

## “COERCIVE COOPERATION”? ONTARIO’S PAY EQUITY ACT OF 1988 AND THE GENDER PAY GAP

JUDITH A. MCDONALD and ROBERT J. THORNTON\*

*Evaluating the effect of pay-equity laws is important and yet difficult as one needs to deduce what would have occurred without the policy intervention. We use a new tool, synthetic-control method, to examine the effects of Ontario’s Pay Equity Act on the gender pay gap. This tool enables us to create a “Synthetic” Ontario, which resembles Ontario more closely than does any other single province. Using Synthetic Ontario to compare what actually happened in Ontario to what would have happened, we find that the act has had little or no effect on the female-male wage gap in Ontario. (JEL J7, J3)*

### I. INTRODUCTION

Many laws are coercive: they mandate behavior that might not be forthcoming in the absence of a legal requirement. But some coercive laws also require cooperation: they require an individual to engage in a complex task that can be completed successfully only with the individual’s active, even enthusiastic, cooperation. But might a law that mandates enthusiastic cooperation be ineffective if it is able to elicit only grudging cooperation? “They pretend to pay us, so we pretend to work,” said a member of Solidarity about Poland’s then-communist government. Ontario’s Pay Equity Act of 1988 mandated employers to overhaul their job evaluation systems. To the extent that employers, especially small-to-medium size firms, found these laws not only cumbersome but also very costly to follow, their cooperation was often reluctant at best and researchers have found high levels of noncompliance (see, e.g., McDonald and Thornton 1998). Thus, Ontario’s Pay Equity Act provides a nice example of the ways in which a law that counts on cooperative compliance may ultimately fail.<sup>1</sup>

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*McDonald:* Professor, Department of Economics, Lehigh University, Bethlehem, PA 18015. Phone 610-758-5345, Fax 610-758-4677, E-mail djm0@lehigh.edu

*Thornton:* Professor, Department of Economics, Lehigh University, Bethlehem, PA 18015. Phone 610-758-3460, Fax 610-758-4677, E-mail rjt1@lehigh.edu

1. Note that “pay equity” is the phrase used in Canada when referring to policies that attempt to equalize the pay for men and women for “work of equal value.” “Comparable worth” is the phrase commonly used in the United States, and

Evaluation of policy interventions like Ontario’s can be difficult because what is needed is a counterfactual—a way to deduce what would have occurred without this particular intervention. In addition, the data available to study these interventions tend to be aggregate-level data (at the province or state level), rather than individual-level data. To deduce the effectiveness of a policy intervention, traditionally these data have simply been eyeballed, which is not very satisfactory as no one province is much like Ontario. Moreover, any subsequent changes in the gender pay gap in Ontario may not necessarily be due to the act itself. What is therefore needed is a counterfactual: what would have happened to the wage gap in Ontario if the act hadn’t been passed? To answer this question, we use a recently proposed methodology, a synthetic-control method (“Synth”), developed by Abadie and Gardeazabal (2003) and Abadie, Diamond, and Hainmueller (2010).<sup>2</sup> Synth builds a “Synthetic Ontario” using relevant characteristics of British Columbia (given a weight of 64%), Alberta (weighted by 20%),

elsewhere in the world “equal pay for work of equal value” is most often used.

2. Synth is a package that is available in the computer language R (2012), available online at <http://www.r-project.org/>.

#### ABBREVIATIONS

NDP: New Democratic Party  
 OECD: Organisation for Economic Co-operation and Development  
 PSECA: Public Sector Equitable Compensation Act  
 Synth: Synthetic-Control Method

and Manitoba (weighted by 16%). Thus, our “Synthetic Ontario” resembles Ontario far more closely than does any other single province in the years prior to the act, but it did not implement Ontario’s Pay Equity Act.

Because pay equity continues to be a hotly debated issue, it is important to ascertain whether Ontario’s law has had any effect. As Briscoe (2009, 3) put it: “[T]he battle for gender pay equality provokes strong emotions but there is an absence of hard data to match the hard feelings on either side of the debate.”<sup>3</sup> Synth represents an important new way of doing the best we can with the data we have; it is a critical first step toward the sorts of “hard-headed” program evaluations first proposed by Campbell (1969). In the following sections, we first present an overview of the differences among the provinces in their pay-equity laws, after which we turn to recent pay-equity developments in Ontario. We then evaluate two papers in which traditional methodologies have been used to deduce whether pay equity has had an effect on the gender pay gap, first for Canada overall and then in Ontario. We next present our findings for Ontario using synthetic-control methods.

## II. PAY EQUITY IN CANADA

Canada has been called a world leader in comparable worth, having the “most extensive pay-equity legislation in the world.”<sup>4</sup> However, as Table 1 shows, in Canada as a whole over the past decade the trend in the female-male earnings ratio has risen only slightly, from 62.8% in 2002 to 66.7% in 2011, with a jump up to 68.6% in 2009.<sup>5</sup> But was this (rather modest) shrinkage of the average gender pay gap in Canada due to pay-equity laws? Federal equal-pay legislation, embedded in the Canadian Human Rights Act, means that all Canadians are covered by “complaint-based” pay-equity laws, with female employees bearing the burden of proving that they were underpaid. Similar human rights provisions also cover the Yukon, the Northwest Territories, and Nunavut (Canadian Labour Congress

3. For example, there were 48 responses of varying views to the *Maclean’s* article written by Wherry (2009).

4. See, for example, Weiner and Gunderson (1990). The quotation is from Baker and Fortin (2001, 346).

5. Drolet (2011) attributes the narrowing of the wage gap in 2009 to several factors, including an increase of about 2 years in the average job tenure for women over the period 1978–2008; and an increase in the proportion of women with a university degree from 15.7% in 1990 to 29.3% in 2008.

