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Research on Labour Market Impacts of the Temporary Foreign Worker Program

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Revised Final Report *

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1 Summary

In this study, we investigate the labour market impacts of Canada's Temporary Foreign Worker Program (TFWP) during the 2010-2017 time period using detailed data sourced from individual and firm tax files, as well as TFWP administrative records.[1] A major challenge of administering a Temporary Foreign Worker (TFW) program is that foreign workers facing poor employment options in their home country have incentives to accept jobs to work in Canada for lower wage rates than a typical Canadian would accept. This can lead to worse outcomes for Canadians in the labour market if firms internalize this knowledge when making hiring decisions and select TFWs over Canadians. Alternatively, it may also be true that firms require TFWs to fill legitimate labour shortages that would otherwise remain unfilled without the TFWP. Distinguishing between these two possibilities is empirically challenging, but crucial, in an assessment of Canada's TFWP. With these concerns in mind our report focuses on three main topics: (1) the potential impacts of the TFWP's low-wage stream on the Canadian labour market, focusing on the potential suppression of Canadian earnings, (2) the extent to which the TFWP is meeting the needs of Canadian firms, and (3) the effects of the reformed TFWP on the labour market. Throughout our report, when referring to TFW employment or TFW hires, we are only considering the TFWs hired through the TFWP, that is, where firms were required to submit a Labour Market Impact Assessment (LMIA) as a condition of their employment. This excludes the foreign workers hired through Immigration, Refugees and Citizenship Canada's (IRCC) International Mobility Program to fill positions that are LMIA exempted. The LMIA process aims to ensure that there is a need for a temporary worker and that no Canadians or permanent residents are available to do the job.

[1] In the context of this study, the term *firms* is used to refer to both private and public sector organizations.

1.1 Key Findings

We find a negative correlation between low-skilled TFW employment and the annual earnings of Canadians employed in the same firms. The negative correlation between earnings and low-skilled TFW employment is strongest for Canadians with low earnings in a firm. An additional low-skilled TFW worker at a particular firm is correlated with a 0.57% decrease in the earnings of the lowest earning Canadians (i.e., those in the first quartile) at the same firm. We show this effect in a series of regressions where we decompose TFW employment at a firm by skill level and interact this variable with the placement of Canadians within the firm's earnings distribution. These findings are consistent across the pre-reform (2010-2013) and post-reform (2014-2017) time periods. We also find that both low-skilled and high-skilled TFW employment is correlated with higher earnings of Canadian workers for those at the upper end of a firm's earnings distribution. These results showcase how the impact of the TFWP on Canadians is highly dependant on the substitutability between TFW hires and Canadian workers.[2] For example, the earnings of Canadian workers at the top end of a firm's earnings distribution are correlated with a 0.64% increase with each additional high-skilled TFW worker at the same firm. We also investigate whether any differences in this relationship exist across industry of employment and find that, regardless of their placement on their firm's earnings distribution, Canadians employed in the agricultural industry do not experience *any* statistically significant negative correlation between their earnings and TFW hiring at their firm. Our findings on the *causal* relationship are less conclusive. We do not find a significant negative relationship between TFW employment at firms and the annual earnings of Canadians.

We also find that TFW employment at firms is correlated with greater access to international markets. We show that TFW employment is correlated with increased trade participation, trade volume, expanded entry into foreign markets, and product diversification; both for imports and

[2]Substitutability (and complementarity) across workers is dependant on the similarity of skills and attributes, where two highly similar workers are more likely to be substitutes for each other. If lower skilled TFWs possess a set of skills that are found in abundance throughout the Canadian workforce it would lead to increased competition for these skills and put downward pressure on the returns to those skills. However, employment gains can also be generated from complementarities in production through, for example, gains from specialization when TFWs possess a set of desirable, and relatively scarce skills. Their presence may enable their Canadian counterparts to be redeployed to another position at their firm where they are relatively more productive, thereby improving their own compensation and total firm performance.

exports. We find the strongest results for importing behaviour relative to exporting.

1.1.1 Key Findings Bullet Points

1. TFW employment is negatively correlated with earnings of low-skilled, low-earning Canadians at the same firm.

2. TFW employment is positively correlated with earnings of high-skilled, high-earning Canadians at the same firm.

3. TFW employment at firms is correlated with increases to firm import and export participation.

4. Canadians employed in the agricultural industry do not experience any statistically significant negative correlation between their earnings and TFW hiring at their firms.

5. Results are solely showing correlations and they should not be interpreted as establishing a causal relationship.

2 Rationale and Context of the Study

2.1 Literature Review

Given the scale and scope of immigration in many developed countries, policy makers are interested in measuring the consequences of immigration. The impact on the wages and employment status of a country's residents could potentially be used as a barometer in setting immigration policy. This is particularly relevant in temporary worker programs, such as Canada's TFWP.[3] The objective of the program is to allow employers to hire foreign workers to fill labour or skills needs on a temporary basis when no Canadians or permanent residents are available. When properly implemented, Canadian and permanent resident workers should face no negative impacts since it is assumed that the need for foreign workers solely depends on there being no Canadian or permanent resident workers to meet that labour demand.[4]

There are several empirical obstacles in studying the labour market impacts from any immigration policy (Card, 1990, 2001; Borjas, 2003). However, the unique features of the TFWP, coupled with shifts in policy surrounding the program, offer opportunities for credible identification strategies of the program's impact on the Canadian economy.

One of the key features of the TFWP is the restricted mobility of foreign workers. The program constrains foreign workers to a particular employer and prevents them from seeking employment in firms other than the one that recruited them (with a few exceptions). This means that foreign workers in the TFWP cannot easily respond to labour demand differences across regions by moving to booming regions and leaving slowing ones. Compared to their domestic-born counterparts, immigrant workers are more likely to respond to wage changes across regions (Cadena and Kovak, 2016). This selection on location can potentially obscure the impact of immigration on Canadian-born workers' economic outcomes. Therefore, it is one of the most important challenges in studying the impact of immigration on the domestic labour market

[3] Other programs include the H-1B visa program in the United States

[4] This may be due to a lack of available workers whose skills match the position requirements needed for the role or due to a lack of interest in applying for vacant positions. Employers must obtain a positive or neutral LMIA to hire foreign workers to fill temporary labour and skill shortages. The LMIA is conducted to ensure that there is a need for a temporary worker and that no Canadians or permanent residents are available to do the job. An important innovation of the 2014 reforms to the TFWP was the creation of a separate program, the International Mobility Program (IMP) for LMIA exempted positions.

(Borjas, 2003). For example, if TFW workers endogenously select into thriving regions, there may be a spurious positive correlation between TFW employment and domestic-born wages.

Another important issue that is relevant in the literature of immigration is that the hiring of immigrants across firms is not random (Foged and Peri, 2016; Dustmann and Glitz, 2015). Differences in firm-specific factors, both persistent and transitory, can have an effect on immigrant employment and these same factors can be correlated with labour market outcomes for Canadians. This is particularly relevant for the TFWP given that employers submit applications specifically to obtain the authorization to hire temporary foreign workers. To deal with this concern, the conventional approach relies on using predictions of international immigrant inflows into a region based on historical settlement (Card, 2001; Kerr, Kerr and Lincoln, 2015). However, this solution is not appropriate for our setting because firms are not limited to recruiting TFWs from their local regions. Instead, we use variation in Canadian workers' exposure to TFWs across firms and local labour markets to identify the TFWP impact. We exploit the plausible exogeneity of TFW employment across firms stemming from major policy changes to Canada's TFWP over time. In one of our applications, we use the policy change announced on June 20, 2014 that included a provision to increase the TFWP application fee that employers pay per position requested from $275 to $1000, effective immediately. The policy change also featured the introduction of binding wage floors for new TFW hires under the TFWP among other changes.[5] Because of firm-specific differences (e.g., business cycle, fiscal year-ends), employers submit applications for TFWs at different times on a given year. We will use the distribution of firm's TFW application dates over the calendar year as an instrument for the number of TFWs at the firm, following the 2014 policy changes. [6]

[5] Binding wage floors do not apply when TFWs are hired under the IMP, that is, in LMIA exempted positions.

[6] A concern could be that since TFWs are not hired immediately when their application is submitted, there is room for a firm to preempt an application that would have normally occurred later in the year to bypass the new policy changes. Our findings on the gap between application and TFW employment start dates over the period when the policy was introduced, shows no evidence of this systematically occurring. As a robustness measure, we also use the start date of TFW employment at a firm over the calendar year as an instrument for TFW employment and our results remain similar.

2.2 Program Background

Created in 1973, the TFWP enables Canadian employers to hire foreign workers to fill temporary labour shortages when there are no Canadians or permanent residents available to do the job. The program has been updated throughout its existence to balance the employment needs of Canadian employers while continuing to protect Canadian and permanent resident workers. Major reforms introduced in June 2014 overhauled the program due to concerns that employers were not using the program as intended - a last and limited resort to hire workers when no qualified Canadians or permanent residents are available. Following the 2014 reforms employers can hire TFWs under only four streams: the high-wage stream, the low-wage stream, the primary agriculture stream, and a stream to support permanent residency. Relative to the former TFWP the biggest change was a removal of the high-skilled and low-skilled streams to the new high-wage and low-wage ones.[7] The determination of high-wage or low-wage stream for TFWs is based on their wage relative to the provincial median wage of their place of employment. TFWs paid above the provincial median wage are considered high-wage and those being paid under are considered low-wage. The change to a wage-based classification system provided a more objective measure to reflect skill level and labour in a given area of the country. The 2014 reforms also introduced a new and more rigorous labour market verification process, the LMIA, to ensure that bringing in a worker under the TFWP was necessary. Relative to the previous labour market assessment, called Labour Market Opinion (LMO), the LMIA uses new and better sources of information to determine if there are Canadians or permanent residents available to fill employers' needs. They also require employers to include information on Canadians and permanent residents that applied and interviewed for a job posting and why they were not hired. Other important changes to the program included an introduction of a cap of 10% or 20% on the proportion of an employer's workforce that are low-wage TFWs and increasing the LMIA fee from $275 to $1,000 per position requested.[8] The introduction of this cap and increasing the LMIA fee followed evidence that

[7] For consistency across the pre-reform and post-reform in our analysis, we group TFWs based on their skill level imputed from the National Occupational Classification (NOC).

[8] Some exceptions to the low-wage cap apply for employers hiring workers in some sectors for specific time periods. For example, during April 30, 2022 to April 30, 2023 employers in the Construction and Food Manufacturing sectors are eligible for a low-wage cap limit of 30%. See https://www.canada.ca/en/employment-social-development/services/foreign-workers/

employers built their business model on hiring TFWs from the program, with some firms having TFWs represent 50% of their workforce (Employment and Social Development Canada, 2014). In our analysis that follows, we use the major policy overhaul to the TFWP in 2014 as a source of exogenous variation to determine whether the hiring of foreign workers through the TFWP low-wage stream has caused downward pressure on Canadian wages.

New findings on the habitual use of the TFWP as a temporary solution for permanent labour and skill needs show that the program can also be used by employers on an on-going basis Employment and Social Development Canada (2021). After proving that they are unable to meet their labour needs using other means, some Canadian employers commonly use the TFWP to help fill their reoccurring labour needs using TFWs, whose visa to work lasts up to two years.

The other main program in which foreign workers enter Canada to work on a temporary basis is the International Mobility Program (IMP). In contrast to the TFWP, employers hiring foreign workers entering via the IMP, are not subject to a labour market assessment requirement. The primary objective of this program is to advance Canada's economic national interest, rather than filling particular skill shortages. Furthermore, entrants to Canada under the IMP generally have open work permits whereas, under the TFWP, work permits are tied to a particular employer. In 2021, there were 10 times as many TFWs employed in Canada through the IMP compared to the TFWP[9].

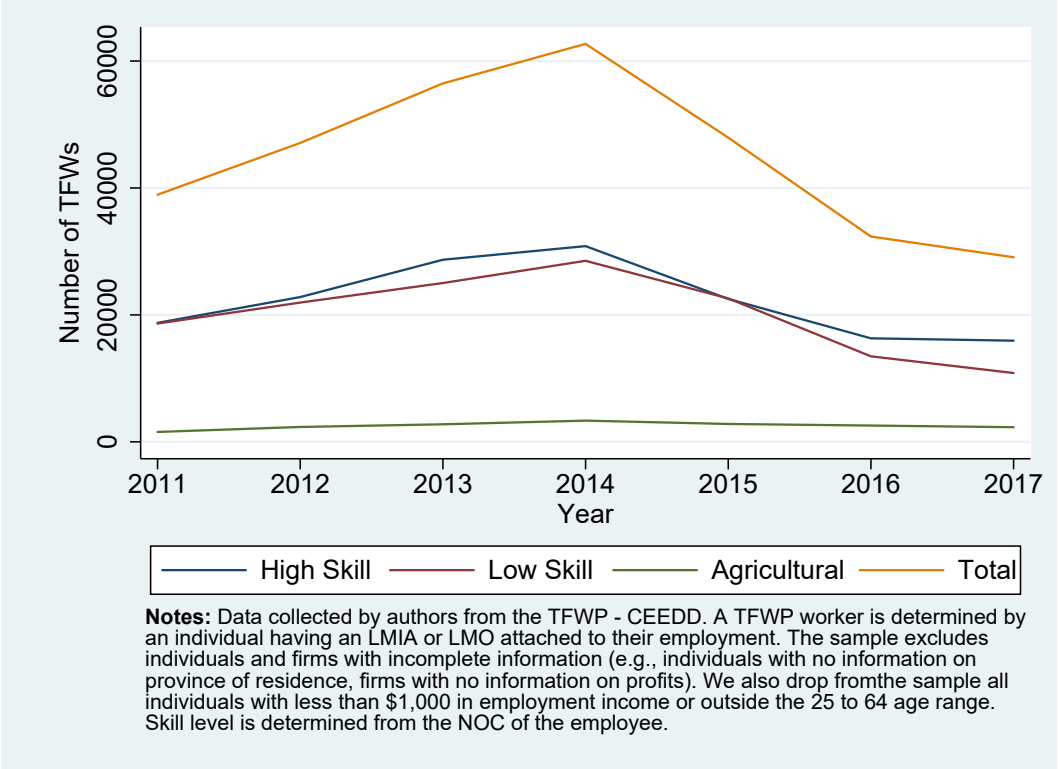
median-wage/low/requirements.html#h2.5 for a full list of exemptions.

