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An Empirical Evaluation of the Effect of Covid-19 Travel Restrictions on Canadians' Cross Border Travel and Canadian Retailers

Jen Baggs
University of Victoria

Loretta Fung
National Tsing Hua University

Beverly Lapham

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

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An Empirical Examination of the Effect of Covid-19 Travel Restrictions on Canadians' Cross Border Travel and Canadian Retailers*

Jen Baggs† Loretta Fung‡ Beverly Lapham§

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Abstract

This paper estimates the impact on Canadian retailers' revenues of significantly decreased international travel by Canadians in response to the Covid-19 related travel restrictions imposed on the US-Canada border. We use detailed data from 1991 to 2020 on Canadians' travel to the United States to estimate the monthly fraction of a community's residents who cross the border for 237 communities within 150 kilometres of the border. We estimate the model of cross-border travel from Baggs, Fung and Lapham (2018) and use those estimates to establish community-level counterfactual crossing rates had the pandemic not occurred. We then combine those rates with actual crossing rates to estimate the revenue *losses* that small Canadian retailers' *avoided* due to the near cessation of cross-border travel by Canadians as a result of the pandemic. Our results suggest that, on average, the border closure prevented a 1.7% decrease in revenues for a small Canadian retailer located within 150 kilometers of the border. However, we document considerable variation in the magnitude of this decrease across communities and retail sectors, with estimates ranging from approximately 0% to 234%. Specifically, retailers that are located in less affluent communities near sizeable US shopping opportunities and that are in sub-sectors that cater to travelers experienced the largest foregone revenue losses due to border closures in 2020.

JEL: F1

Keywords: Covid-19; cross border shopping; international price differences

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†Gustavson School of Business, University of Victoria. E-mail: jenbaggs@uvic.ca.

‡Department of Economics, National Tsing Hua University. E-mail: phfung@mx.nthu.edu.tw

§Department of Economics, Queen's University. E-mail: laphamb@queensu.ca.

1 Introduction

The Covid-19 global pandemic has created unprecedented economic conditions in Canada. Many of these economic implications arose as a result of public policies which encouraged or enforced mobility restrictions as a means for reducing virus transmission. In this paper, we analyze the impact on the revenue of Canadian retailers of one of these policies, the closure of the Canada-US border to non-essential travel by Canadians.

When Canadians travel across the US-Canada border to make purchases from US retailers, Canadian retailers forego those sales. Thus, if Canadians are prohibited from crossing the US-Canada border, such a policy results in a decline in the revenue losses experienced by Canadian retailers due to cross-border shopping by Canadians. Using geographically disaggregated data, we estimate the magnitude of such foregone revenue losses for small retailers due to the Covid-19 border closures for Canadian communities within 150 kilometers of the border. Although we focus on Covid-19 border restrictions, our analysis contributes to an understanding of the effects on Canadian retailers of policies which limit Canadians' cross-border expenditures more generally, such as personal exemptions and the de minimis threshold.

It is well-known that Canadian retailers experienced catastrophic aggregate revenue declines in the second quarter of 2020 that were primarily a result of a combination of government mandated or voluntary business closures and a collapse in demand as consumers avoided public spaces. As Figure 1 shows, some retailers, such as grocery stores, experienced an increase in sales but the retail sector as a whole suffered considerably at the beginning of the pandemic in Canada. In particular, relative to the same months in 2019, in 2020, retail sales in Canada were 9.6% lower in March, 45% lower in April, and 19% lower in May. However, the figure also demonstrates that sales in aggregate retail and in many retail sub-sectors rebounded in the later half of 2020.[1]

As described above, one potential buffer acting on Canadian retailers' revenues is that Canadians have diverted a smaller portion of their spending to American retailers than they did pre-pandemic. Avoiding this loss of revenue from Canadians' cross-border shopping activities may be a small bright spot in the Canadian retail landscape. This follows from the findings of Baggs, Fung and Lapham (2018) who show that the disruption in border crossings resulting from the events of September 11, 2001 significantly mitigated the revenue losses that small Canadian retailers could have experienced during the appreciation of the Canadian dollar from 2002 to 2007, particularly those located close to the border. Clearly, policies associated with the

[1] Our data ends in November 2020 just as a second wave of Covid-19 cases was building across much of Canada. The policy measures which accompanied the second wave, such as the closure of non-essential retailers in several provinces, suggest another increase in turmoil across the Canadian retail landscape extending well into 2021.

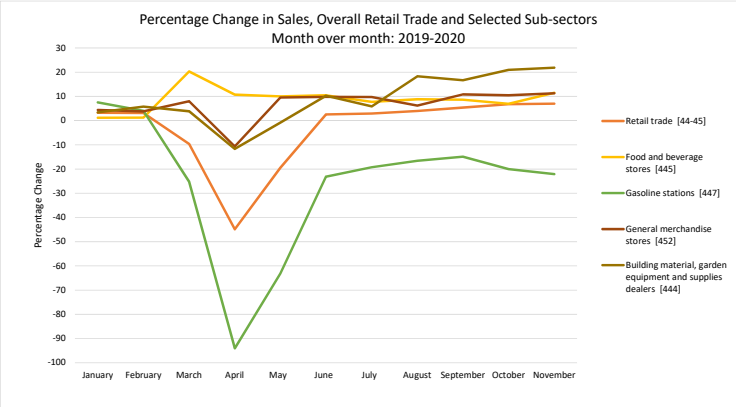

Figure 1: Retail Sales Growth Rates

Covid-19 pandemic have created a much larger decline in border crossings, with non-essential travel at land crossing between Canada and the US *prohibited* beginning March 21, 2020.

To illustrate the magnitude of the impact of these policies on travel, Figure 2 depicts the monthly number of Canadians who travelled to the United States by automobile from January 2015 to November 2020. In addition, Table 1 presents the number of such Canadian same day and overnight travelers in 2020 relative to the average over 2015-2019 for the same month. The number of travelers in January and February are close to their respective averages but trips are significantly lower for all subsequent months. The most severe declines in cross border travel to date occurred in April and May where the number of same-day travelers fell to about 6% of the previous average for those months. Overnight travelers decreased even further to around 2% of the monthly average. Cross border travel recovered slightly after those months but for the most recent data we have, November 2020, same-day travel by Canadians was still only approximately 10 % of the monthly average and overnight travel was about 4% of the monthly average.

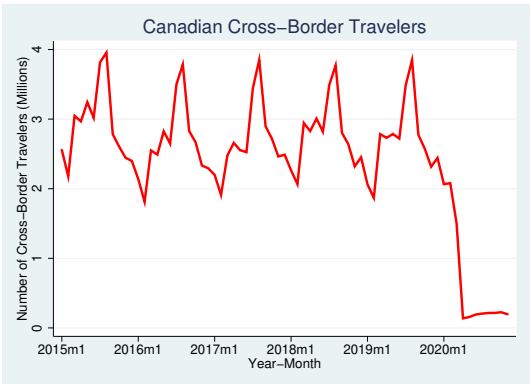

Figure 2: Number of Canadian Cross-Border Travelers by Automobile

Table 1: Number of Canadian Cross-Border Travelers Relative to Five-year Monthly Average

Month	Sameday	Overnight
January 2020	0.907	0.953
February 2020	1.050	1.075
March 2020	0.447	0.722
April 2020	0.058	0.035
May 2020	0.069	0.023
June 2020	0.087	0.031
July 2020	0.082	0.021
August 2020	0.083	0.020
September 2020	0.103	0.027
October 2020	0.108	0.035
November 2020	0.101	0.039

Notes: (1) Source: Statistics Canada Table 24100041. (2) The five-year monthly average is calculated over the same month from 2015 to 2019.

We begin our quantitative analysis by using regression analysis on monthly data for aggregate crossings from January 1991 to November 2020. This allows us to demonstrate the quantitative importance of various factors which may affect border crossings by Canadian residents. In particular, it provides a broad picture of the relationship between border policies and Canadians' cross-border travel over the last thirty years. It also provides some perspective on the relative magnitude of the Covid-19 border disruptions.

Next, we estimate a model of cross border travel using pre-pandemic community level crossing data from January 1991 to September 2019, and use the resulting estimated parameters to generate counterfactual fractions of community residents who would have crossed border had the pandemic not occurred. We then combine these with estimated elasticities of a firm's real revenue with respect to their community's staying rate, as calculated in Baggs, Fung and Lapham (2018), to estimate the impact on retailers' real revenues of the Covid-19 cross-border travel restrictions imposed on Canadians.

