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How Does Industry Gender Ratio
Affect Workplace Sexual Assault against Women?
- A Panel Analysis in Canada

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ABSTRACT

Sexual assault against women has become a serious crime with a high incidence in Canada. As a form of sexual assault, workplace sexual assault not only does harm to women's physical and mental health, but also to their career development and financial situation. Thus, to reduce and eliminate workplace sexual assault against women is of great significance. According to the sex-role spillover model by Gutek and Morasch and the integrated model by Fitzgerald and colleagues, the industry gender ratio, i.e. the proportion of male to female in industries, is a potential determinant to the occurrence of workplace sexual assault against women. However, a gap in the current knowledge of workplace sexual assault against women was revealed that no research has addressed relationships between industry gender ratio and workplace sexual assault in a Canadian context. This study wishes to find if how industry gender ratio affects workplace sexual assault against women. After reviewing the previous studies in workplace sexual assault and Canada's policies against it, a panel data analysis using a Canadian nationwide survey dataset was conducted to explore the relationship between industry male share and female victim share of workplace sexual assault. The analysis found that on average a 100% increase in industry male share is significantly associated with a 4.8% decrease in female victim share of workplace sexual assault, holding age, province fixed effects, industry fixed effects and time fixed effects constant. This result suggests that industry gender ratio has a significant impact on workplace sexual assault against women in a Canadian context. With regard to the literature review and the empirical analysis, policies and strategies related to industry gender ratio are recommended to contribute to the reduction and elimination of workplace sexual assault in Canada.

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INTRODUCTION

Since the “#MeToo” campaign against sexual violence has gained momentum in social media and popular discussion in 2017, the dialogue and concern about sexual violence around the globe has reached a new height (Azzopardi and Smith 2019; Caputi, Nobles, and Ayers 2019; DePoint 2018; Gash and Harding 2018; Gronert 2019; Hegarty and Tarzia 2019; Rees et al. 2019; Rentschler 2018).

Sexual assault, as a form of sexual violence, refers to “sexual contact or behaviour that occurs without the explicit consent of the victim, including attempted rape, fondling or unwanted sexual touching, forcing a victim to perform sexual acts, etc.” (United Nations 1993). The definition of sexual assault differs in many areas. For instance, rape or sexual penetration is a form of sexual assault in some countries (e.g. Canada and the United Kingdom¹) whereas not in other countries (e.g. the United States²). Since it is based on the Canadian context, this research follows Canada’s legal definition of sexual assault which is introduced in Chapter 1. Sexual assault is a serious public health problem in Canada. For instance, 58 victims per 100,000 population reported sexual assault incidents to police in 2016. As #MeToo spread widely, the rate of reported sexual assault incidents increased by 13% and became 65.5 per 100,000 population during post-#MeToo time periods³ (Rotenberg and Cotter 2018).

¹The definition of sexual assault in the United Kingdom can be summarized as “a person intentionally physically offends another person in a sexual and/or aggravated way (such as abuse of position, use of drugs or other substances, use of violence or use of a weapon) without victim’s consent”. Long L, Butler B. Sexual assault. *The Obstetrician & Gynaecologist* 2018; DOI: 10.1111/tog.12474. <<http://onlinetog.org>>

²The definition of sexual assault in the United States: The U.S. Department of Justice, Office on Violence Against Women (OVW) defines sexual assault as “any nonconsensual sexual act proscribed by Federal, tribal, or State law, including when the victim lacks the capacity to consent”. See U.S. Department of Justice, Office on Violence Against Women. 2018. “Sexual Assault.” <<https://www.justice.gov/ovw/sexual-assault#sa>> (accessed December 20, 2019).

³According to Statistics Canada *Police-reported sexual assaults in Canada before and after #MeToo, 2016 and 2017*, the pre-#MeToo time periods refers to January 1st, 2016 to September 30, 2017, and the post-#MeToo period includes October 1st, 2017 to December 31, 2017. The study used average quarterly numbers for the pre-#MeToo period in this study to better compare with the three-month post-#MeToo period. See Statistics Canada, “Police-

Sexual assault brings serious harm to a female victim's physical and mental health. Due to the disparity on strength, the possibility of being physically injured makes women more vulnerable when facing sexual assault including sexual touching and sexual attacks. In Canada, sexual assault is a severe crime. Research indicates that there are 460,000 sexual assaults in Canada each year (Government of Ontario 2015). Sexual assault represents 10% of all victimization incidents as the fourth most frequently reported crime in Canada. Sexual assault is also a gendered issue currently in Canada. Almost 90% of victims of sexual assault are women while over 97% accused perpetrators are men (Cecilia et al. 2015; Prochuk 2018; Brennan et al. 2008; Rotenberg and Cotter 2018). An estimation suggests that 1 in 3 women in Canada would experience sexual assault at some point in their lives (Government of Ontario 2011). The perpetrator could be victim's intimate-partner, classmate, co-workers even family member.

Some topics about sexual assault incidents have been discussed by scholars in the world, such as sexual assault taking place on college and university campuses (Berzofsky et al. 2019; Neilson et al. 2018; O'Boyle and Li 2019; Halstead, Williams, and Gonzalez-Guarda 2017a; 2017b), in the military (Margret E. Bell et al. 2018; M. E. Bell, Turchik, and Karpenko 2014; M. Bell and Reardon 2011; Kang et al. 2005) or in the hospitals (AbuAlRub, Khalifa, and Habbib 2007; Hesketh et al. 2003; Shiao et al. 2010; Yassi 1994). These fields are deeply researched because many relevant survey results have shown that women are at great risk of experiencing sexual assault when on school or at work (Blayney and Read 2018; Workforce 2006). While compared to sexual assault on campus, workplace sexual assault has a severer result. It not only leads to negative outcomes on victim's physical health and mental health, but is associated with negative effects on victim's job outcomes and finances as an external barrier in both short-term

reported sexual assaults in Canada before and after #MeToo, 2016 and 2017". November 8, 2018. <
<https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54979-eg.htm>> (accessed February 9, 2020).

and long-term considerations (Campbell 2018; Fitzgerald et al. 1988; Halstead, Williams, and Gonzalez-Guarda 2017a; Neilson et al. 2018; Neville et al. 2014; Coulter et al. 2017; Berzofsky et al. 2019; O'Boyle and Li 2019).

In Canada, workplace sexual assault represents about 6% of all kinds of police-reported sexual assaults, but the number of reported sexual assaults at work increased by 65% after #MeToo (Rotenberg and Cotter 2018). The great increase in reported workplace sexual assault suggests that many female victims of workplace sexual assault were silent about reporting workplace sexual assault to police before encouraged by #MeToo and may have been silent of all time. Research in the hospitals in British Columbia and Alberta suggest that healthcare industry exists a high incidence of sexual assault against nurses in emergency and psychiatry department by patients (50%) and hospital co-workers (50%), but only 27.9% of sexual assaults by patients are reported and only 4.5% of sexual assaults by co-workers are reported (Hesketh et al. 2003). The example in healthcare industry reflects a high incidence and a low report rate of workplace sexual assault against women workers in Canada. This phenomenon leads to the questions (1) Does industry gender ratio affect incidents of workplace sexual assault against women? In other words, is industry gender ratio a risk factor of workplace sexual assault against women? If does, how does it affect? and (2) Is the under-reported victimization of workplace sexual assault related to the industry gender ratio?

Two theories related to industry gender ratio and workplace sexual harassment are reviewed to bring up explanations of the above questions since workplace sexual assault and workplace sexual harassment have many similar characteristics and consequences and sometimes are examined together in research (J. B. Pryor, LaVite, and Stoller 1993; Buchanan et al. 2014; Fitzgerald et al. 1997). The first question can be explained by Gutek and Morasch's sex spillover

theory and Fitzgerald and colleagues' job gender context variable in the integrated model. They suggest that women experience more workplace sexual harassment than men either in male-dominated industries or female-dominated industries. In male-dominated industries, as the number of men workers significantly outnumbers the number of women, women are treated differently from men workers in the same jobs and are associated with a higher possibility of workplace sexual harassment (Fitzgerald et al. 1997; Fitzgerald, Drasgow, and Magley 1999; Gutek and Morasch 1982; Willness, Steel, and Lee 2007). In female-dominated industries, however, the working environment endows women with more competitive advantage than men but also increases the possibility of experiencing workplace sexual harassment (Gutek and Morasch 1982). As to the second question, Gutek and Morasch (1982) think that sexual harassment could be under-reported when (1) all the women workers are treated with the same sexual harassment behaviours and/or do not label them as sexual harassment and/or (2) the perpetrators are in greater power than victims (e.g. when the perpetrator is victim's supervisor) and impose their will on women. This circumstance may happen in traditionally "masculine" occupations (Stockdale and Hope 1997). Given the similar characteristics of workplace sexual harassment and workplace sexual assault, it is suggested that (1) women working in male-dominated industries are more likely to experience workplace sexual assault and (2) women working in male-dominated industries are more likely not to report their experience of workplace sexual assault.

This research reviews the theories above and conducts a quantitative analysis to explore how industry gender ratio affects workplace sexual assault against women in a Canadian context. The first chapter brings an overview of workplace sexual assault and industry gender ratio in Canada, including their definitions, prevalence, consequences and relevant policies. The overall introduction in Chapter 1 indicates that industry gender ratio is a risk factor to workplace sexual

assault against women, that the change in industry gender ratio is associated with changes in incidents of workplace sexual assault against women. To know how industry gender ratio affects workplace sexual assault against women, a panel analysis using the Canadian national survey datasets is conducted in the second chapter. The independent variable – industry male share and the dependent variable – female victim share of workplace sexual assault are used to represent industry gender ratio and workplace sexual assault against women respectively. The result of the analysis shows that (1) the negative correlation between industry male share and female victim share of workplace sexual assault is statistically significant. With a 100% increase of industry male share, the female victim share of workplace sexual assault decreases by 4.8% when controlling for age, province fixed effects, industry fixed effects and time fixed effects; and (2) the industry male share does not have a statistically significant correlation with the number of reports on workplace sexual assault to the police. The empirical result indicates that industry gender ratio has a significant impact on workplace sexual assault against women. With regard to this relationship, several policy options such as mitigating gendered treatment and improving victimization transparency are raised to contribute to reducing and eliminating workplace sexual assault against women in Canada.

CHAPTER ONE: WORKPLACE SEXUAL ASSAULT & INDUSTRY GENDER RATIO

1.1 Definitions of Workplace Sexual Assault in Canada

Workplace sexual assault can be defined as a sexual assault occurring at the workplace or work-related places. The legal definition of sexual assault in Canada can be summarized into three levels (Brennan et al. 2008):

“Sexual Assault (Level 1): An assault committed in circumstances of a sexual nature such that the sexual integrity of the victim is violated, involving minor physical injuries or no injuries to the victim; Sexual Assault (Level 2): Sexual assault with a weapon, threats, or causing bodily harm; Aggravated Sexual Assault (Level 3): Sexual assault that results in wounding, maiming, disfiguring or endangering the life of the victim.”

Similarly, Statistics Canada summarized sexual assault as “forced sexual activity, attempted forced sexual activity, unwanted sexual touching, grabbing, kissing or fondling, or sexual relations without being able to give consent” (Perreault 2014). In Canada, the legal age of consent to sexual activity is 16 (with an exception where young people are close in age) (Perreault 2014). The range of “workplace” is not limited to traditional workplaces, but also off-site work-related events such as business conferences and trade shows, or a visit to clients' homes resulting from a work-related purpose (C. C. for O. H. and S. Government of Canada 2020).

1.2 Industry Gender ratio in Canada

The gender ratio means the proportion of male and female workers in the industry/organization. The industry gender ratio is a reflection of the gendered nature of the job. Some industries have traditionally male characteristics where the majority of workgroup, supervisors, co-workers are men; some industries are the traditional female-dominated industries

where female becomes the numerical majority gender of the overall occupations in the industry (Willness, Steel, and Lee 2007). In Canada, the proportion of men and women is significantly imbalanced in some industries. For instance, manufacture, agriculture and transportation industries are male-dominated industries, where men are the majority, while healthcare, service and education are female-dominated industries, where most occupations are taken by women (Brennan et al. 2008).

