Prescribing Power and Equitable Access to Care: Evidence from Pharmacists in Ontario, Canada*

Alex Hoagland[†] Guan Wang[‡]

May 13, 2025

Abstract

Allowing pharmacists to directly treat patients may increase equitable access to healthcare and improve patient outcomes, but may also raise concerns about supply-side moral hazard or lead patients to substitute away from regular physician-based care. We study the effects of a 2023 policy allowing pharmacists to prescribe for minor ailments in Ontario, Canada. We use Advan foot traffic data to measure how this policy affected visits to pharmacies, with particular emphasis on heterogeneity across neighborhoods and spillover effects on visits to other non-pharmacy medical facilities. Allowing pharmacists to prescribe led to a 16% increase in total visits to pharmacies, and a 3% increase in visits to other healthcare providers. These increases were concentrated in materially deprived neighborhoods and benefited non-minority, non-immigrant populations the most. We use the policy as exogenous variation to identify substitution elasticities between pharmacy visits and traffic to other medical facilities. Overall, 23% of increases in traffic to pharmacies spillover into increased use of outpatient-based care. Importantly, pharmacy traffic is a substitute for visits to hospitals and emergency departments, potentially as patients rely on pharmacists for triaging rather than emergency care.

Keywords: Health spillovers, pharmacist scope of practice, health equity

JEL codes: I18, I11, I14

*We are grateful to Audrey Laporte, Boriana Miloucheva, and Adrian Rohit Dass for useful feedback. This study was supported by funding through the Partnerships for Research Evaluation Program (PEPR), in partnership with the Ontario Ministry of Health. This study was also supported by ICES, which is funded by an annual grant from the Ontario MOH and the Ministry of Long-Term Care (MLTC). The opinions and conclusions expressed or implied in this manuscript are those of the authors, and are not intended to represent the views of the Province of Ontario.

[†]University of Toronto. alexander.hoagland@utoronto.ca

[‡]University of Toronto. wang.guan@mail.utoronto.ca

1 Introduction

Promoting equitable access to health services and reducing health disparities requires reducing barriers to access for vulnerable populations (Hoagland and Kipping, 2024). In many developed health systems including Canada and the United States, vulnerable populations report limited access even to primary healthcare professionals such as general practice physicians (Riley, 2012). Differences in the care received across populations can be attributed to differences in physician reimbursement (Decker, 2012; Alexander and Schnell, 2024) or insurance coverage (Hoagland et al., 2024a,b). However, even in countries with universal insurance coverage and uniform reimbursement, disparities persist (Martin et al., 2018). These continued differences may result in reduced health for the most at-risk patients (Chandra et al., 2024).

In addition to institutional barriers such as insurance coverage and provider incentives, patients may also face individual barriers to accessing care, such as income and liquidity constraints in the US (Gross et al., 2022) or limited access to a family physician in Canada (Isabelle and Stabile, 2020). These barriers may be partially mitigated by expanding the supply of medical services. Pharmacists, in particular, are uniquely poised to be able to expand access to low-acuity health care for vulnerable populations through expanded prescribing powers (Wenger et al., 2016). Such expansions are becoming increasingly common in the United States, Canada, and other developed countries such as Australia and Ireland.

However, these expansions come with the potential tradeoff of introducing both supply- and demand-side ex-post moral hazard (Einav et al., 2013). On the supply side, pharmacists report feeling pressure to prescribe for patients in order to increase pharmacy profits (Tsergas, 2024). On the demand side, patients may demand higher levels of potentially inappropriate care through pharmacies (Baicker et al., 2015; Anderson et al., 2024). Collectively, these effects may lead to the over-utilization of low-value care while crowding out more high-return interactions with physicians.

In this paper, we assess how a 2023 reform expanding prescribing power for pharmacists in Ontario, Canada affected the flow and substitution across facilities for patients visiting medical institutions. We leverage novel data on patient mobility in a difference-in-differences framework to evaluate this policy's impact on visits to pharmacies as well as other healthcare institutions, including hospitals, primary care offices, and urgent care centers. In practice, evaluating the impact of policy on access to care faces the critical data limitation that claims are only visible in the data for patients who were successful in obtaining care. By using foot traffic data, we are able to assess the impact of the policy in real time, without waiting for administrative data to accumulate. We also directly observe data for the population of Ontario patients regardless of whether or not they received care. Finally, we are also not limited to studying certain sectors of the healthcare system, as is generally true when using claim-based or electronic health record (EHR)-based data.

Our results suggest that expanding pharmacist scope of practice (SOP) led to a strong and persistent increase in foot traffic to pharmacies in the medium run. Immediately following the policy's implementation, foot traffic to pharmacies increased by an average of 16%; this result persisted for at least one year following the expansion. Importantly, this result differs across patient groups. We show that pharmacies in neighborhoods with the lowest levels of material resources, employment, and housing stability exhibit the largest uptake of pharmacists post-implementation; the most deprived regions exhibit a 25% increase in foot traffic. Interestingly, these increases are concentrated most in the regions with high material deprivation but less racial or immigrant-based diversity, suggesting that the policy generated the largest impact among disadvantaged non-minority Canadian citizens. Neighborhoods with high concentrations of immigrants or visible minorities experienced significant declines in foot traffic. We show these declines may be attributable to limited supply of pharmacies and patient substitution across pharmacies in these areas.

Increased traffic to pharmacies may impact demand for other healthcare services, potentially alleviating pressure on other parts of the healthcare system. We examine how foot traffic to other medical institutions changed following the policy's implementation, particularly across neighborhoods. Overall, we find positive complementarities between foot traffic to pharmacies and visits to medical facilities in the first year post-expansion, suggesting that expanding pharmacist prescribing power led to increased visits to outpatient medical care centers. We observe a 9% reduction in traffic to emergency departments and hospitals and a 4% increase in traffic to outpatient care centers, resulting in an overall increase in the use of medical care. These results are particularly surprising given that outpatient care is not generally needed to treat these minor ailments, except to obtain prescriptions. The results suggest that pharmacists serve important roles in redirecting patients from hospital- to outpatient-based care, an important triaging role.

Finally, we leverage the SOP expansion as exogenous variation to directly estimate the elasticity of substitution for visits across types of medical facilities, in an instrumental variables framework. Importantly, this allows us to overcome two key limitations of the data: spillover effects may be endogenous and reflect market-level differences in health risk, and foot traffic data indicates only visits to a location, not the definitive receipt of care. However, using the policy's variation as an instrument identifies a local average treatment effect (LATE) specific to the subset of pharmacy visitors who were induced to visit as a result of the policy (e.g., to seek care from a pharmacist), and reduces measurement error in the data (Schennach, 2016). Using this approach, we find that the exogenous increase in traffic to pharmacies led to an overall increase in traffic to non-pharmacy medical institutions, driven by increases in use of outpatient care that swamped declines in visits to hospitals. Our estimates 22.8% of new pharmacy visits translated into outpatient care visits, with a 7.0% reduction in hospital and ED visits.

Primarily, our work contributes to a quickly evolving literature studying the effects of SOP expansions in healthcare. As occupational licensing rules have relaxed, various healthcare professionals including nurse practitioners, physician assistants, and pharmacists have been given increased prescribing power and reduced physician oversight. Previous work has found that these expansions have led to increased utilization of healthcare—including primary care—and subsequent improvements in physical and mental health (Alexander and Schnell, 2019; Traczynski and Udalova, 2018). Furthermore, these improvements are typically directly observed in previously under-served areas, rural regions, or among potentially marginalized populations (McMichael, 2023). To date, the only work focusing on pharmacist SOP expansions has been limited to expanded prescribing powers for contraceptive services (Grossman et al., 2025). To this work, we add several contributions. First, we use a novel data set to estimate the impacts of pharmacist SOP expansions on a broad set of health outcomes. The greatest advantage of our data relative to previous approaches is that we can observe high-frequency, granular data on visits to both pharmacies and other medical institutions. Evaluating the broad effect of pharmacist SOP expansions—particularly *within* a state or province—has previously been difficult without these linkages. Second, we directly assess the potential spillover effects of an SOP expansion on physician, hospital, and emergency department visits, providing key information into the indirect effects of such expansions. Previous work has found complementarities within primary care settings between expanded SOP and physician engagement in substance abuse care (Guo et al., 2024). Our data allows us to generalize beyond the primary care setting and is informative of the potential tradeoffs across inpatient, outpatient, and pharmacy care broadly. Finally, although our data is limited in our ability to observe individual claims linked to pharmacy visits, we use a instrumental variable approach in order to directly estimate the elasticity of healthcare visits across sectors to the SOP expansion.

Our work also contributes to a rich literature on access to care and health equity (McIntyre and Mooney, 2007). Income inequalities have been shown to exacerbate health disparities, and SOP expansions are typically promoted as a way to eliminate access differences caused, in part, by socioeconomic differences (Finkelstein et al., 2022). Previous work studying SOP expansions have noted that in the US, gains from expanded prescribing power typically are strongest for rural areas or under-served populations (Alexander and Schnell, 2019; McMichael, 2023). Relative to this work, we make two contributions. First, we highlight that even in publicly-funded healthcare systems with universal coverage, SOP expansions may reduce inequitable gaps in taking up healthcare services. This is important as the determinants of health disparities in these systems—where prices do not directly affect access—are less well understood (Propper, 2024; Cookson et al., 2016). Our results show that patients from under-served regions experienced the largest increases traffic to both pharmacies and medical institutions as a result of the expansion. Second, we use the richness in our data to further decompose these regional differences to identify which patient groups, specifically, benefit from the policy expansion. We find that patients living in lower-income regions benefited most from the expansion, but that these benefits accrued almost entirely to non-immigrant populations. Our work therefore contributes to discussions on access to care by noting the importance of taking an intersectional approach to more carefully consider the complex experiences of individuals from different backgrounds (Anyosa and Anderson, 2024).

In studying SOP expansions, our work also contributes to a deeper understanding of the tradeoffs associated with expanded access to care outside of the hospital. In general, patients choosing where to seek are face a tradeoff between the time or monetary cost of seeking care immediately (e.g., in a pharmacy) and the potential aggravation of a condition from delaying costlier, but more targeted care (e.g., in a hospital). On the one hand, many preventable hospitalizations could be addressed by increasing direct access to prescriptions (Kakanai et al., 2025); on the other hand, allowing pharmacists to write prescriptions raises concerns that pharmacists will either act as poor gatekeepers and inappropriately direct patients to or away from the ED—resulting in behavioral hazard concerns—or respond to private financial incentives, resulting in supply-side moral hazard concerns (Einav and Finkelstein, 2018; Baicker et al., 2015). Previously, these tradeoffs have been studied in the context of urgent care centers and their role in either substituting for emergency care or inappropriately funneling patients to further seek hospital care (Allen et al., 2021; Zeltzer et al., 2021). Our work adds to this discussion by studying these tradeoffs in the context of prescriptions in a publicly-funded health insurance system, a novel setting. We highlight that reducing these costs associated with care lead to overall complementarities in demand for healthcare from various sectors, potentially increasing the takeup of primary care utilization while alleviating some of the burden on hospitals and emergency departments (Ouyang et al., 2022).

Finally, our work contributes to a broader literature on the spillover effects of economic policy in healthcare markets. Policies affecting aspects of healthcare markets typically generate spillover effects, making their welfare impacts difficult to ascertain (Hendren, 2016). Spillover effects may complicate the responses of patients or providers to prices for care (McCarthy and Raval, 2023), innovation (Hoagland, 2024a), or even a person's own health shock (Hoagland, 2024b; Fadlon et al., 2024). In this paper, we highlight the spillovers associated with expanding access to care through one channel on downstream care received through other channels. Understanding these substitution patterns is critical for evaluating the social welfare associated with expanding access to care through pharmacists.

The remainder of the paper proceeds as follows. Section 2 provides background on the policy change we study. Section 3 provides details on the data on which we rely and details of our empirical design. Section 4 documents the effect of expanding pharmacist prescribing power on foot traffic to pharmacies, as well as differences across neighborhoods and potential spillover effects on foot traffic to other health institutions. Section 5 leverages the SOP expansion in an instrumental variables framework to identify elasticities of substitution across medical facilities and pharmacies. We also discuss the efficiency implications of our estimated treatment effects in the contexts of moral and behavioral hazard. Finally, Section 6 concludes.

2 Background

In recent decades, the role of pharmacists in providing healthcare has evolved significantly across Canada and the United States. Whereas historically, pharmacists were primarily responsible only for dispensing medication, filling prescriptions provided by physicians, and offering basic advice on medication use, recent policies have expanded pharmacists' scope of practice to initiating, modifying, or discontinuing medications for certain conditions and minor ailments. Currently, 18 states in the U.S. and all 10 provinces in Canada allow pharmacists to prescribe medication for minor ailments, with differing levels of authority and scope.

These expansions have the potential to mitigate barriers to accessing timely care for patients seeking treatment for common, non-complex health issues while simultaneously relieving pressure on primary healthcare and hospital-based care. At the same time, concerns about the effectiveness of pharmacist care and the prospective negative influences of moral hazard remain. For example, pharmacists may be particularly responsive to profit incentives, resulting in incentives to over-prescribe medications for patients (Tsergas, 2024). What's more, patients may substitute demand for health services away from physicians towards pharmacists, crowding out high-value preventive screenings and wellness visits.

Pharmacist prescribing authority varies across Canada, as regulations are deferred to individual provinces or territories. Initial programs piloting the role of pharmacists in treating minor ailments occurred in Quebec (2011) and Alberta (2007). In Ontario, pharmacists were first allowed to write prescriptions with very limited scope in 2012. However, legislation providing an expansion of prescribing powers took effect in January 2023, allowing pharmacists to directly prescribe medications for 13 minor ailments.[1] The aim of the 2023 expansion was to reduce avoidable emergency departments visits, free physicians to focus on more complex treatments, and enable patients, in general, to receive timely care for minor conditions (Nakhla and Shiamptanis, 2021). Appendix Table A1 lists the relevant ailments included in both parts of the expansion. To date, nearly every pharmacy in the province participates in this program; by the end of October 2023, Ontario pharmacists had issued over 1 million assessments for these conditions. Participating pharmacies received an average of $10,520 in provincial reimbursements for minor ailment assessments, over and above any relevant prescription revenue; this was particularly pronounced for large corporate pharmacies (Pukhov et al., 2025).

3 Data and Empirical Framework

3.1 Data

Advan Foot Traffic Data. We used Advan foot traffic data between 2022 and 2024 to estimate the causal effect of the SOP expansion on visits to pharmacies and other healthcare institutions. Advan data uses mobile phone location and GPS data relative to tailored geofences to measure foot traffic, which is then anonymized and aggregated to the weekly level (Corporation, 2024). This data enables researchers to analyze patterns of visitors to healthcare institutions over time and geography. Foot traffic data is available for commercial points of interests (POI), including restaurants, stores, hotels, public

[1] The selection of these minor ailments was primarily based on the urgency of condition, potential to prevent ED visits and reliance on prescription drugs (Nakhla et al., 2024). The set of conditions was expanded to 19 total ailments beginning in October 2023.

buildings, and healthcare facilities; in our study, we limited attention to foot traffic to all facilities providing healthcare services and pharmacies and reserved remaining data for falsification tests. For each healthcare POI in the provinces of Alberta, British Columbia, Ontario, and Quebec, we observed total visits as well as unique visitors and their home locations for each week. We limited the sample to POIs observed continuously from 2022 to 2024 to avoid any identification issues associated with pharmacy entry or exit during the sample period.[2]

Advan foot traffic data is subject to several limitations, including the rate at which POIs are visited over time by individuals with smart phones that then transmit GPS location data. In particular, changes in the underlying panel of devices over time may introduce noise to the raw visit counts estimated in the data. To accommodate this, we normalize the measures of raw foot traffic using the mobile device sampling rate for each province-week, following Advan's micro-normalization methodology (Hou et al., 2024). Throughout, however, our results are robust to using only the raw visit and visitor counts, rather than relying on the weighting scheme.[3]

Appendix Figure A1 shows the distribution of normalized weekly visits in the sample. The distribution is highly skewed, but most pharmacies see between 500 and 5,000 total visitors in a given week. On average, Ontario pharmacists see higher levels of foot traffic than the other three provinces, as discussed below. Even within Ontario there exists considerable variation, with the bottom quintile of pharmacies receiving fewer than 575 visits monthly (e.g., in remote regions of Northern Ontario), and the top quintile receiving upwards of 17,000 visits monthly (e.g., in Toronto). Throughout, we report results for the total monthly visit count as the primary outcome. However, our results are robust to considering instead the number of unique visitors as opposed to aggregate visits.

