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RESEARCH ARTICLE

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A breath of fresh air: The effect of public smoking bans on Indigenous youth

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Abstract

In general, past studies have estimated the average effect of public smoking bans on youth, ignoring differences across sub-populations. We extend the literature by considering Indigenous youth, who are a vulnerable and previously unexamined group (however, our analysis excludes First Nations youth who live on reserve). We also consider previously unexamined outcomes among youth: self-assessed health and subjective well-being. Our difference-in-differences estimates from Canada indicate that public bans reduced youth smoking and second-hand exposure in public places, on average. There was no displacement on the extensive margin, but the bans increased the number of people who smoke in the homes of youth, conditional on the presence of smokers in the household. Beyond average effects, however, we find that public bans reduced second-hand exposure in the homes of Indigenous youth (particularly Métis youth), on the extensive and intensive margins. The same youth experienced concurrent improvements in self-assessed health and life satisfaction. We conclude that public bans mitigate disparities in health and well-being between Indigenous and non-Indigenous youth, but the extent varies across Indigenous sub-populations, even within a particular country.

KEYWORDS
Indigenous, regulation, smoking, well-being, youth

JEL CLASSIFICATION
I12, I18, I31, J13, J15

1 | INTRODUCTION

Smoking is a leading cause of preventable morbidity and mortality, including cardiovascular disease, respiratory disease and cancer. These conditions are also attributable to second-hand exposure, no level of which is risk-free (Centers for Disease Control and Prevention, 2019a). Public bans are one of the many approaches used to control smoking and second-hand exposure, with the goal of preserving health. Past studies have estimated the effect of public bans on smoking and second-hand exposure among youth, but they typically condition on the mean. There is limited evidence on sub-populations, such as Indigenous Peoples, who tend to have lower levels of health and well-being (including higher rates of smoking). The objective of this study is to examine the effect of public smoking bans on Indigenous

youth, who are a vulnerable and previously unexamined group. Specifically, we examine whether the bans have a differential effect relative to non-Indigenous youth and, if so, whether they mitigate or exacerbate disparities in health and well-being. Unfortunately, we do not observe First Nations youth who live on reserve, which is important from a policy standpoint because they tend to have lower levels of health and well-being compared to those who live off reserve (Reading & Wien, 2009). Thus, we caution readers that our study is not generalizable to this sub-population; our analysis should be interpreted as a comparison of Indigenous and non-Indigenous youth, excluding First Nations youth who live on reserve. Our outcomes pertain to smoking, second-hand exposure, self-assessed health and life satisfaction. The latter two outcomes reflect a second contribution of this work—to estimate the effect of public smoking bans on *youth* self-assessed health and subjective well-being. Past studies have largely focused on adults in the context of these outcomes.

We examine these issues using a difference-in-differences model, in which we exploit variation in the timing of public bans across Canadian provinces/territories, testing for heterogeneity between Indigenous and non-Indigenous youth. Consistent with past literature, we find that public bans reduced smoking and second-hand exposure in public places among youth aged 12 to 17. We find no evidence that the bans displaced smoking from public to private places on the extensive margin (there was no change in the probability of youth being exposed in vehicles or homes). On the intensive margin, however, public bans increased the number of people who smoke in homes, conditional on the presence of smokers in the household. Looking beyond average effects, we find that public bans reduced second-hand exposure in the homes of some Indigenous youth, namely Métis youth. This occurred on both the extensive and intensive margins. The bans also improved self-assessed health and life satisfaction among Métis youth, with comparatively little effect at the mean. Taken together, our findings suggest that public smoking bans mitigate disparities in health and well-being between Indigenous and non-Indigenous youth, but the effects vary across Indigenous groups, even within a particular country.

In what follows, we discuss past literature on public smoking bans, in addition to providing an overview of the policy setting and Indigenous Peoples in Canada. In Sections 4 to 6, we describe our data and methods, followed by results in Section 7. In Section 8, we discuss and conclude.

2 | PAST LITERATURE

Public bans are an important non-price deterrent of smoking, ranked ahead of information campaigns, advertising bans, package warnings and treatment for smokers (Joossens & Raw, 2006).[1] Past studies find that public bans have little effect on smoking among adults (Anger et al., 2011; Carpenter et al. 2011; Chaloupka & Warner, 2000; Jones et al., 2015). However, they reduce second-hand exposure in public places. Carpenter et al. (2011) find no evidence of displacement to private vehicles or homes, while Adda and Cornaglia (2010) find that public bans increase second-hand exposure in private places (based on cotinine levels in body fluids), especially among children and those living with smokers. An alternative possibility is that public bans alter social norms, leading to voluntary restrictions on smoking in private places (such as vehicles and homes), thereby reducing second-hand exposure in these contexts. This is known as social diffusion (Borland et al., 2006; Cheng et al., 2015; Edwards et al., 2008; Monson & Arsenault, 2017; Nanninga et al., 2018). Consistent with this *negative* displacement, it is also possible that public bans reduce smoking among some members of the household, thus reducing second-hand exposure among others.

In addition to smoking and second-hand exposure, there is evidence that public bans improve self-assessed health among non-smoking adults, with larger gains for women (Kuehnle & Wunder, 2017; Wildman & Hollingsworth, 2013). They also improve subjective well-being among married women with children (Yang & Zucchelli, 2018) and smokers (Brodeur, 2013; Odermatt & Stutzer, 2015). The latter implies that smokers have time-inconsistent preferences, and public bans serve as a self-control device for those who would like to quit (Gruber & Köszegi, 2001). This conflicts with Becker and Murphy (1988), who theorize that smokers choose a consumption path to optimize lifetime utility. Public bans restrict this choice, and thus reduce subjective well-being. See Cawley and Ruhm (2011) for a review.

In addition to adults, it is important to consider how public bans affect youth because initiation generally occurs in adolescence (Jarvis, 2004) and deterring initiation may reduce eventual smoking rates (Auld, 2005). Indeed, there is evidence that public bans reduce youth smoking (Hawkins et al., 2016; Ross & Chaloupka, 2004; Wakefield et al., 2000), especially among boys and those of high socio-economic status (Tauras et al., 2013).[2] Few studies consider the differential effect of public bans on youth sub-populations, such as racial and ethnic groups other than White, Black/African American and Hispanic/Latinx (Tauras 2007). Indigenous youth are a major oversight as they have relatively

high rates of smoking and second-hand exposure, as well as substance-related morbidity and mortality (Carson et al., 2012; Stevenson et al., 2017). These differences may be attributable to early initiation, normalization of smoking, access to tobacco, other addiction and mental health problems. Moreover, they may be compounded by low socio-economic status and inadequate access to health care (Carson et al., 2012; DiGiacomo et al., 2011).

We add to the literature by considering the effect of public smoking bans on Indigenous youth. Specifically, we examine whether they mitigate or exacerbate differences in smoking, second-hand exposure, health and well-being relative to non-Indigenous youth. Coincidentally, we also add to the literature by considering how public smoking bans affect *youth* self-assessed health and subjective well-being. In the past, this line of investigation has focused on adults. Using Canada as a case study, we have a nationally representative sample of youth, including the Northern territories (Yukon, Northwest Territories, Nunavut), which are not regularly observed in microdata.[3] This region has a relatively young population and large proportion of Indigenous Peoples, who tend to have lower levels of health and well-being, including high rates of youth smoking and second-hand exposure (Burton et al., 2015).

3 | POLICY SETTING

"Canada is well known in the tobacco control community for its progressive policies to reduce tobacco use: these include ... restrictions on smoking in public places" (Tilson n.d. p. 3). As outlined in Table 1, public bans have been implemented in all provinces/territories, with Yukon being the last to adopt in May 2008. The bans apply to various public places, including restaurants, bars, billiard and bingo halls, bowling alleys, shopping malls and sports venues. They are generally enforced by business owners, who face fines for non-compliance, as do smokers. Fines are as high as $10,000 in the province of Saskatchewan (Carpenter et al., 2011). For the purposes of this study, we focus on 100% bans at the province/territory level, under which there are no place-specific exemptions (e.g., bars) or designated smoking areas. Thus, we provide lower bound estimates of how public smoking bans affect youth because weaker restrictions were previously implemented in some jurisdictions, as were restrictions at lower levels of geography.[4] However, our results are robust to accounting for bans that existed in large municipalities prior to provincial/territorial legislation (e.g., Halifax, Ottawa, Toronto, Winnipeg, Saskatoon, Edmonton, Vancouver). Still, the effect of the bans may be biased by youth residing near provincial/territorial borders with different legislation. For example, youth in the province of Saskatchewan were part of the treatment group as of January 2005. However, those who were close to the border could avoid public bans by going to Alberta, which did not adopt until January 2008.