**TABLE 1**  
Average Earnings by Gender in Canada,  
2002–2011

Year	Women (\$)	Men (\$)	Female-Male Earnings Ratio (%)
2002	29,300	46,700	62.8
2003	29,000	46,000	62.9
2004	29,400	46,200	63.5
2005	30,000	46,900	64.0
2006	30,500	47,100	64.7
2007	31,300	47,800	65.5
2008	31,700	49,300	64.3
2009	32,600	47,400	68.6
2010	32,600	47,800	68.1
2011	32,100	48,100	66.7

*Notes:* Data are provided in constant 2011 dollars for all earners; full-year, full-time.

*Source:* Statistics Canada (2013, CANSIM, Table 202-0102).

2008, 14–15).<sup>6</sup> However, Tables 2–4 show that individual Canadian provinces have taken very different approaches to pay equity.

As shown in Table 2, six provinces have pay-equity laws that are “proactive,” meaning that employers are responsible for basing pay levels on comparable-worth principles. To do so, employers are required to evaluate, without bias, jobs held mainly by women and men and to pay equal wages and benefits for jobs deemed comparable. Ontario’s act, passed in 1988, was the most ambitious as it covered both the public and private sectors, whereas the acts passed in Manitoba (1985), Nova Scotia (1989), and Prince Edward Island (1988) covered only the public sectors and did not require that pay equity be “maintained.” Maintaining pay equity meant that once a pay-equity comparison was complete, incumbents in every female job class must receive the same increases given to those in the male comparator job class. It also meant that these comparisons must be made for new female job classes using the same comparison system that had been used for other job classes in the establishment (Pay Equity Commission 2008, 8). In 1996, Quebec enacted a law very similar to Ontario’s; however, payouts were not required to be made until 2001. Up until 2009, only Ontario and Quebec required

6. During March 2009 Prime Minister Stephen Harper’s Conservative government passed into law the Public Sector Equitable Compensation Act (PSECA) as part of a bill that also contained the 2009 federal budget and economic stimulus measures. The PSECA was very controversial; critics argued that the PSECA would effectively “gut” the right to equality in the workplace.

**TABLE 2**  
Pay-Equity Laws in Canada: Proactive Pay-Equity Laws

Where	Who's Covered	Date of Pay Equity Act (PEA) <sup>a</sup>	Pay-Equity Payout Deadlines	Union Pay-Equity Role	Pay-Equity Agency	Must Maintain Pay Equity
Ontario	Public and private sector	1988	1990–1994*	Yes	Yes	Yes
Quebec	Public and private sector	1996	2001	Yes	Yes	Yes
Manitoba	Public sector only	1985	1987	Yes	Yes	No
New Brunswick	Government employees only	1989 <sup>b</sup>		Yes	Yes	Yes under new PEA
Nova Scotia	Public sector	1989		Yes	Yes	No
PEI	Public Sector	1988		Yes	Yes	No

*Notes:* \*See Table 1 in Baker and Fortin (2004, 855) for the different deadline dates for different-sized private-sector firms; all public-sector employers faced a 1990 deadline.

<sup>a</sup>From Young (2002, 38).

<sup>b</sup>PEA 2009 replaced the 1989 PEA that was repealed on April 1, 2010 (Pay Equity Commission 2013a).

*Sources:* Canadian Labour Congress (2008) and Pay Equity Commission (2013a).

**TABLE 3**  
Pay-Equity Laws in Canada: Complaint-Based Pay-Equity Laws

Where	Who's Covered	Union Role	Pay-Equity Agency	Must Maintain Pay Equity
Canada (Federal)	Public and private sector	Support individuals	No—under Canadian Human Rights Act	No
NWT	Public and private sector	Support individuals	No—under Northwest Territories Human Rights Act	No
Nunavut	Public and private sector	Support individuals	No—under Northwest Territories Human Rights Act Drafting a New Public Services Act	No
Yukon	Public and private sector	Support individuals	No—under Yukon Human Rights Act	No

*Sources:* Canadian Labour Congress (2008) and Pay Equity Commission (2013a).

**TABLE 4**  
Pay-Equity Laws in Canada: No Pay-Equity Law

Where	What
British Columbia	Public Sector Employers' Council Pay Equity Policy Framework and government encouraged voluntary pay equity
Saskatchewan	Government Equal Pay for Work of Equal Value and Pay Equity Framework
Alberta Newfoundland and Labrador	No legislation—no policy Pay-equity negotiations with public sector unions

*Sources:* Canadian Labour Congress (2008) and Pay Equity Commission (2013a).

that pay equity be maintained. After repealing its 1989 pay-equity act, New Brunswick's Pay Equity Act 2009 required that pay equity be maintained, but it covers only public-sector employers with ten or more employees (Pay Equity Commission 2013a).

As shown in Table 4, four provinces have no pay-equity law at all. In March 2001, British

Columbia's New Democratic Party (NDP) government enacted complaints-based pay-equity legislation, but during August of that same year, the newly elected B.C. Liberal government repealed this legislation. At the present time, British Columbia still does not have a pay-equity law. In addition to British Columbia, Newfoundland and Labrador, Alberta, and Saskatchewan adopted limited "nonlegislative approaches" to pay equity (Pay Equity Task Force 2004, 72); currently, these provinces still have no legislation at all governing equal pay for work of equal value.

The sentiment behind legislation matters, but so do its effects. It is therefore important to ascertain what Ontario's Pay Equity Act did. Did the act have its intended effects? Did it have unintended effects?

### III. PAY EQUITY IN ONTARIO

On January 1, 1988, Ontario introduced the most comprehensive comparable-worth or "pay-equity" legislation in North America, if not the

world. Ontario's act was significant in several respects: it included not only the public sector but all private-sector employers with at least ten employees as well; it was proactive, rather than complaints-based. The act required employers to

*... us[e] a gender-neutral comparison system, compare the female job classes in each establishment ... with the male job classes in the same establishment to determine whether pay equity exists for each female job class ... Documents, to be known as pay equity plans, shall be prepared ... to provide for pay equity for the female job classes in each establishment of every employer ... and shall identify all job classes which formed the basis of the comparisons ... If both female job classes and male job classes exist in an establishment, every pay equity plan for the establishment shall describe the gender-neutral comparison system used ... shall set out the results of the comparisons carried out ... shall identify all positions and job classes in which differences in compensation are permitted by subsection 8 (1) or (3) and give the reasons for relying on such subsection; shall, with respect to all female job classes for which pay equity does not exist according to the comparisons under section 12, describe how the compensation in those job classes will be adjusted to achieve pay equity ... (Ontario 2013)*

That is, all employers were required to develop a pay-equity plan or plans, determine male and female job classes, implement a "gender-neutral" job evaluation system, and compare the compensation of female and male job classes of similar value to determine the adjustments needed to attain pay equity. (For more details, see Pay Equity Commission 2013b.)