We also use this data to examine foot traffic to other, non-pharmacy medical institutions, including hospitals and emergency departments, outpatient care centers (such as urgent care centers or family physician offices), and others. These are identified in

[2]Specifically, we excluded 206 (2.7%) of pharmacies that opened or closed in our full sample, as well as 2,471 (21%) with one or more weeks where no raw visits were recorded in Advan data. This is a limitation of the Advan data, which only registers a subset of visits to a particular location; including these pharmacies with intermittent visitor counts would likely bias down our estimates of true foot traffic as these pharmacies likely had unregistered foot traffic in a given week. We are not concerned that these drives our results for two reasons. First, of the 2,471 pharmacies dropped from analysis, 2,373 (96%) had two or fewer weeks of missing data. Second, our results are robust to both aggregating to the provincial level and including all pharmacies in the analytic sample, including zeros when appropriate for both missing data and pharmacy entry and exit. This is discussed below.

[3]Advan data also includes synthetic counting of visitors for roughly 2.5% of pharmacies in our sample. Our results are virtually unchanged if we ignore pharmacies affected by this.

the Advan data directly based on their North American Industry Classification System (NAICS) codes and verified based on location name, address, and website.

Ontario Marginalization Index. We linked Advan data to the 2021 Ontario Marginalization Index (ON-Marg) based on dissemination areas (DAs) (Matheson et al., 2012). The ON-Marg is a publicly available data tool measuring distinct dimensions of marginalization based on demographic indicators including housing stability, material resources (including employment and education), age-based marginalization, and racialized and newcomer populations. We stratified POIs included in this study based on the quintile of estimated marginalization across each of the four distinct categories, with the first quintile representing the least marginalized and the fifth quintile the most marginalized.[4] Given that ON-Marg data is not available for our control provinces, we used the full set of control group data for each stratification, comparing the evolution of visit counts in each quintile of marginalization across all unaffected pharmacies in AB, BC, and QC.

Using the linked data, we documented the baseline access to pharmacy care across each group in Appendix Table A2. Although pharmacies are widely considered the most accessible form of health care even in publicly-funded healthcare systems, geographic variation in pharmacy availability and the unequal distribution of operating hours may lead to differential access to pharmacy care even prior to the SOP expansion (Wang and Ramroop, 2018). Appendix Table A2 highlights that pharmacy foot traffic is generally declining in the marginalization of a pharmacy's neighborhood, with the notable exception that pharmacy foot traffic is considerably higher in neighborhoods with a higher density of racial minorities and immigrants. These differences are attributable to more than just differences in the spatial distribution of pharmacies, as has been argued previously for the US (Suri et al., 2024). Rather, we find that neighborhoods with a higher fraction of racially diverse inhabitants also tend to have roughly half as many pharmacies per capita. Hence, these patterns may also be the result of differences in healthcare-seeking behaviors across immigrant and non-immigrant populations. These differences persist even when examining other healthcare foot traffic, including visits to hospitals and outpatient centers.

3.2 Research Design

We evaluated the causal effect of expanding pharmacist prescribing powers in Ontario using a difference-in-differences framework, comparing foot traffic outcomes in Ontario

[4] We are able to link approximately 90% of DAs in Ontario to ON-Marg scores. Some DAs with extremely low levels of population or household counts do not have ON-Marg scores, as Statistics Canada does not release census information for these areas to ensure data quality and privacy.

before and after the expansion to pharmacies in Alberta (AB), British Columbia (BC) and Quebec (QC). AB and QC did not update or expand their pharmacists' SOP during the full study period, making them suitable comparators to Ontario in the analysis. BC introduced novel prescribing powers for pharmacists roughly 6 months after Ontario's 2023 reform; hence, their comparator data is used only through June 2023 in regressions.[5] In our primary specification, we present medium-run results, estimating causal effects for up to twelve months following the SOP expansion.

To accommodate potential heterogeneous and time-varying treatment effects—particularly for areas of different levels of marginalization in Ontario—we used a local projections difference in differences (LP-DID) estimator (Dube et al., 2023), a "stacked" regression-based framework to implement differences-in-differences with multiple time periods. Similar to a naïve difference-in-differences estimator, our LP-DID estimator recovers the average effect of the SOP expansion under the assumptions of no anticipation and parallel trends. In addition, the estimator is unaffected by potential bias arising from heterogeneous treatment effects (Roth et al., 2023). The LP-DID regression performs similarly to other approaches in this context, including weighted stacked DID regressions (Wing et al., 2024; Cengiz et al., 2019) and imputation estimators (Sun and Abraham, 2020; Callaway and Sant'Anna, 2021). Formally, for h periods pre- and post-treatment, we estimate the equation

$$y_{poi,t+h} - y_{poi,t-1} = \beta_h^{\text{LP-DID}} \Delta D_{poi,t} + \alpha_{poi} + \tau_t + \varepsilon_{poi,t}^{h}, \tag{1}$$

where the sample is restricted to newly treated ($\Delta D_{poi,t} = 1$) or clean controls ($\Delta D_{poi,t+h} = 0$). Outcomes include foot traffic to pharmacies and other medical institutions intervention volumes at the place of interest (poi) level, with periods separated into months t. We cluster standard errors at the province level, the level of the treatment.

Throughout, the identifying assumption is that the timing of the SOP expansion is exogenous for those visiting pharmacies across provinces, in the sense that there are parallel trends and no anticipatory changes in traffic. These assumptions can be examined directly by assessing differential pre-trends in our dynamic specifications. Additionally, Appendix Figure A2 shows trends in total pharmacy visits across each of the four provinces, providing justification for the parallel trends assumption in the raw data. The figure shows province-level variation in pharmacy foot traffic in two ways: in panel (a), visits are aggregated to the province level and presented as raw counts; in panel (b), we follow our preferred specification and present the logarithm of the average pharmacy-level monthly

[5] Throughout, results are robust to excluding BC from the control group entirely.

visit count.

Several features of our data are immediately apparent in this figure. First, Ontario has much higher traffic than other provinces, due to its larger population relative to the other provinces. Second, there is some seasonality in pharmacy visits, with visits tending to increase in each of the provinces in the late fall and winter, as seasonal respiratory illnesses become more common.[6] Both sets of these differences—across provinces and over time—are absorbed by the fixed effects in Equation 1. Importantly, panel (b) shows that trends in pharmacy-level foot traffic, when measured in logs, are parallel and roughly constant across time for each of the provinces. Beginning in January 2023, there is a clear break leading to increased foot traffic in Ontario, which is observed in both panels.[7]

Our estimator recovers the average treatment effect of the policy on foot traffic to pharmacies and other medical institutions.[8] Interpreting these regression results therefore requires several caveats. First, foot traffic data relies on mobile phone and GPS data to estimate visits; while Advan normalizes their data to adjust for estimated visits by those without a smart phone, this data may not fully capture all visitors to a location. Our results are unchanged by whether or not we use the raw or normalized data, suggesting that this is not an issue in interpreting our results, particularly when estimated as percentage changes. Second, and more importantly, our results reflect the impact of the policy to *traffic* to a location, which does not equate to receiving healthcare services. For instance, it cannot distinguish between individuals visiting pharmacies seeking prescriptions from those visiting for other purchases. In Section 5, we use an IV framework to back out implied effects of true prescription seeking behavior on utilization of other medical care services.

[6] There is an idiosyncratic spike in month 6 (July 2023) for all four provinces in the province-level data. This is both substantially less of a threat in the log specification (panel b); additionally, this should be captured by the month fixed effects included in our specification (Equation 1).

[7] Spillovers in traffic across provinces may constitute one potential threat to our identification strategy. For example, patients living in Quebec may travel to Ontario to seek prescriptions from Ontario pharmacists. In general, this is unlikely to be true, as each province independently operates their own health insurance system, and hence patients run the risk of paying out-of-pocket for care received outside of the province in which they are insured. Additionally, the raw data does not suggest that these spillovers are occurring—if anything, pharmacy traffic to Quebec increases as well, which would attenuate our estimates.

[8] Note that in our setting, there although there are multiple treated units, they are all treated at the same time and within the same province. Hence, the LP-DID regression approach accommodates potential heterogeneous treatment effects across these units, but there is little *ex-ante* reason to be concerned that a typical two-way fixed-effects estimator would be biased in this setting as there is no staggered adoption. In fact, we show that our results are robust to this more traditional estimation in Appendix Figure A3. Throughout, LP-DID effects were estimated using the LPDID package in Stata (Busch and Girardi, 2023).

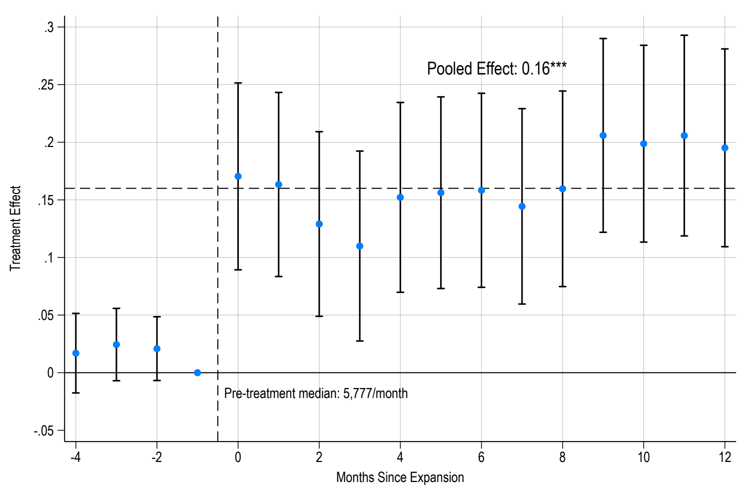
3.3 Summary Statistics

Our data contained 95 measures of weekly foot traffic data for 7,758 pharmacies and 48,323 other medical institutions across the four Canadian provinces of interest. Table 1 provides summary statistics for our analytical sample across the four provinces. We link pharmacies to census data for the aggregated dissemination area and report average characteristics of the geography they serve as well as foot traffic data from Advan.[9]

Overall, the results are consistent with the raw data presented in Appendix Figures A1 and A2. The level differences in pharmacy foot traffic across provinces is driven by Ontario reporting roughly three times as many pharmacies as the other provinces; visit counts are relatively consistent across Ontario, Alberta, and British Columbia. In addition, there are few differences across neighborhood demographics in the four provinces in terms of income, household makeup and ownership, education, and employment. Ontario has an overall higher fraction of immigrants than Alberta and Quebec, respectively; this is consistent with the overall census differences across provinces.

4 Event-Study Analysis

Figure 1. Effect of SOP Expansion on Foot Traffic to Pharmacies



Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

[9]DAs are roughly equivalent to a US Census Subdivision.

Table 1. Summary Statistics

	Province			
	ON	AB	BC	QC
Panel A: Foot Traffic				
Pharmacies	3,616	1,081	1,163	1,898
Normalized visitor count/pharmacy-week	4,077.03	4,354.80	4,845.66	2,565.23
	(229.186)	(430.407)	(616.240)	(162.034)
Raw visitor count/pharmacy-week	55.83	59.62	66.28	35.13
	(3.152)	(5.905)	(8.427)	(2.226)
Average time spent in pharmacy (minutes)	78.85	64.27	94.93	78.42
	(3.003)	(4.241)	(5.977)	(3.948)
Panel B: Other Demographics				
Age	42.31	40.08	43.71	43.65
	(6.136)	(11.794)	(13.134)	(10.149)
% Female	51.23%	50.12%	51.20%	50.75%
	(0.027)	(0.050)	(0.073)	(0.050)
Median income (individual)	$35,471	$39,137	$34,514	$33,492
	(107.0)	(184.1)	(165.5)	(134.1)
% Unemployed	12.88%	12.08%	8.74%	8.17%
	(5.459)	(8.950)	(5.594)	(6.551)
% With high school diploma or higher	70.41%	70.54%	71.57%	66.80%
	(0.100)	(0.208)	(0.204)	(0.177)
% Homeowners	58.92%	62.50%	57.85%	60.82%
	(15.757)	(34.820)	(30.408)	(20.660)
Household size	2.51	2.44	2.29	2.17
	(0.815)	(1.267)	(1.334)	(0.748)
% First-generation immigrants	30.32%	22.35%	29.11%	15.92%
	(0.305)	(0.393)	(0.476)	(0.342)

Notes: This table presents summary statistics for the analytical sample. Summary means and standard errors are calculated for 2022, the year prior to SOP expansion. Panel A summarizes Advan data for pharmacy and drug store POIs across each province, including the treatment province (ON) and control provinces (AB, BC, QC). POIs from Advan are linked to Statistics Canada data based on Aggregate Dissemination Areas (ADAs) for Panel B.

Figure 1 shows the estimated difference-in-differences results. Prior to the 2023 SOP expansion, the median (average) pharmacy received 5,777 (16,324) total visitors per month. Following the policy's implementation, foot traffic increased by an average of 16%, corresponding to an increase of roughly 924 (2,612) patients for the median (average) pharmacy. This increase was persistent over time for the first year post-expansion, indicating a shift in the consumption of pharmacy care following the expanded prescribing powers. However, we note given the recency of the SOP expansion that these results only capture causal effects of the policy on pharmacy traffic in the short to medium run.

One potential concern is that our estimated treatment effects represent more than simply the causal effect of the SOP expansion in Ontario. For example, our results could be contaminated either by concurrent changes in Ontario's foot traffic patterns or by structural differences in the data between 2022 and 2023 (given the timing of the expansion at the start of the calendar year). To examine this more carefully, we consider falsification tests in which we estimate the effects of the SOP expansion on foot traffic outcomes that are unlikely to be affected by the expansion. These include visits to grocery stores, restaurants, and hotels.

Appendix Figure A4 presents the results, with the coefficients from Figure 1 presented for comparison. While we observe immediate and significant increases in foot traffic to pharmacies, we do not observe similar changes in foot traffic for other sites of interest. Specifically, the pooled post-treatment estimates for each of these categories is close to zero and statistically insignificant. These findings suggest that our regression results are truly identifying the effect of the SOP expansion and not more general policy or data changes around the time of the SOP expansion in Ontario.[10]

4.1 Heterogeneity Across Neighborhoods

Importantly, our estimated effects differed based on the available resources of a local neighborhood. To see this, we stratified the main outcome across quintiles of marginalization to assess how the policy may have differentially affected vulnerable patient groups.

