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"I think the young women have it easier": Age, Gender, and Women's Experiences in Canadian Engineering

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ABSTRACT
Engineering has long been a male-dominated profession, with a reputation of being less than welcoming to women. In Canada and other Western countries, efforts to attract more women into the field date back decades. As a result of such initiatives, women entering engineering today could experience their work differently than those who preceded them. This paper draws on the life course paradigm to determine whether there are gender differences in engineering across age cohort. Analysing data from a survey and in-depth interviews with engineers in Ontario, Canada, the paper explores whether gender intersects with age cohort to determine experiences of employment, opportunities, and work-family conflict. Although women share some experiences across age – such as concerns about pay and recognition – differences by cohort emerged. Young women are disadvantaged compared to young men and others with respect to securing stable employment in engineering. Older women report more challenges with work-family conflict and have less decision-making authority at work. Interviews further suggest that young women both have it 'easier' and harder than others. The findings demonstrate how the life course paradigm can also be used to shed light on the intersection of gender and age in professions.

KEYWORDS
Engineering, Employment, Ontario Canada, Women, Age, Life Course

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INTRODUCTION

In Western countries, over the last few decades, women have been moving into formerly male-dominated professions in large numbers, but engineering remains stubbornly male-dominated. There is a sizeable literature, published over several decades, documenting the many challenges women engineers face in professional practice (see for instance, Cech et al., 2011; Ranson, 2005; Tao and McNeely, 2019). Academic research has identified a 'leaky pipeline' in the field (Faulkner, 2009): many women who embark on engineering training and practice eventually leave (Cech et al., 2011; Sharp et al., 2012; Tao and McNeely, 2019). Lack of opportunities for meaningful work and promotion, difficulty combining engineering work with family life, and hostile working environments are just some of the barriers that discourage women's participation in engineering (Evetts, 1994; Hatmaker, 2013; Sharp et al., 2012).

In Canada, the number of women in the profession is growing, thanks in part to concerted campaigns within engineering to recruit and retain more women, and establish more gender equity (Engineers Canada, 2021). There is reason to believe that working conditions for women in engineering are changing. Moreover, based on international evidence, there is reason to believe that work-family conflict in engineering is less intense than it was (Ayre et al., 2011). Thus, it may be the case that the younger women entering the profession today have experiences that are distinct from their older counterparts. Such variations can be obscured in research that treats women as a monolithic group. Such depictions can also limit effective policy, especially in professions like engineering that are actively endeavoring to become more gender balanced, by obscuring challenges faced by one segment of the profession more than others.

This paper draws on the life course paradigm (Elder et al., 2003; Shanahan and Macmillan, 2008) to explore gender differences within engineering across an age cohort, through analyses of survey and interview data from a sample of professional engineers in the province of Ontario, Canada. The focus is on areas highlighted in the literature as potentially problematic for women in engineering: job opportunities, assessments of competence, and work-family conflict.

THEORETICAL FRAMEWORK

Professions are gendered institutions (Faulkner, 2007; Hearn et al. 2016). Male-dominated professions like medicine, dentistry, law, and engineering were traditionally structured for men; there were many structural and cultural barriers to women's entrance and participation (Davies, 1996; Dryburgh, 1999). While women continue to face challenges working in traditionally male-dominated professions, gender parity is emerging in many, including medicine and law (Adams, 2010; Bolton and Muzio, 2007; Hearn et al., 2016). Engineering, however, remains strongly male-dominated. In Canada, only 14% of licensed engineers are women

(Engineers Canada, 2020). Both informal and formal barriers remain. Research on women in engineering in Western countries documents women's experiences of discrimination and sexism upon entering engineering careers (Gill et al., 2008; Seron et al., 2016). The gendering of competence in the field is also a disadvantage (Kmec, 2013). In science and technology fields, men are believed to be naturally more skilled than women (Harding, 1986; Seron et al., 2016); some unfairly question women's technical skills when they practise as engineers (Hatmaker, 2013; Kmec, 2013). Moreover, research has shown, the structure of engineering careers is not typically conducive to work-life balance (Herman et al., 2013; Ranson, 2005).

Professions, like other occupations and institutions, are not simply gendered, but also racialized (Acker, 2006; Holvino, 2010; Melaku, 2019), and heteronormative (Cech and Pham, 2017). Increasingly, researchers are adopting an intersectional lens when researching professions like engineering (Alegria, 2019; Ruel, 2019; Tao and McNeely, 2019). Intersectionality theories argue that gender, class, and race are co-constructed through "simultaneous processes of identity, institutional and social practice" (Holvino, 2010, p.249), shaped by social-historical context and subject to social change (Acker, 2006). This work is helpful in guiding research on intersectionality; however, it tends to ignore the role of the age cohort (McMullin, 2011), and pays scant attention to change over time. Age is a different kind of marker of inequality—one that is changeable across the life course, and possibly less "embedded in organizing processes" (Acker, 2006, p.445). As a result, few have tried to theorize and research intersections between age and gender at work (Choroszewicz and Adams, 2019).