The female-male pay gap in Ontario has fallen from 35% in 1988 to 21% in 2009 (Statistics Canada 2013). But to what extent has the act itself been responsible for the reduction in the gap? Table 5 provides the female-male earnings ratios for full-year, full-time workers in Ontario and all the other Canadian provinces over the period 1988–2005. It is interesting to note that despite having ostensibly the most aggressive pay-equity legislation in Canada, as of 2005 Ontario's gender pay gap (29.6%) is the third largest. Only Alberta, with a gap of 35.7%, and Newfoundland and Labrador, with a gap of 34.6%, have larger pay gaps; and as noted in the previous section, neither of these provinces have pay-equity laws.

McDonald and Thornton (1998) conducted a small survey of private firms in Ontario and found that 10 years after the act's passage both the magnitude and the scope of pay-equity adjustments were rather modest. In 10 of the 27 interviews they conducted, examples of noncompliance or manipulation of some of the requirements of

the act were clear. One employer said that he had increased the pool of employees so that it would be possible to find a man who was paid less, thus obviating the need for adjustments. Another employer said there was so much costly paperwork required that the attitude eventually became one of doing only the bare minimum. He also said that one could "massage" the data to obtain desired results; indeed, at a course he had taken to learn about pay-equity implementation, the instructor encouraged data manipulation to avoid pay-equity adjustments as long as they would have been small. Baker and Fortin (2004) also found that there were substantial lapses in pay-equity compliance among smaller firms in Ontario where the majority of men (60%) and women (67%) work.

In what sense was it hard to evaluate whether cooperation was given and hence easy to shirk? Firms were expected to comply with the requirements of the act, but they were not required to submit any evidence of compliance. Enforcement was very spotty; it consisted of "randomly monitor[ing] the preparation and implementation of pay equity plans and processes." Since the early 1990s, the Ontario government has reduced the budget of the Pay Equity Commission and Hearings Tribunal by half, further reducing the government's ability to enforce the act and thus necessitating an even greater need for employers' cooperation.<sup>7</sup> Cornish and Faraday (2008) point out that the commission's failure to undertake a strong enforcement role has "encouraged employers to believe they can get away with violating the law." Given that there was very little enforcement, the act in effect required cooperation on the part of employers.

#### IV. TWO STUDIES OF THE EFFECTS OF PAY EQUITY IN CANADA

There have been several studies that use controls to deduce the effects of pay equity in a

7. As noted by Cornish (2008, 3), "By 2006, [the] combined budgets [of the Pay Equity Commission and Tribunal] had fallen to just \$3.4 million—one half of the 1992–93 budget. Today, there are only 32 employees and 16 review officers to cover the entire province." Cornish and Faraday (2008) point out that some women who had initially benefited subsequently lost the gains they had made because of "all the labour-market changes since the 1990s." They also note that "[w]orkers in the female-dominated broader public sector, such as in child-care centres and community agencies, were owed more than \$150 million [as of 2008], with millions more owed in future years because after 2005 the government failed to continue pay equity funding awarded following a Charter [the Canadian Charter of Rights and Freedoms] legal challenge."

TABLE 5

Female-Male Average Earnings Ratio for Full-Year, Full-Time Workers in Ontario, Other Provinces, and Synthetic Ontario, 1988–2005

Year	Ontario	Alberta	New Brunswick	British Columbia	Nova Scotia	Newfoundland	Quebec	Saskatchewan	Manitoba	Prince Edward Island	Median
1988	<b>64.6</b>	65.2	69.5	61.2	64.0	74.4	65.9	68.0	68.9	71.4	67.0
1989	<b>67.4</b>	66.5	62.3	62.6	66.0	70.5	62.8	73.2	64.7	74.8	66.3
1990	<b>64.9</b>	65.7	66.3	67.1	69.8	72.0	68.0	75.0	70.8	77.9	68.9
1991	<b>68.1</b>	64.6	65.1	69.2	66.5	73.6	69.7	69.2	75.4	82.3	69.2
1992	<b>69.5</b>	69.9	68.9	68.2	67.9	66.9	72.8	72.7	71.6	78.8	69.7
1993	<b>72.6</b>	66.5	61.2	67.6	67.5	71.0	72.8	77.0	73.5	82.8	71.8
1994	<b>68.2</b>	66.9	63.5	68.4	70.7	67.9	69.1	68.1	71.7	78.5	68.3
1995	<b>72.6</b>	70.8	64.2	72.4	69.0	66.9	74.5	69.5	69.2	76.5	70.2
1996	<b>74.9</b>	64.7	68.4	70.8	74.0	71.0	71.8	71.5	77.2	72.3	71.7
1997	<b>69.4</b>	60.8	67.9	69.4	70.9	71.6	68.4	69.2	74.8	74.1	69.4
1998	<b>71.9</b>	67.5	69.5	74.2	70.2	74.1	72.7	76.2	73.5	72.6	72.7
1999	<b>66.1</b>	64.6	69.5	63.3	72.9	67.7	74.8	77.9	78.8	83.0	71.2
2000	<b>67.4</b>	65.6	70.9	67.7	69.4	73.4	79.4	75.7	82.1	83.2	72.2
2001	<b>67.0</b>	62.6	69.2	69.6	69.4	67.9	78.9	72.3	78.8	86.2	69.5
2002	<b>68.4</b>	64.6	70.7	71.8	68.0	69.1	75.5	73.6	79.0	73.2	71.3
2003	<b>69.3</b>	61.7	71.2	69.7	68.2	67.0	76.3	78.9	76.4	82.4	70.5
2004	<b>67.3</b>	63.6	72.4	76.0	69.3	60.5	75.3	77.4	77.9	82.4	73.9
2005	<b>70.4</b>	64.3	73.2	74.1	70.7	65.4	71.6	74.9	75.8	86.2	72.4
Median	<b>68.3</b>	65.0	69.1	69.3	69.4	69.8	72.8	73.4	75.1	78.7	70.3