[9]See https://open.canada.ca/data/en/dataset/360024f2-17e9-4558-bfc1-3616485d65b9 for details

3 Data and Descriptive Findings

In this section, we describe the data sources and document the broad data patterns of TFW employment over time, across entry categories, and industries. The main data we use is sourced from the Canadian Employer-Employee Dynamics Database (CEEDD), a linkage environment that matches workers and firms across administrative and tax datasets. This employee-employer matched data is merged with the TFWP administrative files dataset, which we refer to as the TFWP-CEEDD. The findings in this section are either (i) not centered around a particular issue but are nonetheless important when thinking about the broad impact of the TFWP or (ii) references in multiple sections throughout the report and in lieu of repeating them across sections they are included here. Please refer to the appendix for table versions of the figures that contain exact numerical values.

Figure 1: Distribution of TFWP employment, by year and skill level

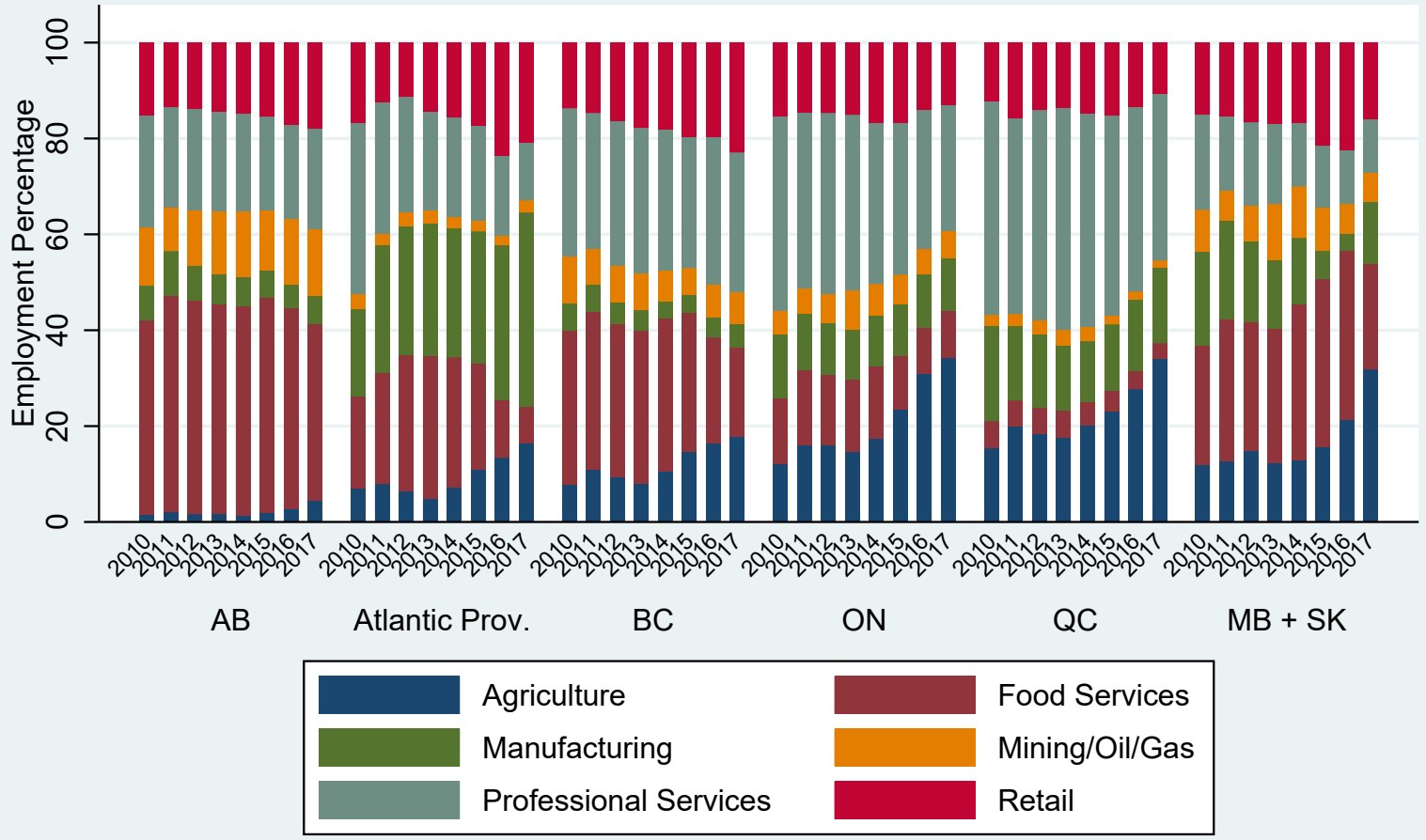


Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also drop fromthe sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range. Skill level is determined from the NOC of the employee.

Figure 1 shows the distribution of TFW employment by skill levels for seven years starting in 2011. We group TFWs based on their skill level imputed from the National Occupational Classification (NOC). We follow the standard in the literature and define NOC codes beginning with 0,

A, B as high-skilled and those beginning with C and D as low skill. Agricultural classification is based on the type of work permit listed within the Longitudinal Immigration Database (IMDB). We use these groupings in our main analytical sections because it can help shed light on the mechanisms by which TFW employment affects the labour market outcomes of Canadians. For example, within a particular location, industry, and firm, a low-skilled TFW may contribute more to reducing the earnings of low-skilled Canadians employed in the same location, industry, and firm than a high-skilled TFW. Over the years, the share of low-skilled TFWs decreased from a high of 73% in 2014 to a low of just 27% in 2017. This shift coincided with the introduction of substantial reforms to the TFWP in 2014. In addition to changing the composition of TFWs from low-skilled to high skilled, the 2014 reforms also led to an abrupt decrease in the total number of TFWs employed across all skill groups; between 2014 and 2015, TFW employment fell by 25%. An alternative to this skill based categorical approach is to group TFWs by their entry stream. However, changes in entry stream categories across the pre-reform and post-reform time periods precludes us from having a consistent way of using the entry stream categories of TFWs. After the 2014 reforms, the determination of high-wage or low-wage stream for TFWs became based on their wage relative to the provincial median wage of their place of employment whereas before it was based on an imputed measure of skill, regardless of wages.

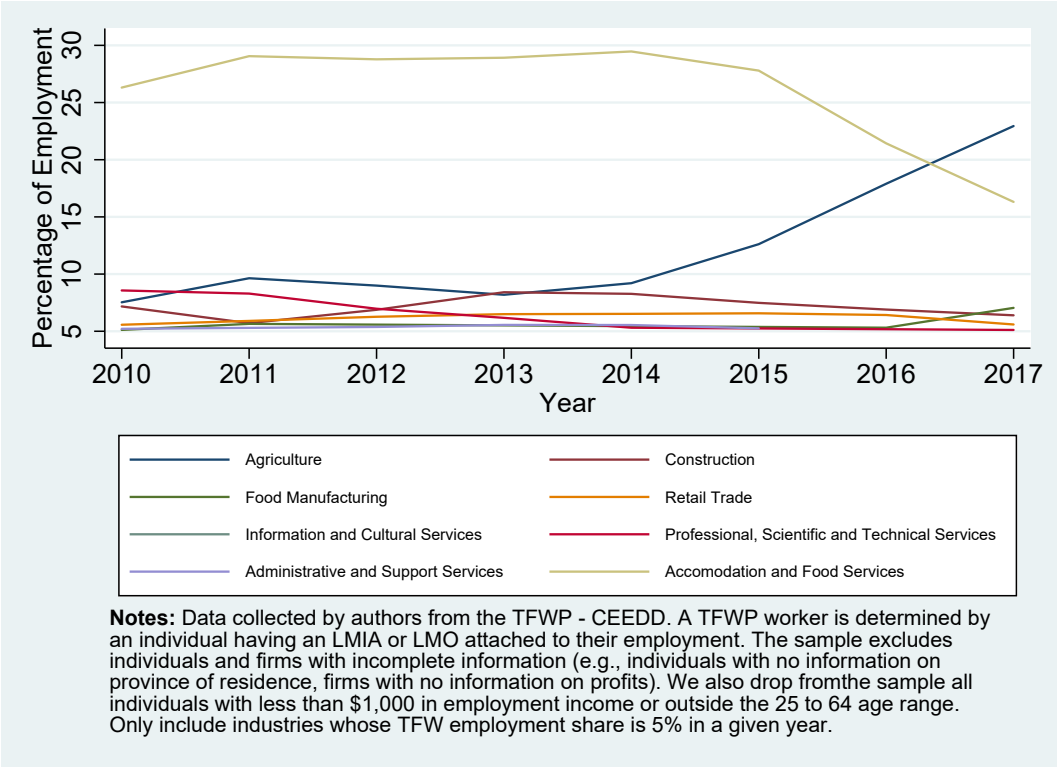
Figure 2: Fraction of TFWP employment across industries, by region and year



Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also drop fromthe sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range.

Figure 2 reports the fraction of TFW employment by province and industry over time. We observe substantial heterogeneity in the distribution of TFW industrial employment across provinces during our sample period. For example, in Alberta, the Accommodation and Food Services Industry (NAICS 72) is the largest employer of TFWs whereas for Quebec that industry is the smallest employer of TFWs. These results suggest that there exists significant regional differences in employment needs across industries and provinces. Not only are there differences in the distribution of TFWs across industries but, if we adjust by provincial population, we find that the ratio of TFWs in Alberta is much higher (and vice versa in Quebec). Adjusting for provincial population, in 2013, there is 330% *more* TFW employment than expected in Alberta and 60% *less* TFW employment than expected in Quebec. The unequal distribution of TFWs across economic regions and industries will factor into the labour market impacts, which we study in detail in the next section. See Tables (A.2) and (A.3) in Appendix for provincial normalization details.

Figure 3: Distribution of TFWP employment, by year and industry



Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also drop fromthe sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range. Only include industries whose TFW employment share is 5% in a given year.

Figure 3 reports the distribution of TFW employment by 2-digit NAICS industry for eight years starting in 2010. We categorize industry of employment based on records from a firm's tax

filing. Industries with the largest exposure to TFW employment are accommodation and food services and agriculture. In any given year they account for 30-40% of all TFWP employment.

Table 1: New TFW Employment, by month and year

	2010	2011	2012	2013	2014	2015	2016	2017	Total
January	2,122	6,676	7,387	10,463	10,713	7,042	7,535	9,182	61,120
February	3,612	7,687	11,454	13,116	12,773	8,655	10,193	9,718	77,208
March	4,407	9,421	10,677	10,843	10,535	8,190	6,678	7,835	68,586
April	3,925	5,628	6,452	7,336	5,886	3,986	4,681	3,841	41,735
May	3,967	5,136	8,225	6,218	4,786	3,424	3,327	3,912	38,995
June	4,435	5,534	8,197	5,345	3,729	3,700	3,326	3,504	37,770
July	4,541	5,621	6,296	4,991	2,640	3,228	2,242	2,076	31,635
August	4,529	5,220	6,985	4,239	2,186	2,407	2,379	2,067	30,012
September	4,754	4,426	6,321	3,717	1,784	2,360	2,664	1,413	27,439
October	5,261	5,473	9,512	5,370	6,816	7,224	7,603	1,048	48,307
November	5,731	5,732	8,952	7,462	5,451	7,193	8,551	650	49,722
December	4,713	5,435	6,810	7,024	5,134	8,238	7,874	130	45,358
Total	51,997	71,989	97,268	86,124	72,433	65,647	67,053	45,376	557,887

Notes: Data collected by authors from the TFWP - CEEDD. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on revenue). New refers to the inflow of TFWP employment in a given month and year.

Table 1 reports the distribution of new TFW employment by month for eight years beginning in 2010. We observe a substantial shift in new TFW employment coinciding with the introduction of substantial reforms to the TFWP in 2014. We use the term *new* to refer to the inflow of TFW employment from the TFWP in a given month and year. We use the findings from this table in support of our Instrumental Variables (IV) strategy which we present in detail in Sections (4.1) and (4.3)

4 Three Issues to Address

4.1 Potential impacts of the TFW program

Potential impacts of the Temporary Foreign Worker Program's low-wage stream on the Canadian labour market, focusing on the potential suppression of Canadian wages and displacement of Canadian workers.

4.1.1 Key Findings

The earnings of Canadians at the lower end of a firm's earnings distribution are *negatively correlated* with low-skilled TFW employment at their firm. In contrast, the earnings of Canadians at the higher end of a firm's distribution are *positively correlated* with low-skilled TFW employment. We show this effect in a series of regressions where we decompose TFW employment at a firm by skill category and interact this variable with the placement of Canadians within the firm's earnings distribution.[10] We also investigate whether any differences exist in the relationship between the earnings of Canadians and their industry of employment. We find that, regardless of their placement on their firm's earnings distribution, Canadians employed in the agricultural industry do not experience *any* statistically significant negative correlation between their earnings and TFW hiring at their firm. Our model prevents us from determining the causality of these results. Further analysis with more detailed data (e.g., hourly wages) would be required to confirm the causal relationship.

4.1.2 Sample of Interest

We restrict our main analysis in this section to an unbalanced panel[11] of Canadians that were employees of tax-filing firms between the years 2010-2013, which are all the years available to

[10] Given the strong correlation between earnings and education levels, workers located in the 1st quartile of a firm's earnings distribution are more likely to be low-skilled.