Our results suggest that, on average, the border closure policy prevented a 1.74% annual revenue loss in 2020 for small retailers located within 150 kilometres of the border. Not surprisingly, there is considerable variation in these foregone losses by both geography and by retail sectors. Foregone revenue loss percentages range from 0% to 94% across communities for overall small retailers where those differences arise from variation in the proximity of a community to the border, its income, and the availability of US shopping across the border from the community. In particular, less affluent communities which have nearby US shopping opportunities have avoided larger revenue losses due to Canadians' cross-border purchases than other communities according to our estimates. The variation across retail sectors arises from differences across sub-industries in the responsiveness of retailers' revenues to fluctuations in the rates at

which Canadians engage in cross-border travel. Here, the average estimated percentage foregone revenue losses calculated across communities varies between 1.1% and 4.3%.

These latter figures are relatively modest and may appear to be surprisingly low given the severity of current border disruptions and the earlier results of Baggs, Fung, and Lapham (2018). However, the modest effects are partially explained by the fact that the Canadian dollar was weaker when the pandemic began in Canada than during the years following the less severe border disruptions beginning in 2001. Hence, even in the absence of travel restrictions, we would not have expected Canadians' cross-border shopping during 2020 to be very high relative to historical levels. With that said, for retailers operating in communities and sectors which are most exposed to fluctuations in demand due to cross-border travel, the foregone revenue losses in 2020 were likely quite significant.

Beyond their relevance for the effects of pandemic policies on the Canadian economy, these results inform broader policy perspectives around domestic retail protection from cross-border shopping. Policies regarding the de minimis threshold for e-commerce imports and personal duty exemptions for travelers returning to Canada from abroad are predicated on limiting cross-border shopping by Canadians in order to protect domestic retailers. The Covid-19 border policies prohibiting non-essential cross-border travel have effectively also prohibited in person cross-border shopping, creating an unexpected natural experiment from which to evaluate the revenue losses Canadian retailers might otherwise have experienced. Quantifying the revenue losses associated with cross-border shopping will inform future policy decisions which restrict or facilitate the ability of Canadians to purchase goods and services from foreign retailers.

In addition to policy relevance, findings from the current paper contribute to the emerging field of pandemic economics, and the established literatures on retailers, border policy effects, and international mobility. Regarding pandemic economics, this paper relates to Keogh-Brown et. al. (2010) which predicts declines of roughly 6% of retail GDP in the UK, France, Belgium and the Netherlands in response to a theoretical "severe"pandemic. Boyd et. al. (2018) examined the economic implications of border closures during a theoretical pandemic in New Zealand and found these closures had both economic costs and benefits. This paper also contributes to the new and growing Covid-19 specific literature, for example, Sharma et. al. (2020) who document and discuss the effects of Covid-19 related uncertainty on multinational retailers.

This paper also builds on previous research on cross-border shopping and cross-border travel. Timothy and Butler (1995), Di Matteo and Di Matteo (1996), Ferris (2000) and Chandra, Head and Tappata (2014) provide evidence that many consumers cross the border to take advantage of international price differences, and their findings suggest that cross-border trips from Canada

to the United States are sensitive to the value of the Canadian dollar. We also contribute to a literature focused on the impact of cross border shopping on retailers. Campbell and Lapham (2004), Asplund, Friberg and Wilander (2007), Baggs, Beaulieu, Fung and Lapham (2016), and Baggs, Fung, and Lapham (2018) find that changes in international relative prices affect retailer performance with effects that diminish with distance of the retailer from the border.

This paper is organized as follows. Section 2 describes the data used in the empirical analysis. Section 3 summarizes findings from a preliminary empirical analysis of aggregate cross border travel patterns. Section 4 presents the results of our counterfactual community-level border crossings analysis and provides estimates of the impact of current travel restrictions on Canadian retailers' revenues. Section 5 considers some policy implications of our research while Section 6 discusses the robustness of our results. Section 7 concludes.

2 Data

For the majority of our empirical analysis, we begin with data at the Canadian census division level (CD hereafter). We then disaggregate CDs into our primary unit of analysis, a *community*. If a CD contains a single border post, then the CD itself is a community. If a CD contains multiple border posts, then it is divided into multiple communities where a community is an area within the CD such that firms within that area share the same closest land border post. Baggs, Fung, and Lapham (2018) provides further details regarding the use of firm-level data to facilitate the division of CDs into communities.[2] In total, there are 108 border posts, 280 CDs, and 490 communities in our data set. We use monthly data from January 1991 to November 2020.[3]

2.1 Distance Measures

A community's border post distance is measured by the median driving distance across firms in a community to the closest border post. Median driving distances are calculated using data from Statistics Canada's T2-LEAP database as used in Baggs, Fung and Lapham (2018). Because travelers' cross-border travel decisions are affected by the travel distance from their community to their border post *and* from their border post to the closest shopping destination in the United States, we also include a measure of distance from border posts to US shopping

[2]Statistics involving firm-level data from Statistics Canada have been subject to vetting and passed the Disclosure Rules and Regulations set forth by Statistics Canada.

[3]After combining border posts closed during the sample period with nearby border posts, there are 108 border posts. These posts are used in the regression analysis in Section 3. Due to confidentiality issues with firm-level data, we further combine small border posts, leaving us with 64 border posts for the analysis in Section 4.

destinations. A community's shopping distance is the driving distance from the relevant border post to the closest US shopping city or shopping outlet.[4] The overall distance measure for a community that we use, effective distance, is the sum of a community's border post distance and its shopping distance.

2.2 Travelers' Data

Analyzing border crossing patterns at the community level requires detailed travelers' data. We use data from Statistics Canada on the number of Canadian residents who cross and return through each border post by automobile, separated into three categories according to length of their stay in the US. As in Chandra, Head, and Tappata (2014) and Baggs, Fung, and Lapham (2018), we also use International Travel Survey (ITS) data from Statistics Canada. This database has information from a sub-sample of Canadian travelers including their CD of residence and the length of their stay in the US. We consider three categories of trip lengths; same day, overnight, and combined. On a same day trip, a traveler crosses the border and returns within a twenty-four hour period while overnight trips include all trips that last longer than a same day trip. Combined trips includes all trips of any length of stay. Over our sample, on average, 72% trips by Canadian residents are same day trips.

Following the methodology used in Baggs, Fung, and Lapham (2018), for each category of trip length, we combine the two travelers' data sets described above to estimate the monthly number of Canadian travelers emanating from each community. The estimation method accounts for the fact that some CDs have multiple border posts and that some border posts serve multiple CDs. We first use firm shares to apportion surveyed travelers from each CD to communities within the CD. We then estimate the fraction of travelers through a border post that should be allocated to each community. Finally, this fraction is used to portion actual total travelers through each border post to each relevant community, giving us estimates of the number of cross-border trips by community. Finally, we calculate community-level crossing fractions by dividing the estimated community-level number of cross-border trips by the number potential trips (30 days multiplied by the community population). A detailed explanation of the estimation method is contained in the appendix.

2.3 Demographic Data and Nominal Exchange Rates

We have annual estimates of Canadian population by CD from Statistics Canada and annual population estimates for our US destination shopping cities from the US Census Bureau. We use

[4] A shopping city is defined as a city with population greater than ten thousand.

these population measures to estimate monthly population series by applying the linear trend between the unit's (Canadian CD or US city) annual data points. Monthly Canadian community level population series are estimated by multiplying monthly CD population estimates by the share of firms in a community.

We also have median income for each Canadian CD from Statistics Canada for census years 1991, 1996, 2001, 2006, 2011 and 2016. We use these to estimate monthly median income by CD by applying the linear trend between the unit's census year observations.[5]

We use monthly averages of the bilateral nominal exchange rate between Canada and the United States from the Pacific exchange rate service. We include this variable in our detailed analysis of travel patterns as previous studies have clearly demonstrated that cross-border travel is correlated with bilateral nominal exchange rates. In particular, appreciations of the Canadian dollar tend to be positively correlated with cross-border trips by Canadians, particularly same day trips.[6]

2.4 Summary Statistics

As cross-border trips are highly sensitive to distance, following Baggs, Fung and Lapham (2018), our detailed data analysis in Section 4 restricts attention to the subsample of 237 communities which are located within 150 kilometres of the southern Canadian border with the US. Furthermore, as explained in that section, we undertake estimation using data from January 1991 to September 2019 so as to capture pre-pandemic travel patterns.

Table 2 reports summary statistics for key variables for the 237 communities over the 345 months between January 1991 and September 2019. We note that our measures of crossing fractions appear to be low because as described above, they reflect the ratio of actual crossings to a relatively high number of *potential* crossings.