[10] Additional robustness checks are reported in the Appendix. Specifically, our results are robust to measuring the outcome using raw visit counts (without relying on Advan's normalization algorithm) or after dropping pharmacy-weeks with synthetically computed counts, as well as when measuring the outcome in unique visitors rather than total counts. These robustness checks are summarized in Appendix Table A3. Additional robustness checks include estimating results at the province level to abstract away from pharmacy opening and closing decisions (Appendix Figure A5); using raw counts rather than normalized data (Appendix Figure A6); and including pharmacies with missing weeks of foot traffic (including openings and closings) as zeroes (Appendix Figure A7). Our treatment effects are consistently estimated throughout these specifications; if anything, treatment effects generally increase using these robustness checks.

Table 2. Pooled Treatment Effects of SOP Expansion, by ON-Marg Quantiles

	Least Disadvantaged Q1	Q2	Q3	Q4	Most Disadvantaged Q5
Outcome: Log(Total Weekly Visitors to Pharmacies)					
Material Resources	0.01	0.02	0.07	0.09**	0.25***
	(0.043)	(0.047)	(0.042)	(0.036)	(0.032)
Age and Labor Force	-0.03	0.06	0.15***	0.20***	0.22***
	(0.037)	(0.040)	(0.042)	(0.046)	(0.033)
Household Dwellings	-0.19***	0.04	0.16***	0.25***	0.10***
	(0.057)	(0.051)	(0.048)	(0.035)	(0.029)
Racialized and Immigrant Populations	0.47***	0.26***	0.23***	0.05	-0.14***
	(0.048)	(0.037)	(0.038)	(0.034)	(0.036)
Pharmacy FEs	✓	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓	✓

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the weekly level, averaged over a month. Standard errors are clustered at the province level. The average sample size across the 20 specifications is 92,317. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Appendix Figures A8 through A11 show corresponding event study for each of the 20 specifications.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 presents the results using the four unique dimensions of the ON-Marg data. For each dimension quintile, we report the pooled post-treatment effect from Equation 1. For three measures of marginalization—measured based on household dwellings, material resources, or age and labor force participation—we find a strong gradient through which expanding pharmacist scope of practice caused larger increases in pharmacy foot traffic in more marginalized regions. For example, pharmacies in the most materially deprived neighborhoods of Ontario saw increases in traffic as high as 25% following the SOP expansion, compared with relatively precise null changes for those in the least deprived neighborhoods. Similarly, pharmacies in the most deprived neighborhood measured by housing stability and quality saw increases of 25% and 10%; in contrast, foot traffic in the least deprived neighborhoods was estimated to decline by 19%.

Interestingly, when examining the last dimension of marginalization based on racial inequality and new immigration flows, we find a gradient in the opposite direction. Specifically, among the most marginalized communities by this measure, the SOP expansion caused a 14% *decline* in pharmacy foot traffic; on the other hand, neighborhoods with the fewest immigrants and visible racial minorities experienced a nearly 50% increase in pharmacy foot traffic. This is consistent with previous findings using the ON-Marg data, which has highlighted nuanced correlations between the distinct dimensions of marginalization scores (Anyosa and Anderson, 2024). Using K-means clustering algorithms, this work presented a new way of clustering neighborhoods based on the ON-Marg data to accommodate these correlations: (1) Advantaged White Canadians, (2) Disadvantaged White Canadians, (3) Advantaged Visible Minorities and Immigrants, and (4) Disadvantaged Visible Minorities and Immigrants. Our analysis, in keeping with this methodology, suggests that the policy's effects were most pronounced among the "Disadvantaged White Canadians" group, but did not expand access to pharmacy care for the "Disadvantaged Visible Minorities and Immigrants" group. Taken together with the baseline access to pharmacy care reported in Appendix Table A2, this also suggests that the SOP expansion generated the largest percentage increases in accessing care for those with the lowest baseline levels of access across each dimension of marginalization, even after accounting for the negative gradient across race- and immigrant-based marginalization.

One might be concerned that the heterogeneity we observe in these pooled estimates may be driven by different pre-trends across communities. We therefore report individual event study regressions for each of the 20 specifications presented in Table 2 in Appendix Figures A8 through A11. We do not find any significant violations of the parallel trends assumption even when using this more granular approach to estimation, suggesting that this heterogeneity is not an artifact of estimation on potentially heterogeneous subgroups.

4.2 Pharmacy Supply and Substitution Patterns

What drives differences in the SOP expansion's effects on pharmacy foot traffic across neighborhoods experiencing different types of marginalization? To assess this more directly, Appendix Figure A12 shows the estimated treatment effects of the policy stratified across the two conflicting dimensions of marginalization: resource-based marginalization and the proportion of visible minorities in a region. In keeping with the findings presented in Table 2, we find that the SOP expansion significantly increased traffic in materially-deprived but racially homogeneous neighborhoods, consistent with the group of "disadvantaged White Canadians." On the other hand, neighborhoods with high immigrant and visible minority populations experienced significant declines in foot traffic following the policy's expansion.

Understanding what leads to declines in foot traffic for this "Disadvantaged Visible Minorities and Immigrants" group is particularly relevant given that these individuals are significantly more likely to be unattached to a primary care physician (Ahmed et al., 2016). This means this group generally has more limited access to primary care services, further increasing the potential benefit of SOP expansions. There are several competing hypotheses to understand these effects. First, neighborhoods might have different levels of ex-ante access to pharmacies, as some regions may have fewer pharmacists available to take up the prescribing expansion. Second, this expansion may have led to substitution as visitors change which pharmacies they visit in order to receive prescriptions. Finally, broader cultural issues such as language barriers and gaps in institutional trust in the healthcare system may contribute to different effects for racial majority Canadians and visitors from other racial, ethnic, and immigrant groups. We consider these in turn.

First, accessing pharmacists for prescriptions may be more limited in marginalized regions of the province due to limited supply. For example, if there are fewer pharmacies per capita in areas with high populations of recently landed immigrants or visible minorities, then we would expect smaller increases in pharmacy foot traffic in these areas. As noted previously and in our discussion of Appendix Table A2, our data suggests that this may be the case: areas with a high proportion of non-minority Canadians typically have an average of 2.0–2.2 pharmacies per 1,000 residents, while DAs in the highest quintile of racialized marginalization contain an average of only 0.9 pharmacies per 1,000 population, a reduction by more than half. Importantly, these differences are even larger when considering the "Disadvantaged Visible Minorities and Immigrants" subpopulation. Neighborhoods that are materially deprived but do not have high immigrant or racial minority populations have an average of 3.3 pharmacies per 1,000 residents; on the other hand, materially deprived regions that are largely made up of non-native Canadians or racial minorities have about 46.7% as many pharmacies per capita, significantly reduced access to services. This results in limited traffic to pharmacies in these neighborhoods even prior to the SOP expansion.

On its own, the differential availability of pharmacies in neighborhoods does not explain the significant declines in foot traffic reported in Table 2, given that these differences existed prior to the enactment of the policy. However, if the policy induced patient substitution across pharmacies, communities with a more limited supply of pharmacies may experience reduced visit rates. For example, those who normally visited pharmacies in one community—for general purchases or to pick up prescriptions—may instead choose to visit pharmacies closer to their home once the opportunity to receive prescriptions becomes available.

While we cannot observe visitor's home neighborhoods directly, our data allows us to observe the median distance visitors traveled from their home to reach a pharmacy. By observing how these distances change as a result of the SOP expansion, we can identify these substitution effects. Overall, we observe significant declines in the median distance traveled to a pharmacy as a result of the policy, with distance traveled declining by 28.1% (Appendix Figure A13). This decline reflects both changes in the distance traveled by existing visitors—who may substitute to visiting pharmacies closer to their home—as well as differences between existing and new visitors to pharmacies. Here, our results suggest that the increases in foot traffic we observed due to the SOP expansion stemmed from visitors closer to a pharmacy's geographic location.

This overall decline, coupled with our foot traffic estimates presented in Table 2, provides insight into substitution patterns across pharmacies. Appendix Table A4 summarizes these results.[11] We observe negative effects on distance traveled across all neighborhoods regardless of material deprivation, indicating that post-expansion, the increased traffic came from visitors relatively close to each pharmacy. However, when examining neighborhoods based on racial and immigrant-based disadvantage, a second story emerges. Along this dimension, the least marginalized (majority White Canadian) neighborhoods saw an increase in foot traffic but no change in distance traveled. But for pharmacies in the most marginalized neighborhoods, for whom we also saw declines in foot traffic, median travel to the pharmacy declined. These effects together suggest that the declines in foot traffic for marginalized regions may be driven by visitors who live further away from these locations, presumably as they substitute their visits to a pharmacy closer to home. This leaves the pharmacies in this region to serve fewer patients who reside closer to the pharmacy than the average visitor prior to the policy's expansion.

4.3 Assessing Substitution Across Neighborhoods

A potential concern in our data is that marginalization is assigned at the neighborhood level where the pharmacy is located, not at the visitor level. Hence, these reported distance effects may be, at least in part, driven by changes in consumer behavior for visitors from other neighborhoods with different levels of marginalization. In general, our results do not suggest this is a strong concern—given that we observe negative distance effects, visitors to pharmacies driving our observed increases in foot traffic are highly likely to live in the same neighborhoods as the pharmacies and hence have the same level of assigned marginalization. However, the observed *declines* in foot traffic from the most racially marginalized communities may be driven by consumers visiting from other

[11] Appendix Figures A14 through A17 show corresponding event study figures.

neighborhoods, meaning this negative effect may be more attributable to substitution than to a true underlying change in access to pharmacy care.

We test this formally by examining a subset of pharmacies that are located in "clusters" of neighborhoods with similar levels of marginalization. Specifically, we use a local indicator of spatial association (local Moran's I statistic) to identify DAs whose neighbors all have similar levels of marginalization as the centroid DA (Bivand et al., 2009). We then limit our analysis to pharmacies in the centroid DAs (that is, in the center of the cluster) and re-estimate our overall foot traffic events (Table 2) on this sample. The intuition is that visitors to these pharmacies are significantly more likely to come from similar levels of marginalization as the pharmacy itself even if they reside in another neighborhood, given the surrounding geographic characteristics of the neighborhoods.

Appendix Table A5 presents the results for the limited sample, which includes 65,119 (24.3%) of the Ontario pharmacies in areas with highly similar levels of marginalization. Our results are virtually unchanged in both magnitudes and statistical significance when using this subsample. In particular, we continue to find strong increases in foot traffic for pharmacies in neighborhoods with both high levels of material deprivation (22%) and low levels of racial diversity (44%). When using the smaller sample, we continue to find a negative point estimate in foot traffic for pharmacies in highly racially diverse neighborhoods (-7%); however, this is statistically insignificant and roughly half the magnitude of the initial finding in Table 2. This, combined with the distance results presented in Appendix Table A4, suggests that the declines in foot traffic to racially diverse neighborhoods is driven by changes in consumer traffic for consumers living in other, less diverse neighborhoods. We do not find evidence, however, that the rest of our results may be explained by visitors to pharmacies who may have substantially different backgrounds or marginalization levels compared to the pharmacies they visit, based on the similarities between these tables.

Taken together, these results suggest that the SOP expansion meaningfully affected not only who visited pharmacies but which pharmacies they visited to seek out prescriptions. However, our main effects may also be the result of additional factors that affect pharmacy demand differently for different patient groups. Information about the policy and what prescriptions a pharmacist could provide may not have been adequately disseminated to some groups, particularly for immigrants without majority language (e.g., English or French) speaking skills. Importantly, these groups may also have reduced trust in the healthcare system (Hoagland and Kipping, 2024); hence, even if they were informed about the policy appropriately, patients from historically marginalized groups may not demand care from pharmacists in the same way patients from majority race and ethnic groups would. Finally, we cannot directly assessed whether changes in foot traffic for one group of visitors crowded out pharmacy visits for others in the same neighborhood, potentially contributing to the overall traffic declines in racially diverse neighborhoods. Absent data on individual home regions or specific pharmacy enrollment in the SOP expansion, we cannot separate the effect of patient substitution and supply constraints from these more institutional barriers to access. However, taken together, these factors may have generated declines in travel to pharmacies for these patient groups.

4.4 Spillover Effects

While expanding prescribing power for pharmacists meaningfully increased overall foot traffic, it may also have affected visits to other types of healthcare institutions. We assess these effects by examining traffic to all non-pharmacy medical institutions, as well as specific changes in visits to hospitals (for emergency, inpatient, or outpatient care), emergency departments, and other outpatient care centers.

Figure 2 presents the results for the medium run, estimating twelve months of post-expansion causal effects.[12] In aggregate, expanding prescribing power to pharmacists resulted in a 3% increase in total non-pharmacy visits to medical institutions. This result is the combination of two competing effects: first, we observe an increase of 4% in visits to outpatient facilities (including walk-in clinics and urgent care centers).[13] On the other hand, the SOP expansion also led to a substantial, albeit noisy, decline in foot traffic to hospitals and emergency departments. We observe this traffic fall by 9%, with a p-value of 0.08.

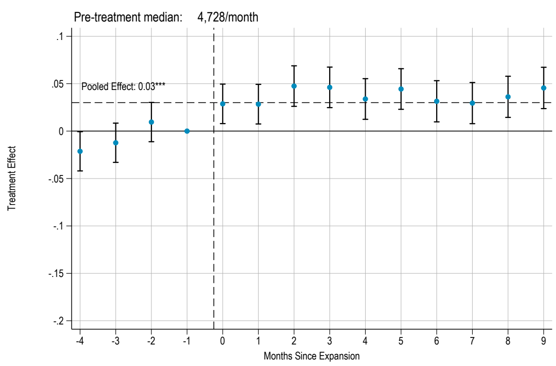
These reductions in hospital traffic are relatively immediate—lagging the uptick in pharmacy foot traffic by only one month—and sizable given that pharmacist prescribing powers are for minor ailments only. These treatment effects are likely the combination of changes to hospital foot traffic for four groups of patients: those requiring inpatient admissions, those requiring only emergency care, those requiring only outpatient services,

[12] Appendix Figure A18 shows the visualization in the raw data for each of these outcomes, following the construction of Appendix Figure A2. In general, these treatment effects are smaller and less obvious in the raw data, as one might expect with spillover effects.

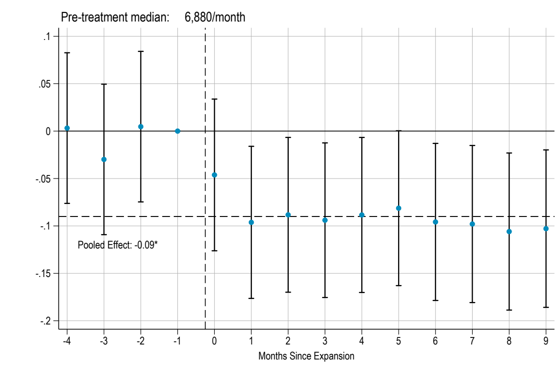
[13] When we restricted our sample only to institutions that we could identify as walk-in clinics or urgent care centers with certainty, we estimated a noisy decline in foot traffic of -3.4% ($p = 0.824$). Urgent care centers make up approximately 2–5% of Ontario outpatient healthcare centers; hence, as a conservative back-of-the-envelope calculation, we estimate that if foot traffic to urgent care centers declined by 3.4%, foot traffic to all other outpatient facilities would need to increase by 4.37% increase to justify the observed treatment effect.