There are three Indigenous groups in Canada (First Nations, Métis, and Inuit), with diverse histories, cultural practices and spiritual beliefs. Tobacco is a sacred plant for many Indigenous Peoples, especially First Nations and Métis (tobacco could not be cultivated in the Arctic, but was later introduced to Inuit by explorers, whalers and traders). It is often used in prayers and spiritual ceremonies, and for healing purposes. Tobacco may be placed on water or the ground, chewed, burned or smoked in pipes (Kelly & Smith, 2002; National Collaborating Centre for Aboriginal Health, 2013). "Today, tobacco still holds traditional spiritual, cultural and medicinal value for many Indigenous Peoples, but misuse of commercial tobacco products (such as cigarettes) has become a significant public health problem" (National Collaborating Centre for Aboriginal Health, 2013 p. 1).

Between 2011 and 2014, the average smoking rate among Indigenous Peoples aged 12 to 24 (excluding First Nations Peoples who live on reserve) was 23.6%, compared to 8.9% of the non-Indigenous population (Statistics Canada n.d.). Similarly, focusing on youth in grades nine to 12, Elton-Marshall et al. (2011) find that 24.9% of Indigenous youth smoke, compared to 10.4% of non-Indigenous youth. Moreover, looking at youth in grades six to nine, Elton-Marshall et al. (2013) find that 9.3% of Indigenous youth smoke, compared to 3.1% of non-Indigenous youth. An objective of this study is to estimate the extent to which public smoking bans mitigate differences in smoking and second-hand exposure between Indigenous and non-Indigenous youth, with important implications for health and well-being.

4 | DATA

We use repeated cross-sectional microdata from the Canadian Community Health Survey (CCHS), which are available from Statistics Canada (2019b). The CCHS is representative of the population aged 12 and older, except full-time members of the military, institutional residents, those in very remote areas (e.g., we only observe the 10 largest

TABLE 1 Implementation of public bans

Province/Territory	Implementation
Prince Edward Island	May 2003
Northwest Territories	June 2004
Nunavut	June 2004
Manitoba	October 2004
New Brunswick	October 2004
Saskatchewan	January 2005
Newfoundland and Labrador	June 2005
Ontario	June 2006
Quebec	June 2006
Nova Scotia	December 2006
Alberta	January 2008
British Columbia	April 2008
Yukon	May 2008

Source: Carpenter et al. (2011).

communities in Nunavut) and First Nations Peoples who live on reserve.[5] These exclusions represent less than 3% of the Canadian population, and response rates are more than 70% in all provinces/territories (Statistics Canada 2011). However, we recognize that these exclusions represent a larger share of the Indigenous population in Canada, given that almost 40% of First Nations Peoples live on reserve (Kelly-Scott & Smith, 2015). Thus, our analysis should be interpreted as a comparison of Indigenous and non-Indigenous youth, excluding First Nations youth who live on reserve.

The CCHS was conducted every 2 years from 2000–2001 to 2007, then it became an annual survey. We pool eight cycles of data, ranging from 2003 to 2012.[6] This allows us to examine the period during which public smoking bans were implemented across provinces/territories. Incidentally, it is prior to the widespread popularity of electronic cigarettes/vaping (Centers for Disease Control and Prevention, 2019b) and legalization of marijuana (Bilefsky, 2018). Otherwise, differences in these behaviors across provinces/territories could impact our outcomes (smoking, second-hand exposure, self-assessed health, subjective well-being) and implementation of public smoking bans. An identifying assumption of our model is the absence of coincidental shocks that affected the relative outcomes of youth covered by the bans versus those who were not.

By pooling eight cycles of the CCHS, we obtain a relatively large sample of youth. This is important for studying Indigenous Peoples, who represent less than 5% of the Canadian population (Statistics Canada 2018). Indeed, an objective of the CCHS is to support research on small populations through large samples. Another advantage of the CCHS is that it includes the Northern territories (Yukon, Northwest Territories, Nunavut), unlike most other Canadian microdata. This region has a relatively young population and large proportion of Indigenous Peoples, ranging from 23% in Yukon to 86% in Nunavut, compared to 5% in all of Canada (Statistics Canada 2018). We cannot differentiate between off-reserve First Nations, Métis and Inuit youth in 2003.[7] Thus, we consider them collectively, then examine group differences using a subset of the data that excludes 2003. In this subset, 2.6% of youth are First Nations, 2.5% are Métis and 0.2% are Inuit. This is similar to the share of the Canadian population in each of these groups (Statistics Canada 2018).

In the CCHS, basic demographic and socio-economic information is provided by a household representative, then one member is selected for a more in-depth health interview. In other words, there is only one observation per household in each cycle of the CCHS—the member who participated in the health interview (it is possible that a household was selected in multiple cycles of the CCHS, but we cannot identify or link these records). Our sample consists of youth aged 12 to 17. Privacy is assured during the interviews. For example, if a parent insists on being present, the youth can respond to questions on a computer instead of orally. This is important given the sensitive nature of the outcomes. Similarly, we drop proxy interviews, which are completed by the household representative if the youth is unable to participate due to poor physical or mental health.

TABLE 2 Summary statistics of outcomes for Indigenous and non-Indigenous youth, respectively

			Indigenous		Non-Indigenous			
	Range	Sample	Obs.	Percentage or mean	Obs.	Percentage or mean	Obs.	Difference
Smoking	0–1	All youth	32,055	14.479 (1.247)	2,379	6.426 (0.237)	29,676	8.054*** (1.269)
Exposure in public places	0–1	Youth who do not smoke	29,586	21.513 (1.630)	1,970	20.302 (0.382)	27,616	1.210 (1.673)
Exposure in vehicles	0–1	Youth who do not smoke	29,586	25.241 (1.769)	1,970	15.036 (0.329)	27,616	10.205*** (1.799)
Exposure in homes	0–1	Youth who do not smoke	29,586	29.359 (1.853)	1,970	15.962 (0.344)	27,616	13.397*** (1.884)
Number of people who smoke in homes	1–15	Youth who do not smoke and are exposed in homes	5,896	1.596 (0.060)	589	1.513 (0.023)	5,307	0.083 (0.064)
Self-assessed health	0–1	All youth for whom this is observed	31,671	59.897 (1.793)	2,352	70.449 (0.436)	29,319	−10.551*** (1.845)
Life satisfaction	0–1	All youth for whom this is observed until 2008	18,399	40.359 (3.147)	1,176	46.276 (0.627)	17,223	5.917* (3.208)

Notes: Summary statistics are expressed in percentage terms, except mean *Number of people who smoke in homes*. Standard errors are reported in parentheses.
Source: Authors' calculations.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

As outlined in Table 2, our outcomes pertain to smoking, second-hand exposure, self-assessed health and subjective well-being. First, we consider smoking on the extensive margin. All youth are asked: *At the present time, do you smoke cigarettes daily, occasionally or not at all?* From this, we create a binary variable that takes a value of one if the youth smokes daily or occasionally and zero if not at all. This sample consists of 32,055 youth, of whom 2,379 are Indigenous. We then consider binary measures of second-hand exposure *every day or almost every day* in public places, vehicles and homes, respectively.[8] This sample consists of 29,586 non-smoking youth, of whom 1,970 are Indigenous; questions about second-hand exposure are not asked to smokers in the CCHS. The latter two measures (second-hand exposure in vehicles and homes) are used to determine whether public bans displace smoking to private places, as concluded by Adda and Cornaglia (2010). Similarly, we consider second-hand exposure on the intensive margin in the homes of affected youth. Specifically, non-smoking youth who are exposed in homes are asked: *How many people smoke inside your home every day or almost every day?* This measure ranges from 1 to 15 because it is conditional on youth being exposed to second-hand smoke in homes. Finally, we consider self-assessed health and subjective well-being. In particular, youth are asked: *In general, would you say your health is excellent, very good, good, fair or poor?* From this, we create a binary variable that takes a value of one if the youth is at the top of the scale (*excellent* or *very good*) and zero otherwise. Likewise, youth are asked: *How satisfied are you with your life in general (very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied)?* We create a binary variable that takes a value of one if the youth is at the top of the scale (*very satisfied*) and zero otherwise. For this analysis, we only use data from 2003 to 2008, after which there is a change in the life satisfaction measure in the CCHS.

5 | SUMMARY STATISTICS

Table 2 contains summary statistics of our outcomes, testing for differences between Indigenous and non-Indigenous youth. We find that a larger percentage of Indigenous youth are smokers (14.5% vs. 6.4% of non-Indigenous youth), and the difference is statistically significant at the 1% level. These rates are within the range of past studies, as is the disparity between Indigenous and non-Indigenous youth. For example, our rates are between those of Elton-Marshall et al. (2013) and Elton-Marshall et al. (2011), who focus on youth in grades six to nine and nine to 12, respectively. Moreover, in past studies, the difference between Indigenous and non-Indigenous youth ranged from 58.2 to 66.7% (Elton-Marshall et al., 2011, 2013; Statistics Canada n.d); it is 55.9% in our study. We also find significant differences in second-hand exposure in vehicles and homes: rates are higher for Indigenous

youth by 10.2% points and 13.4% points, respectively. There is, however, no difference in the number of people who smoke in homes, conditional on the presence of smokers in the household. Finally, only 59.9% of Indigenous youth report excellent or very good health, compared to 70.4% of non-Indigenous youth.[9] The former also have marginally lower life satisfaction.