3 Preliminary Analysis of Cross-Border Trips

Before presenting our detailed empirical analysis of the impact of Covid-19 related travel restrictions on Canadians' cross-border travel and retailer revenues, we present some exploratory estimates related to cross-border travel. We briefly examine empirical regularities in monthly border crossings by Canadian residents for the two categories of trip lengths, same day and overnight, using monthly data from January 1991 through November 2020. This analysis pro-

[5]For the months in 2020 for population data, we apply the linear trends from 2018 to 2019. For median income, for months in the years beyond 2016, we apply the linear trend from 2011 to 2016.

[6]See, for example, Baggs, Fung, and Lapham (2018), Chandra, Head and Tappata (2014) and Di Matteo and Di Matteo (1996).

Table 2: Summary Statistics

Variable	Observations	Mean	Standard Deviation
Same day Crossing Fraction	81,765	0.015	0.052
Overnight Crossing Fraction	81,765	0.003	0.013
Combined Crossing Fraction	81,765	0.018	0.061
Border Post Distance (km)	81,765	72.700	43.238
Shopping Distance (km)	81,765	93.764	77.016
Effective Distance (km)	81,765	166.465	86.899
Population (persons)	81,765	171,822.400	381,216.100
US City Population (persons)	81,765	182,896.100	374,054.200
Median Income (dollars)	81,765	24,615.910	6,444.672
Nominal Exchange Rate (USD/CAD)	81,765	0.805	0.113

Notes: Summary statistics are based on monthly data for the subsample of 237 communities within 150km from the border from January 1991 to September 2019.

vides a broad picture of the impact on travel of changes in border policies that have occurred over the last thirty years. It also provides some perspective of the relative magnitude of the Covid-19 border disruptions.

The regression specification in this section is motivated by previous papers such as Baggs, Beaulieu, Fung, and Lapham (2016), Baggs, Fung, and Lapham (2018), Chandra, Head, and Tappata (2014), Di Matteo and Di Matteo (1996) and Ferris (2000 and 2010). We include bilateral nominal exchange rates and indicator variables to reflect three important changes in border policies that occurred during the period we analyze. The first was tighter border controls following the terrorist attacks in September 2001; the second change was the introduction of a passport requirement for crossers in June 2009; and the most recent change in border policies are the travel restrictions imposed in response to the outbreak of Covid-19.

We estimate the following equation by OLS:

$$\begin{aligned} \ln N_{bt} = \rho_0 + (\rho_1 + \rho_2 911_t + \rho_3 Pass_t) \ln S_t + \rho_4 911_t + \rho_5 Pass_t + \rho_6 Covid_t \\ + \theta_b + \theta_m + \theta_y + \theta_{py} + \theta_{sy} + \epsilon_{bt}, \end{aligned} \tag{1}$$

where b denotes border post and t denotes time (year-month). The dependent variable, N_{bt}, is the number of Canadian residents who travel across the border and return to Canada through border post b at time t. The regressors include the nominal exchange rate expressed as the number of US dollars per Canadian dollar, S_t; an indicator variable which equals 1 after September 2001 (inclusive), 911_t; an indicator variable which equals 1 after June 2009 (inclusive), $Pass_t$; and an indicator variable which equals 1 after March 2020 (inclusive), $Covid_t$. Based on earlier findings in Baggs, Fung, and Lapham (2018), we also interact the first two border policy indica-

tors with the nominal exchange rate. We include border post, month, year, province-year, and state-year fixed effects denoted by θ_b, θ_m, θ_y, θ_{py}, and θ_{sy} respectively. The province-year and state-year fixed effects are included to account for changes in local economic conditions. The error term is denoted ϵ_{bt}.

The results of estimating equation (1) using 108 border posts are reported in Table 3. Columns 1 and 2 summarize results for same day trips while Columns 3 to 4 present results for overnight trips. Consistent with previous studies, we find that an appreciation of the Canadian dollar is associated with a rise in Canadian residents' cross-border trips of all lengths. The results in Columns 2 and 4 suggest that the border disruptions following the terrorist attacks in September 2001 and passport requirement significantly weaken this relationship for some period of time.

Not surprisingly, the three restrictive border policy changes that we consider are directly associated with a decrease in the number of Canadian travelers, with the severe Covid-19 related travel restrictions having, by far, the largest negative effects. Using the estimated coefficients, we see that Covid-19 border restrictions are associated with a fall in both same day and overnight trips from Canada to the US of more than 94 percent.[7]

Table 3: OLS Regressions of Number of Cross Border Trips by Border Post

Variable	Same Day Trips	Same Day Trips	Overnight Trips	Overnight Trips
	(1)	(2)	(3)	(4)
ρ_0: Constant	6.490***	6.667***	1.803***	1.994***
	(0.090)	(0.090)	(0.118)	(0.121)
ρ_1: ln(Nominal Exchange Rate) (S_t)	0.814***	2.152***	0.649***	2.079***
	(0.082)	(0.143)	(0.089)	(0.225)
ρ_2: ln(Nominal Exchange Rate) ×		-1.362***		-1.234***
Post 9/11 Indicator ($S_t \times 911_t$)		(0.196)		(0.262)
ρ_3: ln(Nominal Exchange Rate) ×		-0.712***		-1.571***
Passport Requirement Indicator ($S_t \times Pass_t$)		(0.212)		(0.210)
ρ_4: Post 9/11 Indicator (911_t)	-0.190***	-0.780***	-0.089*	-0.615***
	(0.072)	(0.139)	(0.053)	(0.152)
ρ_5: Passport Requirement Indicator ($Pass_t$)	-0.077***	-0.136***	-0.078**	-0.230***
	(0.027)	(0.028)	(0.035)	(0.042)
ρ_6: Covid-19 Indicator ($Covid_t$)	-2.872***	-2.897***	-3.255***	-3.295***
	(0.105)	(0.106)	(0.117)	(0.119)
Year FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Border Post FE	YES	YES	YES	YES
Province-Year FE	YES	YES	YES	YES
State-Year FE	YES	YES	YES	YES
Adjusted R-Squared	0.933	0.933	0.919	0.919
Observations	38772	38772	38772	38772

Notes: (1) The data is based on 108 border posts and is monthly from January 1991 to November 2020. (2) Robust standard errors, adjusted for clustering at the border post level, are in the parentheses. (3) Significance indicated by *** at the 1% level; ** at the 5% level; * at the 10% level.

[7] Calculated as $(\exp(\hat{\rho}_6)) - 1) \times 100\%$.

4 Counterfactual Analysis of Cross-Border Trips and Retailer Revenues

Quantifying the impact of Covid-19 on Canadians' cross-border travel requires a comparison between estimated counterfactual crossing rates had the Covid-19 outbreak not occurred in North America and actual crossing rates. To measure counterfactual crossing rates, we estimate a crossing rate equation using monthly pre-pandemic data which reflects crossing rate patterns during "normal times." We define the pre-pandemic period as January 1991 to September 2019 as Asian countries may have started to be affected by Covid-19 in the fourth quarter of 2019.

4.1 Crossing Fraction Regressions

A detailed analysis of Canadian residents' cross-border travel for use in our counterfactual predictions involves estimating the theoretical model of travel for geographically disaggregated units developed in Chandra, Head, and Tappata (2014) and Baggs, Fung and Lapham (2018). Following the latter paper, we specify the following fractional probit model for estimation of crossing rates by Canadian communities:

$$x_{ct} = \Phi(\beta_0 + (\beta_1 + \beta_2 911_t + \beta_3 Pass_t)\ln S_t + \beta_4 \ln I_{ct} + \beta_5 \ln Rpop_{ct} + \beta_5 \ln D_c + \beta_7 911_t + \beta_8 Pass_t + \phi_p + \phi_m + \phi_y), \quad (2)$$

where c denotes community and t denotes the time period.[8] The dependent variable, x_{ct}, is the estimated fraction of Canadian residents' potential trips from community c to the US with a return to Canada at time t (see the appendix). The additional regressors relative to equation (1) include median income in the census division where the community resides, I_{ct}; the ratio of community population to the population of the nearest US shopping city, $Rpop_{ct}$; and the distance between the community and the nearest US shopping location, D_c. We also include province, month, and year fixed effects denoted by ϕ_p, ϕ_m, ϕ_y respectively.

The results of estimating equation (2) for trips of various lengths are reported in Table 4.[9] Columns 1 and 2 report results for same day trips, Columns 3 and 4 reflect longer trips, and results for all types of trips (combined trips) are displayed in Columns 5 and 6. Many of our findings based on monthly community-level data are consistent with the results of Baggs, Fung, and Lapham (2018) based on annual data, as well as with our preliminary results based

[8] We include only the regressors from Baggs, Fung, and Lapham (2018) that were significant at the 5% level and below.