Year	Ontario (1)	Synthetic Ontario (2)	(1) – (2)
1988	<b>64.6</b>	63.3	1.3
1989	<b>67.4</b>	63.7	3.7
1990	<b>64.9</b>	67.5	-2.5
1991	<b>68.1</b>	69.3	-1.2
1992	<b>69.5</b>	69.1	0.4
1993	<b>72.6</b>	68.4	4.2
1994	<b>68.2</b>	68.7	-0.5
1995	<b>72.6</b>	71.6	1.0
1996	<b>74.9</b>	70.7	4.2
1997	<b>69.4</b>	68.6	0.8
1998	<b>71.9</b>	72.8	-0.9
1999	<b>66.1</b>	66.2	-0.1
2000	<b>67.4</b>	69.7	-2.3
2001	<b>67.0</b>	69.8	-2.8
2002	<b>68.4</b>	71.6	-3.2
2003	<b>69.3</b>	69.3	0.0
2004	<b>67.3</b>	73.9	-6.6
2005	<b>70.4</b>	72.5	-2.1
Median	<b>68.3</b>	69.3	-0.3

Notes: Ontario is followed by all the other provinces in an order that reflects their median earnings ratios. Synthetic Ontario = 16.8% Manitoba + 19.4% Alberta + 63.8% British Columbia.

Sources: All data except for "synth" are from Statistics Canada (2009). "Synth" data are from authors' calculations, using "Synth" program in R. Data are in constant 2005 dollars.

certain jurisdiction. However, to our knowledge, all such prior analyses either involve a single best comparison (e.g., Quebec) when such a comparison may not be satisfactory, or researchers use traditional regression methodologies that are not able to deduce the effect of the act in Ontario—that is, to answer the question what would have happened in Ontario if the act had not been passed. Here, we summarize two studies that do an otherwise excellent job using single controls in an attempt to deduce the efficacy of pay-equity laws.

Drolet and Mumford (2009) investigate the gender pay gap for private-sector employees in Canada with linked employee-employer data using Britain as a control. During the period under study (2003–2004), macroeconomic conditions were comparable in Canada and Britain (Drolet and Mumford 2009, 7). They also note that Canada and Britain share common legal and cultural roots, similar trade union membership and collective agreement rates, and that minimum-wage legislation covers low-wage workers in both countries (Drolet and Mumford

2009, 3); however, the two countries differ in their adoption of comparable-worth principles in wage legislation.<sup>8</sup> By using linked employee-employer data for international comparisons, Drolet and Mumford control for many of the unobservable institutional factors that might affect wages.

Drolet and Mumford's most critical finding is that pay differences between men and women in the private-sector economy are "similar, substantial and significant" in both Canada and Britain. This finding implies that Canada's more aggressive pay-equity policies have not worked to narrow the gender pay gap. They also find that workplace segregation accounts for more than half of the adjusted earnings differential for older women in both countries. Furthermore, they find that women enjoy a higher within-workplace wage premium in Canada, which results in the gender pay gap being lower. In Britain, the situation is reversed: men receive a higher within-workplace wage premium, which increases the gender earnings gap (Drolet and Mumford 2009, 23).<sup>9</sup>

The second study that we summarize is by Baker and Fortin (2004), who compare wages in Ontario before and after the Pay Equity Act was introduced.<sup>10</sup> They argue that Quebec serves as a good control for Ontario because, even though Quebec did have comparable-worth provisions, they were little used. Also, there were

8. Drolet and Mumford note, however, that the British experience is unique in several respects. First, of the Organisation for Economic Co-operation and Development (OECD) member countries, Britain has the second highest proportion of part-time workers among women, whereas in Canada the proportion of women working part time is close to the OECD average. Second, the relative position of British women working part time has not improved much, which is very different from the Canadian experience. Also, gender differences in higher levels of educational attainment are more common among mature workers in Britain (Drolet and Mumford 2009, 9).

9. For their linked employee and workplace-level data set, Drolet and Mumford use decomposition techniques to break down gender wage differences to differences in workplace-specific fixed effects and to differences in personal attributes (including human capital). They find that some workplaces pay different wage premiums to their male and female workers, differences that could result from factors such as a union presence in the workplace, the existence of equal opportunity policies in the workplace, and the like.

10. They note that "to effectively difference out other changes in the economic environment that were co-incident with the implementation of the law, the control jurisdiction must be a good match for Ontario in all dimensions except the evolution of pay equity legislation. Our choice is workers in the province of Quebec. This adjacent province is most comparable to Ontario in both population and economic activity" (p. 862).

no important relevant pay-equity initiatives in Quebec during the period of interest. They do note, however, that there are some important differences among workers in Ontario and Quebec. For example, Quebec's unionization rate is higher than Ontario's (by approximately 10 percentage points).<sup>11</sup> They conclude that Ontario's pay-equity law seems to have had no effect on aggregate wages in female jobs or on the gender wage gap.

However, it is not clear that Quebec is indeed the best "comparator" for Ontario. For example, although Baker and Fortin claim that Ontario and Quebec have comparable levels of "economic activity," during 1997, after Ontario's Pay Equity Act had been in effect for 10 years, Quebec's unemployment rate was 11.4% compared to Ontario's 8.4%.<sup>12</sup> In addition, real GDP per capita "before the law," 1987–1988, was \$23,862 in Quebec and \$30,699 in Ontario, whereas "after the law," 1997–1998, it was \$25,902 in Quebec and \$32,004 in Ontario. Unemployment rates were also quite different in the two provinces: during 1987, Quebec's unemployment rate was 10.2% whereas Ontario's was 6.1%. We show later that in fact there are many other provinces that were more similar to Ontario than was Quebec with respect to GDP per capita just before the passage of the Pay Equity Act, that is, over the period 1981–1987.