Consistent with the literature, Table 2 indicates that Indigenous youth have relatively high rates of smoking and second-hand exposure, as well as poorer health and well-being. Past studies suggest that low socio-economic status is a contributing factor (Carson et al., 2012; DiGiacomo et al., 2011). While we do not test the relationship here, Table 3 indicates differences in family structure, education and income between Indigenous and non-Indigenous youth.[10] For example, a relatively large percentage of Indigenous youth have a lone-parent family (27.2% vs. 17.6% of non-Indigenous youth) or other living arrangements (18.3% vs. 9.3% of non-Indigenous youth).[11] Indigenous families also have lower levels of formal education and income, on average. For example, only 68.4% have post-secondary education, compared to 80.7% of non-Indigenous families. Likewise, real equivalent income is $31,929 (2006 dollars), compared to $41,737 among non-Indigenous families.

Next, we examine changes in the outcomes across time for Indigenous and non-Indigenous youth, concurrently with changes in the percentage of those covered by public bans, in order to determine whether there may be a relationship between the two. Figures 1a and 1b indicate that the percentage of youth covered by public bans increased from about zero percent in 2003 to 100% by 2009 (this is consistent with Table 1, which outlines the implementation of public bans across provinces/territories). At the same time, there was a reduction in the smoking rate among Indigenous youth, from 28.8% in 2003 to 9.9% in 2012, with little change among non-Indigenous youth. We also find that, for both groups, there was a reduction in the percentage of youth exposed in vehicles (by 14.8 points for Indigenous youth and 10.9 points for non-Indigenous youth) and homes (by 19.2 points for Indigenous youth and 12.3 points for non-Indigenous youth). However, there was a lot variation in the number of people who smoke in homes (conditional on the presence of smokers in the household), with a net reduction for Indigenous youth and increase for others.

Also coinciding with the bans, Figure 2a indicates that the percentage of Indigenous youth who reported excellent or very good health increased from 44.9% in 2003 to 65.9% in 2012. Likewise, the percentage of Indigenous youth at the top of the life satisfaction scale increased from 26.4 to 47.4% between 2003 and 2008. At the same time, there were negligible changes in self-assessed health and life satisfaction among non-Indigenous youth (Figure 2b).

6 | METHODS

We use a difference-in-differences model to identify the effect of public smoking bans, testing for heterogeneity between Indigenous and non-Indigenous youth. Specifically, we exploit variation in the timing of the bans across provinces/territories, assuming there were no coincidental shocks that affected the relative outcomes of youth covered by the bans versus those who were not. The estimating equation is:

$$Y_{ipt} = \beta_0 + \beta_1 Ban_{pt} + \beta_2 (Ban_{pt} * Indigenous_i) + \beta_3 Indigenous_i + \beta_4 \boldsymbol{X}_{ipt} + \beta_5 \boldsymbol{Z}_{pt} + \boldsymbol{Province}\Big/\boldsymbol{Territory}_p + \boldsymbol{Year}_t + \varepsilon_{ipt} \quad (1)$$

Y_{ipt} denotes one of seven outcomes for individual i in province/territory p and time t: daily or occasional smoking (1) versus not at all (0); exposed to second-hand smoke in public places (1) versus not (0); exposed to second-hand smoke in vehicles (1) versus not (0); exposed to second-hand smoke in homes (1) versus not (0); number of people who smoke in homes, conditional on the presence of smokers in the household (1–15); excellent or very good self-assessed health (1) versus not (0); very satisfied with life (1) versus not (0). The latter is based on data from 2003 to 2008, after which there is a change in the life satisfaction measure in the CCHS.

Ban_{pt} indicates whether the youth was affected by a public smoking ban. $Indigenous_i$ reflects whether they are off-reserve First Nations, Métis or Inuit youth. The reference group consists of non-Indigenous youth. We also estimate regressions in which we differentiate between off-reserve First Nations, Métis and Inuit youth, but the number of observations is reduced because this information is not observed in 2003. $\boldsymbol{X}_{ipt}$ is a vector of individual characteristics, including age (12 to 13 or 16 to 17 vs. 14 to 15), girl (vs. boy), immigrant (vs. non-immigrant), family structure (lone-parent or other living arrangements vs. two-parent), education (less than high school or post-

TABLE 3 Summary statistics of key covariates for Indigenous and non-Indigenous youth, respectively

	Indigenous	Non-Indigenous	Difference
Aged 12 to 13	32.958 (1.755)	33.991 (0.452)	−1.033 (1.812)
Aged 14 to 15	39.332 (1.860)	35.816 (0.462)	3.516* (1.916)
Aged 16 to 17	27.710 (1.597)	30.192 (0.437)	−2.482 (1.655)
Girl	53.672 (1.849)	48.243 (0.478)	5.428*** (1.909)
Two-parent family	54.459 (1.877)	73.133 (0.436)	−18.674*** (1.927)
Lone-parent family	27.199 (1.687)	17.567 (0.356)	9.632*** (1.724)
Other living arrangements	18.342 (1.543)	9.299 (0.321)	9.042*** (1.576)
Less than high school family	9.065 (0.957)	3.384 (0.174)	5.680*** (0.973)
High school family	22.490 (1.529)	15.887 (0.345)	6.602*** (1.567)
Post-secondary family	68.446 (1.687)	80.727 (0.374)	−12.282*** (1.728)
Real equivalent income	31,929 (1,065.0)	41,737 (336.5)	−9,808*** (1,117)
Rural	23.363 (1.366)	19.60 (0.330)	3.763*** (1.405)
Observations	2379	29,676	–

Notes: Summary statistics are expressed in percentage terms, except mean *Real equivalent income* in 2006 dollars. Standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

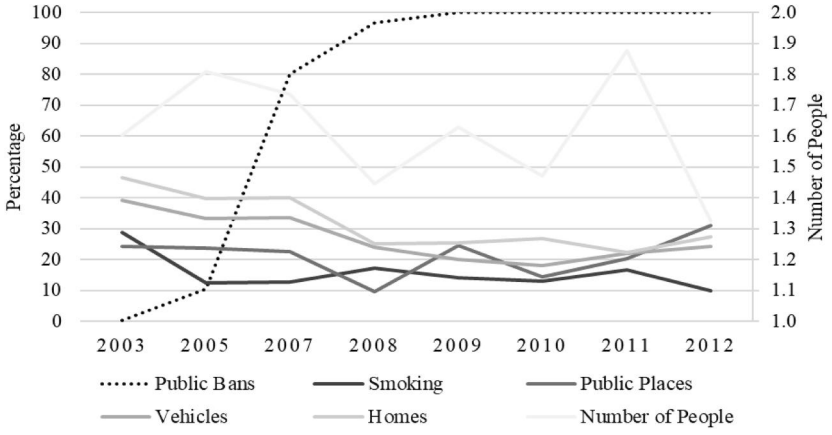

FIGURE 1 (a) Percentage of youth covered by public bans, smoking and second-hand exposure in public places, vehicles and homes, as well as the mean number of people who smoke in homes, conditional on the presence of smokers in the household—Indigenous youth. Source: Authors' calculations.

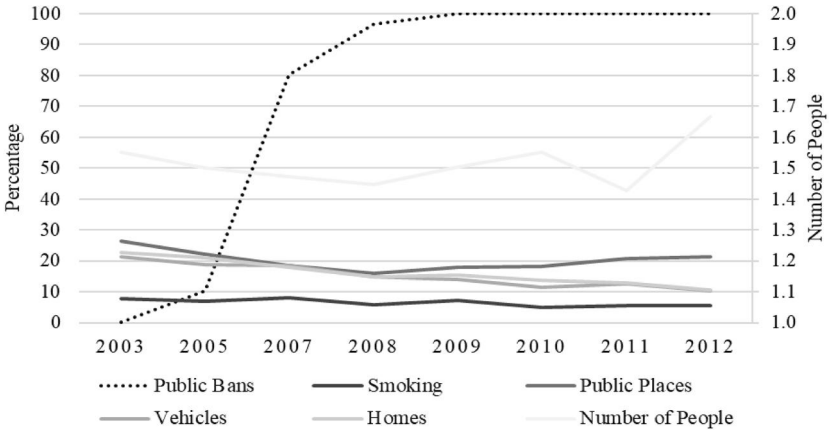

FIGURE 1 (b) Percentage of youth covered by public bans, smoking and second-hand exposure in public places, vehicles and homes, as well as the mean number of people who smoke in homes, conditional on the presence of smokers in the household—Non-Indigenous youth. Source: Authors' calculations

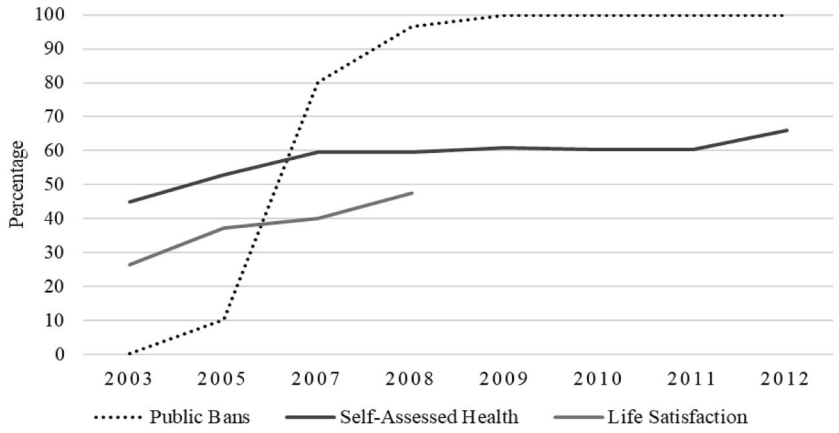

FIGURE 2 (a) Percentage of youth covered by public bans, self-assessed health and life satisfaction—Indigenous youth. Source: Authors' calculations.

