Commissioned Paper
February 2015

Gender and Numeracy Skill Use: Cross-National Revelations from PIAAC

Author:
Danielle J. Lindemann

Suggested Citation: Lindemann D. J. (2015). *Gender and Numeracy Skill Use: Cross-National Revelations from PIAAC.* Retrieved [insert date], from [insert website].

This project has been funded by the American Institutes for Research through a contract with the National Center for Education Statistics (NCES) of the U.S. Department of Education. This report is based on PIAAC data released in October 2013. The views expressed in this paper do not necessarily reflect the views or policies of the American Institutes for Research, National Center for Education Statistics, or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement of same by the U.S. Government.

AIR-PIAAC Contact:

Jaleh Soroui (AIR-PIAAC Director)
Saida Mamedova (Senior Research Analyst)
PIAACgateway.com
piaac@air.org

Author Contact:

Rutgers University. New Brunswick, NJ.
Danielle J. Lindemann at djlind@work.rutgers.edu

"Gender and Numeracy Skill Use: Cross-National Revelations from PIAAC"

Danielle J. Lindemann
Research Director and Assistant Research Professor
Center for Women and Work, Rutgers University
djlind@work.rutgers.edu

Acknowledgements

This paper has been commissioned by American Institutes for Research, funded through a contract with the National Center for Education Statistics (NCES). The author wishes to thank Dana Britton and the Center for Women and Work at Rutgers University. All errors are the author's own.

Abstract

While much prior research has investigated the underrepresentation of women in STEM (Science, Technology, Engineering, and Math) college majors and careers, most of this scholarship has looked at the level of academic discipline, occupation, or mathematical proficiency, rather than assessing potential gender differences in the use of numeracy skills at work. This literature has left open the possibility that women are engaging in quantitative tasks at work as often as men but doing it in careers not typically falling under the umbrella of what is commonly considered "STEM." Data from the 2012 PIAAC (Programme for the International Assessment of Adult Competencies) Survey of Adult Skills allow us, for the first time, to look cross-nationally at gender gaps in the use of numeracy at work. The author finds that male workers, overall, are significantly more likely than female workers to be using numeracy skills in their jobs. However, these mean differences in numeracy skill use are not statistically significant within every OECD country or every sub-population of workers. Furthermore, focusing on respondents living in the United States (n=5010), the author finds that men and women who perform large amounts of numeric tasks at their jobs are employed in many of the same job categories. However, even controlling for a variety of covariates, numeracy skill use at work is also stratified in ways that align with historical patterns of occupational gender segregation in the United States. While in some ways these findings are in accordance with previous scholarship about gender and work, in another sense they problematize previous research by revealing the large amounts of numeracy involved in some historically-"female" occupations. They also suggest that the literature on gender and STEM participation should broaden its focus beyond white collar occupations requiring advanced degrees. The paper concludes with a discussion of the implications of these findings for research on gender, numeracy, and work, as well as potential fruitful avenues of inquiry involving the PIAAC dataset.

Introduction

Previous research has repeatedly called attention to the under-representation of women in STEM (Science, Technology, Engineering, and Math) college majors and careers. For instance, despite the fact that women represent a sizable majority of new bachelor's degree recipients in the United States, they earn only about 19 percent of the degrees in physics and engineering (Snyder and Dillow 2012). Among women who do select these majors, about a third ultimately transition into other majors (Chen and Ho 2012). Although research has revealed considerable cross-national differences in the percentages of women who go into these fields, it has also demonstrated that female underrepresentation in STEM is a concern across western countries (Else-Quest, Hyde, and Linn 2010; van Langen and Dekkers 2005; van Langen, Bosker, and Dekkers 2006).

Researchers have pinpointed a variety of reasons for the "leaky pipeline" (Blickenstaff 2005) within which women are less likely than men to opt into, and be retained, within STEM disciplines and careers. These include factors such as lack of exposure to STEM in early education and differences in academic preparation (Blickenstaff, 2005; Huang and Brainard 2001), as well as affective traits such as self-confidence and personal goals (Hill, Corbett, and St. Rose 2010; Margolis and Fisher 2002; Sax 2008; Starobin and Laanan 2008; Yasuhara 2005). Other literature has focused on the role of cultural stereotypes and attitudes in shaping men's and women's performance and interest in STEM. For example, evidence shows that students absorb gender stereotypes about school subjects early on in their schooling (OECD 2012). These stereotypes are associated with differential achievement and levels of interest in STEM. One study of gender attitudes across 34 countries, for instance, found that nation-level implicit stereotypes associating science with males more than females predicted nation-level differences in sciences and mathematics achievement (Nosek et al. 2009).

These gender imbalances are problematic for a variety of reasons. Occupational gender segregation is economically inefficient because it aggravates skill shortages and inhibits the maximal performance of both genders by blocking their movement into professions that would best fit their personal skills and abilities (Hill, Corbett, and St. Rose 2010). It also puts females at a double disadvantage when it comes to earnings. Women earn less than men across most occupations (Institute for Women's Policy Research 2010), and female-dominated occupations pay less than "male" occupations, even after adjusting for skill level (England, Allison, and Wu 2006). Specifically, the filtering of women out of STEM fields contributes to the gender gap in earnings, as STEM jobs offer a substantial salary premium (Bradley 2000; Shauman 2006). It also contributes to a human capital problem: the supply of STEM graduates in most western countries lags far behind employer STEM talent needs (Burning Glass Technologies 2014; Cervantes 1999; Jordan and Yeomans 2003; Roberts 2002).

One lingering area of inquiry is the extent to which these gender differences in careers are associated with gaps in the use of quantitative skills at work. Previous studies predominantly use college major, occupation, or in some cases mathematical proficiency as their units of analyses. No literature of which I am aware looks at these gaps between men and women at the level of skill usage. Does occupational gender segregation at the level of occupation translate to a gender gap in the performance of quantitative tasks at work?

From a human capital perspective, this distinction between one's occupation and the types of skills one uses at work is crucial. Previous research focusing on gender and numeracy has left open the possibility that women perhaps engage in quantitative tasks at work as often as men but do it in careers not falling under the umbrella of what is commonly considered "STEM." Stratification by occupation may not be synonymous with disparities in numeracy skill use. Quantitative tasks such as performing calculations, taking measurements, and preparing charts and graphs are involved in many occupations that are not, strictly speaking, "STEM" professions. Further, these tasks may be central to a variety of occupations—including secretarial work, cashiering, and nursing—that contain relatively large proportions of women (Hegewisch et al. 2010). In fact, some previous research suggests that women who leave the STEM pipeline are drawn to other careers involving quantitative skills. One study found that, in the United States, substantial portions of women who are top performers in math or science in high school go on to enter business, management, or finance positions (21%) and hold positions in medicine and health (10%) (Tomlinson 2014)—all careers that can entail large amounts of numeracy skill use.

Data from the 2012 PIAAC (Programme for the International Assessment of Adult Competencies) Survey of Adult Skills allow us, for the first time, to look cross-nationally at gender gaps in the use of numeracy at work. They give us the opportunity to examine men's and women's workforce participation in STEM in a new light and to contribute to research about gender, STEM, occupational gender segregation, and the mobilization of skill sets crucial to work in the 21st-century.

Research Questions and Hypotheses

I use the Survey of Adult Skills to address the following questions: Are there significant gaps in the extents to which men and women use numeracy skills at work, and how do these gaps vary cross-nationally? What is the importance of a variety of covariates—including education level, age cohort, and hours worked—to these gendered outcomes?