[11] In this context, unbalanced refers to allowing the inclusion of individuals and firms which may not be present in every year of our data. For example, under a balanced panel, if someone were to leave the labour force in 2015 we would have to exclude them from our sample even if they appear in every other year.

us prior to the major reforms in 2014.[12] Our analysis of the TFW effect on employment earnings during the post-reform period, 2014-2017, will be discussed in Section (4.3). Throughout our analysis in Section (4) we focus our analysis on the impact of the TFWP on Canadian workers and firms. However, we also run separate analysis on immigrant workers as part of our GBA+ analysis in Section (5). Our sample contains as many as 70,335,661 unique individual-firm observations. To be included in the sample, individuals and firms must have complete information (i.e., none of the variables are missing). For example, individuals whose province of residence is unknown or a firm with no information on revenue or profits were removed from our sample. Beyond this necessary data requirement, we also placed a requirement that individuals must have earned $1,000 in employment income and be aged 25 to 64. These requirements are present for both TFW and non-TFW employees. These are standard restrictions, common to many Statistics Canada publications when measuring labour market impacts.

4.1.3 Methodology and Analysis

We start our analysis on the impact of the TFWP by regressing annual earnings of individuals on TFW employment at their firm to try to uncover the relationship between them. Although we control for a wide set of covariates, this analysis primarily shows *correlations* in the data and does not establish a causal link. For completeness, we provide the TFW impact where employment of TFW is pooled across skill categories, i.e. high-skilled, low-skilled, agriculture, and then decompose the affect by these skill categories to isolate their respective impacts. We pay particular attention to the low-skilled stream in the discussion of our results in this section but show all skill levels and pooled results as a means of comparison. Equation (1) shows the baseline regression model we employ to study the impact on the log annual earnings (y_{ift}) of

[12] Our analysis throughout Section 4 is centered on Canadian workers, however, in Section 5 we extend our analysis to also include Canadian permanent residents.

Canadian workers[13] stemming from TFW employment at their firm.

$$y_{ift} = x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_1 TFW_{ft} + \beta_2 IMP_{ft} + \beta_3 CMA\_TFW_{ft} + \beta_4 CMA\_IMP_{ft} + \phi_i + \gamma_f + \rho_t + \Phi_d + \sigma_l + \xi_c + \varepsilon_{ift} \quad (1)$$

x_{it}' it is a vector of individual demographic and economic characteristics that includes: age and marital status. z_{ft}' is a vector of firm characteristics that includes: firm revenue, firm profits, and firm employment size. TFW_{ft} (or its lagged term), our variable of interest, represents the number of TFWs employed at firm f in year t. To control for any correlation that may exist between the number of workers employed at the firm under the International Mobility Program (IMP) and TFWs we include the variable IMP_{ft}, the number of IMPs employed at firm f in year t. Additionally, since TFWs and IMPs may indirectly affect employee wages at other firms through a network effect, we also control for TFWs and IMPs employed in the census metropolitan area (CMA) of the firm, CMA_TFW_{ft} and CMA_IMP_{ft}. Lastly, ϕ_i, γ_f, ρ_t, Φ_d, σ_l, and ξ_c capture individual, firm, year, industry, provincial, and CMA fixed effects.[14] To account for potential correlation of the errors across individuals employed at the same firm, we cluster standard errors at the firm level.

Controlling for IMPs employed at a firm and the levels of IMPs and TFWs at the CMA level addresses possible endogeneity concerns that would otherwise bias the coefficient estimate of our main variable of interest in equation (1), β_1. Such endogeneity concerns would arise if IMP employment at a firm is negatively correlated with earnings and firms that hire TFWs through the IMP are also more likely to hire TFWs through the TFWP. Under this scenario we could incorrectly conclude a spurious negative correlation between TFW employment and individual earnings. An important distinction between the two programs is that, unlike workers arriving under the TFWP,

[13]We focus our analysis on Canadian workers due to the specifics of the project requirements. We look at the displacement and potential suppression of wages of Canadian workers from the TFWP low-wage stream. We also run a separate analysis exclusively focusing on immigrants as part of our GBA+ analysis in Section 5. The impact from immigration has been found to be different across groups of workers due to differences in substitutability. For example, new immigrants affect the earnings of recent immigrants more strongly than Canadian-born workers (Ottaviano and Peri, 2012).

[14]Due to computational burden of estimating high-dimensional fixed effects, we separately estimate versions of our regressions with individual and firm fixed effects.

firms hiring workers under the IMP program do not have to submit a LMIA.

An important benefit of our panel data setting is the inclusion of individual and firm fixed effects, ϕ_i and γ_f, to control for time-invariant individual characteristics that may confound our estimation. For example, the portion of individual ability that is time-invariant may be correlated with worse employment outcomes because TFW-dominated industries see slower growth due to Canadians remaining in these industries being negatively-selected on ability.[15]

Location and industry specific controls are used in our analysis to account for geographic or industry-based variation that could potentially bias our results (e.g., differences in policy across locations that promote or hinder TFW employment). For example, whereas firms must pay high-skilled entrants the median wage of the occupation, TFWP agricultural workers' wages are often lower than average because their wages are determined by the price of the commodity.[16] These polices may translate into different incentives for TFW employment across industries and locations. Furthermore, in Quebec, the *Ministère de l'Immigration, de la Francisation et de l'Intégration* (MIFI) can independently change some requirement policies to simplify the hiring of TFWs.[17] As further robustness to this point we also run versions of equation (1) and their extensions solely for Quebec later in this section.

We report our estimates of equation (1) in the first column of Table 2. β_1, the key estimate to evaluate TFW employment, is a constant coefficient semi-elasticity of TFW employment to annual earnings which measures the percentage change in annual earnings following the hiring of one additional TFW at their firm. Using this interpretation, the employment of one additional TFW at a firm is correlated with only a 0.01% increase in the annual earnings of Canadians at that same firm and is not statistically significant. Though equation (1) provides a means of showing the broad relationship between TFW employment and individual earnings, it does not provide direct evidence on the low-skilled category. Given the variation in the magnitude of TFWs entering under different skills categories and industries (see Figures 1, 2, and 3), the impact of TFW

[15]This is an example of a pattern in the data that, if true, would bias our results. We are not assuming it is true or need it to be true to warrant the inclusion of individual fixed effects.

[16]See ESDC TFWP working conditions fact-sheet for details. Low-wage stream TFW workers also have to be paid the prevailing wage for their occupation dependant on geographic area.

[17]See, for example, their decision to prioritize the hiring of TFWs employed in positions considered essential during the COVID-19 pandemic https://www.canada.ca/en/employment-social-development/services/foreign-workers/quebec.html

employment at firms may vary across skills. To isolate the impact of the low-skilled stream, we decompose TFWs based on their skill level imputed from the National Occupational Classification (NOC): high-skilled, low-skilled and agricultural employment. We follow the standard in the literature and define NOC codes beginning with 0, A, B as high-skilled, those beginning with C and D as low skill, and those working in the agricultural industry as agricultural workers[18]. Using this classification, we can rewrite equation (1) as,

$$\begin{aligned} y_{ift} =& x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_{LS} TFW\_low\_skill_{ft} + \beta_{HH} TFW\_high\_skill_{ft} + \beta_{AG} TFW\_agriculture_{ft} \\ &+ \beta_4 IMP_{ft} + \beta_5 CMA\_TFW_{ft} + \beta_6 CMA\_IMP_{ft} + \phi_i + \gamma_f + \rho_t + \Phi_d + \sigma_{lt} + \varepsilon_{ift} \end{aligned} \tag{2}$$

where $TFW\_low\_skill_{ft}$, $TFW\_high\_skill_{ft}$, and $TFW\_agriculture_{ft}$ denote the number of TFWs employed at firm f in year t by their respective imputed NOC skill level. All other variables remain the same. Relative to β_1 in equation (1), β_{LS} now denotes the impact of TFW low-skilled stream employment, independent of TFW employment of the other skill groupings at a firm. β_{HS} and β_{AG} have the same interpretation for their respective NOC skill levels.

The estimates of equation (2), reported in the second column of Table 2, show that higher employment of low-skilled TFWs is correlated with lower earnings for Canadians employed in the same firms. However, the negative impact is relatively minor and the point estimate is not statistically distinguishable from zero.[19] One additional low-wage stream TFW employee at a firm is correlated with a 0.01% decrease in the annual earnings of Canadians at that same firm. The TFW employment effect varies by skill level, high-skilled TFW employment is correlated with higher annualized earnings. However, similar to the low-skilled effect, it is also not statistically significant.[20]

[18] We use a variable named "classification_id" in the IMDB, which specifies the permit type issued for a TFW as one of: live-in caregiver, agricultural worker, or other. We assign the agricultural employment category to a TFW when this variable equals agricultural worker. When the "classification_id" variable identifies a worker in the other category we use their NOC code to assign them into the high-skilled or low-skilled employment category. We do not include Global Talent or Permanent Resident Only streams in our decomposition as they represent less than 1% of TFW employment in any given year.

[19] Statistically this translates to the 95% confidence interval of our point estimate falling between zero.

[20] We run versions of equations (1) and (2) including firm-fixed effects and find qualitatively similar results.

Table 2: OLS estimates of log earnings equations, Canadians

Dependent variable:	Log Earnings	
	(1)	(2)
TFW_{ft}	0.0001	
	(0.0001)	
$TFW\_low\_skill_{ft}$		-0.0001
		(0.0002)
$TFW\_high\_skill_{ft}$		0.0006
		(0.0004)
$TFW\_agriculture_{ft}$		-0.0002
		(0.0001)
IMP_{ft}	-0.0002***	-0.0002***
	(0.0000)	(0.0000)
CMA_TFW_{ft}	3.29e-06	9.49e-07
	(0.0000)	(0.0000)
CMA_IMP_{ft}	7.00e-07	3.90e-07
	(0.0000)	(0.0000)
Firm-year obs.	20,448,860	20,448,860
Adjusted R^2	0.643	0.643

Notes: The table contains estimates of the log earnings equations (1) and (2), from data pooled for all individual-firm observations prior to the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, CMA, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

We can further exploit the data on TFW skill category used in equation (2) to shed additional light on the mechanisms by which TFW employment affects labour market outcomes. Coupled with data on the skills of Canadian employees[21] at a firm the skill category of TFWs can be used to proxy for the degree in substitutability between a TFW and Canadian worker.[22] For example, within a particular location, industry, and firm, a low-skilled, low-paid TFW may contribute more to reducing the earnings of low-skilled Canadians employed in the same location, industry, and firm than a high-skilled, highly paid TFW. The main obstacle in making this comparison is the lack of a direct measure of skill for Canadians in our data. To circumvent this issue we rely on an individual's placement on their firm's earning distribution as a proxy for their skill. For example,

[21] In our Gender-based Analysis Plus (GBA+) we separately identify the impacts of TFW employment on Canadians relative to permanent residents.

[22] Using U.S. Census data, Ottaviano and Peri (2012) show that the impact from immigration on the earnings of domestic workers depends critically on their education, experience, and gender.

given the strong correlation between earnings and education levels, workers located in the first quartile of a firm's earnings distribution are more likely to be low-skilled relative to those located in the fourth quartile of a firm's earning distribution. By including an interaction term between an individual's placement on the firm's earnings distribution with the number of TFWs employed at the firm, decomposed by skill level, we can separately identify the differential impact of low-skilled TFW employment on those at the bottom and top of a firm's earnings distribution. We estimate versions of equations (1) and (2) replacing TFW employment, and TFW employment by skill level, with the corresponding employment interacted with quartile placement, for example, $\beta^{Q} TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = Q\right)$ or $\beta^{Q}_{LS} TFW\_low\_skill_{ft} \mathbb{1}\left(Quartile_{ift} = Q\right)$, where $Quartile_{ift}$ is the placement of individual i on firm $f's$ earnings distribution and $Q \in \{1, 2, 3, 4\}$ (1st, 2nd, 3rd, or 4th quartile) in year t.[23] This method enables us to estimate a unique β^{Q} coefficient for every combination of TFW employment-quartile combination. These estimates measure the percentage change in annual earnings following the hiring of one additional TFW at their firm, *conditional* on a Canadians' placement on the firms earnings distribution.

These results shown in columns one and two and of Table 3 highlight the importance of accounting for the degree of substitutability across workers when measuring the impact of TFW employment. Whereas our results from equations (1) and (2) pointed to a weak relationship between the annualized earnings of Canadians from TFW and low-skilled TFW employment, the results for the model with interaction terms suggest a much stronger and statistically significant relationship. In particular, we find the earnings of Canadians at the low end of a firm's earnings distribution are negatively correlated with additional TFW employment at their firm and statistically significant. For each additional low-wage stream TFW employee at a firm, a low-earning and low-skilled Canadian at the same firm experiences a 0.57% decrease in their annual earnings. In contrast, Canadians at the higher end of a firm's distribution (3rd and 4th quartile) experience earnings *gains* as high as 0.67% per TFW employee at their firm. This suggests there may be complementarities in production at play between TFW employment for higher

[23] For example equation (1) now becomes, $y_{ift} = x'_{it}\gamma + z'_{ft}\Gamma + \beta^{Q} TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = Q\right) + \beta_2 IMP_{ft} + + \beta_3 CMA\_TFW_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_{lt} + \varepsilon_{ift}$

skilled Canadians[24].

[24]We proxy for high skilled Canadians based on their placement on the firm's earnings distribution. These production complementarities are, in part, why Ottaviano and Peri (2012) estimate that in the long run there was an average positive effect of immigration on domestic-born worker wages of about 0.6% .