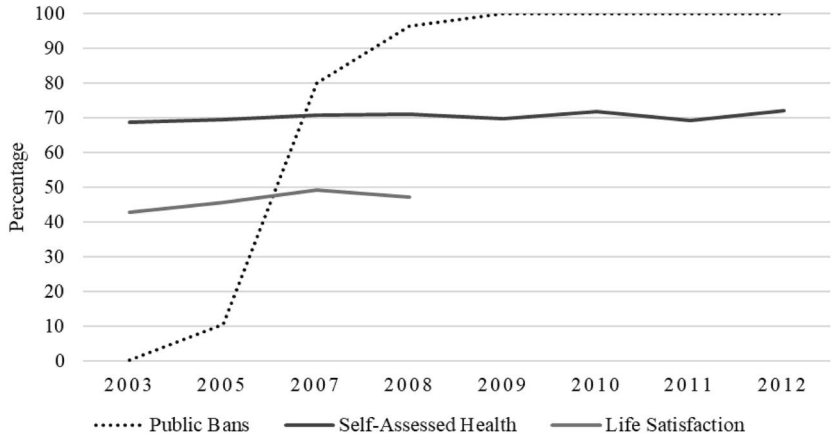

FIGURE 2 (b) Percentage of youth covered by public bans, self-assessed health and life satisfaction—Non-Indigenous youth. Source: Authors' calculations

secondary vs. high school family), log of real equivalent family income (2006 dollars) and rural residence (vs. urban). Results are robust to controlling for household size. $\boldsymbol{Z}_{pt}$ is a vector of time-varying province/territory characteristics, such as annual unemployment rates, the quadratic thereof and real monthly cigarette prices. These are available from the Canadian Socio-Economic Information Management System (Statistics Canada 2019a). $\boldsymbol{Province/Territory}_p$ and $\boldsymbol{Year}_t$ are fixed effects. Results are robust to controlling for Indigenous-specific province/territory and year fixed effects. We also control for month of interview to account for seasonality.

β_j for $j = [0,5]$ are parameters to be estimated. Of note, β_1 is the average effect of the bans and β_2 is the differential effect on Indigenous youth. ε is the error term. We estimate Equation (1) using probit regressions of binary outcomes (smoking, second-hand exposure in public places, vehicles and homes, self-assessed health, life satisfaction). We also estimate zero-truncated negative binomial regressions of number of people who smoke in homes, conditional on the presence of smokers in the household. Normalized sampling weights are applied in all analyses since the number of observations varies across cycles of the CCHS, assuming that each is a separate draw on the same population.

As a robustness check, we estimate placebo regressions with flu shots as the dependent variable (although it could be argued that public smoking bans yield more time for preventative care, to the extent they reduce substance-related morbidity and mortality). In the CCHS, respondents are asked: *Have you ever had a flu shot?* From this, we create a binary variable that takes a value of one if the youth responds affirmatively and zero otherwise. We find that β_1 (the average effect of the bans) is small but statistically significant. However, lending credibility to our findings related to Indigenous youth, the probability of having a flu shot is not affected by the bans (β_2 is not statistically significant). This holds whether we consider Indigenous youth collectively or differentiate across groups, and whether we estimate these models using probit or ordinary least squares regressions. These estimates are available upon request.

TABLE 4 Smoking and second-hand exposure - Key estimates for Indigenous and non-Indigenous youth

	Smoking	Exposure in public places	Exposure in vehicles	Exposure in homes	Number of people
Public ban	−0.020** (0.008)	−0.057** (0.023)	0.014 (0.017)	0.010 (0.020)	0.291** (0.132)
Public ban × Indigenous	−0.001 (0.018)	0.014 (0.039)	−0.033 (0.025)	−0.055** (0.023)	−0.303 (0.197)
Indigenous	0.055*** (0.019)	0.021 (0.037)	0.108*** (0.024)	0.147*** (0.023)	0.402*** (0.125)
Observations	32,055	29,586	29,586	29,586	5,896

Notes: We report average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from a zero-truncated negative binomial regression of number of people who smoke in homes, conditional on the presence of smokers in the household. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

7 | RESULTS

7.1 | Smoking and second-hand exposure

Table 4 contains average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from a zero-truncated negative binomial regression of the number of people who smoke in homes, conditional on the presence of smokers in the household. We focus on key estimates (β_1, β_2 and β_3), but we include a full set of covariates in each regression. They are presented in Appendix Table A1. We find that, on average, public bans reduced the probability of smoking by 2.0% points. This is consistent with past studies in the United States (Hawkins et al., 2016; Ross & Chaloupka, 2004; Wakefield et al., 2000). The bans also reduced second-hand exposure in public places by 5.7% points. Like Carpenter et al. (2011), we do not find evidence of displacement to private places on the extensive margin; our binary measures of exposure in vehicles and homes are small and statistically insignificant. However, on the intensive margin, there was a 34% increase in the number of people who smoke in the homes of youth, conditional on the presence of smokers in the household (e0.291=1.34). This is consistent with Adda and Cornaglia (2010), who find increased cotinine levels in body fluids, especially among children and those living with smokers. We recognize, however, that our estimates may be biased in the second-hand exposure analysis. Specifically, public bans reduced smoking, while questions about second-hand exposure are only asked to non-smokers. Thus, the bans changed the composition of our treatment group in this analysis. We argue, however, that this issue is less relevant when considering the differential effect of public bans on second-hand exposure among Indigenous youth, since the reduction in smoking affected the population overall and was not specific to Indigenous youth.

Indeed, Table 4 indicates that public bans reduced the probability of second-hand exposure in the homes of Indigenous youth by 5.5% points. When we differentiate across Indigenous groups using a subset of the data, we find this was driven by Métis youth, who experienced an 11.8% point reduction in the probability of exposure in homes (Table 5). The bans also reduced the number of people who smoke in Métis homes, conditional on the presence of smokers in the household. This may reflect social diffusion, such that public bans altered social norms and lead to voluntary restrictions in homes, thus reducing second-hand exposure (Borland et al., 2006; Cheng et al., 2015; Edwards et al., 2008; Monson & Arsenault, 2017; Nanninga et al., 2018). These results suggest that social diffusion may be particularly salient for Métis youth, which is consistent with evidence from the United States that social diffusion varies across racial/ethnic minority groups (Daley et al., in press). An alternate hypothesis is that public bans reduced smoking among other members of Métis households (e.g., parents, siblings, other relatives or cohabitants), thus reducing second-hand exposure in homes. Then again, public bans do not differentially affect smoking among Indigenous youth, nor do they affect smoking among Canadian adults (Carpenter et al. 2011), although differences between Indigenous and non-Indigenous adults have not been explored. Finally, it is interesting to note that public bans increase second-hand exposure in vehicles among Inuit youth. However, this estimate is based on a small number of observations; as noted earlier, Inuit youth constitute 0.2% of the sample.