[9] The results in Table 4 are very similar to ones generated using alternate methods for accounting for missing observations in the survey data when estimating the dependent variable, crossing fractions.

on monthly number of crossings by border post contained in Table 3. In particular, crossing fractions are positively associated with Canadian dollar appreciations and negatively associated with more restrictive border policies. Furthermore, the strength of the relationship between exchange rates and crossing fractions weakens in 2001. In contrast to our findings using number of crossers in Section 3, we find here that the relationship between crossing fractions and exchange rates strengthens slightly in 2009. This difference in results appears to result primarily from the inclusion of the unusual travel data patterns from the latter half of 2020 in our preliminary analysis.

Regarding the role of community characteristics, there is a negative relationship between community income and crossing fractions for same day travel and a negative association between relative population and crossing fractions and between community distance and crossing fractions for trips of all lengths. The results for combined travel are mainly driven by same day crossing fractions as same day trips account for a large share of total cross-border travel. Our findings regarding cross-border travel patterns are all quite intuitive and we refer the reader to Baggs, Fung, and Lapham (2018) for a more detailed explanation of the forces behind those relationships.

Table 4: Fractional Probit Estimation of Community Level Crossing Rates

Variable	Same-day Crossing Fractions	Same-day Crossing Fractions	Overnight Crossing Fractions	Overnight Crossing Fractions	Combined Crossing Fractions	Combined Crossing Fractions
	(1)	(2)	(3)	(4)	(5)	(6)
β_0: Constant	7.669***	7.705***	-3.857	-3.809	4.793*	4.830*
	(2.956)	(2.955)	(2.641)	(2.641)	(2.745)	(2.744)
β_1: ln(Nominal Exchange Rate) (S_t)	0.394***	0.676***	0.316***	0.681***	0.408***	0.699***
	(0.048)	(0.090)	(0.042)	(0.106)	(0.045)	(0.081)
β_2: ln(Nominal Exchange Rate) ×		-0.376***		-0.444***		-0.388***
9/11 Indicator ($S_t \times 911_t$)		(0.077)		(0.102)		(0.074)
β_3: ln(Nominal Exchange Rate) ×		0.109**		0.055		0.127***
Passport Indicator ($S_t \times Pass_t$)		(0.055)		(0.036)		(0.047)
β_4: ln(Median Income) (I_{ct})	-0.709**	-0.709**	0.236	0.236	-0.422	-0.422
	(0.360)	(0.360)	(0.308)	(0.308)	(0.337)	(0.337)
β_5: ln(Relative Population) ($Rpop_{ct}$)	-0.317***	-0.317***	-0.173*	-0.173*	-0.298***	-0.298***
	(0.093)	(0.093)	(0.092)	(0.092)	(0.101)	(0.101)
β_6: ln(Effective Distance) (D_{ct})	-0.433**	-0.433**	-0.217*	-0.217*	-0.412**	-0.412**
	(0.171)	(0.171)	(0.123)	(0.123)	(0.160)	(0.160)
β_7: 9/11 Indicator (911_t)	-0.064***	-0.230***	-0.031***	-0.225***	-0.058***	-0.229***
	(0.018)	(0.043)	(0.008)	(0.048)	(0.016)	(0.039)
β_8: Passport Indicator ($Pass_t$)	-0.043***	-0.026***	-0.037***	-0.025***	-0.039***	-0.020***
	(0.004)	(0.005)	(0.008)	(0.007)	(0.005)	(0.007)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Log-Likelihood	-4928.09	-4928.05	-1707.56	-1707.54	-6025.72	-6025.67
Observations	81435	81435	81435	81435	81435	81435

Notes: (1) Results are for the subsample of communities within 150km from the border from January 1991 to September 2019. (2) Robust standard errors, adjusted for clustering at the census division level, are in the parentheses. (3) Significance indicated by *** at the 1% level; ** at the 5% level; * at the 10% level.

4.2 Counterfactual Staying Rate Results

To examine the impact of Covid-19 related travel restrictions on cross-border travel by Canadians and the subsequent foregone losses in revenue for Canadian small retailers, we first compare estimated counterfactual *staying rates* to actual staying rates. The staying rate is the fraction of potential cross-border trips that did *not* occur from a community and is equal to one minus the crossing fraction. Focusing on staying rates allows us to directly use estimates from Baggs, Fung, and Lapham (2018) based on firm-level data to quantify the foregone revenue losses for Canadian retailers resulting from the policy-induced fall in cross-border purchases by Canadians during 2020.

We first describe our method for estimating Covid-19 counterfactual monthly staying rates for the 237 communities within 150 kilometres of the border from October 2019 to December 2020. We generate counterfactual crossing fractions for those months using the point estimates of the coefficients from Columns 2, 4, and 6 of Table 4 with right-hand side variables set to counterfactual levels as follows. We use the linear projections for community median income, community population, and the relevant US shopping city population as described in Section 2. We use the actual measure of a community's effective distance to the nearest US shopping area. We set the 911 and passport indicators equal to 1. We set the month and province fixed effects at their relevant estimated levels and we set the year fixed effects for all observations equal to the estimated fixed effect for 2019. The only remaining variable is the nominal exchange rate. According to Ca'Zorzi and Rubaszek (2018), a random-walk forecast for the Canada-US bilateral nominal exchange rate outperforms other relatively standard forecasting methods at the forecasting horizons we use in this paper (between one and fifteen months ahead).[10] Hence, using the random-walk forecast, we set the nominal exchange rate at its September 2019 level of 0.755 for each subsequent month up to December 2020 in our baseline counterfactual analysis.

After generating counterfactual estimates of crossing fractions, we measure counterfactual staying rates as one minus those counterfactual crossing fractions. We denote our monthly counterfactual estimates of the staying rate for community c at time t for October 2019 to December 2020 as $\hat{z}_{ct}$. We generate predicted staying rates from January 2015 to September 2019 using in-sample predicted crossing fractions based on point estimates from Table 4. We

[10] Ca'Zorzi and Rubaszek (2018) demonstrate that a forecast of the Canada-US nominal exchange rate using a calibration methodology outperforms random-walk only at horizons longer than two years. As Canada is a commodity exporter, it has been noted that there is a positive correlation between the value of the Canadian dollar and commodity prices. Devereux and Smith (2019), for example, report a correlation between the Canada-US nominal exchange rate and an energy price index equal to 0.37 at monthly frequencies. While energy prices have fallen during the pandemic, a pre-pandemic report by Deloitte (2019) forecasted stable WTI oil prices through the end of 2020. Hence, we believe a random-walk forecast is an appropriate choice for our counterfactual forecast of nominal exchange rates.

also denote these in-sample predicted staying rates as $\hat{z}_{ct}$ for community c for January 2015 to September 2019. Henceforth, we refer to this variable as the predicted/counterfactual staying rate.

Next, we construct an actual/projected staying rate series for each community. We denote this for each community as v_{ct}, where $v_{ct} = 1 - x_{ct}$ for October 2019 to November 2020. We set the crossing rate for December 2020 equal to the observed rate for November 2020 to reflect the fact that travel restrictions in December 2020 were similar to those imposed in November 2020.

In the final steps, we first calculate percentage differences between actual/projected staying rates and predicted/counterfactual staying rates for each community from January 2015 to December 2020:

$$d_{ct} \equiv 100 \left(\frac{v_{ct} - \hat{z}_{ct}}{\hat{z}_{ct}} \right). \tag{3}$$

Finally, to account for systematic prediction errors, we construct adjusted counterfactual percentage differences for each community for October 2019 to December 2020 as follows:

$$\delta_{ct} \equiv d_{ct} - \tilde{d}_c. \tag{4}$$

Here $\tilde{d}_c$ is the median percentage difference between predicted and actual staying rates over 2015 to 2019 for the same month as in period t if the month is between January and September and the median over 2014 to 2018 if the month is between October and December. We refer to δ_{ct} as the counterfactual percentage difference based on point estimates. These are our primary estimates of the percentage changes in community-level staying rates during 2020 due to the Covid-19 pandemic. We also report parallel measures using 95% confidence interval bounds in place of point estimates for the coefficients from the crossing fraction regressions to allow for sampling uncertainty.[11]

To further clarify our method for estimating counterfactual percentage differences, Figure 3 depicts actual/projected and predicted/counterfactual staying rates for combined trips for one example community in our sample, along with 95% confidence interval bounds for the predicted/counterfactual rates. The example community is the combined census division of Fraser Valley, British Columbia and border post Aldergrove, British Columbia. Referring to the figure, consider the observations for July 2020. For our main measure based on point estimates, we take the percentage difference between the solid line and the dashed line for

[11] Note that because we adjust our counterfactual percentage differences based on in-sample differences between actual and predicted rates based on point estimates or based on confidence interval bounds, the measures using confidence intervals may be above or below those based on point estimates.

that month and subtract the median distance between those two lines for the July observation across the previous five years. This gives our measure of δ_{ct} based on point estimates for that community for July 2020.

