Effects of Deregulation on Labour Supply: The Case of Compulsory Certification in British Columbia

By

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Abstract

Compulsory Trades in British Columbia (BC), Canada provides a natural experiment to measure the impact of deregulating compulsory certification, a form of occupational regulation and licensure. Beginning in 1967, several trades occupations in BC required a government recognized certification to practice work in these trades. Beginning in 2003, the government of BC repealed compulsory certification, and 11 formerly compulsory trades no longer required certification to practice. To study the impact on labour force participation, I gathered data from Statistics Canada's Labour Force Survey by National Occupation Code on Labour Force Status for ten formerly compulsory trades (Autobody and Collision Repair, Automotive Service Technician, Industrial Electrician, Construction Electrician, Plumber, Powerline Technician, Refrigeration Mechanic, Roofer, Sheetmetal Worker, Steamfitter/Pipefitter) at the occupation and province level from 1997 – 2010. Using a two-way fixed effects difference-in-differences model with a vector of demographic controls, I estimate the change in labour force participation in the selected occupations due to deregulation. My results indicate statistically significant and positive effects on labour force participation among the study trades combined and for the Construction Electrician, Refrigeration Mechanic, and Automotive Service Technician occupations individually. Lastly, I implement an event study to assess the identifying assumption of difference-in-differences and examine whether there are differential effects of deregulation over time. The event study results indicate that deregulation of compulsory certification had an increasing positive effect on labor force participation over time for Construction Electrician and Refrigeration Mechanic.

1. Introduction

Mandatory or compulsory certification in British Columbia's construction trades has been a topic of debate for many years due to the specific intersections of apprenticeship training, the supply and cost of labor, and the competing interests of labour unions and business associations. Compulsory certification is a policy requiring trade workers within a specific occupation to receive a government recognized certification before practicing legally. In 2003, the policy requiring compulsory certification in 10 trades; Automotive Service Technician, Autobody Collision Repair Technician, Construction Electrician, Industrial Electrician, Plumber, Power Line Technician, Refrigeration and Air Conditioning Mechanic, Roofer, Sheet Metal Worker, and Steamfitter/Pipefitter[1] was removed by the BC Liberals, reflecting a politicized debate between the two most influential parties in the province, the BC Liberals and the New Democratic Party of British Columbia (BC NDP).

Compulsory trades are consistently listed among the province's most highly demanded occupations, measured by the number of job openings and employment growth[2]. With such high demand, and unless legally enforced, trade occupations are filled by both certified and uncertified workers. Historically, trades unions in BC have supported compulsory certification, while business associations have supported its removal. This is because compulsory certification has the potential to disrupt the supply of workers, while raising wages within the trade.

Certification in compulsory trades occurs through apprenticeship, a method of training where 80% takes place on a job site under the direct supervision of a certified tradesperson

[1] Appendix Table A1.1 provides the National Occupational Classification (NOC) occupation codes at the five-digit level for these occupations.
[2] WorkBC. "High Opportunity Occupations, 2023." *Province of British Columbia*, (2022).

within the same trade, and 20% occurs within a classroom. Certified tradespersons are known as journeypersons while their trainees are referred to as apprentices. A full apprenticeship requires as many as four years of training and experience before the apprentice can seek certification and become a journeyperson. Individuals with the appropriate knowledge of the occupation, but who have not completed an official apprenticeship, may receive certification by successfully passing all applicable certification exams. In Canada, the federal government works with provinces to recognize trades through the Interprovincial Standards Red Seal Program, which sets common standards to assess skills and training for over 50 trades. However, it is the power of each province to control which trades to designate as compulsory certification trades. In BC, there are 108 recognized trade certifications, though prior to 2003, only ten were compulsory. Though all other provinces maintain a set of compulsory trades, only BC decided to deregulate in 2003, so the removal of compulsory certification in BC offers a unique opportunity to study the impact of occupational deregulation on labor force participation in these occupations.

Past research has extensively investigated the effect of occupational regulation on labour supply, while my research makes use of a natural experiment to determine the effects of deregulation on labour supply (Kim & Law, 2005; Kleiner, 2006; Blair & Chung, 2019). In this essay, I explore the effect of removing compulsory certification in BC in 2003 on the supply of workers in trade occupations. Using data from the Statistics Canada's Labour Force Survey (LFS), a difference-in-differences (DiD) causal inference methodology, and a supporting event study, I determine the causal effect of removing compulsory certification on labor force participation[3] in the deregulated trades occupations. The results suggest the removal of

[3]Labour Force Statuses: employed, at work; employed, absent from work; unemployed temporary layoff; unemployed, job searcher; unemployed, future start are aggregated to represent labour force participation. Statuses not in the labour force, able to work and not in the labour force, and permanently unable to work are excluded.

compulsory certification led to an expansion of the trades workforce in BC, predominantly driven by Construction Electricians, Refrigeration and Air Conditioning Mechanics, and Automotive Service Technicians.

The rest of the paper is organized as follows. In Section 2, I describe the structure of apprenticeship training, the recognition of credentials in trades occupations, and the political context of compulsory trades certification in BC. Section 3 reviews past literature on occupational regulation, and Section 4 describes the data used in my analyses. In Section 5, I provide the difference-in-differences model and results. Following this, Section 6 presents the model and results of an event study, which also provides evidence of the identifying assumption of my DiD model. Finally, I conclude with a discussion of how the results relate to previous research, and how my research provides new insights on the discussion of occupational licensing, which is equivalent to compulsory certification in my research context.

2. Context

Occupational licensing effects approximately 20% of Canadian occupations[4] and has many implications for the labour market. Occupational regulation in Canada is largely undertaken by provincial governments as opposed to the federal government. Some provinces regulate certain trades and occupations, while others do not. Regulation of trades and other occupations is most often managed through specific regulatory bodies, some of which work together interprovincially, but licensing requirements can vary between provinces. Similarly, the recognition of trades, as an occupation befitting the apprenticeship model of training, is determined by each province individually, though the federal government's Red Seal

[4] 1990-2022 The Canadian Information Centre for International Credentials (CICIC), a unit of the Council of Ministers of Education (CMEC), Canada.

certification has contributed to harmonizing skills assessment and certification recognition across provinces. As mentioned, the federal government recognizes 54 trades and apprenticeships, each awarded a Red Seal upon completion. Red Seal is not required to work in the majority of trades occupations with only a subset of approximately 11 trades requiring certification to practice in one or more provinces. For example, BC recognizes 108 trades; the 54 federally recognized trades and an additional 57 trades, of which ten (of the total 108) are compulsory. Competencies within the trades are tested through as many as four different exams, conducted each year of an apprenticeship. The provincial governments, through the post-secondary system and their provincial apprenticeship agency, cooperate with employers and journeypeople, to facilitate apprenticeship training and prepare apprentices in each province for the federal Red Seal and provincial certification exams.

Though the federal government sets the Red Seal standards, it is a power of the provinces to govern apprenticeship training and certification, meaning the provinces each designate a subset of recognized trades as requiring certification to practice. Provincial governments also use their apprenticeship training systems to specialize apprenticeships according to their provincial industries. As such, British Columbia, grants the provincial Certificate of Qualification (CoQ) to workers in compulsory occupations upon completion of an apprenticeship. Naturally, trades that are recognized both provincially and federally can receive a CoQ and a Red Seal, first completing the CoQ exam, and subsequently ‘challenging’ the federal Red Seal exam at each level. When it comes to compulsory certification, provincial governments have the power to require certification through apprenticeship or, in some cases, by challenging each level exam, in order to legally practice the trade.

According to a report issued by BC provincial government, compulsory certification's greatest overall impacts are on labour supply (PWC, 2020). Changes to labour supply and demand affect outcomes and access to labour and training for workers and employers. Workers in compulsory certification trades in BC compose approximately 2.3% of the total labour force, but nearly 20% of the total trades labour force[5]. Compulsory certification can have a significant impact on the labour supply in British Columbia, both in terms of the number of individuals who are able to work in certain trades, and the types of qualifications that are valued by employers.

The reasons for removal of compulsory certification point to the change in government and a shift in the primary stakeholders influencing policy at the time (Matte, 2020). Support for compulsory certification became associated with the New Democratic Party (BC NDP), who led the provincial government from 1991 to 2001. The BC NDP had strong associations with labour unions within the province, who encouraged the government to undertake compulsory trades and stood to gain from an increase in membership and greater control over the apprenticeship training system (Barbash, 1968).

From 1967 to 1996, BC made certification compulsory for 11 trades: Automotive Collision Repair Technicians, Automotive Refinishing Technicians, Automotive Service Technicians, Electricians, Plumbers, Power Line Technician, Refrigeration Mechanics, Roofers, Sheet Metal Workers, Sprinkler System Installers, and Steamfitter/Pipefitters (Table A1.2). The provincial election in 2001 highlighted a pivotal change in politics for the province, as the BC Liberal Party was voted into government, and union influence was largely replaced with that of

[5]Using total study trades relative to the sum of NOC 72 and 73, and 2003 as a reference period.

business associations. The new government favored modular[6] training, labour fluidity, and deregulation. This may have benefited businesses by potentially increasing the number of workers in previously regulated occupations and lowering wages in these occupations. In 2003, the Liberal government removed the requirement for certification in these trades with the Industry Training Authority Act, effectively repealing legislation requiring compulsory certification. The BC Liberal Party remained in power until 2017 when they were replaced by a resurgent BC NDP government.

