Increasing Earnings Inequality and the Gender Pay Gap in Canada: Prospects for Convergence[1]

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Abstract. This paper retraces the evolution of Canadian women's labour force participation and of the gender earnings ratio across the generations to understand better the prospects for gender convergence in pay. Using administrative annual earnings data from the LWF, as well as public use LFS data, the paper assesses the role of increasing top income inequality in the persistence of the gender pay gap. Having identified a substantial role for vertical gender segregation, the paper then performs a critical analysis of the impact of existing gender equality policies centered on horizontal occupational gender segregation and discusses alternative policies for the future.

Résumé. Cet article retrace l'évolution de la participation des femmes au marché du travail canadien et celle du rapport des salaires hommes-femmes à travers les générations afin de mieux comprendre les perspectives de convergence des salaires. En utilisant les données administratives sur les gains annuels de la FLM, ainsi que les données de l'EPA à usage public, l'article évalue le rôle de l'augmentation des inégalités de revenu dans la persistance de l'écart salarial entre les sexes. Ayant identifié un rôle important pour la ségrégation verticale entre les sexes, cet article effectue une analyse critique de l'impact des politiques publiques de parité salariale existantes axées sur la ségrégation occupationnelle horizontale entre hommes et femmes et suggère des politiques alternatives pour l'avenir.

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1. Introduction

One of the most remarkable labour market developments in the second half of the twentieth century has been the dramatic increase in women's labour force participation. As shown in Figure 1, the strong growth in female labour force participation (LFP) among workers aged 25 to 64 of more than 1% a year has been replaced in the 2000s by significant leveling-off in Canada as a whole.[2] Figure 1 singles out the province of Quebec which introduced a subsidized universal child-

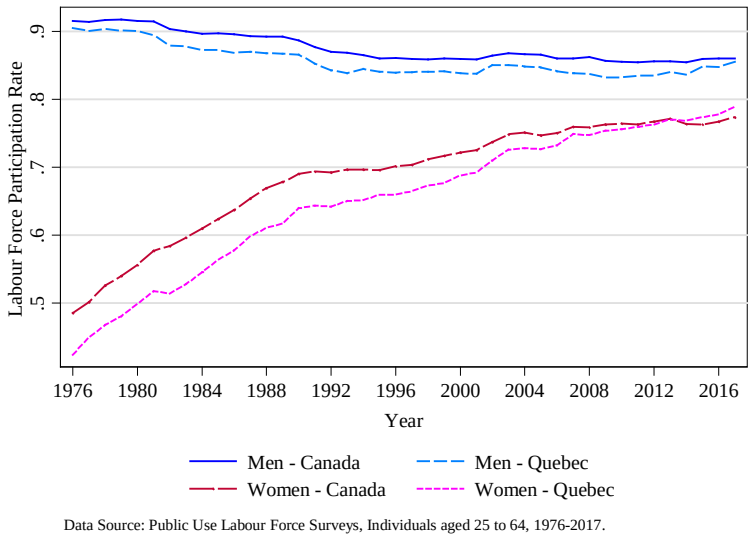


Figure 1: Labour Force Participation among 25 to 64 year olds by Gender and Jurisdiction

care program in 1997 and saw a more continuous growth in female LFP.[3] The figure also shows a substantial convergence of the labour force participation between men and women, as the divergence therein narrowed from more than 40 percentage points in the late 1970s to single digits in the 2010s. It might be natural to anticipate a steady gender convergence in pay given this longstanding gender convergence in labour force participation. The goal of the current paper is to document the gender

[2] Starting at age 25 avoids problems linked to full-time/part-time students who take-on jobs not representative of their long term career prospects. Individuals between the ages of 15 and 24 are thus excluded.

[3] More precisely, for Canada as a whole, while female LFP grew at rate of 0.6% over the entire period, that rate was twice as high at 1.1% from 1976 to 1996, and down to 0.3% from 1997 to 2017. In Quebec, that rate was at 1.2% from 1976 to 1996, and continued at 0.6% from 1997 to 2017, twice the rate of Canada as a whole. Note that the slightly higher female FLP rate in 2017 in Quebec than in Canada (78.9% vs 77.4%) is not found in the "employed at work" numbers (65.8% vs 65.7%) and could be related to differences in maternity leaves policies ("employed, not at work", but still "in the labor force") discussed in Section 4.

convergence in pay in Canada and assess the prospects for future progress. Of particular concern are the presence of strong cohort effects and persistent gender-specific life-cycle effects, overall increasing wage and earnings inequality, and public policies that focus on peculiar dimensions of gender inequality, thus leaving open the possibility of unintended consequences. To facilitate discussions and replications, most of the analysis draws on data from the public use files of Statistics Canada's Labour Force Surveys (LFS) and makes extensive use of data visualization to illustrate the trends. Some analyses focusing on top earners appeal to data sources where the representation of these high incomes individuals is superior to that of the LFS.

In Section 2, the paper begins by setting up the stage for a more nuanced view of the gender pay gap in Canada than is generally portrayed in the public debate, by considering life-cycle issues. In Section 3, the paper turns to accounting and simulation exercises to assess the role of increasing earnings inequality on the gender pay gap. These concerns for the impact of vertical segregation are in line with some of the new reporting requirements implemented in the United Kingdom in April 2018, where firms with more have 250 employees have to post six measures of the gender pay gap, including the proportion of males and females in each pay quartile.[4] Finally, in Section 4 the impact of the pay equity policies, implemented in the private sector of Canada's two most populous provinces, is scrutinized in terms of its effectiveness at closing the gap faster than in other jurisdictions, and its unintended consequences are exposed. In Section 5, the paper concludes by reviewing alternative policies, including some of the more novels policies implemented in Europe, and identifying areas for future research.

2. Women's Labour Market Decisions across the Generations and over the Life-Cycle

According to the Mincer-Polachek hypothesis (1974), gender differences in experience and labour force attachment are the key determinants of the gender wage gap, consistent with the human capital model. In this model, given the almost complete closing of the gender gap in educational attainment, the closing of the gender pay gap would be contingent on the extent to which labour market experience also converged across genders. Blau and Kahn (2017) have indeed found that declining gender differences in labour experience in the United States accounted for 18-31% of wage convergence between men and women over the 1980-2000 period. The human capital model

[4] The six measures of the gender gap that UK firms need to publish on their organization public-facing web site and on the government's online reporting service are the mean and median gender pay gap, the mean and median bonus gender pay gap, the proportion of males and females receiving a bonus payment, and the proportion of males and females in each pay quartile (ACAS, 2017).

also predicts the typical pattern of experience(age)-earnings profiles over the life-cycle: after a steep climb following labour market entry, earnings should level off during middle-ages and then decline as labour market experience depreciates closer to retirement age.[5] It is therefore useful to understand women's historical prospects for the accumulation of labour force experience over the life-cycle across birth cohorts in this context. Goldin and Katz (2002) and Bailey (2006) point out to fundamental changes in women's LFP emanating from the Women's Liberation Movement of the 1960s and the introduction of the "Pill" as a reliable contraceptive. Figure 2 displays the female LFP by birth cohorts distinguishing the pre-Pill birth cohorts (the mid-1950s and earlier) from subsequent cohorts.[6]

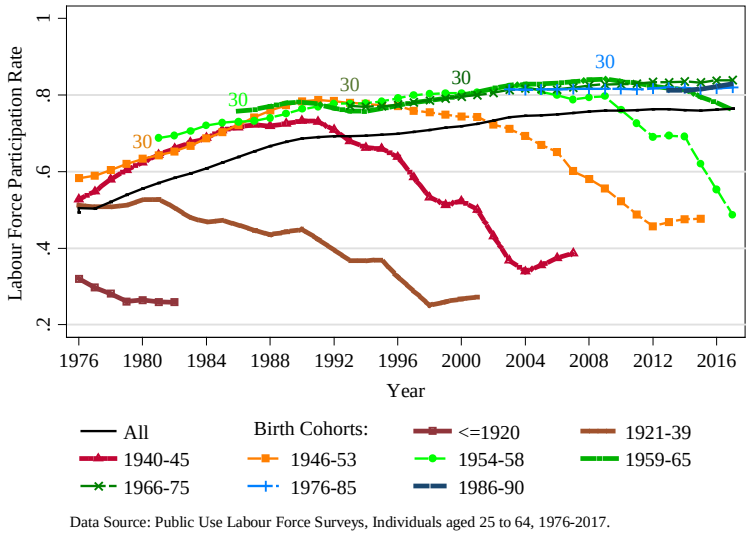


Figure 2: Women's Labour Force Participation by Synthetic Birth Cohorts

As underlined by Bailey (2006) for the United States, the life-cycle participation pattern of women from the 1940-45 birth cohort, for example, in Figure 2 is hump-shaped.[7] This pattern reflects the fact that, for most women from earlier generations, motherhood and homemaking were their primary "career". They often entered the labour market after having raised their children and retired from secondary careers that had offered little upward mobility, earlier than subsequent generations. By contrast, the labour force participation of women from the 1959-65 birth cohort, for

[5] See Beaudry and Green (2000) for an analysis of the age-earnings profiles of Canadian men across cohorts and education level.

[6] The numbers "30" in the figure indicate the year the cohort members were 30 years old on average.