TABLE 5 Smoking and second-hand exposure - Key estimates for off-reserve First Nations, Métis, Inuit and non-Indigenous youth

	Smoking	Exposure in public places	Exposure in vehicles	Exposure in homes	Number of people
Public ban	−0.026*** (0.009)	−0.048** (0.023)	0.012 (0.016)	0.006 (0.018)	0.333*** (0.119)
Public ban × First Nations	0.005 (0.026)	0.051 (0.062)	−0.039 (0.075)	−0.030 (0.068)	0.050 (0.292)
Public ban × Métis	0.051 (0.042)	−0.019 (0.077)	−0.050 (0.043)	−0.118** (0.051)	−0.692** (0.308)
Public ban × Inuit	−0.048 (0.053)	0.152 (0.153)	0.212** (0.104)	0.077 (0.165)	0.562 (0.349)
First Nations	0.050** (0.025)	−0.024 (0.053)	0.117 (0.078)	0.143** (0.068)	0.041 (0.287)
Métis	0.003 (0.043)	0.064 (0.068)	0.114*** (0.030)	0.173*** (0.044)	0.794*** (0.190)
Inuit	0.033 (0.037)	−0.130 (0.117)	−0.124* (0.069)	0.059 (0.154)	−0.332** (0.147)
Observations	25,385	23,550	23,550	23,550	4,268

Notes: We report average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from a zero-truncated negative binomial regression of number of people who smoke in homes, conditional on the presence of smokers in the household. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

7.2 | Self-assessed health and life satisfaction

Table 6 contains average marginal effects from probit regressions of self-assessed health (excellent or very good vs. not) and life satisfaction (very satisfied vs. not). Again, we focus on key estimates (β_1, β_2 and β_3), but we include a full set of covariates in each regression. They are presented in Appendix Table A2. Conditioning on the mean, we find that public bans had little effect on self-assessed health, but there was a reduction in the probability of being at the top of the life satisfaction scale. Moreover, beyond average effects, we find that public bans increased the probability of excellent or very good health among Indigenous youth by 8.8% points. Indigenous youth also experienced improvements in life satisfaction as a result of the bans; the probability of being at the top of the scale increased by 14.9% points.[12] As a robustness check, we estimate ordered probit regressions of self-assessed health and life satisfaction as five-point scales. These estimates, which are provided in Appendix Table A3, are consistent with those presented above. Specifically, public bans do not affect self-assessed health, on average, but they increase the probability of excellent or very good health (and reduce the probability of good, fair or poor health) among Indigenous youth. Moreover, conditioning on the mean, public bans reduce the probability of being very satisfied with life and increase the probability of being in the lower categories. However, they improve life satisfaction among Indigenous youth, who experience an increase in the probability of being very satisfied with life and reduction in the probability of being in the lower categories.

In Table 7, we again differentiate between off-reserve First Nations, Métis and Inuit youth using a subset of the data. We find that improvements were largely driven by Métis youth, who experienced an increase in the probability of excellent or very good self-assessed health (13.1% points). The bans also improved their life satisfaction, offsetting disparities relative to non-Indigenous youth. Taken together, our results suggest that Métis youth were less likely to be exposed to second-hand smoke in homes, and they experienced concurrent improvements in self-assessed health and subjective well-being. We hypothesize that improvements in health and well-being are related to reductions in second-hand exposure, but we do not directly test this relationship. To this point, there were no changes in second-hand exposure in the homes of off-reserve First Nations youth, but they were more likely to be at the top of the life satisfaction scale as a result of the bans. Moreover, while public bans do not affect self-assessed health or life satisfaction among Inuit youth, we again caution readers about the small number of observations (only 0.2% of youth are Inuit).

As a robustness check, we estimate the above models using ordinary least squares—in recognition of the complexities associated with interaction terms in non-linear models, such as probit regressions. As shown by Ai and Norton (2003), the size, sign and statistical significance may be impacted. Moreover, we estimate the above

TABLE 6 Self-assessed health and life satisfaction - Key estimates for Indigenous and non-Indigenous youth

	Self-assessed health	Life satisfaction
Public ban	0.048 (0.031)	−0.062** (0.029)
Public ban × Indigenous	0.088** (0.040)	0.149*** (0.055)
Indigenous	−0.154*** (0.039)	−0.143*** (0.031)
Observations	31,671	18,399

Notes: We report average marginal effects from probit regressions of self-assessed health and life satisfaction. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE 7 Self-assessed health and life satisfaction - Key estimates for off-reserve First Nations, Métis, Inuit and non-Indigenous youth

	Self-assessed health	Life satisfaction
Public ban	0.059* (0.033)	−0.056* (0.030)
Public ban × First Nations	0.046 (0.071)	0.181* (0.098)
Public ban × Métis	0.131** (0.058)	0.146** (0.067)
Public ban × Inuit	−0.182 (0.287)	−0.066 (0.229)
First Nations	−0.133* (0.072)	−0.201*** (0.052)
Métis	−0.163*** (0.052)	−0.116** (0.052)
Inuit	0.041 (0.263)	0.178** (0.074)
Observations	25,078	11,806

Notes: We report average marginal effects from probit regressions of self-assessed health and life satisfaction. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

models separately for Indigenous and non-Indigenous youth, which circumvents the need for an interaction term and recognizes important differences between these groups. Specifically, these models allow us to examine the effect of public bans on Indigenous youth, without direct comparisons to non-Indigenous youth. This is important because self-reporting may be impacted by the normalization of tobacco in Indigenous communities, leading to more truthful reporting of smoking and second-hand exposure. As shown in Appendix Table A4 (smoking and second-hand exposure) and Appendix Table A5 (self-assessed health and life satisfaction), our key estimates are robust in terms of sign and statistical significance. However, they are marginally smaller than those obtained via ordinary least squares and group-specific models (e.g., exposure in homes and self-assessed health among Indigenous youth).

Also recall that public bans were implemented between 2003 and 2008, while our study period ranges from 2003 to 2012; we use additional cycles of data to increase the sample of Indigenous youth, who represent a small share of the Canadian population (Statistics Canada 2018). However, the difference-in-differences estimator is a "weighted average of all possible two-group/two-period DD [difference-in-differences] estimators" and the weights are affected by the length of our study period (Goodman-Bacon, 2019). By extending the study period to 2012, we inherently place more weight on late adopters of public bans. Thus, as a robustness check, we compare our main results (2003 to 2012) with estimates derived from a more limited study period (2003 to 2008).[13] Note, however, that we always use data from 2003 to 2008 when considering life satisfaction because this measure changes in later cycles of the CCHS. As shown in Appendix Table A6, many of our key estimates are unchanged, including the reduction in second-hand exposure in public places and increase in the number of people who smoke in homes—conditioning on the mean. However, the reduction in youth smoking is no longer statistically significant at conventional levels (the *p*-value is 0.206). For Indigenous youth, we continue to find a reduction in second-hand exposure in homes on the extensive margin, and the effect is larger when we limit the study period. However,

as shown in Appendix Table A7, the improvement in self-assessed health is no longer statistically significant at conventional levels (the *p*-value is 0.141). This may reflect the small sample of Indigenous youth when we limit the study period (we drop almost 40% of observations). Moreover, the lack of statistical significance with respect to smoking and self-assessed health may be explained by the time needed to quit smoking and for the positive health effects to materialize.

Finally, we previously noted that 2003 may serve as a pseudo pre-policy period since only 0.2% of the sample was covered by public bans at that time. We do, however, have a genuine pre-policy period for two of our outcomes; we have data on smoking and self-assessed health in 2000–2001. Thus, in Appendix Tables A6 and A7, we show that results are generally robust to using a study period that ranges from 2000–2001 to 2012. Specifically, we continue to find that public bans reduce smoking, on average, although the point estimate is not statistically significant at conventional levels (the *p*-value is 0.202). Moreover, we continue to find that public bans improve self-assessed health among Indigenous youth. The size of the effect is slightly smaller compared to our main results (5.8% points vs. 8.8% points), but it remains statistically significant.

8 | DISCUSSION

An objective of this study is to estimate the effect of public bans on Indigenous youth, who tend to have higher rates of smoking and second-hand exposure, as well as substance-related morbidity and mortality. At the same time, they are underrepresented in the literature. We find that public bans reduced smoking and second-hand exposure in public places, for both Indigenous and non-Indigenous youth. Consistent with Carpenter et al. (2011), there was no displacement to vehicles or homes on the extensive margin. There was, however, an increase in the number of people who smoke in the homes of youth, conditional on the presence of smokers in the household. This coincides with Adda and Cornaglia (2010), who find increased cotinine levels in bodily fluids. In contrast to average effects, we find that Métis youth experienced a reduction in second-hand exposure in homes, on the extensive and intensive margins. This may be due to social diffusion, such that public bans lead to voluntary smoking restrictions in homes (Borland et al., 2006; Cheng et al., 2015; Edwards et al., 2008; Monson & Arsenault, 2017; Nanninga et al., 2018). Alternatively, it may be that public bans reduced smoking among other members of Métis households, and thus reduced second-hand exposure in homes. It should be noted, however, that public bans do not have a distinct effect on smoking among Indigenous youth. Moreover, conditioning on the mean, public bans do not reduce smoking among Canadian adults (Carpenter et al. 2011), but differences between Indigenous and non-Indigenous adults have not been considered in past studies. Notably, the bans also increased self-assessed health and life satisfaction among Métis youth, with comparatively little effect on the overall population. This finding is consistent with the reduction in second-hand exposure in homes.