Building upon the answers to these questions, I seek to better understand the connection between gender and the occupational contexts in which numeracy skill use occurs. In particular, I ask: when women *do* engage in work requiring large amounts of numeracy, what are the occupations in which they do it? Due to space constraints it was not feasible to explore the answer to this question for every national entity in the PIAAC dataset, so in this second set of analyses, I narrow my focus to one context: the United States. I select the United States because it is the national context in which much of the work surrounding gender differences in STEM has been done, as well as being my own national affiliation.

Focusing on the United Stated context, I ask: since we know they are not going into most STEM occupations at the same rates as men, in what capacities are women using quantitative skills? Finally, how does field of academic study relate to numeracy skill use in one's current occupation? What are the "feeder" areas of study for individuals who perform large amounts of numeracy in their jobs, and how do these areas differ by gender?

I hypothesize that significant gender gaps in numeracy skill usage at work will persist across OECD countries. A previous analysis of PIAAC's Survey of Adult Skills has revealed that gender variation in numeric *proficiency* is reduced by controlling for characteristics such as educational attainment (OECD 2013a, p. 28). I postulate that factors such as level of education, age, and hours worked will reduce the gap in numeracy skill *use* as well. Further, I hypothesize that men and women in the United States who engage in large amounts of numeracy skill use at work come from different academic disciplines and are concentrated within different professions. I expect to find that women who use quantitative skills at work will cluster within some female-dominated occupations—a finding that would problematize the idea that women are assorted out of quantitatively-oriented careers.

I elect to focus on numeracy skill use rather than numeric proficiency in these particular analyses because these data provide the unique opportunity to look at gender differences at the level of discrete skills. As discussed, other researchers have looked at these differences previously using different units of analysis, including proficiency, as outcome variables. For example, the *OECD Skills Outlook 2013* contains an excellent summary of gender differences in skill proficiency cross-nationally and by age (pp. 108-109). I take a different tack with this analysis, focusing on skill in lieu of proficiency or career type, which is the primary contribution of this paper.

Methods and Analysis

Description of Data

All data are drawn from the 2012 PIAAC Survey of Adult Skills. The aim of the survey is to measure key cognitive and workplace skills and competencies, including literacy, numeracy, and the ability to solve problems in technology-rich environments. PIAAC collects an array of information, including how these skills are used at work and at home. The data collection for the survey took place from 1 August 2011 to 31 March 2012 in most participating countries. Around 166,000 adults, representing 724 million adults aged 16 to 65, were surveyed in 24 countries and sub-national regions in the official language/s of the countries. Each participating country had about 5,000 individual respondents, who were surveyed in their homes. Respondents answered questions via computer, although the survey could also be implemented via pencil and paper.

For my first group of mean comparisons, I compare all of the OECD national entities: Australia, Austria, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Poland, the Republic of Korea, the Slovak Republic, Spain, Sweden, and the United States. For the second set of comparisons, I focus solely on respondents living in the United States (n=5010).

Analysis

For data analysis, I use the PIAAC International Data Explorer (http://piaacdataexplorer.oecd.org) in combination with the IDB Analyzer and SPSS. For SPSS analyses, I use the PIAAC Public Use Files, which were last updated on 7 November 2013. Unless otherwise specified, international and U.S. data are weighted using the final person weight.

First, I use the Data Explorer to compare means for numeracy skill use at work, by gender, across OECD countries.

Respondents who currently work or have worked in the last 12 months are asked “In your job/last job how often do/did you usually,” followed by the following items:

…calculate prices, costs or budgets?

…use or calculate fractions, decimals or percentages?

…use a calculator - either hand-held or computer based?

…prepare charts, graphs or tables?

…use simple algebra or formulas?

…use more advanced math or statistics such as calculus, complex algebra, trigonometry or use of regression techniques?

Responses were collected using a Likert five-point scale, ranging from "Never" to "Every Day," for the above items.

The dependent variable used in this paper, "numeracy skill use at work," utilizes a skill use index derived by PIAAC study personnel, based on IRT estimation procedures. The Likert scale responses to the above questions were incorporated into the index but the index does not correspond one-to-one to the Likert responses, which explains why the index ranges from 0 to 4 while the Likert scale ranges from 1 to 5. The index has been standardized to have a mean equivalent to 2 and standard deviation equal to 1 across the pooled sample of respondents in all countries (appropriately weighted). For further information about the computing of this variable, see Box 4.1 on page 143 of the *OECD Skills Outlook*[1] and Box 2.1 on pages 43-44 of the *Survey of Adult Skills Reader's Companion.*[2]

The initial independent variables are gender and country of residence. I then expand the analysis using the Data Explorer to include separately the following covariates: age (in 10-year bands), highest degree earned (limiting the analysis to individuals who have earned the equivalent of an undergraduate degree or higher[3]), and hours worked (limiting the analysis only to full-time workers, including both employees and self-employed workers).

To further test the hypothesis that women use large amounts of numeracy in occupational contexts outside of those traditionally associated with STEM (*e.g.* secretary or registered nurse, versus chemist or engineer), I pinpoint the industries in which men and women are most likely to report large amounts of numeracy skill use. For these analyses, I focus solely on the United States, using the IDB analyzer and SPSS in order to examine the occupations associated with maximal numeracy skill use for men and women.[4] I operationalize workers with "large amounts" of numeracy skill use as those measuring in the top 20% on the derived numeracy skill use index. For occupational categories, I use the "current job occupations" variable, which was based on ISCO (International Standard Classification of Occupations occupational codes.[5] I then limit my focus to three different types of sub-populations—the youngest cohort of workers, respondents with undergraduate degrees or higher, and full-time workers—to examine the

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[1]http://www.oecd.org/site/piaac/Skills%20volume%201%20(eng)--full%20v12--eBook%20(04%2011%202013).pdf
[2]http://www.oecd.org/site/piaac/Skills%20(vol%202)-Reader%20companion--v7%20eBook%20(Press%20quality)-29%20oct%200213.pdf
[3]ISCED 5 or 6, which include the following degrees: Associate, Bachelor's (*e.g.* BA, AB, BS), Master's (*e.g.* MA, MS, Meng, Med, MSW, MBA), professional (*e.g.* MD, DDS, DVM, LLB, JD), and doctorate (*e.g.* PhD, EdD).
[4]Males were more likely to be employed than females and, subsequently, were more likely to have responded to the questions assessing numeracy skill use at work. For the numeracy index variable, there were valid skips for 14.2% of men and 22.6% of women; a chi-square test reveals this difference to be significant at the p<.001 level.
[5]http://www.ilo.org/public/english/bureau/stat/isco/isco08/

association between these factors and the occupational contexts in which men and women most commonly use large amounts of numeracy.

Finally, I assess the most common "feeder" academic disciplines for workers who engage in maximal numeracy skill use. "Academic discipline" refers to the area of study in which the respondent received her highest degree and was reported as one of the following nine items:

General programs

Teacher training and education science

Humanities, languages and arts

Social sciences, business and law

Science, mathematics and computing

Engineering, manufacturing and construction

Agriculture and veterinary

Health and welfare

Services

I look, by gender, at the most common disciplines for respondents measuring in the top quintile for numeracy skill use at work. I also examine, by gender, the proportions of individuals from each area of study who measure in the top 20% for numeracy skill use at their current jobs.