[7] The trends are smoothed as three-years moving averages, except for the first and last years which are two-years moving averages. Because the age variable is available in 5-years categories in the public use LFS files, attrition in the older age group leads to a misleading upward bend in LFP. Only the younger of the oldest category are observed in the later years. This bend is an artifact of the data construction under these constraints and should be disregarded.

example, in Figure 2 is much more constant over the life-cycle, more like men's. These post-Pill women acquired higher education in greater numbers (Goldin, Katz, and Kuziemko, 2006) and, at age 25, were participating in the labour market at rates approaching 80% since the 1990s.[8] Therefore, the gradual convergence between men and women labour force participation in Figure 1 masks the more dramatic shifts across the generations from hump-shaped patterns of female LFP to more linear ones, illustrated in Figure 2.[9]

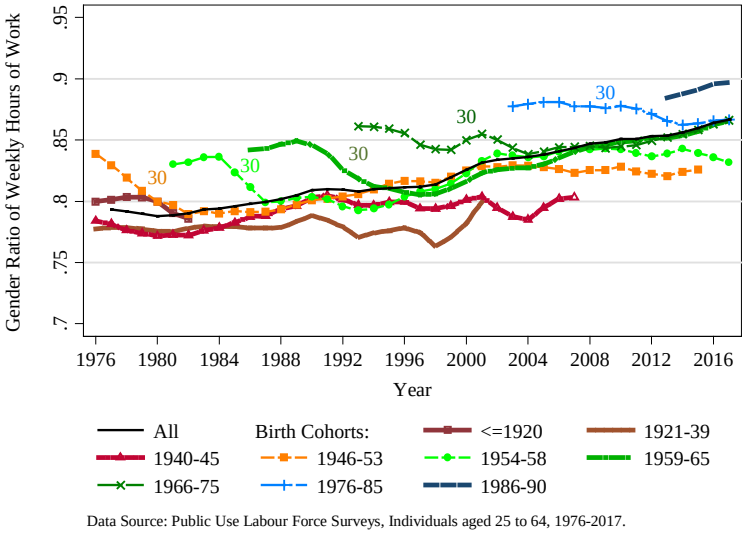


Figure 3. Gender Ratio in Usual Weekly Hours of Work by Synthetic Cohorts

The generational progress shown at the extensive margin in Figure 2 is also found at the intensive margin in Figure 3, which displays the gender gap in weekly hours of work, focusing only on women who supply positive hours to the labour market. Here at the intensive margin, increases in the gender ratio of weekly hours of work across cohorts appear more pronounced that the life-cycle changes. The gender ratio in hours of work among the pre-Pill cohorts is below 80%; among recent cohorts, the gender weekly hours ratio exceeds 85%. Some of the acceleration in the overall ratio in the late 1990s is coming from the fact that 1921-1939 cohorts reached retirement age. The life-cycle profiles of the gender ratio in hours of work nevertheless show substantial reductions around childbearing ages, but a consistent rebound at older ages for the baby-boom generations (1946-53, 1954-58, 1959-65).[10] The still sizeable differences in weekly hours of work across

[8] Fortin (2015) also documents the decline in traditional gender roles attitudes—men as breadwinners and women as homemakers—across cohorts; noting however that this decline stabilized in the mid-1990s in the United States.
[9] Goldin and Mitchell (2016) document a similar shift in life-cycle patterns across cohorts by for the United States.
[10] There are differences in access to contraceptive technology (the Pill and abortions) from the early baby boom cohort (1946-53) to the middle baby boom cohort (1954-59), and to the late boomers (1959-65) that warrant these distinctions.

genders imply that the comparison of hourly wages across gender is needed to avoid confounds from labour supply issues.

Despite more sustained labour force participation and labour supply, illustrated in Figures 2 and 3, women from the post-Pill generations naturally withdraw from the labour market for childbirth and childcare. These withdrawals lead to interruptions in the accumulation of on-the-job human capital that may imply earning losses beyond those predicted by a simple reduction in labour market experience. By allowing women to return to the same employer, maternity leaves are intended to minimize earnings losses from childbearing. However, depending on the length of the absence from work, many mothers may face delays or miss altogether some promotion opportunities. Others return to work on a part-time basis or in positions that offer more flexible work hours. These labour market interruptions imply that the age-earning profiles of mothers will likely show an earnings dip around childbearing ages with differential rebounds depending on the length of the maternity leaves, the age of childbearing, and the conditions of their return to work.

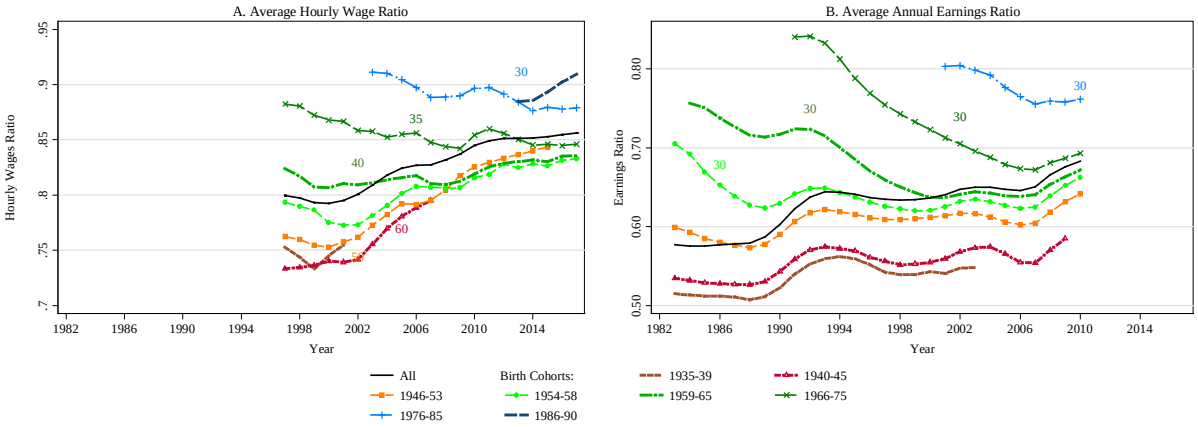
A growing body of literature studying the impact of children on mothers' earnings has indeed found large and persistent negative effects on labour market outcomes, often using employer-employee databases.[11] While each study emphasizes a particular aspect of the employment relationship and work-life balance, in the end the findings offer a consensus. Following childbirth, mothers are less likely to further their educational attainment. They often move to part-time work or a more flexible schedule, to family-friendly, less profitable, and lower paying firms, and are less likely to be promoted. Recent papers (Lucifora, Meurs, and Villarz, 2017; White, 2018) focusing on internal labor markets have also shown that employers often view part-time employees as less committed to the organization, and give them lower performance assessments and bonuses.

Figure 4 displays the evolution of the gender ratios of hourly wages (Panel A) and of average annual earnings (Panel B) by synthetic birth cohorts over the years for which the data is available.[12] The previous discussion let us anticipate distinct generational patterns as well as life-cycle effects, where positive selection into the labour market among women aged 50 to 64 from the

[11] For the United States, Wilde, Batchelder, and Ellwood (2010); for Italy: Del Bono and Vuri (2011); for Germany: Fitzenberger, Sommerfeld, and Steffes (2013), Adda, Dustmann, and Stevens (2017); for Spain: Fernández-Kranz and Rodrìguez-Planas (2011); for Austria: Frühwirth-Schnatter, Pamminger, Weber, and Winter-Ebmer (2014); for Portugal: Card, Cardoso and Kline (2016); for Sweden: Angelov, Johansson, and Lindahl (2016), Karimi, Hotz, and Johansson (2016); for Denmark: Kleven, Landais, and Sogaard (2016).

[12] Hourly wage data was collected from 1997 onwards in the LFS. The annual data is available from LWF from 1983 to 2010.

pre-Pill cohorts is likely at play.[13]



Data Source: A, Public Use LFS, 1997-2017; B. LWF, 1983-2010, Individuals aged 25 to 64 .

Figure 4. Gender Pay Ratio by Synthetic Cohorts

Contrary to what aggregate numbers suggest in terms of progressive improvements in the gender pay ratio—totaling 5 percentage points over the period—, the figure paints a picture of parallel shifts in the gender pay ratio across successive cohorts, in particular for cohorts born after 1960, notwithstanding life-cycle effects.[14] Some increases in the overall ratio appear when younger cohorts enter the labour market (actually the sample): when the 1966-75 enters in the early 1990s, or when the 1976-85 birth cohorts enters the labour market in the early 2000s. The gender differences in hours of work from Figure 3 let us anticipate a much less favorable gender ratio in annual earnings than in hourly wages. In addition, annual earnings include bonuses from which mothers may benefit less. The dramatic decline in the gender ratio in annual earnings after age 30 is thus consistent with the recent literature documenting the career costs of children.

Note that the possible confusion between cross-sectional improvements and cohorts effects is not new. Borjas (1985) pointed out that the improvements in the relative earnings of immigrants had been wrongly interpreted as favorable economic integration effects (Chiswick, 1978), whereas they actually emanated from differences across cohorts in origin countries, as well as positive selection into the host country of remaining older cohorts. Here also, some of the rapid improvements in the gender pay ratio at the aggregate level, in the first decade of the observation

[13] The wages and earnings of women from pre-Pills cohorts who entered the labour market as secondary earners are likely lower than those of women from the same cohorts who entered life-long careers. The former are also likely to retire earlier (negative selection into retirement) and the later stays in the labour market longer (positive selection into the labour market). A formal test of this hypothesis would require historical panel data.

[14] The numbers in the Figure indicate approximate average age of cohort members.

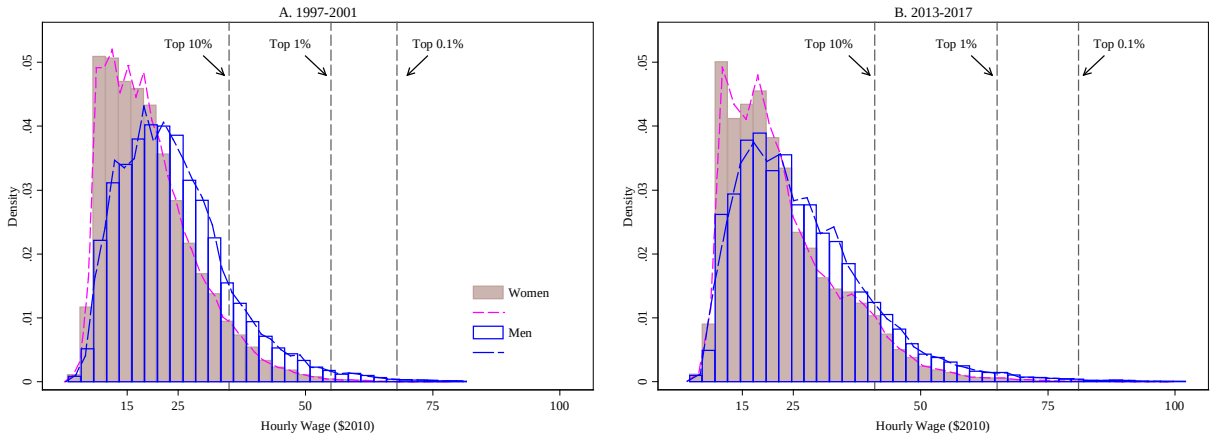
period, seem to arise from the negative selection into retirement of the pre-Pill generations. Mulligan and Rubinstein (2008) have argued that the closing of the US gender pay gap, from 1975 to 2000, was due mainly to changing selection of women into the labour market. Instead one could understand this "changing selection" in terms of changing attachment to the labour market across cohorts.

In summary, some of the recent improvements in the overall gender pay ratio have arisen in part because of the negative selective attrition into retirement of cohorts (1935-39 and 1940-45) with historically lower labour force attachment and substantially lower cohort-specific gender pay ratio. Given that the gender pay ratio among the baby boom generations is more similar to that of recent cohorts, it is fair to say that by 2010, the improvements in the gender pay gap that arise from generational composition effects associated with the 1960s Women's Revolution have largely been exhausted. Improvements along the life-cycle as the baby-boom generations reach their peak earnings years should be a more promising avenue along which to expect further closing of the pay gap. That is, notwithstanding glass ceiling issues, which are discussed next.