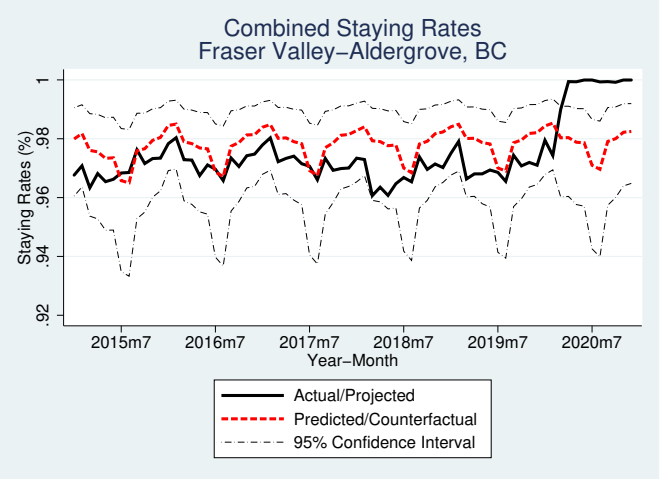

Figure 3: Example Monthly Staying Rate Variables

In what follows, we focus on two time periods in reporting our results regarding the impact of Covid-19 travel restrictions: the third quarter of 2020 when travel rates are historically at their peak during each year and the full year of 2020. We use our monthly actual, projected, predicted, and counterfactual staying rates to construct monthly staying levels, aggregate those to quarterly and annual frequencies, and then use those to construct quarterly and annual staying rates for reporting purposes.[12]

Table 5 presents summary statistics for our estimated counterfactual percentage differences for the third quarter of 2020 across the communities in our sample. Figure 4 provides a visual presentation of the results based on point estimates, allowing us to present variation within and across provinces in our estimated impact on staying rates of Covid-19 related travel restrictions for that time period.

We first note that there is significant variation in estimated staying rate counterfactual percentage differences across communities and a handful of communities have negative differences. The figure suggests that cross-border travel by residents of Alberta and Saskatchewan is relatively unaffected by the travel restrictions. In contrast, British Columbia, Ontario, and Quebec house communities in which there were very large predicted effects. As expected from the results of Table 4, the estimated impact on staying rates of the border closure tends to be larger for relatively less affluent communities which reside near more favorable US shopping

[12]We measure the number of potential quarterly crossings as $90 \times Pop_{ct}$ and the number of potential annual crossings as $365 \times Pop_{ct}$.

Table 5: Counterfactual Percentage Differences in Staying Rates: Third Quarter 2020

Based on:	Mean	Median	Standard Deviation	Minimum	Maximum
Point Estimates					
Same Day	0.970	0.050	4.361	-0.284	49.477
Overnight	0.515	0.081	1.834	-0.223	18.452
Combined	1.522	0.208	6.078	-0.338	69.128
95% Confidence Interval Lower Bounds					
Same Day	1.056	0.016	5.546	-1.050	70.737
Overnight	0.540	0.112	1.958	-0.343	18.537
Combined	1.702	0.167	8.316	-0.945	109.923
95% Confidence Interval Upper Bounds					
Same Day	0.946	0.066	4.000	-0.070	42.572
Overnight	0.507	0.074	1.809	-0.239	18.425
Combined	1.471	0.214	5.474	-0.209	57.317

Note: Statistics are calculated across the sample of 237 communities.

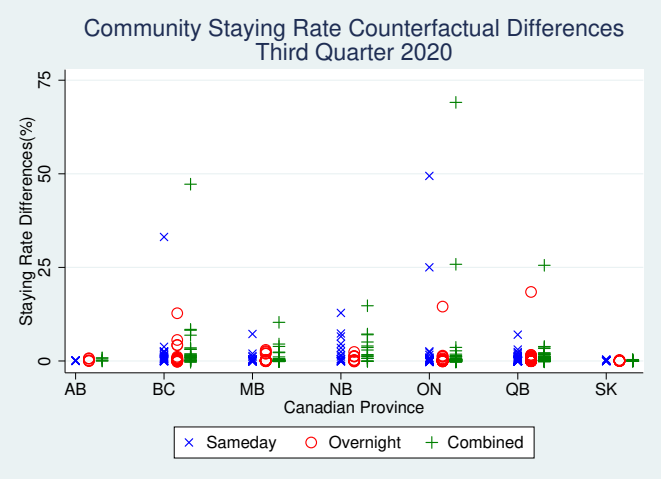

Figure 4: Staying Rate Counterfactual Percentage Differences

opportunities. For example, the community with the largest estimated counterfactual rise in staying rates (69%) is Chatham-Kent, Ontario combined with the Windsor Tunnel border crossing. This community is fifty-two kilometers from Detroit, has population which is only 2% that of Detroit, and has median income which is 15% below the median income across communities in 2020. In contrast, for Levís, Quebec combined with border post St-Just-De-Bretenieres, we estimate no effect on staying rates. This community is 267 kilometers from a US shopping destination, has population sixteen times greater than that US destination, and median income 10% above the median income across communities. A more detailed discussion of the role of community characteristics in affecting outcomes is deferred to the section below focused on retailers' revenues.

We also note the considerable variation in our estimates across the three categories of trip lengths. As expected, we estimate larger effects on same day trips which gets reflected in

combined trips. For the remainder of the paper, we focus on combined trips.

To provide further information on geographical variation in combined staying rates counterfactual percentage differences, we aggregate our results to the census division level for mapping purposes. Figure 5 depicts the geographic variation in the size of those differences for the third quarter of 2020 across the 125 Canadian census divisions within 150 kilometers from the border. According to our estimates, the darkest census divisions on that map will experience the largest increases in their staying rates during this quarter, with increases above 3%. These are communities for which we estimate a counterfactual crossing fraction around 3% which is a very high fraction considering that crossing fractions are measured with a base of total monthly *potential* same day trips equal to 90 times the population of the census division. For our example census division above, Fraser Valley, this represents a fall of approximately 910,000 cross-border travelers during the third quarter of 2020 due to Covid-19 related travel restrictions. The foregone losses in retail sales for firms located in that census division due to those would-be Canadian travelers who instead stay and make purchases in their local community can be significant. In the next section, we provide estimates of those foregone revenue losses.

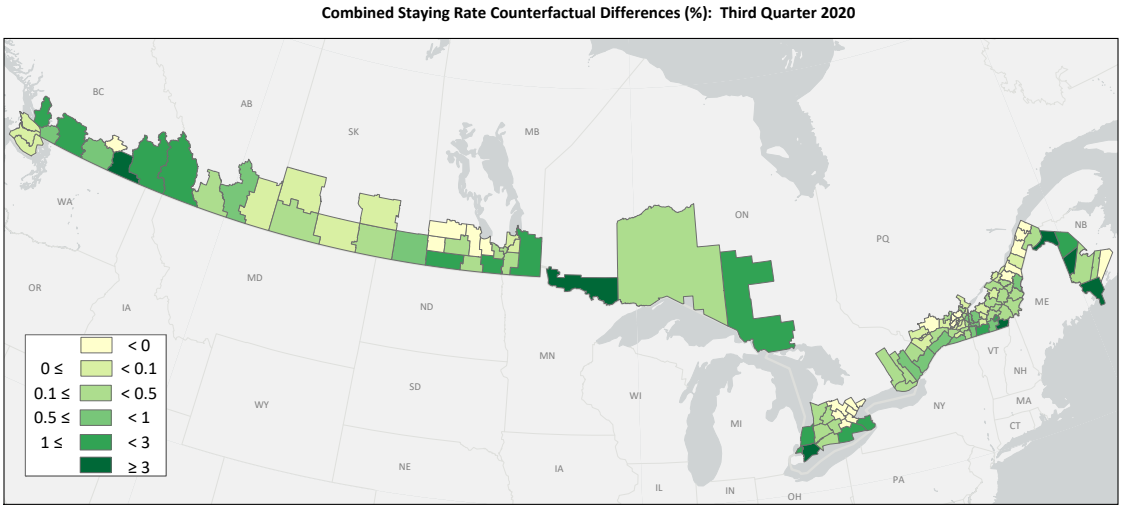

Figure 5: Combined Staying Rate Counterfactual Percentage Differences

4.3 Counterfactual Retailer Foregone Revenue Losses

The paper by Baggs, Fung, and Lapham (2018) uses a theoretical model and retailer firm-level data to estimate the elasticity of a small retailer's real revenue with respect to their community's combined staying rate.[13] We combine those estimated elasticities with our combined staying rate counterfactual percentage differences to estimate foregone real revenue losses to small retailers

[13] A small retailer is defined as one with twenty or fewer employees.

of Covid-19 travel restrictions imposed on Canadian travelers. To do so, we first aggregate our staying rate counterfactual percentage differences to annual percentage changes for the year 2020 because our revenue elasticities are based on annual data. We then multiply those differences for each community by the retailer revenue elasticity estimates from Baggs, Fung and Lapham (2018) for various retail sub-industries to generate estimates of foregone losses to Canadian retailers from restricting cross-border travel by Canadians.