Results

Gender Differences in Use of Numeracy at Work: International Comparisons (All Workers)

In accordance with my hypothesis and previous literature concerning gender disparities in STEM participation, I find that males measure significantly higher than women on the index of numeracy skill use at work, across most OECD countries. Table 1 illustrates with grey shading the jurisdictions in which the male mean for numeracy skill use is *not* significantly higher than the female mean. These include only the Czech Republic, Italy, Poland, and the Slovak Republic.

[Table 1 about here]

Gender Differences in Use of Numeracy at Work: International Comparisons (by Age)

However, even in countries showing significant gaps in skill use, these mean differences are not statistically significant within every sub-population of workers. For instance, as shown by Table 2, among workers aged 24 or younger these gaps are significantly reduced. Males in this age category measure significantly higher than their female counterparts in only a few OECD countries. And even in these countries—France, Germany, the Netherlands, and the United States—the numeracy gaps are smaller than those in the overall population of workers.

Yet mean gender differences in numeracy skill use at work within every cohort but the youngest are statistically significant in many countries, including Australia, Austria, Canada, Denmark, Finland, Japan, Norway, the Republic of Korea, and Sweden. On the other hand, in Poland and the Slovak Republic, *no* age cohorts report significant gaps. Italian data are not available for the youngest cohort, but no other cohort of Italians demonstrate significant gender gaps in numeracy skill use at work. In Estonia, only workers aged 25-34 and 35-44 report significant gender gaps in numeracy usage. Respondents from France and the United States in every age cohort except 25-34 demonstrate significant gaps. Germans report significant mean differences within every cohort except 25-34 and the oldest cohort (55+). In Ireland, workers aged 25-34, 35-44, and 55 or older report significant gender gaps in their numeracy usage. In Spain, significant gaps persist only among the two oldest cohorts of employees: those aged 45-55 and 55 or older. In the Netherlands, however, significant gaps persist across all age categories, including the youngest.

We might imagine that one potential explanation for the diminution of these gaps among the youngest respondents may be historical change, with the more recent cohorts of female workers increasingly moving into male-dominated fields involving quantitative skills. However, this explanation would be largely inconsistent with previous research. In the United States, for instance, progress in desegregating occupations by gender has stalled since the mid 1990's (Hegewisch et al. 2010). A more likely explanation is an age, rather than a cohort, effect: as individuals progress in their careers they become more highly specialized in their tasks, which exacerbates the gender divide between those who perform large amounts of numeracy and those who do not. Women are also less likely than men to remain in STEM occupations as their careers progress (Hill, Corbett, and St. Rose 2010).

[Table 2 about here]

Gender Differences in Use of Numeracy at Work: International Comparisons (Undergraduate Degree Recipients)

Based on previous PIAAC research demonstrating that numeracy proficiency gaps are reduced by accounting for educational attainment (OECD 2013, p. 28), I hypothesized that controlling for level of education would mediate some of the gender gaps in numeracy skill use as well. On the contrary, limiting the sample to only respondents who have received an undergraduate degree or higher reveals statistically significant gender gaps in numeracy skill use within all countries (Table 3). These gaps are significant at the $p<.001$ level within all jurisdictions, except for the Czech Republic ($p<.05$).

One potential reason for this result may be types of jobs that college-educated individuals perform. As I later discuss in my analysis of the United States sample, some of the top jobs for women who engage in large amounts of numeracy skill use—including sales and secretarial positions—do not necessarily require undergraduate degrees. When women who perform these jobs are dropped from the analysis, it is logical that numeracy skill use gaps between the genders would broaden. In fact, these findings are in line with previous research suggesting that resolving gender disparities in higher education has not had the ameliorative effect on occupational gender segregation that had been anticipated. In Sweden, for instance, changes implemented in order to broaden women's access to higher education may have inadvertently contributed to labor market disparities, with the influx of women into female-dominated fields, such as nursing (Bradley 2000).

[Table 3 about here]

Gender Differences in Use of Numeracy at Work: International Comparisons (Full-Time Workers)

Controlling for hours worked also does little to reduce gender gaps in the performance of numerical tasks. As Table 4 demonstrates, among full-time employees, mean differences between male and female workers remain significant across OECD countries, except in the four cases where they are not significant within the overall populations: the Czech Republic, Italy, Poland, and the Slovak Republic.

[Table 4 about here]

Where Do U.S. Male and Female Workers Use Large Amounts of Numeracy?

Narrowing the data to look at workers in the United States who measured in the top quintile of the numeracy index reveals some expected findings about occupational gender segregation. However, it also brings to light some unexpected results regarding the types of fields in which both men and women are most likely to be performing large amounts of numerical tasks.

Previous research on STEM has focused on the importance of gender parity in fields such as engineering and computer science, but results from the Survey of Adult Skills suggest that the occupations in which both men and women most commonly perform large amounts of numeracy are blue collar occupations or white collar jobs that do not necessarily require graduate or even four-year college degrees. This is true for both men and women, but arguably less so for men, whose top ten high-numeracy jobs also include careers, such as engineering professional and software developer, associated with advanced degrees. Table 5 details the top ten most common occupations for men and women who measure in the top 20% for numeracy skill use at work.

It should be noted that Tables 5 through 10 (excluding 5a) are meant to be read as exploratory lists of the most common professions for high levels of numeracy skill use, by gender. No significance testing was performed within these particular analyses to probe differences in the percentages of men and women within these occupations. The primary aim of these analyses was to determine whether the occupations where women engaged in large amounts of numeracy mapped onto historically masculinized occupations or whether they were in fact using these skills within stereotypically "female" jobs. The top male occupations for numeracy skill use are also included as an interesting counterpoint. Further, where noted, small sample sizes may affect the reliability of some of these estimates. I discuss this point further in the "Conclusions" section.

As Table 5 illustrates, top-quintile men and women are both relatively likely to be working in sales: as shop salespersons (5.02% of top-quintile men and 9.75% of top-quintile women); sales, marketing, and development managers (4.08% of top-quintile men); and sales and purchasing agents and brokers (3.88% of top-quintile women).

However, these results also reveal gendered patterns in areas of high numeracy skill use—patterns that align with historically male- and female-dominated occupations in the United States. Women are more likely than men to be using large amounts of numeracy as nursing and midwife professionals and primary school or early childhood educators, while top-quintile men are more likely than women to be working in mining, manufacturing, and construction, working as engineers, working in computer software development or analysis or in information technology, or working as mechanics.

[Table 5 about here]

As a point of interest, I also include Table 5a, which details the top occupations for numeracy skill use, by gender, by mean measurement on the numeracy skill use scale. For both males and females, these are largely historically male-dominated occupations. For instance, the highest mean measure of numeracy skill use for women was in the field of machinery mechanics and repairs. As might be expected, life science professionals and engineers also rank highly on this list.

[Table 5a about here]

Where Do <u>Young</u> U.S. Male and Female Workers Use Large Amounts of Numeracy?

Men in the United States also report high levels of numeracy skill use within a wider array of jobs than do female workers. Men across 90 discrete occupations self-rate in the top quintile for numeracy skill use, compared to women's 69. Top-quintile workers of both genders aged 24 or younger, however, span far fewer categories. Men in this age cohort who use large amounts of numeracy in their jobs fall into 38 discrete categories—women, only 13.