3. Increasing Earnings Inequality and the Gender Pay Gap

Another remarkable labour market development in the past decades has been the rapid rise in wage and earnings inequality, initially associated with the 1980s' computerization and skill-biased technological change. Several papers (Blau and Kahn, 1992, 1994; Fortin and Lemieux, 2000) have explored the consequences of rising wage dispersion (increased variance) for the gender pay gap. When residual inequality experienced substantial increases in the 1980s, Blau and Kahn (1997) coined the term "swimming upstream" to characterize women's pursuit of pay equality in the face of countervailing currents. The interaction between wage inequality and the gender pay gap can also work its way through the gender differences in hours noted above. Kuhn and Lozano (2008) have first shown that increases in long hours of work (>48 hours a week) among highly educated highly-paid older men was greatest in detailed occupations and industries with larger increases in residual wage inequality. Given the high penalty for flexibility in some high wage occupations, Goldin (2014) further conjectures that rewards to working long hours are an obstacle for the gender gap in pay to vanish. Cortes and Pan (2016) find that highly competitive jobs (O*NET characteristics) also have long hours, putting mothers at particular disadvantage.

In the twenty-first century, prominent studies of increasing inequality (e.g., Piketty and Saez, 2003, 2013; Saez and Veall, 2005) have focused on top earners implicating globalization forces and increases in the size of the financial sector. Although increases in the income share of the top 1% in Canada have not been as dramatic as in the United States, these increases have been sizeable. From 8.1% in 1990, the income share of Canada's top 1% climbed to 12.1% in 2006 but was down at 11.2% in 2015 (Statistics Canada, 2017). Although women have made steady inroads into the top 1%, in 2015, they accounted for only 23.2% of the top 1% of tax filers by contrast with 52.1% of the bottom 99% of tax filers. The underrepresentation of women among top earners implies that increases in top earnings inequality will disproportionally accrue to men. It is, therefore, possible that the recent increases in top incomes (increased skewness) have led to countervailing effects similar to the 1980s increases in residual wage inequality. These increases could in part account for the slower progress in the gender pay gap and the growth in the unexplained (by traditional factors) part of the gap in the 2000s.



Data Source: Public Use LFS, 1997-2017, Individuals aged 25 to 64.

Figure 5. Density of Hourly Wages ($2010) by Gender and Overall Threshold of Top Earners

Figure 5 displays the densities of real hourly wages ($2010) of men and women separately for the beginning and end five years periods for which data is available.[15] Vertical lines in the figure indicate the threshold of the top 10%, top 1% and top 0.1% of all wage earners (men and women combined).[16] The analysis of wages in levels rather than in logarithms is meant to emphasize the

[15] Hourly wages are adjusted for inflation using monthly CPI data from CANSIM Table 326-0020.

[16] Because wages are top coded in the LFS and because top earners are likelyunderrepresented in the survey, the top earnings thresholds computed from these data are lower than the thresholds computed using Longitudinal Administrative Databank (LAD) or LWF data, for example. Using five years of data helps obtain a sufficient number of top earners. Some low wage trimming has also been applied; observations with wages are less than half the minimum wages have

top, which is muted in the literature using the logarithm of wages or earnings.[17] In Panel A, the (transparent) density (and histogram) of male hourly wages combining five years of LFS data from 1997 to 2011 is superimposed on the (solid) density (and histogram) of female wages. Panel B displays similar densities for the more recent 2013-2017 period. The figure illustrates the differences in shapes between the female and male distributions. The distributions of women' wages show substantially higher mass in the lower tail, among minimum wage earners, something that is referred to as a "sticky floor" phenomenon. Men's wages shows more mass in the upper tail, including an extended right skew where women are essentially absent, a phenomenon called the "glass ceiling" effect.

Table 1 - Impact of Men's and Women's Distribution across Centile Groupings on Gender Wage Differentials

	(1)	(2)	(3)	(4)	(5)		(6)
	Men		Women		Contribution to the Gender Pay Gap		Gender Ratio
A: 1997-2001	Proportion	Average Wage	Proportion	Average Wage			
Bottom 90%	0.8641	21.14	0.9387	18.06	1.31	27%	0.854
Next 9%	0.1191	41.97	0.0583	40.89	2.61	54%	0.974
Next 0.9%	0.0134	60.00	0.0028	59.16	0.64	13%	0.986
Top 0.1%	0.0033	75.39	0.0002	70.33	0.24	5%	0.933
Total	1.0000	24.32	1.0000	19.51	4.81	100%	0.802
Counterfactual				21.50	2.82		0.884
B: 2013-2017							
Bottom 90%	0.8710	23.14	0.9264	20.87	0.82	21%	0.902
Next 9%	0.1139	48.81	0.0687	47.68	2.28	59%	0.977
Next 0.9%	0.0119	70.93	0.0042	70.46	0.55	14%	0.993
Top 0.1%	0.0032	88.23	0.0007	85.45	0.23	6%	0.969
Total	1.0000	26.85	1.0000	22.96	3.88	100%	0.855
Counterfactual				24.72	2.12		0.921

Note: Average wages in $2010. The contribution to the gender pay gap is computed as the difference between the product of col.(1) times col.(2) minus the product of col.(3) times col.(4). The counterfactual average female wages is computed as the sum of the product of the proportion of men, col.(1), times the average females wages, col.(4), in each centile groupings

Table 1 illustrates this point numerically by reporting the proportion of men and women, their respective average wages, the contribution of the centile groupings to the gender pay gap, as well as

been excluded. As before, workers aged 15 to 24, and self-employed workers are excluded.

[17] This departs from the traditional literature on glass ceiling effects (Albrecht, Björklund, Vroman, 2003; Arulampalam, Booth, and Bryan, 2007). The later computes the (log) earnings differences between women and men in top centiles of the gender-specific distributions, but does not link these differences to the average gap.

the gender ratios in the partitions delimited by the three vertical dashed lines in Figure 5. Following the literature on top incomes, the three thresholds of the distribution of men and women combined divide the distribution of wages into four percentile groupings: the bottom 90%, the next 9%, the next 0.9% and the top 0.1%. The numbers show that women are over-represented in the bottom 90% and under-represented in the other percentile groupings, although over time their proportion has more than doubled in the next 0.9% and top 0.1%, and has increased by close to one percentage point in the next 9%. The proportion of men in the three percentile groupings has decreased, but average wages among these top earners have increased. Thus, as a percentage of the gender pay gap, the contribution of the top 1% to the average gender pay gap has increased from 18% to 20%, contributing almost as much as the bottom 90% in the mid-2010s. The contribution of the entire top decile to the gender pay gap has increased from 73% to 79%.[18] In other words, further improvements in the top decile will be four times more important to the closing of the gender gap than improvements in the bottom 90%. It is important to note that the gender ratio in the bottom 90% is already five percentage points higher than the overall gender pay ratio.[19]

Using administrative data from Canada, Sweden, and the United Kingdom, Fortin, Bell, and Boehm (2017) study the consequences of the underrepresentation of women among earners in the top decile for the overall gender annual earnings gap. They construct counterfactuals asking "what if women were represented in the above top centile groupings of the earnings distribution of men and women combined in the same way men are?" This particular choice of top centile groupings is used to ask whether glass ceiling effects can hinder improvements in the average gender pay gap, but we show the robustness of the results to alternative centile groupings. It is nevertheless important to note that a more general counterfactual asking "what if the representation of women across all centiles or deciles of the combined earnings distribution was the same as men's" would explain away all average gender differences in earnings. The counterfactual average female wage that corresponds to the hypothetical "what if women's distribution across the above centile groupings (the bottom 90%, the next 9%, the next 0.9% and the top 0.1%) was identical to men's" is computed by multiplying the proportion in col.(1) by the average wages in col.(4).[20] It is reported at the bottom of col.(4) in each panel and the corresponding gender pay gap and gender pay ratio

[18] These numbers are computed by adding the third and fourth rows to obtain the top centile, and adding the second row to cover the entire top decile.

[19] The gender ratio of the next 9% and next 0.9% are closer to parity almost by construction.

[20] Maintaining the common assumption of invariance of the conditional wage distribution (Fortin, Lemieux, and Firpo, 2011), this counterfactual neglects the fact that the entry of women in the top percentiles would change the thresholds of the distribution and therefore the conditional average wages in the partitions.

are in col.(5) and (6), respectively. Under that scenario, the gender pay ratio would be 7 to 8 percentage points more favorable, and the gender pay would decrease by 55 to 59%.

For the three countries under study, Fortin, Bell, and Boehm (2017) conduct similar counterfactual analyses on annual earnings, which encompass more components of earnings including bonuses and performance pay but confound the issue of gender differences in labour supply. The gender ratios in annual earnings are therefore lower (in the 62-74% range in 2010) than with those computed on hourly wages. There we find counterfactual gender ratios that are more favourable than the actual ratios by 14 to 25 percentage points. More precisely, in 2010 gender disparities across the centile groupings accounted for 58% of the earnings gap (19 out of 33 percentage points) in Canada. In Sweden, they accounted for 54% of the gap (14 out of 26 percentage points), and in the United Kingdom, the gender disparities also account for more than half, 51%, of the gap (20 out of 38 percentage points).

The fact that this proxy of vertical segregation alone accounts for more than half of the gender gap is noteworthy in the literature on gender wage differentials, which has seen the explanatory power of traditional factors dwindle. In a recent review Blau and Kahn (2017) find that, for the United States, the share of the hourly wage gap explained by an extensive set of human capital variables, occupation, industry, private/public sector and union coverage dummies portion adds up to only 62% of the gap in 2010. For Canada, Baker and Drolet (2010) reports an increase, from 1981 (61%) to 2008 (85%), in the share of gap that is unexplained by education, occupation and industry, amidst some progress in the unexplained gap from 0.163 log points in 1981 to 0.141 log points in 2008. Baker and Drolet (2010) explain that in many dimensions, such as education, women increasingly have an advantage over men. Because women's wages have not seen commensurate increases, these factors have negative explanatory power (dis-explain) towards the gap. They argue that most significant exception to this is the industrial distribution of employment in which men maintain a significant advantage. Schirle (2015) also finds that in most provinces more than half of the private sector gender pay gap in 2014 remains unexplained; although, for most provinces, the industrial composition is the most significant single explanatory factor. However, Bonikowska, Drolet, and Fortin (2017) show that industrial composition captures a mixture of vertical and horizontal segregation. For example, workers in sectors such Finance, Insurance, and Real Estate and Professional, Business and Management Services are over-represented in the top decile of the earnings distribution whereas workers in the Retail Trade and Personal Services sectors are over-represented in the bottom 90%.

The next section turns to running horse races between traditional explanatory factors and this

new proxy of vertical segregation. First, an assessment of the impact of differences across provinces in the implementation of pay equity laws will be useful to understand the effect of horizontal occupational gender segregation on the pay gap.