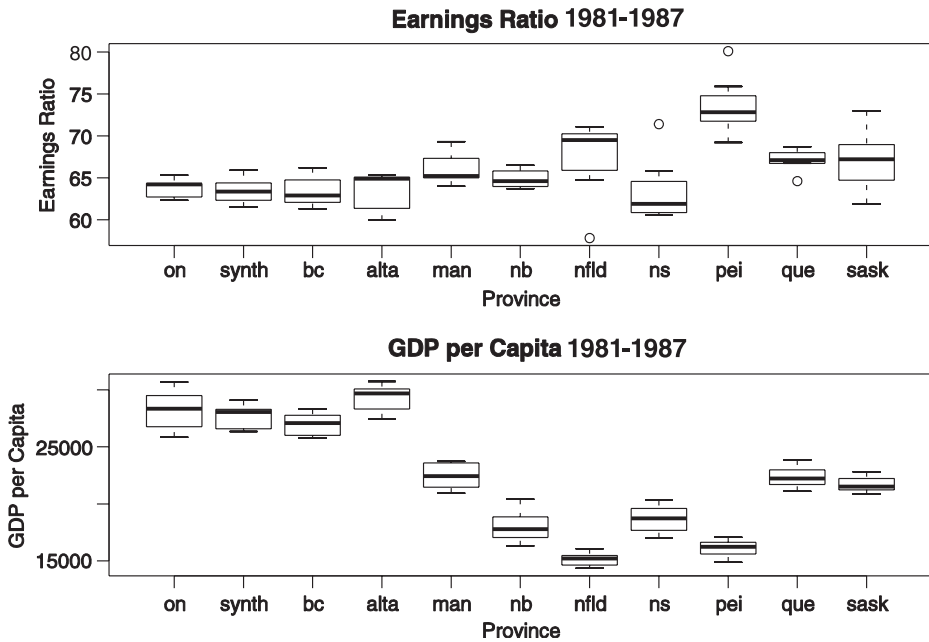
In any case, as both Drolet-Mumford and Baker-Fortin admit, their single controls are imperfect. Therefore, with what other Canadian province or provinces should a comparison be made? The problem is that *no* other Canadian province closely resembles Ontario. What is needed is some *combination* of provinces that will provide a better comparison for Ontario than any single province or country can. This is what we do in the next section when we use data-driven procedures to construct a suitable comparison for Ontario. Our "synthetic" control consists of several provinces that are chosen objectively by means of an optimizing algorithm. As we show, the weighted average of the several provinces that the Synth program constructs is more similar to Ontario than is any single

11. Also there is a greater growth of educational attainment in Quebec, as measured by the percentage of the population with university degrees. For example, the proportion of men with a university degree in Ontario rises from 0.183 in 1987–1988 to 0.202 in 1997–1998, whereas for men in Quebec the comparable figures are 0.147 and 0.187 (p. 865).

12. The unemployment data are from Statistics Canada, Table 42. The real GDP per capita data are from Table 41.

**FIGURE 1**

Ontario Compared to Synthetic Ontario and Each Province, Prior to Ontario’s Pay Equity Act in 1988



*Notes:* bc, British Columbia; alta, Alberta; man, Manitoba; nb, New Brunswick; nfld, Newfoundland; ns, Nova Scotia; pei, Prince Edward Island; que, Quebec; and sask, Saskatchewan. The “o’s” in the Earnings Ratio boxplots represent outliers.

*Sources:* All data except for “synth” are from Statistics Canada (2009). “Synth” data are from authors’ calculations, using “Synth” program in R. Data are in constant 2005 dollars.

province.<sup>13</sup> And, because synthetic-control techniques perform an objective optimization, they are an improvement over current practices.

V. SYNTHETIC-CONTROL METHODS: BUILDING AN ONTARIO WITHOUT A PAY-EQUITY LAW

In order to estimate accurately the effect that Ontario’s Pay Equity Act has had on the gender pay gap, one needs to answer the following question: What would have happened to the gender pay gap in Ontario if the act had *not* been passed?<sup>14</sup> In practice, finding the correct control (comparison) is not easy to do. Ideally, such a control would be identical in every way to Ontario except that it did *not* pass any pay-equity legislation; that is, the control would proxy for

what would have happened in the “counterfactual Ontario,” the one without pay equity. Researchers typically use their personal judgment to choose the best such control for comparison. However, as we have already noted, no province in Canada closely resembles Ontario.

Figure 1 compares Ontario to the other nine provinces prior to the introduction of the Pay Equity Act in Ontario in 1988 using boxplots. Prior to 1988, the male-female earnings ratio was higher in Quebec and lower in British Columbia than in Ontario, so neither Quebec nor British Columbia alone is a suitable control for Ontario. Prior to 1988, only Alberta had a higher GDP per capita than Ontario.

The program “Synth,” which is available in the computer language R, builds a Synthetic Ontario from the other provinces; that is, it chooses the best control objectively. Using aggregate provincial data on all Canadian provinces over the period 1981–1987 (before the policy intervention, Ontario’s Pay Equity Act), we used Synth to construct a synthetic control for Ontario. Synth picks nonnegative weights to attach to control

13. Admittedly, there is no perfect comparison for Ontario, and Synth, just as with regression, cannot control for effects that cannot be measured.

14. Throughout this article, we define the pay gap as 1 minus wages of females/wages of males, which is the wages of males minus the wages of females divided by the wages of males.

provinces so that Synthetic Ontario resembles actual Ontario as closely as possible with respect to several important time-series variables measured prior to the start of the Ontario Pay Equity Act in 1988. The aggregate or province-level data that we use to find the optimal synthetic control for Ontario are (1) real GDP per capita, (2) the unemployment rate, and (3) the female-male earnings ratio during the pretreatment years, 1981–1987.