1.3 Prevalence of Workplace Sexual Assault against Women in Canada

While sexual violence such as sexual harassment and sexual assault has been much discussed and studied in Canada (Government of Ontario 2015; Cecilia et al. 2015; McInturff 2013; Prochuk 2018), workplace sexual assault, as a small proportion of all kind of sexual violence, receives less study on limited types of industries and occupations such as in the military and in the hospital (Watkins et al. 2017; Brennan et al. 2008; Rotenberg and Cotter 2018; Hesketh et al. 2003; Fitzgerald, Drasgow, and Magley 1999; Margret E. Bell et al. 2018).

Military as a traditional male-dominated place (men significantly outnumber women) has been a major area of workplace sexual assault research (Buchanan et al. 2014; Fitzgerald, Drasgow, and Magley 1999; Margret E. Bell et al. 2018; Watkins et al. 2017; Barth et al. 2016; M. E. Bell, Turchik, and Karpenko 2014). With the contribution of emphasis on hypermasculinity and violence (Castro et al. 2015; Turchik and Wilson 2010), scholars found that the most strongly associated risk factor is being female in the military (Institute et al. 2014; Street et al. 2007; Morral, Gore, and Schell 2015; M. E. Bell, Turchik, and Karpenko 2014). Consistent with this finding, a recent study in Canadian military indicates that Canadian military women are at greater risk for military-related sexual assault than male counterparts. The result of the Canadian Forces Mental Health Survey in 2013 shows that 15.5% of women have self-reported military-related sexual

assault (men 0.8%), a quarter of whom have at least once sexual assault victimization on deployment (Watkins et al. 2017).

Apart from the military, another research on the healthcare industry in Canada also exists a high incidence of workplace sexual assault. In a study on workplace violence in Alberta and British Columbia hospitals, half of the nurses working at the department of emergency and psychiatry experience sexual assault in their last five shifts (Hesketh et al. 2003). The study in the Canadian military and healthcare industry are examples indicating that workplace sexual assault has been seriously affecting women both in the male-dominated industry and female-dominated industry in Canada. Nonetheless, the problem of workplace sexual assault in Canada is not only the great number of female victims but also the great number of under-reported victimization.

In research on police-reported sexual assaults in Canada before and after #MeToo periods in 2016 and 2017⁴, the female is still the vast majority of victims of police-reported sexual assault (89%). Though workplace sexual assault only represents 6% of all kinds of police-reported sexual assault, the number of reported workplace sexual assaults increased by 65% after #MeToo (Rotenberg and Cotter 2018). The great increase in reported workplace sexual assault suggests that many female victims of workplace sexual assault were silent about reporting workplace sexual assault to police before and may be silent of all time if not encouraged by #MeToo.

The examples in military, healthcare industry suggest that (1) Canadian women workers are at great risk of experiencing workplace sexual assault no matter working in male-dominated industries or female-dominated industries and (2) the victims may choose not to report their

⁴ According to Statistics Canada *Police-reported sexual assaults in Canada before and after #MeToo, 2016 and 2017*, the pre-#MeToo time periods refers to January 1st, 2016 to September 30, 2017, and the post-#MeToo period includes October 1st, 2017 to December 31, 2017. The study used average quarterly numbers for the pre-#MeToo period in this study to better compare with the three-month post-#MeToo period. See Statistics Canada, “Police-reported sexual assaults in Canada before and after #MeToo, 2016 and 2017”. November 8, 2018.
< <https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54979-eg.htm> > (accessed February 9, 2020).

victimization. These two phenomena lead to the questions (1) Does industry gender ratio affect incident of workplace sexual assault against women? In other words, is industry gender ratio a risk factor of workplace sexual assault against women? If does, how does it affect? and (2) Is the under-reported victimization of workplace sexual assault related with industry gender ratio? These questions in the Canadian context are to be explained with the help of the review of relevant literature and the quantitative analysis conducted in this research.

1.4 Previous research on Workplace Sexual Assault and Industry Gender Ratio

The research on the relationship between industry gender ratio and workplace sexual assault against women is in a minority compared to the research on the relationship between industry gender ratio and general workplace sexual violence or workplace sexual harassment. To proceed with the review of previous literature and explain the relationship between industry gender ratio and workplace sexual assault, this research also reviews theories about the relationship between industry gender ratio and workplace sexual harassment. The reasons of including workplace sexual harassment theories are (1) workplace sexual assault and workplace sexual harassment have many characteristics in common, for instance, female victims outnumber male victims significantly (Harned et al. 2002; LeardMann et al. 2013; M. E. Bell, Turchik, and Karpenko 2014; Sadler et al. 2018; Margret E. Bell et al. 2018; Blayney and Read 2018) (2) workplace sexual assault and workplace sexual harassment have many consequences and influence on victims in common, such as post-traumatic stress disorder (PTSD) and lower job satisfaction (Aquino and Thau 2008; Laschinger and Grau 2012; Morrow, McElroy, and Phillips 1994; Schat and Frone 2011; Harned et al. 2002) (3) workplace sexual assault and workplace sexual harassment have risk factors in common, such as perpetrator's characteristics (e.g. power and occupation disparity) (J. B. Pryor, LaVite, and Stoller 1993; R. G. L. Pryor 1987), victim's characteristics (e.g.

socioeconomic status and power, such as age, education level, marriage status, payment grade) (Harned et al. 2002; Sadler et al. 2003; 2018; LeardMann et al. 2013) and organizational climate (Fitzgerald et al. 1997; Blayney and Read 2018; Moylan and Wood 2016; Ingemann-Hansen et al. 2009; Willness, Steel, and Lee 2007).

Most of the research on the relationship between industry gender ratio and workplace sexual assault (harassment) indicates that industry gender ratio, as a variable of the organizational factor job gender context, is a risk factor of workplace sexual assault (harassment) (Fitzgerald et al. 1997; Schneider, Swan, and Fitzgerald 1997; Hulin, Fitzgerald, and Drasgow 1996; Willness, Steel, and Lee 2007; Fitzgerald, Drasgow, and Magley 1999). The main theories are Gutek and colleague's sex-role spillover model and Fitzgerald and colleagues' integrated model of sexual harassment in organizations.

Sex-role Spillover model

Gutek and Morasch's sex-role spillover model (1982) explained workplace sexual harassment against women as a result of the imbalanced organizational gender ratio. In this model, people have two identities, *work-role* and *sex-role*. In the *work-role*, both women and men are expected to behave as a worker. They are expected to accomplish the tasks assigned in the job but not make sexual comments or behaviours. In the *sex-role*, people are expected to behave as men and women. Women in sex-role are expected to become a dating object or a mother. In the working environment, women in sex-role are more expected to be the former – an object with sexual attractiveness. Sex-role spillover is “a carryover into the workplace of gender-based expectations for behaviour” (Gutek and Morasch 1982). Sex-role spillover occurs when the number of men and women workers is imbalanced. The workplace gender ratio decides the kind of sex-role spillover,

thus the male-dominated workplace and female-dominated workplace have different kinds of sex-role spillover.

In a male-dominated workplace (men are numerically dominant in the organization), the expectation of women changes from work-role to sex-role. Here sex-role spillover happens to the women at work, which shows up that (1) women are treated differently from men with behaviours that are inappropriate for work (e.g. sexual touch and comments) (2) women are regarded more in a way of sex-role (i.e. as women at work) rather than work-role (i.e. as workers) and (3) women are aware of the differential treatment since the expectation could be changed by both genders, that men may take a woman worker as a sex object and the woman worker may also expect men to regard her as a sex object.

In a female-dominated workplace (women are numerically dominant in the organization), women experience a different kind of sex-role spillover when the job itself is sexualized. Women may still work with men such as supervisors, colleagues, subordinates or customers. The sex-role spillover occurs in the job itself, which means (1) women's work-role is practically the same as sex-role when they are treated as women rather than workers (2) women are unaware of the treatment based on sex-role if all the women workers are treated the same and (3) women may think the received sex-role-based treatment is a function of their job.

[Integrated Model of Sexual Harassment in Organizations](#)

The sex-role spillover model was widely acknowledged. The construct that gender ratio affects workplace sexual harassment was taken into Fitzgerald and colleagues' integrated model (1997). This integrated model suggests that *organizational climate* and *job gender context* are the risk factors leading to workplace sexual harassment. The model has a good fit with much general research on different kinds of sexual violence such as sexual harassment and sexual assault (Ali

and Kramar 2015; Antecol and Cobb-Clark 2004; Berdahl 2007; Laschinger and Grau 2012; Menendez et al. 2012; Morgan, Kaleka, and Katsikeas 2004; Raver and Gelfand 2005; Stockdale and Hope 1997). The integrated model became one of the predominant theories of sexual violence and organizational conditions.

Organizational climate refers to organizational characteristics such as companies' tolerance of sexual harassment and employees' perception about company policies related to sexual harassment (Fitzgerald et al. 1997; Naylor, Pritchard, and Ilgen 1980). Company tolerance refers to how companies value sexual harassment and deal with (Hulin, Fitzgerald, and Drasgow 1996; Fitzgerald et al. 1997). The organizational tolerance is high is companies do not take it seriously, the perpetrators are not punished appropriately while the victims are punished for reporting or complaining. Organizational tolerance is negatively related to incidents of workplace sexual harassment. Employees' perception is how employees feel about the implementation of organizational policies and procedures in the workplace, including the measures to prevent about sexual harassment and measures to protect the victims of it (Parker et al. 2003; Fitzgerald, Drasgow, and Magley 1999; Willness, Steel, and Lee 2007; Fitzgerald et al. 1997). If the company implement the relevant policies effectively, which means the organizational climate is positive, then the incidence of sexual harassment is lowered and employees' physical health, mental health and job satisfaction will be improved (Glomb et al. 1999; Bergman et al. 2002).

Job gender context is the proportion of men and women workers in the workplace. Workplace gender distribution is mostly decided by the nature of job duties and historical social institutions. For instance, there are more men in agriculture and manufacture industries because they usually have better physical strength than women; women work more in service industries which require less strength (Gutek, Cohen, and Konrad 1990). The result of Fitzgerald and

colleagues' research in 1993 suggests that only male-dominated workplace is significantly associated with an increase in workplace sexual harassment against women, which is not completely consistent with sex-role spillover model's conclusion that women in both male- and female- dominated workplace are at increased risk of sexual harassment (Fitzgerald, Drasgow, and Magley 1999). With regard to this difference, Fitzgerald and colleagues think that the increased risk in male-dominated is not due to a higher male share than female share in the workplace, but to a large number of men workers in a male-oriented industry. Different from their opinion, Buchanan and colleagues (2014) think the significantly increased risk in the male-dominated industry is because the numerical gender disparity contributes to the social bias which favours masculinity and encourages mistreatment of women. This explanation is consistent with the research on Canadian military in Section 1.3 that female victims are more than male victims because of the emphasis of hypermasculinity and violence in the military.

To conclude, the sex-role spillover model and the integrated model suggest that the change in workplace gender ratio is associated with changes of workplace sexual harassment, meaning gender ratio is a risk factor of workplace sexual harassment. As stated at the beginning of this section, due to the similarities of workplace sexual assault and workplace sexual harassment, industry gender ratio is a risk factor of workplace sexual assault. And the under-reported victimization can be explained by the unawareness of women when treated with the same sexual-related behaviours. However, the question of how gender ratio affects workplace sexual assault cannot be answered by the theories above because there are different opinions among the scholars. To explore the answer to this question in the Canadian context, an empirical analysis is conducted in the next chapter using the datasets of Canadian national surveys. Before Chapter 2, the following

two sections introduce the consequences of workplace sexual assault and the relevant policies in Canada.

1.5 Consequences of Workplace Sexual Assault

The experience of workplace sexual assault victimization against women is negatively associated with the victim's physical health, psychological health, career development and finances (World Health Organization 2020). The incidents of workplace sexual assault also result in the employer's loss, including legal costs, employee turnover and lower company internal working motivation.

Physical health

Women are at a disadvantage when facing sexual assault, particularly when violated by male perpetrators. The most direct result of sexual assault is overwhelming burden of injury and disease even if victims don't compromise since it is hard for women to fight against perpetration and protect themselves due to the disparity of strength between men and women. Most sexual assault victims are subjected to extended reactions after the victimization experience (Schneider, Swan, and Fitzgerald 1997). They may have headaches, sleep disturbance, suppressed immune function (Magley et al. 1999; Smith 2006; Wasti et al. 2000).