4. Accounting for the Gender Pay Gap and the Impact of Gender Equality Public Policies

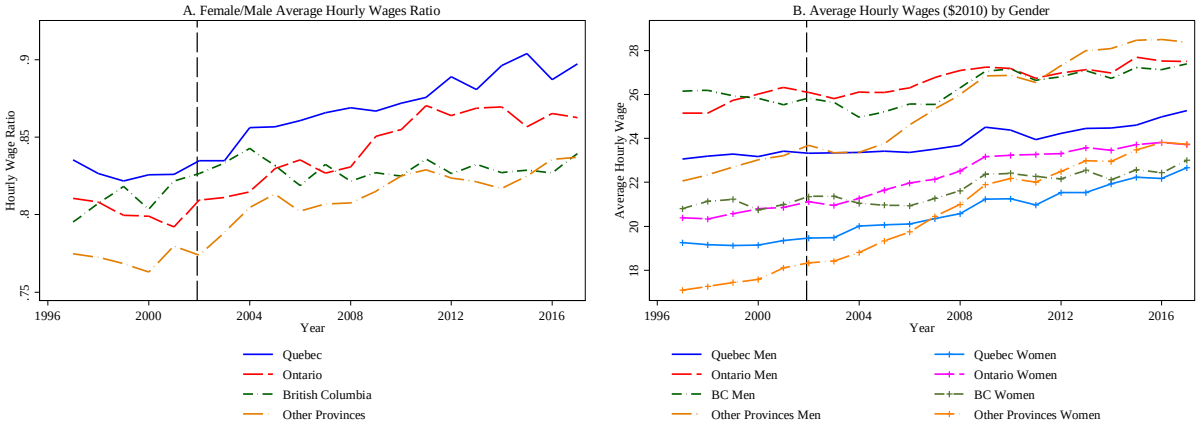
Analyses of the gender pay gap accounting for the underrepresentation of women among top earners (Fortin, Bell, and Boehm, 2017; Bonikowska, Drolet, and Fortin, 2017; Table 1 above) suggest that moving forward further reduction in the gap will primarily have to come from an increase in the representation of women among top earners. It is appropriate to discuss the effectiveness of existing Canadian public policies aimed directly at improving gender equality in pay in this context. This begins with a broad discussion of the target of these policies in relation to gender disparities in the occupational and industrial composition of employment. It is followed by a comparative evaluation of Quebec's gender equality and family friendly policies implemented in the 2000s. Then, a set of Oaxaca-Blinder decompositions is used to highlight the potential areas for further improvements.

The more common policies to improve gender equality in pay focus on within-job-establishment pay disparities, promoting "equal pay for equal work", or on within-establishment disparities, promoting "equal pay for work of equal value" also called comparable worth or pay equity. These policies essentially work on pay disparities at similar hierarchical levels within an organization. Pay equity (comparable worth) laws have been implemented in the public sector of six provinces, as well as the federal jurisdiction, and have been extended to the private sector of Canada's two most populous provinces (Ontario and Quebec) in the 1990s.[21] Pay equity legislation addresses gender pay differentials resulting from horizontal occupational gender segregation in a within-establishment setting. Because these laws are not set up to address pay differentials resulting from vertical segregation in a within-establishment setting and even less from industrial segregation, their overall impact on the gender pay gap is mitigated in the presence of such segregation.

Pay equity laws work along the concept of compensating wage differentials, evaluating jobs along four or five characteristics (such as on skill or qualifications, physical and mental effort,

[21] Provinces with pro-active public sector pay equity legislation include Manitoba, New Brunswick, Nova Scotia, and PEI. The Pay Equity Act of Quebec was passed into law on November 20, 1996, but most employers with 10 or more employees in Quebec had a period of five year to comply, i.e. by November 20, 2001.

responsibility, and working conditions). The idea is to estimate the returns to these characteristics from a sample of male-dominated job classes and use the estimates to predict what should be the pay in comparable female-dominated job classes. The rationale for the comparison between male-dominated and female-dominated job classes was bolstered by findings of a negative relationship between the gender composition of occupation and log wages in the United States (Macpherson and Hirsch, 1995).[22] For Canada, Baker and Fortin (2001) find weaker support as the estimates of the female penalty on female wages are smaller and generally not statistically significant. Baker and Fortin (1999) reconcile the Canada-U.S. differences in the effect of gender composition on female wages, by showing that differences in the relative positions of occupations, in particular of workers in "public good" sectors, such as secondary teachers and nursing assistants rank higher in Canada.



Data Source: Public Use LFS, 1997-2017, Individuals aged 25 to 64.

Figure 6. Evolution of Provincial Gender Wage Ratios and Average Hourly Wages

Panel A of Figure 6 displays provincial trends in gender wage ratios, comparing the two provinces that have implemented pay equity legislation in their private sector to trends in British Columbia and the remaining provinces as "other." Ontario implemented its law before 1997, and the first awards in Quebec were given after November 20, 2001, indicated by the vertical line. British Columbia is the only province for which the assumption of common trends (with Quebec) in gender ratios before that date cannot be rejected.[23] As shown in Panel B, the average male wages

[22] Macpherson and Hirsch (1995) report that the estimated penalty for American females in 1988 is -0.119 and for males -0.0989.

[23] The time trends in the gender ratios in Quebec, Manitoba, and BC are not statistically different from zero prior to 2002. The time trends stand at −0.0019 (0.0014) in Quebec, and 0.0049 (0.0028) in BC, but the time interaction with Quebec in

in these three provinces display a moderate continuous growth, as wages there have been less affected by the resources boom of the mid-2000s than in other provinces. Panel B also shows that although the average wages of women in Quebec are lower than that of their counterparts in all other provinces, there has been more convergence over time in average female wages across provinces, than for average male wages.

As discussed in Fortin and Lemieux (2015), in the mid-2000s the growth of the extractive resource sector bolstered average wages in Newfoundland, Saskatchewan and Alberta, with some sizeable spillover effects in the Maritimes and Manitoba. While these wage impacts were relatively higher for young and less educated males, we find substantial spillover effects that may account for the faster average growth in female wages in these provinces than in Quebec and Ontario, as shown in Figure 6b. This discussion underscores the importance of controling for determinants of wages, in particular industrial sectors, as discussed by Baker and Drolet (2010) and Schirle (2015).

Baker and Fortin (2004) conducted a detailed evaluation of the impact of the 1987 Ontario pay equity law. We focused on workers who should have directly benefited from the law, that is, female workers in female-dominated jobs comparing wage gains across establishments of different sizes progressively covered by the law, also comparing Ontario (treated) with Quebec (control). While we found some positive effects of the law on the wages of women in some occupations, such as clerical occupations in large establishments, these wage gains were not widely share. We thus concluded that, a few years after the awards, the law had not contributed to shrink the gender pay gap in the province. More precisely, we found the relative effect of the law on the overall gender log wage gap, estimated with an interaction between gender, Ontario, and year of awards, to be 0.003 with a standard error of (0.011). Nevertheless, in the comparisons below, some specifications exclude Ontario to provide a cleaner control group without private sector pay equity legislation.

Here, a first approach to evaluate the impact of Quebec's gender equality policies is to estimate a triple differences (DDD) model where a first difference compare male and female log real hourly wages to get at the gender pay gap in percentage terms. A second difference compares the "before" the actual implementation of the law (1997-1999) to a short-term "after" (2003-2005) and to a long-term "after" (2014-2016).[24] The third difference comes from the comparison of Quebec with

a regression including these two provinces is not statistically significant. The trend in Ontario is significantly negative at −0.0046 (0.0006), and, in terms of point estimates, is closer to that of Quebec. From 2002 onwards, the trends in Quebec, 0.0041 (0.0004), Ontario, 0.0042 (0.0005), and Manitoba, 0.0035 (0.0010), are similar.

[24] In the 2017 public use files of the LFS, changes in the occupation codes (NOCS-21) could be cross-walked to the former (NOCS-47). Therefore, this part of the analysis finishes in 2016.

other provinces, first with British Columbia, second with all provinces, and third a similar comparator group omitting Ontario.[25] Alternatively, the triple differences estimator can be interpreted as the difference between the differences-in-differences (DD) (relative wage changes over time between jurisdictions implementing the law and those who did not) for the treated group, women, and the differences-in-differences for a placebo or control group, men, who were not targeted by the law. The validity of the triple-differences approach thus depends on the assumption that men are unaffected by other shocks during the period of study. The absence of large shocks to men's wages is another argument that makes British Columbia a more appropriate control jurisdiction.

It is important to note that this approach will bundle together the Quebec pay equity policy with the province's other family-friendly policies. First, a subsidized child care system was introduced in 1997 (before the pay equity awards came into effect), but it became progressively available to a larger number of families over time (Haeck, Lefebvre, and Merrigan, 2015). Second, in 2006, Quebec introduced its own maternal and paternal leave policy. The Quebec Parental Insurance Plan (QPIP) introduced an exclusive paternity leave (five weeks of paid leave for the father to use or lose), a 32 weeks parental leaves to be shared by the parents, in addition to an 18 weeks maternity leave. These rules imply that a maternal leave could be extended up to 50 weeks. As noted in the discussion above on the career costs of children, these family-friendly measures are likely consequential for the labour supply of women (Baker, Gruber, and Milligan, 2008; Lefebvre and Merrigan, 2008), but also for their ability to return to full-time work after childbirth and their subsequent level of pay.

The estimating equation for the DDD strategy is the following:

$$\begin{aligned}\ln(w_{it}) = {} & \alpha_0 + \alpha_1 After * Female * Quebec + \alpha_2 After * Female \\ & + \alpha_3 Female * Quebec + \alpha_4 After * Quebec + \alpha_5 Female + \alpha_6 Quebec + \alpha_7 After \\ & + \boldsymbol{X}'_{it}\boldsymbol{\beta} + \delta_t D_t + \varepsilon_{it}\end{aligned} \quad (1)$$

where $\ln(w_{it})$ denote the logarithm of real hourly wages of individual *i* at time *t*, the first seven variables are dummies variables capturing what their names indicate. A vector of explanatory variables, $\boldsymbol{X}_{it}$, includes demographics (age, marital status, number of children in five age

[25] Attempts to use to a synthetic cohorts approach gave too much weight to PEI, a province where the gender pay gap has turned positive in 2017, and whose industrial structure is not comparable to Quebec. British Columbia is not ideal because of its smaller manufacturing sector and larger construction sector, but the results are robust to alternative controls. Van Audenrode, Paradis, and Lafeuille (2008) focus on comparisons between Quebec and Ontario, as well as with British Columbia.

categories), job status (part-time status, union coverage, and tenure), eleven industry and forty-seven occupations categories, and ε_{it} are the error terms.[26] The parameter of interest is α_1 which captures the relative changes in wages in female wages versus male wages in Quebec versus the control provinces. A tighter treatment would focus, as in Baker and Fortin (2004), only on employees in female-dominated jobs (no senior managers) working in establishments of sufficient size to be covered by the law.