One way forward may be through the life course paradigm. The term 'life course' refers "to the age-graded sequence of roles, opportunities, constraints and events that shape the biography from birth to death" (Shanahan and Macmillan, 2008, p.40). Life course scholars are interested in the social pathways through which individuals traverse these roles and events, and how these pathways vary across time and place (Elder et al., 2003; Shanahan and Macmillan, 2008). These pathways are structured by social institutions, norms, and social interactions, and they encompass numerous life transitions, during which people exit one role to enter another (for example, school-to-work transitions, or a transition to parenthood). These transitions are key life events (or turning points) that can shape subsequent trajectories over a substantial period of time (Castano and Webster, 2011; Shanahan and Macmillan, 2008: pp. 80–82). Because transitions and trajectories are shaped by social norms, institutions, and social events, social-historical context is seen as crucial in shaping social experiences and opportunities.

Applying these insights to careers, research had shown that initial labour force experiences can structure subsequent career trajectories: labour market conditions combine with prevailing gender norms and social policies to shape opportunities (Castano and Webster, 2011; Moen, 2011). Life courses are gendered such that men's and women's experiences of work and life are different, especially since care for children remains institutionalized as women's responsibility (Herman and Webster, 2010; Moen, 2011). Women's career aspirations may be undermined by

family responsibilities, or vice versa (Moen, 2011), especially since career-building and family-building years often coincide (Hochschild, 2003). Structural disadvantages faced by women over the course of their careers and lives accumulate over time (Castano and Webster, 2011). These cumulative disadvantages contribute to women's marginalization within, and exit from, male-dominated careers, such as those in STEM (Castano and Webster, 2011; Tao and McNeely, 2019). A gendered life course approach allows us to explore the intersection of age and gender across the life course, and across the social–historical context.

To capture differences across historical time, life course scholars trace people's social pathways across age cohorts and generations. The term 'cohort' refers to a "group of people who experience the same event or conditions within the same interval" (Shanahan and Macmillan, 2008, p.127). That is, individuals born around the same time, or those entering the labour force around the same time, may have very similar experiences of historical events and culture. Some scholars link these cohorts to generations—a category that has a broader range than cohort—sometimes grouping together people born within 10–20 years of each other. Unfortunately, there is no widespread agreement on when one generation ends and another begins (Kelan, 2014). Even widely used generational terms such as 'baby-boomers'—typically used to refer to those born during the fertility surge following the Second World War—do not have universal boundaries (Shanahan and Macmillan, 2008; Zemke et al., 2013). Most scholars identify 'Generation X' as the one that follows the baby-boomers, beginning in the mid-1960s, and ending in the late 1970s or early 1980s (Shanahan and Macmillan, 2008; Zemke et al., 2013). Those born closer to the millennium are typically called 'Millennials'.

The life course perspective suggests that experiences of work and life may differ across generation and/or age cohort (the terms are used interchangeably here; Shanahan and Macmilllan 2008; Zemke et al., 2013). Social, technological and institutional changes ensure that the opportunities and experiences of members of each generation upon career entry will likely differ. Members of these distinct generations often share some attitudes and habits as a result of shared social events and life course experiences (Kelan, 2014). Thus, there is reason to believe that the work experience of older generations, such as the baby-boomers will differ from those of younger generations, like the Millennials. Gender may be a notable dimension of difference. As the gendering of professional work alters in response to social change and the efforts of professionals to generate positive change, professions that were traditionally masculine may slowly change to become more female-friendly. As a result, women entering male-dominated careers more recently may have had different work experiences and career trajectories than those who came before them (Castano and Webster, 2011).

Women in Engineering

Studies on women in engineering in Canada and other western cultures published in previous decades documented a masculine 'work hard, play hard' culture (Dryburgh, 1999; Evetts, 1994; Heap and Scheinberg, 2005). Although many women successfully adapted to the culture in school (Dryburgh, 1999), they

encountered hostility and sexism upon entering engineering workplaces (Devine, 1992; Evetts, 1994). Research found that women engineers had less access to training opportunities and mentorship (Devine, 1992), and, hence, limited opportunities for promotion (Evetts, 1994). Women who did earn promotions were typically childless and had pursued promotion with "single-minded dedication" (Evetts, 1994, p.108). Those women engineers who had children indicated it was very difficult to combine work and family (Devine, 1992; Ranson, 2005). Women were said to succeed in the masculine engineering culture by becoming "conceptual men" (Ranson, 2005, p.146). However, their status as 'one of the boys' was undermined when engineers became mothers (Herman et al., 2013; Ranson, 2005). In response to blocked opportunities and hostile working environments, women (especially mothers) tended to seek other labour market opportunities (Shih, 2006); however, this strategy could lead them out of engineering and into different, even unanticipated, careers (Ranson, 2005).