Figure 2. Effect of SOP Expansion on Foot Traffic to Medical Institutions

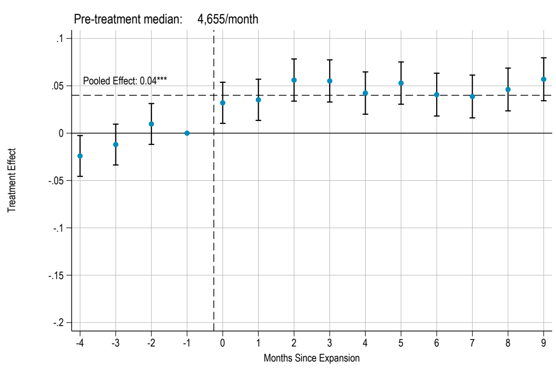
(a) All Non-Pharmacy Medical Visits



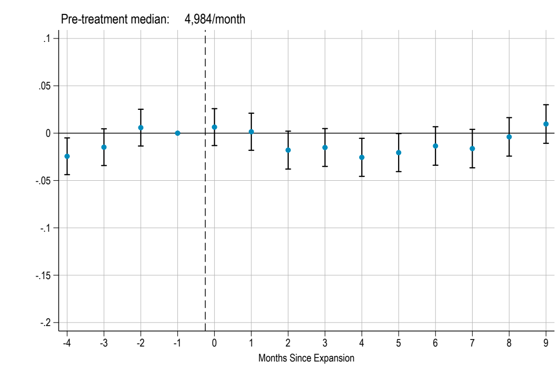
(b) Hospital & Emergency Visits



(c) Outpatient, Lab, & Walk-in Visits



(d) All Other Medical Visits



Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest in each panel is the natural logarithm of total visitors to non-pharmacy medical institutions, including all institutions, hospitals (including emergency departments and ambulatory surgical centers), outpatient clinics (including diagnostic labs, walk-in clinics, and urgent care centers), and all other medical visits (including skilled nursing facilities and dental care, among others). Visits are measured at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. See Appendix Figure A18 for visualization of these effects in the raw data.

and those traveling to the hospital who don't ultimately receive any type of care. We therefore put our treatment effect into context with a simple back-of-the-envelope calculation considering these groups in Appendix Table A6. We first link provincial data on the number of patients treated in Ontario hospitals to our foot traffic data, estimating that roughly 30% of hospital foot traffic results in patient care. Of these, the annual hospital reports suggest that roughly 15% of patients are admitted for any inpatient care, while 33% are not admitted but receive ED care and 52% of patients receive only outpatient care. Assuming that foot traffic for outpatient services increases by 4% (per Figure 2), and assuming conservatively that foot traffic for inpatient admissions does not change following the policy, we estimate by what fraction ED traffic, specifically, would need to change to yield the treatment effects we observe. We compare two cases: one where the average reduction in hospital traffic is homogeneous across visits for ED and those not receiving care, and one where the effect on ED foot traffic is capped at 4.3%, following prior literature (Alsabbagh and Houle, 2019).[14] For the median hospital, we estimate that the estimated 9% reduction in overall hospital foot traffic can by either a 12.1% in ED visits and all other foot traffic, or a 4.3% reduction in ED visits and a 13.2% reduction in all other types of care.[15]

Taken together, these results suggest a combined redirection of patients from inpatient triaging (e.g., through an ED) to seeking care in an outpatient setting. These complementarities are particularly surprising, given that outpatient care is not generally needed to treat these minor ailments (except for visits specifically to obtain prescriptions). The results suggest that pharmacists may serve a role in directing patients who need care appropriately to either an outpatient provider such as a family physician, or to an inpatient setting when care is more urgently required. Interestingly, this triaging resulted in an overall *increase* in foot traffic to non-pharmacy medical institutions.

Neighborhood Heterogeneity. The effects presented in Figure 2 also vary considerably across neighborhoods based on their available resources. Figure 3 presents these

[14] Previous work by Alsabbagh and Houle (2019) posited that roughly 4.3% of Ontario ED visits could be resolved by expanded pharmacist prescribing powers. The most frequent complaint for these resolvable visits were for diagnoses including acute pharyngitis, conjunctivitis, rashes, acute sinusitis, and dermatitis, consistent with the prescribing powers in our policy. While it is likely that the policy could also reduce inpatient hospitalizations—particularly preventable hospitalizations—we conservatively assume that no such change occurs post-policy. Previous work has suggested that expanding access to outpatient care reduced ED visits, which ultimately had an indirect effect reducing inpatient admissions (Bruni et al., 2016).

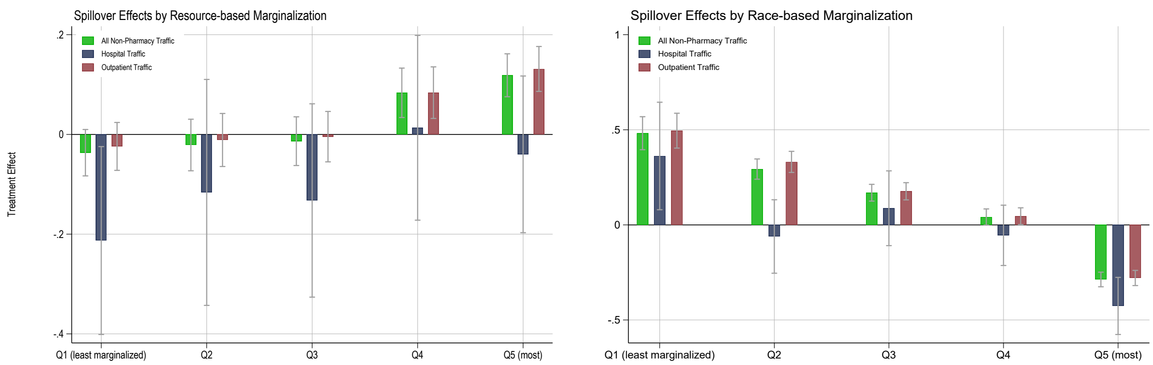
[15] Particularly, this is in line with later work by Alsabbagh and Houle (2022), who find that "depending on the geographic location, the proportion of avoidable ED visits by Ontarians during the study period that could have potentially been managed by a pharmacist under an ambulatory conditions program ranges from 11% to 57%."

results.

Figure 3. Effect on Foot Traffic to Medical Institutions, by Marginalization

(a) Resource-based Marginalization

(b) Race- and Immigrant-based Marginalization



Notes: This figure plots estimates of pooled LP-DID post-treatment effects of the SOP expansion in January 2023. The outcome of interest in each panel is the natural logarithm of total visitors to non-pharmacy medical institutions, including all institutions, hospitals (including emergency departments and ambulatory surgical centers), and outpatient clinics (including diagnostic labs, walk-in clinics, and urgent care centers). Data is stratified by quintile of neighborhood marginalization. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Overall, three results stand out. First, there is a clear positive correlation between increased foot traffic to pharmacies and overall visits to other medical institutions. Traffic to medical facilities also increased in the same neighborhoods where pharmacies saw large increases in their own foot traffic after the SOP expansion (Table 2).

Second, these increases are almost entirely driven by increases in outpatient care visits, including visits to family physicians and urgent care centers. These increases are largest in the most materially-deprived regions as well as regions with the highest proportion of disadvantaged non-minority Canadians, consistent with the results presented above. In fact, for the least racially diverse communities, foot traffic to outpatient care centers increases by roughly 50% as a result of the policy.

Finally, the effect of pharmacist prescribing on foot traffic to hospitals exhibits a more nuanced pattern. Among high-income neighborhoods, we observe large declines in hospital-based traffic on the order of 20%. This suggests that for these neighborhoods, pharmacies may be successfully redirecting patients away from the ED, particularly for low-acuity patients. Interestingly, this is also true for highly racially-diverse neighborhoods; however, these neighborhoods do not see a corresponding increase in use of outpatient care.

5 Implied Elasticities of Seeking Medical Care

A natural question, given the spillover effects observed in Figure 2, is to what extent changes in pharmacy foot traffic directly cause increased visits to non-pharmacy medical institutions. This is a natural policy question when considering expanding the prescribing power of pharmacists. On the one hand, pharmacists may be able to effectively triage patients, helping some patients to substitute from ED-based care to outpatient care and effectively reducing waiting times for more acutely serious medical events in the hospital. On the other hand, pharmacist prescriptions may give patients a less costly way to seek care, reducing overall demand for other types of medical care. Physician labor groups and other mainstream healthcare professionals have argued that expanding pharmacist SOP would lead to this result, at the expense of overall patient health.

Identifying the causal effect of visiting pharmacies on utilization of other medical care requires overcoming two distinct but interrelated challenges. First, these spillover effects may be endogenous, meaning that neighborhoods with riskier patients may experience high traffic to both pharmacies and other healthcare institutions. This would not be a concern if we could directly link patients in their visits across facilities, which would allow us to adjust for patient risk. Hence, a second challenge is that our data only measures raw foot traffic to and from locations, including traffic for unrelated purposes (e.g., those shopping for groceries at a pharmacy or delivering food at a hospital).

The 2023 policy, however, provides a source of exogenous variation which overcomes both challenges. First, the policy provides an exogenous shock to pharmacy foot traffic across the province, overcoming endogeneity concerns.[16] Second, using the policy as an instrument meaningfully identifies a group of compliers who *do* visit pharmacies in order to seek care. Note that in this context, the compliers include everyone seeking care from a pharmacist; however, it is not the case that every complier received a prescription. We therefore interpret our results throughout this section as the causal effect of *visiting* a pharmacist on additional visits to Ontario health institutions.[17]

[16]In addition to being a strong instrument (shown below), the policy change also likely satisfies the remaining conditions for a valid instrumental variable. In particular, the policy would only have effects on visits to other medical institutions through the channel of affecting patient choices to visit the pharmacy for care. Additionally, the policy change is uncorrelated with other drivers of visits to medical institutions or pharmacies, including the measurement error inherent in using foot traffic data to infer actual care utilization. Finally, the policy likely satisfies the monotonicity requirements of an IV, as the SOP expansion represented an extensive margin change in prescribing powers. Hence, it is not possible for the expansion to have induced some patients *not* to seek care at a pharmacy who otherwise would have, as no such options existed for patients.

[17]This is still a policy-relevant parameter of interest given that the policy is intended to increase access to the expertise health professionals (who may or may not write prescriptions for minor ailments) above

We therefore use this policy change as an instrumental variable to identify the elasticity of traffic to medical institutions with respect to pharmacy visits. That is, we estimate the following specification:

$$\log(\text{Medical Traffic}_{DA,t}) = \beta_0 + \beta_1 \log(\text{Pharmacy Traffic}_{DA,t}) + \gamma \vec{X} + \alpha_{DA} + \tau_t + \varepsilon_{DA,t}, \quad (2)$$

where DA indicates a dissemination area and t is measured in either weeks or months. Isolating the elasticity from pharmacy foot traffic to non-pharmacy traffic requires exogenous variation changing pharmacy traffic independently from other patient flows; we therefore use a binary indicator for if a DA was affected by the policy at time t as an instrument for $\log(\text{Pharmacy Traffic}_{DA,t})$, using the methodology of de Chaisemartin et al. (2024). Unsurprisingly given the evidence above, this policy change is a strong instrument for changes in pharmacy traffic, with a first-stage F statistic around 790. The regression adjusts for DA and time fixed effects, as well as controls included in the vector $\vec{X}$. In our preferred specification, $\vec{X}$ includes the number of pharmacies and other medical institutions in each DA-week.

Table 3. Implied Foot Traffic Elasticities to Non-Pharmacy Medical Facilities

	Implied Elasticities of Log(Traffic to Medical Facilities)		
	All Non-Pharmacy Traffic	Inpatient Visits	Outpatient Visits
Log(Pharmacy Foot Traffic)	0.228***	-0.070***	0.203***
	(0.0266)	(0.0147)	(0.0262)
First-stage F Statistic	789.94	789.94	789.94
DA FEs	✓	✓	✓
Week of Year FEs	✓	✓	✓
N	396,030	396,030	396,030

Notes: Table presents 2SLS regression estimates identifying the elasticity of travel to medical facilities following changes in travel to pharmacies. The specification is estimated following Equation 2. Coefficients represent approximate percentage changes in foot traffic per unit change in foot traffic to pharmacies. Standard errors are clustered at the province level, and the F-statistic from the first stage regression of log(traffic to pharmacies) on the policy change indicator is reported for each column. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 shows the results. Consistent with Figure 2, we find exogenously increasing traffic to pharmacies leads to increases in visits to outpatient-based medical institutions.

and beyond increasing access to prescriptions themselves.

This results in an overall increase in foot traffic to other medical institutions. Our estimates suggest that nearly one-quarter of increases in pharmacy traffic as a result of the SOP expansion policy translated into visits to medical facilities; for each 1% increase in pharmacy traffic, foot traffic to all other facilities increased by 0.23%. Given that our results suggested an average increase in pharmacy foot traffic of 16%, this corresponds to a 3.68% increase in all foot traffic, remarkably consistent with the 3% increase estimated in Figure 2. On the other hand, increasing traffic to pharmacies *reduced* visits to hospitals and EDs, suggesting a substitution between the two. This could arise either because patients traveled directly to a pharmacy instead of to an ED when seeking acute care, or because pharmacists were able to mitigate patients' symptoms through prescribing until they were able to receive outpatient-based care, when otherwise they would have needed inpatient or emergency care while waiting to see a clinician. Finally, the reduced costs of accessing healthcare through pharmacies may lead individuals to consume more outpatient care as they learn about the value of that care.

Interpreting these results in an IV setting is particularly useful given the local average treatment effect (LATE) implied by the policy. The results in Table 3 yield estimates of how foot traffic to pharmacies affected visits to non-pharmacy medical care precisely for patients who were induced by the SOP expansion policy to visit a pharmacy, presumably to seek care from a pharmacist. Hence, this framework allows us to use foot traffic data to isolate changes in traffic related to the policy in order to infer how patient flows to other healthcare institutions would be affected. Our estimates hence provide an informative estimate of the moral hazard and substitution effects of seeking healthcare as a result of expanding pharmacist prescribing powers.

5.1 Efficiency Considerations

Our event study and IV results suggest that the SOP expansion meaningfully changed traffic to pharmacies, and that these changes causally affected foot traffic to other healthcare institutions. Hence, a central question raised by the SOP expansion is whether the observed changes in care-seeking behavior reflect improved efficiency or instead generate inefficiencies through increased moral or behavioral hazard. Importantly, the effects we observe could represent reduced burden on hospitals and EDs as well as greater overall access to outpatient care; however, it is also possible that these observed effects could be driven by a combination of pharmacist-induced demand and adverse health effects arising from inappropriate prescriptions and resulting in additional needs for outpatient care (Tsergas, 2024; Baicker et al., 2015).

Increased pharmacy visits could be efficient if they generate shifts in foot traffic that enable low-acuity patients to obtain timely treatment at lower cost while reserving time with specialists (e.g., in EDs or hospitals) for higher-severity patients. This could both lower overall healthcare costs as well as prevent cascades of care or downstream health complications. Our results indicate that 23% of increased pharmacy traffic leads to outpatient care, while ED and hospital visits decline. This pattern is consistent with a model where SOP expansions lower the fixed costs of accessing care and enable patients to substitute from higher-cost acute settings to more efficient outpatient settings. In general, if pharmacist prescribing were causing adverse health events to occur, we would not expect to see increases in overall traffic to outpatient centers with corresponding declines in traffic to EDs and urgent care centers or walk-in clinics, as discussed above. Nonetheless, without direct clinical data on patient outcomes or prescriptions filled, we cannot fully evaluate whether these observed shifts generate welfare improvements. As in other work on the behavioral and allocative consequences of expanding access to care (e.g., Anderson et al. (2024); Einav and Finkelstein (2018)) these substitution patterns may reflect both efficiency gains and behavioral hazard. Future research linking SOP expansions to clinical outcomes or total healthcare spending would be valuable for quantifying their net social return.