Females are also vulnerable to sexual and reproductive health consequences, and some of the diseases can be fatal for them (M. R. Decker et al. 2009; Michele R. Decker, Silverman, and Raj 2005; Hess et al. 2012). The common sexual disturbances of female victims are fear of sex, arousal dysfunction and desire dysfunction (Feinauer 1989; Mohammed and Hashish 2015). They may suffer from unexpected consequences such as unwanted pregnancy and a higher risk of sexually transmitted infections (STI) including human immunodeficiency virus (HIV) during

vaginal intercourse (M. R. Decker et al. 2009; Michele R. Decker, Silverman, and Raj 2005; Hess et al. 2012; Muldoon et al. 2017; Steiner et al. 2014; Teitelman et al. 2016).

Psychological health

Sexual assault victimization is followed by many psychological symptoms. Post-traumatic stress disorder (PTSD) is the most well-documented consequence of exposure to a traumatic incident such as sexual assault (Kessler et al. 1995; Kilpatrick et al. 1997; Nickerson et al. 2013; Rothbaum et al. 1992). And PTSD is generally followed by other kinds of comorbidities such as depression, anxiety, panic disorders, suicidal thoughts, hyperarousal and intrusion symptoms (McFarlane and Papay 1992; Mollica et al. 1999; Momartin et al. 2004; Nickerson et al. 2013; Ullman et al. 2006). The mental illness could result in a negative effect on physical health in return, for instance, anxiety and panic disorders contribute to insomnia and lack of sleep leads to poor physical health (Baglioni et al. 2010; 2011; Jansson-Fröjmark and Lindblom 2008; Mason and Harvey 2014; Ozdemir et al. 2015).

Career development

Workplace sexual assault causes increased job stress and decreased job satisfaction, organizational commitment and reduced quality of victim's life (Aquino and Thau 2008; Laschinger and Grau 2012; Morrow, McElroy, and Phillips 1994; Schat and Frone 2011; Schneider, Swan, and Fitzgerald 1997; Shiao et al. 2010). To avoid the perpetrators, victims may be forced to reduce or give up on-the-job learning or promotion opportunities, (MacIntosh et al. 2010; National Academies of Sciences 2018). The career disruption of workplace sexual assault could also lead to the absence, forced duty changes or leave from well-paying jobs and long-term influence on career attainment (Blackstone 2017; Garrett 2011; Gerberich 2004; Heponiemi et al. 2014).

Financial stress

Research shows that a great number of women enter the workplace due in part to their single-parent families and the depressed economy (Garrett 2011). Absence or resignation adds to the burden of victims who quit jobs to avoid workplace sexual assault (MacIntosh et al. 2010; Sullivan and Yuan 1995; Yassi 1994). The financial stress increases with medical treatment or legal assistance. According to a report by Canada's Department of Justice, the total victim costs of female sexual assault victims (including medical costs, lost productivity and intangible costs) in 2009 were more than \$3 million, triple amount of male victims' costs; the criminal justice system's costs on female victims of sexual assault were about \$1 million, ten times more than the justice system costs on male victims (Hoddenbagh et al. 2015).

Loss on employers

The incident of workplace sexual assault causes increased legal costs if the victim employee chooses to formally charge the perpetrator and/or the company. The estimation of employer's costs on female sexual assault victimization in 2009 in Canada were \$8,872,446 (Hoddenbagh et al. 2015). The absence or resignation of victims leads to employee turnover, reduced productivity of the company and heavier job stress on other employees (Blackstone 2017; Cheung 2008; Fitzgerald et al. 1997). The costs on employee turnover have been found to constitute the largest economic cost considerably higher than costs related to litigation (Merkin and Shah 2014).

The serious consequences of workplace sexual assault against victims especially female victims are of significance to the individual victim but also the company. To prevent and protect

people from workplace sexual assault, the Canadian federal government and provincial governments have released and implemented a series of relevant policies.

1.6 Policies on Workplace Sexual Assault in Canada

Currently, little Canadian policies are specifically made for workplace sexual assault. Since workplace sexual assault can be regarded as a form of sexual violence and also a form of workplace violence, the policies regarding sexual violence and workplace violence by the federal government and provinces (territory not included) are introduced below. Among all the listed policies below, measures that are frequently taken by the governments include: building and/or funding sexual assault centres (e.g. Ontario, New Brunswick, Nova Scotia, Prince Edward Island and Saskatchewan) , providing counselling service (e.g. Alberta, British Columbia, New Brunswick, Newfoundland and Labrador, Nova Scotia and Quebec), releasing action plans about sexual assault to raise public awareness and make further plans (e.g. Ontario, Alberta and Quebec) and requiring employers to improve workplace safety (e.g. Ontario and Alberta).

Federal government

Canada has been engaged in fighting against sexual violence and advancing gender equality and improving women and girls' quality of life at home and abroad. Currently, there's no national sexual violence policy, but Canada has been implementing the *2030 Agenda for Sustainable Development's Goal No.5*, which is to achieve gender equality and empower all women and girls since 2015. Policies supporting female victims will be made in many sectors such as health care, justice and policing, education, social protection, and economic development (Government of Canada 2017).

The federal government also has made policies regarding workplace violence. *Part XX of the Canada Occupational Health and Safety Regulations dealing with Violence Prevention in the Work Place* - was introduced by the Government of Canada and came into effect on May 28, 2008⁵. Part XX prescribes steps that federally-regulated employers must implement in their workplace to protect employees against violence (E. and S. D. Government of Canada 2015). Workplace violence hereby has a broader range including physical actions (conducting threat or gesture) and psychological violence (such as bullying, teasing and other aggressive behaviours), so that the employees can obtain full protection from this policy regarding their injuries or harm from workplace violence.

Ontario

The Government of Ontario launched the *Changing attitudes, changing lives - Ontario's Sexual Violence Action Plan* in 2011 (Government of Ontario 2011). It is indicated in the Action Plan that there are 41 government-funded sexual assault centres across Ontario, including 11 French-language centres, that offer free and confidential specialized support services to survivors of sexual violence. The sexual assault centres provide individual and group counselling, hospital, court and police accompaniment, and access to 24-hour crisis and support lines. The Action Plan made a significant contribution in enhancing prevention and support for female victims of sexual violence including sexual assault in Ontario (Cecilia et al. 2015).

In 2015, Ontario released *It's Never Okay: An Action Plan to Stop Sexual Violence and Harassment* (Government of Ontario 2015). It is reported that 28% of Canadians reported receiving unwelcome sexual advances, requests for sexual favours or sexually-charged talk while

⁵ Part XX of the *Canada Occupational Health and Safety Regulations* dealing with Violence Prevention in the Work Place <https://www.canada.ca/en/employment-social-development/services/health-safety/reports/violence-prevention.html>

on the job. The Action Plan made commitments to improve workplace safety, in which sexual harassment will be (1) introduced into the Occupational Health and Safety Act, under which the employers are required to investigate and address workplace sexual harassment complaints, and protect workers from workplace sexual harassment; (2) addressed by a special enforcement team of trained inspectors across the province and (3) introduced in educational materials to help employers create a safer workplace. The Action Plan raised public awareness of sexual violence and made great efforts to fulfil the commitment (Government of Ontario 2015). In the Progress Report of the Action Plan, Ontario invested \$1.75 million for Ontario's 42 community-based sexual assault centres for services like crisis help-lines, counselling and referrals. The Sexual Violence and Harassment Action Plan Act, 2015 was introduced and came into force in 2016 (Government of Ontario 2016).

Regarding workplace violence, Ontario requires every employer to prepare and review policies on workplace violence at least annually. This policy is required regardless of the size of the workplace or the number of workers. If six or more workers are regularly employed at a workplace, this policy must be in writing and posted in a conspicuous place in the workplace⁶. Besides, a province-initiated program *Independent Legal Advice for Survivors of Sexual Assault Pilot Program* provides eligible survivors of sexual assault with up to four hours of free, legal advice from one or more lawyers on the referral list by phone, or in person⁷.

⁶ Understand the law on workplace violence and harassment, Ontario <https://www.ontario.ca/page/understand-law-workplace-violence-and-harassment>

⁷ Independent Legal Advice for Survivors of Sexual Assault Pilot Program <https://www.attorneygeneral.jus.gov.on.ca/english/ovss/ila.php>

Alberta

An Alberta provincial support organization, the Association of Alberta Sexual Assault Services (AASAS), is making efforts in provincial coordination and collaboration of sexual assault services. The Association increases public and government awareness of sexual violence including sexual assault and provides access to healing and recovery services for victims of sexual assault through toll-free talk-text-and chat services, online counselling course, (AASAS 2020). In 2017, AASAS issues the first Action Plan and suggested in many sectors such as (1) sexual assault prevention education should be applied across all ages and in all communities; (2) specialized and effective services should be provided for sexual assault victims and (3) charges about sexual assault should be proceeded effectively and efficiently through the criminal justice process (AASAS 2017).

Policies about workplace violence are included in Alberta's *Occupational Health and Safety Act*, which requires employers to help prevent workplace harassment and violence including workplace sexual assault, and address incidents when they do occur in the (Government of Alberta 2012). Employers are required to (1) investigate incidents of workplace sexual assault and take corrective action; (2) develop workplace sexual assault prevention plans; (3) review prevention plans at least once every 3 years; (4) advise victimized employees of treatment options and (5) entitle their wages and benefits while attending treatment programs (Government of Alberta 2020).

British Columbia

British Columbia introduced sexual assault on its government website (M. of P. S. and S. Government of British Columbia). Victims services such as the *Crime Victim Assistance Program (CVAP)* and the *Ending Violence Program (EVA)* work to provide supportive counselling services,

financial help, information and referrals, accompaniment for victims of all crimes including sexual assault (M. of A. Government of British Columbia).

Manitoba

Manitoba passed legislation making April the Sexual Assault Awareness Month to share information about available resources of sexual assault, raise public awareness and foster a greater understanding of consent (Government of Manitoba 2018).

A government-issued brochure *You Have Options: Help After Sexual Assault* is intended to introduce sexual assault and provide suggestions for sexual assault victims in regard to proceeding through the criminal justice system, reporting to police, recovery from victimization and getting counselling and help (Government of Manitoba).

In 2013, Winnipeg City in Manitoba was selected as the first city in Canada to join the UN Global Safe Cities Initiative to reduce sexual violence against women and girls. The goal of the Safe Cities Initiative is to generate innovative approaches to preventing and reducing violence, particularly sexual violence against women and girls in urban public spaces, enabling women and girls to move more safely (Government of Manitoba 2013).

New Brunswick

A sexual assault centre in New Brunswick, Sexual Violence New Brunswick (SVNB), works provincially to help other New Brunswick communities to enhance and establish sexual assault services. In 2010, SVNB collaboratively created the Provincial Strategy on Sexual Assault Services to respond to and address the issue of sexual assault (2011). The Provincial Strategy using a community-based approach assists in (1) provincial sexual assault services such as provincial awareness activities; (2) establishing a comprehensive network of 24-hour community-based crisis

support and (3) training for crisis interveners and service providing organizations (Government of New Brunswick). The Provincial Strategy brings together service providers and stakeholders across the province and enhances community responses to sexual assault in New Brunswick (2011).

Newfoundland and Labrador

A provincially mandated and recognized non-profit organization NL Sexual Assault Crisis & Prevention Centre (NLSACPC) was established to support individuals of all genders who have been victimized and/or impacted by sexual violence including sexual assault through 24-hour support line, accompaniments and in-person support services (Newfoundland & Labrador Sexual Assault Crisis & Prevention Centre).

Nova Scotia

Currently, there are three sexual assault centres in Nova Scotia providing services such as recovery suggestions, problem-solving support, advocacy, accompaniment and referral (Government of Nova Scotia). The Government of Nova Scotia released *Breaking the Silence - A Coordinated Response to Sexual Violence in Nova Scotia* in 2013. It is indicated that the provincial rate of sexual assault in 2013 decreased by three per cent but was still above the national rate. The government policies in response to this fact include (1) improving services and supports through enhancing community-based response services and increasing funding for the current three Sexual Assault Centres; (2) improving public awareness through establishing provincial committees on public awareness and service providers training, and setting a fund for better use of technology and support of marginalized population including LGBTQ community; (3) producing annual reports on sexual assault and improving cooperation on sexual assault services through information sharing among different departments (Government of Nova Scotia 2015).

Prince Edward Island

The Government of Prince Edward Island established the non-profit Prince Edward Island Rape and Sexual Assault Centre to provide adult (women and men) and youth (over age 16) victims of sexual assault with services related to sexual abuse and recovery such as individual therapy, men matter, information support and partnership and consultation (Prince Edward Island Rape and Sexual Assault Centre 2019).