More recent research has documented changes within engineering education that encourage women's participation; however, studies have also identified forces contributing to women's segregation and marginalization (Seron et al., 2016; Seron et al., 2018). Upon entering the labour force, whether during internships or first jobs, women may experience sexism, leading them to question engineering as a career choice (Seron et al., 2016), and reducing their confidence in their ability to succeed in engineering (Cech et al., 2011), potentially encouraging career exit (Tao and McNeely, 2019). Young women feel unprepared to navigate these gendered workplaces (Gill et al., 2008). Colleagues, coworkers and clients may question their competence and technical expertise (Hatmaker, 2013; Kmec, 2013), and they may be given stereotypical female tasks, such as taking notes for their colleagues (Gill et al., 2008; Hatmaker, 2013). As they progress in their careers, women find they experience a decline in career opportunities when they have children (Herman et al., 2013). Nevertheless, some research suggests this might be changing. In their study of women engineers in Australia, Ayre et al. (2011) found that the number of engineering workplaces with family-friendly policies increased between 1999 and 2007. Nonetheless, barriers to utilizing these policies may remain (Wharton, 2015).

THIS STUDY

Considering the literature on gender differences in engineers' employment experiences in western countries together with the life course perspective, it seems likely that these gender differences vary by age. If the engineering profession is now more welcoming to women than ever before, then there should be fewer differences between younger men and women embarking on engineering careers. Observed gender differences may be more apparent among older cohorts, in which women experienced more work-family conflict and other barriers compared to men, leading to a cumulative disadvantage that manifests as gender differences within older cohorts.

This study explores the hypothesis that, in Canadian engineering, gender differences in experiences are higher within older (Gen X or baby boomer) cohorts than in younger generations.

Conversely, there could be a selection effect at play whereby older cohorts of women who faced significant barriers in engineering have already left the profession; those who remain in the profession could be the 'most successful', and the 'most like men'. Younger women may experience more barriers that will drive some out of engineering in the future.

Thus, an alternative hypothesis, consistent with a leaky pipeline, is that there are fewer gender differences among older cohorts, compared to younger cohorts. To assess these competing hypotheses, this paper draws on cross-sectional survey and interview data which explore particular areas of gender difference in engineering employment highlighted in the literature. The areas investigated include: perceptions and experiences of inequalities in pay, promotion, job outcomes and work-family balance; whether these differences vary across age cohorts; and whether older and younger women believe that there are generational differences in these experiences.

Methodology

To assess the hypotheses, mixed methods were employed: in-depth interviews and survey data. As part of a broader study on the changing nature of professional work in Canada, interviews were first conducted with 15 key informants who were experienced engineers. Subsequently, an online survey was circulated with the assistance of a professional association, and interviews were conducted with 52 Ontario engineers who volunteered after taking the survey. Analyses presented here focus on answers to attitudinal survey questions respecting perceived gender differences in pay and promotion, work-family conflict, and questions on current employment. Then, interview findings are discussed to shed more light on the women's experiences and perceptions of working in engineering in Ontario, Canada.

Survey Data

The online survey of Ontario engineers was conducted between October 2016 and February 2017. The survey focused on a variety of issues including work experiences, workplace change, and attitudes to professional and social issues. A link to the survey was disseminated by the Ontario Society of Professional Engineers (OSPE), initially to its members via email. Three follow-up notices including the survey link were sent out via email and social media not only to OSPE's roughly 8,000 members, but 20,000 additional Canadian engineers between November 2016 and January 2017. There were approximately 800 survey respondents, but analysis was limited to the 600 actively working at the time of the survey. As with other online surveys distributed via social media, survey generalizability is limited.

Not surprisingly, given the makeup of the profession in Ontario, 82% of respondents were men; only 18% identified as women (none identified as non-binary). Women, then, were slightly over-represented among respondents: at the time of the survey women comprised only 13% of licensed engineers in the province. Regardless, the number of women in the survey is on the low side, limiting the scope of data analyses undertaken.