Table 2 - Impact of Quebec's Gender Equality Policies on Log Hourly Wages

	(1)	(2)	(3)	(4)	(5)	(6)
After period:	2003-2005			2014-2016		
Female* Quebec*After	-0.012	-0.002	-0.011*	0.020*	0.020*	0.026*
	(0.002)	(0.005)	(0.004)	(0.006)	(0.006)	(0.010)
After*Female	0.023*	0.014*	0.023***	0.026***	0.026***	0.025*
	(0.001)	(0.005)	(0.004)	(0.005)	(0.005)	(0.010)
Female*Quebec	0.008	0.021	0.035*	0.019	0.019	0.031*
	(0.001)	(0.010)	(0.013)	(0.009)	(0.009)	(0.012)
After*Quebec	0.059*	0.012	0.013	-0.035	-0.035	-0.085
	(0.002)	(0.011)	(0.023)	(0.042)	(0.042)	(0.065)
Female	-0.165*	-0.168***	-0.186***	-0.162***	-0.162***	-0.173***
	(0.006)	(0.010)	(0.012)	(0.008)	(0.008)	(0.014)
Quebec	-0.152**	-0.072*	-0.039	-0.068*	-0.068*	-0.033
	(0.001)	(0.025)	(0.048)	(0.026)	(0.026)	(0.049)
After	-0.073	-0.018	-0.024	0.074	0.074	0.119
	(0.016)	(0.012)	(0.024)	(0.040)	(0.040)	(0.066)
Control Provinces:						
British Columbia	Yes	Yes	Yes	Yes	Yes	Yes
Ontario	No	Yes	No	No	Yes	No
Other Provinces	No	Yes	Yes	No	Yes	Yes
R-square	0.49	0.48	0.47	0.49	0.49	0.48
No.of observations	804807	2914163	1989985	2460554	2460554	1711702

Note: The dependent variables is the log hourly wages. The "before" period is 1997-99. Explanatory variables include tenure as a continuous variable, dummies for part-time status and union coverage, plus 8 age, 4 marital status, 5 children, and 7 education classes, 11 industry, 47 occupation categories, as well as year dummies. *** p < 0.01, ** p < 0.05, * p < 0.1.

The results of the estimation strategy are presented in Table 2.[27] Columns (1) to (3) compare the

[26] Individuals in the base or omitted group are married or co-habitants with no kids, high school dropout, 30 to 34 years old, working full-time as sales person (24 in NOCS47) in the retail trade (27 in NAICS43) with no union coverage.

[27] The eleven industry categories regroup categories from the NAISC 43 as in Bonikowska, Drolet, and Fortin (2017). Robust standard errors clustered at the provincial level are displayed in parentheses below the estimated coefficients.

1997-1999 period to the 2003-2005 period, while columns (4) to (5) use 2014-2016 as the after period, and therefore bundles the potential impact of the parental leave policy. The adjusted penalty faced by women in Quebec in comparison to other provinces in the "before" period is obtained by adding $\alpha_3 + \alpha_5$ and ranges from -0.14 to -0.16 across specifications. This corresponds to an adjusted gender ratio of about 0.85, whereas the unadjusted ratio in Figure 6 was around 0.82. The short-term (arguably cleaner) effect of Quebec's pay equity law is given by α_1 in columns (1) to (3), with column (1) using the preferred control; it is not statistically significant, but has a negative point estimate.

This null impact of pay equity result may appear puzzling to proponents of the law, but is not so different from what Baker and Fortin (2004) find in their analysis of 1987 Ontario pay equity law. Pay equity laws target only women in female-dominated jobs. It is thus conceivable that when pay equity awards in particular years exhaust the funds that a firm can allocate to pay increases, women in male-dominated jobs (such as managerial positions) do not receive any increases (or smaller increases) in those years, and therefore fall behind in real terms.[28] Because as shown in Section 3, gender wage differentials in the top decile have a relatively larger impact on the overall gender pay gap, the above scenario would rationalize the null result found here.

On the other hand, the longer-term impact of Quebec's gender equality policies, reported in columns (4) to (6), shows a weakly significant but more positive impact of 0.020, quite similar across control groups. It doubles the relative wage gains shared by all women, α_2 , equal to 0.026 reported in the second row. The robustness of the results across control provinces indicates that the explanatory variables help capture other provincial differences. It is difficult to know from these results which gender equality policy has the most important impact, perhaps the stronger enforcement of pay equity laws in recent years, perhaps the longer-term effects of increased child care spaces or increased maternity leave generosity. In an attempt to better understand the mechanisms at play, a second approach performs some Oaxaca-Blinder (OB) decompositions, which run horse races between the different explanatory factors, comparing the before and after periods across provinces.

The "regression-compatible" approach suggested in Fortin (2008) is used to maintain compatibility with Table 2. A specification similar to equation (1) is estimated separately for Quebec, Ontario, British Columbia, and the remaining provinces for each of the three time periods;

[28] A similar argument could account for the negative point estimates, α_4, for men in Quebec "After" the law in columns (4) to (6). But these estimates are not statistically significant.

therefore the dummies "After" and "Quebec" and their interactions are not included in the pooled regression,

$$\ln(w_i) = \gamma_0 + \gamma_1 Female + \boldsymbol{X}_i'\boldsymbol{\beta}^* + \varepsilon_i \,. \qquad (2)$$

This regression-compatible decomposition assumes that the pooled wage structure $\boldsymbol{\beta}^*$would prevail in the absence of discrimination that is, under the assumption that the female dummy captures the discriminatory penalty. Along with pooled equation (2), gender-specific regressions (without the gender dummy) are estimated, yielding estimated female returns $\widehat{\boldsymbol{\beta}_f}$ and male returns $\widehat{\boldsymbol{\beta}_m}$. Let $\overline{\boldsymbol{X}}_f'$ and $\overline{\boldsymbol{X}}_m'$ denote the average of the female and male characteristics. The idea is to construct two counterfactual average log wages, the average log wages that women would have earned at the pooled returns, $\overline{\boldsymbol{X}}_f'\,\widehat{\boldsymbol{\beta}}^*$, and the average log wages that men would have earned at the pooled returns, $\overline{\boldsymbol{X}}_m'\,\widehat{\boldsymbol{\beta}}^*$. After subtracting and adding these counterfactual wages to the male-female average log wage difference, the decomposition is written as

$$\overline{\ln w_m} - \overline{\ln w_f} = \left(\overline{\boldsymbol{X}}_m' - \overline{\boldsymbol{X}}_f'\right)\widehat{\boldsymbol{\beta}}^* + [\overline{\boldsymbol{X}}_m'\left(\widehat{\boldsymbol{\beta}_m} - \widehat{\boldsymbol{\beta}}^*\right) - \overline{\boldsymbol{X}}_f'\left(\widehat{\boldsymbol{\beta}_f} - \widehat{\boldsymbol{\beta}}^*\right)]. \qquad (3)$$

The results of this decomposition are illustrated in Figure 7 for the three largest provinces separately and the remaining provinces together, for each period indicated by its starting year. Model 1 in Panel A, C, D, and F uses the same explanatory variables as in Table 2; Model 2 in Panel B, D, F and G adds the centile groupings used in Table 1, as a proxy of vertical segregation.[29] To avoid leading zeros, the dependent variable "log wages" is multiplied by 100 and therefore the gender pay gap is in log points. The unadjusted or raw log wage gap is equal to the total length of the bars, shrinking over time from 19-22 log points to 15-18 log points.

The log wage gap adjusted for differences in male and female characteristics evaluated at pooled prices—the term in brackets in equation (3) —correspond to the (light gray) longer part of the bar "Unexplained" by gender differences in characteristics. Like in Blau and Kahn (2017) and Baker and Drolet (2010), as a proportion of the raw gap, the share of the unexplained gap has grown over time. This result is illustrated here by the fact that the corresponding (light gray) part has shrunk less over time that the total length of the bars. Importantly and perhaps more clearly seen in Table A1, before 2014-16 the adjusted log wage gaps in Quebec are generally larger (not always with statistical significance) than the adjusted log wage gaps in Ontario and British Columbia. This helps explain the absence of significant effects of Quebec's policies before 2014-16 found in Table 2, despite apparent more favorable raw gender ratios in this province illustrated in

[29] Table A1 report the detailed numbers behind Figure 7 along with standard errors.

Figure 5. The other portions of the bars correspond to the first term of equation (3) summed over the relevant explanatory variables that is, the male-female average differences in characteristics evaluated at the pooled returns.

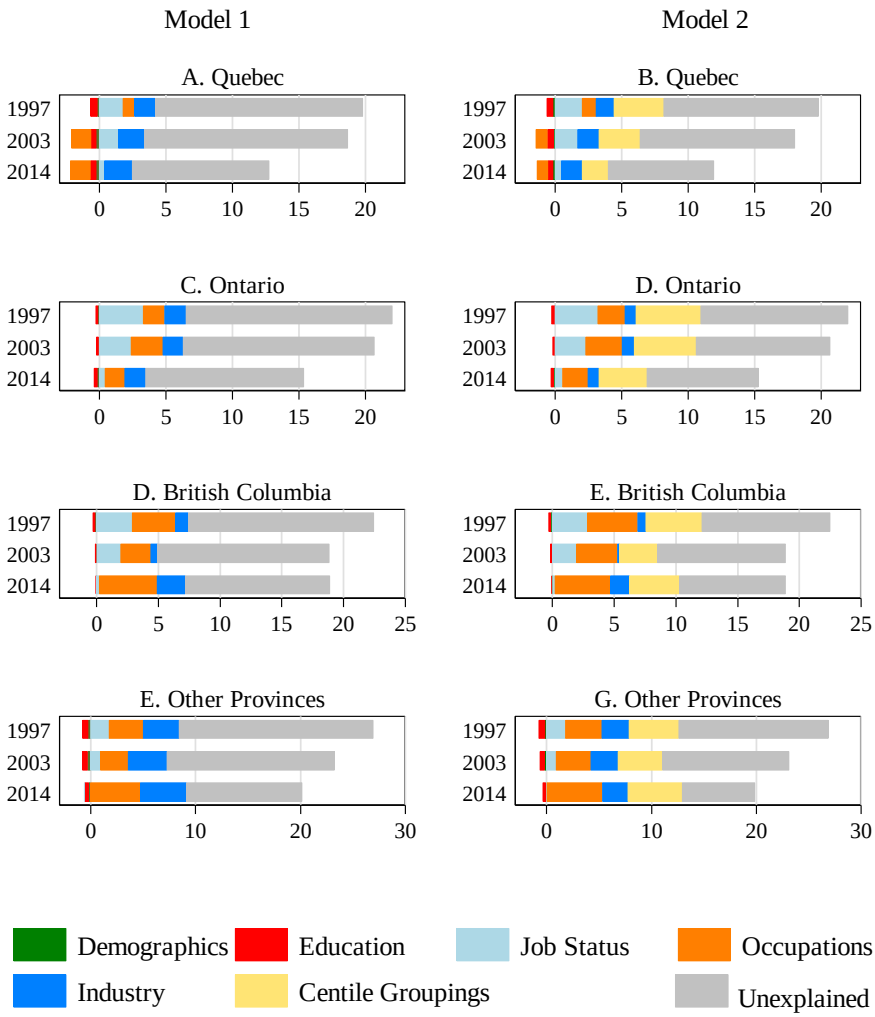


Figure 7. Regression-Compatible OB Decompositions of Gender Log Wage Differentials