6 Conclusion

This paper uses foot traffic data to study patient flows to pharmacies and other medical institutions after provincial policy expanded the prescribing power of pharmacists to treat minor ailments in Ontario. The results illustrate that this policy led to increased visits to pharmacies in the year following SOP expansion, particularly in materially deprived regions of the province; in contrast, these effects were not observed in communities with a high proportion of visible minorities or immigrants. In part, these differences can be explained by the limited supply of pharmacies in marginalized neighborhoods and visitor substitution across pharmacies as prescriptions become more readily available.

We also identify how these changes spillover into patient visits to other medical institutions, including visits to hospitals and emergency departments as well as outpatient clinics, laboratories, and urgent care centers. The results quantify the way in which increasing access to care at one point in the healthcare system (pharmacies) may generate competing substitution effects changing where patients seek care as their health event progresses. We highlight how these spillover effects differ across types of medical facilities and neighborhoods, and then use the policy as exogenous variation to identify the elasticities of substitution for foot traffic. We find complementarities between pharmacy visits and outpatient care, with roughly one-quarter of an increase in pharmacy traffic passed on to outpatient visits. More importantly, seeking care at a pharmacy is a substitute for hospital-based care.

Our estimates of the treatment effect likely include patient-driven substitution across modes of care, but may also reflect inefficient substitution arising from pharmacist-induced demand or adverse health effects from inappropriate pharmacists' prescriptions, resulting in increased need for outpatient care. In addition, behavioral hazard—driven by patients seeking more flat-of-the-curve care as its marginal cost declines—may also generate inefficient responses to the SOP expansion. Overall, however, we estimate that the expansion was effective at reducing the healthcare burden borne by hospital campuses as measured by foot traffic, potentially reflecting cost savings in addition to any positive patient health outcomes. Ultimately, as we cannot directly observe patients' health outcomes in our data, we are limited in our ability to identify the efficiency implications of the SOP expansion.

It is also notable that our study period closely follows the onset of the COVID-19 pandemic, with the pre-period beginning in January 2022. To the best of our knowledge, there are no events occurring concurrently with the SOP expansion that could affect pharmacy visits or healthcare foot traffic more generally. Our falsification exercises (in particular, Appendix Figure A4) also suggest that our results are not artifacts of other policy changes that affect consumer traffic in Ontario. Although there is evidence of long-term effects of the COVID-19 pandemic on consumer healthcare-seeking behaviors (Samman et al., 2024; Huang et al., 2024), this does not bias our regression results provided no Ontario-specific differences in COVID-19 responses began in January 2023.

All of these results suggest that expanding the scope of practice of pharmacists may increase access to care for some populations, particularly disadvantaged non-minority populations within Canada. This increased access may allow patients to be better connected to some parts of the healthcare system, such as with their family physician, rather than relying on emergency departments to treat ailments. One potential policy response to connect immigrant populations to outpatient care in the same way may be to increase knowledge of the policy in minority neighborhoods, particularly crossing language barriers (e.g., in advertising) to do so.

Counter to expected thought, our results do not suggest that patients are replacing their family physician with their pharmacist, nor do they indicate that physicians may be over-treating patients in ways that are harmful to them. As policies seeking to improve equitable access to care continue to leverage frontline healthcare workers and adjacent professionals, the complementarities and substitution patterns we highlight shed important light on the potential benefits and tradeoffs of promoting equitable access to care while successfully directing patients to appropriate sources of medical expertise. Doing so may reduce barriers to accessing care while simultaneously having positive impacts on wait times for hospital care for more acute health events.

References

Ahmed, Salim, Nusrat S Shommu, Nahid Rumana, Gary RS Barron, Sonja Wicklum, and Tanvir C Turin, "Barriers to access of primary healthcare by immigrant populations in Canada: a literature review," *Journal of immigrant and minority health*, 2016, *18*, 1522–1540.

Alexander, Diane and Molly Schnell, "Just what the nurse practitioner ordered: Independent prescriptive authority and population mental health," *Journal of Health Economics*, 2019, *66*, 145–162.

_ **and** _ , "The Impacts of Physician Payments on Patient Access, Use, and Health," *American Economic Journal: Applied Economics*, July 2024, *16* (3), 142–177.

Allen, Lindsay, Janet R Cummings, and Jason M Hockenberry, "The impact of urgent care centers on nonemergent emergency department visits," *Health services research*, 2021, *56* (4), 721–730.

Alsabbagh, Mhd Wasem and Sherilyn KD Houle, "The proportion, conditions, and predictors of emergency department visits that can be potentially managed by pharmacists with expanded scope of practice," *Research in Social and Administrative Pharmacy*, 2019, *15* (11), 1289–1297.

Anderson, David M., Alex Hoagland, and Ed Zhu, "Medical Bill Shock and Imperfect Moral Hazard," *Journal of Public Economics*, 2024, *236*, 105152.

Anyosa, Renzo Calderon and Geoffrey Anderson, "Exploring Intersectionality of Race and Newcomer Status with Material and Social Deprivation in Ontario Census Data: A Comparative Analysis of the ON-MARG Deprivation Index and Machine-Learning Derived Demographic Clusters," November 2024.

Baicker, Katherine, Sendhil Mullainathan, and Joshua Schwartzstein, "Behavioral Hazard in Health Insurance," *The Quarterly Journal of Economics*, 2015, *130* (4), 1623–1667.

Bivand, Roger, Werner G Müller, and Markus Reder, "Power calculations for global and local Moran's I," *Computational Statistics & Data Analysis*, 2009, *53* (8), 2859–2872.

Bruni, Matteo Lippi, Irene Mammi, and Cristina Ugolini, "Does the extension of primary care practice opening hours reduce the use of emergency services?," *Journal of Health Economics*, 2016, *50*, 144–155.

Busch, Alexander and Daniele Girardi, "lpdid: The STATA Command for A Local Projections Approach to Difference-in-Differences Event Studies," Software November 2023.

Callaway, Brantly and Pedro H. C. Sant'Anna, "Difference-in-Differences with Multiple Time Periods," *Journal of Econometrics*, December 2021, *225* (2), 200–230.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer, "The Effect of Minimum Wages on Low-Wage Jobs," *The Quarterly Journal of Economics*, 2019, *134* (3), 1405–1454.

Chandra, Amitabh, Pragya Kakani, and Adam Sacarny, "Hospital Allocation and Racial Disparities in Health Care," *The Review of Economics and Statistics*, July 2024, *106* (4), 924–937.

Cookson, Richard, Carol Propper, Miqdad Asaria, and Rosalind Raine, "Socio-Economic Inequalities in Health Care in England," *Fiscal Studies*, September 2016, *37* (3-4), 371–403.

Corporation, Advan Research, "Weekly Patterns Data," 2024.

de Chaisemartin, Clément, Xavier D'Haultfoeuille, Félix Pasquier, Doulo Sow, and Gonzalo Vazquez-Bare, "Difference-in-Differences Estimators for Treatments Continuously Distributed at Every Period," July 2024.

Decker, Sandra L., "In 2011 Nearly One-Third Of Physicians Said They Would Not Accept New Medicaid Patients, But Rising Fees May Help," *Health Affairs*, August 2012, *31* (8), 1673–1679.

Dube, Arindrajit, Daniele Girardi, Oscar Jorda, and Alan Taylor, "A Local Projections Approach to Difference-in-Differences Event Studies," *Federal Reserve Bank of San Francisco, Working Paper Series*, April 2023, *2023*, 01–56.

Einav, Liran, Amy Finkelstein, Stephen P. Ryan, Paul Schrimpf, and Mark R. Cullen, "Selection on Moral Hazard in Health Insurance," *American Economic Review*, 2013, *103* (1), 178–219.

_ and _ , "Moral Hazard in Health Insurance: What We Know and How We Know It," *Journal of the European Economic Association*, 2018, *16* (4), 957–982.

Fadlon, Itzik, Tal Gross, Alex Hoagland, and Timothy J. Layton, "The Protective Effects of a Healthy Spouse: Medicare as the Family Member of Last Resort," 2024.

Finkelstein, Daniel M., Jessica F. Harding, Diane Paulsell, Brittany English, Gina R. Hijjawi, and Jennifer Ng'andu, "Economic Well-Being And Health: The Role Of Income Support Programs In Promoting Health And Advancing Health Equity," *Health Affairs*, December 2022, *41* (12), 1700–1706.

Gross, Tal, Timothy J. Layton, and Daniel Prinz, "The Liquidity Sensitivity of Healthcare Consumption: Evidence from Social Security Payments," *American Economic Review: Insights*, 2022, *4* (2), 175–190.

Grossman, Daniel, Arijit Ray, and Allyssa Wadsworth, "The pharmacist will see you now: Pharmacist prescribed contraceptives and fertility rates," *Journal of Health Economics*, 2025, *100*, 102942.

Guo, Jiapei, Angela E Kilby, and Mindy S Marks, "The impact of scope-of-practice restrictions on access to medical care," *Journal of Health Economics*, 2024, *94*, 102844.

Hendren, Nathaniel, "The Policy Elasticity," *Tax Policy and the Economy*, January 2016, *30* (1), 51–89.

Hoagland, Alex, "Innovations and Inequities in Access to Medical Services," 2024.

_ , "An Ounce of Prevention or a Pound of Cure? The Value of Health Risk Information," *Working Paper*, 2024.

_ **and Sarah Kipping**, "Challenges in Promoting Health Equity and Reducing Disparities in Access across New and Established Technologies," *Canadian Journal of Cardiology*, 2024.

_ **, Olivia Yu, and Michal Hornỳ**, "Inequities in Unexpected Cost-Sharing for Preventive Care in the United States," *American Journal of Preventive Medicine*, 2024.

_ **,** _ **, and** _ , "Social Determinants of Health and Insurance Claim Denials for Preventive Care," *JAMA Network Open*, 2024, *7* (9), e2433316–e2433316.

Hou, Young, Christopher Poliquin, Mariko Sakakibara, and Marco Testoni, "Using Smartphone Location Data for Strategy Research," *Available at SSRN 4796679*, 2024.

Huang, Wei-Lun, Shu-Lang Liao, Hsueh-Ling Huang, Pei-Ju Tsai, Hsin-Hsun Huang, Chien-Yu Lu, and Wei-Sho Ho, "Impact of post-COVID-19 changes in outpatient chronic patients' healthcare-seeking behaviors on medical utilization and health outcomes," *Health Economics Review*, September 2024, *14* (1), 71.

Isabelle, Maripier and Mark Stabile, "Local Inequality and Departures from Publicly Provided Health Care in Canada," *Health Economics*, 2020, *29* (9), 1031–1047.

Kakanai, Pragya, Simone Matecna, and Amitabh Chandra, "Expert patients' use of avoidable health are," 2025. NBER Working Paper.

Martin, Danielle, Ashley P. Miller, Amélie Quesnel-Vallée, Nadine R. Caron, Bilkis Vissandjée, and Gregory P. Marchildon, "Canada's Universal Health-Care System: Achieving Its Potential," *The Lancet*, 2018, *391* (10131), 1718–1735.

Matheson, Flora I, James R Dunn, Katherine LW Smith, Rahim Moineddin, and Richard H Glazier, "Development of the Canadian Marginalization Index: a new tool for the study of inequality," *Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique*, 2012, pp. S12–S16.

McCarthy, Ian M. and Mehul V. Raval, "Price Spillovers and Specialization in Health Care: The Case of Children's Hospitals," *Health Economics*, 2023, *32* (10), 2408–2423.

McIntyre, Di and Gavin Mooney, *The Economics of Health Equity.* 2007.

McMichael, Benjamin J, "Supply-side health policy: The impact of scope-of-practice laws on mortality," *Journal of Public Economics*, 2023, *222*, 104901.

Nakhla, Nardine and Anastasia Shiamptanis, "Pharmacist Prescribing for Minor Ailments Service Development: The Experience in Ontario," *Pharmacy*, 2021, *9* (2).

_ , Valerie Leung, and Kevin L. Schwartz, "Expansion of pharmacist prescribing could help improve health care access and quality," *Canadian Family Physician*, 2024, *70* (7-8), 441–443.

Ouyang, Huiyin, Junyan Wang, Zhankun Sun, and Eddy Lang, "The impact of emergency department crowding on admission decisions and patient outcomes," *The American journal of emergency medicine*, 2022, *51*, 163–168.

Propper, Carol, "Socio-Economic Inequality in the Distribution of Health Care in the UK," *Oxford Open Economics*, 2024, *3* (Supplement_1), i577–i581.

Pukhov, Olexiy, Alex Hoagland, and Paul Grootendorst, "Pharmacy Reimbursement in Ontario," 2025.

Riley, Wayne J, "Health disparities: gaps in access, quality and affordability of medical care," *Transactions of the American Clinical and Climatological Association*, 2012, *123*, 167.

Roth, Jonathan, Pedro H. C. Sant'Anna, Alyssa Bilinski, and John Poe, "What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature - ScienceDirect," *Journal of Econometrics*, 2023, *235* (2), 2218–2244.

Samman, Karol, Cathie-Kim Le, Brett Burstein, Salma Rehimini, Anthony Grenier, Claudia Bertrand-Bureau, Myriam Mallet, David Simonyan, and Simon Berthelot, "Parents' perspective on pediatric emergency department visits for low-acuity conditions before and during the COVID-19 pandemic: a cross-sectional bicentric study," *CJEM*, January 2024, *26* (1), 31–39.

Schennach, Susanne M., "Recent Advances in the Measurement Error Literature," *Annual Review of Economics*, 2016, *8*, 341–377.

Sun, Liyang and Sarah Abraham, "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects," *Journal of Econometrics*, 2020, p. 53.

Suri, Abhinav, James Quinn, Raymond R Balise, Daniel J Feaster, Nabila El-Bassel, and Andrew G Rundle, "Disadvantaged groups have greater spatial access to pharmacies in New York state," *BMC health services research*, 2024, *24* (1), 471.

Traczynski, Jeffrey and Victoria Udalova, "Nurse practitioner independence, health care utilization, and health outcomes," *Journal of health economics*, 2018, *58*, 90–109.

Tsergas, Nick, "Pharmacists Say Power to Prescribe Often Comes with Pressure to Prescribe, and Generate Profits," *Toronto Star*, November 2024.

Wang, Lu and Sasha Ramroop, "Geographic disparities in accessing community pharmacies among vulnerable populations in the Greater Toronto Area," *Canadian Journal of Public Health = Revue Canadienne de Santé Publique*, August 2018, *109* (5-6), 821–832.

Wenger, Lisa M., Meagen Rosenthal, Jane Pearson Sharpe, and Nancy Waite, "Confronting Inequities: A Scoping Review of the Literature on Pharmacist Practice and Health-Related Disparities," *Research in Social and Administrative Pharmacy*, March 2016, *12* (2), 175–217.

Wing, Coady, Seth M. Freedman, and Alex Hollingsworth, "Stacked Difference-in-Differences," Technical Report, National Bureau of Economic Research 2024.

Zeltzer, Dan, Liran Einav, Avichai Chasid, and Ran D Balicer, "Supply-side variation in the use of emergency departments," *Journal of Health Economics*, 2021, *78*, 102453.