Taken together, our findings suggest that public smoking bans reduce disparities in health and well-being between Indigenous and non-Indigenous youth. However, improvements were not equally distributed across Indigenous groups; they were largely concentrated among Métis youth. While not tested here, this may be related to unobserved differences in history, culture and/or spiritual beliefs, including the traditional importance of tobacco (Kelly & Smith, 2002; National Collaborating Centre for Aboriginal Health, 2013), which could affect social diffusion and/or changes in smoking among other household members. This is consistent with past evidence that social diffusion may vary across racial/ethnic minority groups (Daley et al. in press). In any case, we urge caution in generalizing our results to other Indigenous groups, in other countries. Even in the Canadian context, we do not observe First Nations youth who live on reserve (to our knowledge, there are few nationally representative surveys that include individuals who live on reserve; for example, they are represented in the First Nations Regional Health Survey, but it does not include other Canadian youth). In our study, this exclusion is appropriate from a methodological standpoint because many reserves have bylaws that permit smoking in public places. Moreover, First Nations Peoples who live on reserve may be exempt from cigarette taxes, and this is not reflected in our measure of real cigarette prices. Of course, from a policy standpoint, First Nations Peoples who live on reserve are an important subpopulation. They tend to have lower levels of health and well-being compared to those who live off reserve, including higher rates of smoking (Reading & Wien, 2009). We again remind readers that our analysis should be interpreted as a comparison of Indigenous and non-Indigenous youth, excluding First Nations youth who live on reserve. We suggest that they be considered in future work, data permitting.

Future work should also consider the applicability of these finding to other substances, such as electronic cigarettes/vaping and marijuana. The latter was legalized in Canada in October 2018. Moreover, future work should consider the mechanisms through which public bans reduce second-hand exposure in the homes of Métis youth (e.g., the relative contributions of social diffusion and reductions in smoking among other household members). The latter would require more detailed information about the living situation of youth and smoking behavior of their household members than is available in the CCHS.

As noted earlier, tobacco is a sacred plant for many Indigenous Peoples in Canada, and this may include pipes (Kelly & Smith, 2002; National Collaborating Centre for Aboriginal Health, 2013). While our smoking dependent variable is specific to cigarettes, which are considered misuse of tobacco (National Collaborating Centre for Aboriginal Health, 2013), second-hand exposure in homes may include cigarettes, cigars and pipes. In this case, we cannot distinguish between traditional uses of tobacco and misuse of commercial products.

Another limitation of this study is that we do not control for anti-smoking sentiment (we are unaware of such measures in Canada). It is possible that differences in anti-smoking sentiment across provinces/territories are correlated with our outcomes and implementation of public bans. Likewise, we do not observe access to tobacco or normalization of smoking. The latter may lead to differences in self-reported smoking and second-hand exposure between Indigenous and non-Indigenous youth, thus impacting the differential effect of public bans (although our results are generally robust to estimating the models separately for Indigenous and non-Indigenous youth). Despite these limitations, we extend the literature on public smoking bans by considering a vulnerable and previously unexamined sub-population (Indigenous Peoples, excluding First Nations Peoples who live on reserve), as well as previously unexamined outcomes among youth (self-assessed health and subjective well-being). While public bans generally have little effect on smoking among adults (Anger et al., 2011; Carpenter et al. 2011; Chaloupka & Warner, 2000; Jones et al., 2015), we find reductions in youth smoking and second-hand exposure in public places. Moreover, there are differences between Indigenous (especially Métis) and non-Indigenous youth in terms of the effect on second-hand exposure in homes, self-assessed health and life satisfaction.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

Data were accessed at the New Brunswick Research Data Center of Statistics Canada (https://www.statcan.gc.ca/eng/rdc/index).

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ENDNOTE

[1] Smoking is also restricted in most workplaces. This largely occurred prior to government intervention (Bitler et al., 2010; Carpenter 2009).

[2] Tauras et al. (2013) also find that girls and those of low socio-economic status are more responsive to changes in cigarette prices, as are Black/African American and Hispanic/Latinx youth. Similarly, Nonnemaker and Farrelly (2011) find that higher cigarette prices deter initiation, especially among Black/African American youth.

[3] We note, however, that our sample is not representative of the Indigenous population in Canada since we only observe the 10 largest communities in Nunavut. Moreover, regardless of province/territory, we do not observe First Nations youth who live on reserve.

[4] We also understate the effect of public bans to the extent that it takes time to implement them (i.e., if actual implementation occurred after the dates shown in Table 1). Similarly, people may have changed their behavior prior to implementation. For example, it is possible that some restaurants and bars became smoke-free in anticipation of the bans. Consistent with this possibility (and *announcement effects* more generally), Carpenter et al. (2011) find that a one-year policy lead had a negative and statistically significant effect on second-hand exposure in restaurants among Canadian adults.

[5] Even though we only observe the 10 largest communities in Nunavut, 70% of the territorial population is represented (Statistics Canada, 2011). Thus, the CCHS excludes roughly 9,165 Indigenous Peoples in Nunavut, which is equivalent to 0.5% of the Indigenous population in Canada (Statistics Canada, 2018). This is an approximate calculation based on Indigenous population counts and the percentage excluded in Nunavut. However, we recognize that youth outside of the 10 largest communities in Nunavut may differ from other Indigenous Peoples in our sample—in ways that affect smoking, second-hand exposure, self-assessed health and subjective well-being.

[6] We do not use data from 2000-2001 because five of seven dependent variables are not available; life satisfaction is not included in 2000–2001 and the four measures of second-hand exposure are defined differently compared to later cycles. However, we note that 2003 may serve as a pseudo pre-policy period in our difference-in-differences model since only 0.2% of the sample was covered by public bans at that time (as depicted in Figures 1a, 1b, 2a and 2b). We also note that, in studying the effect of public bans on Canadian adults, Carpenter et al. (2011) report that results are unchanged whether their sample starts in 2000–2001 or 2003. Similar to Carpenter et al. (2011), we extend our sample to 2000–2001 for smoking and self-assessed health—the only outcomes for which data are available during this period. Our key estimates are generally robust, as discussed in the results section.

[7] In Canada, information about Indigenous identity is not consistently or reliably recorded in population health data, and the misclassification of Indigenous Peoples may lead to an underestimation of health disparities (Smylie & Firestone, 2015).

[8] In the CCHS, non-smoking youth are asked: *In the past month, were you exposed to second-hand smoke, every day or almost every day, in public places such as bars, restaurants, shopping malls, arenas, bingo halls, bowling alleys? In the past month, were you exposed to second-hand smoke, every day or almost every day, in a car or other private vehicle? Including both household members and regular visitors, does anyone smoke inside your home, every day or almost every day?* The latter includes cigarettes, cigars and pipes.

[9] Since a large percentage of youth are at the top of the scale, it would be interesting to examine alternate measures of health. Unfortunately, such measures are not readily available in the CCHS. For example, the Health Utility Index was *optional content* in most cycles of data used in this study, and it was not available in 2011.

[10] In addition to differences in socio-economic status, Table 3 indicates that a larger share of the Indigenous sample is female, compared to the non-Indigenous sample. This is consistent with evidence that many First Nations reserves, which are excluded from our study, have a male-female ratio greater than 1.5 due to gender differences in migration between reserve and non-reserve communities (Akee & Feir, 2020).

[11] Other living arrangements include: being unattached; living with a partner; living with own children; living with a partner and own children.

[12] Available upon request, we estimate these models separately for smokers and non-smokers. We find that improvements in self-assessed health and life satisfaction among Indigenous youth are driven by non-smokers.

[13] To further examine the potential bias resulting from late adopters, we also examined a subset of the data (2003 and 2005), such that our regressions incorporated those who had yet to adopt public bans and those who had not adopted in 2003 but did so by 2005. Results are very similar to those presented in Appendix Tables A6 and A7, and are available upon request.