As found in other studies (e.g., Blau and Kahn, 2017; Baker and Drolet, 2010), the explanatory power of education has gone negative as the women's education level exceeds that of men. The sum of gender mean differences in education categories, $\bar{E}_{.j}, j = 1, \ldots 5$, evaluated at pooled returns, $\sum_{j=1}^{5}(\bar{E}_{mj} - \bar{E}_{fj})\hat{\beta}^{*}_{E,j}$, is negative, thus the corresponding portion of the bars extends below zero in most panels.[30] Another common trend is the shrinking of the portion of the gap

[30] For the sum to be negative, it has to be the case that the returns $\hat{\beta}^{*}_{E,j}$, where $\bar{E}_{fj} > \bar{E}_{mj}$, are sufficiently large to offset to exceed the positive terms arising at levels of education where $\bar{E}_{fj} < \bar{E}_{mj}$.

explained by gender differences in job status, which includes part-time status, union coverage, and tenure. As explained in Section 2, women's labour force attachment has grown over time and is more similar to men's among recent cohorts of women.

A striking difference across the provinces is the fact that the explanatory power of occupations has gone negative —like that of education — in Quebec in the "After" time periods. It is possible that the pay equity legislation, which works on equalizing pay between comparable female-dominated and male-dominated occupational wages, is modifying the wage structure. The fact that gender differences in occupations are dis-explaining the gender pay gap rather than just shrinking over time (as job status does) requires closer inspection. The contribution of occupation classes, $\bar{O}_{.j}, j = 1, \ldots 47$, will turn negative when the value (at pooled returns) of gender differences in female occupations, $\sum_{\{j:\bar{o}_{mj}<\bar{o}_{fj}\}}(\bar{O}_{mj} - \bar{O}_{fj})\hat{\beta}^{*}_{O,j}$, exceeds the value (at pooled returns) of gender differences in male occupations, $\sum_{\{j:\bar{o}_{mj}\geq\bar{o}_{fj}\}}(\bar{O}_{mj} - \bar{O}_{fj})\hat{\beta}^{*}_{O,j}$. Focusing on Model 1 for the 2014-16 period, the contribution of occupations stands at -1.5 log points in Quebec and 1.4 log points in Ontario, while it is much larger at 4.6 log points in BC and 4.7 log points in the other provinces. However, there is relatively little difference across provinces in the contribution of female occupations: -12.4 in Quebec, -11.8 in Ontario, -12.1 in BC, and -12.3 in the other provinces in log points.[31] The larger interprovincial differences come from the contribution of male occupations: 10.9 log points in Quebec, 13.2 log points in Ontario, 16.8 log points in BC, and 17 log points in the other provinces. It would thus appear the Quebec pay equity law has exhausted its potential to narrow the overall gender pay gap, other explanatory factors, besides occupational classes, have to be considered.

The results of Figure 7 speak to the growing importance of industry as an explanatory factor over time, as suggested by Baker and Drolet (2010) and Schirle (2015). For example, focusing again on Model 1 in the 2014-16 period, the positive contribution of male-dominated Mining, Oil & Gas, Utilities, and Construction sectors account for 2.1 log points in Quebec and Ontario, 2.5 log points in BC, but it stands at 5.5 log points in the other provinces. It is partly offset by the negative contribution of the female-dominated sectors of Educational, Health Care, and Social Assistance Services, which ranges from -1.4 log points in Quebec to -2.5 log points in the other provinces.

[31] Female occupations, $\{j: \bar{O}_{mj} < \bar{O}_{fj}\}$, and male occupations, $\{j: \bar{O}_{mj} \geq \bar{O}_{fj}\}$, in this computation are defined on the basis of the Quebec proportions in order to compare the same occupations across provinces. The Ontario and BC an important advantage in male occupations comes mostly from Managerial occupations (NOCS1-4), and Occupations in the Natural and Applied Sciences (NOCS11 and 12), while there is also an important BC-Quebec advantage in Construction and Transportation Trades (NOCS33 and NOCS39).

Another less discussed offsetting sector is the Finance, Insurance, and Real Estate sectors, which holds more promise for female gains. Indeed, Bonikowska, Drolet, and Fortin (2017) report that, in the 2006-2010 period, this sector employed 22.5% and 32.5% of women in the next 0.9% and top 0.1%, respectively, of the annual earnings distribution of men and women combined. Among top earners, the Mining, Oil & Gas, Utilities, and Construction sectors was a strong second employing 11.7% and 15.5% of the women in the next 0.9% and top 0.1%.[32] Meanwhile, the corresponding proportions for Health Care and Social Assistance Services were 7.8% and 3.1%, and for Educational Services the percentage in the next 0.9% was 2.1% and the percentage in the top 0.1% was too small to report.

Given the substantial impact of vertical segregation on the gender pay gap discussed in Section 3, the OB decompositions in Model 2 include centile groupings to run a horse race between this (admittedly imperfect) proxy and the other factors considered above. With an explanatory power in the 2 to 5 log points range (see Table A1) the centile groupings show that improvement in the representation of women in top jobs has a substantial potential to reduce the gap further. The growing importance of this factor over time for Canada as a whole discussed in Section 3 is seen only among other provinces, which include the extractive resource provinces of Newfoundland, Saskatchewan and Alberta, along with the Maritimes and Manitoba, provinces that have seen significant spillovers on wage levels (Fortin and Lemieux, 2015). This geographical concentration is in line with the above discussion of a growing presence of top earners in the Mining, Oil & Gas, Utilities, and Construction sectors (Bonikowska, Drolet, and Fortin, 2017).

In summary, the results of Table 2 and Figure 7 call into question the ability of gender equality policies based on comparable worth principles to close the gender pay gap. Other measures are needed to address the obstacles that women face as they attempt to move up the echelons of organizations into traditionally male-dominated jobs. The traditionally female-dominated sectors of Educational, Health Care, and Social Assistance Services offer comparatively little opportunities for women to move into the top 1% of earners. Subsidized childcare and parental leaves have proven to be implementable in Quebec and should be extended to other jurisdictions as part of the family-friendly policies that help "level the playing field."

5. Novel Initiatives and Prospects for Continued Convergence

In the title words of Groshen (1991) "The structure of the female/male wage differential: Is it

[32] For men, the Mining, Oil & Gas, Utilities, and Construction sectors is a stronger employer of top earners, employing 18.4% and 21.1% of men in the next 0.9% and top 0.1%. However, the Finance, Insurance, and Real Estate sectors is also where most male top earners are found at 18.9% and 29.5% in the next 0.9% and top 0.1%, respectively.

who you are, what you do, or where you work?", pay equity principles rely exclusively on a narrow definition of the second source of "what you do" of earnings differentials. Pay equity does not address potential inequities between men and women's pay for women who work in non-female dominated job, and therefore it is not surprising that their impact on the overall gender pay gap is limited. Gender differences between occupation groups are the "what you do," but the "who you are" and "where you work" are also implicated in the gender wage gap.

Pay equity laws are not the panacea that they often touted to be (e.g., Chicha, 2006). They may introduce procedural fairness in the pay setting process, at least for those targeted by the law. However, pay equity laws could evolve into more encompassing strategies, involving less micro-management of the pay structure.

The "Equal Pay Label" initiatives implemented in several European countries in the 2010s are inclusive of all employees, irrespective of the maleness or femaleness of their job, and may have some potential. These initiatives also use regression-aided programs to help companies evaluate their firm-level adjusted female penalty. They started in Switzerland (Logib-CH) in 2006, quickly spread to Germany (Logib-D) in 2009, were transformed into "equal pacE" in 2013, and extended to Finland, Flemish-Belgium/the Netherlands, France, Poland and the United Kingdom.[33] The current initiative is presented as a web tool to help companies voluntarily identify the causes of a potential gender pay gap that may exist on the company level.

The first Swiss initiative included random checks on firms with more than 50 employees to determine whether their wage policy was discriminatory, that is whether the firm-level adjusted female penalty was larger than a tolerance level of 5% with p-value 0.05, accounting for age, education, training, and other job characteristics.[34] In the absence of a significant female penalty, firms would gain the "Equal Pay" certification, intended to give firms a competitive edge and profile to attract the best employees. Vaccaro (2016) use the regression discontinuity design in firm size (at 50 employees) in a differences-in-differences framework to study the impact of the policy comparing the 1996-2004 period to the 2008-2014 period. She finds that after the introduction of this Swiss policy, the unexplained wage gap of firms with 50 workers or more decreased by 4.5% points on average. Felfe, Trageser and Iten (2015) report more modest improvements over time in

[33] The Logib-D web tool was a substantial enhancement of the Swiss original version Logib-CH, which was initially based on Excel. The current "equal pacE" is publicized as a web tool-based equal gender pay analysis for a competitive Europe. Some of the regressors used to estimate the adjusted the female penalty are similar to the job characteristics used in pay equity evaluations, others includes echelons within the firm.

[34] Felfe, Trageser and Iten (2015) note the arbitrariness of the 5% level for the adjusted penalty. In other contexts, a statistically significant penalty has been judged discriminatory.

the adjusted female penalty, which decreased from around 11 log points in 2000-02 to 9 log points in 2010-12 in the private sector for the country as a whole (p. 34).