A Appendix Tables and Figures

Expansion Date	Ailments
January 1, 2023	- Allergic Rhinitis - Candidal Stomatitis (Oral Thrush) - Conjunctivitis (Bacterial, Allergic, Viral) - Dermatitis (Atopic, Eczema, Allergic, Contact) - Dysmenorrhea - Gastroesophageal Reflux Disease (GERD) - Hemorrhoids - Herpes Labialis (Cold Sores) - Impetigo - Insect Bites/Urticaria - Musculoskeletal Sprains and Strains - Tick Bites - Uncomplicated Urinary Tract Infections
October 1, 2023	- Acne (Mild) - Aphthous Ulcers (Canker Sores) - Diaper Dermatitis - Nausea and Vomiting in Pregnancy - Pinworms and Threadworms - Vulvovaginal Candidiasis (Yeast Infections)

Appendix Table A1. Minor Ailments Affected by 2023 Ontario SOP Expansions

Notes: Table lists the minor ailments pharmacists can prescribe for in Ontario as of January 1 and October 1, 2023.

Appendix Table A2. Baseline levels of access per 1,000 population, by ON-Marg Quantiles

	Least Disadvantaged Q1	Q2	Q3	Most Disadvantaged Q4	Q5
Panel A: Average Total Monthly Visitors to Pharmacies (SD)					
Material Resources	23.23	23.68	15.59	15.02	10.25
	(58.80)	(106.67)	(32.26)	(35.35)	(21.94)
Age and Labor Force	23.92	18.26	13.39	12.35	11.98
	(91.57)	(52.12)	(34.23)	(27.36)	(24.97)
Household Dwellings	19.38	14.92	12.98	11.63	19.82
	(29.66)	(30.45)	(35.35)	(26.59)	(76.29)
Racialized and Immigrant Populations	6.00	8.55	11.38	15.52	29.19
	(10.59)	(14.68)	(26.76)	(32.00)	(93.65)
Panel B: Average Total Monthly Visitors to Hospitals (SD)					
Material Resources	26.41	18.84	18.17	11.33	11.88
	(63.75)	(38.57)	(53.47)	(22.18)	(25.15)
Age and Labor Force	26.00	11.16	14.15	15.53	15.43
	(60.06)	(18.22)	(48.79)	(34.16)	(34.58)
Household Dwellings	19.23	14.67	9.36	14.66	19.11
	(40.39)	(28.32)	(17.80)	(36.22)	(49.42)
Racialized and Immigrant Populations	5.30	13.52	12.40	13.38	28.18
	(6.83)	(23.51)	(34.89)	(27.20)	(64.71)
Panel C: Average Total Monthly Visitors to Outpatient Facilities (SD)					
Material Resources	22.45	14.45	9.46	8.96	7.54
	(68.52)	(63.68)	(21.35)	(22.00)	(19.98)
Age and Labor Force	22.81	8.82	10.08	7.68	11.78
	(80.90)	(21.25)	(27.73)	(20.40)	(32.54)
Household Dwellings	10.12	8.51	6.34	7.51	17.79
	(20.26)	(18.98)	(15.15)	(22.01)	(61.20)
Racialized and Immigrant Populations	2.88	4.64	8.86	12.97	23.21
	(8.40)	(10.38)	(25.89)	(38.84)	(73.46)

Notes: This table summarizes utilization of pharmacy, hospital, and outpatient foot traffic prior to the SOP expansion. Baseline access is measured as the average monthly foot traffic per 1,000 population at the DA-level. DAs are stratified based on their reported quantiles of marginalization using the ON-Marg index. Averages and standard deviations are shown for each of the three outcomes.

Appendix Table A3. Robustness in Primary Specification

	(1) Primary Specification	(2) Without Visit Normalization	(3) Without Synthetic Visit Counts	(4) Unique Visitors
Pooled Post-Expansion Effect	0.159***	0.160***	0.165***	0.165***
	(0.0405)	(0.0405)	(0.0411)	(0.0395)
Pharmacy FEs	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓
N	306,022	306,022	295,865	306,022

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the weekly level, averaged over a month. Standard errors are clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. The primary specification is presented in column (1). Columns (2) through (4) indicate alternative specifications including measuring the outcome in raw visit counts without Advan normalization; dropping pharmacy-weeks where the visit count was synthetically imputed; and measuring the outcome in unique visitors rather than total visit counts. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Table A4. Heterogeneous Effects of SOP Expansion on Distance Traveled to Pharmacies

	Least Disadvantaged				Most Disadvantaged
	Q1	Q2	Q3	Q4	Q5
Outcome: Median Distance Traveled to Pharmacies (km)					
Material Resources	-5.01***	-2.33*	-2.37*	-1.31	-3.82***
	(1.204)	(1.119)	(1.160)	(1.029)	(0.890)
Age and Labor Force	-5.46***	-1.99	-1.59	-0.53	-3.51***
	(0.981)	(1.091)	(1.150)	(1.229)	(0.929)
Household Dwellings	-0.87	-0.44	-2.63*	-1.16	-5.01***
	(1.598)	(1.463)	(1.279)	(0.961)	(0.779)
Racialized and Immigrant Populations	2.51	-1.25	-1.17	-3.63***	-6.77***
	(1.378)	(1.124)	(1.082)	(0.971)	(0.908)
Pharmacy FEs	✓	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓	✓

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor's home), measured in kilometers. Standard errors are clustered at the province level. The average sample size across the 20 specifications is 92,317. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Appendix Figures A14 through A17 show corresponding event study figures.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Table A5. Robustness of Heterogeneous Treatment Effects, Limited to DAs with Similar Neighbor Marginalization

	Least Disadvantaged Q1	Q2	Q3	Q4	Most Disadvantaged Q5
Outcome: Log(Total Weekly Visitors to Pharmacies)					
Material Resources	0.07	0.14**	0.11*	0.07	0.22***
	(0.051)	(0.055)	(0.049)	(0.042)	(0.041)
Age and Labor Force	0.06	0.05	0.14**	0.24***	0.17***
	(0.047)	(0.047)	(0.046)	(0.054)	(0.042)
Household Dwellings	-0.22***	0.01	0.25***	0.22***	0.11***
	(0.075)	(0.066)	(0.059)	(0.040)	(0.034)
Racialized and Immigrant Populations	0.44***	0.24***	0.22***	0.03	-0.07
	(0.059)	(0.0345)	(0.046)	(0.038)	(0.049)
Pharmacy FEs	✓	✓	✓	✓	✓
Month of Year FEs	✓	✓	✓	✓	✓

Notes: Table presents pooled post-treatment estimates of the LP-DID treatment effects following the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the weekly level, averaged over a month. Standard errors are clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Here, the sample has been limited to only include pharmacies in DAs located in clusters of similar levels of marginalization. Clusters were defined using local Moran's I statistic, a local indicator of spatial association identifying clusters based on the ON-Marg index values. DAs were included if this statistic was statistically significant for at least 2 of the 4 measures of marginalization, reducing the sample size to 65,119 (24.3%) pharmacies in Ontario. Compare with Table 2.

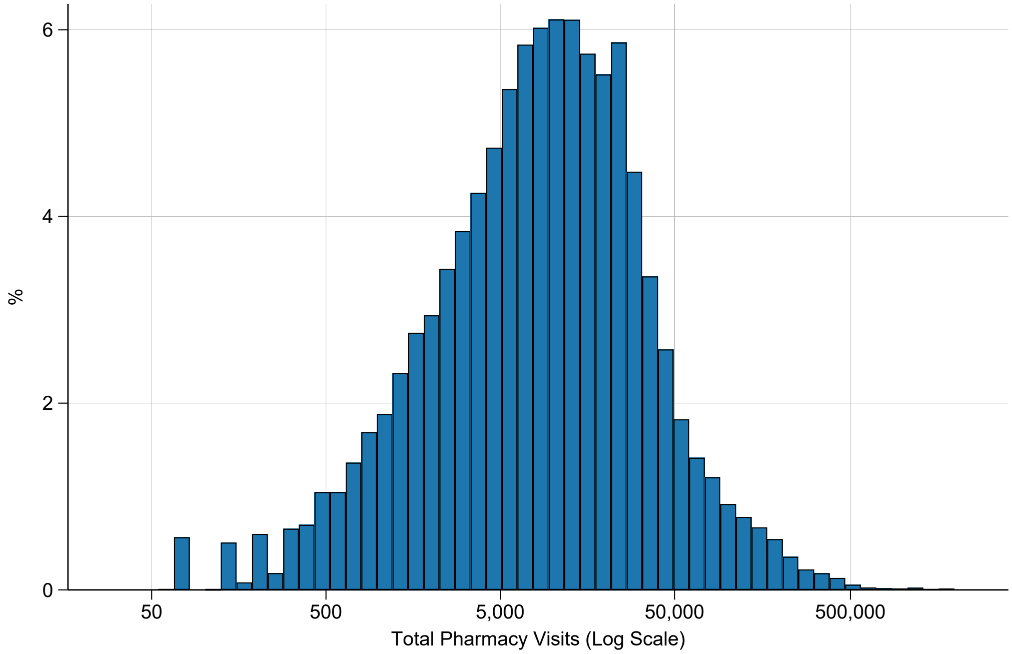
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Table A6. Back-of-the-Envelope Calculations Decomposing Hospital Traffic

	Pre-Policy	Post Policy		% Change
		Case 1	Case 2	
Total Foot Traffic	6,880	6,260	6,260	↓ 9%
Receiving Care	2,064	2,025	2,078	
Inpatient	310	310	310	0%
ED	681	599	652	↓ 12.1% or 4.5%
Outpatient	1,073	1,116	1,116	↑ 4%
Not Receiving Care	4,816	4,235	4,182	↓ 12.1% or 13.2%

Notes: Table presents back-of-the-envelope calculations decomposing the estimated 9% reduction in hospital foot traffic resulting from the SOP expansion (Figure 2). We show estimates here for the median pre-treatment hospital, which received 6,880 visits in an average month prior to the SOP expansion. We use provincial reports on hospital volumes to disaggregate total foot traffic into groups: roughly 30% of hospital foot traffic results in patient care while 70% do not ultimately receive care. Of those receiving care, 15% are admitted for any inpatient care, 33% are not admitted but receive ED care and 52% receive only outpatient care. We assume that the policy increases foot traffic for outpatient services by 4% and (conservatively) that the policy does not affect inpatient traffic. We then compare two cases: one where the average reduction in hospital traffic is homogeneous across visits for ED and those not receiving care, and one where the effect on ED foot traffic is capped at 4.3%, following prior literature (Alsabbagh and Houle, 2019). The "% Change" column indicates by how much total foot traffic in each category is estimated to change in both cases, resulting in the overall 9% change in total hospital foot traffic.

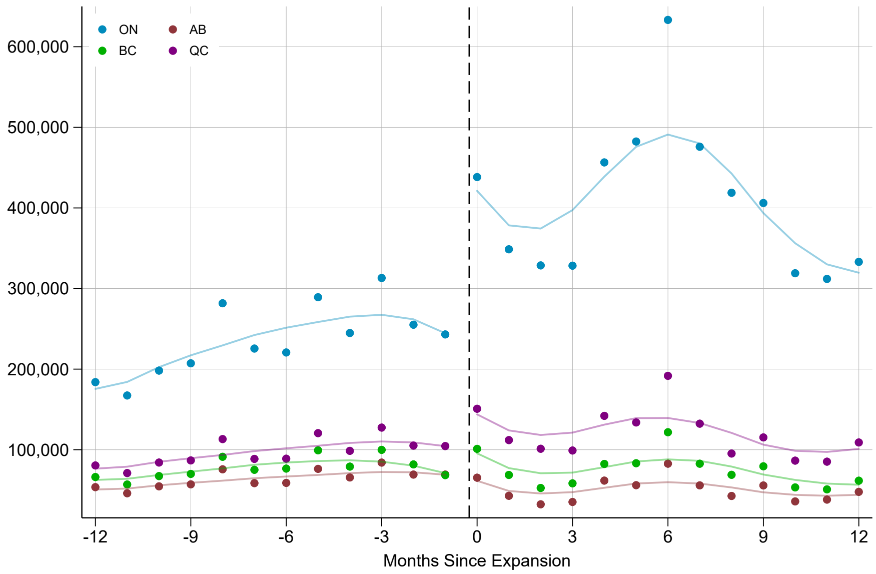
Appendix Figure A1. Distribution of Monthly Total Visits for Pharmacies, All Provinces



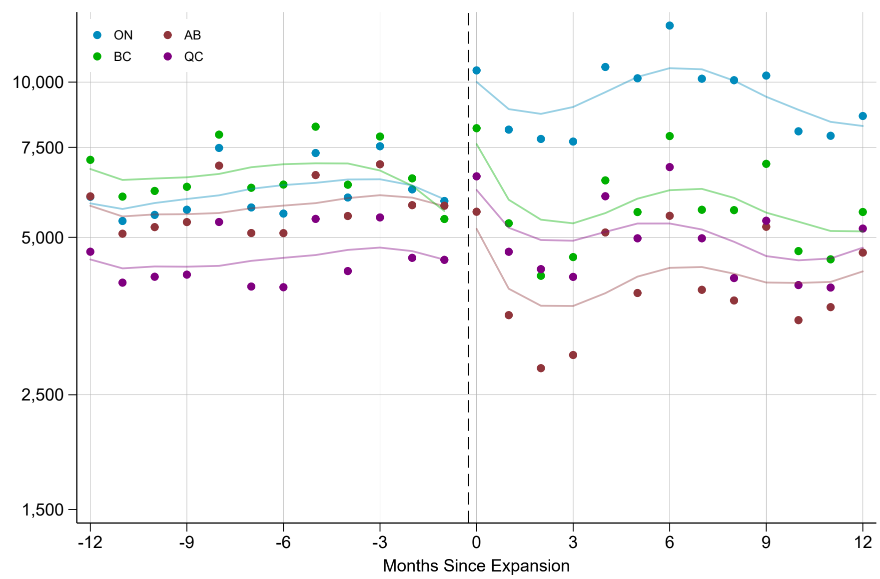
Notes: This figure plots the distribution of total monthly pharmacy visits across all pharmacy-weeks in the four provinces of our analytical sample.

Appendix Figure A2. Raw Data Variation, Pharmacy Foot Traffic

(a) Monthly Pharmacy Visits, Province Level

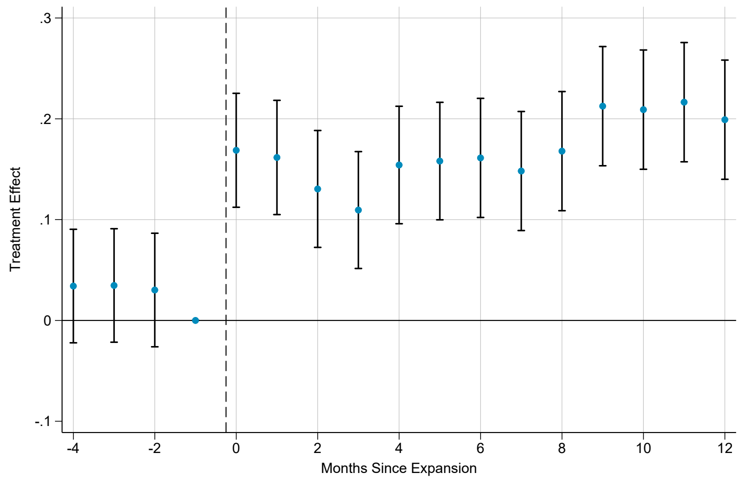


(b) Log(Monthly Pharmacy Visits), Pharmacy Level



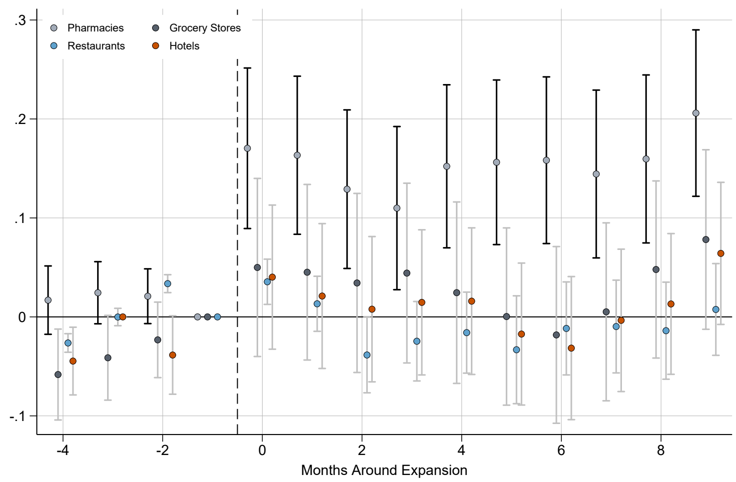
Notes: This figure plots monthly averages of the total visitors to pharmacies to show the variation in our raw data. Panel (a) aggregates visits to the province level and presents them as raw counts. Panel (b) follows our preferred specification, showing the average pharmacy-level visit count per week taken in logs and aggregated to the monthly level. Both figures show variation across the four provinces in the months around the SOP expansion in January 2023. Scatter plots indicate raw average levels at the province-month or pharmacy-month level, respectively; lines indicate smoothed trends using local nonlinear regression estimated separately before and after the policy expansion.