In 2022, after nearly two decades without, compulsory certification was reinstated. The provincial NDP government made the decision to reinstate the regulation following a tenuous term under the Confidence and Supply agreement with the BC Green party, which provided three seats and granted the BC NDP a 44 to 43 majority over the BC Liberal party (Elections BC, 2017). As the NDP held a delicate coalition in 2017, compulsory trades were not reinstituted until after they won a majority government in 2020. This also indicated another shift in the political mandate, as the NDP had the confidence of government, and unions grew their political influence. This meant the "industry-driven," modular, supply-based training models of the BC Liberals would give way to "the traditional role of trade unions and labour organizations… in providing training" (Doyle, 2008). There was pressure from union stakeholders to reinstate compulsory certification, who believed that the reputation of their industries could be improved by requiring all workers to have the same level of education, training, and certification. As stated by PricewaterhouseCoopers (2020), "mandatory certification... is a means to develop the trades workforce needed for high quality economic growth… and improving employment prospects

[6] UNESCO, International Centre for Technical and Vocational Education and Training defines modular training as a system in which qualifications consist of a number of modules, each of which can be certified independently. This means four-year programs were modularized into smaller, certifiable, components.

for… those working in the trades." This was seen as particularly important for trades in industries such as construction, mechanical, and electrical, where mistakes or errors could create risks to the public.

The removal of compulsory certification in 2003 was met with both support and opposition, some arguing that it would increase competition and lower costs for consumers, while others were concerned about the potential impact on public safety. Proponents of compulsory certification argued that individuals working in certain trades must have the skills and knowledge obtained by an apprenticeship to perform their jobs safely and effectively. They argued that the removal of compulsory certification would have serious implications for labour force development; that skilled trades would be devalued in BC, as well as pose risks to the public (CAUT, 2003). According to the BC Federation of Labour (2017), "Compulsory certification requirements increase labour market demand for certified workers… put upward pressure on wages, attracting more workers to the trade." They believed that certification ensured that individuals working in these trades performed their jobs safely and that removing this requirement could lead to a rise in workplace accidents and injuries. They also believed that certification was an important tool for ensuring that individuals working in these trades met the standards developed in apprenticeships, reflecting a high quality of work and public safety. "To successfully pass the provincial or territorial examination for their trade, trade qualifiers [apprentices] must have sufficient work experience and knowledge in that trade." (Desjardins, 2010).

Opponents of compulsory certification argued that individuals who have skills and experience should be allowed to work in these trades and professions without certification (Brydon & Dachis, 2013). They argued that under compulsory certification, individuals seeking

employment were forced to complete a formal apprenticeship program and pass a certification exam. This process can be costly, as apprentices become indentured to their journeyperson, often working several years for minimum wage before certification is obtained. As quoted from a business association representative, “B.C.’s trades training system is overwhelmed – there simply is not enough training spaces to meet demand. The result is that it can take nearly a decade for an apprentice to complete a red seal designation” (Gardener, 2022). These factors create barriers to workers directly entering the labour force in these occupations. Opponents also believed removing compulsory certification would increase competition and lower costs for consumers, while providing opportunities for individuals who may have been excluded from these industries in the past. They believed that employers would decide what level of skills and experience could be trusted to perform the work competently, and that compulsory certification was creating a barrier to entry for individuals who had the necessary skills and experience but lacked the formal education or training required for certification (Industry Training Authority Act, 2003).

3. State of Knowledge

The arguments regarding compulsory certification fit into academic discussions regarding regulatory capture theory and public interest theory, albeit with more attention to unions and business associations (Akerlof 1970, Posner, 1974, Leland, 1970). Public interest theory implies that occupational regulation serves members of the public by reducing information asymmetry on quality and potential harm caused by inadequately skilled workers. Regulatory capture speaks to the use of occupational regulation by interest groups, including professional associations and unions, to control wages by limiting the supply of workers. This serves people already working in the occupation, who are often responsible for controlling access to the occupation. This

discussion is rooted in Akerlof's (1970) seminal paper on the "market for lemons", which demonstrated that asymmetrical information on the level of quality of commodities (or, in my application, trade workers) creates a market where low quality becomes the norm, and regulation presents as a solution. Relating this discussion on asymmetric information to a theory of economic regulation, Posner (1974) notes, "A great deal of economic regulation serves the interests of small businesses – or nonbusinesses –groups… above all union labor" (p.11). Posner suggests that regulators use claims of 'lemons', and the reasoning of public safety and wellbeing, as red herrings to justify regulation; a "figleaf which the regulatory process uses to conceal from the public its domination by an interest group" (p.32). Building on Akerlof, Leland (1979) makes use of mathematical theory to show that markets with high levels of asymmetric information will tend towards a market for lemon unless properly regulated. "Quality standards based on the actual quality of the product or on quality-improving actions that sellers [of labour] may undertake may have socially useful role in alleviating market failure" (Leland 1979, p.1340). Though, Leland admits, the minimum quality standards set by professional groups will likely be higher than the socially optimal standard; "If a professional group… is allowed to set minimum quality standards… there is reason to expect too-high standards to be the more likely case." (Leland 1979, p.1342).

Determining the effect of occupational licensing (i.e., compulsory certification) on labor market outcomes has interested many scholars in recent decades (Kleiner, 2006; Law & Marks, 2009; Blair & Chung, 2019; Kleiner & Soltas, 2019). Scholarship on occupational regulation has noted a relationship between the increasing complexity of jobs, the corresponding informational asymmetry, and a rise in the number of licensed occupations (Law & Kim, 2005). An American study by Kleiner & Krueger (2010) found workers in licensed industries grew from 5% in 1950

to 20% in 2000, while over the same period union membership fell. The research shows that by 2006, the number of workers in occupations requiring a license was approximately 29%. They found having a license is associated with 15% higher wages and is positively associated with education; 40% of licensed individuals have post college education and only 11% have less than high school education. Members of unions are more likely to be in licensed occupations and government workers are more likely to be licensed than non-government workers. Carollo et al. (2023) find that professional associations can increase the likelihood of occupational regulation by 15 percentage points.

Kleiner & Johnson (2017) provide evidence that occupational licensing is a barrier to interstate migration by analyzing data from the U.S. Census Bureau's American Community Survey. Specifically, the study looks at the effects of state-level occupational licensing laws on migration across state borders. They find that states with more stringent licensing requirements have lower levels of interstate migration and that the difference is especially pronounced among lower-income workers. Conversely, DePasqale & Stange (2016) find agreements on interstate licensing through the Nursing Licensure Compact, which allows nurses to freely practice across all states in the compact, did not increase labor supply or mobility, highlighting the limited impact of licensing agreements to reduce inter-state barriers. An Italian study by Mocetti, Rizzica, and Roma (2021) found that “mobility from and into regulated occupations is significantly lower than for non-regulated ones: only 13.5% of workers in regulated occupations and 9.5% of those in professional occupations change jobs, against 19.5% of those in non-regulated occupations.” More interestingly, their research found that regulation lowers the probability of entering a given occupation by 4%, which, in the study, accounted for over half of

the difference in entry rates between regulated and non-regulated occupations (Mocetti, Rizzica, & Roma, 2021).

There is also evidence that occupational licensing can increase participation of traditionally marginalized groups within an occupation, while effectively demonstrating the quality of the practitioner. Law & Marks (2009) investigated the impact of occupational licensing on black and female workers during the Progressive era, from 1890s to the 1920s. Despite the overall negative effect on occupation participation, they show that occupational licensing increased the participation of blacks in medical professions and women in engineering and pharmacy (Law & Marks, 2009). “It is revealing that the occupations where licensing regulation appears to have helped female or black workers are also relatively technical…, where information about worker quality is likely to be a serious concern” (Law and Marks 2009, p. 23). This suggests that licensing can reduce statistical discrimination by serving as a credible signal of worker quality. Hicks (2022) finds slightly different results, that occupational licensing reduced black insurance agents and black beauticians/manicurists, by 6% and 33% respectively but increased black plumbers by 18%. Law & Kim (2005) examine whether licensing primarily limited competition or demonstrated professional quality. The authors find evidence that occupational regulation had a negative effect on labour force growth and entry for architects, dentists, physicians, and veterinarians, but had a positive effect on entry for beauticians. Additionally, the study found physician licensing lowered mortality rates in some areas, while increasing the number of malpractice lawsuits. Ultimately, the research supports a trade-off between information asymmetry and labour force growth and supply.