One important advantage of "Equal Pay Label" type of policies is that all women (except senior management) are included in the analysis, and that reverse discrimination (male penalty) could be detected, but there are some disadvantages. First, like pay equity, these policies are within-firm measures and do not address gender differentials arising from industry composition. A second disadvantage is that it is unclear how progress is achieved and whether it is widely shared. Reducing gender differentials at higher echelons (reducing vertical segregation) may be a more effective way to reduce a firm-specific penalty than equalizing pay at lower ranks. The fact that the current "equal pacE" is publicized as a web tool-based for firms to gain a competitive advantage calls into question whether these tools are used to help contain the wage bill. This preoccupation may also apply to the application of pay equity, which is often implemented with the help of pay consultants who may assist employers in revising their entire pay structure. Thus, these types of policies should include a detailed empirical evaluation requirement to study not only how they work, but what their outcomes are.[35] Many countries have constructed administrative employer-employee databases that could be used for that purpose. It is perplexing that pay setting policies implemented in many countries include an empirical evaluation requirement, while it has not been the case in Canada.[36]

Third, the effectiveness of voluntary measures is naturally doubtful and therefore audit studies of the implementation of the tools may be needed. Alternatively, as mentioned in the introduction, the United Kingdom saw the first implementation of their gender pay gap web reporting measure in April 2018. Firms with more than 250 employees have to publicize not only the mean and median gender pay gap, but also the mean and median bonus gender pay gap, the proportion of males and females receiving a bonus payment, and the proportion of males and females in each pay quartile (ACAS, 2017). Disclosing bonuses and female representation in the upper quartile of the firm is helpful to determine the extent of vertical segregation and its potential impact on gender differentials. It will be interesting to see what the impact of this web disclosure strategy will be.

To promote female representation at the higher echelons of the firm, in recent years many countries have implemented female quotas or disclosure rules about diversity on the board of directors of firms on public stock exchanges. Short of calling for gender quotas, the Canadian

[35] There are many Swiss studies on the application of the policy but they do not go far enough to answer the questions of who gets the pay equality awards.

[36] Rather than been mandated by law makers, the Van Audenrode, Paradis, and Lafeuille (2008) study was sponsored by the "Ordre des conseillers en ressources humaines et en relations industrielles agrees" (ORHRI) of Quebec.

Securities Administrators of seven provinces and territories implemented "comply-or-explain" female representation rules on January 1, 2015 (CSA, 2015). These rules require companies listed on their stock exchanges to disclose how many women they have on their boards and in their executive ranks. A year later, many companies had shown bare "technical compliance" with the reporting rules, which was deemed "simply not good enough" by Howard Wetston, the Ontario Securities Commission chair (MacFarland, 2015).

Fortin, Bell, and Boehm (2017) study the impact of quotas and disclosure rules on female representation on board of directors and in senior management in a differences-in-differences framework. We consider the experience of a dozen of countries which had introduced regulatory quotas for female directors on corporate boards and of another seven countries who passed regulatory disclosure rules regarding the percentage of women at different levels of the organization.[37] The changes over time, from 2006 to 2014, in female shares of board members and senior management, were compared to similar changes in comparable countries.[38] The results showed that the board quotas were effective towards their intended objective of increasing the female representation on boards by about 40%, and that disclosure rules were half as effective.

On the other hand, we found no evidence of trickle-down effects of these policies on the share of women in senior management. Similarly using employer-employee data from Norway, an early adopter of quotas, Bertrand, Black, Jensen, and Lleras-Muney (2017) find that the quotas increased representation of women among the top five highest earners, but have no effect at other points in the distribution or on the gender pay gap. However, they found some support that the reform improved the labour market outcomes of young women with graduate business degrees in early career stages.

More research is needed on pro-active means to increase female representation at higher echelons. Beyond the hindering role of family responsibilities, on which there is much active research as pointed out earlier, a new research agenda on the impact of sexual harassment on the job as impediment has risen to prominence with the #MeToo movement. Studies of the impact of sexual harassment on women's ability to move up the ranks are still at an early stage. For example, Chen and Sethi (2018) show that previous clap down helps new entrants. If we are the dawn of a new Women's Revolution Movement, its benefits will accrue to next generation.

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[37] By 2014, a dozen of countries had implemented or were in the process of implementing board quotas: Australia, Austria, Belgium, Denmark, France, Greece, Israel, Italy, Malaysia, the Netherlands, Norway, and Spain. Seven countries, Finland, Hong Kong, Japan, New Zealand, Poland, Turkey, and the United Kingdom, has put in place disclosure rules.
[38] The countries included as controls were Canada, Chile, the Czech Republic, Egypt, Germany, Hungary, Indonesia, Ireland, Mexico, Morocco, Peru, Portugal, Philipines, Russia, Shanghai-China, South Africa, Sweden, Switzerland, Thailand, South Africa, and the United States. The analysis also included country-fixed effects.

Appendix -Tables

Table A1 - Regression-Compatible OB Decompositions of Gender Log Wage Differentials

	Model 1			Model 2		
	1997-99	2003-05	2014-16	1997-99	2003-05	2014-16
A, Quebec: Raw Log	19.184	16.614	10.618	19.184	16.614	10.618
Wage Gap (× 100)	(0.172)	(0.173)	(0.208)	(0.192)	(0.195)	(0.234)
Explained by:						
Centile Groupings				3.740	3.105	1.943
				(0.065)	(0.065)	(0.072)
Demographics	-0.123	-0.204	-0.209	-0.115	-0.108	-0.141
	(0.028)	(0.023)	(0.027)	(0.022)	(0.019)	(0.023)
Education	-0.524	-0.398	-0.455	-0.517	-0.439	-0.391
	(0.038)	(0.022)	(0.024)	(0.026)	(0.019)	(0.020)
Job Status	1.806	1.452	0.377	2.022	1.687	0.493
	(0.067)	(0.061)	(0.062)	(0.061)	(0.057)	(0.060)
Industry	1.528	1.940	2.086	1.359	1.612	1.547
	(0.086)	(0.096)	(0.127)	(0.074)	(0.085)	(0.111)
Occupation	0.871	-1.492	-1.503	1.063	-0.873	-0.800
	(0.139)	(0.160)	(0.195)	(0.122)	(0.137)	(0.169)
Total Explained	3.559	1.297	0.295	7.550	4.985	2.650
	(0.166)	(0.165)	(0.195)	(0.167)	(0.169)	(0.198)
Total Unexplained	15.626	15.317	10.323	11.634	11.629	7.968
	(0.209)	(0.210)	(0.246)	(0.182)	(0.185)	(0.216)
B. Ontario: Raw Log	21.790	20.512	14.998	21.790	20.512	14.998
Wage Gap (× 100)	(0.130)	(0.137)	(0.181)	(0.142)	(0.151)	(0.200)
Explained by:						
Centile Groupings				4.856	4.669	3.632
				(0.056)	(0.059)	(0.076)
Demographics	-0.073	-0.06	-0.119	-0.017	-0.004	-0.072
	(0.019)	(0.019)	(0.024)	(0.015)	(0.016)	(0.018)
Education	-0.177	-0.139	-0.278	-0.228	-0.176	-0.228
	(0.026)	(0.012)	(0.016)	(0.016)	(0.010)	(0.013)
Job Status	3.319	2.398	0.462	3.222	2.319	0.55
	(0.053)	(0.049)	(0.056)	(0.047)	(0.045)	(0.050)
Industry	1.606	1.500	1.595	0.835	0.911	0.792
	(0.066)	(0.076)	(0.100)	(0.056)	(0.064)	(0.085)
Occupation	1.589	2.397	1.441	2.036	2.715	1.942
	(0.102)	(0.120)	(0.157)	(0.086)	(0.098)	(0.130)
Total Explained	6.264	6.096	3.101	10.703	10.434	6.615
	(0.121)	(0.127)	(0.165)	(0.125)	(0.131)	(0.171)
Total Unexplained	15.526	14.417	11.897	11.086	10.079	8.384
	(0.151)	(0.161)	(0.207)	(0.129)	(0.136)	(0.175)

Note: Entries are the male-female differences in the explanatory variables multiplied by the corresponding pooler coefficients. Demographics include plus 8 age, 4 marital status, 5 children categories; education includes 7 education classes; job status include tenure, part-time and union coverage status; industry include 11 categories, and occupation 47 categories. Selected centiles are computed on Canadian real hourly wages grouping: bottom 90%, next 9%, next 0.9%, top 0.1%. Standard error are in parentheses.

Table A1 - Regression-Compatible OB Decompositions of Gender Log Wage Differentials

	Model 1			Model 2		
	1997-99	2003-05	2014-16	1997-99	2003-05	2014-16
C. BC Raw Log	22.220	18.747	18.860	22.22	18.747	18.86
Wage Gap (× 100)	(0.231)	(0.235)	(0.261)	(0.240)	(0.251)	(0.290)
Explained by:						
Centile Groupings				4.547	3.050	4.010
				(0.096)	(0.093)	(0.104)
Demographics	-0.098	0.040	0.015	-0.077	0.042	0.020
	(0.033)	(0.030)	(0.034)	(0.028)	(0.026)	(0.030)
Education	-0.162	-0.098	-0.059	-0.199	-0.153	-0.043
	(0.037)	(0.019)	(0.020)	(0.025)	(0.017)	(0.017)
Job Status	2.907	1.92	0.245	2.847	1.931	0.228
	(0.098)	(0.092)	(0.090)	(0.091)	(0.085)	(0.084)
Industry	1.041	0.568	2.337	0.672	0.162	1.531
	(0.122)	(0.126)	(0.155)	(0.106)	(0.110)	(0.135)
Occupation	3.489	2.446	4.636	4.058	3.316	4.481
	(0.185)	(0.200)	(0.243)	(0.161)	(0.170)	(0.211)
Total Explained	7.177	4.876	7.173	11.847	8.348	10.227
	(0.217)	(0.219)	(0.246)	(0.222)	(0.225)	(0.251)
Total Unexplained	15.043	13.871	11.687	10.373	10.399	8.633
	(0.265)	(0.274)	(0.322)	(0.231)	(0.241)	(0.282)
D. Other Provinces Raw	26.141	22.51	19.558	26.141	22.51	19.558
Log Wage Gap (× 100)	(0.136)	(0.138)	(0.170)	(0.132)	(0.133)	(0.160)
Explained by:						
Centile Groupings				4.728	4.268	5.178
				(0.043)	(0.047)	(0.063)
Demographics	-0.226	-0.275	-0.17	-0.137	-0.168	-0.075
	(0.018)	(0.017)	(0.018)	(0.016)	(0.014)	(0.014)
Education	-0.58	-0.494	-0.372	-0.597	-0.486	-0.281
	(0.024)	(0.014)	(0.016)	(0.018)	(0.012)	(0.012)
Job Status	1.779	0.902	-0.053	1.792	0.935	0.023
	(0.050)	(0.042)	(0.043)	(0.047)	(0.039)	(0.038)
Industry	3.425	3.696	4.41	2.571	2.566	2.447
	(0.073)	(0.080)	(0.106)	(0.065)	(0.068)	(0.084)
Occupation	3.229	2.668	4.708	3.505	3.287	5.301
	(0.107)	(0.119)	(0.149)	(0.097)	(0.100)	(0.121)
Total Explained	7.627	6.497	8.524	11.861	10.404	12.593
	(0.123)	(0.121)	(0.142)	(0.123)	(0.121)	(0.141)
Total Unexplained	18.514	16.013	11.035	14.28	12.106	6.965
	(0.151)	(0.151)	(0.185)	(0.134)	(0.130)	(0.150)

Note: Entries are the male-female differences in the explanatory variables multiplied by the corresponding pooler coefficients. Demographics include plus 8 age, 4 marital status, 5 children categories; education includes 7 education classes; job status include tenure, part-time and union coverage status; industry include 11 categories, and occupation 47 categories. Selected centiles are computed on Canadian real hourly wages grouping: bottom 90%, next 9%, next 0.9%, top 0.1%. Standard error are in parentheses.

