to the OECD is concerning and calls for a reassessment of programs geared towards early childhood education, primary and secondary schools. The numeracy outcomes are alarming; and should act as a red flag for our education system from primary school all the way to post secondary education.

### Bottom Line

Ten years ago, it was clear that there was an essential skills problem in Canada. With the release of the PIAAC results, it is clear that the problem has clearly not gone away – and if anything we are heading in the wrong direction. Not all the results were doom and gloom. The strong showing by Canada in the PS TRE category is encouraging and points to a population capable of excelling in a more technologically driven environment. The recent release was accompanied by a “first glance” report for Canada. We look forward to learning more about Canada’s PIAAC performance through a series of future reports that will provide a deeper dive into the PIAAC results. In particular, the disparity in regional results within Canada warrants further analysis.

The incentives to improve essential skills are clear. The need to address Canada’s productivity challenge, as well as improved social and health outcomes all point to addressing Canada’s essential skills gap.

important piece of the productivity puzzle for Canada will be the improvement in the skill set of the Canadian labour force – the foundation of which are essential skills.

It should be acknowledged that part of Canada’s performance in the PIAAC assessment reflects the makeup of its population. Specific groups that underperform across all surveyed nations – immigrants and the Aboriginal population – account for a large share of the Canadian economy compared to its peer nations. As such, Canada’s scores are weighed down by the performance of these two groups. However, the reality is that newcomers and Aboriginal populations will be looked upon as a source for population growth in the future and improving their skills are imperative for Canada’s future economic competitiveness. But, the issue goes beyond Aboriginal and immigration populations, as low-income Canadians also score poorly in literacy and numeracy. Indeed, TD Economics believes that inadequate essential skills are contributing to Canada’s income inequality challenge.

From a policy perspective, there are a plethora of programs and policies in place – at both the provincial and federal level – aimed at addressing essential skills either directly through the education system or by targeting programs

## End Notes

1. The results released October 8th represent the first round of results of which Canada was included. A second round of results will be released in 2016 that will include nine more countries.
2. The OECD has administered two previous surveys to assess foundational competencies: International Adult Literacy Survey (IALS, 1994) and Adult Literacy and Life skills Survey (ALL, 2003).
3. Due to methodological and design differences between the two surveys, the PIAAC results cannot be directly compared with ALL. For the purposes of this report, the results used for historical comparison are sourced from Statistics Canada publication no. 89-555-X which re-estimates the 2003 along PIAAC scales for comparative purposes.
4. OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, Chapter 2, October 2013.
5. Alexander, Craig “Literacy Matters: A Call for Action”, TD Bank Financial Group, 2007.
6. The re-estimated results for 2003 for Ontario and Prince Edward Island are not statistically significantly different from the 2012 estimates at the 5% level (for both numeracy and literacy).
7. Hall, Jennifer, “Gender Issues in Mathematics: An Ontario Perspective”. Journal of Teaching and Learning, 2012, Vol 8 No.1.
8. Statistics Canada, Catalogue no. 89-555-X, “First Results from the Programme for the International Assessment of Adult Competencies (PIAAC)”, October 8, 2013.
9. This category is defined as persons whose highest level of schooling successfully completed includes non-university certificates or diplomas from a college, school of nursing, or technical institute; trade/vocational certificates; apprenticeship certificates; CEGEP diplomas or certificates; university transfer programs; and university certificate or diploma programs below bachelor’s degree.
10. OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, Chapter 6, October 2013. Hourly wages are defined as hourly wages including bonuses expressed in purchasing power parity adjusted USD.
11. The OECD assumes that the effects of educational attainment and literacy on wages are independent of one another in this estimation.
12. The OECD does not report these results on a country by country basis.
13. Gulati, Sonya “Literacy Matters: Unlocking the Literacy Potential of Aboriginal Peoples in Canada”, TD Bank Financial Group, June 20, 2013.
14. Ibid.
15. Ibid.
16. The Council of Ministers of Education, PIAAC in Canada Slide Presentation, October 2013.
17. Alexander, Craig “Literacy Matters: A Call for Action”, TD Bank Financial Group, 2007.

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