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APPENDIX

TABLE A1 Smoking and second-hand exposure - Full set of estimates for Indigenous and non-Indigenous youth

	Smoking	Exposure in public places	Exposure in vehicles	Exposure in homes	Number of people
Public ban	−0.020** (0.008)	−0.057** (0.023)	0.014 (0.017)	0.010 (0.020)	0.291** (0.132)
Public ban × Indigenous	−0.001 (0.018)	0.014 (0.039)	−0.033 (0.025)	−0.055** (0.023)	−0.303 (0.197)
Indigenous	0.055*** (0.019)	0.021 (0.037)	0.108*** (0.024)	0.147*** (0.023)	0.402*** (0.125)
Aged 12 to 13	−0.092*** (0.007)	−0.070*** (0.009)	−0.025*** (0.008)	−0.011 (0.014)	−0.102 (0.081)
Aged 16 to 17	0.055*** (0.004)	0.011 (0.011)	0.034*** (0.007)	−0.009 (0.008)	−0.022 (0.081)
Girl	0.001 (0.004)	0.030*** (0.005)	0.007 (0.008)	−0.005 (0.005)	0.150** (0.062)
Immigrant	−0.020* (0.011)	−0.017 (0.022)	−0.073*** (0.015)	−0.089*** (0.025)	−0.521*** (0.166)
Lone-parent family	0.034*** (0.004)	0.019** (0.009)	0.042*** (0.006)	0.060*** (0.007)	−0.386*** (0.104)
Other living arrangements	0.044*** (0.006)	0.011 (0.015)	0.060*** (0.015)	0.063*** (0.018)	0.314*** (0.112)
Less than high school family	0.020*** (0.008)	−0.019 (0.013)	0.034*** (0.013)	0.028* (0.015)	0.167* (0.087)
Post-secondary family	−0.027*** (0.005)	−0.005 (0.01)	−0.049*** (0.011)	−0.086*** (0.009)	−0.138** (0.068)
Log of real equivalent income	−0.003* (0.002)	0.005 (0.004)	−0.010** (0.004)	−0.022*** (0.004)	−0.039* (0.022)
Rural	0.011** (0.005)	−0.014* (0.008)	0.040*** (0.012)	0.035*** (0.011)	−0.001 (0.038)
Newfoundland and Labrador	0.039 (0.032)	0.033 (0.039)	0.131* (0.069)	−0.016 (0.035)	−1.027* (0.531)
Prince Edward Island	0.020 (0.033)	−0.075** (0.033)	0.090** (0.043)	0.021 (0.024)	−0.400 (0.343)
Nova Scotia	0.005 (0.017)	−0.008 (0.023)	0.052 (0.035)	0.012 (0.024)	−0.334 (0.265)
New Brunswick	0.009 (0.014)	−0.021 (0.033)	0.076*** (0.018)	0.060*** (0.020)	−0.427** (0.164)
Quebec	0.050*** (0.010)	0.002 (0.013)	0.057*** (0.018)	0.085*** (0.016)	0.0970 (0.136)
Manitoba	0.024 (0.033)	0.094* (0.048)	0.020 (0.037)	−0.029 (0.032)	−0.537 (0.395)
Saskatchewan	0.027 (0.028)	0.047 (0.039)	0.045 (0.035)	−0.002 (0.031)	−0.285 (0.321)
Alberta	0.021 (0.019)	0.061* (0.032)	0.054** (0.023)	0.002 (0.031)	−0.141 (0.179)
British Columbia	0.004 (0.019)	−0.011 (0.020)	−0.021 (0.020)	−0.071** (0.030)	−0.360 (0.255)
Yukon	0.032 (0.031)	−0.102*** (0.039)	0.032 (0.044)	−0.032 (0.036)	−0.313 (0.531)
Northwest Territories	0.061 (0.038)	−0.007 (0.052)	0.024 (0.058)	−0.058 (0.043)	−0.685 (0.522)
Nunavut	0.122*** (0.043)	0.020 (0.046)	−0.020 (0.062)	−0.090** (0.041)	−0.792 (0.590)
February	0.013 (0.013)	0.000 (0.016)	−0.013 (0.014)	−0.007 (0.013)	−0.306 (0.225)
March	0.002 (0.010)	−0.002 (0.012)	−0.035*** (0.013)	−0.019* (0.010)	−0.075 (0.163)
April	0.006 (0.009)	0.002 (0.009)	−0.019 (0.018)	0.001 (0.011)	−0.127 (0.201)
May	−0.001 (0.010)	0.002 (0.009)	−0.022* (0.012)	−0.017* (0.009)	−0.185 (0.241)
June	0.026** (0.012)	0.020 (0.016)	−0.007 (0.014)	0.003 (0.021)	−0.095 (0.154)
July	−0.001 (0.006)	0.007 (0.013)	−0.013 (0.018)	−0.032*** (0.011)	−0.415 (0.283)
August	0.003 (0.012)	−0.021 (0.015)	−0.028* (0.015)	−0.061*** (0.014)	−0.272 (0.260)
September	0.001 (0.007)	−0.015 (0.016)	−0.013 (0.010)	−0.005 (0.013)	−0.286 (0.214)
October	−0.001 (0.008)	−0.014 (0.015)	−0.042*** (0.016)	−0.025 (0.015)	−0.456* (0.242)
November	−0.015** (0.008)	0.004 (0.016)	−0.034*** (0.013)	−0.022 (0.014)	−0.320 (0.206)
December	0.016 (0.014)	−0.001 (0.019)	−0.011 (0.017)	−0.041*** (0.011)	−0.437 (0.310)

(Continues)

TABLE A1 (Continued)

	Smoking	Exposure in public places	Exposure in vehicles	Exposure in homes	Number of people
2005	−0.011 (0.007)	−0.018* (0.010)	−0.031*** (0.008)	−0.015** (0.007)	−0.079 (0.060)
2007	0.012 (0.014)	−0.001 (0.020)	−0.044* (0.025)	−0.046** (0.022)	−0.292** (0.127)
2008	−0.003 (0.014)	−0.037* (0.022)	−0.087*** (0.023)	−0.082*** (0.022)	−0.400** (0.179)
2009	0.003 (0.011)	−0.053** (0.026)	−0.084*** (0.025)	−0.066*** (0.025)	−0.275 (0.187)
2010	−0.014 (0.013)	−0.049* (0.027)	−0.108*** (0.025)	−0.081*** (0.025)	−0.201 (0.232)
2011	−0.012 (0.009)	−0.016 (0.020)	−0.111*** (0.021)	−0.101*** (0.024)	−0.382*** (0.143)
2012	−0.018 (0.012)	0.001 (0.025)	−0.133*** (0.023)	−0.124*** (0.025)	−0.125 (0.168)
Unemployment rates	0.012 (0.014)	0.071*** (0.014)	0.000 (0.015)	−0.014 (0.014)	0.018 (0.135)
Unemployment rates quadratic	−0.001 (0.001)	−0.003*** (0.001)	0.000 (0.001)	0.001 (0.001)	0.002 (0.007)
Real cigarette prices	0.000 (0.001)	−0.002 (0.001)	−0.001 (0.002)	0.001 (0.001)	0.019 (0.019)
Observations	32,055	29,586	29,586	29,586	5,896

Notes: We report average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from a zero-truncated negative binomial regression of number of people who smoke in homes, conditional on the presence of smokers in the household. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A2 Self-assessed health and life satisfaction - Full set of estimates for Indigenous and non-Indigenous youth

	Self-assessed health	Life satisfaction
Public ban	0.048 (0.031)	−0.062** (0.029)
Public ban × Indigenous	0.088** (0.040)	0.149*** (0.055)
Indigenous	−0.154*** (0.039)	−0.143*** (0.031)
Aged 12 to 13	−0.009 (0.010)	0.054*** (0.009)
Aged 16 to 17	−0.017* (0.009)	−0.054*** (0.014)
Girl	−0.013*** (0.005)	−0.015 (0.010)
Immigrant	0.028** (0.013)	−0.028 (0.027)
Lone-parent family	−0.033** (0.013)	−0.063*** (0.016)
Other living arrangements	−0.035** (0.016)	−0.054*** (0.020)
Less than high school family	−0.018 (0.024)	−0.027 (0.029)
Post-secondary family	0.049*** (0.017)	0.047*** (0.012)
Log of real equivalent income	0.024*** (0.006)	0.018*** (0.007)
Rural	−0.006 (0.008)	0.016 (0.013)
Newfoundland and Labrador	−0.018 (0.072)	−0.163 (0.123)
Prince Edward Island	−0.015 (0.043)	0.000 (0.071)
Nova Scotia	0.021 (0.035)	−0.028 (0.048)
New Brunswick	−0.032 (0.028)	0.042 (0.028)
Quebec	−0.026 (0.016)	0.016 (0.028)
Manitoba	−0.055 (0.047)	−0.055 (0.077)
Saskatchewan	−0.057 (0.048)	−0.006 (0.074)
Alberta	−0.036 (0.027)	−0.018 (0.042)

TABLE A2 (Continued)

	Self-assessed health	Life satisfaction
British Columbia	−0.003 (0.034)	−0.031 (0.052)
Yukon	0.044 (0.053)	0.037 (0.130)
Northwest Territories	−0.047 (0.083)	−0.103 (0.147)
Nunavut	−0.048 (0.092)	0.005 (0.149)
February	0.002 (0.021)	0.006 (0.029)
March	0.008 (0.020)	0.028 (0.021)
April	0.022 (0.020)	0.058** (0.027)
May	0.017 (0.017)	−0.002 (0.022)
June	0.036* (0.019)	0.037 (0.033)
July	0.020 (0.020)	0.031 (0.021)
August	0.046* (0.024)	0.054** (0.022)
September	0.032* (0.018)	0.033** (0.016)
October	0.023 (0.026)	0.020 (0.033)
November	0.023 (0.020)	−0.007 (0.029)
December	0.045* (0.024)	0.036 (0.028)
2005	−0.004 (0.013)	0.031** (0.014)
2007	−0.031 (0.038)	0.104*** (0.027)
2008	−0.036 (0.036)	0.104*** (0.031)
2009	−0.030 (0.035)	–
2010	−0.016 (0.030)	–
2011	−0.039 (0.032)	–
2012	−0.013 (0.031)	–
Unemployment rates	−0.025 (0.024)	−0.052*** (0.017)
Unemployment rates quadratic	0.001 (0.001)	0.003*** (0.001)
Real cigarette prices	0.000 (0.002)	0.001 (0.004)
Observations	31,671	18,399

