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EDUCATION, SKILLS AND LABOUR MARKET

Talkin' 'Bout My Generation: More Educated but Less Skilled Canadians

by

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- Canada's working-age population is experiencing a troubling decline in adult skills. Comparing results of international surveys from 2003 and 2012 reveals that literacy and numeracy skills of Canadians, on average, declined during the period, even though more Canadians obtained a post-secondary education.
- This E-Brief shows that aging and generational differences, such as in education quality and work environment, largely contribute to these declines. Skills erode with age at an accelerated rate, intensifying the negative impact of aging population on average performance. As well, recent generations of Canadians achieved lower scores in literacy and numeracy, regardless of education level.
- Lower skill levels among those with higher educational attainment may reflect a trade-off between expanded post-secondary access and admitting more academically weak students.
- In order to tackle the skills decline, policymakers should make programs that mitigate age-related declines in skills more accessible for older workers and low-achievers. Provinces should also focus their attention on education quality at all levels.

The economic relationships are well-researched. Employment and earnings potential depends largely on literacy and numeracy skills (Hanushek et al. 2013; Quintini 2014). Skilled workforces drive broader prosperity and economic growth (Flisi et al. 2015), with positive impacts as well on social well-being such as health (Dinis Mota Da Costa et al. 2014).

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In this E-Brief, I compare the literacy and numeracy skill levels of Canadians in 2012, the latest evaluation, to those comparable competencies in 2003 (see Box for an explanation of these two international OECD surveys). Although more Canadians over the 2003-2012 period obtained a post-secondary education, their skill levels in literacy and numeracy moderately declined. Most participating OECD countries also experienced a decline in average numeracy scores, but Canada and Norway were the only two with a fall in literacy skills (Figures 1A and 1B).

I look at two possible explanations for this literacy decline: aging and generational differences. It is well established that cognitive skills such as literacy and numeracy decline with age, and an aging population will, therefore, drag down average performance. As a result, the rate of skills deterioration among older workers, in age cohorts over 35, should raise concerns as Canada's population ages (Barrett and Riddell 2016).

On the other hand, Canadians had lower skill levels in 2012 at almost any age. Indeed, younger Canadians, (ages 25-34) recorded lower literacy and numeracy scores in 2012 than the same age group in 2003, regardless of education.

By considering the differences in socioeconomic characteristics, this E-Brief shows how much aging and generational differences account for lower literacy skills over time. Although aging largely contributes to the decline from 2003 to 2012, generational differences also seem to be significant: more recent generations have lower literacy skills than past generations. Among various factors, including those related to labour-market conditions and socioeconomic and personal characteristics, which may impact literacy outcomes, education is an important element. One potential explanation for the lower literacy levels of equally educated adults over generations can be differing education quality (OECD 2013 and 2017).

Furthermore, age-related poor-skills performance is substantially worse among those at the bottom of skills distribution and who are more likely to be less educated. The most recent generation of those individuals obtained the lowest score in literacy – a score far below those of other generations.

Age-related declines in literacy and numeracy skills differ across OECD countries, reflecting variations in education, labour markets and skills policies. Ensuring people complete each level of their education with the highest possible skills level is the best strategy to limit age-related skills decline. Other potential policies to tackle this decline include encouraging active learning and offering adult training opportunities for those, particularly older workers, who are at higher risk of skills depreciation (Paccagnella 2016).

In response, policymakers should emphasize programs that mitigate age-related declines in skills and focus their attention on education quality. Both provincial and federal policymakers need to periodically review their targeted on-the-job training programs to ensure their effectiveness in slowing the skills decline as people age. Provinces, which are responsible for education, must especially reverse the recent trend of declining skills among new generations of graduates.¹

Trends in Literacy and Numeracy Skills

Statistics Canada's revised measures of literacy and numeracy from the 2003 Adult Literacy and Life Skills Survey (ALL) makes comparisons possible with the 2012 PIAAC skills survey. Over those nine years, numeracy skill

1 For governments, this decline has a policy implication as late retirement is one option to alleviate the fiscal burden of aging populations.

Box: The OECD Surveys Explained

In 2012, the OECD Programme for the International Assessment of Adult Competencies (PIAAC) conducted a survey of adult skills in more than 40 countries. It measured basic information-processing skills such as literacy and numeracy. Only seven countries, including Canada, also participated in the Adult Literacy and Life Skills Survey (ALL), undertaken in 2003.