Table 3: OLS estimates of log earnings interaction equations, Canadians

Dependent variable:	Log Earnings	
	(1)	(2)
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0041***	
	(0.0046)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0008***	
	(0.0002)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0023***	
	(0.0005)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0031***	
	(0.0007)	
$TFW\_low\_skill_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0057***
		(0.0012)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0018***
		(0.0008)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0047***
		(0.0014)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0067***
		(0.0022)
$TFW\_high\_skill_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0026***
		(0.0009)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0003
		(0.0002)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0010***
		(0.0004)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0013***
		(0.0005)
$TFW\_agriculture_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0031***
		(0.0009)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0017***
		(0.0007)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0031***
		(0.0014)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0048
		(0.0019)
IMP_{ft}	-0.0001**	-0.0002***
	(0.0000)	(0.0000)
CMA_TFW_{ft}	7.21e-07	1.46e-06
	(0.0000)	(0.0000)
CMA_IMP_{ft}	-6.18e-08	-3.23e-08
	(0.0000)	(0.0000)
Firm-year obs.	20,448,860	35,598,046
Adjusted R^2	0.655	0.616

Notes: The table contains estimates of the log earnings equations (1) and (2) with interaction terms for the quartile in the distribution of individual earnings within a firm, from data pooled for all individual-firm observations prior to the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Although our earlier regressions controlled for industry of occupation, since we do not estimate a separate marginal effect by industry, the impact on earnings from an additional TFW is identical across all industries. However, considering that the TFWs hired through the TFWP are concentrated in specific industries, see Figure (2), it is plausible that this implicit assumption is not valid. To test this possibility, we interact TFW employment with industry of employee occupation to estimate a TFW effect on earnings that is industry specific. Due to the large amount of coefficients resulting from an interaction between TFW employment and firm industry at the two-digit NAICS level we regroup the 20 industries into six larger sectors. Our groupings were based on the similarity of employment and number of TFWs employed across industries. The six sectors can be broadly categorized into (1) agricultural, (2) mining and construction, (3) manufacturing, (4) sales, (5) professional services, and (6) food services. [25] Our results, shown in Tables (4) and (5) validate our concerns and show that the correlation between TFW employment and earnings of Canadians is *not* uniform across industries. For example, regardless of their placement on a firm's earnings distribution, Canadians employed in the agricultural industry do not experience *any* statistically significant negative correlation between their earnings and TFW hiring at their firms. This is in contrast to our other five industry groupings where the earnings of Canadians at the lower end of a firm's earnings distribution are negatively correlated with TFW employment at their firms. Among these sectors, the earnings of Canadians employed in the professional services and sales sectors have the largest negative correlation with TFW employment. An additional TFW worker at a particular firm in the professional services or sales sectors is, respectively, correlated with a 0.74% and 0.78% decrease in the earnings of the lowest earning Canadians (i.e., those in the first quartile) at the same firm. There is also a large degree of heterogeneity in the positive earnings correlation for Canadians at the top end of firm's earnings distribution from TFW employment at their firm. The earnings of Canadians employed in mining and construction exhibit a 200% larger positive earnings correlation from TFW employment at their firm relative to the manufacturing industry[26]. Taken together, these results show there is a

[25] See Table (A.5) for full details.

[26] The percentage change increase in annual earnings of the lowest earning Canadians (i.e., those in the first quartile) following the hiring of one additional TFW at their firm is 0.53% in mining and construction relative to only 0.17% in manufacturing.

diverse impact from TFW employment across industries and that high levels of TFW employment does not necessarily lead to negative earnings correlation for Canadians employed in those industries, such as in the agricultural industry.

Table 4: OLS estimates of log earnings with industry interaction equations, Canadians

Dependent variable:	Log Earnings
	(1)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right)$	0.0005
	(0.0007)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right)$	0.00004
	(0.0002)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right)$	0.00005
	(0.0003)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right)$	-0.00020*
	(0.0001)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right)$	-0.0002
	(0.0002)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right)$	0.0002***
	(0.0001)
IMP_{ft}	0.0003
	(0.0000)
CMA_TFW_{ft}	6.82e-07
	(0.0000)
CMA_IMP_{ft}	-6.79e-08
	(0.0000)
Firm-year obs.	20,449,000
Adjusted R^2	0.378

Notes: The table contains estimates of the log earnings equations (1) and (2) with interaction terms for the quartile in the distribution of individual earnings within a firm, from data pooled for all individual-firm observations prior to the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Table 5: OLS estimates of log earnings with industry and quartile interaction equations, Canadians

Dependent variable:	Log Earnings
	(1)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0025
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0067***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0027***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0078***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0074***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right) * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0053***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0008
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	-0.0005***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	-7.49e-06
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0009***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0012***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right) * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0009***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0021**
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0026***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0006***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0019***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0016***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right) * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0012**
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0036***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0053***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0017***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0049***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0044***
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right) * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0037***
IMP_{ft}	8.96e-06
	(0.0000)
CMA_TFW_{ft}	6.65e-07
	(0.0000)
CMA_IMP_{ft}	-7.20e-08
	(0.0000)
Firm-year obs.	20,449,000
Adjusted R^2	0.378

Notes: The table contains estimates of the log earning equations (1) with interaction terms for the quartile in the distribution of individual earnings within a firm combined with industry of occupation, from data pooled for all individual-firm observations prior to the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue, profit, and employment size. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Standard errors are not displayed. Significance denoted by * (10%), ** (5%), and *** (1%).

While we included provincial and CMA fixed effects to control for provincial and regional level differences in our earlier regressions, we now extend our previous results to exclude Quebec. Our motivation for including this robustness check stems from Quebec's unique structure, where the *Ministère de l'Immigration, de la Francisation et de l'Intégration* (MIFI) can, for instance, independently change some requirement policies to simplify the hiring of TFWs through the TFWP.[27] The outcomes of the model excluding firms located in Quebec are presented in the first four columns of Table 6, which shows that they are consistent with our earlier results. In contrast to our previous regressions, we include the full time period of our data, 2010-2017, in these regressions.[28] TFW employment at firms is correlated with lower annual earnings for Canadians employed in the same firms, and this correlation is strongest for the employment of low-skilled TFWs.[29] Column four shows the results of the model that includes a proxy of skill for Canadians. We find further evidence that the substitutability of skills matter: workers located in the first and second quartile of a firm's earnings distribution experience lower earnings across all TFW entry streams. In contrast, workers in the third and fourth quartile of the earnings distribution within a firm experience higher earnings from TFW employment, especially from high-wage stream TFW employment. The results from the different model specifications are consistent and suggest that TFW employment is correlated with lower annual earnings for Canadians employed in the same firms as TFWs but that this relationship is heterogeneous. Canadians at the lower end of a firm's earnings distribution (regardless of TFW skill level) are experiencing the largest reduction to their earnings.

[27] One policy unique to Quebec is that the MIFI determines prevailing wages using a different wage grid relative to other provinces, conditional on the region and occupation the MIFI also takes into account the level of experience needed for the position.

[28] Another difference is our classification of TFWs based on their entry-stream information instead of their imputed skill levels from NOC codes. Limited vetting time required that we prioritize results from our previous tables but this will be updated for the next report.

[29] This effect is only present for Canadian's employed in the same firms as TFWs.

Table 6: OLS estimates of log earnings equations excluding Quebec, Canadians

Dependent variable:	Log Earnings			
	(1)	(2)	(3)	(4)
TFW_{ft}	0.0001			
	(0.0001)			
$TFW\_low\_wage_{ft}$		-0.0001		
		(0.0001)		
$TFW\_high\_wage_{ft}$		0.0003		
		(0.0029)		
$TFW\_agriculture_{ft}$		-0.0001		
		(0.0004)		
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$			-0.0062***	
			(0.0010)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$			0.0013***	
			(0.0003)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$			0.0033***	
			(0.0006)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$			0.0041***	
			(0.0007)	
$TFW\_low\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = \{1,2\}\right)$				-0.0017***
				(0.0003)
$TFW\_low\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = \{3,4\}\right)$				0.0021***
				(0.0004)
$TFW\_high\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = \{1,2\}\right)$				-0.0049***
				(0.0011)
$TFW\_high\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = \{3,4\}\right)$				0.0067***
				(0.0014)
$TFW\_agriculture_{ft} * \mathbb{1}\left(Quartile_{ift} = \{1,2\}\right)$				-0.0020***
				(0.0006)
$TFW\_agriculture_{ft} * \mathbb{1}\left(Quartile_{ift} = \{3,4\}\right)$				0.0021*
				(0.0010)
IMP_{ft}	4.21e-08	3.41e-08	8.21e-08	
	(0.0000)	(0.0000)	(0.0000)	
CMA_TFW_{ft}	-4.80e-07	-5.66e-07	-3.23e-07	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Firm-year obs.	70,335,661	70,335,661	70,335,661	70,335,661
Adjusted R^2	0.592	0.592	0.610	0.561

Notes: The table contains estimates of the log earnings equations (1) and (2), from data pooled for all individual-firm-year observations. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

The results shown so far were obtained by controlling for a rich set of covariates from our administrative data. However, it is possible that unobservable individual and firm characteristics are biasing our results on how low-skilled TFW employment impacts the Canadian labour market. For example, if TFW hiring firms are highly selected, even after controlling for revenue, profit, employment and firm fixed effects, our results could be misconstruing the relationship between TFW employment and labour market outcomes.[30]

To address these concerns and identify the causal impact of the TFWP low-skilled stream on the Canadian labour market, we will employ an instrumental variable approach that exploits the major policy overhaul to the TFWP in 2014.[31] The new policies limited employers' access to TFWs, introduced more and higher quality labour market information, strengthened enforcement, and increased the penalties for employers who do not comply with the program's requirements.[32] This overhaul to the program generated plausible exogenous variation in TFW employment across firms, independently of any firm features that would be correlated with employee earnings and TFW hiring. These changes were, in part, a response to data showing that the TFWP was not being used to fulfill firms' immediate skill and labour shortages as intended, but instead as a permanent solution to meet labour demand.[33]

The identifying assumptions of our instrumental variable approach are that the new rules for the TFWP were unexpected and that the timing of TFW applications at a given firm is independent of all other factors that influence individual earnings, conditional on our observables. For example, a firm that submitted the bulk of their TFW applications early in the year would, in the short term, be largely unaffected by the policy change whereas firms that submitted their TFW applications later in the year would have to pay four times as much per position requested. This steep increase

[30] This would be true if there exists some features of a firm that are associated with higher TFW employment and lower wages for all their workers, which we cannot control for. For example, transitory productivity shocks which are not accounted for in our time-invariant firm fixed effect or unobserved demand shocks. For example, following an unobserved demand shock (e.g., a large unexpected production order), a firm might hire TFWs to help meet their labour demand and pay their existing Canadian workers more in the form of overtime. This would lead to a positive correlation between TFW employment and annual earnings because of this unobserved production shock. If so, TFW employment is not random.

[31] Exploiting policy changes is a rich source of exogenous variation that is standard in the literature to estimate causal effects (see Mayda et al. (2018); Amuedo-Dorantes and Furtado (2019) for an application of this methodology to the immigration literature in the United States).

[32] See Appendix for full details on the reform timeline.

[33] See the report from the Office of the Auditor General of Canada (2017).

in application fees in addition to the introduction of wage floors, caps on the number of low-wage TFWs that a firm can hire, and other restrictions would then lead to exogenous changes in the level of TFW across firms.[34]

The first stage equation of this IV approach is as follows,

$$\widehat{TFW}_{ft} = \sum_{k=Jan}^{Dec} \beta_k TFW\_submission_{fk2013} + \phi_f + \rho_t + \Phi_d + \epsilon_{ft}, \text{ if } t = 2014, 2015 \tag{3}$$

Our instrument, $TFW\_submission_{fk2013}$, is the number of monthly low-skilled TFW entrants at firm f in month k in 2013, the year before the reforms were enacted.[35] ϕ_f, ρ_t, Φ_d captures firm, year, and industry fixed effects. To account for correlation of the errors across time within a firm, we cluster standard errors at the location-firm level. Our first-stage prediction of $\widehat{TFW}_{ft}$[36] can then be used in our second-stage regression to estimate the causal impact of TFW employment of annual earnings,

$$\begin{aligned} y_{ift} =& x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_1 \widehat{TFW\_ft} + \beta_4 IMP_{ft} + \beta_5 CMA\_TFW_{ft} + \\ & \beta_6 CMA\_IMP_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_{lt} + \varepsilon_{ift} \end{aligned} \tag{4}$$

Our IV results, presented in Table 7 show that TFW hires causes a drop in earnings for workers at their firms but this effect is not significantly different from zero. Our earlier regressions pointed towards a statistically significant and negative correlation between TFW and the earnings of low-earning Canadian workers, but the estimated coefficients from our IV regressions suggest that more work is required to confirm the robustness of this claim. These results indicate that, within our empirical framework, we do not observe a *causal* negative relationship between TFW low-skilled employment at firms and the annual earnings of Canadians employed in those same firms. A potential explanation for why we find no statistical significance in our IV results relative

[34] We expand our discussion on the exogeneity of our instrument in Section (4.3) as it pertains specifically to the effects of the reformed TFWP.

[35] Our choice of instrument is based on an exogenous policy change that affected all firms. There is no reason to believe that some firms were systemically affected by the policy changes and that the degree of exposure to the change is related to firm unobservables that affect both TFW shares and firm outcomes. Therefore, we conclude that a traditional Heckman 2-step correction model is not required.

[36] We run similar first-stage regressions to generate $\widehat{TFW}_{ft}$, $\widehat{TFW}_{ft}^{HW}$ and $\widehat{TFW}_{ft}^{AG}$

to our earlier OLS ones is that the occupations that TFWs are heavily employed may possess some unobserved features that are correlated with the wages and salaries firms offer to their other non-TFW employees. For example, firms may offer a low salary and have difficulty in retaining Canadian workers for occupations with few long-term growth prospects, irrespective of whether they're a TFW worker or Canadian worker. This could create a spurious correlation between earnings and TFW employment that our IV is potentially solving that our baseline OLS results would suffer from.[37]

[37] This is a potential explanation, one of possibly many, that may explain the differences our OLS and IV results.