Notes: We report average marginal effects from probit regressions of self-assessed health and life satisfaction. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A3 Self-assessed health and life satisfaction (five-point scales) - Key estimates for Indigenous and non-Indigenous youth

Self-assessed health (31,671 obs.)	**Poor**	**Fair**	**Good**	**Very good**	**Excellent**
Public ban	0.000 (0.001)	−0.004 (0.006)	−0.016 (0.022)	0.002 (0.002)	0.019 (0.027)
Public ban × Indigenous	−0.001 (0.001)	−0.010 (0.007)	−0.038 (0.024)	0.004* (0.003)	0.045 (0.029)
Indigenous	0.003*** (0.001)	0.026*** (0.006)	0.094*** (0.022)	−0.010*** (0.002)	−0.111*** (0.028)
Life satisfaction (18,399 obs.)	**Very dissatisfied**	**Dissatisfied**	**Neither**	**Satisfied**	**Very satisfied**
Public ban	0.000 (0.000)	0.002** (0.001)	0.009* (0.005)	0.035* (0.020)	−0.047* (0.027)
Public ban × Indigenous	−0.001** (0.001)	−0.007*** (0.003)	−0.027*** (0.010)	−0.102*** (0.036)	0.137*** (0.049)
Indigenous	0.001** (0.000)	0.006*** (0.002)	0.025*** (0.006)	0.092*** (0.019)	−0.124*** (0.027)

Notes: We report average marginal effects from ordered probit regressions of self-assessed health life satisfaction. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A4 Smoking and second-hand exposure - Key estimates for Indigenous and non-Indigenous youth - Ordinary least squares and group-specific models

Probit and zero-truncated negative binomial regressions (Table 4)	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.020** (0.008)	−0.057** (0.023)	0.014 (0.017)	0.010 (0.020)	0.291** (0.132)
Public ban × Indigenous	−0.001 (0.018)	0.014 (0.039)	−0.033 (0.025)	−0.055** (0.023)	−0.303 (0.197)
Indigenous	0.055*** (0.019)	0.021 (0.037)	0.108*** (0.024)	0.147*** (0.023)	0.402*** (0.125)
Ordinary least squares regressions	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.019** (0.009)	−0.058** (0.023)	0.014 (0.019)	0.012 (0.020)	0.158** (0.068)
Public ban × Indigenous	−0.015 (0.034)	0.021 (0.040)	−0.075* (0.038)	−0.112*** (0.037)	−0.217 (0.138)
Indigenous	0.084** (0.035)	0.015 (0.038)	0.158*** (0.035)	0.218*** (0.037)	0.268** (0.108)
Probit and zero-truncated negative binomial regressions (Indigenous youth)	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.039 (0.067)	0.055 (0.060)	−0.107 (0.084)	−0.157** (0.072)	0.012 (0.262)
Probit and zero-truncated negative binomial regressions (non-Indigenous youth)	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.020** (0.010)	−0.066*** (0.025)	0.020 (0.017)	0.021 (0.019)	0.420*** (0.140)

Notes: In panel 1, we repeat key estimates from Table 4. In panel 2, we estimate these models using ordinary least squares regressions. In panels 3 and 4, we estimate these models separately for Indigenous and non-Indigenous youth. In panels 1, 3 and 4, we report average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from zero-truncated negative binomial regressions of number of people who smoke in homes, conditional on the presence of smokers in the household. In panel 2, we report coefficients from ordinary least squares regressions. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A5 Self-assessed health and life satisfaction - Key estimates for Indigenous and non-Indigenous youth - Ordinary least squares and group-specific models

Probit regressions (Table 6)	**Self-assessed health**	**Life satisfaction**
Public ban	0.048 (0.031)	−0.062** (0.029)
Public ban × Indigenous	0.088** (0.040)	0.149*** (0.055)
Indigenous	−0.154*** (0.039)	−0.143*** (0.031)
Ordinary least squares regressions	**Self-assessed health**	**Life satisfaction**
Public ban	0.049 (0.031)	−0.062** (0.029)
Public ban × Indigenous	0.103** (0.046)	0.143*** (0.053)
Indigenous	−0.172*** (0.044)	−0.136*** (0.028)
Probit regressions (Indigenous youth)	**Self-assessed health**	**Life satisfaction**
Public ban	0.176* (0.097)	0.234*** (0.079)
Probit regressions (Non-Indigenous youth)	**Self-assessed health**	**Life satisfaction**
Public ban	0.047 (0.034)	−0.079*** (0.029)

Notes: In panel 1, we repeat key estimates from Table 6. In panel 2, we estimate these models using ordinary least squares regressions. In panels 3 and 4, we estimate these models separately for Indigenous and non-Indigenous youth. In panels 1, 3 and 4, we report average marginal effects from probit regressions of self-assessed health and life satisfaction. In panel 2, we report coefficients from ordinary least squares regressions. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A6 Smoking and second-hand exposure - Key estimates for Indigenous and non-Indigenous youth - Study period from 2003 to 2008, and from 2000-2001 to 2012

Probit and zero-truncated negative binomial regressions 2003 to 2012 (Table 4)	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.020** (0.008)	−0.057** (0.023)	0.014 (0.017)	0.010 (0.020)	0.291** (0.132)
Public ban × Indigenous	−0.001 (0.018)	0.014 (0.039)	−0.033 (0.025)	−0.055** (0.023)	−0.303 (0.197)
Indigenous	0.055*** (0.019)	0.021 (0.037)	0.108*** (0.024)	0.147*** (0.023)	0.402*** (0.125)
Probit and zero-truncated negative binomial regressions 2003 to 2008	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.014 (0.011)	−0.066*** (0.018)	0.008 (0.024)	0.012 (0.019)	0.221* (0.114)
Public ban × Indigenous	−0.002 (0.022)	−0.022 (0.048)	−0.059 (0.039)	−0.096** (0.041)	−0.265 (0.182)
Indigenous	0.062*** (0.019)	0.030 (0.036)	0.131*** (0.027)	0.169*** (0.022)	0.398*** (0.125)
Probit regression 2000–2001 to 2012	**Smoking**	**Exposure in public places**	**Exposure in vehicles**	**Exposure in homes**	**Number of people**
Public ban	−0.014 (0.011)	–	–	–	–
Public ban × Indigenous	−0.015 (0.016)	–	–	–	–
Indigenous	0.074*** (0.013)	–	–	–	–

Notes: In panel 1, we repeat key estimates from Table 4 (2003 to 2012). In panel 2, we limit the study period (2003 to 2008). In panel 3, our study period ranges from 2000-2001 to 2012 for smoking; this is not possible for second-hand exposure, which is defined differently in 2000–2001. We report average marginal effects from probit regressions of smoking and second-hand exposure, as well as coefficients from a zero-truncated negative binomial regression of number of people who smoke in homes, conditional on the presence of smokers in the household. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE A7 Self-assessed health and life satisfaction - Key estimates for Indigenous and non-Indigenous youth - Study period from 2003 to 2008, and from 2000–2001 to 2012

Probit regressions 2003 to 2012 (Table 6)	**Self-assessed health**	**Life satisfaction**
Public ban	0.048 (0.031)	−0.062** (0.029)
Public ban × Indigenous	0.088** (0.040)	0.149*** (0.055)
Indigenous	−0.154*** (0.039)	−0.143*** (0.031)
Probit regressions 2003 to 2008	**Self-assessed health**	**Life satisfaction**
Public ban	0.039 (0.027)	−0.062** (0.029)
Public ban × Indigenous	0.075 (0.051)	0.149*** (0.055)
Indigenous	−0.153*** (0.040)	−0.143*** (0.031)
Probit regression 2000–2001 to 2012	**Self-assessed health**	**Life satisfaction**
Public ban	0.037 (0.027)	–
Public ban × Indigenous	0.058* (0.033)	–
Indigenous	−0.123*** (0.03)	–

Notes: In panel 1, we repeat key estimates from Table 6 (2003 to 2012). In panel 2, we limit the study period (2003 to 2008). Note that we always use data from 2003 to 2008 when considering life satisfaction because this measure changes in later cycles. In panel 3, our study period ranges from 2000–2001 to 2012 for self-assessed health; this is not possible for life satisfaction because it is not included in 2000–2001. We report average marginal effects from probit regressions of self-assessed health and life satisfaction. We include a full set of covariates in each regression. Robust standard errors are reported in parentheses.

Source: Authors' calculations.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.