Following Abadie and Gardeazabal (2003), there are nine available control provinces—the Canadian provinces that remain when Ontario is excluded. Let the “treated unit” be Ontario; the treatment is the policy intervention in 1988, the Pay Equity Act. Let  $\mathbf{W} = (w_1, \dots, w_9)$  be a  $(9 \times 1)$  vector of nonnegative weights that sum to one. Note that each different set of weights (or different value for  $\mathbf{W}$ ) produces a different Synthetic Ontario. The weights are chosen so that Synthetic Ontario most closely resembles the actual Ontario before the Pay Equity Act is implemented in 1988. All provinces are observed annually at the same time,  $t = 1981, \dots, 2005$ . The treated unit, Ontario, is exposed to the treatment (the Pay Equity Act) at time  $T_0$  (1988), where  $1981 < T_0 < 2005$ . Let  $\mathbf{X}_1$  be a  $(K \times 1)$  vector of pre-1988 values of relevant economic variables for Ontario and  $\mathbf{X}_0$  be a  $(K \times 9)$  matrix that contains the values of the same variables for the nine possible control provinces. Note that preintervention characteristics in  $\mathbf{X}_1$  and  $\mathbf{X}_0$  may include preintervention values of the outcome variable, the female-male earnings ratio. Thus,  $(\mathbf{X}_1 - \mathbf{X}_0 \mathbf{W})$  represents the difference between the preintervention characteristics of Ontario and a synthetic control for Ontario; the program Synth chooses those weights in  $\mathbf{W}$  that minimize the size of this difference. In other words, Synth minimizes the difference between Ontario and all the other provinces for the female-male earnings ratio and two variables that describe the provinces: real GDP per capita and unemployment rates. That is, Synth finds the best set of comparator provinces for Ontario. The resulting “Synthetic Ontario” is a weighted combination of British Columbia, Alberta, and Manitoba with weights of 0.638 for British Columbia, 0.194 for Alberta, and 0.168 for Manitoba.<sup>15</sup>

15. When control provinces were restricted to those that did not pass pay-equity laws—Newfoundland, Saskatchewan, Alberta, and British Columbia—the weights assigned to British Columbia and Alberta both increased (from 0.638 in unrestricted case to 0.693 for British Columbia and from 0.194 to 0.282 for Alberta). Neither Newfoundland

nor Saskatchewan were controls in the unrestricted case; however, here Newfoundland had a weight of 0.0011 and Saskatchewan had 0.024.

Figure 1 shows boxplots for Ontario (*on*) compared to its synthetic control (Synthetic Ontario or *synth*) as well as to each of the individual provinces for two of the data series that were used, the female-male earnings ratio and real GDP per capita. Each of the standard boxplots shows the median (the bold line) as well as the third (or upper) and first (or lower) quartiles. The limits (fences) above and below each box represent a distance of 1.5 times the interquartile range, with the outliers represented here by “o’s.” These boxplots show that Ontario (*on*) and “Synthetic Ontario” (*synth*) resemble one another more closely in the “pretreatment” years or years before the act, 1981–1987, than Ontario resembles any other single province. This illustrates a key idea behind the synthetic-control approach of Abadie, Diamond, and Hainmueller (2010)—that a combination of units often provides a better comparison for the unit exposed to the intervention than any single unit alone.<sup>16</sup> Thus, Abadie, Diamond, and Hainmueller’s (2010) synthetic-control method effectively provides researchers with a new tool that—by coming up with the best set of comparator provinces to serve as a “counterfactual”—allows for more accurate evaluations of policy interventions than what has typically been carried out up until now.

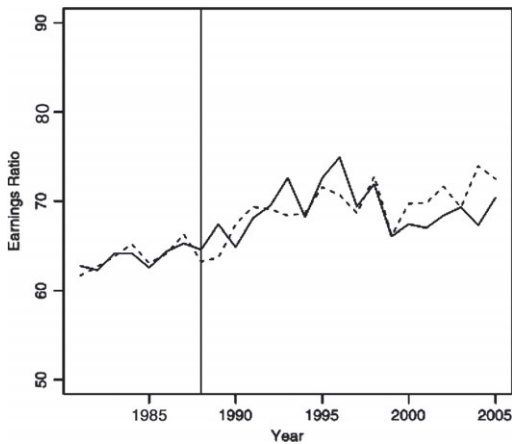
It should also be noted, again, that two of the three provinces that were chosen by the Synth program to make up Synthetic Ontario—Alberta and British Columbia—did not enact pay-equity laws during the period under study, so it is not surprising that they serve as especially good controls for the effect of Ontario’s act. Although the third province, Manitoba, did enact a pay-equity act during 1985, as noted earlier it only covered its public-sector employees and was not maintained,

16. Abadie, Diamond, and Hainmueller (2010, 3) note that both comparative case studies and studies using aggregate data can be useful in evaluating policy interventions at an aggregate (or macro) level. However, aggregate-data-driven procedures such as Synth reduce the amount of discretion that must be used in the choice of the comparison control units. In practice, it is often difficult to find a single “unexposed” unit that approximates the most relevant characteristics of the unit(s) exposed to the event of interest. Synth also allows researchers to decide on the study design without knowing how those decisions will affect the conclusions of their studies. A good research design in observational studies means that one should remain “blind” as to how each particular decision affects the conclusions of the study. Additional technical details about “Synth” may be found in Abadie and Gardeazabal (2003) and Abadie, Diamond, and Hainmueller (2010).



**FIGURE 2**

Comparison of Ontario and Synthetic Ontario before and after Ontario's Pay Equity Act in 1988



Notes: Ontario is shown as the solid line and Synthetic Ontario is shown as the dashed line. Synthetic Ontario = 16.8% Manitoba + 19.4% Alberta + 63.8% British Columbia. The vertical line indicates 1988, the year during which Ontario passed its Pay Equity Act.

Sources: Ontario data are from Statistics Canada (2009). Data for Synthetic Ontario are from authors' calculations, using "Synth" program in R. Data are in constant 2005 dollars.

as it was in Ontario. In any case, Manitoba's weight in the construction of Synthetic Ontario is only 16.8%.