Table 7: IV estimates of log earnings equations, Canadians

Dependent variable:	Log Earnings		
	(1)	(2)	(3)
TFW_{ft}	0.0004		
	(0.0004)		
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0032	
		(0.0011)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0161	
		(0.0175)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$		-0.0079	
		(0.0209)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0003	
		(0.0071)	
$TFW\_low\_skill_{ft}$			-0.0002
			(0.0006)
$TFW\_high\_skill_{ft}$			0.0007
			(0.0006)
$TFW\_agriculture\_skill_{ft}$			-0.0001
			(0.0009)
IMP_{ft}	-0.0005***	-0.0007***	-0.0005***
	(0.0001)	(0.0001)	(0.0001)
CMA_TFW_{ft}	0.00002	0.00001	0.00001
	(0.0000)	(0.0000)	(0.0000)
CMA_IMP_{ft}	7.05e-06	0.00001**	5.41e-07
	(0.0000)	(0.0000)	(0.0000)
Firm-year obs.	925,655	925,655	925,655

Notes: The table contains estimates of the log earnings equations (1) and (2), from data pooled for all individual-firm observations prior to the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue, employment size, and profits. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Next, we use equations (5) and (6) to test for correlation between job separation of Canadians and their level of TFW employment at firms across all years, 2010-2017. Our measure of separation is the total instances of record of employments at a firm. These separations may occur for a number of reasons, including but not limited to, firm layoffs stemming from a shortage of work, retirements, or resignations. Our findings reported in Table 8 show a statistically significant positive correlation between job separation and TFW employment. When we decompose TFW

employment by skill level, we find significant heterogeneity: high-skilled TFWs are correlated with the largest increases in job separations but the relationship is not statistically significant. It is important to note that these results are only showing a *correlation*, there could be other variables that we are unable to control for that are increasing both the job separations of Canadians and TFW employment that are biasing these results. For example,[38] poor working conditions may lead to higher levels of job separation for Canadians and these employers turn to TFWP to hire TFWs in the positions left vacant by Canadian workers. In this case, it is the poor working conditions that have led to both higher job separations and TFW employment. Since we do not have complete information on working conditions, we cannot control for this in our regression and therefore we cannot exclude the possibility that this is what is driving the positive correlation. Although it is outside the scope of this study, the results also show that IMP employment is correlated with job separations at the firm level.

$$Job\_Separations_{ft} = z'_{ft}\Gamma + \beta_1 TFW_{ft} + \beta_2 IMP_{ft} + +\beta_3 CMA\_TFW_{ft} + \phi_f + \rho_t + \Phi_d + \sigma_l + \varepsilon_{ft} \tag{5}$$

$$\begin{aligned} Job\_Separations_{ft} =& z'_{ft}\Gamma + \beta_{LW} TFW\_low\_wage_{ft} + \beta_{HW} TFW\_high\_wage_{ft} + \beta_{AG} TFW\_agriculture_{ft} \\ &+ \beta_2 IMP_{ft} + +\beta_3 CMA\_TFW_{ft} + \phi_f + \rho_t + \Phi_d + \sigma_l + \varepsilon_{ft} \end{aligned} \tag{6}$$

[38] This is solely an example to show how the results may be biased; we are not claiming this is occurring but only that *if* it is occurring it could lead to a bias of our results.

Table 8: OLS estimates of job separation equation, Canadians

Dependent variable:	Log Earnings	
	(1)	(2)
TFW_{ft}	0.6061*	
	(0.3363)	
$TFW\_low\_wage_{ft}$		0.3472
		(0.2907)
$TFW\_high\_wage_{ft}$		1.5434
		(1.0324)
$TFW\_agriculture_{ft}$		0.0455
		(0.1656)
IMP_{ft}	0.3721***	0.3716***
	(0.0431)	(0.0434)
CMA_TFW_{ft}	1.16e-05	1.04e-05
	(0.0000)	(0.0000)
Firm-year obs.	71,096,555	71,096,555
Adjusted R^2	0.587	0.587

Notes: The table contains estimates of the job separation equation (5) and (6), from data pooled for all firm-year observations. Firm covariates include revenue and employee size. All regressions also include a year, province, industry and firm fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

4.2 Meeting the needs of Canadian firms

The extent to which the Temporary Foreign Worker Program is meeting the needs of Canadian firms and the labour market as a whole.

4.2.1 Key Findings

Canada's TFWP was designed, in part, to help firms stay competitive and react rapidly to changes in their industries by allowing them to hire a foreign workers to fill labour and skill shortages when they are not able to hire a Canadian worker. Our findings on the extent to which the TFWP is meeting the needs of Canadian firms clearly show that that firms are experiencing significant positive benefits from TFW employment. We show that TFW employment is correlated with positive outcomes across eight different firm outcomes: trade participation, trade volume, expanded entry into new foreign markets, and increased product volume, separately for exports and imports. We find the strongest results for importing behaviour relative to exporting. Furthermore, we explore the heterogeneity of these findings across TFW skill categories and find agricultural TFWs are the most strongly correlated to firms accessing international markets, especially for import participation.

Our findings in this section are instrumental to understanding the role that immigration has in facilitating trade. This topic has important policy implications. As with the TFWP in Canada, a key aspect of a developed country's immigration policy is to use immigration to assist firms in overcoming their labour and skill shortages. Policymakers are also generally interested in encouraging domestic firms' exports. For example, Export Development Canada is a government agency that exists to promote international trade. Our analysis of the firm-level effects of TFW employment on exporting behavior show that these goals are interdependent, and the effects of immigration policies or export-promotion policies should take into account the relationship between the two.

4.2.2 Sample of Interest

We restrict our analysis to an unbalanced panel of firms between the years 2010-2017, which are all the years for which the TFWP administrative data is available. Our sample contains as many as 2,838,405 unique firm-year observations. For consistency, we restricted the set of firms in this section to be the same that firms that appeared in Section (4.1).

4.2.3 Methodology and Analysis

We consider the impact that TFWs have on firm growth, with a focus on a firm's ability to expand to international markets. The link between foreign worker employment at a firm and a firm's success in international markets is well documented.[39] Our work in this section explores the impact that TFW employment may have on a firms' ability to enter international markets, either as exporters or importers. The trade benefits of TFW employment can be an important source of positive economic growth for firms.[40] Exporting firms experience faster employment growth and pay higher wages (Brambilla, Chauvin and Porto, 2017; Frias, Kaplan and Verhoogen, 2012), benefiting the employees of an exporting firm and importing firms have higher revenue productivity and are larger than non-importing plants (Ramanarayanan, 2020).

We study the impact of total TFW employment on the trade behaviour for firms using equations (7)-(10). We estimate each equation separately for export flows and import flows. Our dependent variables, in order from (7)-(10), measure: trade participation for firm i in year t, $Trade_{ft}$ [41], trade volume for firm i in year t, log $Trade\_Value_{ft}$, number of countries firm i in year t trades with, $Trade\_Markets_{ft}$, and the number of unique goods[42] firm i in year t trades in, with, $Trade\_Goods_{ft}$. These eight specifications (four for each direction of trade) provide a thorough

[39] Studies using matched employer-employee data for European countries include Hiller (2013); Hatzigeorgiou and Lodefalk (2016); Marchal and Nedoncelle (2017) and Cardoso and Ramanarayanan (2019) for Canada. All studies find a significant and robust positive correlation between immigrant employment at a firm and export performance.

[40] We use exports as a proxy for economic growth at a firm due to the strong theoretical link between foreign worker employment and export performance. Our focus on trade performance enables a clear *quantifiable* comparison between TFW hiring and non-TFW hiring firms on one aspect of organizational needs. There are other organizational needs, not reflected in trade performance, that benefits firms which we do not capture. For example, TFW hiring in service oriented occupations such as NOC 6341 - Hairstylists and barbers.

[41] For example we estimate equation (7) using an export participation indicator variable takes the value of 1 if a firm exports and 0 otherwise and then separately using an import participation indicator variable takes the value of 1 if a firm imports and 0 otherwise.

[42] Measured by the number of unique harmonized system (HS) 6 codes a firm trades in a given year.

exploration on how TFW employment affects the extensive margin of firm trade (entry into trade and entry into new markets), as well as the intensive margin of firm trade (level of exports and magnitude of unique products traded).

$$Trade_{ft} = \beta_1 x'_f + \beta_2 TFW_{ft} + \beta_3 IMP_{ft} + \beta_4 CMA\_TFW_{ft} + \beta_5 CMA\_IMP_{ft} + \rho_t + \Phi_d + \phi_f + v_{ik} \tag{7}$$

$$\log Trade\_Value_{ft} = \beta_1 x'_f + \beta_2 TFW_{ft} + \beta_3 IMP_{ft} + \beta_4 CMA\_TFW_{ft} + \beta_5 CMA\_IMP_{ft} + \rho_t + \Phi_d + \phi_f + v_{ik} \tag{8}$$

$$Trade\_Markets_{ft} = \beta_1 x'_f + \beta_2 TFW_{ft} + \beta_3 IMP_{ft} + \beta_4 CMA\_TFW_{ft} + \beta_5 CMA\_IMP_{ft} + \rho_t + \Phi_d + \phi_f + v_{ik} \tag{9}$$

$$Trade\_Goods_{ft} = \beta_1 x'_{ft} + \beta_2 TFW_{ft} + \beta_3 IMP_{ft} + \beta_4 CMA\_TFW_{ft} + \beta_5 CMA\_IMP_{ft} + \rho_t + \Phi_d + \phi_f + v_{ik} \tag{10}$$

In all our specifications x'_{ft} is a vector of firm characteristics that influence trade flows, such as firm size measured by number of employees and revenues. TFW_{ft}, our variable of interest, represents the number of TFWs employed at firm f in year t. We include in our model the number of workers employed under the IMP, IMP_{ft}, to control for any correlation that may exist between them and TFWP employees. Additionally, since the supply of TFWs and IMPs may indirectly affect outcomes at other firms through a network effect, we also control for TFWs and IMPs employed in the CMA of the firm, CMA_TFW_{ft} and CMA_IMP_{ft}. In all approaches, we control for year, province, industry, and firm fixed effects. Firm fixed effects are particularly important as they control for the time-invariant firm-specific productivity that may confound our estimation. Given the well-established positive relationship between firm productivity and trade performance, a potential issue would arise if TFW employment were correlated with unobservable firm productivity [43]. Under those conditions, we might observe a spurious correlation between TFW employment and trade growth.

[43]There is evidence showing the hiring of TFWs through the TFWP makes it possible for some Canadian firms to increase their output and meet their financial targetsEmployment and Social Development Canada (2021). In our setting, the problem arises since firm productivity is not directly observable to the econometrician and therefore not an additional control we can introduce in our regressions.

Our estimates of β_2 across our four basic export specifications are reported in Table 9. We conclude that TFW employment is weakly positively correlated with firm growth in trade, solely though entering new export markets. For example, the coefficient on export participation reported in column two shows each additional TFW hire results in an additional 0.03% likelihood of exporting. Similarly, our estimates of β_2 across our four basic import specifications are reported in Table 10. We observe a stronger correlation between firm import behaviour and TFW employment than with exporting. TFW employment is positively correlated with both an increase in the value a firm imports from a country as well as the number of products they are importing. For example, conditional on already importing, the hiring of one additional TFW employee is correlated with a 9.25% increase in the number of unique products a firm imports.

Table 9: OLS estimates of export equations

Dependent variable:	Log exports (1)	Export participation (2)	Destinations (3)	Products (4)
TFW_{ft}	-0.0010	0.0003**	-0.0022	-0.0096
	(0.0024)	(0.0001)	(0.0037)	(0.0164)
IMP_{ft}	0.000228	-3.33E-05	0.000829	0.0196**
	(0.00109)	(0.00006)	(0.00170)	(0.00857)
CMA_TFW_{ft}	0.0513***	0.00102***	0.0147	0.140*
	(0.01700)	(0.00034)	(0.03430)	(0.07880)
CMA_IMP_{ft}	0.0107	0.000838*	-0.0321	0.169
	(0.02240)	(0.00043)	(0.03890)	(0.10700)
$\log Revenue_{ft}$	0.644***	0.0103***	0.607***	1.231***
	(0.03330)	(0.00044)	(0.05530)	(0.12300)
$\log Employee_{ft}$	0.316***	0.00527***	0.576***	1.371***
	(0.02870)	(0.00044)	(0.07110)	(0.14200)
$\log Profit_{ft}$	0.0184***	-5.71E-05	0.00305	0.00376
	(0.00536)	(0.00011)	(0.00966)	(0.02450)
Firm-year obs.	155,705	2,838,405	155,705	155,705
Adjusted R^2	0.874	0.74	0.911	0.861

Notes: The table contains estimates of the export flow versions of equations (7-10), from data pooled for all firms, destination countries, and years. All regressions include a year, province, industry and firm fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Table 10: OLS estimates of import equations

Dependent variable:	Log imports (1)	Import participation (2)	Destinations (3)	Products (4)
TFW_{ft}	0.00207**	-2.29E-05	0.000876	0.0925*
	(0.00098)	(0.00015)	(0.00436)	(0.05580)
IMP_{ft}	-0.00021	1.59E-06	0.0045	0.0676**
	(0.00035)	(0.00007)	(0.00408)	(0.02670)
CMA_TFW_{ft}	0.00807	5.64E-04	0.0152	0.201
	(0.01110)	(0.00066)	(0.01860)	(0.12400)
CMA_IMP_{ft}	0.0198	0.00322***	0.0327	0.124
	(0.01450)	(0.00090)	(0.02220)	(0.14100)
$\log Revenue_{ft}$	0.751***	0.0371***	0.780***	5.097***
	(0.02240)	(0.00077)	(0.03340)	(0.23600)
$\log Employee_{ft}$	0.145***	0.0164***	0.426***	2.932***
	(0.01560)	(0.00078)	(0.02950)	(0.22900)
$\log Profit_{ft}$	0.00226	-0.000729***	-0.0199***	-0.0616
	(0.00318)	(0.00021)	(0.00646)	(0.03760)
Firm-year obs.	518,250	2,838,405	518,260	518,250
Adjusted R^2	0.857	0.693	0.893	0.911

Notes: The table contains estimates of the import flow versions of equations (7-10), from data pooled for all firms, destination countries, and years. All regressions include a year, province, industry and firm fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Given the different roles and responsibilities of TFWs across skill levels, it is possible there is considerable heterogeneity in their impact on firm trade performance.[44] To isolate the impact of each skill category independently, we decompose TFW employment at the firm by their respective skill groups: low-skilled, high-skilled, and agriculture, using our earlier specifications, equations (7)-(10).[45] From these results, reported in Tables 11 and 12, for exports and imports respectively, we find that low-skilled and agricultural TFWs provide the largest benefits to firms overcoming international frictions and improving their trade performance. For example, the coefficient on import destinations reported in column three of Table 12 shows that hiring on additional

[44]For example, Head and Ries (1998); Cardoso and Ramanarayanan (2019) find that the trade creation effect of immigrants is conditional on immigration entry category (skilled worker, family, investor, refugee, or other). These papers show that the employment of investor class immigrants leads to the highest increase in export participation for a firm, followed by the skilled class and family class immigrants.