To explore differences across age cohort, respondents' ages were grouped into three categories, resembling the generations identified in some research (Zemke et al., 2013). Those who were 35 and under during data collection (2015–17), were born in 1980–2 and later, and can be categorized as Millennials (36% of respondents). Those aged 36–50 equate to Generation X, born between 1965 and 1980 (24%). Those who were 51 and over approximate to baby boomers (39%).

The outcome variables used in this study include several survey questions assessing perceptions of gender inequality at work (along a 5-point Likert scale):

> At my workplace, men get more credit for their contributions and skills than women do.
>
> Men in engineering make more money than women do, even when completing similar work.
>
> Work–family balance is difficult to achieve in the engineering field.

These statements address key points of gender difference identified in the literature. The remaining outcome variables address employment outcomes (working in field, permanent or temporary job), and authority level:

> Does your job require an engineering degree?
>
> Is your job permanent, or temporary/seasonal?
>
> Do you participate in workplace decision-making?

Analysis

To identify any gender differences within and across age groups, cross-tabular analyses were calculated using chi-squared tests of significance. For ease of interpretation (and to ensure all cell sizes were 5 or more) outcome variable response categories were collapsed. Results, presented below in the Findings section, reflect analyses exploring age differences on the various outcome measures, across gender. Analyses exploring gender difference within age categories were also conducted but are of less focus here.

Interview Data

As noted above, two sets of interviews were completed with engineers in Ontario, Canada. In 2015, key informant interviews were conducted with 15 experienced professional engineers (8 of whom were women). The goal of these interviews was to explore changes in the profession over time, especially with respect to training, skills, and practice. Interviews were conducted in person, over the phone, or over Skype and lasted between 30 and 90 minutes. After the survey, in 2017, follow-up interviews were conducted with 52 survey respondent volunteers (13 of whom were women). The latter interviews were semi-structured, and their goal was to probe further on several issues related to workplace change that emerged as being important within the survey. As before, interviews were conducted in person, over the phone or over Skype, and lasted between 45 and 80 minutes.

For the purposes of this paper, the focus is on the 21 interviews with women engineers (8 in phase one and 13 in phase two). All but one were recorded and transcribed. It is important to note that gender issues were not the central focus of either set of interviews. However, gender was frequently raised during interviews by participants. When it did not arise spontaneously, participants were invited to share their thoughts on the experiences of women in engineering. Similarly, while no question explicitly explored age cohort differences in the engineering profession, most participants were asked about challenges experienced by younger people embarking on engineering careers, since this was a hot topic in the profession at the time (OSPE, 2015).

Analysis

Transcripts were analysed both descriptively and thematically. Transcripts were read several times to identify experiences of work and career transitions. Then, transcript excerpts were grouped by theme and by age cohort, to identify patterns within and across cohort. Particular attention was paid, not only to the experiences women described, but *how* they described their experiences, and how they felt their own experiences were similar to or different from others' within their age cohort or outside of it. Although women discussed a wide range of experiences, several attracted more attention, recurring in most interviews—work and family, treatment by male colleagues, and career trajectories. Subsequent analysis focused on these areas more closely, within and across age categories. In the presentation of findings below, all interview participants have been assigned pseudonyms.

FINDINGS

Analysing the survey and interview data revealed that gender differences persist in engineering, but that these sometimes vary by age cohort. The experiences of older and younger women in engineering are different in significant ways.

Attitudes Respecting Pay and Promotion

Tables 1 and 2 show responses to the survey questions about perceived gender differences in pay and promotion by gender and age. Women are much more likely than men to strongly agree or agree that men make more money than women in engineering: 80% of women respondents, but only one quarter of men, agree with this statement. In reality national statistics show that Canadian women in engineering's average income is 80% of men's income (Statistics Canada, 2017). There are some variations in perceptions across age cohort. Younger women are *most* likely to agree with this statement, while younger men are *least* likely to agree. Older women respondents were less likely than other women to agree this is the case, although two-thirds of them did so. The latter could reflect a 'survivor' effect among older women in engineering, where those who remain in the profession into their 50s have been very successful. Younger women, in contrast, clearly feel women are at a disadvantage.