References

Advisory, Conciliation and Arbitration Service (ACAS), 2017, Managing gender gap reporting. Government Equalities Office. London, UK. Accessed April 24, 2018. http://www.acas.org.uk/media/pdf/m/4/Managing_gender_pay_reporting_04_12_17.pdf

Adda, J., Dustmann, C., Stevens, K., 2017. The career costs of children. Journal of Political Economy, 125 (2), 293-337.

Albrecht, J., Björklund, A., Vroman, S., 2003. Is there a glass ceiling in Sweden? Journal of Labor Economics, 21(1), 145–177.

Angelov, N., Johansson, P., Lindahl, E., 2016. Parenthood and the gender gap in pay. Journal of Labor Economics, 34(3), 545–579.

Arulampalam, W., Booth, A. L., Bryan, M.L., 2007. Is there a glass ceiling over Europe? Exploring the gender pay gap across the wage distribution. Industrial & Labor Relations Review, 60(2), 163–186.

Bailey, M.J., 2006. More power to the pill: the impact of contraceptive freedom on women's life cycle labor supply. Quarterly Journal of Economics, 121(1), 289-320.

Baker, M., Drolet, M., 2010. A new view of the male/female pay gap. Canadian Public Policy, 36(4), 429–464.

Baker, M. Fortin, N.M., 1999. Women's wages in women's work: A US/Canada comparison of the roles of unions and" public goods" sector jobs. American Economic Review, 89(2), 198-203.

Baker, M. Fortin, N.M., 2001. Occupational gender composition and wages in Canada, 1987–1988. Canadian Journal of Economics, 34(2), 345-376.

Baker, M., Fortin, N.M., 2004. Comparable worth in a decentralized labour market: the case of Ontario. Canadian Journal of Economics. 37(4), 850–878.

Baker, M., Gruber, J., Milligan, K., 2008. Universal child care, maternal labor supply, and family well-being. Journal of Political Economy. 116(4), 709–745.

Beaudry, P., Green, D. A., 2000. Cohort patterns in Canadian earnings: assessing the role of skill premia in inequality trends. Canadian Journal of Economics, 33(4), 907-936.

Bertrand, M., Black, S.E., Jensen S., Lleras-Muney, A., 2017.Breaking the glass ceiling? The effect of board quotas on female labor market outcomes in Norway (No. w20256). National Bureau of Economic Research.

Blau, F.D., Kahn, L.M., 1992. The gender earnings gap: learning from international comparisons. American Economic Review, 82(2), 533-538.

Blau, F.D., Kahn, L.M., 1994. Rising wage inequality and the US gender gap. American

Economic Review, 84(2), 23-28.

Blau, F.D., Kahn, L. M., 1997. Swimming upstream: Trends in the gender wage differential in the 1980s. Journal of Labor Economics, 15(1), 1-42.

Blau, F. D., Kahn, L.M., 2017. The gender wage gap: Extent, trends, and explanations. Journal of Economic Literature, 55(3), 789-865.

Bonikowska, A., Drolet, M., Fortin, N.M., 2017. Earnings Inequality and the Gender Pay Gap in Canada: The Role of Women's Under-representation Among Top Earners. Mimeo prepared for Economic Insights, Statistics Canada.

Borjas, G.J., 1985. Assimilation, changes in cohort quality, and the earnings of immigrants. Journal of Labor Economics, 3(4), pp.463-489.

Canadian Securities Administrators (CSA). 2015. Multilateral staff notice 58-307: Staff review of women on boards and in executive officer positions – Compliance with NI 58-101 disclosure of corporate governance practice.

Card, D., Cardoso, A.R., Kline, P., 2016. Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women. Quarterly Journal of Economics. 131(2), 633–686.

Chicha, M.T., 2006. A comparative analysis of promoting pay equity: models and impacts. ILO.

Chiswick, B.R., 1978. The effect of Americanization on the earnings of foreign-born men. Journal of Political Economy, 86(5), 897-921.

Chen, D.L. and Sethi, J., 2018. Insiders and Outsiders: Does Forbidding Sexual Harassment Exacerbate Gender Inequality? Mimeo. Toulouse School of Economics.

Cortes, P., Pan, J., 2016. When Time Binds: Returns to Working Long Hours and the Gender Wage Gap among the Highly Skilled (No. 9846). IZA Discussion Papers.

Del Bono, E., Vuri, D., 2011. Job mobility and the gender wage gap in Italy. Labour Economics. 18(1), 130–142.

Felfe, C., Trageser, J. and Iten, R., 2015. Etude des analyses appliquées par la Confédération pour évaluer l'égalité des salaires entre femmes et hommes. Bureau fédéral de l'égalité entre femmes et hommes. Zurich, Switzerland.

Fernández-Kranz, D., Rodríguez-Planas, N., 2011. The part-time pay penalty in a segmented labor market. Labour Economics. 18(5): 591–606.

Fitzenberger, B., Sommerfeld, K., Steffes, S., 2013. Causal effects on employment after first birth — A dynamic treatment approach. Labour Economics. 25, 49–62.

Fortin, N.M., 2008. The gender wage gap among young adults in the United States the importance of money versus people. Journal of Human Resources, 43(4): 884–918.

Fortin, N. M., 2015. Gender Role Attitudes and Women's Labor Market Participation: Opting-Out, AIDS, and the Persistent Appeal of Housewifery," Annals of Economics and Statistics, 117-118, Special Issue on the Economics of Gender, 379-401.

Fortin, N.M., Lemieux, T., 2000. Are women's wage gains men's losses? A distributional test. American Economic Review, 90(5), 456–460.

Fortin, N.M., Lemieux, T., 2015. Changes in wage inequality in Canada: An interprovincial perspective. Canadian Journal of Economics, 48(2,: 682-713.

Fortin, N.M., Lemieux, T., Firpo, S. 2011. Decomposition Methods, in O. Ashenfelter and D. Card (eds.) Handbook of Labor Economics, Vol. 4A, Amsterdam: North-Holland, Chap. 1, 1–102.

Frühwirth-Schnatter, S., Pamminger, C., Weber, A., Winter-Ebmer, R., 2014. When is the best time to give birth – Career effects of early birth decisions (No. 10132). CEPR Discussion Papers.

Goldin, C., 2014. A grand gender convergence: Its last chapter. American Economic Review, 104(4), 1091–1119.

Goldin, C., Katz, L.F., 2002. The power of the Pill: Oral contraceptives and women's career and marriage decisions. Journal of Political Economy, 110(4), 730-770.

Goldin, C., Katz, L.F., Kuziemko, I. 2006. "The homecoming of American college women: The reversal of the college gender gap." Journal of Economic Perspectives, 20(4): 133-156.

Goldin, C., Mitchell, J. 2016. The New Lifecycle of Women's Employment: Disappearing Humps, Sagging Middles, Expanding Tops, NBER Working Papers 22913, National Bureau of Economic Research, Inc.

Groshen, E.L., 1991. The structure of the female/male wage differential: Is it who you are, what you do, or where you work? Journal of Human Resources, 26(3), 457-472.

Haeck, C., Lefebvre, P. and Merrigan, P., 2015. Canadian evidence on ten years of universal preschool policies: The good and the bad. Labour Economics, 36(October), 137-157.

Karimi, A., Hotz, V.J., Johansson, P., 2016. Family friendly firms? Worker mobility, firm attributes and wage trajectories of women and men. Discussion Paper.

Kleven, H.J., Landais, C., Sogaard, J.E., 2016. Children and gender inequality: Evidence from Denmark. Discussion paper, London School of Economics.

Kuhn, Peter, and Fernando Lozano (2008) "The Expanding Workweek? Understanding Trends in Long Work Hours among US men, 1979-2004." Journal of Labor Economics, 2008, 26(2): 311-343.

Lefebvre, P. and Merrigan, P. 2008. Child-care policy and the labor supply of mothers with young children: a natural experiment from Canada. Journal of Labor Economics, 26(3), 519–548.

Lucifora, C., Meurs, D., and Villarz, E. (2017) Children, Earnings and Careers in an Internal

Labor Market. An Event Study. Paper presented at SOLE 2018.

Macpherson, D.A. and Hirsch, B.T., 1995. Wages and gender composition: why do women's jobs pay less?. Journal of Labor Economics, 13(3):.426-471.

MacFarland, Janet (2015) "OSC Rebukes Firms for Lack of Action on Gender-Diversity Rules," The Globe and Mail, June 16 2015.

Mincer, J., Polachek, S. 1974. Family investments in human capital: Earnings of women. Journal of Political Economy, 82(2, Part 2), 76–110.

Mulligan, C.B., Rubinstein, Y., 2008. Selection, investment, and women's relative wages over time. Quarterly Journal of Economics, 123(3), 1061-1110.

Piketty, T., Saez, E., 2003. Income Inequality in the United States, 1913–1998. Quarterly Journal of Economics, 118 (1): 1–41.

Piketty, T., Saez, E., 2013. Top incomes and the great recession: Recent evolutions and policy implications. IMF Economic Review, 61(3), 456–478.

Saez, E. Veall, M.R., 2005. The evolution of high incomes in Northern America: lessons from Canadian evidence. American Economic Review, 95(3), 831-849.

Schirle, T., 2015. The gender wage gap in the Canadian provinces, 1997–2014. Canadian Public Policy, 41(4), 309-319.

Statistics Canada. 2017. High-income trends among Canadian tax filers, 2015. The Daily, November 15, 2017.

Vaccaro, G., 2016. Using econometrics to reduce gender discrimination: Evidence from a Regression Discontinuity Design.

Audenrode, M.C., Paradis, P.E., Lafeuille, M.-H. 2008. Analyse de l'impact économique de la loi sur l'équité salariale, Groupe Analyse : Montreal.

White, R. 2018. There and Back Again – The performance evaluation effects of going to and returning from part-time status, Paper presented at SOLE 2018.

Wilde, E.T., Batchelder, L. Ellwood, D.T., 2010. The mommy track divides: The impact of childbearing on wages of women of differing skill levels (No. w16582). National Bureau of Economic Research.