Table 6 provides summary statistics for estimated percentage foregone decreases in retailer revenues across the 237 communities in our sample for all small retailers and for a set of retail sub-industries. For all small retailers, the predicted counterfactual difference based on point estimates varies from -0.375% to 93.924% and the average is 1.736%.[14] Figure 6 depicts the geographic dispersion of the estimates for all small retailers across census divisions. Not surprisingly, Figure 6 suggests that retailers in communities closer to the border experienced larger foregone revenue losses, particularly in British Columbia, New Brunswick and Ontario. Furthermore, less affluent communities located relatively near advantageous US shopping centers tend to have larger foregone revenue losses. In particular, the medians for relative population, median income, and distance to nearest US shopping opportunities equals 0.61, $29,995.68, and 112.26 kilometers, respectively, for communities with foregone revenue losses greater than 1% whereas the counterpart medians across communities with foregone losses below 1% are 0.86, $33,654.40, and 160.29 kilometers, respectively.

Table 6 also demonstrates considerable variation in estimated foregone revenue losses across sub-industries. The impact is larger for sub-industries that are known to be particularly exposed to fluctuations in demand due to cross-border travel and tourism. In particular, the foregone losses are largest for gasoline stations and accommodations which are two industries where we expect a significant level of expenditures by traveling Canadians on US service providers. Furthermore, in contrast to the other sub-industries in the table, there are no enforceable Canadian restrictions on the amount of those services that Canadians are able purchase while outside of Canada. Nonetheless, our median estimates suggest significant foregone losses in the more goods-oriented sub-industries as well in our sample. We estimate foregone revenue percentage losses of similar magnitude for apparel and general retail, and furnishings and appliances, and smaller losses for sporting and hobby goods and books.

[14]Because we do not have current access to firm-level data due to confidentiality issues, it is difficult to estimate the exact effects on the levels of firms' revenues. However, if small retailers' real revenues were relatively stable prior to the onset of the pandemic, we are able to use real retail sales figures from Baggs, Fung, and Lapham (2018) to provide rough estimates of average level effects on firm-level revenues. For an average-sized small retailer in a community with the mean percentage change in real revenues given in Column 1 of Table 6, we estimate a foregone loss of approximately $10,755 in annual real (2002 dollars) firm-level revenue due to Covid-19 related restrictions on Canadians' travel.

Table 6: Estimated Foregone Percentage Decrease in Retailers' Revenues in 2020

Based on:	Mean	Median	Standard Deviation	Minimum	Maximum
Point Estimates					
All Small Retailers	1.736	0.187	7.492	-0.375	93.924
Gasoline Service Stations	4.327	0.466	18.672	-0.935	234.086
Accommodations	3.454	0.372	14.906	-0.746	186.864
Apparel & General Retail	2.164	0.233	9.339	-0.467	117.072
Furnishings & Appliances	2.027	0.218	8.748	-0.438	109.665
Sporting Goods, Hobby & Books	1.138	0.123	4.912	-0.246	61.574
95% Confidence Interval Lower Bounds					
All Small Retailers	2.017	0.163	10.585	-0.889	147.115
Gasoline Service Stations	5.028	0.407	26.382	-2.215	366.654
Accommodations	4.014	0.325	21.060	-1.768	292.689
Apparel & General Retail	2.515	0.204	13.194	-1.108	183.372
Furnishings & Appliances	2.356	0.191	12.359	-1.038	171.770
Sporting Goods, Hobby & Books	1.323	0.107	6.940	-0.583	96.445
95% Confidence Interval Upper Bounds					
All Small Retailers	1.646	0.177	6.644	-0.299	78.689
Gasoline Service Stations	4.103	0.441	16.558	-0.746	196.117
Accommodations	3.276	0.352	13.218	-0.595	156.554
Apparel & General Retail	2.052	0.221	8.281	-0.373	98.083
Furnishings & Appliances	1.922	0.207	7.757	-0.349	91.877
Sporting Goods, Hobby & Books	1.079	0.116	4.356	-0.196	51.587

Notes: (1) Counterfactual crossing rates are based on crossing regression results using data from 1991 to 2019. (2) Statistics are calculated across the sample of 237 communities.

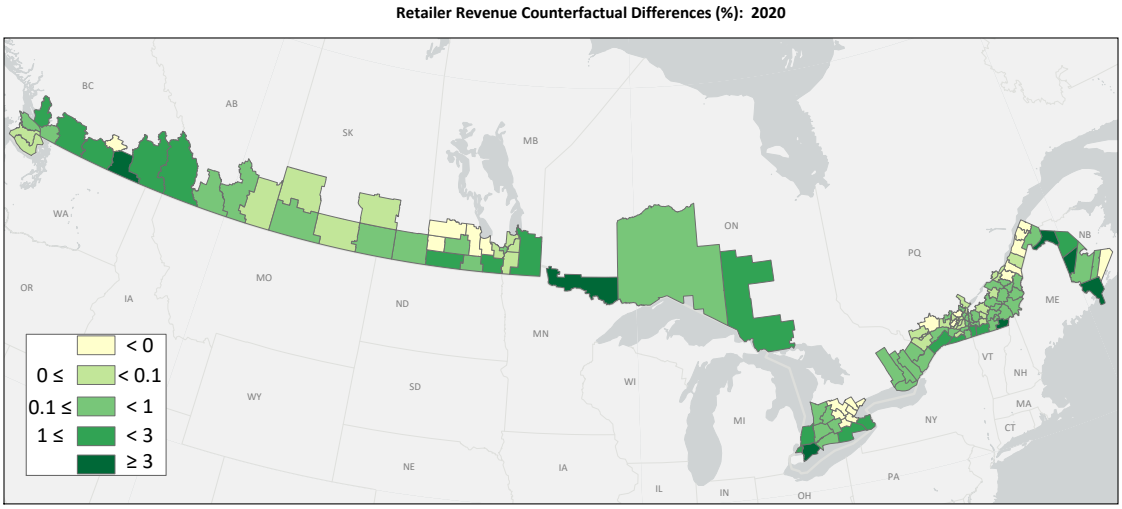

Figure 6: Estimated Foregone Percentage Decreases in Retailers' Revenues in 2020

Overall, our estimates can be thought of as representing the modest buffer that the closure of the Canada-US border to non-essential travel offers Canadian retailers during Covid-19 related economic disruptions. By limiting the ability of Canadians to engage in cross-border shopping and tourism, this closure is especially relevant to retailers located in less affluent communities close to good US shopping opportunities and those in sectors particularly exposed to fluctuations in demand due to cross border travel.

5 Policy Implications

In addition to contributing to our understanding of the effects of pandemic related border policies on retailers, our analysis also informs discussion around two other specific policies: the personal duty free exemption for Canadian residents returning from foreign travel, and more indirectly, the de minimis threshold for postal and courier imports. Both of these policies act to insulate domestic retailers from cross-border shopping.

We first consider the personal duty free exemption policies. For Canadian travelers, these exemptions were increased in 2012, allowing returning residents to bring up to $200 of goods into Canada without paying taxes or duties if they were away for 24-48 hours, and up to $800 if their absence exceeded 48 hours. There is no exemption for absences of less than 24 hours. The Covid-19 border policies analyzed in this paper effectively created a situation where there has been only negligible in-person cross-border shopping. Hence, we can consider the losses Canadian retailers avoided in this situation as analogous to what might occur if duties and taxes applied at the border, and the enforcement thereof, were sufficiently high so as to almost completely deter in-person cross-border shopping.[15] Our results suggest that the forgone losses are relatively small on average, but much larger for retailers closer to the border in sub-sectors and communities particularly prone to cross-border shopping. Understanding this heterogeneity in how border communities and retailers are affected by the personal exemption threshold, and enforcement of that policy, will contribute to optimizing future policy decisions which restrict or facilitate the ability of Canadians to engage in cross-border shopping.