This youngest cohort of workers, moreover, exhibits slightly different patterns in terms of gender, high numeracy skill use, and occupation than does the broader working population. Table 6 illustrates the top ten most common occupations for men and women under the age of 25 in the United States who perform large amounts of numeracy in their jobs. Both women and men in this age group who are in the top quintile for numeracy usage are relatively likely to work in entry-level service-sector jobs commonly associated with early life-course labor force participation. These include occupations such as shop salesperson (21.51% of top-quintile women and 4.67% of top-quintile men) and waiter or bartender (20.00% of top-quintile women). Four of the top ten job categories for top-quintile females in this age group involve sales.

[Table 6 about here]

In some senses, these results for the youngest age cohort reflect expected patterns related to gender and job type. For example, men who use large amounts of numeracy in their jobs are more likely than their female counterparts to be working in historically-"male" jobs such as the armed forces (4.78%) and information technology (4.06%). Top-quintile men of this age are *most* likely to be employed as "other elementary workers"—a category that includes workers who "deliver and carry messages and packages, collect money and stock vending machines, read meters, collect water and firewood, [or] collect and issue tickets for parking or events."[6]

However, in another sense, these results are surprising. Top-quintile young female workers are relatively likely to work in the male-dominated field of machinery mechanics and repair (4.25%) (although top-quintile men in this age cohort are *more* likely to be machinery mechanics and repairers (5.23%)). It is difficult to make sense of this finding based on previous literature about gender and work. While some countries have seen women moving into historically male-dominated blue collar professions involving machinery (Juhn, Ujhelyi, and Villegas-Sanchez 2014), this has not been true within the United States (Gabriel and Schmitz 2007). More likely, one explanation for this curious finding is the relatively low sample size of young women who fall into the top 20% of the numeracy skill use index. In the overall working population in the United States, 26.52% of men and 17.54% of women fall into the top quintile for numeracy skill use. However, among those 24 and younger, only 13.39% fall into the top quintile for numeracy skill use, including 16.67% of males and only 9.80% of females.[7] As discussed, while small sample sizes may influence the reliability of some of these analyses, the outputs here should be viewed as exploratory lists intended to spur further research.

Where Do College-Educated U.S. Male and Female Workers Use Large Amounts of Numeracy?

As my previous analyses demonstrated, controlling for educational attainment and hours worked does little to reduce gender gaps in the performance of numerical tasks, in the United States and other OECD countries. In fact, as Table 7 demonstrates, when the sample is limited to top-quintile American workers who have earned BA's or higher, men and women cluster within many of the same occupational categories. These include business services and administration managers (7.48% of top-quintile men and 9.11% of top-quintile women); finance professionals (6.06% of top-quintile men and 5.02% of top-quintile women); and shop salespersons (3.84% of top-quintile men and 4.15% of top-quintile women).

However, undergraduate degree recipients who use large amounts of numeracy in their jobs are not immune from typical gendered occupational patterns. Software development, engineering, IT work, construction management, and architecture—all traditionally male-dominated arenas—are among the top occupations for men in this subsample, while women are more likely to cluster within the "female" fields of early childhood education and nursing.

[Table 7 about here]

Where Do Full-Time U.S. Male and Female Workers Use Large Amounts of Numeracy?

Limiting the sample to only full-time workers produces similar results (Table 8). Full-time male and female employees who measure in the top quintile for numeracy skill use work in some of the same fields, such as shop sales and finance. However, these results also reflect expected gendered patterns, with males more likely to be working in fields such as construction and computing and females more likely to be working as secretaries, early childhood educators, and nurses.

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[6]http://www.ilo.org/public/english/bureau/stat/isco/isco08/
[7]Unweighted percentages.

[Table 8 about here]

What Are the "Feeder" Areas of Study for High-Numeracy Jobs?

I next assess the "feeder" areas of study for high-numeracy jobs. How are gender and area of study at school related to working in jobs that require large amounts of numeric skills? Table 9a details the most common areas of study for males and females who measure in the highest 20% of the numeracy skills index. Table 9b presents the same results in a different layout to enable side-by-side comparisons of the genders.

As expected based on previous research concerning gender stratification in secondary and post-secondary education, women who perform large amounts of quantitative tasks at work have majored in different fields from their male counterparts. While engineering, manufacturing and construction are the top areas of study for men who go on to engage in high-numeracy work (28.67%), only 1.93% of top-quintile women studied these areas. Similarly, 20.53% of top-quintile men studied science, mathematics, and computing—compared to 14.13% of top-quintile women. On the other hand, top-quintile women are far more likely than men to come from the fields of health and welfare (23.67%, compared to 3.59%) and teacher training and education (14.42%, compared to 2.99%). About half of women using large amounts of numeracy in their jobs have studied either social sciences, business and law or health and welfare.

[Tables 9a and 9b about here]

Finally, Table 10 details the percentages of men and women from each area of study who are currently employed in high-numeracy occupations. While the findings depicted in Tables 9a and 9b show different "feeder" areas for men and women in high-numeracy jobs, Table 10 demonstrates that women in every area of study are less likely than men to go into high-numeracy jobs. That is, even among men and women who study the same areas, female respondents measure in the top quintile for numeracy skill use at lower rates.

For example, while 38.75% of men who studied science, mathematics, and computing currently measure within the top quintile of the index of numeracy skill use at work, the same is true for only 25.27% of women who studied the same disciplines. Along the same lines, 45.56% of males studying engineering, manufacturing and construction are currently in the top quintile for skill use, compared to only 31.23% of their female peers.

The results of these analyses at the level of skill usage support previous research about the "leaky pipeline," through which women trickle out of STEM at multiple stages. Females are less likely than males to opt into, and remain in, STEM areas of study. Further, those who do major in STEM are less likely than their male peers to opt into, and remain in, STEM careers (Blickenstaff 2005; Hill, Corbett, and St. Rose 2010).

[Table 10 about here]

<u>Summary of Findings</u>

Occupational gender segregation involves stratification in type of skill use as well as category of job. Male workers, overall, are significantly more likely than female workers to be performing numerical tasks associated with "STEM" occupations. However, these mean differences in numeracy skill use are not statistically significant within every OECD country or every sub-population of workers. Among workers aged 24 or younger, males only measure higher than females on the numeracy skill use index in four countries, and even in these countries—France, Germany, the Netherlands, and the United States—the skill use gaps are smaller than the gender gaps found in the overall populations of workers. Limiting the samples to only undergraduate degree recipients, on the other hand, reveals significant gender gaps in numeracy skill use across all OECD countries. Controlling for hours worked also does little to reduce these disparities.

Narrowing the data to look at workers in the United States who measured in the top quintile of the numeracy index reveals that men and women who perform large amounts of numeric tasks at their jobs are employed in many of the same job categories. However, numeracy skill use at work is also stratified in ways that align with historical patterns of occupational gender segregation in the United States—even when limiting the sample to those aged 24 or younger, undergraduate degree recipients, or full-time workers. Top-quintile women cluster within careers such as nursing and early childhood education, while men who use large amounts of numeracy in their job are more likely to be working in mining, manufacturing, and construction, working as engineers, working in computer software development or analysis or in information technology, or working as mechanics. While these findings are expected in that they are in accordance with previous scholarship about gender and work, in another sense they problematize previous research by revealing the large amounts of numeracy involved in some historically-“female” occupations.