Table 1: Men in engineering make more money than women do even when completing similar work: Percentage Agreement by gender and age

	Women	Men	Age Totals	Total N
35 and Under	**85.8% (42)**	**18.6% (20)**	**39.5% (62)**	157
36-50	**80.0% (20)**	**25.0% (22)**	**37.2% (42)**	113
51 and Over	**68.4%(13)**	**26.9% (45)**	**31.2% (58)**	186
All Ages (N's)	**80.7% (93)**	**24.0% (363)**	**35.5%**	456

All gender differences significant at p<.001

Table 2: Men get more credit for their contributions than women: Percentage agreement by gender & age

	Women	Men	Age Totals	Total N
35 and Under	**67.9% (36)**	**16.1% (22)**	**30.5% (58)**	190
36-50	**60.7% (17)**	**11.5% (12)**	**21.8% (29)**	133
51 and Over	**68.5%(13)**	**12.6% (21)**	**15.4% (34)**	220
All Ages (N's)	**66.0% (100)**	**12.4% (443)**	**22.2%**	543

All gender differences significant at p<.001

There is also a significant gender gap in agreement with the statement 'men get more credit for their contributions than women'. Two-thirds of women survey respondents, but only 12% of men respondents, agree with this statement.

The survey identified no significant differences across age cohort among women (and men), but in interviews, it was younger women who were most likely to voice frustration at being discredited. Elizabeth (<35) talked about having to take notes in meetings, and having her ideas ignored. Ying (<35) found that clients and customers would often ask her male counterparts about technology she designed since "women are not commonly perceived as very technically enabled." Raina (<35) indicated that her instructions were challenged and resisted by male co-workers. Nevertheless, young women had the impression that their experiences were better than those of previous generations: Elizabeth (<35) said, "It's a lot better than it used to be 20 years ago from the stories I heard from other women." Ying (<35) agreed that "we're much better than before, but still …" Kimberly (36–50) had worked in the profession for a while and claimed that "the engineers have become a little more enlightened … now that you're getting some of the younger people in there."

When women in older cohorts discussed lack of credit or respect for their skills, they often referenced experiences from earlier in their careers. For instance, Zoe (36–50) explained that she learned to "adjust [her] style of speaking to get things done." When asked to explain, she provided an example of an exchange she had

with a construction worker on a job site when still fairly new at her job. She told him she would like him to have a room drywalled by the following Wednesday:

> Next week Wednesday comes and goes. I go into the [room], the drywall is not complete. So, I see the guy and I'm like, "Ah, I thought I told you this had to be done on Wednesday." He's like, "No you didn't. You said you would *like* it. […]."So, I'm like, oh, okay, my mistake: "Okay, you better have this done by Friday, or else I'm going to call your boss." And he got it done by Friday.

Zoe felt she had to change her interaction style to be taken seriously. She had to become "more assertive." Zoe elaborated,

> I feel that in a male dominated profession like engineering there's two roles for women. You're either sort of that aggressive bitch […]. Or you can be the one that makes the cookies and is the mother role and, you know, organizes the Christmas party type of thing. So, those are sort of the two choices. So, I picked being the more aggressive person. There's no sort of middle ground.

Nonetheless, even senior women had their skills questioned. Indeed, women expressed surprise when, outside of engineering, their abilities were acknowledged. Zoe (36–50) found it "kind of funny" that her current (non-engineering) employer assumes that she has "a certain level of expertise, whether I do or don't." Ruth (51+) concurred: "I go out, and you know, tell somebody, 'yeah I'm an engineer', and outside the industry there's respect."

To summarize, women were more likely to believe that they get less credit than men for their work, and in interviews clarified that women engineers—perhaps especially younger women—have their skills and judgment devalued by co-workers.

Work–family conflict

Gender differences were surprisingly muted on the issue of work–family conflict within engineering. A majority of men and women aged 50 and younger agreed that balance is hard to achieve. It is only among the oldest cohort of engineers (51 and over) that a statistically significant gender difference emerged. Over two-thirds of older women engineer survey respondents indicated work–life balance was a challenge, compared to 43% of same–age men.

Table 3: Work–family balance is difficult to achieve: Percent agree/strongly agree by gender and age

	Women	**Men**	**Age Totals**	**Total N**
35 and Under	57.1 (32)	55.1 (81)	55.7% (113)	190
36-50	59.3 (16)	53.9 (62)	54.9% (78)	133
51 and Over	**68.4 (13)****	**43.1 (93)**	45.1% (106)	220
All Ages (N's)	59.8 (102)	49.4 (478)	51.2%	580

** p<.01

These findings suggest that experiences of work–family conflict differ for women across a cohort: Millennial women have allies among same-age men who are just as concerned with work–family balance as they are; older women have had fewer allies among men in their cohort.

It may be the case that work–life balance for engineers has improved over time. For Delilah (36–50), changing social attitudes among younger cohorts of men were important in invoking positive change:

> I think that's what's made the engineering workforce now start to recognize that that philosophy of just killing yourself for a client and, "no, you don't get holidays and compensation for your overtime and we don't care that you've got children to drop off at day care." That's changing because men themselves have those obligations now.

The result, according to Delilah, is that more companies are starting "to create environments where making accommodations for family life is not a negative."