Quebec

In 2008, Quebec announced the *Action Plan on Sexual Assault 2008–2013* to prevent and intervene in sexual assault against women (UN Women 2008). In 2016, to curb sexual assault and sexual exploitation, *2016-2021 Government Strategy to Prevent and Counteract Sexual Violence* was issued and implemented by government departments and organizations (Gouvernement du Québec 2016). The Action Plan committed to improving sexual assault services through actions such as carrying out awareness campaigns, training service providers and promoting the accessibility of victim tele-testimony (Gouvernement du Québec 2016). The *Governmental Action Plan on Domestic Violence* also introduced sexual violence and raised public awareness (Gouvernement du Québec 2018).

Saskatchewan

The Government of Saskatchewan has been funding sexual assault services for many years. For instance, the provincial government funded the Saskatchewan Association of Sexual Assault Services \$70,000 in 2008 for its provincial office's operation (Government of Saskatchewan 2008), Saskatoon Sexual Assault & Information Centre Inc. \$254,770 in 2011 for the Adult Survivors of Childhood Sexual Abuse Program (Government of Saskatchewan 2011) and six provincial sexual

assault centres \$1.2 million in 2015 to support the 24-hour crisis line, crisis counselling, accompaniments and social services appointments (Government of Saskatchewan 2015), and \$109,750 in 2019 for the sexual assault support services delivery in Swift Current area (Government of Saskatchewan 2019a).

Apart from funding, Saskatchewan held a sexual violence education program for judges, lawyers and other justice system professionals in September 2019 with the goal of this program is to provide Saskatchewan legal community with knowledge and practices related to legal protections in criminal prosecution (Government of Saskatchewan 2019b).

The overview in Chapter 1 indicates that (1) workplace sexual assault in Canada is a serious issue and women are the majority of victims; (2) the gender ratio differs distinctly among industries in Canada; (3) the industry gender ratio is a risk factor to workplace sexual assault against women in Canada; (4) workplace sexual assault against women is destructive to victims' health and jobs, as well as employer's companies; and (5) many governmental policies have been implemented to prevent and eliminate sexual assault in Canada. To know how industry gender ratio affects workplace sexual assault against women, a panel analysis is conducted in the next chapter.

CHAPTER TWO: A PANEL DATA ANALYSIS IN CANADA

As stated in Chapter 1, scholars think that industry gender ratio is a risk factor to sexual violence such as sexual harassment and sexual assault (Fitzgerald et al. 1997; Gutek and Morasch 1982). With the support of the theoretical framework, a panel analysis is conducted to find out how industry gender ratio affects workplace sexual assault against women using a Canadian dataset.

3.1 Proposed Model

The purpose of this research is to find out how industry gender ratio affects workplace sexual assault against women. As reviewed in Section 1.4, the gender ratio in the workplace is a risk factor of workplace sexual harassment. In this empirical analysis, the industry gender ratio is the independent variable and workplace sexual assault against women is the dependent variable. This analysis chooses to use the industry male share as the independent variable to represent the industry gender ratio. The industry male share is the total number of workers of both genders divided by the total number of men workers, grouped by year, province and industry. The industry is male-dominated if the male share is higher than 50%, and the industry is female-dominated if male share is lower than 50%. The workplace sexual assault against women is represented by the share of the female victim of workplace sexual assault. The female victim share is the total number of women workers divided by the number of women who experienced workplace sexual assault, grouped by year, province and industry. The dataset used in this analysis is individual dataset. Each woman keeps all the individual data she has and is assigned with the data of industry male share and female victim share of workplace sexual assault based on the year she responds, the province she lives and the industry she works in. The proposed model is:

$$\begin{aligned}
\text{Female victim share of workplace sexual assault}_{pti} = & \beta_0 + \beta_1 \text{Industry male share}_{pti} \\
& + \beta_2 \text{Age}_{pti} + \alpha_p + \partial_i + \lambda_t + u_{pti}
\end{aligned}$$

The independent variable (x) in this model, *industry male share*_{pti}, is the proportion of men workers in each industry (i.e. the total number of workers divided by the total number of men, ranging from 0% to 100%). The industry male share varies across provinces, industries and over time. The dependent variable (y), *female victim share of workplace sexual assault*_{pti}, is the share of female experiencing workplace sexual assault in the past twelve months (ranging from 0% to 100%). It also changes across provinces and industries and varies over time. The controlled variables in the multiple regression include: (1) a confounding variable – age of women (*age*_{pti}) and (2) three fixed effects – province fixed effects (α_p), industry fixed effects (∂_i) and time fixed effects (λ_t). The explanation of the confounding variable and fixed effects are as follows.

The age of women (*age*_{pti}) is considered as a variable influencing both the industry gender ratio and workplace sexual assault against women. It varies across provinces, industries and over time. Studies have proved that age is a risk factor for sexual assault. People of a young age are the majority victims (Ingemann-Hansen et al. 2009; Acierno et al. 1999; Larsen, Hilden, and Lidegaard 2015; Government of Ontario 2015). Age also affects people’s choice of profession. For instance, people in their thirties are experiencing a dynamic professionalization and their priorities of the profession are more changeable than people in fifties (Hildebrandt and Eom 2011).

The province fixed effects (α_p) refer to the individual-specific variables which affect every individual in the sample in a similar way, varying across provinces (p) but do not change across industries (i) nor over time (t). The province fixed effects include factors that are not easy to be observed, such as the natural resources needed by the industry (e.g. iron ores, natural gas and oil)

and the governmental supportive policies on specific industries (e.g. tax reduction and exemption). The industry fixed effects (∂_i) are another kind of individual-specific variables that vary among industries (i) but do not vary across provinces (p) nor over time (t). The factors affecting every individual could be working environment (e.g. indoors or outdoors) and the shift time (e.g. day-time shift or night-time shift). The time fixed effects (λ_t) refer to the time-specific variables that influence all the individuals in the sample, change over time (t) but do not vary across provinces (p) nor industries (i). Similar to province fixed effects and industry fixed effects, time fixed effects are unobservable factors, for instance, national political changes or economic shocks.

These confounding variable and fixed effects are controlled to reduce the unobservable influence on the individuals in the sample and to obtain an analysis result with higher accuracy and to reflect the real relationship between x and y in the proposed model.

3.2 Research Question

In Section 1.3, two questions about industry gender ratio and workplace sexual assault against women were raised: (1) is industry gender ratio a risk factor of workplace sexual assault against women? If does, how does it affect? and (2) Is the under-reported victimization of workplace sexual assault related with industry gender ratio? The literature review in Section 1.4 answered the questions with theoretical explanation, that (1) industry gender ratio is a risk factor to workplace sexual assault against women and (2) the under-reported victimization of workplace sexual assault is related to and industry gender ratio since female victims working in female-dominated industries may be unaware of the sexual-related behaviours. However, the theories cannot explain more details about the questions. Thus, through the following empirical analysis, this research wishes to obtain a clearer explanation about (1) how industry gender ratio affects workplace sexual assault against women and (2) how the under-reported victimization of

workplace sexual assault is related to and industry gender ratio in a Canadian context. With the setting of the model and variables in the previous section, the hypotheses of the analysis are:

Hypothesis 1: Higher industry male ratio is associated with higher female victim share of workplace sexual assault.

Hypothesis 2: Higher industry male share is associated with a higher report rate of female victimization of workplace sexual assault.

3.3 Method

To answer the research question, several regressions are conducted using individual data. The first part is a simple regression. The female victim share of workplace sexual assault (y) is simply regressed on the industry male share (x) to show the associated between them. Then the regression is conducted again to compare the influence of x on y among different industries, and the third regression is to compare the influence of x on y among different provinces, so that policy suggestions can be raised for each industry and province in particular. Secondly, multiple regressions are conducted to reduce the influence of unobservable factors. The y is regressed on x holding age (age_{pti}) constant to eliminate the influence of women's age on the relationship between industry male share and female victim share of workplace sexual assault. Then y is regressed on x again holding age and all the fixed effects (α_p , θ_i and λ_t) constant to eliminate the influence of unobservable factors on the regression result. Lastly, a dummy variable of report victimization to the police is regressed on industry male share holding age and all the fixed effects constant to see how under-reported victimization is associated with industry gender ratio.

3.4 Data and Measures

Data source

The data used in this research is taken from the *General Social Survey (Victimization) Public Use Microdata File (PUMF)* published in 2004, 2009 and 2014. The General Social Survey (GSS) is a nationwide annual survey conducted by Statistics Canada. The data files and documentation are downloaded at ODESI⁸.

Measures

The demographic variables selected in this research include (1) province of residence (ten categories: Ontario, Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan); (2) working industry (ten categories: Management, Business and finance, Natural and applied science, Health, Education and law, Art and sport, Sales and service, Transport and equipment operator, Agriculture and natural resources, Manufacturing and utilities); (3) age at the time of survey (seven ordinal categories: 15 to 24 years old, 25 to 34 years old, 35 to 44 years old, 45 to 54 years old, 55 to 64 years old, 65 to 74 years old, and 75 years and older); and (4) marital status (six categories: Single and never married, Married, Living common-law, Widowed, Separated and Divorced).

The victimization variables are (5) experienced one or more sexual assault in the past 12 months (Yes or No); (6) incident happened at workplace (Yes or No); and (7) report victimization experience to the police (Yes or No).

The population of this analysis are the 41,815 women respondents of the GSS in 2004, 2009 and 2014. The sample of the analysis is the 9,932 women respondents from each year's GSS who have valid answers for the survey questions about their gender, age, province of residence, working industry, sexual assault experience, incidents occurred at workplace and report to the police. The male individuals who are used to calculate the industry male share are filtered out with

⁸ ODESI <https://search1.odesi.ca/#/>

the same condition on the female sample, that all the answers for the demographic questions are valid. The number of population and sample in each year are in Table 1.

Table 1: Population and Sample

	2004	2009	2014
Population	13166	10694	17955
Sample	4024	2907	3001

Data source: Statistics Canada

3.5 Results

Descriptive information

The sample characteristics including demographic information and victimization information are described in Table 2 below. The demographic characteristics didn't change much over 10 years. On average, women living in New Brunswick take up more than one-fourth of the sample. About 20% of the sample work in the business industry and 30% in the service industry. Most of the women are at working age, only around 10% of the sample are at retiring age which is older than 55. Nearly one-third of women in the sample are married and another one-third women are single. As to the sample's characteristics of victimization, compared to 2004, more women who experienced workplace sexual assault, while less of them chose to report to the police.

Table 2: Demographic Information of Research Sample

	2004		2009		2014	
	n = 4024	%	n = 2907	%	n = 3001	%
Province						
ON	126	3.13	117	4.02	115	3.83
AB	78	1.94	51	1.75	69	2.30
BC	230	5.72	141	4.85	303	10.10
MB	215	5.34	107	3.68	120	4.00
NB	422	10.49	554	19.06	449	14.96
NL	1253	31.14	714	24.56	816	27.19
NS	454	11.28	218	7.50	285	9.50
PE	256	6.36	204	7.02	198	6.60
QC	468	11.63	476	16.37	330	11.00
SK	522	12.97	325	11.18	316	10.53
Industry						
Management	226	5.62	182	6.26	213	7.10
Business	950	23.61	666	22.91	576	19.19
Science	114	2.83	82	2.82	100	3.33
Health	412	10.24	355	12.21	380	12.66
Education	500	12.43	469	16.13	606	20.19
Artistic	174	4.32	123	4.23	141	4.70
Service	1402	34.84	888	30.55	870	28.99
Transport	78	1.94	54	1.86	51	1.70
Agriculture	51	1.27	27	0.93	21	0.70
Manufacture	117	2.91	61	2.10	43	1.43
Age						
15 – 24	911	22.64	574	19.75	653	21.76
25 – 34	1030	25.60	589	20.26	597	19.89
35 – 44	998	24.80	700	24.08	650	21.66
45 – 54	754	18.74	663	22.81	609	20.29
55 – 64	296	7.36	323	11.11	419	13.96
65 – 74	34	0.84	54	1.86	69	2.30
> 75	1	0.02	4	0.14	4	0.13
Marital Status						
Married	1361	33.82	1060	36.46	1073	35.75
Living common-law	468	11.63	367	12.62	326	10.86
Widowed	76	1.89	60	2.06	87	2.90
Separated	247	6.14	155	5.33	117	3.90
Divorced	355	8.82	260	8.94	237	7.90
Single, never married	1517	37.70	1005	34.57	1161	38.69
Sexual assault						
Yes	257	6.39	169	5.81	252	8.40
No	3767	93.61	2738	94.19	2749	91.60
At workplace						
Yes	484	12.03	533	18.34	585	19.49
No	3540	87.97	2374	81.66	2416	80.51
Report to police						
Yes	968	24.06	677	23.29	660	21.99
No	3056	75.94	2230	76.71	2341	78.01

Data source: Statistics Canada

Table 3 below shows the male share in each industry in each year. Based on the percentage of men workers, the industries could be divided into two groups. The male-dominated industries where men workers are more than 50% include Management, Science, Transport, Agriculture and Manufacture. Men have absolute advantages in some of these industries, for instance, they take up more than 90% of workers in the transport industry, more than 80% in the agriculture industry and more than 70% in the science industry. The industries such as Business, Health, Education, Art and Service are female-dominated industries where men workers are less than 50%. More than 80% of the employees in the health industry are female, as well as about 60% in business and education industry. Management, Service and Art have less obvious gendered characteristics, whereas the first two industries have shown a stable status in gender ratio over the past fifteen years, the gender distribution in art industry has been more dynamic.