Kleiner (2006) finds that licensing restricts labour supply, which can increase wages for those already working in an occupation but can also limit employment growth overtime. It was

found that being in a licensed profession can increase hourly earnings by 10-12%, as compared to unlicensed counterparts, but reduce the growth of overall employment in the field by as much as 20%. Blair and Chung (2018) investigate the effect of occupational licensing on labour supply using state-level variation in licensing laws. The analysis uses data gathered from the Current Population Survey (CPS) and regression discontinuity to compare employment across state boundaries where one state has enacted licensing while another has not. The researchers find that occupational licensing is responsible for a reduction in labour supply by an average of 17% to 27%. This effect is more pronounced among white workers, who experience significant labour supply reduction, while the impact on black workers was smaller and statistically insignificant. A paper by Kleiner and Soltas (2023) further supports these results. The researchers find that licensing an occupation can increase wages by 15%, increase hours worked by 3%, while causing a 29% decrease in overall employment. The resulting 12% lost surplus is born 70% by the worker and 30% by the consumer. The research concludes that licensing imposes significant barriers to labour supply. While licensing aims to ensure quality, it restricts labour market entry and reduces overall employment.

Compulsory certification can create barriers to entry for individuals who may have the necessary skills and experience but lack the formal education or training required for certification. This can limit the supply of available labour and may make it more difficult for employers to find workers. Additionally, it’s likely to raise the cost of labour, pushing some consumers out of the market, potentially reducing demand. On the other hand, compulsory certification can also help to ensure that individuals who are working in these trades have the necessary skills and knowledge to perform their jobs to a certain standard and improve the overall quality of work, which may increase demand. By reducing the number of uncertified

workers and improving overall quality, compulsory certification may attract qualified individuals to the occupation, while pushing out workers with lower-level qualifications and less experience.

4. Data

To answer the study question, I obtain monthly times series data on estimated provincial labour force numbers by occupation from the Labour Force Survey (LFS), a household survey carried out monthly by Statistics Canada.[7] The study uses LFS estimated month counts of labor force participants in an occupation from January 1997 until December 2009. The occupations of interests are ten trades[8] identified by National Occupation Code (NOC); Automotive Collision Repair Technician and Automotive Refinishing Technician (two trades which are combined into a single occupation code), Autobody and Collision Repair Technician, Automotive Service Technician, Construction Electrician and Industrial Electrician, Plumber, Power Line Technician, Refrigeration and Air Conditioning Mechanic, Roofer, Sheet Metal Worker, and Steamfitter and Pipefitter (which also includes Sprinkler Systems Installer, both of which were compulsory, and both of which are classified within the same NOC). This data was retrieved via Statistics Canada Real-time Remote Access through a license held by the McPherson Library at the University of Victoria.

I begin with labour force estimates for each occupation and province monthly from 1997 to 2009. The labour force estimates for an occupation are divided by the total provincial labour force to determine each occupation's share of the total provincial labour force, as well as the share of the total provincial labour force of all study trades combined. By dividing the total number of people in the occupation by the total provincial labour force, I account for differences

[7] Statistics Canada. "Labour Force Survey (LFS)". *Government of Canada*, (2024).
[8] Appendix Table A1.1: BC's Compulsory Trades Prior to 2003

in occupation counts and total labour force size across provinces. Similarly, control variables, including percent of the labour force that is male, percent with some post-secondary schooling, percent married or common law, and percent with a child under the age of 18, are constructed monthly by province using LFS count data on, gender, post-secondary education levels, marital status, and family structure.

Table 1 contains summary statistics for the treatment group (BC) and comparison group (all other provinces) for the study occupations and each control variable. Beginning with the control variables, percent of the labour force in BC that is male decreased slightly, from 54% to 53%, the same was true of the aggregated comparison provinces.[9] There is growth in people in the labour force with more than a high school education in BC, with an average of 62% in the pre-treatment period, and 64% in the post-treatment period. This is compared to 58% to 62% across the aggregated comparison provinces. The percentage of people in the LFS reference group with children in BC, declined from 42% to 39%, while across the comparison provinces there was a greater change, from 46% to 41%. Finally, people among the LFS reference group classified as married or common law in BC declined slightly, from 73% to 72%, while across the aggregated comparison provinces the percentage fell from 79% to 77%.

Moving to the variables of interest, the total percentage of workers in all study trades combined in BC grew from an average of 2.3% in the pre-treatment period to an average of 2.4% in the post-treatment period. For the comparison provinces, the average total percentage of workers in the study trades did not grow, remaining at 2.4% throughout the periods, suggesting that treatment may have affected the treated occupations, but more coming into line with the

[9] Comparison provinces include Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, PEI, New Brunswick, Newfoundland and Labrador.

comparison provinces, rather than exceeding them. Roofers and Shinglers in BC showed a modest increase over the period, which is similar growth to that of the other provinces. For Plumbers, BC grew more strongly from 0.24% to 0.27%, as compared to 0.21% to 0.22% in the comparison provinces. Sheet Metal Workers grew slightly more in BC than in the comparison provinces. Construction Electricians in BC increased to a greater degree, 0.38% to 0.54%, than in the comparison provinces, 0.37% to 0.47%. Industrial Electricians declined over the period to a greater degree in BC than the comparison provinces. Powerline Technicians in BC showed more growth across periods, from 0.05% to 0.06%, though claiming less of an overall share of the labour force compared to comparison provinces. Steamfitters and Pipefitters in BC grew less as a share of the overall labor force than the comparison provinces, from an average 0.11% in the pre-treatment period to an average of 0.13% in the post-treatment period, as compared to 0.16% and 0.18% for the comparison provinces. Refrigeration and Airconditioning Mechanics in BC grew relatively strongly, from an average of 0.06% to 0.11%, putting it in line with the comparison provinces, which grew from 0.09% to 0.11% over the same period.

Table 1: Province Level Summary Statistics for Treatment (British Columbia) and Control Provinces 1997 - 2009

	Total	Roof and Shingle 73110S	Plumber 72300S	Sheet Metal Worker 72102S	Const. Elec. 72200S	Industrial Elec. 72201S	Power Tech. 72203S	Steam and Pipe 72301S	Refriger. Air Con. 72402S	Auto. Service 72410S	Auto. Collision 72411S	Controls PerPS	Controls PerChd	Controls PerMale	Controls PerCM
Treatment (BC)															
Mean	2.3%	0.14%	0.25%	0.13%	0.46%	0.16%	0.05%	0.12%	0.09%	0.69%	0.23%	63%	40%	53%	73%
Pre	2.2%	0.13%	0.24%	0.12%	0.38%	0.18%	0.04%	0.11%	0.06%	0.68%	0.25%	62%	42%	54%	73%
Post	2.4%	0.16%	0.27%	0.13%	0.54%	0.14%	0.06%	0.13%	0.11%	0.69%	0.20%	64%	39%	53%	72%
SD	0.3%	0.05%	0.08%	0.06%	0.15%	0.06%	0.03%	0.05%	0.05%	0.10%	0.07%	2%	2%	1%	1%
Min	1.7%	0.04%	0.08%	0.02%	0.21%	0.03%	0.00%	0.01%	0.00%	0.47%	0.08%	60%	36%	52%	71%
Max	3.0%	0.30%	0.49%	0.29%	0.88%	0.39%	0.15%	0.23%	0.21%	0.98%	0.40%	67%	44%	55%	75%
Obs.	156														
Controls															
Mean	2.4%	0.10%	0.22%	0.10%	0.42%	0.18%	0.09%	0.17%	0.10%	0.81%	0.24%	60%	44%	53%	78%
Pre	2.4%	0.09%	0.21%	0.09%	0.37%	0.20%	0.08%	0.16%	0.09%	0.86%	0.26%	58%	46%	54%	79%
Post	2.4%	0.12%	0.22%	0.10%	0.47%	0.17%	0.10%	0.18%	0.11%	0.75%	0.21%	62%	41%	53%	77%
SD	0.4%	0.08%	0.11%	0.07%	0.17%	0.11%	0.07%	0.13%	0.08%	0.19%	0.11%	4%	3%	1%	4%
Min	0.9%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50%	35%	50%	70%
Max	3.8%	0.47%	0.76%	0.41%	1.28%	0.63%	0.39%	0.79%	0.52%	1.55%	0.80%	69%	57%	56%	89%
Obs.	1404														

Notes: Standard deviations are listed for the total study period. Descriptive statistics are derived from Statistics Canada, Labour Force Survey 1997 – 2009. The population used to calculate the descriptive statistics are over 15 years of age, and noted as Employed, at work, Employed, absent from work, Unemployed, temporary layoff, Unemployed, job searcher, Unemployed, future start. It does not include people not in the labour force. The population used to calculate percent of labour force that is married or common law, and the population use to calculate economic families with children over 18 years of age, includes reference persons and their spouses (if present) in the civilian, non-institutionalized population aged 25 years and over. The pre-treatment period includes monthly observation from December, 1997 to May, 2003, while the post-treatment period include monthly observations from June, 2003 to December, 2009.

Automotive Service Technician, the largest of the study trades, grew only slightly in BC from an average of 0.68% of the total labour force to 0.69%; however, the comparison provinces declined from 0.86% to 0.75%. Autobody Collision Repair Technicians fell as a share of the provincial labour force in BC from 0.25% to 0.20%. This drop also appears to have occurred in the comparison group, which also fell from 0.26% to 0.21%. The growth among study trades appears to be greater in BC than the comparison provinces for Plumbers, Sheet Metal Workers, Construction Electricians, Refrigeration and Airconditioning Mechanics, and Automotive Service Technicians, while Industrial Electricians, Autobody Collision Repair Technicians showed a decline in BC relative to comparison provinces.