Older women struggled to achieve work–life balance. Battling a long-working-hours culture that did not accommodate childrearing, baby boomers like Ruth (51+) fought for family-friendly policies—but they paid a price for it:

> One lady that I first worked with, she had her kids in the late 70s and was given six weeks maternity leave, and she rushed right back. Didn't hurt her career at all. When I had my kids, we had, I think three or four months' maternity leave, but we had a guarantee of coming back. We could take a year off, and we could come back to our job. And we wouldn't be paid for that time. So [my cohort] […] we had our kids, we took the maternity leave, in fact, we job-shared or did reduced hours of work. And we were stigmatized for that. We were all, you know, 'you're on the mommy track'.

Ruth's generation was penalized if they cut back on their work hours; their career progress stalled. This has changed, Ruth believes:

> And now, the ladies coming in are given a year maternity leave, but I don't think there's any stigma anymore. I think there's been a lot of recognition that men have a part to play.

Work–family conflict combined with blocked mobility to shape the career paths of women engineers in the oldest cohort, in particular. Many women in the 51+ age group reported changing jobs after having children: some sought more family-friendly work environments, while others started their own firms. For example, Shawna (51+) had great success working in the private sector, but when she had young children she first decided to start her own company to achieve more work-life balance, and eventually settled in the public sector. As she said, "trying to manage a young family with working 80 plus [hours] per week — that didn't make sense." In public sector workplaces, she argued, there is "more time for your family, more time for yourself, or doing other things that you enjoy." When

Veronica (51+) was asked what led her to become self-employed, she said, "it was a better family/working kind of situation." Before striking out on her own she asked her company if she could work from home some days, and they said no. Delilah (51+) also said her move to self-employment was a response to the fact that "a regular engineering job was not conducive to family life." She had found previous employers totally inflexible, and unsympathetic to work–family conflict. Men rarely mentioned work–family conflict in interviews, and the few that did were all in the youngest age cohort with small children. Overall, both the survey and interview findings suggest that older women have had been particularly impacted by work–family conflict, experiencing blocked mobility and altered career paths. Gender differences are less apparent within the youngest age cohort.

Work characteristics

Table 4 shows gender differences within and across age categories with respect to employment in a job that requires an engineering degree. Overall, there is no difference between men and women: about 60% of survey respondents are in jobs specifically requiring engineering training. Thus, many engineers are employed outside of engineering (see also OSPE, 2015; Tao and McNeely, 2019). The engineering profession in Ontario is concerned about how this trend affects young workers seeking to break into the profession (OSPE, 2015). However, the survey suggests that it is particularly young women who are disadvantaged. Almost two-thirds of men aged 35 and under are employed in engineering compared to just over half of the younger women respondents. Table 5 shows that young women are also less likely to hold permanent jobs. A quarter of them are employed in temporary or seasonal jobs, compared to 11 percent of their male counterparts, and a similar percentage of women and men in other age cohorts. These disadvantages could contribute to the leaky pipeline whereby women who enter engineering do not stay in the field.

Table 4: Does your current job require an engineering degree? Percent "yes" by gender & age

	Women	Men	Age Totals
35 and Under	**56.3% (36)***	**65.2% (105)**	62.7% (141)
36-50	65.6% (21)	61.9% (73)	62.7% (94)
51 and Over	65.0% (13)	60.3% (132)	60.7%(145)
All Ages (Total N)	60.3% (116)	62.3% (498)	61.9% (614)

* p<.05

Table 5: Percentage of permanent employment (vs temporary) by gender and age

	Women	Men	Age Totals
35 and Under	**75.4% (46)***	**89.0% (138)**	85.2% (184)
36-50	100% (29)	89.0% (103)	91.7% (132)
51 and Over	88.9% (16)	83.8% (176)	84.2% (192)
All Ages	84.3% (108)	86.9% (480)	86.4% (588)

* p<.05

In interviews older and younger women mentioned challenges faced by younger workers:

> I'm a little surprised at how many engineering graduates I know that have struggled to find work. I know that wasn't the case when I graduated, so I do think it is harder for them. (Zoe, 36–50)
>
> Young people aren't able to find jobs as easily as, perhaps, a generation before. (Ying, <35)

For some, the real problem was finding a good, secure job in the engineering field:

> The job market and culture has changed. It's become a lot more sporadic. A lot more contract, part-time […] The 'having a job before you graduate' thing seems like a pipe dream almost nowadays. […] So, to be able to graduate and get a full-time, permanent job is highly unlikely. (Madelyn, 36–50)

Respondents were divided as to the cause of these challenges. Some pointed to structural changes in engineering and decreasing opportunities:

> I think a lot of times, especially for this generation right now that are just graduating, the circumstances are such that they don't get an opportunity. It's a lack of opportunity versus their personal choice of not practising engineering. (Julia 36–50)

However, other respondents individualized the problem, suggesting that the problem lay with younger people being too "picky". Raina (<35) said:

> I do find it really difficult to really understand where people are like, 'Oh, I can't find a job […].' Okay, well, have you looked anywhere north, anywhere at all? And they're like 'Oh, no, I want to live in a city.' Well, there's your problem.