Unlike PIAAC, ALL reports literacy as two separate domains – prose literacy and document literacy – on two separate scales and does not integrate the concept of digital literacy. Furthermore, PIAAC participants had an option to do the tests on a computer and its numeracy score is based on the collection of more data, despite maintaining the same concept of numeracy relative to 2003. To allow comparisons of skills measures in 2012 to those in 2003, Statistics Canada applied a complex procedure, both conceptually and technically, to re-estimate and re-scale the results for prose and document literacy in ALL and reports them on a single scale. The results for numeracy in ALL have also been re-estimated to ensure better comparability with PIAAC (Statistics Canada et al. 2013). Both surveys provide a set of 10 imputed proficiency scores (plausible values) that measure literacy and numeracy skills on a scale of zero to 500.

levels of Canadian-born adults declined by seven points while literacy dropped eight points (Table 1). Because most immigrants obtained all or part of their education in another country, I exclude them to better identify variations in education quality across Canadian birth-year generations. Still, despite 58 percent of Canadian-born individuals having a post-secondary education in 2012, compared to only 44 percent in 2003 (Figure 2), they recorded, on average, lower literacy and numeracy levels in 2012 than in 2003.

Furthermore, all Canadian-born respondents surveyed in 2012 obtained, on average, lower literacy and numeracy scores than those in 2003 at most ages, indicating that education is not the sole indicator of adult skills. The skills change is positive only for age groups with a markedly higher proportion of more educated individuals in 2012 than in 2003. The 25-to-34-year-old age group also has the highest literacy skills of other age groups in both surveys, implying that literacy declines with age.

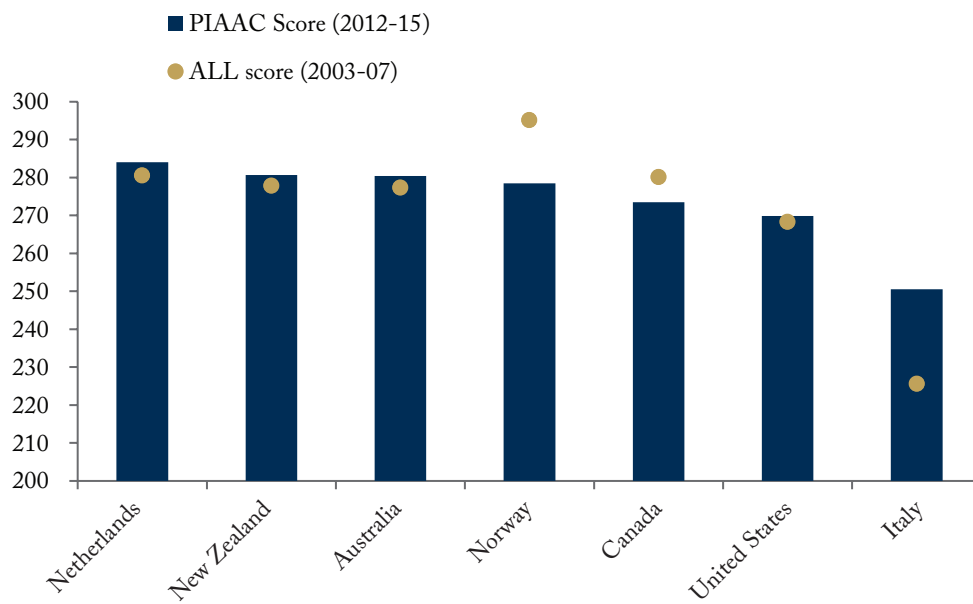
These results highlight the importance of acquiring the highest possible literacy skills as early as possible since cohort scores start declining upon individuals finishing school, likely due to a lack of investment in continuing learning or not applying existing literacy skills frequently enough before the aging effect begins. They may also, to some extent, reflect variations in education or other socioeconomic factors.

One would expect skill levels to progress over time due to better access to education and improvements in learning technology. However, falling numeracy and literacy skills signal that we are moving in the wrong direction. I explore two possible explanations for these changes: the impact of aging and generational changes.