Table 3: Industry Male Share

	2004	2009	2014
Industry	%	%	%
Management	59.43	59.56	61.69
Business	26.53	27.69	31.75
Science	75.11	77.41	76.19
Health	17.60	18.01	19.15
Education	32.16	29.15	35.60
Art	44.23	50.20	39.48
Service	40.67	40.48	42.08
Transport	91.80	92.87	93.34
Agriculture	82.71	86.22	84.78
Manufacture	69.05	72.27	78.71

Data source: Statistics Canada

The female victim share of workplace sexual assault in the sample is shown in Table 4 below. The female victim shares in Alberta, British Columbia, New Brunswick and Newfoundland and Labrador have increased from 2004 to 2014. And the highest female victim share appears in

Table 4: Female Victim Share

	2004	2009	2014
	%	%	%
Province			
ON	0.79	2.56	0.87
AB	0.00	1.96	2.90
BC	1.30	2.13	2.97
MB	2.79	0.00	0.83
NB	0.24	1.44	2.00
NL	1.76	1.54	1.72
NS	0.88	2.29	1.75
PE	1.17	1.47	0.51
QC	1.28	2.10	1.21
SK	1.15	1.23	0.95
Industry			
Management	1.33	1.65	0.94
Business	1.26	0.90	1.39
Science	0.00	1.22	4.00
Health	1.46	3.66	1.58
Education	1.20	0.64	2.14
Art	0.00	0.00	1.42
Service	1.64	2.25	1.49
Transport	0.00	0.00	1.96
Agriculture	1.96	0.00	0.00
Manufacture	0.85	3.28	0.00
Age			
15 – 24	1.76	2.09	1.84
25 – 34	1.26	0.68	1.84
35 – 44	1.20	2.57	2.00
45 – 54	0.80	1.81	1.64
55 – 64	1.69	0.62	0.72
65 – 74	0.00	0.00	0.00
> 75	0.00	0.00	0.00
Marital Status			
Married	0.88	1.51	1.21
Living common-law	1.07	2.45	0.92
Widowed	0.00	0.00	1.15
Separated	2.83	3.23	2.56
Divorced	1.41	1.15	1.69
Single, never married	1.52	1.49	2.15

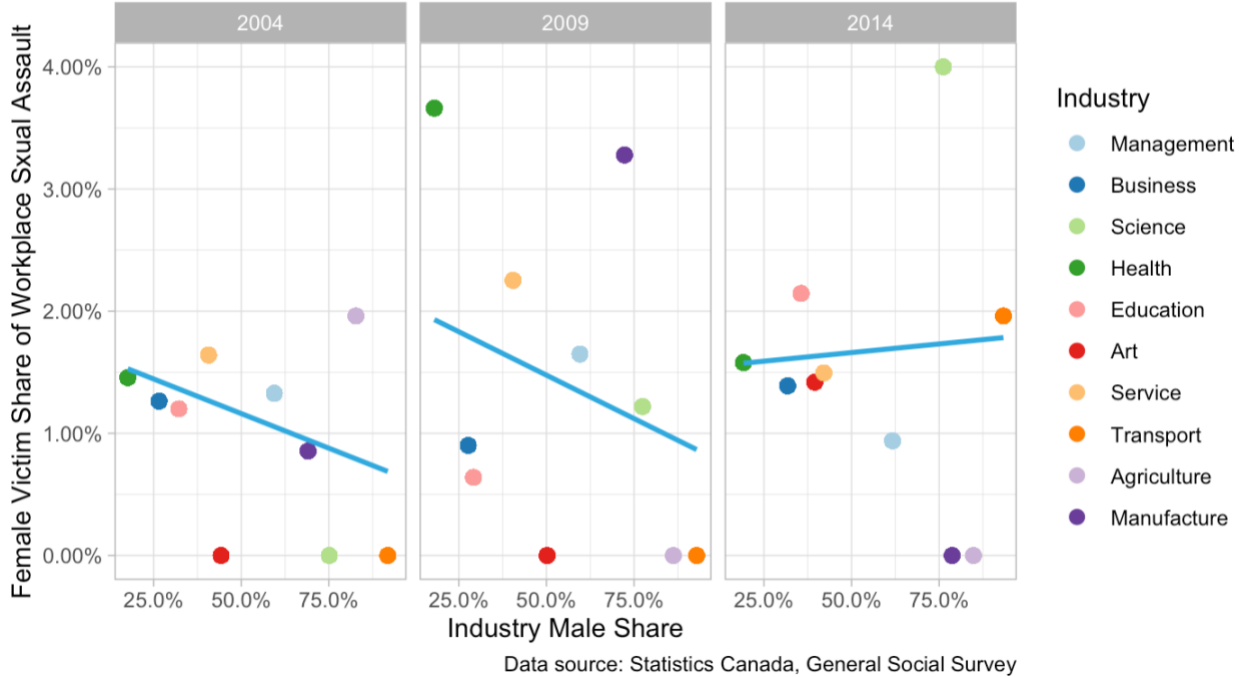
Data source: Statistics Canada

Manitoba in 2004, Ontario in 2009 and British Columbia in 2014. Most of the female victim share in each industry in each year is less than 3%, except for the highest rate of 4% in Science in 2014 followed by 3.66% in Health in 2009. The victim shares in Science, Art and Transport in 2004 are zeros but increase in 2009 and 2014. Agriculture only has victimized sample in 2004, whereas victim share in Manufacture increases about 4 times from 2004 to 2009 and then drops to zero in 2014. Young women aged 15 to 24 years old have a quite high share of workplace sexual assault victimization in each year. Women separated from intimate-partners have a higher victimization share than women of other marital status in the sample.

Regression analysis

Figure 1 illustrates the relationship between industry male share (*x axis*) and female victim share of workplace sexual assault (*y axis*) in every industry in 2004, 2009 and 2014.

Figure 1: Industry Male Share and Female Victim Share
In Canada, 2004, 2009 and 2014



The blue lines are the results of simple regression between x and y in each year. In 2004 and 2009, a higher industry male share is associated with a lower female victim share of workplace sexual assault with statistical significance. Nonetheless, the direction of the regression line of 2014 is inconsistent with the previous regression lines, that a higher industry male share is associated with a slightly higher female victim share, indicating that the positive relationship between x and y is not statistically significant.

According to Figure 1, the result of simple regression in 2019 does not support *Hypothesis 1* that higher industry male ratio is associated with higher female victim share of workplace sexual assault. To know how industry male share is associated with female victim share of workplace sexual assault, a simple regression is conducted using all the sample data of this analysis. As stated in Section 3.1, each woman in the sample is assigned with the data of industry male share and female victim share based on the year she responds, the province she lives and the industry she works in, and still keeps the all the individual data she has.

Table 5: Simple Regression

	Dependent variable:
	Female Victim Share
Industry Male Share	-0.015*** (0.001)
Constant	0.021*** (0.001)
Observations	9,932
R ²	0.015
Residual Std. Error	0.020 (df = 9930)
F Statistic	151.079 *** (df = 1; 9930)

Note: *p<0.1; **p<0.05; ***p<0.01

Data source: Statistics Canada, General Social Survey

Table 5 includes 9,932 samples in 2004, 2009 and 2014. It is suggested that the negative relationship between industry male share and female victim share of workplace sexual assault is statistically significant ($p < 0.01$). The coefficient -0.015 means that when the share of men workers is doubled (increases by 100%), the female victim share decreases by 1.5% on average, indicating that the relationship of x and y in this regression is opposite to *Hypothesis 1*. The standard error on industry male share is 0.001, meaning it is 95% sure that the real relationship between working males and the share of workplace sexually assaulted women falls between -0.017 and -0.013 , that the share of workplace sexually assaulted women will increase by 1.3% to 1.7%. The intercept is 0.021, which means 2.1% of sample face the possibility of being sexually assaulted at workplace when working in an industry with no men at all. The R-squared is 0.015, which means this regression model explains 1.5% of the variability of female victim share of workplace sexual assault.

Table 6 shows a comparison of the regression result among industries. Among all the industries, only the share of men workers in Education industry is positively associated with the female victim share in Education, that holding all the other factors constant, the number of women experiencing workplace sexual assault increases by 1.3% on average when the male share increases by 100%, while individuals the other nine industries face a lower possibility of experiencing workplace sexual assault. The negative relationship between industry male share and female victim share in Science is not statistically significant, while the negative relationship is statistically significant in all the other male-dominated industries (Management, Agriculture, Transport and Manufacture). The highest coefficient is in Transport, that the number of women experiencing workplace sexual assault decreases by 16.2% on average when the male share increases by 100% holding other factors constant. The regression results in each industry except

Education is still opposite to *Hypothesis 1*. Most of the results indicate that the industry male share is negatively associated with female victim share of workplace sexual assault.

Table 6: Simple Regression Comparing among Industry

Dependent variable:										
Female Victim Share										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Management	Business	Science	Health	Education	Art	Service	Transport	Agriculture	Manufacture
Industry Male Share	-0.013*** (0.007)	-0.084*** (0.003)	-0.010 (0.048)	-0.063*** (0.014)	0.013*** (0.005)	-0.045*** (0.006)	-0.065*** (0.005)	-0.162*** (0.044)	-0.084*** (0.017)	-0.020*** (0.012)
Constant	0.021*** (0.004)	0.035*** (0.001)	0.025 (0.036)	0.033*** (0.003)	0.010*** (0.002)	0.023*** (0.002)	0.044*** (0.002)	0.152*** (0.040)	0.074*** (0.013)	0.027*** (0.008)
Observations	621	2,192	296	1,147	1,575	438	3,160	183	99	221
R2	0.007	0.231	0.0002	0.018	0.004	0.131	0.061	0.070	0.209	0.013
Residual Std. Error	0.018 (df = 619)	0.011 (df = 2190)	0.062 (df = 294)	0.031 (df = 1145)	0.016 (df = 1573)	0.016 (df = 436)	0.013 (df = 3158)	0.018 (df = 181)	0.021 (df = 97)	0.021 (df = 219)

Notes:

*p<0.1; **p<0.05; ***p<0.01

Data source: Statistics Canada, General Social Survey

Table 7 below is the simple regression results compared across provinces. Overall, the influence of industry male share is little in each province, and the relationship between industry male share and female victim share is not consistent across provinces. For the samples in British Columbia, Manitoba and Saskatchewan, the share of men workers is positively associated with the female victim share. The regression result of samples from British Columbia indicates that a 100% increase in industry male share is on average statistically associated with an increase of 3.7% of female victim holding other factors constant. The positive relationship between x and y of samples from Manitoba and Saskatchewan are not statistically significant. In all the other seven provinces, the industry share is negatively associated with the female victim share. The industry male share in the samples of Quebec shows that a very weak negative relationship with female victim share, that the number of female victims increases by 0.01% when there is a 100% increase in the share of men workers controlling for other factors. The negative relationship between x and y is statistically significant in the samples from Ontario, Alberta, New Brunswick, Newfoundland and Labrador, Nova Scotia and Prince Edward Island, that an increase in working male share is associated with a decrease in female victim share of workplace sexual assault.