The labour force trends are aggregated to yearly averages, as the monthly values were quite erratic; aggregating yearly allows me to better visually compare and more easily assess whether there is a common pre-treatment trend for the treatment and comparison groups (Appendix Figure A1.2 and A1.3). BC shows a positive trend beginning after deregulation, with the deregulation date denoted by a dotted line in 2003. Among the prairie provinces of Alberta, Saskatchewan, and Manitoba, Saskatchewan and BC trends seem to exhibit the most similar behavior, declining through the pre-treatment period. Compared against the central provinces of Quebec and Ontario, Quebec shows a trend most like BC in the pre-treatment period, while the trends diverged during the post-treatment period. Finally, comparing BC's aggregated study trades as a share of the provincial labour force to the Maritime provinces, the most similarities in the pre-treatment period are between Nova Scotia and BC. Appendix 1 contains trends that compare each occupation as a share of the total provincial labour force. Among these occupational trends, Construction Electricians, Refrigeration and Air Conditioning Mechanics, and Steamfitters and Pipefitters appear to be affected by deregulation.

5. Methodology

The natural experiment lends itself to a difference-in-differences (DiD) methodology, with a date of instantaneous deregulation for all study trades in the treatment province of BC. As a comparison group, we use observations from each of the other Canadian provinces including Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador. The first period of treatment (i.e., the first month of deregulation) is June 2003. This date is chosen because the Industry Training Authority Act was assented to on May 29th, 2003, effectively deregulating compulsory certification in the study trades. This creates a pre-treatment period from January 1997 to May 2003 and a post-treatment period from June 2003 to December 2009. The post-treatment period is limited to balance the number of pre- and post-treatment observations while also limiting exposure to possible policy changes regarding compulsory certification in other provinces over the study period.

The model used to determine the relationship between compulsory certification and the share of the labour force in the study trades is a DiD model with a vector of demographic controls and fixed effects for province, year, and month, as displayed here:

$$OccSh_{str} = \beta_0 + \beta_1 Treatment_{str} + \beta_2 Post_{str} + \gamma_1 (Post \times Treatment)_{str} + \beta_3 X'_{str} + y_t + m_s + p_r + \epsilon_{str}$$

The model specifies $OccSh$ as the dependent variable representing the share of the provincial labor force employed in the specific trade identified by National Occupation Code (NOC 5) in province *r* in year *t* and month s. $Treatment_{str}$ is a binary variable indicating whether it is an observation within the treated group or in the comparison group; BC or all other provinces, respectively. $Post_{str}$ is a binary variable indicating the period before and after treatment.

$(Post \times Treatment)_{str}$ is the interaction term between the post and treatment indicators, and the coefficient γ_1 is the DiD estimate of the effect of deregulation on the study occupations share of the labour force. X' is a vector of control variables including, percent of labour force that is male, percent with post-secondary education, percent that is married or common law, and percent with a child over 18. $Treatment_{str}$ is shown here to demonstrate the model but is removed from the regression to prevent issues of collinearity with the interaction term. To deal with unobserved heterogeneity between time periods and regions I use year, month, and province level fixed effects.

Using other provinces, the model can control other factors that influence the labour force. Finally, the DiD model, when correctly specified, provides casual estimates for the effect of repealing compulsory certification on relative labour force participation. A weakness of this approach is the assumption that the comparison group adheres to a common trend (parallel) prior to treatment. Inter-provincial migration would cause inverse effects. However, data from Statistics Canada (2019) shows that inter-provincial migration is estimated to be a small part of these overall workforces. Additionally, even though the regulatory status of the occupations of interest may differ across provinces, I am concerned with the trends in occupation participation, not levels.

Table 2 contains the results of the DiD specification. Looking at the aggregated study occupations, the amount of variation attributed to deregulation of compulsory certification is an increase of 0.237% in the study occupations' share of the provincial labour force. As a fraction of the pre-treatment average, this represents an approximate 10% increase in the study occupations' share of the provincial labour force. This result is highly statistically significant ($p < 0.01$). For Plumber, Sheet Metal Worker, Powerline Technician, and Steamfitter and

Pipefitters, the coefficient estimates are positive, but not significant ($p > 0.05$). For Roof and Shingler, the coefficient of interest is negative, but not significant. The effect of deregulation is most strongly pronounced in Construction Electrician, where deregulation was responsible for increasing its share of the labour force by 0.101%, which is equivalent to 27% of the pretreatment average. Refrigeration and Air Condition Mechanics grew their share of the total provincial labour force by 0.03%, representing 47% of its pretreatment average share of the labour force. Automotive Service Technicians attribute a 0.12% increase in their share of the provincial labour force to deregulation, constituting 18% of the pre-treatment average. Finally, Autobody Collision Technician and Industrial Electrician, showed decreases of 0.03% and 0.02% in their shares of the total provincial labour force due to deregulation, both composing 12% of the pretreatment average. The results for Construction Electrician, Refrigeration and Air Conditioning Mechanic, and Automotive Service Technician are highly significant ($p < 1\%$). Industrial Electrician and Automotive Collision Repair Technician were significant at the 5% and 10% level respectively. These findings highlight the diverse impact of deregulation, demonstrating significant growth in specific trades while indicating varied effects across others.

Table 2: The Effects of Deregulating Compulsory Certification on Share of Labour Force in Study Occupations

	Total	Roof and Shingle	Plumber	Sheet Metal	Const. Elec.	Industrial Elec.	Powerline Tech.	Steam and Pipe	Refriger. Air Con.	Auto. Service	Auto. Collision
Deregulation Indicator (DI)	0.00237***	-0.00003	0.00012	0.00007	0.00101***	-0.00021*	0.00004	0.00016	0.00029***	0.00121***	-0.00030**
	(0.00042)	(0.00009)	(0.00014)	(0.00012)	(0.00021)	(0.00013)	(0.00008)	(0.00010)	(0.00009)	(0.00023)	(0.00014)
DI over Pretreat. Average	10%	-2%	5%	6%	27%	-12%	9%	14%	46%	18%	-12%
DI over Total Period Average	10%	-2%	5%	5%	22%	-13%	8%	14%	34%	17%	-13%
Percent Male	0.11836***	-0.00329	0.02091***	-0.00184	0.00679	0.02975***	0.00512	0.02555***	0.01097**	0.00396	0.02043***
	(0.02085)	(0.00484)	(0.00660)	(0.00440)	(0.00863)	(0.00630)	(0.00453)	(0.00547)	(0.00472)	(0.00982)	(0.00698)
Percent with Greater than High School	0.02491***	-0.00205	0.00724**	0.00295	0.00326	0.00336	0.00022	-0.00025	0.00100	0.01628***	-0.0071***
	(0.00850)	(0.00910)	(0.00307)	(0.00201)	(0.00340)	(0.00234)	(0.00178)	(0.00253)	(0.00211)	(0.00411)	(0.00270)
Percent Married or Common Law	0.00108	0.00135	0.00512	0.00166	-0.00196	-0.00036	-0.00033	-0.00102	-0.00517**	0.00173	0.00006
	(0.00882)	(0.00222)	(0.00316)	(0.00222)	(0.00420)	(0.00242)	(0.00201)	(0.00264)	(0.00240)	(0.00451)	(0.00318)
Percent with Children over 18	-0.01474	0.00059	-0.00179	-0.00086	-0.0126***	0.00168	-0.00145	-0.0120***	0.00327	-0.00077	0.00916***
	(0.00946)	(0.00208)	(0.00293)	(0.00218)	(0.00403)	(0.00261)	(0.00199)	(0.00308)	(0.00203)	(0.00450)	(0.00317)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Squared	0.435	0.159	0.214	0.151	0.409	0.289	0.156	0.497	0.13	0.315	0.192
Observations	1560										

Notes: *p < 0.10; **p < 0.05; ***p < 0.01. Each column represents a separate regression using Statistics Canada, Labour Force Survey estimates at the province and month levels from 1997 – 2009. Robust Standard errors, clustered by province level are in parenthesis. DI over pre-treatment represents the percent effect, in terms of change in percent share of the provincial labour force, divided by the pretreatment average occupation share of provincial labour force. This is meant to represent the increase in percentage points. This represents the percent change in occupation share of total provincial labour force due to treatment. These results are only significant for the total study occupations, Construction Electrician, Refrigeration and Air Conditioning Mechanic, Automotive Service Technician, and Autobody Collision Repair.

6. Event Study

The difference-in-differences (DiD) approach relies on the assumption that, in the absence of treatment, the treatment and comparison groups would have followed parallel paths. If this assumption is violated, the estimated treatment effect may be biased. The approach may not fully account for unobserved variables such as regulation in other provinces, interprovincial migration, and unobserved social, economic and industrial effects, which could result in deviations from parallel trends prior to treatment and bias my DiD estimate. Any measurement error in the treatment or outcome variable can bias the results. Since the Labour Force Survey estimates the values based on survey responses, this also may be a concern. The main specification also averages treatment effects across post-treatment years, obscuring the potential differential impact of the treatment over time.