A second policy focused on cross-border shopping is the de minimis threshold. From a consumer perspective, this threshold determines the dollar value of e-commerce imports (though technically also mail-in, phone orders, etc.) which can enter Canada without application of duties or taxes. For Canadian retailers, the de minimis acts as domestic protection from foreign competition, but also raises the cost of purchasing intermediate goods in some cases. Histori-

[15] As noted earlier, we expect that many cross-border shopping trips are same day, which technically implies no exemption. However, as noted in Senate of Canada (2012), enforcement of the zero dollar limit and collection of duties and taxes from same day travelers at the border is inconsistent at best.

cally, Canadian brick and mortar retailers have generally opposed increases in the de minimis while consumer groups and foreign and domestic e-tailers have been in favour of higher thresholds.[16] In May 2020, the Canada-US-Mexico Agreement (CUSMA) increased the de minimis threshold for *courier* imports from the US and Mexico from $20 to $40 for taxation and $150 for customs duties. However, the de minimis threshold for *postal* imports remained at $20 for both taxes and duties.

Latipov et. al. (2017) provide evidence that Canada's historically low de minimis threshold has been inefficient and costly for the Canadian economy, including retailers in aggregate. The analysis in this paper suggests that these aggregate effects may obfuscate subsets of retailers that experience particularly large consequences of increased e-commerce imports. At first glance, this seems particularly important as the pandemic disruptions experienced by retailers have occurred concurrently with the policy changes affecting the de minimis thresholds for courier imports. While our results speak directly to in-person cross-border shopping, they reflect only indirectly on policies relating to e-commerce imports. This is an area warranting further study.

6 Robustness and Caveats

In our first robustness exercise, we predicted counterfactual crossing rates based on crossing-rate regressions using data that begins in 2010 instead of 1991. In particular, we use fractional probit regression on a variation of equation (2) which does not include indicator variables for September 2001 or June 2009. Our estimation results are reported in Table 8 in the appendix while the resulting estimated foregone revenue declines for retailers during 2020 are reported in Table 9 in the appendix. The results are very similar to those from our primary specification.

In a second robustness exercise, we estimate foregone retailer revenue losses in 2020 under alternate exchange rate paths. In our baseline specification, we set the nominal exchange rate to its September 2019 value throughout 2020 based on best practices for forecasting the Canada-US nominal exchange rate. Historically, however, the Canada-US nominal exchange rate has varied significantly in some years. For example during the last decade, the largest annual Canadian dollar appreciation vis-à-vis the U.S. dollar was 23% in 2010 and the largest depreciation was 17% in 2015. Hence, here we estimate foregone revenue declines for a 10% nominal exchange rate appreciation and a 10% nominal depreciation. The estimated foregone percentage decreases in retailers' revenues under those scenarios are reported in Table 7. Comparing those results to our baseline specification for all small retailers, we estimate a foregone percentage decrease in

[16] See for example: https://www.retailcouncil.org/advocacy/de-minimis/de-minimis-ensure-a-level-playing-field-for-retailers-in-canada/; Price Waterhouse Coopers (2017); eBay(2014).

revenues which is 9.56% larger if the Canadian dollar had appreciated by 10% during 2020 and which is 9.74% smaller if it had experienced a 10% depreciation.

Table 7: Estimated Foregone Percentage Decrease in Retailers' Revenues in 2020 With Alternate Exchange Rate Paths

Point Estimates Based on:	Mean	Median	Standard Deviation	Minimum	Maximum
10% Nominal ER Appreciation					
All Small Retailers	1.902	0.273	7.655	-0.146	96.114
Gasoline Service Stations	4.741	0.681	19.078	-0.363	239.544
Accommodations	3.785	0.544	15.229	-0.290	191.221
Apparel & General Retail	2.371	0.341	9.541	-0.182	119.802
Furnishings & Appliances	2.221	0.319	8.938	-0.170	112.221
Sporting Goods, Hobby & Books	1.247	0.179	5.018	-0.096	63.010
10% Nominal ER Depreciation					
All Small Retailers	1.567	0.096	7.329	-0.613	91.637
Gasoline Service Stations	3.906	0.239	18.266	-1.527	228.386
Accommodations	3.118	0.191	14.581	-1.219	182.314
Apparel & General Retail	1.953	0.119	9.135	-0.763	114.221
Furnishings & Appliances	1.830	0.112	8.557	-0.715	106.994
Sporting Goods, Hobby & Books	1.027	0.063	4.805	-0.402	60.075

Notes: (1) Counterfactual crossing rates are based on crossing regression results using data from 1991 to 2019. (2) Statistics are calculated across the sample of 237 communities.

Finally, we note some potential limitations of our analysis. First, we note that it is possible that Canadians' physical cross-border shopping might have been partially replaced by cross-border e-commerce purchases. However, as shown in Figure 7, e-commerce imports remained below 2% of total retail sales in Canada in 2020 as well as below their 2019 levels in most individual months. For example, e-commerce imports were roughly 760 million dollars, or 1.32% of Canadian total retail sales, in May 2019 and 667 million dollars, or 1.44% of sales, in May 2020.[17] The shifts in potential physical cross-border shoppers are much larger: in May 2019 there were 1.9 million same day trips by Canadian residents to the US, while in May 2020 there were only 0.1 million same day trips - a 93% decline.[18]

However, perhaps not surprisingly, Canadian domestic e-commerce purchases did increase significantly during 2020. Aston et. al. (2020) indicate that domestic retail e-commerce sales in Canada increased by 99.3% from February to May 2020, reaching 6.6% of total retail sales in the first half of 2020, compared with 4% in 2019. This trend may affect our estimates of the geographical dispersion of the impact on retailers' revenues of the Covid-19 travel restrictions but for our general message, it does not particularly matter whether Canadians switched from cross-border shopping to domestic e-commerce or to domestic in-store purchases. In either

[17] Following Corbi (2014), monthly e-commerce imports are calculated from the Canadian International Merchandise Trade Database, HS 999999, Postal and Courier, while monthly retail trade sales are taken from Statistics Canada, Table 20-10-0008-01.

[18] Furthermore, according to WTO (2020), the Covid-19 pandemic has increased both the time and monetary costs of international freight transport.

case, Canadian consumers diverted a smaller portion of their spending to American retailers and so the border policy diminished Canadian retailers losses due to Canadians' cross-border purchases.

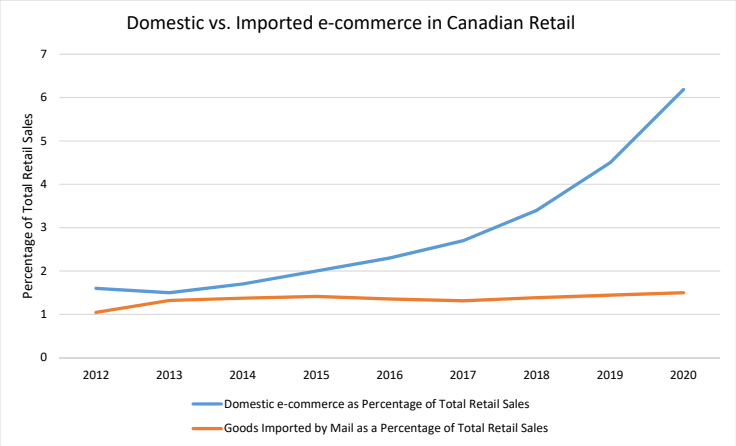

Figure 7: Canadian E-Commerce

A second limitation is that we are only considering the effect of Canadian travelers; due to data limitations, we are unable to include US travelers. Of course, American travelers have also been prevented from crossing the border into Canada for non-essential purposes, which has presumably led to some foregone revenue increases for Canadian retailers who cater to those visitors. While acknowledging this, we note that the number of US travelers who cross the border is significantly below the number of such Canadian travelers. Figure 8 demonstrates this phenomenon.

We also note that US visitors play a much more limited role as *shoppers* in the Canadian retail landscape compared to Canadians shopping in the US. Specifically, following Li (2012) and Government of Canada (2011), we note that retail prices are consistently significantly lower in the US than in Canada, while diversity and variety or products are higher. In addition, unlike Canada, the US population is not concentrated along the border, suggesting longer travel times and higher travel costs for potential shoppers. Further, we expect that the smaller number of US travellers are generally motivated by travel purposes other than shopping, such as tourism. This suggests that foregone revenue gains which Canadian retailers may have experienced emanating from limitations on Americans' travel are likely to be most prominent in the hospitality sectors.