Finally, women who perform large amounts of quantitative tasks at work tend to have studied different fields from their male counterparts. About half of women using large amounts of numeracy in their jobs have studied either social sciences, business and law or health and welfare, while engineering, manufacturing and construction are the top areas of study for men who go on to engage in high-numeracy work. Further, even among men and women who study the same areas, female respondents are less likely than males to indicate that they engage in large amounts of numeracy skill use in their current occupations.

Conclusions

This study has much to add to the literatures about women in STEM and occupational gender segregation more broadly. It demonstrates that not only do women and men assort into different occupations but their amounts of numeracy skill use in their occupations are significantly different—although not within every country or demographic sub-group. This research also contributes new findings about the types of occupations in which men and women in the United States engage in quantitative tasks.

However, it is important to point out some of the limitations of these analyses. First, as discussed, Tables 6, 7, 8, 9a, and 9b, are based on small sample sizes, and should be viewed as exploratory lists meant to spur further scholarship. When data from the U.S. National Supplement is released, researchers will be able to duplicate some of these calculations using larger sample sizes.[8]

[8]Further information on the National Supplement can be found here: https://static.squarespace.com/static/51bb74b8e4b0139570ddf020/t/52581aa4e4b033e8d6d17d3d/1381505700823/National+Supplement_10-2013.pdf

Secondly, the numeracy scale takes into account both basic and advanced skills. My analysis does not assess, in particular, whether men are more likely than women to be dealing with high-level mathematical concepts or performing advanced calculations. Some concern surrounding women's participation in STEM derives from the fact that high-level cognitive skills are now crucial for competing in the 21st century global marketplace (OECD 2013b) while demand in these areas exceeds the number of capable workers (Burning Glass Technologies 2014). Based on previous research about gender disparities in the attainment of advanced degrees in STEM disciplines, we would likely see larger gender gaps in the performance of high-level quantitative tasks. This is an analysis that could be performed in the future using PIAAC data. Third, the tasks evaluated by the numeracy scale do not align exactly with the types of skills required across all STEM occupations. One might imagine a biologist or a psychologist, for example, engaging in a task—such as performing an experiment or evaluating a patient—that is "scientific" but not necessarily quantitative in nature. Such work would not fall under the rubric of "numeracy" as assessed by the PIAAC index.

However, both of these limitations of the analysis are also strengths, in that PIAAC's numeracy index enables a specific and unique contribution to the literature on gender, math, and work. Thinking about "STEM" in terms of high-level occupations such as physicist or engineer, rather than in terms of discrete tasks that can be basic or advanced, eclipses much of the numeracy skill usage that takes place across a spectrum of occupational categories. These findings suggest that the contexts where the most workers in the United States engage in large amounts of numeracy are not all occupations requiring advanced, or even undergraduate, degrees. For example, men who measure in the top quintile for numeracy skill use at work are more often construction supervisors or salespersons than engineers or software developers. Females in the top 20% for numeracy skill use at work are shop salespersons more often than anything else.

These results also suggest that the notion that women are being filtered out of quantitatively-oriented careers is not wholly accurate. Looking at the level of discrete numeric skills allows us to see that women *are* engaging in numeracy skill use – in fact, in some countries and demographic groups, they are doing this at rates comparable to men. Somewhat paradoxically, in the United States, women use large amounts of numeracy relatively often in so-called "pink collar" occupations, such as nursing and secretarial work, that have been historically female-dominated and culturally devalued.

While much scholarship has focused, importantly, on women's underrepresentation in high-level white collar STEM careers, future research should turn greater attention to occupations that entail quantitative skills but do not fall under the traditional "STEM" umbrella. Some policy changes to ameliorate gender segregation within these occupations might include career and technical education programs for students, educational institutions, employees, and employers. Such programs might be designed in order to enable men and women to view the transferability of their skills to non-traditional occupations and to galvanize employers to identify their needs for gender parity and actively recruit and retain employees across gender lines.

Another result that calls for additional scholarship is the finding that some OECD countries do *not* have significant gender disparities in numeracy skill use at work, while others have significant gaps only within certain age cohorts. Future research might focus on the particular economies, educational systems, and job market structures of these countries in order to unravel these jurisdictional differences. Additionally, this analysis has only examined the most common numeracy-oriented occupations for men and women within one national context:

the United States. Future research might repeat this second set of analyses across *all* OECD contexts in order to flesh out cross-national differences in the contexts where numeracy skill use occurs.

Finally, these findings point to myriad ways in which PIAAC data might be used in the future to respond to research questions about gender and work. Future iterations of PIAAC survey administration will enable us to perform these analyses longitudinally in order to assess, for instance, whether an age or cohort explanation is responsible for the diminished gender gaps in numeracy skill use among the youngest respondents. Furthermore, with few exceptions (Tomlinson 2014), little research has analyzed the careers chosen by women who leave the STEM pipeline. These “escape routes,” and their appeal to women, are crucial for future research and policy surrounding gender imbalances in STEM. This is a topic that could also be explored using PIAAC’s Survey of Adult Skills. More broadly, PIAAC offers multiple exciting possibilities for the study of gender and occupations beyond the topic of numeric skill use. Exciting potential areas for research using these data include the interconnection between gender and a myriad of job facets such as flexibility, level of interaction with co-workers, and level of satisfaction with one’s current job. Additionally, it will be fruitful to engage in gendered analyses of numeracy proficiency beyond what has been addressed in prior studies and the *OECD Skills Outlook*. For example, it might be useful to construct nested models looking at the gender gap in skill proficiency and controlling for a variety of factors, including age, educational attainment, work status, and income.

It will be important to travel down these multiple avenues of future research in order to better understand not only female underrepresentation in math and the sciences but occupational gender segregation more broadly and the ways in which stakeholders at the international, national, and local levels can best harness and deploy the skills needed for work in the 21st century.

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<u>Tables</u>

Table 1: Average Numeracy Skill Use at Work Index Measures, by Gender and Jurisdiction (PIAAC 2012), ALL PERSONS EMPLOYED IN THE PAST 12 MONTHS
Areas shaded in gray denote jurisdictions in which males do not measure significantly higher on the numeracy skill use index.

	Male		***Female***	
Jurisdiction	Average	Standard Error	Average	Standard Error
Australia***	2.30	(0.023)	2.06	(0.020)
Austria***	2.07	(0.023)	1.78	(0.025)
Canada***	2.31	(0.019)	2.07	(0.016)
Czech Republic	2.16	(0.033)	2.14	(0.044)
Denmark***	2.06	(0.023)	1.71	(0.021)
Estonia***	2.02	(0.021)	1.94	(0.017)
Finland***	2.25	(0.024)	1.97	(0.021)
France***	2.08	(0.017)	1.87	(0.020)
Germany***	2.14	(0.025)	1.87	(0.027)
Ireland***	2.08	(0.027)	1.89	(0.026)
Italy	1.95	(0.035)	1.89	(0.042)
Japan***	2.05	(0.021)	1.60	(0.018)
Netherlands***	2.19	(0.027)	1.64	(0.022)
Norway***	2.00	(0.019)	1.65	(0.022)
Poland	1.93	(0.030)	1.96	(0.032)
Republic of Korea***	2.11	(0.024)	1.82	(0.024)
Slovak Republic	2.10	(0.028)	2.14	(0.028)
Spain***	2.14	(0.029)	1.95	(0.034)
Sweden***	1.97	(0.020)	1.67	(0.020)
United States***	2.34	(0.029)	2.08	(0.028)

* p < .05 ** p < .01 *** p < .001

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012. This table was generated using the PIAAC International Data Explorer. http://piaacdataexplorer.oecd.org.