During her interview, Raina described work in the Canadian north as both unpleasant and potentially dangerous for women but was still critical of those who did not pursue it. Zoe was similar:

> I do feel they're not as willing to sort of put in their time, and then pay their dues type of thing. Because I knew someone who was a graduate engineer and couldn't find a job in engineering. So, I called some people up and they said that they would hire her, but she would have to go work [in another province] on a project there. The idea being you finish the project, you prove yourself, and you asked to be transferred back to Toronto [Ontario]. […] but, this person that I found the job for said, "No." […] She was not willing to go.

Did young men experience the same challenges? Many participants spoke about the challenges faced by young people entering the profession generally, and at least one felt that the push to hire more women was disadvantaging young men: "I think the young women maybe have it easier getting a job, but the young men are struggling." (Ruth, 51+) Few young men, however, reported struggling in interviews. Nevertheless, some did mention limited opportunities that led them to

work in another country, get more education before settling into a job, or accepting employment outside engineering firms. Several, however, reported finding work before or shortly after completing their degrees. Considering the survey and interview findings together, it appears that young people may struggle in the labour market generally, but on balance it appears that younger women may be particularly impacted.

In interviews, some older women suggested that those who "pay their dues" by taking on less appealing, inflexible jobs early in their careers, will reap rewards eventually. Do older women thrive in the profession? Tables 4 and 5 show that older women respondents are just as likely as older men to hold permanent jobs in engineering. Table 6 looks at participation in decision-making. Here we can see that older women are much less likely than men their age to participate in workplace decision-making. Indeed, the percentage of older women who say they have a role in decision-making (37%) is similar to the percentage of young men 35 and under who do so (36%). Women in other age categories are not quite so disadvantaged, compared to their male peers. It could be the case that older women's experiences with work–family conflict (and receiving less credit for work done), limited their ability to obtain positions of authority. Like Ruth, quoted above, some may have been placed on a 'mommy track', while others have sought out family-friendly workplaces, but at a cost. At least some older women, then, may experience cumulative disadvantage, limiting late career success.

Table 6: Do you participate in workplace decision-making? (% YES) by gender and age**.**

	Women	Men	Age Totals	Total N
35 and Under	23.3% (10)	**36.3% (45)**	32.9% (55)	167
36-50	50.0% (11)	51.5% (53)	51.2% (64)	125
51 and Over	**37.5%(6)**	**62.3% (127)**	**60.5% (133)***	220
All Ages (N's)	**33.3% (81)**	**52.2% (431)**	**49.2%****	512

***p<.05, **p<.01**

Age cohort differences among women

Thus far, interviews (and survey findings) have revealed perceptions of difference across an age cohort or generation among Canadian women engineers. Further analysis of the interview findings revealed additional areas of presumed advantage and disadvantage across a cohort, and some inter-generational tension.

On the one hand, younger women—at least those who successfully found permanent work were considered advantaged. For example, Ruth (51+) believed that younger women had more opportunities than her generation: "When the older cohort is retiring, they're getting a lot of opportunities. So it's changing, but it's

been 40 years." Shawna (51+) also argued that young engineers' prospects were good, but not in the engineering field:

> Well, I think the opportunities are good, if they don't do engineering. They use the engineering degree to do other things. And that's where I see the [young] people go up really, really fast.

On the other hand, some older workers questioned whether Millennial engineers were willing to 'pay their dues' to succeed in the profession, arguing that they were too eager to achieve immediate gains. Consider these comments from Zoe (36–50):

> I think the younger generation wants more. They want the work–life balance as soon as they start work. And, I think the older generation has an expectation that there will be the work–life imbalance that, you know, you devote yourself to work, work, work, work, work. Prove yourself for a couple of years, and then you've earned the right for the work–life balance. And, I'm not saying I think one is right and the other is wrong. But that's what I see.

Zoe's comments hint at a generational divide. Members of the older age cohorts had carefully navigated sexist environments, and eventually carved out fulfilling careers for themselves. Heather (51+) suggested that Millennials had a different approach:

> I know a lot of my colleagues, my peer group, you know, we see younger people, and they're going, 'that's not fair'. You know, it's like, is this a cross you want to bear? Are there different ways of doing it to get to the same result without doing what say you could do at a university, but in a workplace […] might not be the best strategy, right?