If we examine the boxplots for the earnings ratio over the period 1981–1987 in Figure 1, although Synthetic Ontario (*synth*) has a larger interquartile range—and thus wider dispersion—than does Ontario (*on*), *on* and *synth* are most closely matched for both the smallest and the largest non-outlier observations and the median values. As to the boxplots for GDP per capita over 1981–1987, *on* has a larger interquartile range—and thus wider dispersion—than does any other single province or *synth*. However, *synth* is the best match for *on* with respect to the median. Figure 2 provides further evidence that Synthetic Ontario is a good control for Ontario as the gender earnings ratio for our Synthetic Ontario (*synth*) tracks Ontario (*on*) quite nicely prior to the 1988 act, which is shown by the vertical line.

What happened after Ontario introduced its pay-equity laws? The right portions of Figures 2 and 3 provide some indication. These figures show that there is no discernible difference in the level, dispersion, or trend in the female-male

earnings ratio between Ontario and Synthetic Ontario during the years 1988–2005. Looking at Figure 2 and comparing the solid line (Ontario) to the dashed line (Synthetic Ontario), the best evidence of the act having no effect would have been for the two lines to track one another perfectly after 1988, which they do not do in this figure. However, they do tend to move together somewhat closely after 1988, which means that there is no strong indication that the act had any effect. Furthermore, during certain periods (e.g., 1997–1999) the lines are coincident. Since 1988, there are periods (e.g., 1994 and 1996) when Ontario's earnings ratio exceeds that of Synthetic Ontario and other periods (e.g., 2000–2005) when Synthetic Ontario's earnings ratio exceeds Ontario's. So it is not surprising that the median over the period following the act is the same in Ontario and Synthetic Ontario, which is shown in the boxplot on the right-hand side in Figure 3.<sup>17</sup>

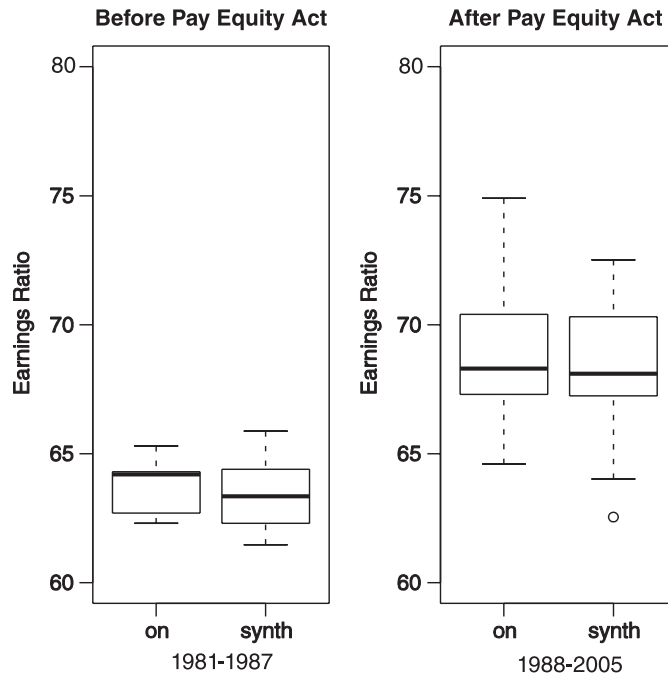
Because the Pay Equity Act sought to address gender inequities in pay, Figure 3 presents boxplots of the female-male earnings ratio for Ontario and Synthetic Ontario both before (1981–1987) and after (1988–2005) the policy intervention of 1988, Ontario's Pay Equity Act. It should be noted that the boxplots on the left for the earnings ratio are the same as those shown for *on* and *synth* in Figure 1. The boxplots on the left show that over the period 1981–1987, before Ontario's Pay Equity Act in 1988, Ontario (*on*) had a higher female-male earnings ratio than did Synthetic Ontario (*synth*). However, the boxplots on the right show that after the Ontario act, over the period 1988–2005, the female-male earnings in Ontario (*on*) and Synthetic Ontario (*synth*) are virtually indistinguishable. Over the period 1988–2005, these data series have a correlation coefficient of .51 ( $p = .031$ ), which (with the exception of British Columbia, for which the correlation coefficient with Ontario is also .51) is much higher than the correlation that Ontario has with any other single province.<sup>18</sup> Thus, Ontario's act had essentially no effect on this ratio.

17. The Ontario government's pay-equity funding issues might explain why the gap is persistently negative; that is, Ontario's earnings ratio is worse than Synthetic Ontario's after 2000.

18. The correlations of Ontario's female-male earnings ratio with that of each of the other provinces are .27 with Alberta, .03 with Manitoba, .01 with Saskatchewan, .16 with Quebec, -.17 with New Brunswick, .37 with Nova Scotia, -.16 with PEI, and -.04 with Newfoundland. None of these has  $p$  values that imply statistical significance.

FIGURE 3

Female-Male Earnings Ratio Boxplots for Ontario and Synthetic Ontario before and after Ontario's Pay Equity Act in 1988



Notes: *on* represents Ontario and *synth* represents Synthetic Ontario, which is 16.8% Manitoba + 19.4% Alberta + 63.8% British Columbia.

Sources: Data for Ontario (*on*) are from Statistics Canada (2009). “Synth” data are from authors’ calculations, using “Synth” program in R. Data are in constant 2005 dollars.

The bottom part of Table 5 provides a more detailed look at the annual earnings ratio for Ontario and Synthetic Ontario over the period 1988–2005. While Ontario’s actual female-male earnings ratio is higher after the act, rising from about 65% in 1988 to 70% in 2005, Synthetic Ontario, which is a good proxy for what would have happened in Ontario if it had *not* instituted the act, shows a very similar increase.

Baker and Drolet (2010) present a new time series on the gender wage gap in Canada over the period 1981–2008 in which they use wage data from various surveys rather than earnings data as most previous studies have. They find that from 1987–1989 through 2006–2008 Ontario’s average gender wage ratio improved by only 10.4%, the second worst improvement out of all the provinces (Table 5, 440).<sup>19</sup> Our findings thus

agree with what Baker and Drolet and others have found. Despite its broad coverage and proactive nature, the act has had very little effect on the female-male wage gap in Ontario.