Table 2: Average Numeracy Skill Use at Work Index Measures, by Gender, Jurisdiction, and Age in 10 Year Bands (PIAAC 2012)
Areas shaded in gray denote jurisdictions in which males do not measure significantly higher on the numeracy skill use index.

		Male		***Female***	
		Average	Standard Error	Average	Standard Error
Age					
24 or less	Australia	1.99	(0.07)	1.94	(0.07)
	Austria	1.78	(0.06)	1.81	(0.06)
	Canada	1.87	(0.04)	1.92	(0.03)
	Czech Republic	1.92	(0.08)	1.95	(0.09)
	Denmark	1.57	(0.05)	1.53	(0.05)
	Estonia	1.73	(0.06)	1.80	(0.04)
	Finland	1.87	(0.06)	1.80	(0.06)
	France*	1.96	(0.07)	1.77	(0.06)
	Germany**	1.92	(0.07)	1.67	(0.05)
	Ireland	1.85	(0.10)	1.71	(0.07)
	Italy	*1.61*	*(0.10)*	‡	*(†)*
	Japan	1.59	(0.08)	1.51	(0.05)
	Netherlands*	1.73	(0.06)	1.53	(0.06)
	Norway	1.63	(0.04)	1.60	(0.05)
	Poland	1.77	(0.04)	1.84	(0.04)
	Republic of Korea	1.66	(0.09)	1.67	(0.06)
	Slovak Republic	1.98	(0.08)	1.95	(0.09)
	Spain	1.71	(0.10)	1.82	(0.08)
	Sweden	1.60	(0.06)	1.48	(0.05)
	United States*	2.11	(0.09)	1.82	(0.08)
25-34	Australia***	2.39	(0.06)	2.13	(0.05)
	Austria***	2.16	(0.05)	1.80	(0.05)
	Canada***	2.36	(0.05)	2.12	(0.04)

	Czech Republic	2.34	(0.06)	2.31	(0.08)
	Denmark***	2.06	(0.05)	1.71	(0.06)
	Estonia**	2.12	(0.04)	1.98	(0.03)
	Finland***	2.24	(0.05)	2.00	(0.04)
	France	2.11	(0.05)	1.98	(0.05)
	Germany	2.15	(0.05)	2.01	(0.05)
	Ireland*	2.19	(0.06)	2.02	(0.05)
	Italy	2.20	(0.09)	2.15	(0.09)
	Japan***	2.05	(0.05)	1.67	(0.04)
	Netherlands***	2.21	(0.07)	1.68	(0.05)
	Norway***	1.95	(0.05)	1.63	(0.04)
	Poland	2.13	(0.07)	2.04	(0.05)
	Republic of Korea***	2.34	(0.05)	2.05	(0.05)
	Slovak Republic	2.08	(0.04)	2.20	(0.05)
	Spain	2.09	(0.06)	2.08	(0.07)
	Sweden***	1.97	(0.05)	1.72	(0.05)
	United States	2.39	(0.07)	2.23	(0.06)
35-44	Australia***	2.39	(0.04)	2.15	(0.05)
	Austria***	2.18	(0.05)	1.85	(0.05)
	Canada***	2.45	(0.04)	2.17	(0.03)
	Czech Republic	2.15	(0.08)	2.08	(0.09)
	Denmark***	2.26	(0.05)	1.81	(0.05)
	Estonia**	2.18	(0.05)	1.99	(0.04)
	Finland***	2.34	(0.04)	2.00	(0.04)
	France**	2.16	(0.05)	1.99	(0.05)
	Germany***	2.25	(0.05)	1.91	(0.06)
	Ireland***	2.28	(0.06)	1.94	(0.05)
	Italy	2.04	(0.07)	1.94	(0.08)

	Japan***	2.17	(0.04)	1.68	(0.04)
	Netherlands***	2.42	(0.06)	1.76	(0.05)
	Norway***	2.14	(0.04)	1.71	(0.04)
	Poland	1.95	(0.06)	2.04	(0.07)
	Republic of Korea***	2.32	(0.04)	1.90	(0.04)
	Slovak Republic	2.21	(0.06)	2.14	(0.05)
	Spain	2.26	(0.06)	2.12	(0.07)
	Sweden***	2.05	(0.05)	1.78	(0.05)
	United States***	2.44	(0.05)	2.09	(0.06)
45-54	Australia***	2.41	(0.05)	2.08	(0.05)
	Austria***	2.04	(0.05)	1.71	(0.05)
	Canada***	2.40	(0.03)	2.09	(0.03)
	Czech Republic	2.18	(0.10)	2.18	(0.09)
	Denmark***	2.08	(0.05)	1.80	(0.04)
	Estonia	2.01	(0.05)	1.98	(0.04)
	Finland***	2.42	(0.04)	2.00	(0.05)
	France***	2.10	(0.04)	1.76	(0.04)
	Germany***	2.20	(0.05)	1.80	(0.06)
	Ireland	1.93	(0.06)	1.87	(0.06)
	Italy	1.78	(0.07)	1.77	(0.08)
	Japan***	2.19	(0.05)	1.62	(0.04)
	Netherlands***	2.19	(0.05)	1.59	(0.05)
	Norway***	2.11	(0.04)	1.69	(0.05)
	Poland	1.77	(0.07)	1.82	(0.08)
	Republic of Korea*	1.98	(0.05)	1.80	(0.05)
	Slovak Republic	2.14	(0.06)	2.16	(0.06)
	Spain***	2.13	(0.06)	1.87	(0.05)
	Sweden**	2.05	(0.04)	1.70	(0.05)

	*				
	United States***	2.39	(0.05)	2.13	(0.05)
55 plus	Australia***	2.20	(0.06)	1.89	(0.06)
	Austria***	2.08	(0.07)	1.62	(0.07)
	Canada***	2.27	(0.04)	1.95	(0.04)
	Czech Republic	1.99	(0.08)	2.04	(0.07)
	Denmark***	2.08	(0.04)	1.56	(0.04)
	Estonia	1.79	(0.05)	1.86	(0.05)
	Finland***	2.23	(0.05)	1.90	(0.04)
	France**	1.92	(0.05)	1.71	(0.05)
	Germany	2.02	(0.06)	1.88	(0.07)
	Ireland*	1.86	(0.08)	1.63	(0.07)
	Italy	1.78	(0.11)	1.62	(0.09)
	Japan***	1.95	(0.04)	1.41	(0.04)
	Netherlands***	2.14	(0.05)	1.52	(0.07)
	Norway***	2.04	(0.05)	1.56	(0.05)
	Poland	1.81	(0.07)	1.94	(0.09)
	Republic of Korea***	1.69	(0.05)	1.28	(0.07)
	Slovak Republic	1.90	(0.08)	2.10	(0.08)
	Spain***	2.14	(0.08)	1.48	(0.07)
	Sweden***	1.97	(0.04)	1.57	(0.04)
	United States***	2.33	(0.07)	2.02	(0.05)

* $p < .05$ ** $p < .01$ *** $p < .001$
† Not applicable.
‡ Reporting standards not met.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

Table 3: Average Numeracy Skill Use at Work Index Measures, by Gender and Jurisdiction, UNDERGRADUATE DEGREE OR HIGHER (PIAAC 2012)