Heather suggested that women needed to pick and choose their battles to succeed. Members of the older generation experienced hardship but regarded their successful career as a reward for paying their dues. Delilah's (51+) comments are also revealing:

> It's so hard for me to talk about, and it might sound like I'm complaining, because I'm not. It's just, it has been very, very tough. And you start reminiscing and I realize, wow, you know, it was so tough, it was so hard. And if I had to do it all over again, I'm not sure I would have. I'm not sure I would have. But now, I mean, on the other hand I keep thinking, if you hadn't done that, you wouldn't be where you are now, you'd be working for the man, so to speak, you know? I don't think I would have had the guts to start my own company whereas, you know, doing everything I had done, I am in a very, very happy position right now. In a very good position, and it has to do with the 25 years of really hard work, and some pain and discomfort. So maybe it's all a good thing.

Older women in engineering carved out successful careers by paying their dues. Some questioned whether younger women were willing to do the same. Instead, it was claimed, young women wanted work–life balance, and a good job in a good

location, immediately. Older women were ambivalent about these attitudes. It was fine to fight for your rights, but privileges were to be earned, they believed. However, it must be noted that none of the younger women interviewed appeared reluctant to 'pay their dues'. All were willing to endure hardship for the sake of a rewarding and fulfilling career. In fact, in light of their early career labour market challenges, younger women may face more difficulties than some of their predecessors in terms of accessing jobs, even if they face fewer challenges with work–family conflict.

DISCUSSION AND CONCLUSION

Western research has long documented the challenges faced by women in male-dominated professions like engineering. Yet, women's experiences are by no means monolithic and unchanging (Tao and McNeely, 2019). Gendered practices and structures change over time. As a result, gender differences within professions like engineering persist, but in ways that can vary across age cohort. Research from Australia and the UK suggests that engineering may be more welcoming for women than in the past (Ayre et al., 2011; Houghton, 2019). On these grounds, hypothesis one predicted that younger women in Canadian engineering might have more positive experiences and fewer differences with their male counterparts than members of older generations. An alternative hypothesis was also proposed: older women as survivors in a profession known to be hostile to women may be similar to their male counterparts, while younger women experience challenges that could eventually drive some out of the profession. Guided by these two hypotheses, this study explored gender differences in promotion, pay, work–family conflict, employment and decision-making authority, across age cohorts.

The survey findings suggest that some gender differences persist across all age groups: especially with respect to perceptions of fairness in pay and credit for work completed. Some gender differences, however, are evident only for certain age groups. Younger women appear disadvantaged compared to their male counterparts (and others) in terms of finding permanent work that requires their training. Older women report more challenges with work–family conflict, compared to older men, and have fewer opportunities to participate in decision-making on the job. Thus, there is some support for both of the competing hypotheses. Although they are entering a more egalitarian profession than their predecessors, younger women in Canadian engineering still face challenges finding stable work. These latter findings are consistent with research on Canadian women in STEM fields generally (Frank, 2019). Once women do gain entry, they might have better opportunities for promotion and experience less work–family conflict than their older counterparts (see also Alegria, 2019; Ayre et al. 2011).

In addition to supporting the survey findings, interviews revealed some degree of intergenerational tension between older and younger women engineers. The older cohorts had a difficult time, but 'paid their dues', and many found success. Some worry that the younger engineers are demanding privileges (including work–life balance), without paying their dues. Both the survey data and interview data, however, suggest that young women continue to face challenges with respect to finding work, and getting credit for their work and skills. The former is a problem

that previous generations of women had to worry about less. Younger women's early career challenges could link to career trajectories that look quite different from those of their predecessors.

To conclude, this study suggests that in Western economies gender differences in the engineering working environment are cross cut by age. The experiences of people in one age cohort may overlap with, but nonetheless be distinct from, those in another.

The life-course perspective used in this work, and in work cited earlier, can clarify the changing nature of professional work and the gendering of professions. It can demonstrate that, while gender inequalities are entrenched in the workplace, they are also mutable in nature, impacting individuals differently. These inequalities have implications for career trajectories, including the potential for cumulative disadvantage only touched on here. Future research should continue to adopt an intersectional life-course lens and explore—across a variety of professions—how gender and age cohorts intersect with other dimensions of inequality that were difficult to study here due to low sample sizes. This includes race, ethnicity, gender identity/expression, and sexual orientation. The adoption of an intersectional life-course lens facilitates research into how inequalities intersect and shift over time, revealing opportunities for greater equality within professions in the future.

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