How Aging and Generational Differences Impact Performance

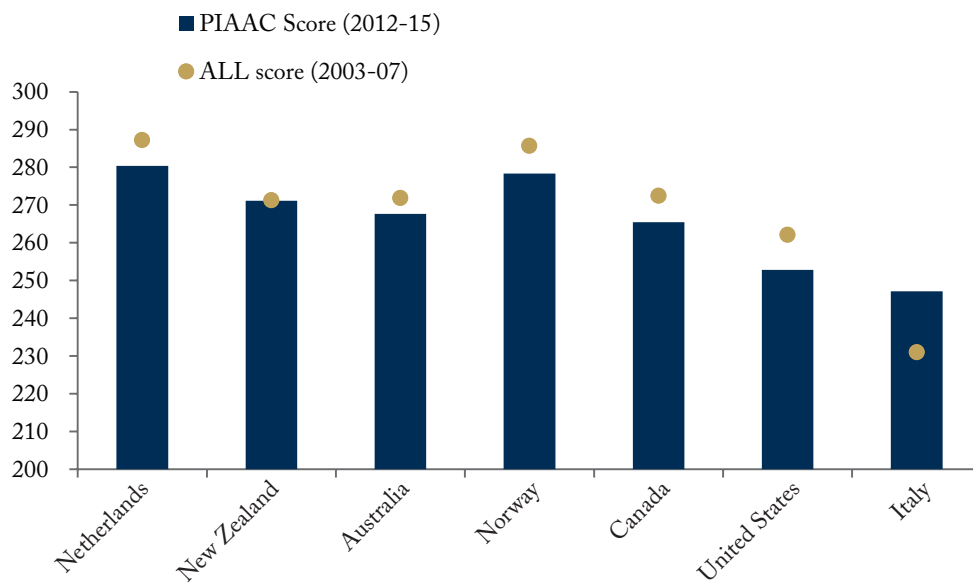
To analyze trends in adult skills performance I look at: 1) the aging effect – individuals obtaining lower test scores as they get older and 2) generational differences, which occur when results differ for individuals in the same age group (e.g., recent high-school graduates or those aged 25-34) at different points in time.

Figure 1A: Changes in Literacy Scores



Source: Author's calculations.

Figure 1B: Changes in Numeracy Scores



Source: Author's calculations.

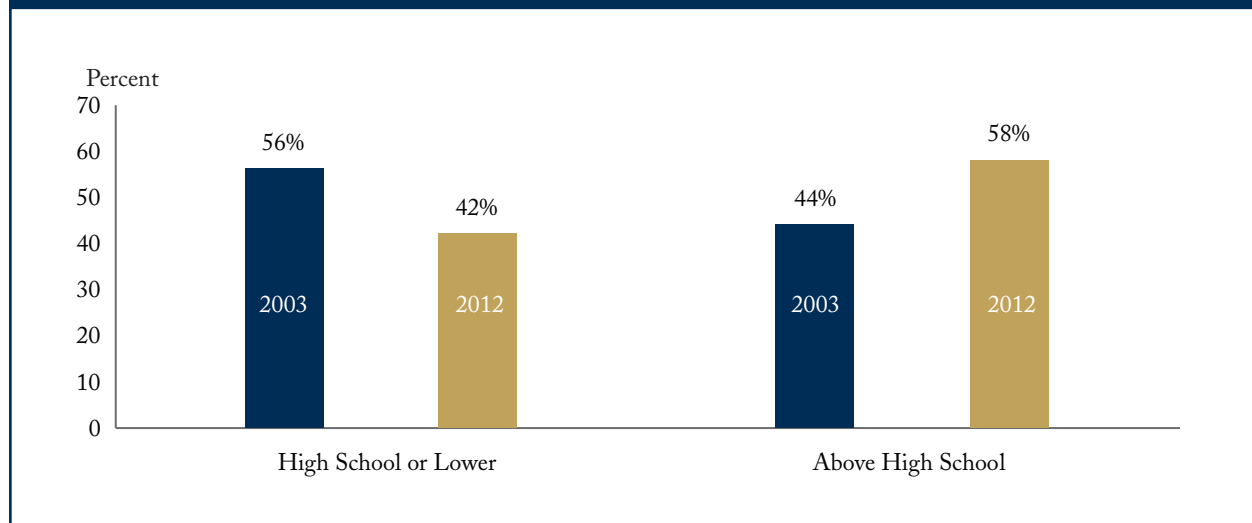
Table 1: Average Literacy and Numeracy Skills (2003 and 2012) for Canadian-born Population

	Score	By Age Group				
		16-24	25-34	35-44	44-54	55-65
Literacy						
2003	287	292	298	289	284	265
2012	279	278	291	288	275	266
Change	-8	-14	-6	-1	-9	1
Numeracy						
2003	278	282	288	279	274	256
2012	271	270	283	279	266	257
Change	-7	-12	-5	0	-8	1

Note: Bold number indicates that the change is significant at 99% confidence level.