To assess the validity of my main DiD specification and examine the dynamic effects of deregulation, I use an event study specification of the DiD model. The following model is estimated for the aggregated study occupations, and for each occupation individually.

$$OccSh_{rt} = \beta_0 + \sum_{k=-K}^{-1} \delta_k \text{Lead}_{rt} + \sum_{k=0}^{K} \gamma_k \text{Lag}_{rt} + \beta_2 X'_{rt} + p_r + y_t + \epsilon_{rt}$$

$OccSh$ is the occupation's share of the total labour force in province p and year y. $Lead_{rt}$ are the set of dummy variables indicating k periods before deregulation, while Lag_{rt} are a set of dummy variables indicating k periods after treatment. δ_k and $\gamma_k$are the coefficients on the set of lead and lag variables, which when using the data averaged by year, allow for examination of the effect six years before and after deregulation. The δ_k terms should not be significant, individually or jointly, if the parallel trends assumption holds. Again, X'_{rt} is the

vector of province level control variables defined in the generalized difference in differences model above. p_r and y_t are the province and year fixed effects, respectively. The reference lag interval is 2003, representing year zero. Data was available to provide for six years in advance of treatment and six years after treatment.

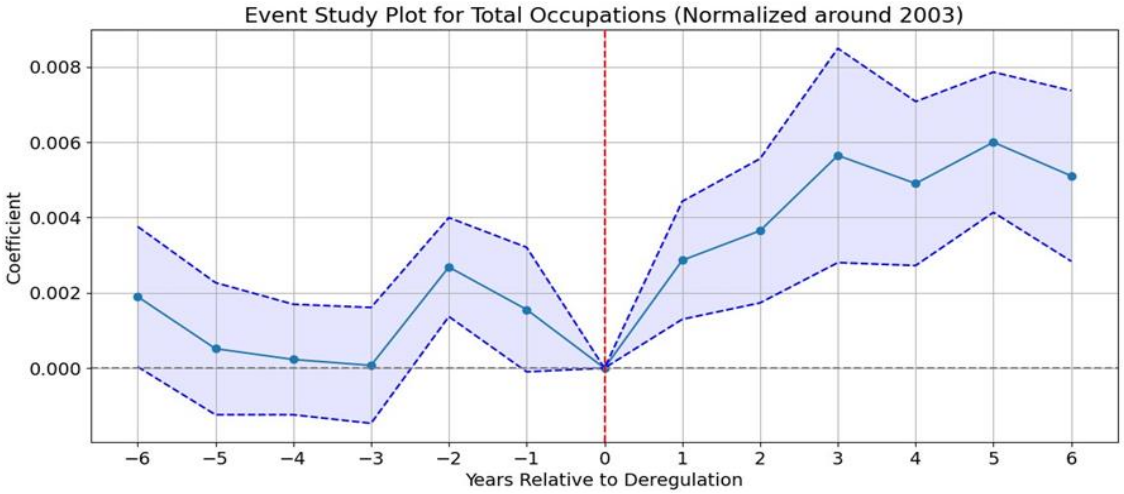
Appendix Table A1.1 contains the full estimation results in. I also conduct a F-test of the hypothesis that all leads are jointly equal zero and all lags are jointly equal to zero. I list the p-values with the coefficient results. With respect to the results for all study occupations combined, the first five periods after deregulation are highly significant, while the five periods before deregulation demonstrate relatively little significance, strongly supporting the trend assumption. Among the individual occupations, Construction Electrician, Refrigeration and Air Conditioning Mechanic, and Automotive Service Technician also show high levels of significance after deregulation. The F- test of the joint significance for total occupations shows a high level of significance in the post treatment period, relative to the pre-treatment period. The F-test results are also reflected by the individual occupations listed above and reflect a higher level of significance in the post treatment period.

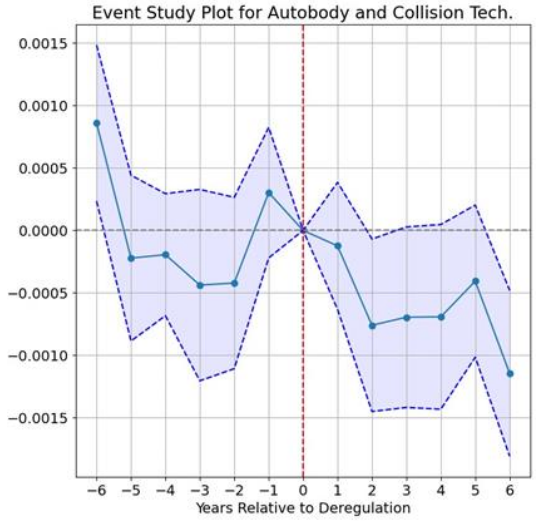
Looking at the event study figures (Figure 1), the solid line represents the lead and lag coefficients from the event study regression, and the dotted lines are a 95% confidence interval around the estimate. The year of deregulation, 2003, is used as the reference period. Figure 1 illustrates the event study results and displays coefficient estimates and confidence intervals for the leads and lags for all study occupations combined and for each occupation individually. With respect to the results for all study occupations combined, the coefficients on the lead periods are all relatively close to zero, while the lag periods show a substantial and growing effect, based on

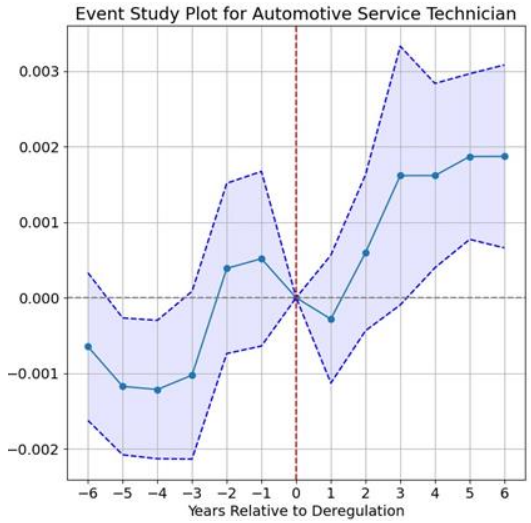
the coefficients. This suggests a dramatic effect in the first three periods after deregulation, and later leveling off.

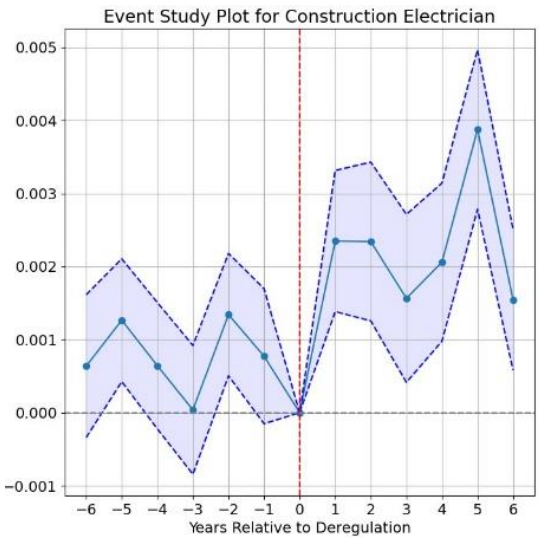
Among the individual occupations, Automotive Service Technician, Construction Electrician, and Refrigeration and Air Conditioning Mechanic, show the best results. With regard to Automotive Service Technician, there is a small decline in the first period, followed by a dramatic increase in periods 2 and 3, leveling off in the latter three periods. It appears deregulation may have had a delayed effect, followed by a dramatic increase. The coefficient patterns for Construction Electrician and Refrigeration and Air Conditioning Mechanic seem close to zero in the pretreatment and increase through the post-treatment period with less stability than the examples above. Each of these occupations shows lead coefficients relatively close to zero in the pre-treatment period and increases in the post-treatment period, suggesting that deregulation had a positive effect on labor force participation in these occupations as a share of the overall labour force. Conversely, Autobody Collision Repair shows decline after treatment, but with increasingly negative coefficients in the post-treatment period. Pretreatment coefficients are close to zero. Generally, the results appear to support the parallel trends assumption made in the DiD model.