[45]For example, equation (7) would become, $Trade_{ft} = \beta_1 x'_f + \beta_{LW} TFW\_low\_skill_{ft} + \beta_{HW} TFW\_high\_skill_{ft} + \beta_{AG} TFW\_agriculture_{ft} + \beta_2 IMP_{ft} + \beta_3 CMA\_TFW_{ft} + \beta_4 CMA\_IMP_{ft} + \rho_t + \Phi_d + \phi_f + v_{ik}$

agricultural TFW is associated with a 1.84% increase in the number of unique import destinations a firm imports from.

Table 11: OLS estimates of export equations of TFW entry categories

Dependent variable:	Log exports (1)	Export indicator (2)	Destinations (3)	Products (4)
$TFW\_high\_skill_{ft}$	-0.0041	0.000296	-0.00435	-0.0052
	(0.00533)	(0.00024)	(0.00534)	(0.0220)
$TFW\_low\_skil_{ft}$	0.00136	0.000491**	-0.000817	-0.0173
	(0.00196)	(0.00020)	(0.00695)	(0.0224)
$TFW\_agriculture_{ft}$	-0.000571	0.000458	-0.00733	0.0027
	(0.00423)	(0.00072)	(0.00597)	(0.0282)
IMP_ft	0.000234	-5.39E-05	0.000875	0.0200**
	(0.00112)	(0.00006)	(0.00173)	(0.0087)
CMA_TFW_{ft}	0.0510***	0.00101***	0.0148	0.141*
	(0.01700)	(0.00034)	(0.03440)	(0.0789)
CMA_IMP_{ft}	0.0107	0.000836*	-0.0321	0.1690
	(0.02240)	(0.00043)	(0.03890)	(0.1070)
$\log Revenue_{ft}$	0.644***	0.0103***	0.607***	1.231***
	(0.03330)	(0.00044)	(0.05530)	(0.1230)
$\log Employee_{ft}$	0.316***	0.00526***	0.576***	1.371***
	(0.0287)	(0.00044)	(0.0711)	(0.1420)
$\log Profit_{ft}$	0.0184***	-5.73E-05	0.00301	0.0038
	(0.0054)	(0.00011)	(0.0097)	(0.0245)
Firm-year obs.	155,705	2,838,405	155,705	155,705
Adjusted R^2	0.874	0.74	0.911	0.861

Notes: The table contains estimates of the export flow versions of equations (7-10), from data pooled for all firms, destination countries, and years. All regressions include a year, province, industry and firm fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Table 12: OLS estimates of import equations of TFW entry categories

Dependent variable:	Log imports	Import indicator	Destinations	Products
	(1)	(2)	(3)	(4)
$TFW\_high\_skill_{ft}$	0.000782	-2.08E-04	0.00261	0.157
	(0.00165)	(0.00021)	(0.00923)	(0.14900)
$TFW\_low\_skill_{ft}$	0.00201	0.000139	-0.00533	0.0194
	(0.00129)	(0.00021)	(0.00457)	(0.04660)
$TFW\_agriculture_{ft}$	0.00593*	-6.43E-05	0.0184**	0.128**
	(0.00318)	(0.00054)	(0.00758)	(0.06210)
IMP_{ft}	-1.91E-04	8.28E-07	0.00478	0.0672**
	(0.00038)	(0.00006)	(0.00425)	(0.02760)
CMA_TFW_{ft}	0.00811	5.62E-04	0.0156	0.207*
	(0.01110)	(0.00066)	(0.01860)	(0.12300)
CMA_IMP_{ft}	0.0198	0.00322***	0.0329	0.126
	(0.01450)	(0.00090)	(0.02220)	(0.14100)
$\log Revenue_{ft}$	0.751***	0.0371***	0.780***	5.095***
	(0.02240)	(0.00077)	(0.03340)	(0.23600)
$\log Employee_{ft}$	0.145***	0.0164***	0.426***	2.931***
	(0.01560)	(0.00078)	(0.02950)	(0.22900)
$\log Profit_{ft}$	0.00226	-0.000729***	-0.0199***	-0.0615
	(0.00318)	(0.00021)	(0.00646)	(0.03760)
Firm-year obs.	518,250	2,838,405	518,250	518,250
Adjusted R^2	0.857	0.693	0.893	0.911

Notes: The table contains estimates of the import flow versions of equations (7-10), from data pooled for all firms, destination countries, and years. All regressions include a year, province, industry and firm fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

4.3 The effects of the reformed TFWP

The effects of the reformed Temporary Foreign Worker Program on Canadian businesses and the labour market. (Make up no more than $15,000 of the proposed budget)

4.3.1 Key Findings

The effects of the reformed Temporary Foreign Worker Program (TFWP) on Canadian businesses and the labour market suggest that there is a *negative correlation* between low-wage TFW employment at firms and the annual earnings of Canadians employed in those same firms. Conversely, we find a *positive correlation* between high-wage TFW employment at firms and the annual earnings of Canadians employed in those same firms. These results are most clearly identified in a series of regressions where we decompose TFW employment at a firm by skill category and interact this variable with the placement of Canadians along the firm's earnings distribution. These regressions show a *negative correlation* between low-skilled TFWs employment and the annual earnings of Canadians at the bottom of a firm's earnings distribution and a *positive correlation* between high-skilled TFWs employment and the annual earnings of Canadians at the bottom of a firm's earnings distribution. Furthermore, industry of employment matters for the direction and strength of the relationship in the correlation between Canadian earnings and TFW employment at their firms. We find that Canadians employed in the agricultural industry experience the least statistically significant negative correlation between their earnings and TFW hiring at their firms. These results are consistent across our pre-reform results discussed in Section (4.1). We find less conclusive evidence on the causality of this result, which indicates that further analysis is needed using more detailed data. For example, our measure of earnings is annualized earnings at a firm whereas hourly wages may be the preferred outcome of interest.

4.3.2 Sample of Interest

We restrict our analysis to an unbalanced panel of individuals that were employees of tax-filing firms between the years 2014-2017, which are all the years for which the TFWP administrative data is available in the post-2014 period. Our sample contains as many as 20,777,815 unique

individual-firm observations. To be included in the sample, individuals and firms must possess all required characteristics to be included in our regressions. Individuals with missing data on their province of residence or a firm without data on revenue were removed from our sample. Beyond this necessary data requirement, we also placed a requirement that individuals must have earned $1,000 in employment income and be aged 25 to 64. These are standard restrictions found in many Statistics Canada publications when measuring labour market impacts. For consistency, these conditions follow the ones established in Section (4.1).

4.3.3 Methodology and Analysis

Our analysis of the effects of the reformed TFWP centers on comparing the labour market impacts of TFW employment following the major reforms that took place during the summer of 2014. We regress annual earnings of Canadian employment at firms on TFW employment between 2014-2017. Table A.1 shows that post-reform TFW employment in Canada dropped significantly, from over 60,000 individuals employed in 2014 to just under 30,000 workers in 2017. It is not clear if the noticeable decrease in TFW employment was matched by a lower impact of these workers on the employment outcomes of the Canadian labour market. Our analysis attempts to address whether, in spite of a smaller number of firms seeking to employ TFWs, the effect of these workers are similar across the pre-reform and post-reform periods.

Equation (11) is our baseline regression models to study of the impact of TFW employment on the log annual earnings of workers (y_{ift}), during the post-reform period.

$$\begin{aligned} y_{ift} =& x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_1^{post} TFW_{ft} + \beta_2 IMP_{ft} + \beta_3 CMA\_TFW_{ft} + \beta_4 CMA\_IMP_{ft} \\ &+ \phi_i + \rho_t + \Phi_d + \sigma_l + \varepsilon_{ift}, \text{ if } t \geq 2014 \end{aligned} \tag{11}$$

x_{it}' is a vector of individual demographic and economic characteristics that includes age and marital status. z_{ft}' is a vector of firm characteristics that includes firm revenue and number of employees. TFW_{ft} (or its lagged term), our variable of interest, represents the number of TFWs employed at firm f in year t. Similarly, for the reasons outlined in Section (4.1), we control for

the number of workers employed at the firm under the IMP, IMP_{ft}, and the number of TFWs and IMPs employed in the CMA where the firm resides, CMA_TFW_{ft} and CMA_IMP_{ft}. Lastly, $\phi_i, \rho_t, \Phi_{dt}$, σ_{lt}, and ξ_c capture individual, year, industry, provincial, and CMA fixed effects. To account for correlation of the errors across individuals employed at the same firm, we cluster standard errors at the firm level.

Our baseline estimate of β_1^{post} in column one of Table 13 suggests that the impact of TFW employment has remained consistent across our sample periods. Higher TFW employment is still weakly correlated with lower annual earnings and the estimates remain statistically insignificant.[46] To test the robustness of this result, we next estimate versions of equation (11) decomposing TFW employment at the firm by imputed skill level based on their NOCs.

Table 13: OLS estimates of post-reform log earnings equations, Canadians

Dependent variable:	Post-reform Log Earnings	
	(1)	(2)
TFW_{ft}	0.0001	
	(0.0001)	
$TFW\_low\_skill_{ft}$		-0.0005***
		(0.0001)
$TFW\_high\_skill_{ft}$		0.0007***
		(0.0004)
$TFW\_agriculture_{ft}$		0.0005***
		(0.0002)
IMP_{ft}	-0.0003***	-0.0003
	(0.0001)	(0.0000)
CMA_TFW_{ft}	4.30e-06***	3.86e-06***
	(0.0000)	(0.0000)
CMA_IMP_{ft}	1.84e-06***	1.66e-06***
	(0.0000)	(0.0000)
Firm-year obs.	20,777,815	20,777,815
Adjusted R^2	0.648	0.648

Notes: The table contains estimates of the log earnings equations (1) and (2), from data pooled for all individual-firm observations prior to and after the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

[46] We can continue to interpret β_1^{post} as the constant coefficient semi-elasticity of TFW employment to annual earnings in the post-reform period which measures the percentage change in annual earnings following the hiring of one additional TFW at their firm.

$$y_{ift} = x_{it}'\gamma + z_{ft}'\Gamma + \beta_{LS}^{post} TFW\_low\_skill_{ft} + \beta_{HS}^{post} TFW\_high\_skill_{ft} + \beta_{AG}^{post} TFW\_agriculture_{ft} + \beta_1 IMP_{ft} + \beta_2 CMA\_TFW_{ft} + \beta_e CMA\_IMP_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_l + \varepsilon_{ift}, \text{ if } t \geq 2014 \tag{12}$$

where $TFW\_low\_skill_{ft}$, $TFW\_high\_skill_{ft}$, and $TFW\_agriculture_{ft}$ denote the number of TFWs employed at firm f in year t by their respective skill levels. All other other variables remain the same.

The estimation results based on equation (12), are reported in column two of Table 13. They show that the impacts of TFW employment depend critically on the skill level of the TFW. The employment of low-skilled TFWs post-reform is negatively correlated with the earnings of Canadians at their firms. In contrast, high-skilled TFWs induce a significant positive earnings correlation in Canadian earnings. Both these relationships are statistically significant. Importantly, these results are not consistent between the pre-reform and post-reform periods. In the pre-reform period discussed in Section 4.1 we find a weakly positive but *insignificant* relationship between TFW employment across entry streams and Canadian earnings.

Next, we include an interaction term between an individual's placement on the firm's earnings distribution and the number of TFWs employed at the firm decomposed by skill level. This enables us to separately identify the differential impact of, for example, low-skilled TFW employment for Canadians at the bottom versus the top of a firm's earnings distribution. We estimate a version of equation (12) replacing TFW employment, and TFW employment by skill level, with the corresponding employment interacted with quartile placement, for example, $\beta^Q TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = Q\right)$ or $\beta_{LS}^Q TFW\_low\_skill_{ft} \mathbb{1}\left(Quartile_{ift} = Q\right)$, where $Quartile_{ift}$ is the placement of individual i on firm $f's$ earnings distribution and $Q \in \{1, 2, 3, 4\}$ (1st, 2nd, 3rd, or 4th quartile) in year t.[47] This method enables us to estimate a unique β^Q coefficient for every combination of TFW employment-quartile combination. These estimates measure the percentage

[47] For example equation (12) now becomes, $y_{ift} = x_{it}'\gamma + z_{ft}'\Gamma + + \beta^Q TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = Q\right) + \beta_2 IMP_{ft} + \beta_3 CMA\_TFW_{ft} + \beta_4 CMA\_IMP_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_l + \varepsilon_{ift}$, if $t \leq 2013$

change in annual earnings following the hiring of one additional TFW at their firm, *conditional* on a Canadians' placement on the firms earnings distribution.