Source: Author's calculations using the 2003 ALL and 2012 PIAAC.

Figure 2: Educational Distribution of Canadian-born Population (2003 and 2012)



Source: Author's calculations using the 2003 ALL and 2012 PIAAC.

Aging and Skills Development

Skills erode over time: empirical evidence shows that literacy and numeracy skills deteriorate with age, implying that an aging population reduces the supply of skilled people (Ferrer et al. 2006; Willms and Murray 2007; Desjardins and Warnke 2012; Green and Riddell 2003 and 2013). Without sufficient skills, older workers may find it more difficult to upgrade their existing levels to meet demand. They also face greater job insecurity and are less employable in the event of layoffs (Malul 2009; Barth 2000; Chan and Stevens 1999).

The negative relationship between age and skills is also in line with studies that show an individual's productivity declines with age (Skirbekk 2003) and that population aging reduces labour-productivity growth (Aiyar et al. 2016 and Maestas et al. 2016). In a given year, however, the literacy skills of, for example, 45-year-old people are different from 35-year-olds not only because they are older, but because they belong to a different birth-year generation. Using the data from both OECD surveys, one can track age-related literacy changes between 2003 and 2012 for four different generations (Table 2).

The trend in the same generation's literacy skills over time confirms that they decline with age (Figure 3). However, the most striking result is that the average literacy test score of individuals from the 1947 – 1957 birth generation (55-65 years old in 2012) declined at a faster rate than others. As well, the impact of age-related skills depreciation matters even more when the share of older people increases over time. For example, the proportion of older individuals in the 2012 sample is 8 percent larger than in 2003.

Generational Trends

The decline in literacy skills may also depend on factors other than age. For example, quality and quantity of education, experience, and work environment all lead to different skill levels. Comparing skills results between 2003 and 2012 shows that individuals aged 25-34 obtained lower scores in literacy and numeracy, by seven and five points respectively, about a decade later (Table 3).² Although skills declined for all education levels, the drops were substantially larger among those without a university degree.

Lower skill levels among those with higher educational attainment may also reflect a trade-off between expanded post-secondary access and admitting more academically weak students. Those with only a high-school education or less are becoming increasingly more marginal as more high-school graduates go on to postsecondary institutions than in the past.

Combining Age and Generational Effects

Another way of understanding the role of aging and generation in literacy outcomes is through an econometric exercise that screens differences between participants in 2003 and 2012. To begin, I combine and examine the