Appendix Figure A3. Robustness of Estimation to Traditional Two-way Fixed Effects



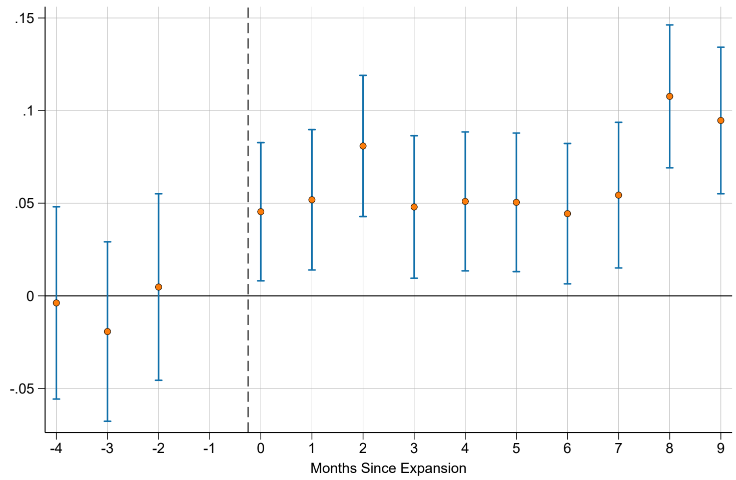
Notes: This figure plots estimates of the treatment effect on foot traffic tracking the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, estimation is performed using traditional two-way fixed effects rather than LP-DID estimation (compare with Figure 1). Error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A4. Effect of SOP Expansion on Foot Traffic to Other Sites of Interest



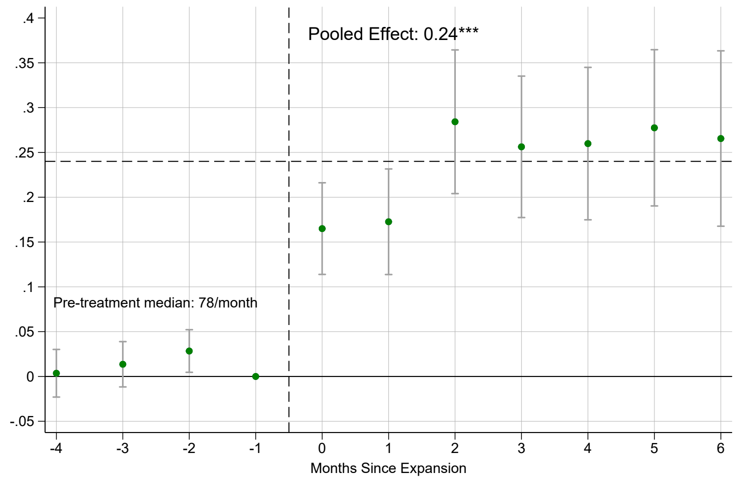
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level, compared to several alternative outcomes including visits to grocery stores, restaurants, and hotels. Sites of interest are identified using the relevant NAICS codes. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A5. Effect of SOP Expansion, Aggregated to Provincial Level



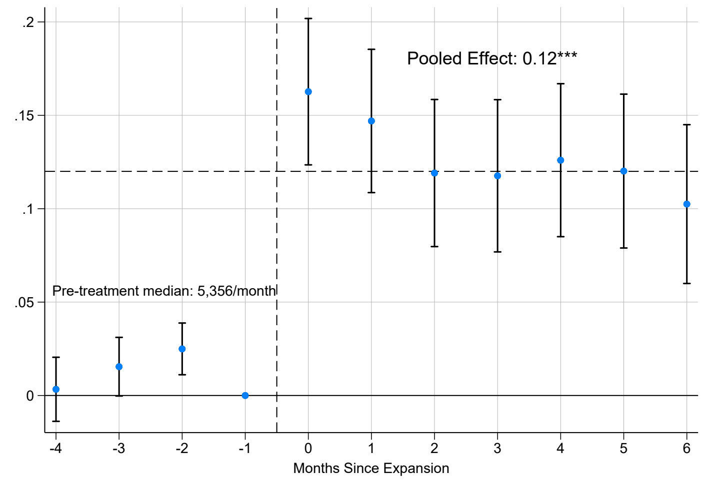
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies aggregated across the province-month. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A6. Effect of SOP Expansion on Raw Foot Traffic Counts to Pharmacies



Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, outcome is measured using only raw counts, not normalized to estimate actual visits. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

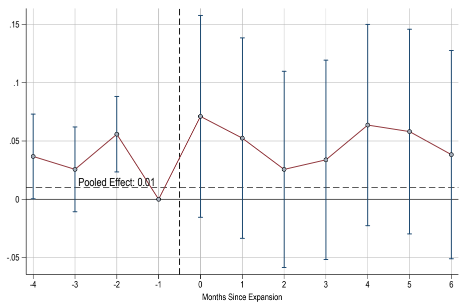
Appendix Figure A7. Estimated Treatment Effects Using Pharmacies that Entered and Exited During Sample Period



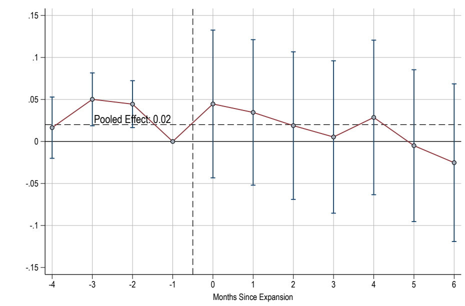
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, all pharmacies that enter the panel at any point are included in estimation, even if the pharmacy opened or closed during the analytical period. Compare with Figure 1. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A8. Effect of SOP Expansion on Pharmacy Foot Traffic, by Quantile of Material Resource Deprivation

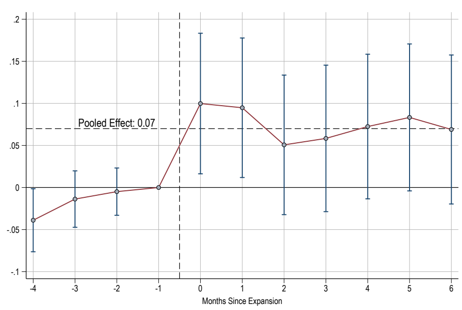
(a) Quantile 1 (Least Disadvantaged)



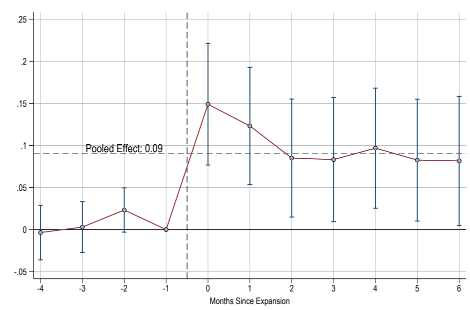
(b) Quantile 2



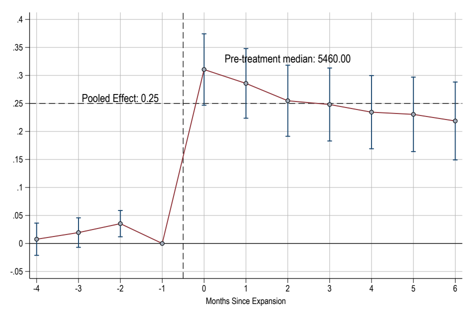
(c) Quantile 3



(d) Quantile 4



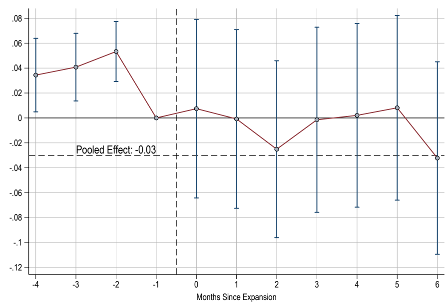
(e) Quantile 5 (Most Disadvantaged)



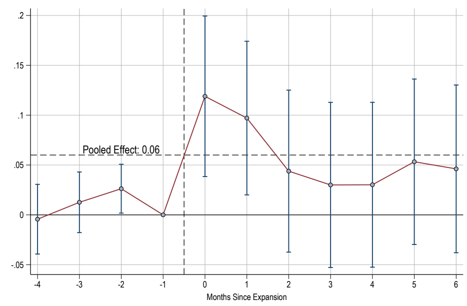
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "resource-based" marginalization from the ON-Marg. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table 2.

Appendix Figure A9. Effect of SOP Expansion on Pharmacy Foot Traffic, by Quantile of Age and Labor Force Deprivation

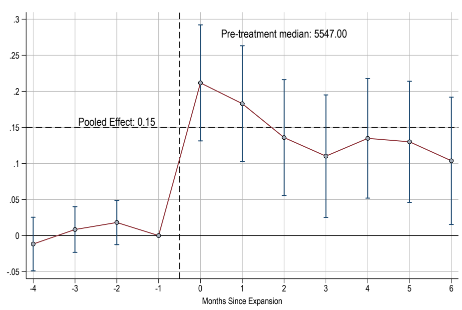
(a) Quantile 1 (Least Disadvantaged)



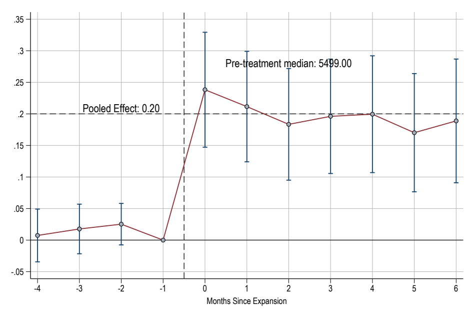
(b) Quantile 2



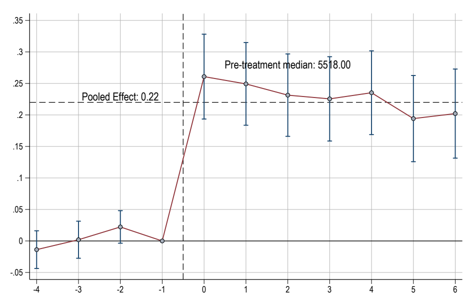
(c) Quantile 3



(d) Quantile 4



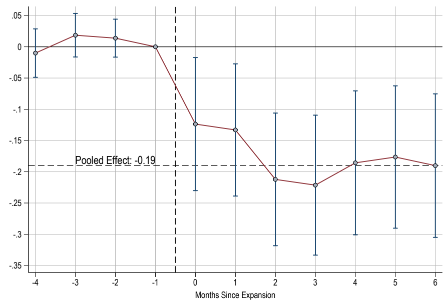
(e) Quantile 5 (Most Disadvantaged)



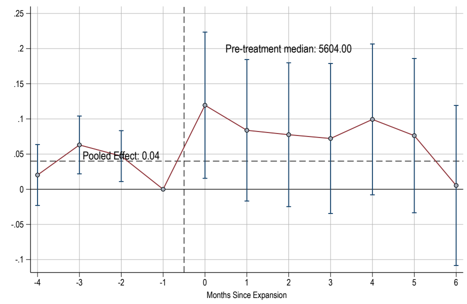
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "age and labour force-based" marginalization from the ON-Marg. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table 2.

Appendix Figure A10. Effect of SOP Expansion on Pharmacy Foot Traffic, by Quantile of Household Dwellings Deprivation

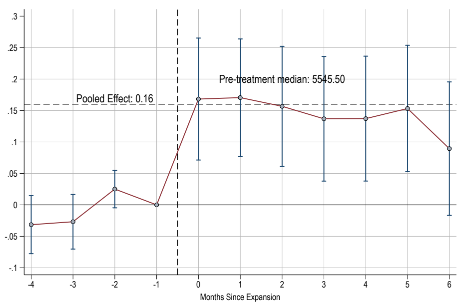
(a) Quantile 1 (Least Disadvantaged)



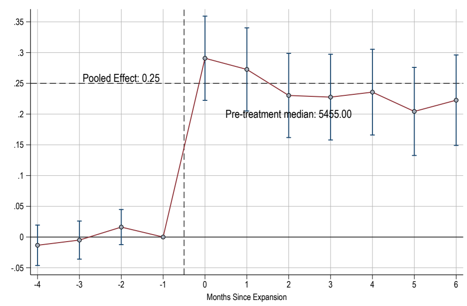
(b) Quantile 2



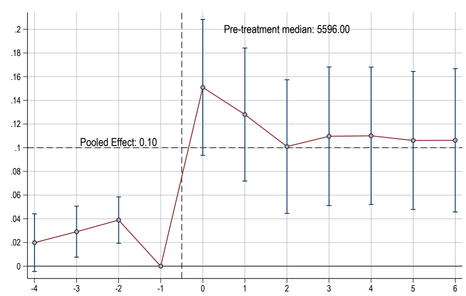
(c) Quantile 3



(d) Quantile 4



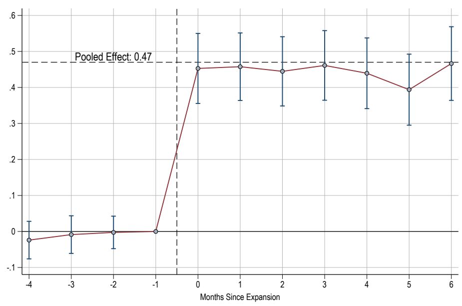
(e) Quantile 5 (Most Disadvantaged)



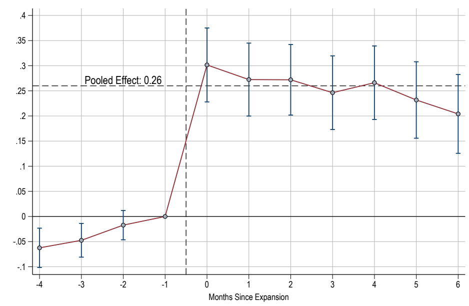
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "household dwellings-based" marginalization from the ON-Marg. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table 2.