The results shown in Table 14 highlight the importance of accounting for the degree of substitutability across workers when measuring the impact of TFW employment. Whereas our results from equations (12) pointed to a relatively weak relationship between the annualized earnings of Canadians from TFW and low-skilled TFW employment, the interaction specifications estimates suggest a much stronger impact. In particular, we find a significant negative correlation between Canadians at the lower end of a firm's earnings distribution and TFW employment, regardless of their skill-level. In contrast, we find that Canadians at the higher end of a firm's distribution (3rd and 4th quartile) experience *gains* in earnings from TFW employment at their firm. This suggests there may be complements in production at play between TFW employment for higher skilled Canadians[48]. Though the impact across the pre-reform and post-reform has remained similar, the exposure to TFW employment, and the accompanied drop in earnings it's associated with, has dropped considerably post-reform.

[48]Proxied by higher earnings.

Table 14: OLS estimates of post-reform log earnings interaction equations, Canadians

Dependent variable:	Post-reform Log Earnings	
	(1)	(2)
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$	-0.0046***	
	(0.0006)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$	0.0003	
	(0.0003)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$	0.0018***	
	(0.0005)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$	0.0026***	
	(0.0007)	
$TFW\_low\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0036***
		(0.0009)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		-0.0011**
		(0.0002)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0003
		(0.0007)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0013
		(0.0009)
$TFW\_high\_wage_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0066***
		(0.0019)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0018***
		(0.0006)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0036***
		(0.0010)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0041***
		(0.0012)
$TFW\_agriculture_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0025***
		(0.0006)
$\mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0024***
		(0.0004)
$\mathbb{1}\left(Quartile_{ift} = 3\right)$		0.0031***
		(0.0004)
$\mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0029***
		(0.0006)
IMP_{ft}	-0.0001	0.0000
	(0.0000)	(0.0000)
CMA_TFW_{ft}	2.86e-06	8.38e-07
	(0.0000)	(0.0000)
CMA_IMP_{ft}	1.92e-06	8.38e-07
	(0.0000)	(0.0000)
Firm-year obs.	20,777,815	20,777,815
Adjusted R^2	0.657	0.657

Notes: The table contains estimates of the log earnings equations (11) interacted with individual employment quartile placement, from data pooled for all individual-firm observations prior to and after the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include firm revenue, employment size, and profits. All regressions also include a year, province, CMA, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Table 15: OLS estimates of post-reform log earnings with industry interaction equations, Canadians

Dependent variable:	Log Earnings
	(1)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 1\right)$	0.0006***
	(0.0002)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 2\right)$	-0.00004
	(0.0001)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 3\right)$	-0.00009
	(0.0001)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 4\right)$	-0.00021**
	(0.0000)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 5\right)$	0.0001
	(0.0001)
$TFW_{ft} * \mathbb{1}\left(Industry_{ift} = 6\right)$	0.0002
	(0.0001)
IMP_{ft}	-0.00004
	(0.00003)
CMA_TFW_{ft}	-2.01e-07
	(0.0000)
CMA_IMP_{ft}	-1.00e-07
	(0.0000)
Firm-year obs.	20,778,000
Adjusted R^2	0.345

Notes: The table contains estimates of the log earning equations (11) with interaction terms for industry of occupation of individuals, from data pooled for all individual-firm observations after the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue, profit, and employment size. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

Table 16: OLS estimates of post-reform log earnings with industry and quartile interaction equations, Canadians

Dependent variable:	Log Earnings (1)
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 1) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0037*
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 2) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0066***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 3) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0061***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 4) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0067***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 5) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0067***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 6) * \mathbb{1}(Quartile_{ift} = 1)$	-0.0052***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 1) * \mathbb{1}(Quartile_{ift} = 2)$	0.0002
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 2) * \mathbb{1}(Quartile_{ift} = 2)$	-0.0004**
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 3) * \mathbb{1}(Quartile_{ift} = 2)$	-0.0003
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 4) * \mathbb{1}(Quartile_{ift} = 2)$	-0.0006***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 5) * \mathbb{1}(Quartile_{ift} = 2)$	-0.0001***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 6) * \mathbb{1}(Quartile_{ift} = 2)$	-0.0010***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 1) * \mathbb{1}(Quartile_{ift} = 3)$	0.0014***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 2) * \mathbb{1}(Quartile_{ift} = 3)$	0.0024***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 3) * \mathbb{1}(Quartile_{ift} = 3)$	0.0013***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 4) * \mathbb{1}(Quartile_{ift} = 3)$	0.0015***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 5) * \mathbb{1}(Quartile_{ift} = 3)$	0.0017***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 6) * \mathbb{1}(Quartile_{ift} = 3)$	0.0012***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 1) * \mathbb{1}(Quartile_{ift} = 4)$	0.0028***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 2) * \mathbb{1}(Quartile_{ift} = 4)$	0.0049***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 3) * \mathbb{1}(Quartile_{ift} = 4)$	0.0037***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 4) * \mathbb{1}(Quartile_{ift} = 4)$	0.0038***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 5) * \mathbb{1}(Quartile_{ift} = 4)$	0.0043***
$TFW_{ft} * \mathbb{1}(Industry_{ift} = 6) * \mathbb{1}(Quartile_{ift} = 4)$	0.0035***
IMP_{ft}	-0.0001
	(0.0000)
CMA_TFW_{ft}	-1.71e-07
	(0.0000)
CMA_IMP_{ft}	-8.87e-08
	(0.0000)
Firm-year obs.	20,778,000
Adjusted R^2	0.377

Notes: The table contains estimates of the log earnings equations (11) with interaction terms for the quartile in the distribution of individual earnings within a firm combined with industry of occupation, from data pooled for all individual-firm observations after the 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue, profit, and employment size. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. To save on space standard errors are not displayed. Significance denoted by * (10%), ** (5%), and *** (1%).

Though our earlier regressions controlled for industry of occupation, since we do not estimate a separate marginal effect by industry, the impact on earnings from an additional TFW is identical across all industries. For the same reasons we outlined in Section (4.1) we extend our analysis and interact TFW employment with industry of employee occupation to estimate a TFW effect on earnings that is industry specific. These results, shown in Tables 15 and 16 show that the correlation between TFW employment and earnings of Canadians continues to *not* be uniform across industries in the post-reform period. For example, regardless of their placement on a firm's earnings distribution, Canadians employed in the agricultural industry do not experience *any* statistically significant negative correlation between their earnings and TFW hiring at their firms, beyond a small negative correlation for Canadians in the first quartile of a firm's earnings distribution and only at the 10% level. This is in contrast to our other five industry groupings where the earnings of Canadians at the lower end of a firm's earnings distribution are negatively correlated at the 1% level with TFW employment at their firms. There is also a smaller degree of heterogeneity in the positive earnings correlation for Canadians at the higher end of a firm's earnings distribution from TFW employment. The earnings of Canadians employed in mining and construction exhibit only a 30% larger positive earnings correlation from TFW employment at their firm relative to the manufacturing industry compared to a 200% larger effect during the pre-form period. Overall, the results reported in Tables 15 and 16 show that industry of employment matters for the direction and strength of the relationship in the correlation between Canadian earnings and TFW employment at their firms.

As highlighted in Tables 14 and 16, TFW employment is only consistently negatively correlated with the earnings of our proxy for low-skilled Canadians. Canadians above the firm's first quartile of the earnings distribution experience significant positive gains to their earnings from TFW employment, regardless of TFW skill category. The increased positive earnings correlation for Canadians stemming from TFW employment are largest for those at the highest quartile of the firm's earnings distribution and from *high-skilled* TFW employment. For the same reasons we outlined in Section (4.1), these estimates may suffer from endogeneity concerns, especially over firm selection into the TFWP. Therefore, as is also discussed in Section (4.1), our method of evaluating the *causal* effects of the TFWP is to exploit the 2014 TFWP policy reforms and measure

what changes the reform had on the Canadian labour market. The new policies limit employers' access to TFWs, make use of more and higher quality labour market information, and feature stronger enforcement and tougher penalties for employers who do not comply with the programs requirements.[49] These changes were, in part, a response to data showing that the TFWP was not being used to fulfill firms' immediate skill and labour shortages as intended but as a permanent solution to meet labour demand[50]. If the policy was effective, we may even expect to observe an improvement on the earnings of workers employed in firms with TFW employment, all other things being equal.[51]

Our instrument is based on the policy change announced on June 20, 2014 that included a provision to increase the TFWP application fee employers pay per position requested from $275 to $1000 effective immediately among other restrictions such as the introduction of binding wage floors for new TFW hires and caps on the number of low-wage TFWs that an employer can hire. Because of firm-specific differences (e.g., business cycle, fiscal year-ends), employers submit applications for TFWs at different times on a given year. We will use the distribution of a firm's TFW application dates over the calendar year as an instrument for the share of TFW at the firm, following the 2014 policy changes. The identifying assumptions of our instrumental variable are that the new rules for the TFWP were unexpected and that the timing of TFW applications at a given firm is independent of all other factors that influence individual earnings, conditional on our observables. For example, a firm that submitted the bulk of their TFW applications early in the year would, in the short term, be largely unaffected by the policy change whereas firms that submitted their TFW applications later in the year would have to pay four times as much per position requested. This steep increase in application fees in addition to the introduction of wage floors and other restrictions would then lead to exogenous changes in the level of TFW across firms. The first stage equation of this IV approach is as follows,

$$\widehat{TFW}_{ft} = \sum_{k=Jan}^{Dec} \beta_k TFW\_submission_{fk2013} + \phi_f + \rho_t + \Phi_d + \epsilon_{ft}, \text{ if } t = 2014, 2015 \qquad (13)$$

[49] See Appendix for full description of the reforms and when they were introduced.
[50] See the report from the Office of the Auditor General of Canada (2017).
[51] For example, a lack of competition from TFWs may drive the wages of comparable Canadian labour.

Our instruments, TFW_{fk2013}, are the monthly approved TFW applications at firm f in month k in 2013, the year before the reforms were enacted.[52] ϕ_f, ρ_t, Φ_d capture firm, year, and industry fixed effects. To account for correlation of the errors across time within a firm, we cluster standard errors at the location firm level. Similar to Section (4.1) we can expand this procedure to also include instruments for low-skilled, high-skilled, and agriculture workers at firms.

This approach complements the literature that utilizes policy changes to study the impact of temporary worker programs in Canada (Gross, 2014), and the United States (Mayda et al., 2018; Amuedo-Dorantes and Furtado, 2019).

As in Section (4.1), our instrumental variable framework will help us deal with the endogeneity concerns surrounding TFW_{ft}. Exploiting the provisions in the 2014 TFWP policy overhaul, where a firm's level of exposure to the TFWP policy change was exogenous, will enable us to measure the *causal* impact of TFW employment at these firms. Given that the variation of treatment exploits an unexpected change in government policy, akin to a randomized experiment, and is grounded in economic intuition[53], we are confident in its use. Therefore, absent treatment, we have no reason to suspect that the firms most affected by the policy (i.e. treated group) would behave any differently than those not affected by the policy (i.e. control group).

The key assumptions on which this approach relies are: the increase in TFWP application fees, (1) must induce changes in the TFW share; and (2) must not have direct effects on the labour market outcomes of Canadians working for those firms. Likewise, we need to observe enough variation in firms' exposure to the policy change that can generate meaningful variation in the share of TFW employment at firms. In Table 1 we show the entry of new TFWs by month over time, we see a steep drop in year-over-year TFW employment following the introduction of the policy reforms in June 20, 2014. The 2013-2014 year-over-year change in new TFW employment between January-March was only a 1.02% decrease whereas in the three months following the introduction of the policy, July-September, employment fell by a dramatic 49.18%. This is strong

[52] Our choice of instrument is based on an exogenous policy change that affected all firms. There is no reason to believe that some firms were systemically affected by the policy changes and that the degree of exposure to the change is related to some firm unobservables that affects both TFW shares and firm outcomes. Therefore, we conclude that a traditional Heckman 2-step correction model is not required.

[53] Increased application and filing costs when filing an application to hire a TFW in addition to the introduction of binding wage floors for new TFW hires and caps on the number of low-wage TFWs that an employer can hire will lower demand for TFWs. Which was, presumably, the intent of the reforms.

evidence to suggest that the policy induced major changes in the hiring decisions of firms and it affected firms differently over the year. Another concern regarding our instrument may be that firms anticipated the policy change and acted strategically to avoid the new measures. For example, firms may have sped up the start date of their TFW employment. In Table 17 we show the length of time between TFW application approval and the workers' start dates and find no significant year-over-year change. Overall, these robustness checks suggest that our instrument did induce exogenous variation in TFW employment across Canadians firms.

Table 17: Length of time (months) between decision and start date, by year

Month	2013	2014
January	5.841441	4.984691
February	4.988182	4.252877
March	5.260076	4.397912
April	4.742775	5.148998
May	5.383885	5.361053
June	5.29392	5.820327
July	5.608295	5.113636
August	5.687898	5.277219
September	5.867366	6.067825
October	6.117691	5.429724
November	5.04208	5.585581
December	4.985194	4.737826
Average	5.335888	4.961344

Notes: Data collected by authors from the CEEDD. Decision date refers to the date that the TFW application was approved. Start date refers to the date that the TFW began working at the firm.

Our first-stage prediction of $\widehat{TFW}_{ft}$ employment can then be used in our second-stage regression to estimate the causal impact of TFW employment of annual earnings during the post-reform period,

$$y_{ift} = x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_1 \widehat{TFW}_{ft} + \beta_2 IMP_{ft} + \beta_3 CMA\_TFW_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_{lt} + \varepsilon_{ift} \quad (14)$$

$$y_{ift} = x_{it}^{'}\gamma + z_{ft}^{'}\Gamma + \beta_{LW} TFW\_\widehat{low\_skill}_{ft} + \beta_{HW} TFW\_\widehat{high\_skill}_{ft} + \beta_{AG} TFW\_\widehat{agriculture}_{ft}$$
$$+ \beta_4 IMP_{ft} + \beta_5 CMA\_TFW_{ft} + \phi_i + \rho_t + \Phi_d + \sigma_{lt} + \varepsilon_{ift} \quad (15)$$

Our IV results, presented in Table 18, show that TFW employment causes a drop in earnings for workers at their firms but this effect is not significantly different from zero. Whereas our earlier regressions on the post-reform impact of the TFWP pointed to a significant and negative correlation between TFW employment for Canadians located at the bottom of a firm's earnings distribution, we do not find the same in our IV regressions. This suggest that there is not an identifiable *causal* negative relationship between TFW employment at firms and the annual earnings of Canadians employed in those same firms.