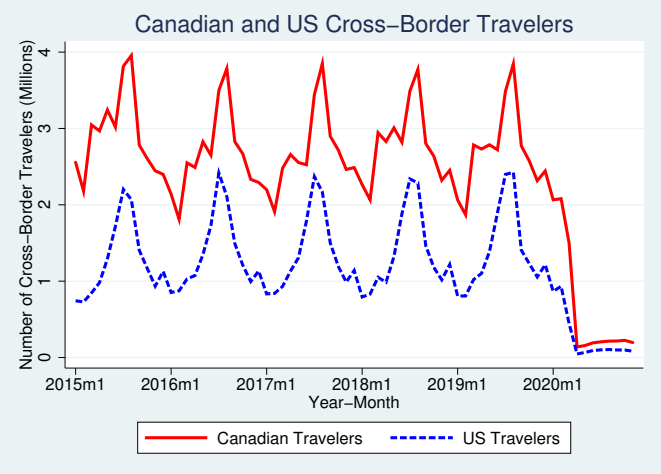

Figure 8: Canadian and US Cross-Border Trips

7 Conclusions

For most retailers, the economic circumstances created by the Covid-19 pandemic have been extremely difficult. In this paper, we note one policy which has provided some indirect relief for Canadian retailers. By restricting cross-border travel, the closure of the Canada-US border to non-essential travel has acted to divert at least some retail spending which would have gone to US retailers if the border was open, to Canadian retailers.

We use detailed travel data by Canadians to estimate counterfactual crossing rates for 2020 in the absence of the pandemic, and pair these with revenue elasticities for Canadian retailers to estimate the magnitude of this effect. Our results suggest that the border closure does act to partially insulate small retailers, particularly those close to the border, from the other negative shocks associated with Covid-19. Our findings also indicate that the degree of insulation varies significantly by industry and by local conditions. The effect is larger for communities that were more exposed to fluctuations in demand due to cross border travel prior to the pandemic such as communities with lower income levels and those with nearby superior shopping opportunities across the border.

Overall, however, our results suggest that the diversion to domestic spending by Canadians arising from travel restrictions offers only a modest buffer from the economic disruptions caused by Covid-19 for Canadian small retailers in most communities. In light of our finding that diverted spending will have relatively small effects in most communities, government programs designed to promote *overall* increases in consumer spending on retail services ("staycations" and the like) may have an important role in facilitating economic recovery of the Canadian retail sector.

Future research on the economic impact of Covid-19 related travel restrictions would include analysis of incoming travelers into Canada, particularly from the US. The International Travel Survey data also includes some information on purpose of trip and expenditures. These components of the data could be exploited in future work. Using data on the number of retailers operating in industries and firm-level employment, revenue, and profit for retailers of all sizes for more recent years, especially during 2020, will be important when that data becomes available.

The pace of change in economic conditions experienced during 2020 is unprecedented. This rapid transformation creates considerable uncertainty for any prediction or counterfactual analysis, including our own. Ex-post analysis of the Covid-19 period is sure to offer refinement and nuance that we are unable to model currently. This paper is at the beginning of what will almost certainly be a large literature on the implications of Covid-19 policies for a diverse set of economic outcomes.

Appendices

A Estimation of Community Crossing Fractions

We first estimate the number of survey respondents in the ITS data at time t who reside in community db, $\hat{r}_{dbt}$, where d is their CD of residence and b is the closest border post for the community. We estimate this as:

$$\hat{r}_{dbt} = s_{db} R_{dt}, \tag{5}$$

where s_{db} is the share of firms in CD d for whom border post b is the closest border post and R_{dt} is the number of surveyed travelers who reside in CD d at time t. Due to data limitations, we assume that all crossers from a community cross through the closest border post, so we have $\hat{r}_{d'bt} = 0$ for any CD d' for which border post b is not the closest post.

We then estimate the number of crossers from community db at time t, $\hat{n}_{bpt}$, by

$$\widehat{n}_{dbt} = \left(\frac{\hat{r}_{dbt}}{\sum_j \hat{r}_{jbt}} \right) N_{bt}, \tag{6}$$

where j indexes CDs, and N_{bt} is the actual number of crossers who returned through border post b at time t. The fraction, $\left(\frac{\hat{r}_{dbt}}{\sum_j \hat{r}_{jbt}} \right)$ is the estimated fraction (based on the surveys from ITS) of travelers through border post b that should be allocated to CD d at time t. To address the volatility in the monthly survey data and a shift in the ITS data format that makes travelers by census division unavailable after 2012, we use a 10 year rolling quarterly average of these fractions to apportion travelers to communities. We also applied our crossing fraction regressions to fractions obtained by averaging across the entire 1991-2012 period and found no meaningful difference in our results. To simplify notation, we henceforth index communities by $c \in \{1, ..., 490\}$ and denote the estimated number of crossers from community c at time t by $\hat{n}_{ct}$.

Following Chandra, Head, and Tappata (2014), using our estimates of the number of crossers for each month for each community, we estimate the crossing fraction for community c at time t as:

$$x_{ct} = \frac{\hat{n}_{ct}}{30 * Pop_{ct}} \tag{7}$$

where Pop_{ct} is the community's population. Population by census division is apportioned to communities according to the share of firms in the census division that are located in the community. As $\hat{n}_{ct}$ is the number of trips during a month and each resident may take multiple trips, we interpret the denominator, $30 * Pop_{ct}$, as the number of *potential* trips that residents of a community c can take during period t. These crossing fractions are our primary variable

of interest for reflecting cross-border travel patterns.

B Robustness Results

Table 8: Fractional Probit Estimation of Community Level Crossing Rates
January 2010 to September 2019

	Same Day Crossing Fractions	Overnight Crossing Fractions	Combined Crossing Fractions
	(1)	(2)	(3)
Constant	4.837	-3.334	2.402
	(3.682)	(3.269)	(3.257)
ln (Nominal Exchange Rate) (S_t)	0.367***	0.237***	0.348***
	(0.040)	(0.038)	(0.034)
ln (Median Income) (I_{ct})	-0.485	0.139	-0.256
	(0.400)	(0.345)	(0.353)
ln (Effective Distance) (D_{ct})	-0.355**	-0.172	-0.325**
	(0.176)	(0.129)	(0.161)
ln (Relative Population) ($Rpop_{ct}$)	-0.310***	-0.163*	-0.284***
	(0.089)	(0.090)	(0.100)
Provincial FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Log-Likelihood	-1346.91	-617.921	-1768.67
Observations	27729	27729	27729

Notes: (1) Results are for the subsample of communities within 150km from the border from January 2010 to September 2019. (2) Robust standard errors adjusted for clustering at the census division level are in the parentheses. (3) Significance indicated by *** at the 1% level; ** at the 5% level; * at the 10% level.

Table 9: Alternative Estimated Foregone Percentage Decrease in Retailers' Revenues in 2020

Based on:	Mean	Median	Standard Deviation	Minimum	Maximum
Point Estimates					
All Small Retailers	1.714	0.178	7.414	-0.375	93.423
Gasoline Service Stations	4.272	0.444	18.477	-0.936	230.346
Accommodations	3.410	0.355	14.750	-0.747	183.878
Apparel & General Retail	2.136	0.222	9.241	-0.468	115.201
Furnishings & Appliances	2.001	0.208	8.656	-0.438	107.912
Sporting Goods, Hobby & Books	1.124	0.117	4.860	-0.246	60.590
95% Confidence Interval Lower Bounds					
All Small Retailers	1.964	0.167	10.499	-0.857	145.702
Gasoline Service Stations	4.895	0.416	26.165	-2.135	363.133
Accommodations	3.907	0.332	20.887	-1.705	289.878
Apparel & General Retail	2.448	0.208	13.086	-1.068	181.612
Furnishings & Appliances	2.293	0.195	12.258	-1.000	170.121
Sporting Goods, Hobby & Books	1.288	0.109	6.883	-0.562	95.519
95% Confidence Interval Upper Bounds					
All Small Retailers	1.643	0.167	6.609	-0.301	78.030
Gasoline Service Stations	4.095	0.415	16.472	-0.750	194.474
Accommodations	3.269	0.332	13.149	-0.598	155.243
Apparel & General Retail	2.048	0.208	8.238	-0.375	9.261
Furnishings & Appliances	1.918	0.195	7.717	-0.351	91.107
Sporting Goods, Hobby & Books	1.077	0.109	4.333	-0.197	51.155

Notes: (1) Counterfactual crossing rates are based on crossing regression results using data from 2010 to 2019. (2) Statistics are calculated across the sample of 237 communities.

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