## VI. DISCUSSION

Synthetic-control methods provide researchers with a new technique that aids in the design and implementation of studies that are interested in assessing the effects of policy interventions. Because Synth is an algorithm that objectively chooses an optimal comparison to be used in the study, not only does it find the “best” comparison (which is usually made up of several entities), but it also removes the bias that might otherwise appear when researchers choose, typically, a single comparison. Thus, Synth improves upon

19. Alberta was the worst over this period: its average gender wage ratio increased by only 4%. Interestingly, PEI showed the greatest improvement in this ratio over this

period, 23.5%, and it consistently had the highest gender wage ratio despite its pay-equity law covering only public-sector employees.

many current practices and allows policymakers to undertake a "hard-headed analysis" of the policy intervention (Campbell 1969, 29).

In this article, we have compared what happened following the Pay Equity Act of 1988 in both Ontario and Synthetic Ontario, which was constructed by Synth to be a weighted average of Alberta, Manitoba, and British Columbia. Both Figures 2 and 3 lead us to believe that if Ontario had not enacted the pay-equity act about 20 years ago, the current gender pay gap would be about the same as it currently is. In other words, the policy intervention failed to affect women's pay relative to men's in Ontario in any clear, discernible way. We have focused on the act's effect on the gender pay gap because identifying and then rectifying any such gap was the intended goal of this act. A limitation of our study is that we have not investigated the potential effects of a subtler, more indirect nature that the act might have had on the working lives of women vis-à-vis men; for example, whether it affected the female participation rate.

Why is the Ontario pay-equity law not doing a better job of reducing the pay gap? Some believe that without employment-equity legislation, which was repealed in 1995, women continue to face systemic, discriminatory barriers to accessing higher-paying, male-dominated jobs.<sup>20</sup> A Pay Equity Commission report (2009, 11–12) provides details on "occupational segregation" in Ontario—the extent to which men and women work in different occupations. Kervin (2007) also notes that men and women were not going to the same jobs in the same proportions in Ontario, nor were they doing so elsewhere, as many other countries have similar issues regarding "occupational segregation."<sup>21</sup> With the growing body of evidence that equal-pay laws do

not seem to work well, perhaps governments should put their efforts toward tackling the gender segregation that exists, both in occupations and in workers' preparation for the job market, as exemplified in their choice of university or college major. The gender wage gap is a product of many different phenomena, including college major choice and different preferences as to job type, so fixing this gap may well require a multipronged approach. Intrusive and ultimately ineffective policies might well end up working against the ultimate goal: fair treatment of both male and female employees. Of course, gender differences across occupations may also reflect still other factors, such as psychological attributes and preferences that differ between men and women, as well as the existence of social norms about what jobs are "appropriate" for men and women. As Bertrand (2011) notes, the past 10 years have seen a growing literature on the importance of these factors in explaining gender differences in labor-market outcomes.

## VII. CONCLUSIONS

Comparable-worth pay policies have become widely accepted in many countries. In the European Union, for example, claims for equal pay for work of equal value are common and are covered by equal pay legislation. In fact, Article 119 of the 1957 Treaty of Rome (which set up the European Common Market, predecessor to the European Union) required that each member state should "ensure and subsequently maintain the application of the principle that men and women should receive equal pay for equal work." It should be noted, however, that the manner in which member states have adopted comparable-worth policies—and the enthusiasm for the principle of comparable worth—has varied. As for assessment of the effects of such policies, most studies (apart from those carried out for the United States) have been undertaken for the Australian, Canadian, or UK labor markets. Not unexpectedly, the evidence is rather mixed, with most studies showing that the effects of such policies have been modest, at best (Hyclak, Johnes, and Thornton, 2013, 397–402). None of the studies, however, have used the Synth method.

There is a class of labor laws that require cooperation on the part of employers, as they can be difficult to enforce. But if employers find

20. Note that "employment equity" is referred to as "affirmative action" in the United States and as "positive action" in Europe.

21. This segregation has been noted in many studies, including Fortin and Huberman (2002), who discuss the effect of occupational segregation on women's wages in Canada, and the OECD (2008, 45), which points out that, although female students now outnumber male students at universities and colleges in many OECD countries (including Canada), men and women still choose different majors, with women largely preferring welfare and health subjects and men gravitating toward engineering and commerce. Consequently, women are more likely to end up in female-dominated fields, for example, nursing and teaching, which tend to be characterized by lower-status and lower-paying jobs. See also McDonald and Thornton (2007) for evidence that men and women at U.S. colleges and universities choose very different majors, which leads to a gap in their starting salaries. Blackburn, Racko, and Jarman (2009, 1) note that the segregation itself is

not important; rather, what matters is the inequality that may be associated with it.

these laws cumbersome, cooperation may manifest itself as a grudging gesture rather than effective implementation. Ontario's Pay Equity Act was well intentioned, and the principles of gender equity that it embodied seem to be very fair. However, if a law is going to be coercive, it should not be easy to shirk and implementation should not be too onerous, which seems to be the case in Ontario. As McDonald and Thornton (1998, 195) discover, many employers "manipulated and interpret[ed] the law so as to minimize their pay-equity payouts."

Evaluation of policy interventions must be able to infer what would have occurred without the intervention. The use of a synthetic-control method has allowed us to examine the effects of Ontario's Pay Equity Act of 1988 on the gender pay gap. With this method, we created a "Synthetic" Ontario, which resembled Ontario more closely than did any other single province, but which did not implement Ontario's Pay Equity Act.

Comparing what actually happened to the pay gap in Ontario to what would have happened in Synthetic Ontario following the act, we find that despite its broad coverage and proactive nature, there is no indication that the act materially affected the female-male wage gap in Ontario. Canadians are neither Earth's most lawless nor most rebellious people; yet, Ontario's Pay Equity Act failed to elicit cooperation through coercion and appears to have had little of its intended effects.

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