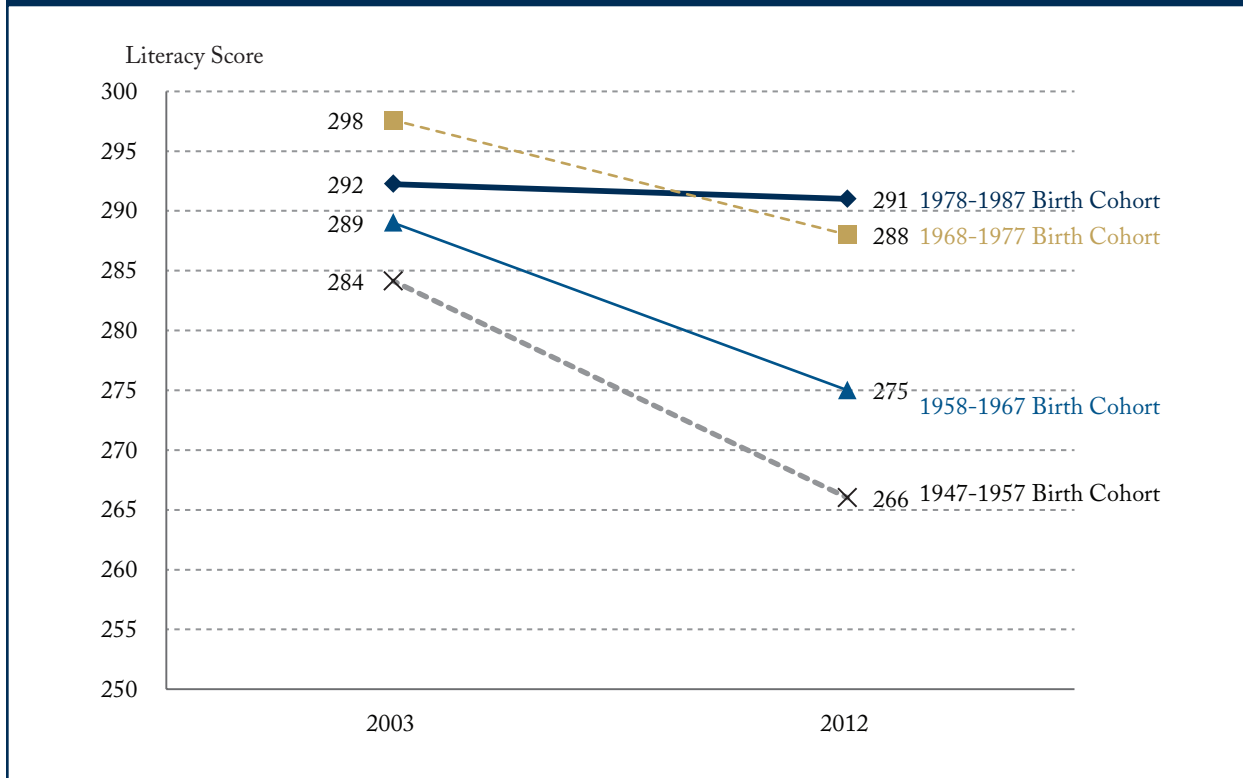
Table 2: Generation Categories and Corresponding Age Groups in 2003 and 2012

Generation	Age Group in 2003	Age Group in 2012
1978-1987	16-25	25-34
1968-1977	26-35	35-44
1958-1967	36-45	45-54
1947-1957	45-55	55-65

Source: Author's calculations.

2 These declines occurred while the proportion of the young Canadian-born population within each level of education remained relatively constant: those with a university degree in 2012 was only 1.6 percent higher than in 2003.

Figure 3: Average Literacy Test Scores by Birth Cohort



Source: Author's calculations using the 2003 ALL and 2012 PIAAC.

surveys of adult skills in 2003 and 2012³ with comparable birth cohorts. Since differences in various factors, including education quality and socioeconomic characteristics, can impact skill levels within and across birth cohorts, I control for differences in gender, Aboriginal status, first-language background, work status and education levels of respondents and their parents. This exercise adjusts the results by taking into account the impact of major socioeconomic characteristics.

Table 4 shows how age and generation strongly contribute to literacy skills. The gap between the youngest age group (age 25-34) and the other groups substantially increases as people get older. Furthermore, more recent generations obtained significantly lower test scores in literacy skills compared to the oldest generation in the pooled samples of participants in 2003 and 2012. The variations in education quality and/or greater access of weaker students to higher education over time may, to some extent, be contributing to lower skill levels for more recent generations.

Meanwhile, both the bottom (10th) and top (90th) literacy quintiles show the different impacts of aging and generational differences (Table 4). The age-related literacy decline is larger at the bottom than at the top of skills

3 The 16-25 age group is excluded from the regression analysis in order to focus on the literacy outcomes of individuals that are more likely not students.

Table 3: Average Literacy and Numeracy Skills of 25-to-34 Canadian Cohort

	Scores	By Level of Education		
		High School or Lower	College	University
Literacy				
2003	298	279	303	321
2012	291	267	288	319
Change	-7	-12	-15	-2
Numeracy				
2003	288	270	290	314
2012	283	257	280	311
Change	-5	-13	-10	-3

Note: Bold number indicates that the change is statistically significant at 99% confidence level.

Source: Author's calculations using the 2003 ALL and 2012 PIAAC.

distribution. In other words, these skills decline faster with age for those who have lower skill levels – they leave school with lower skills and see these skills erode faster than other workers.

The age- and generation-related declines in literacy skills are evident at all education levels, though university-educated grads face less severe declines. In all cases, younger generations are equipped with lower literacy skills than older generations, highlighting that Canada should pay a special attention to those at the bottom of skills distribution and those with lower education levels (Richards 2017).