	Male		***Female***	
Jurisdiction	Average	Standard Error	Average	Standard Error
Australia***	2.65	(0.042)	2.15	(0.03)
Austria***	2.43	(0.055)	1.95	(0.06)
Canada***	2.53	(0.034)	2.14	(0.024)
Czech Republic*	2.57	(0.075)	2.34	(0.072)
Denmark***	2.45	(0.042)	1.77	(0.034)
Estonia***	2.37	(0.039)	2.06	(0.025)
Finland***	2.66	(0.035)	2.12	(0.025)
France***	2.56	(0.037)	2.07	(0.035)
Germany***	2.51	(0.044)	2.01	(0.042)
Ireland***	2.48	(0.039)	2.01	(0.037)
Italy***	2.67	(0.100)	2.16	(0.089)
Japan***	2.24	(0.029)	1.70	(0.028)
Netherlands***	2.56	(0.038)	1.68	(0.036)
Norway***	2.32	(0.033)	1.71	(0.031)
Poland***	2.48	(0.057)	2.14	(0.051)
Republic of Korea***	2.41	(0.038)	1.99	(0.037)
Slovak Republic***	2.59	(0.054)	2.33	(0.047)
Spain***	2.49	(0.046)	2.06	(0.046)
Sweden***	2.29	(0.035)	1.78	(0.034)
United States***	2.65	(0.054)	2.17	(0.031)

* $p < .05$ ** $p < .01$ *** $p < .001$

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012. This table was generated using the PIAAC International Data Explorer. http://piaacdataexplorer.oecd.org.

Table 4: Average Numeracy Skill Use at Work Index Measures, by Gender and Jurisdiction, FULL-TIME EMPLOYEES (PIAAC 2012)
Areas shaded in gray denote jurisdictions in which males do not measure significantly higher on the numeracy skill use index.

	Male		***Female***	
Jurisdiction	Average	Standard Error	Average	Standard Error
Australia***	2.41	(0.028)	2.21	(0.032)
Austria***	2.14	(0.024)	1.87	(0.035)
Canada***	2.42	(0.022)	2.19	(0.022)
Czech Republic	2.21	(0.037)	2.18	(0.051)
Denmark***	2.19	(0.027)	1.85	(0.027)
Estonia**	2.09	(0.023)	2.01	(0.021)
Finland***	2.35	(0.025)	2.04	(0.025)
France***	2.12	(0.019)	1.94	(0.029)
Germany*	2.20	(0.029)	2.08	(0.040)
Ireland**	2.18	(0.029)	2.05	(0.042)
Italy	2.00	(0.039)	1.95	(0.050)
Japan***	2.12	(0.021)	1.78	(0.027)
Netherlands***	2.27	(0.031)	1.79	(0.042)
Norway***	2.08	(0.021)	1.72	(0.027)
Poland	1.97	(0.034)	2.02	(0.039)
Republic of Korea***	2.16	(0.026)	1.94	(0.029)
Slovak Republic	2.12	(0.030)	2.17	(0.032)
Spain***	2.21	(0.034)	2.01	(0.043)
Sweden***	2.04	(0.022)	1.79	(0.029)
United States***	2.44	(0.033)	2.25	(0.033)

*p < .05 **p < .01 ***p < .001

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012. This table was generated using the PIAAC International Data Explorer. http://piaacdataexplorer.oecd.org.

Table 5: Top Occupations for Numeracy Skill Use at Work[1], by Gender[2] (UNITED STATES ONLY)

	Male		***Female***	
Rank	**Occupation**	**Percentage *(Weighted)***	**Occupation**	**Percentage *(Weighted)***
1	Mining, manufacturing and construction supervisors	5.48%	Shop salespersons	9.75%
2	Shop salespersons	5.02%	Administrative and specialised secretaries	5.87%
3	Manufacturing, mining, construction, and distribution managers	4.44%	Business services and administration managers	4.77%
4	Sales, marketing and development managers	4.08%	Nursing and midwifery professionals	4.39%
5	Engineering professionals (excluding electrotechnology)	3.78%	Sales and purchasing agents and brokers	3.88%

6	Business services and administration managers	3.57%	Business services agents	3.54%
7	Software and applications developers and analysts	3.42%	Finance professionals	3.43%
8	Information and communications technology service managers	3.02%	Primary school and early childhood teachers	3.30%
9	Machinery mechanics and repairers	2.81%	Client information workers	3.09%
10	Finance professionals	2.75%	Professional services managers	3.03%

[1]Most common occupations for individuals measuring in highest quintile of numeracy skills use index (derived).
[2]Weighted frequencies by gender: 20,858,841 male; 12,914,924 female.

Table 5a: Occupations with Highest Means for Numeracy Skill Use at Work, by Gender[1] (UNITED STATES ONLY)

	Male			***Female***		
Rank	**Occupation**	**Mean *(Weighted)***	**Std. Dev. *(Weighted)***	**Occupation**	**Mean *(Weighted)***	**Std. Dev. *(Weighted)***
1	Vocational education teachers	4.73	2.04	Machinery mechanics and repairers	3.68	0.93
2	Life science technicians and related associate professionals	4.21	0.87	Information and communications technology professionals	3.40	0.00
3	Engineering professionals (excluding electrotechnology)	3.31	0.87	Engineering professionals (excluding electrotechnology)	3.33	0.25
4	Information and communications technology service managers	3.27	1.10	Veterinary technicians and assistants	3.17	0.04

5	Numerical clerks	3.26	0.91	Life science technicians and related associate professionals	3.17	0.10
6	Sales, marketing and development managers	3.26	1.16	Physical and earth science professionals	3.00	0.48
7	Architects, planners, surveyors and designers	3.11	0.75	Textile, fur and leather products machine operators	2.93	1.99
8	Physical and earth science professionals	3.10	0.84	Veterinarians	2.92	0.00
9	Life science professionals	3.07	1.18	Business services and administration managers	2.88	0.95
10	Business services and administration managers	3.05	0.99	Science and engineering professionals	2.85	0.00

[1]Weighted frequencies by gender: 69,287,487 male; 63,209,560 female.

Table 6: Top Occupations for Numeracy Skill Use at Work[1], by Gender[2] (UNITED STATES, AGE 24 AND UNDER ONLY)[3]

	Male		***Female***	
Rank	**Occupation**	**Percentage *(Weighted)***	**Occupation**	**Percentage *(Weighted)***
1	Other elementary workers	5.99%	Shop salespersons	21.51%
2	Financial and mathematical associate professionals	5.25%	Waiters and bartenders	20.06%
3	Machinery mechanics and repairers	5.23%	Other health associate professionals	13.17%
4	Vocational education teachers	4.96%	Tellers, money collectors and related clerks	9.96%
5	Armed forces occupations, other ranks	4.78%	Sales, marketing and public relations professionals	7.95%
6	Shop salespersons	4.67%	Client information workers	4.77%
7	Electrical equipment installers and repairers	4.53%	Finance professionals	4.35%
8	Information and communications technology operations and user support technicians	4.06%	Machinery mechanics and repairers	4.25%
9	Professional services managers	4.04%	Sales and purchasing agents and brokers	3.92%
10	Veterinary technicians and assistants	3.67%	Other sales workers	3.83%

[1]Most common occupations for individuals 24 and under measuring in highest quintile of numeracy skills use index (derived)
[2]Weighted frequencies by gender: 10,546,736 male; 7,539,636 female.
[3]Results should be interpreted with caution due to low sample sizes in some instances.