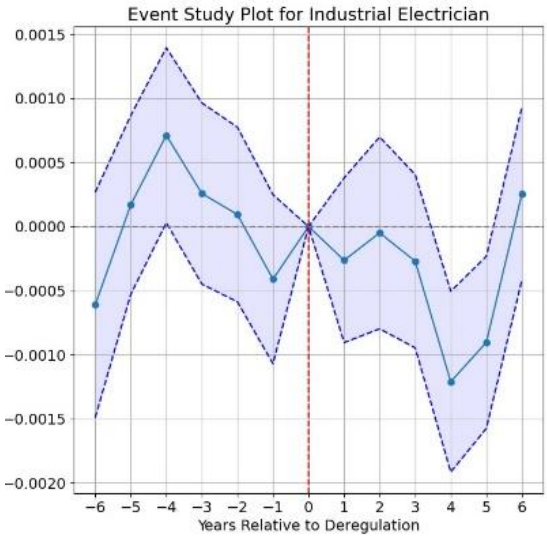
Figure 1: Event study results

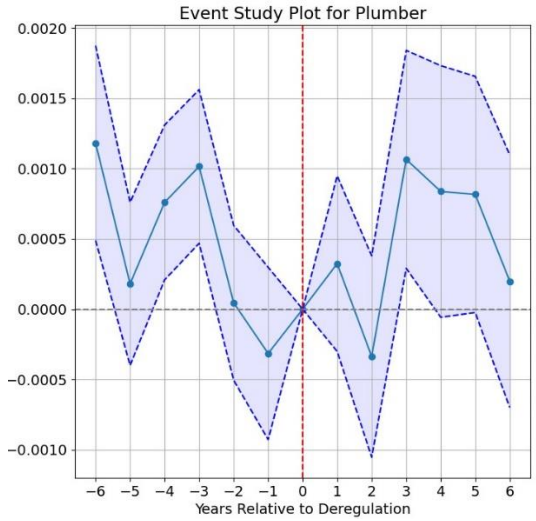


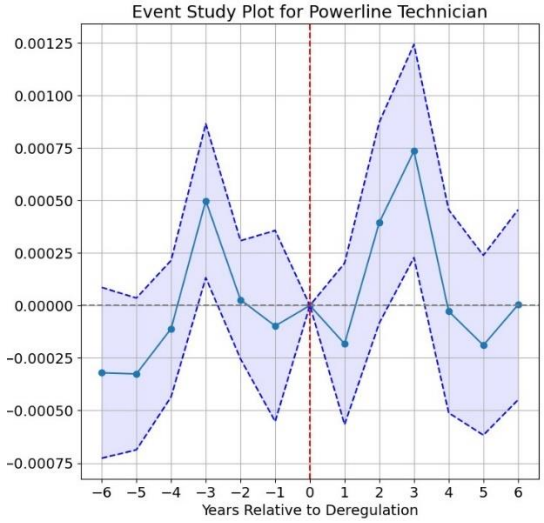


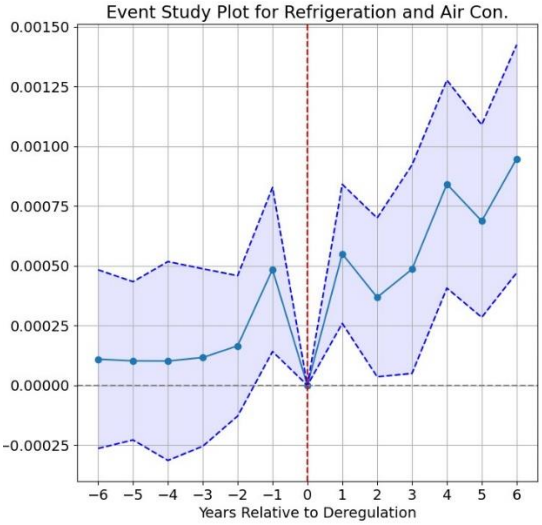


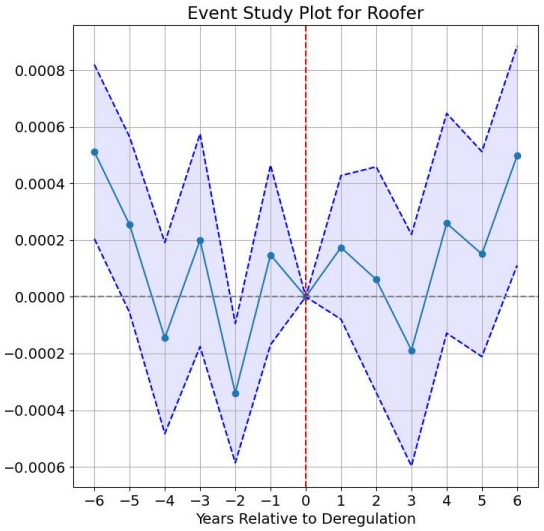


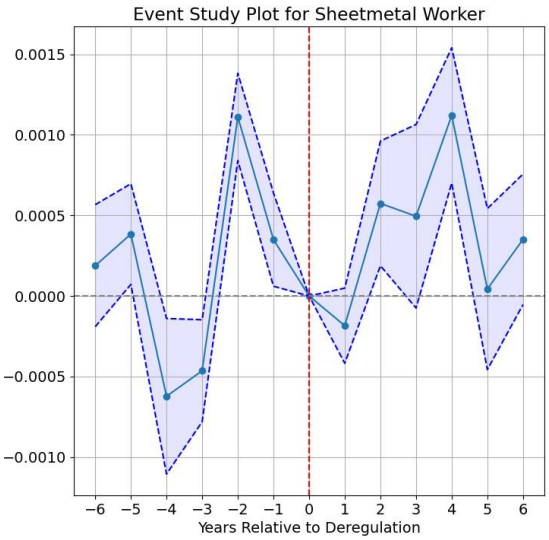


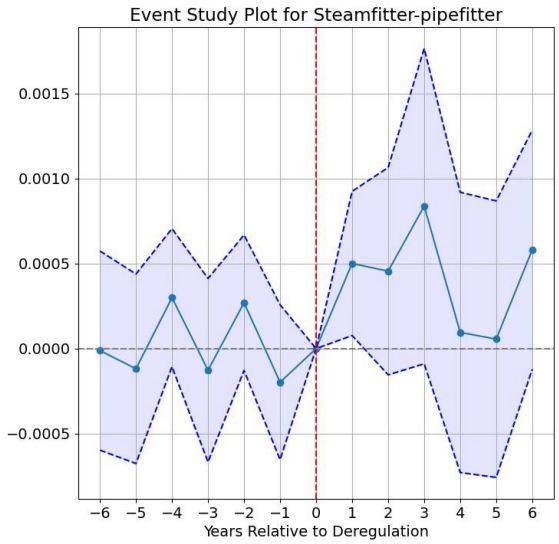












Notes: Solid line provides coefficient estimates for each lead and lag. Deregulation in 2003 is the reference category.

7. Conclusion

Looking at the study overall, it is apparent that deregulation was broadly responsible for an expansion of the labour force. This expansion, however, was driven predominantly by the two most populated trades, Construction Electrician, which saw the largest overall expansion, Refrigeration and Airconditioning Mechanic, which saw the largest relative expansion. Automotive Service Technicians did not see a large expansion in the labour force, but the results suggest that deregulation helped this industry avoid a contraction suffered among provinces in the comparison group. Not all trades in the study experienced an expansion due to deregulation. Notably, Autobody Collision Repair may have been negatively impacted in terms of total labour. It is also evident that Construction Electrician, Automotive Service Technician, and Refrigeration and Air Conditioning Mechanic contain large numbers of uncertified workers that were able to enter the labour force shortly after deregulation.

Evidence from my research supports others (Law and Marks, 2009; Law & Kim, 2005; Kleiner, 2006) that there's a greater effect of certification and deregulation in areas where employers don't need the certification to ensure high quality work. In job markets where asymmetric information can be mitigated using technology or other methods to assess quality, the value of credentials can be reduced and circumvented by less costly alternatives. If certification is already being used to limit asymmetric information, it's likely consumers and employers have developed other methods to limit asymmetric information. Some of this is manifested in the use of technology such as social media and the internet. Google reviews and other mechanisms allow individuals to report the quality of a product, service, or business. The magnitude of the effect also suggests the occupation requirements may have been higher than necessary, keeping competent but lower skill workers from completing work classified under a

compulsory certification trade. Under these circumstances, compulsory certification will likely reduce the amount of labour available without increasing the average quality of work.

Without the requirement for certification, individuals who had the necessary skills and experience, but lacked formal training and certification, were able to enter these industries and increased the pool labour. While compulsory certification can help to ensure that individuals working in certain trades have the skills and knowledge to perform their jobs, it can also constrain labour supply. One of the primary challenges is the cost and time required to obtain certification: formal apprenticeship programs and certification exams can be expensive and time-consuming for potential workers. This is especially prevalent in trades that require a high level of training but contain aspects of work that under-utilize this training, preventing lower-skilled, but capable workers from entering.

Deregulation of compulsory trades leaves much to be studied. For example, how deregulation affected wages, the cost and availability of services, quality and complaints, and career and education decisions. This topic is passionately contested, and depending on the availability of data and personal interest, there is still much to be discovered.