What to do?

While age-related skill declines are common within OECD countries, the reduction rate varies, implying different effectiveness of skills and education policies. Furthermore, not all countries, such as the Netherlands and Finland, experienced lower literacy skills over time and in successive generations (Barrett and Riddle 2016; Paccagnella 2016).

The OECD identifies several potential avenues to stem age-related declines in literacy and numeracy skills. Education, on-the-job-training and skills use at work and in everyday life play important roles in increasing or maintaining skills levels or slowing down the rate of skills decline.

Although higher educational attainment is linked to better literacy and numeracy outcomes, the expansion of post-secondary education does not necessarily slow down the rate of age-related skills decline. Ensuring individuals complete each education level with the highest possible skills is the best approach to tackle skills decline (Paccagnella 2016).

Table 4: Regression Outcomes of Canadian-born Population for Literacy*

Dependent Variable: Literacy Test Scores	All	Results by Quintile		Results by Education Level		
		10 th	90 th	High School or Lower	College	University
Reference age: 25-34						
Age: 35-44	-13	-16	-9	-14	-18	-6
Age: 45-54	-28	-37	-18	-32	-33	-17
Age: 55 plus	-43	-53	-34	-45	-54	-30
Reference Generation: 1947-1957						
Generation: 1958-1967	-14	-20	-8	-17	-17	-7
Generation: 1968-1977	-24	-33	-16	-27	-30	-13

Note: Bold number indicates that coefficients are statistically significant at a 95% confidence level. Other controlling variables include education, parental education, gender, indigenous identity, language background and work status.

* Details of the model identification are provided in the Appendix.

Source: Author's calculations using the 2003 ALL and 2012 PIAAC.

While adult training programs, such as on-the-job training, is another avenue to enhance skills, such opportunities are more likely available to high-skilled individuals (OECD 2013a) and less to older adults, reducing their effectiveness in slowing down the rate of skills decline (Paccagnella 2016). In Canada, 24 percent of those aged above 55 received job-related training relative to 45 percent of those aged 25-54 during the 12 months prior to conducting the 2012 OECD survey.

Federal and provincial government intervention that provides more targeted training opportunities for people such as older workers may help stem the negative impact of aging on skills evolution over a lifetime. The Government of Canada currently supports skills development and on-the-job-training for adults in different age groups including seniors through various programs such as Canada Job Grant at the federal level and Canada-Ontario Job Grant at the provincial level. However, it is important to make sure individuals who are at the most risk have equal opportunity to access these programs and receive appropriate training.

Conclusion

The comparisons of Canadian adult skills in 2003 and 2012 reveal that 2012 participants had lower numeracy and literacy skills than those in 2003, even though more Canadians had received postsecondary education. Although a decline in numeracy skills over time is common among most OECD countries, it is evident that literacy skills have improved in most countries except Canada.

More education does not necessarily guarantee more skills: educational attainment and skills are trending in the opposite direction. Various factors other than educational levels, such as education quality, admission requirements for post-secondary education, personal characteristics, and workplace experience can contribute to skills development.

Furthermore, Canada's lack of improvement in literacy and numeracy skills from 2003 to 2012 partially reflects an aging population. The most recent survey shows a larger share of older participants whose cognitive skills are lower than younger adults due to the impact of aging. Therefore, slowing the rate of skills deterioration is important, especially among low-skilled workers who see sharper decline rates as they age. Maintaining one's skills requires continuous learning. Providing opportunities and encouraging older workers to participate in training programs may help slow the rate of skills deterioration.

Appendix:

The results in Table 2 are estimated using the following regression:

$$Skill_i = \sum_i \beta_i X_i + \varepsilon_i$$

where skill refers to literacy test score of participant i , X is a set of controlling variables including age, generation, educational attainment, parental education, workplace status, language background, indigenous identity and gender. Educational attainment covers five levels of education including less-than high school, high school, college and university. Work status indicates whether participant i had a job at the time of survey.

I considered three generations that present in both surveys: Generation 1, people born during the 1948-1957 period; Generation 2, born 1958-1967 and, finally, Generation 3 from 1968-1977. Age also includes four age categories: 25-34, 35-44, 45-54 and 55 plus.

I estimate β coefficients but only report those parameters that represent the skills gap across the age and generation groups in Table 2.

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