The result of simple regression may be biased if some factors affecting both x and y are not controlled for, for instance, age is a confounding variable in this analysis. Controlling for age when conduct regression is helpful to obtain a more accurate relationship between x and y . Table 8 shows the regression result when holding age constant.

Table 7: Simple Regression Comparing across Province

Dependent variable:										
Female Victim Share										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ON	AB	BC	MB	NB	NL	NS	PEI	QC	SK
Industry Male Share	-0.080*** (0.011)	-0.065*** (0.013)	0.037*** (0.011)	0.001 (0.008)	-0.038*** (0.003)	-0.016*** (0.001)	-0.044*** (0.004)	-0.006* (0.003)	-0.0001 (0.002)	0.004 (0.003)
Constant	0.041*** (0.004)	0.034*** (0.004)	0.007 (0.005)	0.015*** (0.003)	0.028*** (0.001)	0.023*** (0.001)	0.030*** (0.001)	0.013*** (0.001)	0.016*** (0.001)	0.010*** (0.001)
Observations	358	198	674	442	1,425	2,783	957	658	1,274	1,263
R2	0.122	0.107	0.017	0.0001	0.098	0.056	0.131	0.05	0.0000	0.002
Residual Std. Error	0.036 (df = 356)	0.033 (df = 196)	0.040 (df = 294)	0.026 (df = 440)	0.020 (df = 1423)	0.010 (df = 2781)	0.019 (df = 955)	0.015 (df = 656)	0.021 (df = 1272)	0.016 (df = 1161)

Notes:

*p<0.1; **p<0.05; ***p<0.01

Data source: Statistics Canada, General Social Survey

For women aged 15-24, 25-34 and 45-54 years old, the negative relationship between industry male share and female victim share is statistically significant holding age constant. For young women aged 15-24 years old, the share of workplace sexual assault victim decreases by 1.5% on average when the ratio of men workers increases by 100% when controlling for other factors. The intercept 0.022 suggests that theoretically when there is no men worker, the proportion of experiencing workplace sexual assault is 2.2% on average holding age constant. Compared to the simple regression result in Table 5, the coefficient on female victim share does not change.

Table 8: Multiple Regression Holding Age Constant

	Dependent variable: Female Victim Share
Industry Male Share	-0.015*** (0.001)
25 – 34	-0.003*** (0.001)
35 – 44	-0.001 (0.001)
45 – 54	-0.002*** (0.001)
55 – 64	-0.002* (0.001)
65 – 74	-0.005*** (0.002)
> 75	-0.010 (0.007)
Constant	0.022*** (0.001)
Observations	9,932
R2	0.018
Residual Std. Error	0.020 (df = 9924)
Note:	*p<0.1; **p<0.05; ***p<0.01
Data source:	Statistics Canada, General Social Survey

Apart from age, there could be some other factors affecting industry male share and female victim share among industries, across provinces or over time. The province fixed effects include natural resources endorsement, tax reduction policies and talent program which are different across each province. The industry fixed effects such as indoor/outdoor working environment and daytime/nighttime shift affect the proportion of male and female workers as well as the possibility of experiencing workplace sexual assault. In addition, time fixed effects include factors such as changes in national political and global economic shocks which occur sometimes but do not vary

Table 9: Multiple Regression Holding Age and Fixed Effects Constant

	Dependent variable:			
	Workplace sexually assaulted women			
	Age + Province (1)	Age + Time (2)	Age + Industry (3)	Age + Province + Time + Industry (4)
Industry Male Share	-0.016*** (0.001)	-0.015*** (0.001)	-0.041*** (0.003)	-0.048*** (0.003)
25 – 34	-0.002*** (0.001)	-0.003*** (0.001)	-0.002*** (0.001)	-0.001* (0.001)
35 – 44	-0.0005 (0.001)	-0.001 (0.001)	0.0002 (0.001)	0.001 (0.001)
45 – 54	-0.001* (0.001)	-0.002*** (0.001)	-0.0004 (0.001)	0.0002 (0.001)
55 – 64	-0.001 (0.001)	-0.002*** (0.001)	-0.0002 (0.001)	-0.0001 (0.001)
65 – 74	-0.005*** (0.002)	-0.006*** (0.002)	-0.002 (0.002)	-0.003* (0.002)
> 75	-0.009 (0.007)	-0.011 (0.007)	-0.008 (0.007)	-0.009 (0.007)
Observations	9,932	9,932	9,932	9,932
R2	0.039	0.025	0.064	0.098
Residual Std. Error	0.020 (df = 9915)	0.020 (df = 9922)	0.020 (df = 9915)	0.020 (df = 9915)

Notes:

*p<0.1; **p<0.05; ***p<0.01

Data source: Statistics Canada, General Social Survey

across provinces or industries. The relationship between industry male share and female victim share could have less omitted variable bias when controlling for the fixed effects. Table 9 illustrates the regression result when holding age and fixed effects constant.

The negative relationship between x and y is statistically significant when controlling for age and all the fixed effects. A 100% increase of working male is associated with a decrease of 4.8% female victim share of workplace sexual assault when controlling for age, province fixed effects, industry fixed effects and time fixed effects. The estimated error for Column (4) is 0.003, indicating that it is 95% sure that the real relationship between working male share and female victim share of workplace sexual assault falls between -0.054 and -0.042, meaning that the female victim share decreases by 4.2% to 5.4%. Comparing Column (1), (2) and (3), it is indicated that controlling for industry fixed effects helps to avoid more omitted variable bias since the coefficient decreases from -0.016 to -0.041, meaning the statistical significance of the negative relationship between x and y is improved.

Compared to the simple regression result in Table 5, the female victim share decreases more when male share increases holding age and all the fixed effects constant. Though not all the results are statistically significant, the current result does suggest that industry male share (x) is negatively correlated with female victim share of workplace sexual assault (y) when holding age constant and controlling for province fixed effects, industry fixed effects and time fixed effects. This result is opposite to *Hypothesis 1*.

The second hypothesis is about the under-reported incidents and industry male share. *Hypothesis 2* suggests that a higher industry male share is associated with a higher report rate of workplace sexual assault victimization. Regarding this hypothesis, a dummy variable of reporting to the police is regressed on industry male share controlling for province fixed effects, industry

fixed effects and time fixed effects. The dummy variable of report equals 1 if the female victim of workplace sexual assault reported the incident to the police and 2 if she did not. The samples in the male-dominated industries are people who work in an industry where men workers are more than women, and the samples in female-dominated industries are individuals working in industries where women are more than men.

Table 10: Report Individuals Holding Fixed Effects Constant

	Dependent variable:		
	Report dummy variable		
	All Industries (1)	Male-dominated (2)	Female-dominated (3)
Industry	-0.002	0.001	-0.004
Male Share	(0.005)	(0.014)	(0.006)
Observations	9,932	1,461	8,521
R2	0.002	0.010	0.001
Residual Std. Error	0.033 (df = 9910)	0.037 (df = 1441)	0.032 (df = 8500)

Notes:

*p<0.1; **p<0.05; ***p<0.01

Data source: Statistics Canada, General Social Survey

The result in Table 10 indicates that the relationship between industry male share and the dummy variable of reporting to the police is not statistically significant. The relationship between industry male share and report dummy variable is positive for the samples in male-dominated industries, which means holding all the fixed effects constant, a higher industry male share is associated with a higher report rate in the male-dominated industries. The relationship in female-dominated industries is negative, suggesting a higher male share is associated with a lower report rate holding all the fixed effects constant.

3.6 Discussion

With a total research sample of 9,932 women from the year of 2004, 2009 and 2014, the regression analysis is conducted regarding the question of how industry male share affects female victim share of workplace sexual assault. The analysis leads to the following findings: (1) the negative correlation between industry male share and female victim share of workplace sexual assault is statistically significant. With a 100% increase of industry male share, the female victim share of workplace sexual assault decreases by 4.8% when controlling for age, province fixed effects, industry fixed effects and time fixed effects. And it is 95% sure that the real negative relationship between industry male share and female victim share of workplace sexual assault is between 4.2% and 5.4%; (2) the relationship between industry male share and female victim share of workplace sexual assault in the male-dominated industries (i.e. Management, Science, Transport, Agriculture and Manufacture in this analysis) is negative, that a higher male share is associated with a lower female victim share. The same as in female-dominated industries such as Business, Health, Art and Service, except Education. The industry male share of the samples from Education industry is positively associated with the female victim share of workplace sexual assault in Education; (3) The industry male share of the samples from British Columbia, Manitoba and Saskatchewan is positively associated with the female victim share of workplace sexual assault; (4) when holding age constant, the negative relationship between industry male share and female victim share of workplace sexual assault is statistically significant; (5) when the industry male share increases, controlled for age, province fixed effects, industry fixed effects and time fixed effects, the female victim share of workplace sexual assault decreases more than the result only controlling for age; and (6) the industry male share does not have statistically significant correlation with the number of report on workplace sexual assault to the police. In the male-

dominated industries, a higher industry male share is associated with a higher report rate when holding all the fixed effects constant, while in female-dominated industries, a higher industry male share is associated with a lower report rate of workplace sexual assault victimization.

The analysis results using Canadian dataset is not consistent with *Hypothesis 1*, indicating that the relationship between industry male share and female victim share of workplace sexual assault in the Canadian context is different from Gutek and Morasch's sex-role spillover model (Gutek and Morasch 1982) and Fitzgerald and colleagues' integrated model (Fitzgerald et al. 1997). The analysis result suggests that industry male share does not affect report on female victim's report on workplace sexual assault to the police, which is also inconsistent with *Hypothesis 2*.

The analysis on the relationship between industry male share and female victim share of workplace sexual assault is of great significance for this research since it is the way to know the effect of industry gender ratio on workplace sexual assault against women, which is closely related with Canada's industrial development and employment situation. Knowing the relationship between industry gender ratio and workplace sexually assaulted women not only contributes to enhancing Canadian people especially women's well-being of work and living, but also contributes to promoting gender equality in Canadian national economic development and keeping social stability. There is no reverse causality between industry male share and female victim share of workplace sexual assault since people are less likely to choose occupations based on whether there's workplace sexual assault or not, but based on their expertise, interest and/or the nature and requirements of occupations. Thus, female victim share of workplace sexual assault can neither cause people to avoid working in some specific industries nor influence the gender ratio in the industry. The regression analysis suggests a statistically significant negative relationship between industry male share and female victim share of workplace sexual assault. Though a confounding

variable – age and three fixed effects – province fixed effects, industry fixed effects and time fixed effects are controlled for in the analysis, other confounding variables are not controlled for in the model. For instance, the idea of gender equality affects the male/female share in industries, and also affects the incidents of workplace sexual assault against women. The analysis result does not go through all the four hurdles, thus there is no causality between industry male share and female victim share of workplace sexual assault.

There are several limitations to the research. Firstly, using the proportion of male/female instead of the number of individuals in the regression brings a more direct result of the relationship between the independent variable and the dependent variable, but also makes the coefficient very small and not easy to interpret into the reality. Secondly, some potentially relevant factors are not controlled for since they are unobservable and not easy to measure. Further research about female victim share of workplace sexual assault could consider the following factors: employment type (permanent contract, casual contract, etc.), daily working time (daytime or night shift) and working environment (indoor or outdoor). Further research could consider the influence of other confounding variables and conduct analysis using datasets from other countries or any specific industries.

CHAPTER THREE: POLICY SUGGESTION

With regard to the background research of workplace sexual assault in Canada and the quantitative analysis in the previous chapters, the significant impact of industry gender ratio on workplace sexual assault against women indicates that policymaking on industry gender ratio is contributing to the reduction and elimination of workplace sexual assault in Canada, especially those against women. Based on the outcomes of this research, the following policies and strategies are raised to prevent and to eliminate workplace sexual assault against women in Canada.

Mitigate gendered treatment

The first policy option is to reduce the unfair treatment in the industries and organizations dominated by one sex. For companies with imbalanced gender ratio, they are suggested to decrease the different number of male workers and female workers through ensuring equal job opportunities and equal promotion opportunities, as well as maintaining the similar number of managers and directors in each gender. When assigning jobs or evaluating performance, the management layer with power should treat every employee in the same way – as an employee, rather than in a gendered way – as a man or a woman.

The company should also invest more time and finances to conduct risk management for workplace sexual assault prevention. Ontario and Alberta (2020) released the policies requiring companies to protect employees' safety. Policies such as training programs for employees and supervisors also enhance their awareness and increase the efficiency of solving incidents of workplace sexual assault. Apart from these, setting a direct reporting system towards the company leader also makes it easy for employees to report experienced or observed workplace sexual assault secretly and directly if they are free from unfair threats and punishment by powerful perpetrators.