Table 18: IV estimates of log earnings equations, Canadians

Dependent variable:	Log Earnings		
	(1)	(2)	(3)
TFW_{ft}	0.0004		
	(0.0004)		
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$		-0.0032	
		(0.0011)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$		0.0161	
		(0.0175)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$		-0.0079	
		(0.0209)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$		0.0003	
		(0.0071)	
$TFW\_low\_skill_{ft}$			-0.0002
			(0.0006)
$TFW\_high\_skill_{ft}$			0.0007
			(0.0006)
$TFW\_agriculture\_skill_{ft}$			-0.0001
			(0.0009)
IMP_{ft}	-0.0005***	-0.0007***	-0.0005***
	(0.0001)	(0.0001)	(0.0001)
CMA_TFW_{ft}	0.00002	0.00001	0.00001
	(0.0000)	(0.0000)	(0.0000)
CMA_IMP_{ft}	7.05e-06	0.00001**	5.41e-07
	(0.0000)	(0.0000)	(0.0000)
Firm-year obs.	925,655	925,655	925,655

Notes: The table contains estimates of the log earnings equations (1) and (2), from data pooled for all individual-firm observations post 2014 reforms to the TFWP. Individual covariates include age and marital status. Firm covariates include revenue, employment size, and profits. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

5 Gender-based Analysis Plus

We will take special consideration to examine how the TFWP may have affected groups of workers differently.

The substitutability of workers across differences in experience, education, immigration status, and Indigenous status is an important factor to consider when measuring the impact of immigration on a host country's labour market (Ottaviano and Peri, 2012). Therefore, the TFW effect on the employment outcomes of Canadian workers will depend critically on their substitutability. For instance, immigrants with permanent resident status may be more susceptible to TFW employment in certain industries because TFWs may be closer substitutes to their labour compared to Canadian citizens.[54] To account for this, we will change the dependant variable (y_{ift}) in the equations throughout Sections (4.1) and (4.3) to represent the outcomes of permanent residents. Our findings, reported in Table 19 suggest that immigration status is an important factor in how TFW employment affects the economic outcomes of workers. Relative to Canadian-born workers, immigrants at the bottom of a firms earnings distribution experience slightly less of an earnings loss from TFW employment, 0.29% loss compared to a 0.41% loss for Canadians. Additionally, for immigrants placed in the top of a firm's earnings distribution the contribution to their earnings from each additional TFW employee at their firm is higher, 0.49% compared to 0.31% for Canadians.

[54] Ottaviano and Peri (2012) show that immigrants have a larger impact on the earnings of previous immigrants relative to domestic-born workers. They find a small positive effect (+0.6%) from immigration on average local wages and a substantial negative effect(-6.7%) on wages of previous immigrants.

Table 19: OLS estimates of post-reform log earnings equations, permanent residents

Dependent variable:	Log Earnings		
	(1)	(2)	(3)
TFW_{ft}	0.0002***		
	(0.0001)		
$TFW\_low\_skill_{ft}$		-0.0005**	
		(0.0002)	
$TFW\_high\_wage_{ft}$		0.0008**	
		(0.0002)	
$TFW\_agriculture_{ft}$		0.0018***	
		(0.0002)	
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 1\right)$			-0.0029***
			(0.0004)
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 2\right)$			0.0012***
			(0.0002)
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 3\right)$			0.0035***
			(0.0005)
$TFW_{ft} * \mathbb{1}\left(Quartile_{ift} = 4\right)$			0.0049***
			(0.0009)
IMP_{ft}	-0.0003***	-0.0002	-0.0001***
	(0.0000)	(0.0000)	(0.0000)
CMA_TFW_{ft}	7.21e-06	6.81e-06	6.32e-06
	(0.0000)	(0.0000)	(0.0000)
CMA_IMP_{ft}	5.15e-06	5.04e-06	3.96e-06
	(0.0000)	(0.0000)	(0.0000)
Firm-year obs.	626,960	626,960	626,960
Adjusted R^2	0.512	0.512	0.541

Notes: The table contains estimates of the log earnings equations (1), (2), and (1) interacted with individual employment quartile placement from data pooled for all immigrant-firm observations for all years. Individual covariates include age and marital status. Firm covariates include revenue. All regressions also include a year, province, industry and individual fixed effects, as well as a constant. Robust standard errors clustered by firm are in parentheses. Significance denoted by * (10%), ** (5%), and *** (1%).

6 Discussion

6.1 Policy Implications

This report presents strong evidence to suggest that for firms that hire TFWs from the TFWP: (1) TFW employment is correlated with decreases to earnings of low-skilled, low-earning Canadians, (2) TFW employment is correlated with increases to earnings of high-skilled, high-earning Canadians, (3) TFW employment is positively correlated with a firm's trade volume, and (4) regardless of their placement on a firm's earnings distribution, Canadians employed in the agricultural industry do not experience any statistically significant negative correlation between their earnings and TFW hiring at their firms. However, the scope for TFWs to affect the Canadian economy goes far beyond these effects. For example, firms who would not otherwise be able to produce without TFW employees may find it profitable to do so.[55] Furthermore, these results are solely showing *correlations* and they should not be interpreted as establishing a causal relationship between TFW employment and the earnings of Canadians or performance of firms.

6.2 Methodology

Our primary tool to measure the impact of the TFWP program is (1) ordinary least squares (OLS) and (2) instrument variables (IV) regressions. An industry-level descriptive analysis could potentially describe the relationship between TFW employment and labour market outcomes. However, we carried out a different approach as a primary methodology tool to avoid likely causality issues.[56] Our selection of OLS and IV regressions have limitations that we address with appropriate econometric techniques. We discuss these in detail throughout the report.

[55] This is solely an example of subtle changes that *may* be occurring in the economy which we cannot identify in this report.

[56] It is possible that a negative correlation between the outcomes of Canadian workers and the share of TFWs in a given market may be driven by employment and location selection among Canadian workers. For instance, TFW dominated firms and industries may see slower growth because Canadians remaining in these industries may be negatively selected on ability, which could lead to worse labour market outcomes (Heckman, Stixrud and Urzua, 2006; Lindqvist and Vestman, 2011).

6.3 Limitations

The biggest limitation we faced was data-specific. First, we cannot include certain key variables, in particular for Canadian-born workers, (e.g., education level, occupation) in our regressions and they *might* be correlated with TFW employment at a firm or with individual T4 earnings and this would bias our results.[57] Second, the data does not allow us to observe the hourly wage or total hours worked so we use annual employment earnings. Total number of hours worked and hourly wage data would enable to us make a distinction between the intensive (hours worked) and extensive (hourly wage) impact of TFW employment in the Canadian labour market. Our main empirical technique for exploring the *casual* impact of TFW employment on the Canadian labour market is an IV regression based on the major TFWP policy change that occurred during 2014. Therefore, our causal estimates are limited to the post-2014 time period. Lastly, when constructing our sample, we excluded individuals and firms with missing data. For example, individuals whose province of residence is unknown or a firm with no information on revenue or profits were removed. The benefits of removing these data points is having a final data set with complete data for all individuals and firms. If we did not drop these individuals and firms they may be included in some regressions but dropped in others, this creates inconsistency in evaluating the results. However, ensuring this data consistency does require dropping observations that would otherwise contribute to our findings.

[57] Instead, we have to proxy that information with the placement of an individual within a firm's earnings distribution.

7 Glossary

High-wage: wages that are at or above than the provincial / territorial median wage.

Labour Market Impact Assessment (LMIA): a more comprehensive test of the impact that hiring temporary foreign workers would have on the labour market and Canadian workers using more and better labour market information. The LMIA is replacing the Labour Market Opinion.

Low-wage: wages that are less than the provincial / territorial median wage.

P/T Median-wage: the rate above which half a province's or territory's workers are paid and below which the other half are paid.

National Occupational Classification (NOC): nationally accepted reference on occupations in Canada, which organizes over 40,000 job titles into 500 occupational group descriptions. Previously, the Temporary Foreign Worker Program used the NOC coding system to determine the specific skill level of an occupation.

Primary agriculture: Work in the primary agriculture sector means work that is performed within the boundaries of a farm, nursery or greenhouse and involves:

- the operation of agricultural machinery
- the boarding, care, breeding, sanitation or other handling of animals, other than fish, for the purpose of obtaining animal products for market, or activities relating to the collection, handling and assessment of those products
- the planting, care, harvesting or preparation of crops, trees, sod or other plants for market

Temporary Foreign Worker: a foreign national allowed into a country to work for a limited period of time.

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8 Appendix

Table A.1: Distribution of TFWP employment, by year and skill level

Year	high-skilled	low-skilled	Agriculture	Total
2011	18,750	18,635	1,555	38,940
2012	22,810	21,945	2,340	47,095
2013	28,690	25,020	2,765	56,475
2014	30,840	28,525	3,340	62,705
2015	22,515	22,600	2,815	47,930
2016	16,310	13,475	2,565	32,350
2017	15,940	10,840	2,305	29,085

Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also dropped from the sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range. Skill level is determined from the NOC of the employee.

Table A.2: Distribution of TFWP employment, by year and province

Year	Alberta	Atlantic	British Columbia	Ontario	Quebec	Saskatchewan & Manitoba
2010	27,365	2,635	11,935	20,795	6,540	4,215
2011	25,465	3,225	8,920	16,810	6,730	3,150
2012	31,100	4,040	10,220	19,615	7,860	3,850
2013	36,930	4,370	12,200	22,355	9,100	5,225
2014	41,030	4,660	14,410	21,285	9,865	6,565
2015	30,620	3,745	12,755	16,885	9,390	5,600
2016	16,915	3,180	10,565	13,875	8,320	3,675
2017	10,690	3,145	11,735	14,155	8,325	2,105

Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also dropped from the sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range. Atlantic includes the provinces of Prince Edward Island, Nova Scotia, New Brunswick, and Newfoundland and Labrador.

Table A.3: Distribution of TFWP employment normalized by provincial population, by year and province

Year	Alberta	Atlantic	British Columbia	Ontario	Quebec	Saskatchewan & Manitoba
2010	338.08%	51.60%	123.23%	72.99%	38.06%	85.56%
2011	357.21%	72.63%	105.28%	67.46%	44.81%	72.88%
2012	361.03%	77.06%	100.80%	66.11%	44.05%	74.40%
2013	358.33%	71.73%	101.91%	64.17%	43.59%	85.72%
2014	362.06%	71.20%	110.21%	56.45%	43.77%	99.13%
2015	332.72%	71.37%	120.03%	55.47%	51.82%	104.49%
2016	256.91%	85.10%	138.29%	63.60%	64.47%	95.48%
2017	183.19%	95.57%	172.76%	72.99%	72.87%	61.56%

Notes: Data collected by authors from the TFWP - CEEDD. A TFWP worker is determined by an individual having an LMIA or LMO attached to their employment. The sample excludes individuals and firms with incomplete information (e.g., individuals with no information on province of residence, firms with no information on profits). We also dropped from the sample all individuals with less than $1,000 in employment income or outside the 25 to 64 age range. Atlantic includes the provinces of Prince Edward Island, Nova Scotia, New Brunswick, and Newfoundland and Labrador. Normalization used: $\frac{TFW\_Prov_{it}}{\sum_k TFW\_Prov_{kt}} \div \frac{Population\_Prov_{it}}{\sum_k Population\_Prov_{kt}}$

Table A.4: TFWP Reforms: Timeline of Measures coming into Force

Activity	Date
LMIA Fee	June 20, 2014
Introduction of Cap	June 20, 2014
High-Wage Transition Plans	June 20, 2014
Launch enhanced Tip Website	June 20, 2014
New guidelines for intra-company transferees with specialized knowledge	June 20, 2014
10-day Processing Times for certain occupations	June 20, 2014
Fee for open WP holders	Summer 2014
Strengthening compliance system for employers of LMIA-exempt foreign workers	Summer 2014
Information Sharing Agreements between CIC, CBSA, and ESDC to be completed	Autumn 2014
Monetary fine regime to come into force	Autumn 2014
Criminal Investigations	Autumn 2014
Negotiate and implement all other Information Sharing Agreements with provinces	March 2015
Implement expanded inspection regime	March 2015
Begin data collection for the Wage and Vacancy surveys	Spring 2015
Limit Duration for low-wage TFWs	June 20, 2014
Begin utilizing administrative data as part of the LMIA evaluation process	Summer 2015
Compliance fee for employer-specific work-permits	Summer 2015
Measures Compelling Documents from third parties	Late 2015

Notes: Sourced from the *Overhauling the Temporary Foreign Worker Program: Improving clarity, transparency and accountability of the Temporary Foreign Worker Program*, https://www.canada.ca/en/employment-social-development/services/foreign-workers/reports/overhaul.html#h2.3-3.4

Table A.5: New sector classification based on NAICS 2-digit industry

NAICS Industry	New Sector Grouping
Agriculture, forestry, fishing and hunting (11)	1
Mining, quarrying, and oil and gas extraction (21)	2
Utilities (22)	2
Construction (23)	2
Manufacturing (31-33)	3
Wholesale trade (41)	4
Retail trade (44-45)	4
Transportation and warehousing (48-49)	4
Information and cultural industries (51)	5
Finance and insurance (52)	5
Real estate and rental and leasing (53)	5
Professional, scientific and technical services (54)	5
Management of companies and enterprises (55)	5
Administrative and support, waste management and remediation service (56)	5
Educational services (61)	5
Health care and social assistance (62)	5
Arts, entertainment and recreation (71)	5
Other services (except public administration) (81)	5
Public administration (91)	5
Accommodation and food services (72)	6