Table 7: Top Occupations for Numeracy Skill Use at Work[1], by Gender[2] (UNITED STATES, UNDERGRADUATE DEGREE RECIPIENTS ONLY)[3]

Note: 35.3% (unweighted) of the U.S. sample had an undergraduate degree or higher.

	Male		***Female***	
Rank	**Occupation**	**Percentage *(Weighted)***	**Occupation**	**Percentage *(Weighted)***
1	Business services and administration managers	7.48%	Business services and administration managers	9.11%
2	Software and applications developers and analysts	6.26%	Primary school and early childhood teachers	7.31%
3	Finance professionals	6.06%	Finance professionals	5.02%
4	Engineering professionals (excluding electrotechnology)	5.90%	Other teaching professionals	4.64%
5	Sales, marketing and development managers	5.67%	Nursing and midwifery professionals	4.40%
6	Information and communications technology service managers	5.28%	Administrative and specialised secretaries	4.24%
7	Manufacturing, mining, construction, and distribution managers	3.91%	Shop salespersons	4.15%
8	Shop salespersons	3.84%	Administration professionals	3.95%
9	Architects, planners, surveyors and designers	3.49%	Sales and purchasing agents and brokers	3.81%
10	Sales, marketing and public relations professionals	3.34%	Business services agents	3.80%

[1]Most common occupations for undergraduate degree recipients who measure in highest quintile of numeracy skills use index (derived)
[2]Weighted frequencies by gender: 12,379,092 male; 11,305,386 female.
[3]Results should be interpreted with caution due to low sample sizes in some instances.

Table 8: Top Occupations for Numeracy Skill Use at Work[1], by Gender[2] (UNITED STATES, FULL-TIME WORKERS ONLY)[3]

Note: 52.2% (unweighted) of the U.S. sample was currently working full time.

	Male		***Female***	
Rank	**Occupation**	**Percentage *(Weighted)***	**Occupation**	**Percentage *(Weighted)***
1	Shop salespersons	5.66%	Shop salespersons	10.49%
2	Manufacturing, mining, construction, and distribution managers	5.01%	Administrative and specialised secretaries	6.33%
3	Mining, manufacturing and construction supervisors	4.83%	Business services and administration managers	5.83%
4	Sales, marketing and development managers	4.22%	Business services agents	3.94%
5	Business services and administration managers	4.22%	Professional services managers	3.70%
6	Software and applications developers and analysts	3.74%	Primary school and early childhood teachers	3.64%
7	Engineering professionals (excluding electrotechnology)	3.60%	Client information workers	3.57%
8	Information and communications technology service managers	3.56%	Sales and purchasing agents and brokers	3.39%
9	Finance professionals	3.24%	Finance professionals	3.23%
10	Retail and wholesale trade managers	2.84%	Nursing and midwifery professionals	2.96%

[1]Most common occupations for full-time workers who measure in highest quintile of numeracy skills use index (derived)
[2]Weighted frequencies by gender: 15,455,411 male; 8,788,418 female.
[3]Results should be interpreted with caution due to low sample sizes in some instances.

Table 9a: Areas of Study[1] of Respondents Measuring in Top Quintile for Numeracy Skill Use at Work[2], by Gender[3] (UNITED STATES ONLY)[4]

	Male		***Female***	
Rank	**Area of Study**	**Percentage *(Weighted)***	**Area of Study**	**Percentage *(Weighted)***
1	Engineering, manufacturing and construction	28.67%	Social sciences, business and law	23.94%
2	Social sciences, business and law	25.42%	Health and welfare	23.67%
3	Science, mathematics and computing	20.53%	Teacher training and education science	14.42%
4	Humanities, languages and arts	6.78%	Science, mathematics and computing	14.13%
5	Services	5.36%	Humanities, languages and arts	9.03%
6	General programs	4.68%	General programs	6.59%
7	Health and welfare	3.59%	Services	4.60%
8	Teacher training and education science	2.99%	Engineering, manufacturing and construction	1.93%
9	Agriculture and veterinary	1.99%	Agriculture and veterinary	1.70%

[1]"Area of study" refers to the academic discipline in which the respondent received her highest degree and was reported as one of the following nine items: general programs; teacher training and education science; humanities; languages and arts; social sciences, business and law; science, mathematics and computing; engineering, manufacturing and construction; agriculture and veterinary; health and welfare; or services.
[2]Workers who measure in highest 20% of numeracy skills use index (derived). Due to rounding, percentages may not sum to 100.
[3]Weighted frequencies by gender: 2,298,445 male; 1,693,597 female.
[4]Results should be interpreted with caution due to low sample sizes in some instances.

Table 9b: Areas of Study[1] of Respondents Measuring in Top Quintile for Numeracy Skill Use at Work[2], by Gender[3] (UNITED STATES ONLY)[4]

Male		***Female***	
Area of Study	**Percentage *(Weighted)***	**Area of Study**	**Percentage *(Weighted)***
Engineering, manufacturing and construction	28.67%	Engineering, manufacturing and construction	1.93%
Social sciences, business and law	25.42%	Social sciences, business and law	23.94%
Science, mathematics and computing	20.53%	Science, mathematics and computing	14.13%
Humanities, languages and arts	6.78%	Humanities, languages and arts	9.03%
Services	5.36%	Services	4.60%
General programs	4.68%	General programs	6.59%
Health and welfare	3.59%	Health and welfare	23.67%
Teacher training and education science	2.99%	Teacher training and education science	14.42%
Agriculture and veterinary	1.99%	Agriculture and veterinary	1.70%

[1]"Area of study" refers to the academic discipline in which the respondent received her highest degree and was reported as one of the following nine items: general programs; teacher training and education science; humanities; languages and arts; social sciences, business and law; science, mathematics and computing; engineering, manufacturing and construction; agriculture and veterinary; health and welfare; or services.

[2]Workers who measure in highest 20% of numeracy skills use index (derived). Due to rounding, percentages may not sum to 100.

[3]Weighted frequencies by gender: 2,298,445 male; 1,693,597 female.

[4]Results should be interpreted with caution due to low sample sizes in some instances.

Table 10: Percentage Measuring in Top Quintile of Numeracy Skill Use at Work[1], by Gender[2] and Area of Study[3] (UNITED STATES ONLY)

Male		***Female***	
Area of Study	**Percentage *(Weighted)***	**Area of Study**	**Percentage *(Weighted)***
General programs	20.63%	General programs	16.62%
Teacher training and education science	21.55%	Teacher training and education science	19.77%
Humanities, languages and arts	23.07%	Humanities, languages and arts	16.18%
Social sciences, business and law	34.04%	Social sciences, business and law	21.01%
Science, mathematics and computing	38.75%	Science, mathematics and computing	25.27%
Engineering, manufacturing and construction	45.56%	Engineering, manufacturing and construction	31.23%
Agriculture and veterinary	44.73%	Agriculture and veterinary	38.13%
Health and welfare	22.88%	Health and welfare	18.33%
Services	23.45%	Services	14.29%

[1]Workers who measure in highest 20% of numeracy skills use index (derived).
[2]Weighted frequencies by gender: 2,298,445 male; 1,693,597 female.
[3]"Area of study" refers to the academic discipline in which the respondent received her highest degree and was reported as one of the following nine items: general programs; teacher training and education science; humanities; languages and arts; social sciences, business and law; science, mathematics and computing; engineering, manufacturing and construction; agriculture and veterinary; health and welfare; or services.