Another necessary measure to reduce the harm on victims is to offer counselling service and psychological treatment for victims of workplace sexual assault. The company should be responsible to pay for the treatment expense of employees who experienced workplace sexual assault. Employers should also allow employees' temporary leave for recovering from physical injury and/or mental health problems such as post-traumatic stress disorder (PTSD) caused by workplace sexual assault. To enlarge the access to psychological treatment, it is necessary to have governments and non-governmental organizations help with funding and establishing the psychological counselling centres for sexual assault victims. Ontario (2016), New Brunswick (2011), Nova Scotia (2019), Prince Edward Island (2019) and Saskatchewan (2015) have built and/or funded the sexual assault centres for years. The assistance from professional counselling centres helps to relieve the victim's mental status. For the provinces without sexual assault centres, promoting community counselling service regarding sexual assault can also help victims recover from the hurt by workplace sexual assault through talking to the people they know.

[Improve victimization transparency](#)

Another policy option is to improve the transparency of workplace sexual assault in Canada, including access to the data of workplace sexual assault in each industry and each province. The transparency of the information brings direct knowledge of workplace sexual assault to Canadian society and addresses people's awareness of protecting themselves from victimization. It also allows for more accessible data for scholars and thinktanks to use when conducting relevant academic research. In order to obtain accurate statistics about workplace sexual assault, more relevant nation- /province- wide surveys are needed on the basis of protecting the privacy of respondents. The regression results of the samples suggest that the industry male shares in British Columbia, Manitoba and Saskatchewan are positively associated with female victim share of

workplace sexual assault. Measures such as offering counselling service, setting sexual assault centres and setting awareness month are unable to provide official overviews of workplace sexual assault. Regarding this problem, issuing reports and action plans about sexual violence is an effective option. Implemented by Ontario (2011; 2016), Alberta (2020) and Quebec (2008), the frequent and efficient introduction of workplace sexual assault through television, paper publication, social media or podcast could increase people's knowledge and raise their awareness of what sexual assault is, what they should do when experience sexual assault and who they can turn to for help after victimization. The government should also announce the policies and measures to deal with workplace sexual assault. The government can also make a month to be the Sexual Assault Awareness Month and holding relevant events to let more people know about sexual assault.

Not only policymakers, but employers should also be obliged to reveal incidents of workplace sexual assault in the company. The full transparency in the company contributes to enhancing workplace safety and prompting internal solutions to the incidents since it is closely related to the company's reputation and employees' trust. If reporting the company data to the government, the coordination between the government and the company would shorten the time of statistics and fasten the industrial analysis of workplace sexual assault.

CONCLUSION

This research looks into the relationship between industry gender ratio and workplace sexual assault in the Canadian context. The scholars have paid much attention to the relationship between industry gender ratio and workplace sexual harassment, but less attention to the relationship between industry gender ratio and workplace sexual assault. This research uses the theories between gender ratio and workplace sexual harassment to build a model between industry gender ratio and workplace sexual assault and conduct regression analyses using a Canadian panel dataset. Different from the positive relationship between industry male share and workplace sexual harassment against women in the previous research, the empirical analysis here suggests that industry male share has a statistically significant negative relationship with the female victim share of workplace sexual assault. Still, the regression result indicates that with a sample of 9,932 women in Canada in 2004, 2009 and 2014, industry gender ratio is significantly related to workplace sexual assault against women. Then based on the existing governmental policies, several policy options concerning industry gender ratio are raised to reduce and eliminate workplace sexual assault in Canada.

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APPENDIX

Analysis Process in R:

```
# Load the Libraries
library(tidyverse)
library(tibble)
library(stargazer)
library(RColorBrewer)
library(lfe)
library(ggpubr)

# Load the data
# Data Source: Statistics Canada, General Social Survey: Victimization in 2004, 2009 and 2014
# "_m" means "main file", "_i" means "incidence file"
dat_04_m <- read_csv("2004_main.csv")
dat_04_i <- read_csv("2004_incidence.csv")
dat_09_m <- read_csv("2009_main.csv")
dat_09_i <- read_csv("2009_incidence.csv")
dat_14_m <- read_csv("2014_main.csv")
dat_14_i <- read_csv("2014_incidence.csv")

# Select the variables for the following analysis

# SOC91C10 (2004)/ NOCS2006_C10 (2009)/ NOC1110Y (2014): Type of work or occupation (10 categories).
# SEXASSLT (2004&2014) / OCE_Q120_C01 (2009): Sexual assault in the past 12 months, including forced sexual activity, an attempt at forced sexual activity, or unwanted sexual touching, grabbing, kissing or fondling. Since the data is derived from SEXATTK and SEXTOUCH, only data of sexual assault is used in this research to avoid repetition.
# CIR_Q024 (2004)/ WHR_Q150 (2009)/ WHR_150 (2014): The incidence happens at respondent's place of work.
# SEX: Sex of respondent.
# PRV: Province of residence.
# AGEGR10: Age group of respondent (groups of 10).
# CIR_Q530 (2004) / CWP_Q130 (2009) / PFO_105 (2014): Report victimization experience to the police.
dat_04 <- inner_join(dat_04_m, dat_04_i) %>%
  select(industry = SOC91C10,
         sexual_assault = SEXASSLT,
         at_workplace = CIR_Q024,
         gender = SEX,
         province = PRV,
         age = AGEGR10,
         marstat = MARSTAT,
         report = CIR_Q530)
```

```

dat_09 <- inner_join(dat_09_m, dat_09_i) %>%
  select(industry = NOCS2006_C10,
         sexual_assault = SEXASSLT,
         at_workplace = WHR_Q150,
         gender = SEX,
         province = PRV,
         age = AGEGR10,
         marstat = MARSTAT,
         report = CWP_Q130)

dat_14 <- inner_join(dat_14_m, dat_14_i) %>%
  select(industry = NOC1110Y,
         sexual_assault = SEXASSLT,
         at_workplace = WHR_150,
         gender = SEX,
         province = PRV,
         age = AGEGR10,
         marstat = MARSTAT,
         report = PFO_105)

# Create a variable "Year" in both datasets
dat_04$year <- 2004
dat_09$year <- 2009
dat_14$year <- 2014

# Combine the datasets of 2009 and 2014
dat1 <- bind_rows(dat_04, dat_09, dat_14)

# Filter the dataset of the population including men and women
dat2 <- dat1 %>%
  filter(year %in% c(2004, 2009, 2014), gender %in% c(1,2), age %in% c(1,2,3,
4,5,6,7), province < 60, industry < 95, marstat <7,sexual_assault < 10, at_w
rkplace < 10, report < 10) %>%
  mutate(Industry = factor(industry, levels = c(1,2,3,4,5,6,7,8,9,10), labels
= c("Management","Business","Science","Health","Education","Art","Service","
Transport","Agriculture","Manufacture"))) %>%
  select(year, gender, age, province, Industry, marstat, sexual_assault, at_w
orkplace, report) %>%
  mutate(male = as.numeric(gender == 1)) %>%
  mutate(female = as.numeric(gender == 2))

# Table 1: Research Sample
sample <- dat2 %>%
  group_by(year) %>%
  summarise(female_sample = sum(female))

# Table 2: Descriptive variables
sample_province <- dat2 %>%
  group_by(year, province) %>%
  summarise(female_sum1 = sum(female))

```

```

sample_industry <- dat2 %>%
  group_by(year, Industry) %>%
  summarise(female_sum2 = sum(female))

sample_age <- dat2 %>%
  group_by(year, age) %>%
  summarise(female_sum3 = sum(female))

sample_marstat <- dat2 %>%
  group_by(year, marstat) %>%
  summarise(female_sum4 = sum(female))

sample_sexualassault <- dat2 %>%
  group_by(year, sexual_assault) %>%
  summarise(female_sum5 = sum(female))

sample_workplace <- dat2 %>%
  group_by(year, at_workplace) %>%
  summarise(female_sum6 = sum(female))

sample_report <- dat2 %>%
  group_by(year, report) %>%
  summarise(female_sum7 = sum(female))

# Create X variable: Industry male share
# Since the male share is different when group_by(year, Industry) and group_b
y(year, Industry, province),
# there are two datasets for X variable (with and without "province" variabl
e)
dat_x <- dat2 %>%
  group_by(year, Industry) %>%
  summarise(male_share = sum(male) / n())

dat_x_p <- dat2 %>%
  group_by(year, Industry, province) %>%
  summarise(male_share_p = sum(male) / n())

# Combine dat2, dat_x and dat_x_p
dat3 <- dat2 %>%
  inner_join(dat_x, by = NULL) %>%
  inner_join(dat_x_p, by = NULL) %>%
  select(year, Industry, province, male_share, male_share_p, female, male, se
xual_assault, at_workplace, age, marstat, report)

# Table 3: Industry Male Share
table_x <- dat3%>%
  group_by(year, Industry) %>%
  summarise(male_sum_x = sum(male),
            male_share_x = male_sum_x / n())

```

```

# Create Y variable: workplace sexual assaulted women
# Create a dummy variable which equals 1 if the female has been sexually assaulted at workplace and 0 otherwise
# Create another dummy variable which equals 1 if the victims report to police and 0 otherwise
dat4 <- dat3 %>%
  mutate(workassault_female = as.numeric(female == 1 & sexual_assault == 1 &
at_workplace == 1)) %>%
  mutate(reported = as.numeric(female == 1 & sexual_assault == 1 & at_workplace == 1 & report == 1))

# Filter the data and leave women only
dat5 <- dat4 %>%
  filter(female == 1) %>%
  select(year, Industry, province, male_share, male_share_p, workassault_female, age, marstat, reported, female)

# Create a dataset to include sum of assaulted women in every industry every year
# Same as male_share, the workassault_sum was grouped by twice, with and without province variable
dat_plot <- dat5 %>%
  group_by(year, Industry) %>%
  summarise(workassault_sum = sum(workassault_female),
            workassault_share = workassault_sum / sum(female))

dat_plot_p <- dat5 %>%
  group_by(year, Industry, province) %>%
  summarise(workassault_sum_p = sum(workassault_female),
            workassault_share_p = workassault_sum_p / sum(female))

dat6 <- dat5 %>%
  inner_join(dat_plot, by = NULL) %>%
  inner_join(dat_plot_p, by = NULL)

# Table 4: Female Victims Share
table_y1 <- dat5 %>%
  group_by(year, province) %>%
  summarise(workassault_share1 = sum(workassault_female) / sum(female))

table_y2 <- dat5 %>%
  group_by(year, Industry) %>%
  summarise(workassault_share2 = sum(workassault_female) / sum(female))

table_y3 <- dat5 %>%
  filter(Industry == c("Management", "Science", "Transport", "Agriculture", "Manufacture")) %>%
  group_by(year) %>%
  summarise(workassault_share3 = sum(workassault_female) / sum(female))