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APPENDIX

Appendix 1: Additional tables and figures

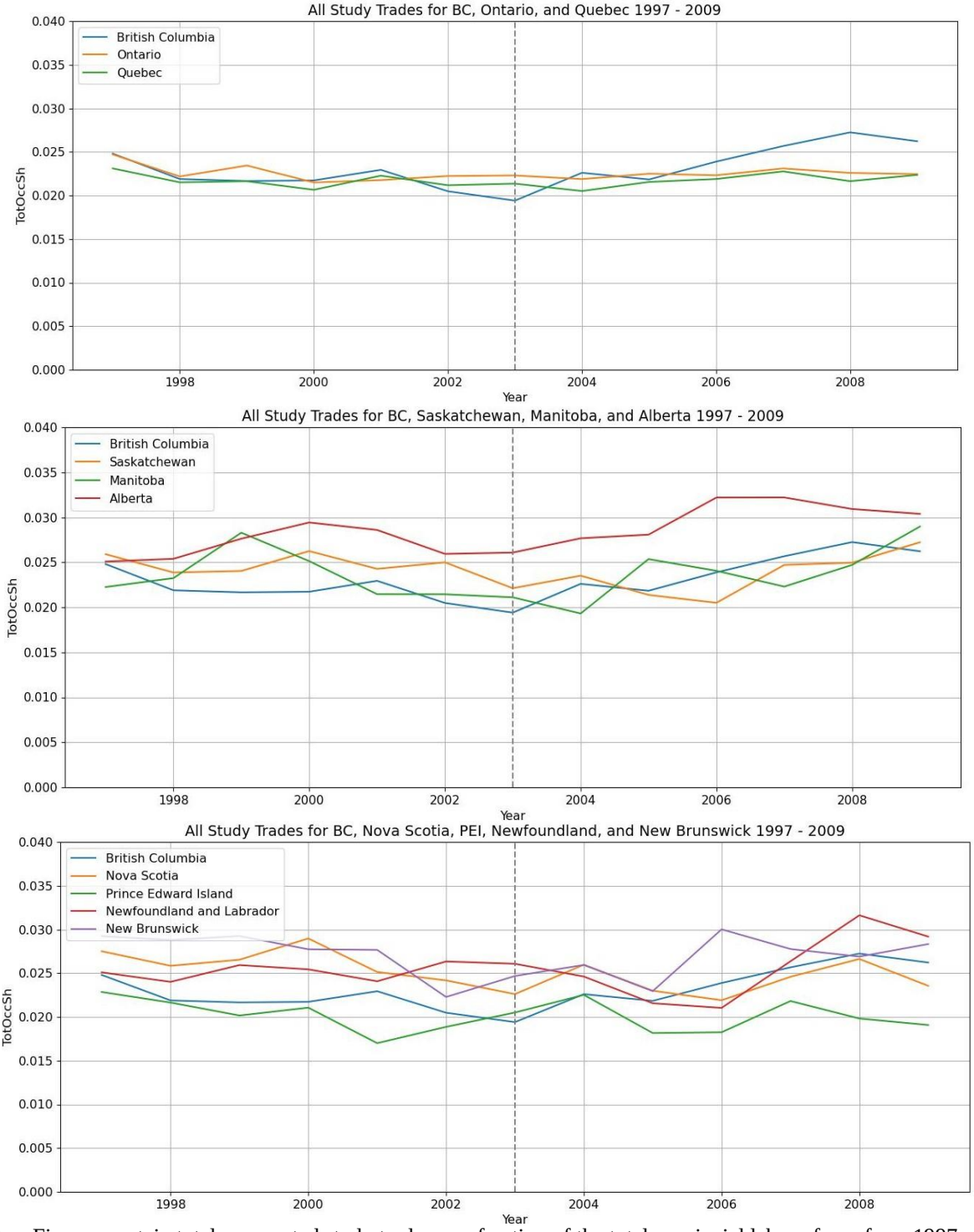
Table A1.1: Study Trades and NOC 5 Codes

1. Automotive Collision Repair Technician	72411
2. Automotive Service Technician	72410
3. Construction Electrician	72200
4. Industrial Electrician	72201
5. Plumber	72300
6. Power Line Technician	72203
7. Refrigeration Mechanic	72402
8. Roofer	73110
9. Sheet Metal worker	72102
10. Steamfitter and Pipefitter	72301

Table A1.2: BC Compulsory Trades and Date Enacted (Prior to 2003)

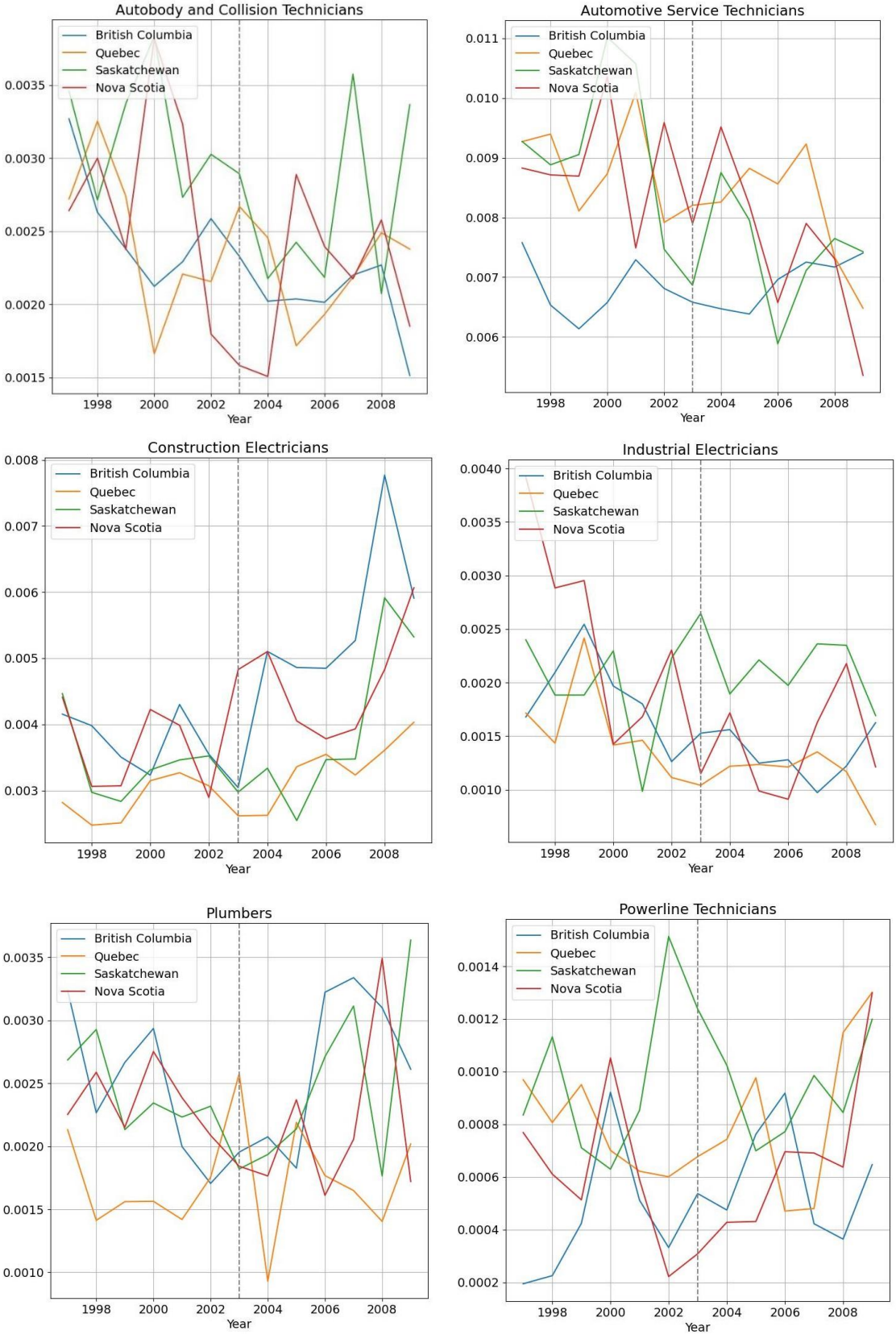
1. Automotive Collision Repair Technician	1996
2. Automotive Refinishing Technician	1996
3. Automotive Service Technician	1996
4. Electrician	1996
5. Plumber	1974
6. Power Line Technician	1996
7. Refrigeration Mechanic	1967
8. Roofer	1976
9. Sheet Metal worker	1967
10. Sprinkler System Installer	1974
11. Steamfitter and Pipefitter	1974