```

```

## Warning in `==.default`(Industry, c("Management", "Science", "Transport",
:
## longer object length is not a multiple of shorter object length
## Warning in is.na(e1) | is.na(e2): longer object length is not a multiple of
f
## shorter object length

table_y4 <- dat5 %>%
  filter(Industry == c("Business", "Health", "Education", "Art", "Service")) %>%
  group_by(year) %>%
  summarise(workassault_share4 = sum(workassault_female) / sum(female))

## Warning in `==.default`(Industry, c("Business", "Health", "Education",
## "Art", : longer object length is not a multiple of shorter object length

## Warning in `==.default`(Industry, c("Business", "Health", "Education",
## "Art", : longer object length is not a multiple of shorter object length

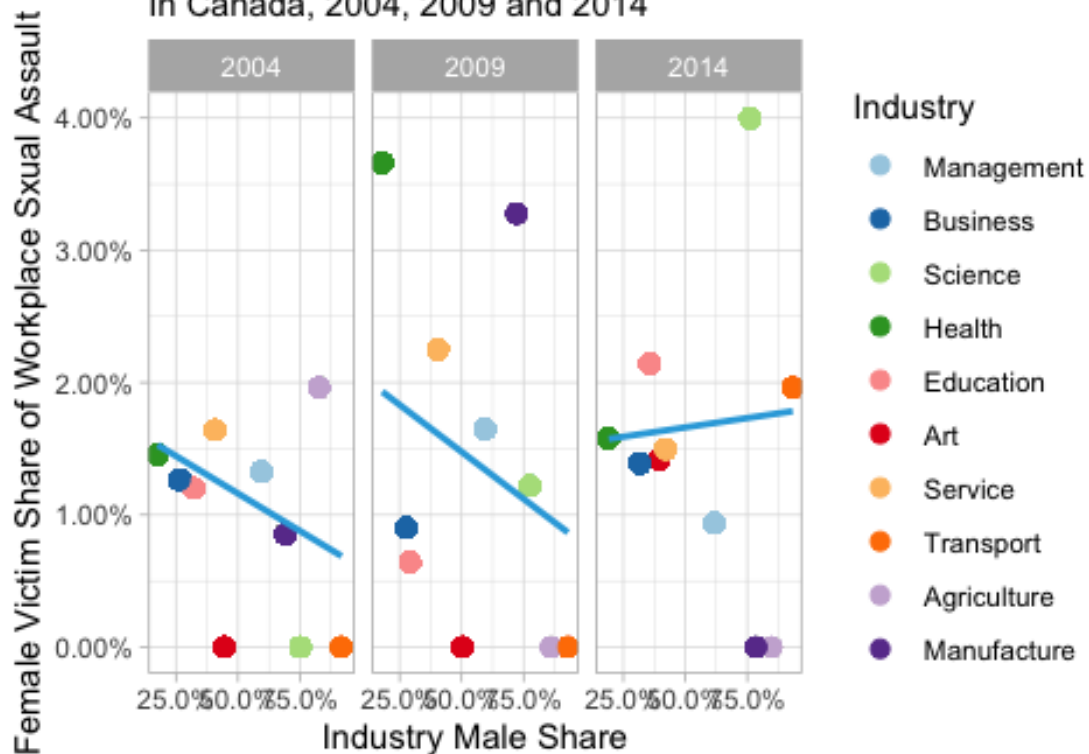
table_y5 <- dat5%>%
  group_by(year, age) %>%
  summarise(workassault_share5 = sum(workassault_female) / sum(female))

table_y6 <- dat5%>%
  group_by(year, marstat) %>%
  summarise(workassault_share6 = sum(workassault_female) / sum(female))

# Figure 1: Male Share and Workplace Sexual Assault against Women (by cross-
sectional approach)
ggplot(dat6,
  aes(x = male_share, y = workassault_share, color = Industry)) +
  geom_point(size = 2.5) +
  scale_color_brewer(palette = "Paired") +
  geom_smooth(method = "lm", se = F, color = "#30A9DE") +
  scale_x_continuous(labels = scales :: percent) +
  scale_y_continuous(labels = scales :: percent) +
  facet_wrap(~year) +
  theme_light() +
  labs(x = "Industry Male Share", y = "Female Victim Share of Workplace Sxual
Assault",
  title = "Figure 1: Industry Male Share and Female Victim Share",
  subtitle = "In Canada, 2004, 2009 and 2014",
  caption = "Data source: Statistics Canada, General Social Survey")

```

Figure 1: Industry Male Share and Female Victim Share
In Canada, 2004, 2009 and 2014



Data source: Statistics Canada, General Social Survey

Table 5: Simple Regression

```
srg <- lm(workassault_share_p ~ male_share_p, data = dat6)
stargazer(srg, type = "text")
```

```
##
## =====
##                               Dependent variable:
##                               -----
##                               workassault_share_p
## -----
## male_share_p                  -0.015***
##                               (0.001)
##
## Constant                      0.021***
##                               (0.001)
## -----
## Observations                  9,932
## R2                            0.015
## Adjusted R2                   0.015
## Residual Std. Error          0.020 (df = 9930)
## F Statistic                   151.079*** (df = 1; 9930)
```

```
## =====
## Note:          *p<0.1; **p<0.05; ***p<0.01

# Table 6: Simple Regression Comparing Industries
srg_mag <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Management"))
srg_bus <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Business"))
srg_sci <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Science"))
srg_hea <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Health"))
srg_edu <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Education"))
srg_art <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Art"))
srg_ser <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Service"))
srg_tra <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Transport"))
srg_agr <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Agriculture"))
srg_man <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(Industry == "Manufacture"))
stargazer(srg_mag, srg_bus,srg_sci,srg_hea,srg_edu, srg_art,srg_ser, srg_tra,
srg_agr, srg_man , type = "text")

## ## =====
=====
=====
##
##                               Dependent variable:
## -----
##                               workassault_share_p
##                               (5)
## -----
## male_share_p      -0.013**      -0.084***      -0.010      -0.063**      0.013**      -0.045***      -0.065***      -0.162***      -0.084***      -0.020*
##                   (0.007)      (0.003)      (0.048)      (0.014)      (0.005)      (0.006)      (0.005)      (0.044)      (0.017)      (0.012)
## Constant          0.021***      0.035***      0.025      0.033***      0.010***      0.023***      0.044***      0.152***      0.074***      0.027***
##                   (0.004)      (0.001)      (0.036)      (0.003)      (0.002)      (0.002)      (0.002)      (0.040)      (0.013)      (0.008)
## -----
## Observations      621          2,192          296          1,147          1,575          438          3,160          183          99          221
## R2                0.007          0.231          0.0002       0.018          0.004          0.131          0.061          0.070          0.209          0.013
## Adjusted R2       0.005          0.230          -0.003       0.017          0.004          0.129          0.061          0.065          0.201          0.008
## Residual Std. Error 0.018 (df = 619) 0.011 (df = 2190) 0.062 (df = 294) 0.031 (df = 1145) 0.016 (df = 1573) 0.016 (df = 436) 0.013 (df = 3158) 0.018 (df = 181) 0.021 (df = 97) 0.021 (df = 219)
## Note:
##                               *p<0.1; **p<0.05; ***p<0.01

# Table 7: Simple Regression Comparing Provinces
srg_10 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 10))
srg_11 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 11))
srg_12 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 12))
srg_13 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 13))
srg_24 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 24))
srg_35 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(province == 35))
```

```

srg_46 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(pro
vince == 46))
srg_47 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(pro
vince == 47))
srg_48 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(pro
vince == 48))
srg_59 <- felm(workassault_share_p ~ male_share_p, data = dat6 %>% filter(pro
vince == 59))
stargazer(srg_10, srg_11, srg_12, srg_13, srg_24, srg_35, srg_46, srg_47, srg
_48, srg_59, type = "text")

```

```

##
## =====
##
##                                     Dependent var
table:
## -----
##                                     workassault_s
share_p
## (6) (7) (1) (8) (2) (9) (3) (10) (4) (5)
## -----
## male_share_p -0.080*** -0.065*** 0.037*** 0.001 -0.038***
-0.016*** -0.044*** (0.011) -0.006* (0.013) -0.0001 (0.011) 0.004 (0.008)
(0.001) (0.004) (0.003) (0.002) (0.003)
##
## Constant 0.041*** 0.034*** 0.007 0.015*** 0.028***
0.023*** 0.030*** (0.004) 0.013*** (0.004) 0.016*** (0.005) 0.010*** (0.003)
(0.001) (0.001) (0.001) (0.001) (0.001)
##
## -----
## Observations 358 198 674 442 1,425
2,783 957 658 1,274 1,163
## R2 0.122 0.107 0.017 0.0001 0.098
0.056 0.131 0.005 0.0000 0.002
## Adjusted R2 0.119 0.102 0.015 0.002 0.097
0.055 0.130 0.004 -0.001 0.001
## Residual Std. Error 0.036 (df = 356) 0.033 (df = 196) 0.040 (df = 672) 0.026 (df = 440) 0.020 (df = 1423) 0.01
0 (df = 2781) 0.019 (df = 955) 0.015 (df = 656) 0.014 (df = 1272) 0.016 (df = 1161)
## =====
## Note:
##                                     *p<0.1; **p<0.05; ***p<0.01

```

Table 8: Multiple Regression Holding Age Constant

```

mrg_age <- felm(workassault_share_p ~ male_share_p + factor(age), data = dat
6)
stargazer(mrg_age, type = "text")

```

```

##
## =====
##                                     Dependent variable:
## -----
##                                     workassault_share_p

```

```

## -----
## male_share_p          -0.015***
##                      (0.001)
##
## factor(age)2         -0.003***
##                      (0.001)
##
## factor(age)3         -0.001
##                      (0.001)
##
## factor(age)4         -0.002***
##                      (0.001)
##
## factor(age)5         -0.002*
##                      (0.001)
##
## factor(age)6         -0.005***
##                      (0.002)
##
## factor(age)7         -0.010
##                      (0.007)
##
## Constant              0.022***
##                      (0.001)
##
## -----
## Observations          9,932
## R2                    0.018
## Adjusted R2           0.017
## Residual Std. Error   0.020 (df = 9924)
## =====
## Note:                  *p<0.1; **p<0.05; ***p<0.01

```

Table 9: Multiple Regression Holding Age and All the Fixed Effects Constant

```

mrg_fe1 <- felm(workassault_share_p ~ male_share_p + factor(age) | factor(province), data = dat6)
mrg_fe2 <- felm(workassault_share_p ~ male_share_p + factor(age) | factor(year), data = dat6)
mrg_fe3 <- felm(workassault_share_p ~ male_share_p + factor(age) | factor(Industry), data = dat6)
mrg_fe4 <- felm(workassault_share_p ~ male_share_p + factor(age) | factor(province) + factor(Industry) + factor(year), data = dat6)
stargazer(mrg_fe1, mrg_fe2, mrg_fe3, mrg_fe4, type = "text")

```

```

##
## =====
##                               Dependent variable:
## -----
##                               workassault_share_p
##                               (1)          (2)          (3)          (4)
## -----
## male_share_p                  -0.016***   -0.015***   -0.041***   -0.048***

```

```

##          (0.001)          (0.001)          (0.003)          (0.003)
##
## factor(age)2      -0.002***      -0.003***      -0.002***      -0.001*
##                   (0.001)          (0.001)          (0.001)          (0.001)
##
## factor(age)3      -0.0005         -0.001         0.0002         0.001
##                   (0.001)          (0.001)          (0.001)          (0.001)
##
## factor(age)4      -0.001*         -0.002***      -0.0004         0.0002
##                   (0.001)          (0.001)          (0.001)          (0.001)
##
## factor(age)5      -0.001         -0.002***      -0.0002         -0.0001
##                   (0.001)          (0.001)          (0.001)          (0.001)
##
## factor(age)6      -0.005***      -0.006***      -0.002          -0.003*
##                   (0.002)          (0.002)          (0.002)          (0.002)
##
## factor(age)7      -0.009          -0.011         -0.008          -0.009
##                   (0.007)          (0.007)          (0.007)          (0.007)
##
## -----
## Observations      9,932          9,932          9,932          9,932
## R2                 0.039          0.025          0.064          0.098
## Adjusted R2       0.037          0.024          0.063          0.096
## Residual Std. Error 0.020 (df = 9915) 0.020 (df = 9922) 0.020 (df = 9915) 0.020 (df = 9904)
## =====
## Note:                                                     *p<0.1; **p<0.05; ***p<0.01

```

Table 10: Multiple Regression Comparing Report Rate across Industry Holding all the Fixed Effects Constant

```

mrg_repo <- felm(factor(reported) ~ male_share_p | factor(province) + factor
(year) + factor(Industry), data = dat6)
mrg_repo_md <- felm(factor(reported) ~ male_share_p | factor(province) + fact
or(year) + factor(Industry), data = dat6 %>% filter(male_share_p >= 0.5))
mrg_repo_fd <- felm(factor(reported) ~ male_share_p | factor(province) + fact
or(year) + factor(Industry), data = dat6 %>% filter(male_share_p <= 0.5))
stargazer(mrg_repo, mrg_repo_md, mrg_repo_fd, type = "text")

```

```

##
## =====
##                               Dependent variable:
##                               -----
##                               factor(reported)
##                               (1)          (2)          (3)
## -----
## male_share_p                  -0.002          0.001          -0.004
##                               (0.005)          (0.014)          (0.006)
##
## -----
## Observations                  9,932          1,461          8,521
## R2                            0.002          0.010          0.001
## Adjusted R2                   -0.0003         -0.003         -0.001
## Residual Std. Error 0.033 (df = 9910) 0.037 (df = 1441) 0.032 (df = 8500)
## =====
## Note:                         *p<0.1; **p<0.05; ***p<0.01

```