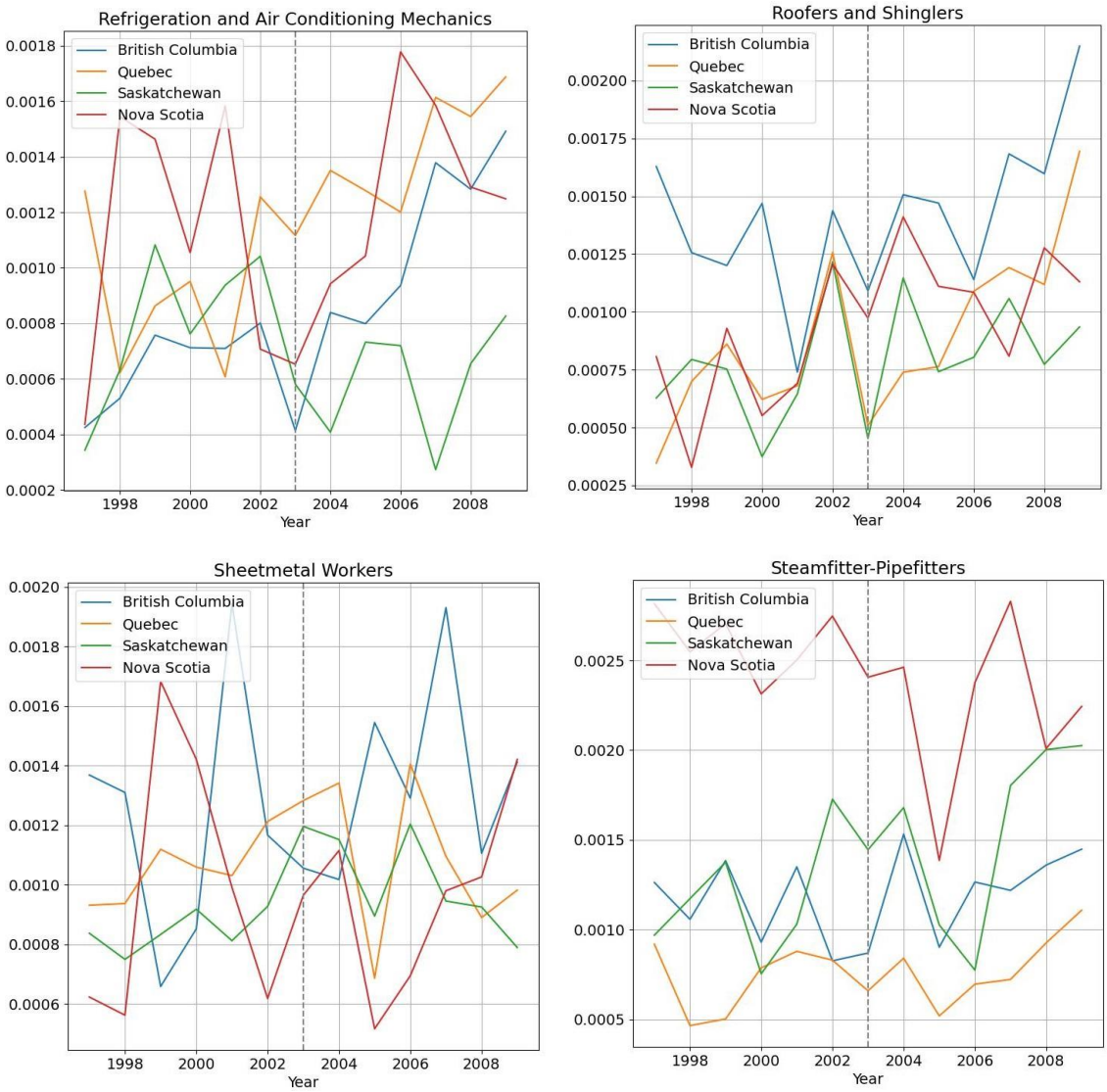
Figure A1.3: Labour supply by province and year



Notes: Figures contain total aggregated study trades as a fraction of the total provincial labour force from 1997 – 2009. Vertical line denotes deregulation year (2003).

Figure A1.4: Labour supply by province, occupation, and year





Notes: Figures contain population working in study trade as a fraction of the total provincial labour force from 1997 – 2009. Vertical line denotes deregulation year (2003).

Table A1.1: Event Studies - Share of Total Provincial Labour Force with 6 Year Leads and 6 Year Lags from Deregulation Period

Years to Deregulation	Total	Roof and Shingle	Plumber	Sheet Metal Worker	Construct Elec.	Industrial Elec.	Powerline Tech.	Steam and Pipe	Refriger. Air Con.	Auto. Service	Auto. Collision
-6	0.00190**	0.00051***	0.00118***	0.00019	0.00064	-0.00061	-0.00032	-0.00001	0.00011	-0.00065	0.00086***
	(0.00095)	(0.00016)	(0.00035)	(0.00019)	(0.00050)	(0.00045)	(0.00021)	(0.00030)	(0.00019)	(0.00050)	(0.00032)
-5	0.00052	0.00025	0.00018	0.00038**	0.00127***	0.00017	-0.00033*	-0.00012	0.00010	-0.00117**	-0.00022
	(0.00090)	(0.00016)	(0.00030)	(0.00016)	(0.00043)	(0.00036)	(0.00018)	(0.00028)	(0.00017)	(0.00046)	(0.00034)
-4	0.00023	-0.00015	0.00076***	-0.00062**	0.00064	0.00071**	-0.00011	0.00030	0.00010	-0.0012***	-0.00019
	(0.00075)	(0.00017)	(0.00028)	(0.00025)	(0.00044)	(0.00035)	(0.00017)	(0.00021)	(0.00021)	(0.00047)	(0.0006)
-3	0.00007	0.00020	0.00102***	-0.00046***	0.00004	0.00026	0.00050***	-0.00013	0.00012	-0.00103*	-0.00044
	(0.00079)	(0.00019)	(0.00028)	(0.00016)	(0.00045)	(0.00036)	(0.00019)	(0.00028)	(0.00019)	(0.00057)	(0.00025)
-2	0.00268***	-0.0003***	0.00005	0.00111***	0.00134***	0.00009	0.00003	0.00027	0.00017	0.00039	-0.00042
	(0.00067)	(0.00013)	(0.00028)	(0.00014)	(0.00043)	(0.00035)	(0.00014)	(0.00020)	(0.00015)	(0.00058)	(0.00035)
-1	0.00155*	0.00015	-0.00031	0.00035**	0.00077	-0.00041	-0.00010	-0.00020	0.00049***	0.00052	0.00030
	(0.00084)	(0.00016)	(0.00031)	(0.00015)	(0.00047)	(0.00034)	(0.00023)	(0.00023)	(0.00018)	(0.00059)	(0.00027)
1	0.00286***	0.00017	0.00032	-0.00018	0.00235***	-0.00026	-0.00018	0.00050**	0.00055***	-0.00028	-0.00012
	(0.00080)	(0.00013)	(0.00032)	(0.00012)	(0.00049)	(0.00033)	(0.00020)	(0.00021)	(0.00015)	(0.00043)	(0.00026)
2	0.00365***	0.00006	-0.00034	0.00057***	0.00234***	-0.00005	0.00040	0.00046	0.00037**	0.00060	-0.00076**
	(0.00098)	(0.00020)	(0.00037)	(0.00020)	(0.00055)	(0.00038)	(0.00024)	(0.00031)	(0.00017)	(0.00053)	(0.00035)
3	0.00565***	-0.00019	0.00107***	0.00050**	0.00156***	-0.00027	0.00074***	0.00084*	0.00049**	0.00162*	-0.00069*
	(0.00145)	(0.00021)	(0.00040)	(0.00029)	(0.00059)	(0.00035)	(0.00026)	(0.00047)	(0.00022)	(0.00087)	(0.00037)
4	0.00490***	0.00026	0.00084*	0.00112***	0.00206***	-0.00121***	-0.00003	0.00010	0.00084***	0.00162**	-0.00069*
	(0.00111)	(0.00020)	(0.00046)	(0.00021)	(0.00055)	(0.00036)	(0.00025)	(0.00042)	(0.00022)	(0.00062)	(0.00038)
5	0.00300***	0.00015	0.00082*	0.00004	0.00388***	-0.00090***	-0.00019	0.00006	0.00069***	0.00187***	-0.00041
	(0.00095)	(0.00019)	(0.00043)	(0.00026)	(0.00056)	(0.00034)	(0.00022)	(0.00041)	(0.00020)	(0.00056)	(0.00031)
6	0.00510	0.00050**	0.00020	0.00035*	0.00154***	0.00026	0.00000	0.00058	0.00095***	0.00187***	-0.0011***
	(0.00116)	(0.00020)	(0.00046)	(0.00021)	(0.00049)	(0.00034)	(0.00023)	(0.00036)	(0.00024)	(0.00062)	(0.00034)
H_0: Leads = 0	0.04	0.26	0.07	0.19	0.04	0.90	0.70	0.91	0.10	0.13	0.93
H_0: Lags = 0	0.00	0.25	0.16	0.01	0.00	0.18	0.50	0.14	0.00	0.01	0.01
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Squared	0.70	0.38	0.48	0.38	0.67	0.57	0.35	0.73	0.32	0.47	0.36

Notes: *p < 0.10; **p < 0.05; ***p < 0.01. Each column represents a separate regression using Statistics Canada, Labour Force Survey estimates at the province and month levels from 1997 – 2009. Robust Standard errors, clustered by province level are in parenthesis.

Appendix 2 – Information on Control Variables

PerMale - fraction of the provincial labour force that is male. This control variable is constructed using information on gender and represents the fraction of the total labour force that is male[10].

PerwPS - fraction of provincial labour force with more than high school education, including those without high school, but some post-secondary/Certificate or degree. This control variable is constructed based on education attainment levels within the labour force and includes people highschool graduates with some post-secondary, those with post-secondary certificate or diploma, and those with a university degree as a fraction of the total labour force[11].

PerCM - fraction of labour force that is married or common law. This control variable is constructed from information on family structure. It is the fraction of total reference persons and their spouse in labour force aged 25 years and over, who are in a married or common law relationship, at the time of the survey. Matte (2022) p.67 career in trades is not the first, so it will be interesting how family development effects these labour market decisions[12].

PerwChld - fraction of provincial labour force with children under 18 years of age. This control variable is constructed from information on family structure. It is the fraction of total reference persons and their spouses in labour force aged 25 years and over, with children under the age of 18, at the time of the survey[13].

[10] Statistics Canada. Table 14-10-0017-01 Labour force characteristics by sex and detailed age group, monthly, unadjusted for seasonality (x 1,000)

[11] Statistics Canada. Table 14-10-0117-01 Labour force characteristics by educational degree, monthly, unadjusted for seasonality

[12] Statistics Canada. Table 14-10-0397-01 Labour force characteristics by family structure, monthly, unadjusted for seasonality

[13] Above