Appendix Figure A11. Effect of SOP Expansion on Pharmacy Foot Traffic, by Quantile of Race and Newcomer-Based Deprivation

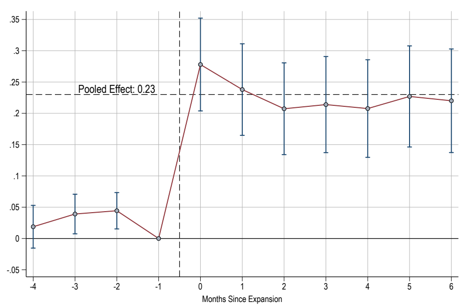
(a) Quantile 1 (Least Disadvantaged)



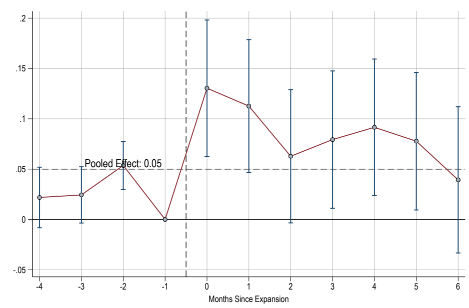
(b) Quantile 2



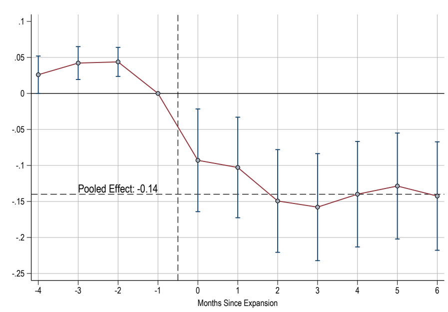
(c) Quantile 3



(d) Quantile 4

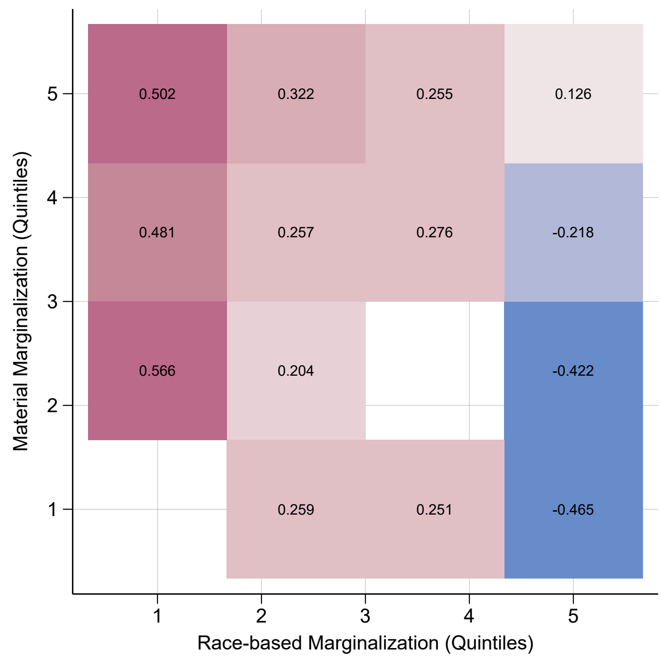


(e) Quantile 5 (Most Disadvantaged)



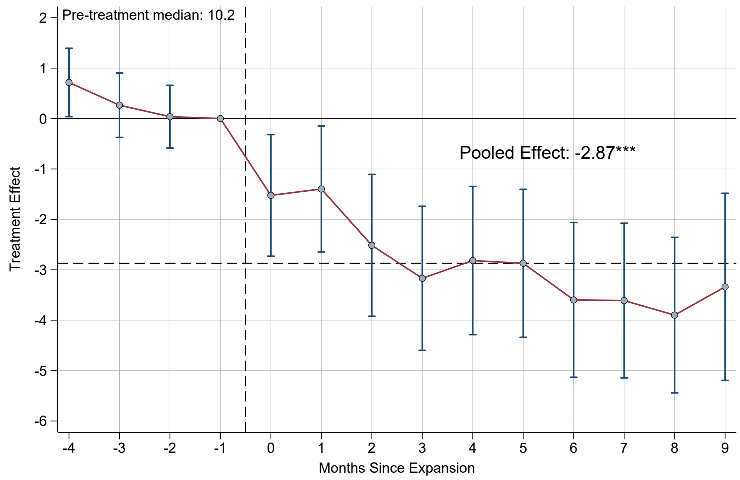
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "Race and Newcomer-Based" marginalization from the ON-Marg. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table 2.

Appendix Figure A12. Effect of SOP Expansion on Pharmacy Foot Traffic, by Material- and Race-Based Marginalization



Notes: This figure plots estimates of pooled post-treatment LP-DID effects of the SOP expansion by Ontario neighborhoods grouped according to both their material-based marginalization and marginalization based on racialized and newcomer populations. The outcome of interest is the natural logarithm of total visitors to pharmacies at the monthly level. Here, outcome is measured using only raw counts, not normalized to estimate actual visits. Only estimates significant at the 95-percent confidence level are shown in the heatmap. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects, and standard errors clustered at the province level.

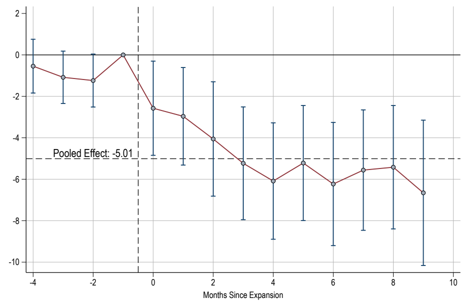
Appendix Figure A13. Effect of SOP Expansion on Median Distance Traveled Pharmacies



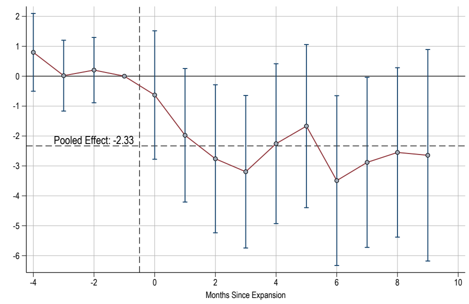
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. The outcome of interest is the median distance visitors to pharmacies traveled, measured in kilometers and averaged over a month. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects.

Appendix Figure A14. Effect of SOP Expansion on Distance Traveled to Pharmacies, by Quantile of Material Resource Deprivation

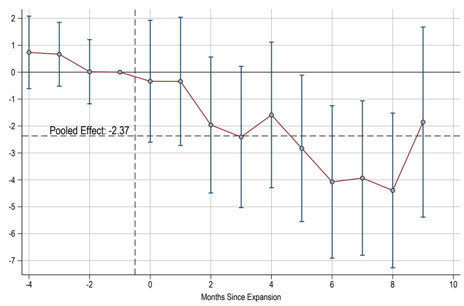
(a) Quantile 1 (Least Disadvantaged)



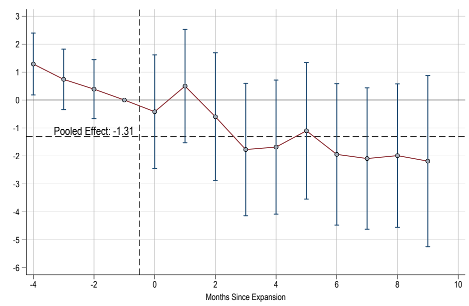
(b) Quantile 2



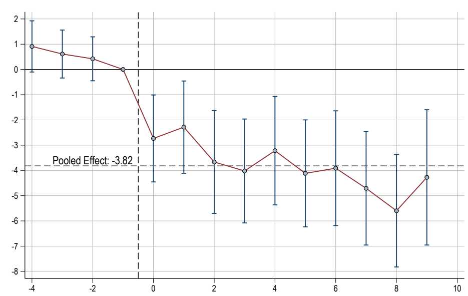
(c) Quantile 3



(d) Quantile 4



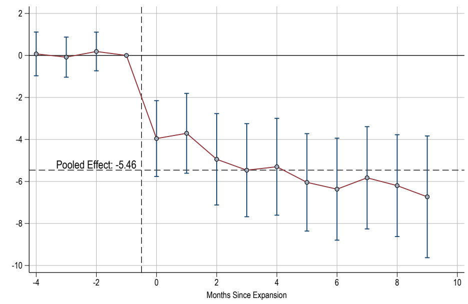
(e) Quantile 5 (Most Disadvantaged)



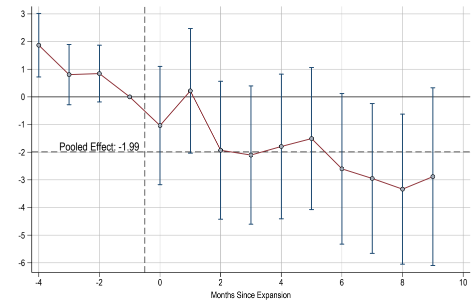
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of “resource-based” marginalization from the ON-Marg. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor’s home), measured in kilometers. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table A4.

Appendix Figure A15. Effect of SOP Expansion on Distance Traveled to Pharmacies, by Quantile of Age and Labor Force Deprivation

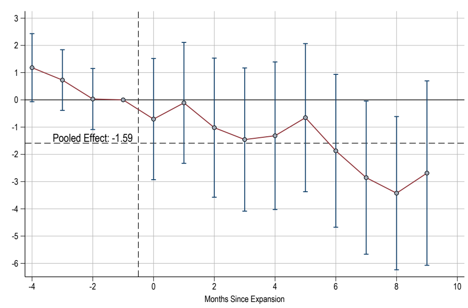
(a) Quantile 1 (Least Disadvantaged)



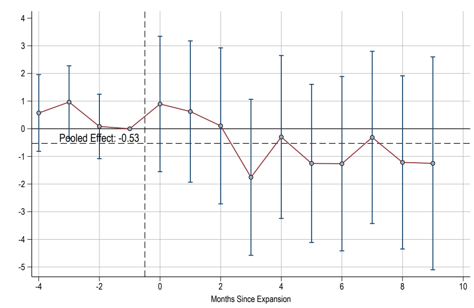
(b) Quantile 2



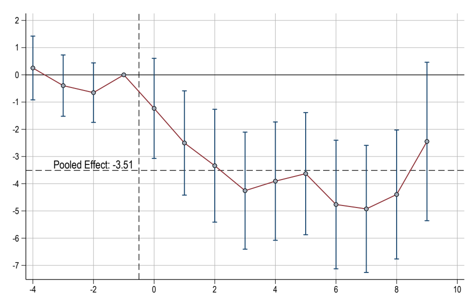
(c) Quantile 3



(d) Quantile 4



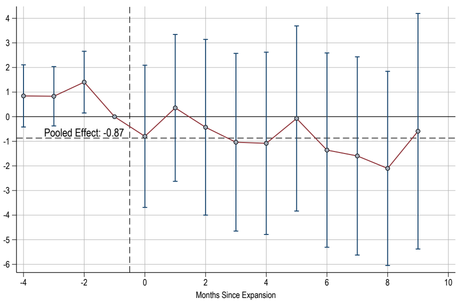
(e) Quantile 5 (Most Disadvantaged)



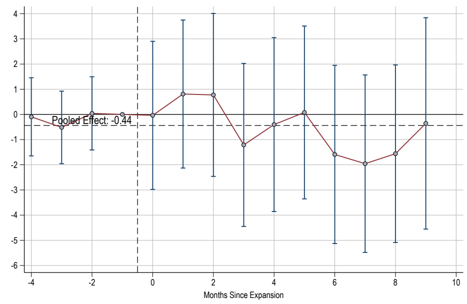
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "age and labour force-based" marginalization from the ON-Marg. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor's home), measured in kilometers. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table A4.

Appendix Figure A16. Effect of SOP Expansion on Distance Traveled to Pharmacies, by Quantile of Household Dwellings Deprivation

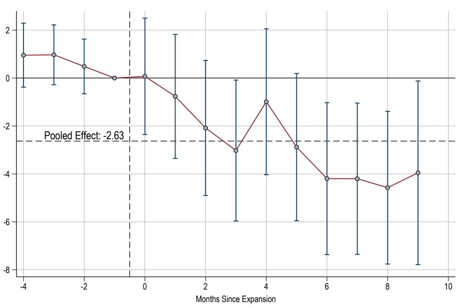
(a) Quantile 1 (Least Disadvantaged)



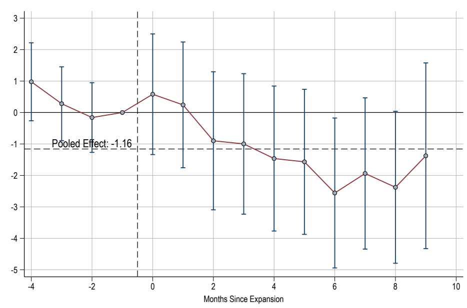
(b) Quantile 2



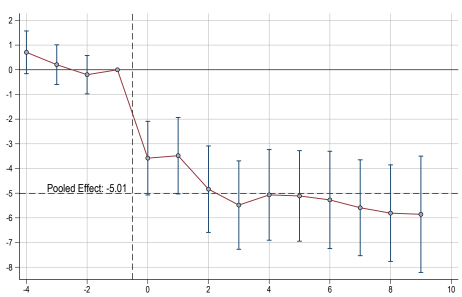
(c) Quantile 3



(d) Quantile 4



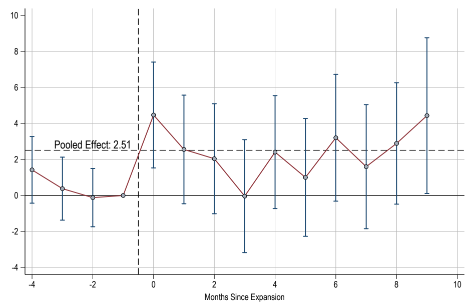
(e) Quantile 5 (Most Disadvantaged)



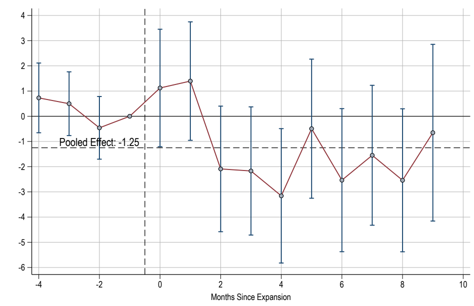
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of “household dwellings-based” marginalization from the ON-Marg. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor’s home), measured in kilometers. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table A4.

Appendix Figure A17. Effect of SOP Expansion on Distance Traveled to Pharmacies, by Quantile of Race and Newcomer-Based Deprivation

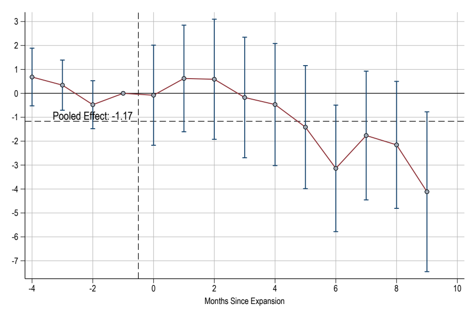
(a) Quantile 1 (Least Disadvantaged)



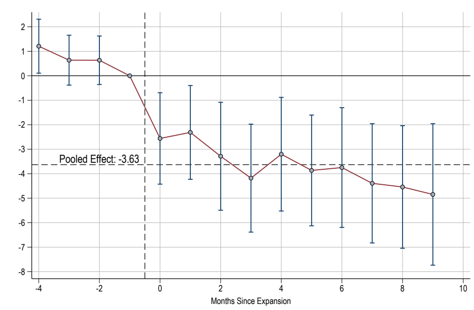
(b) Quantile 2



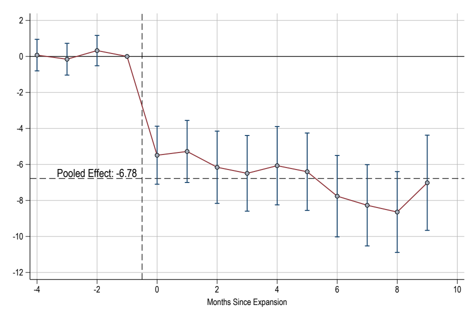
(c) Quantile 3



(d) Quantile 4



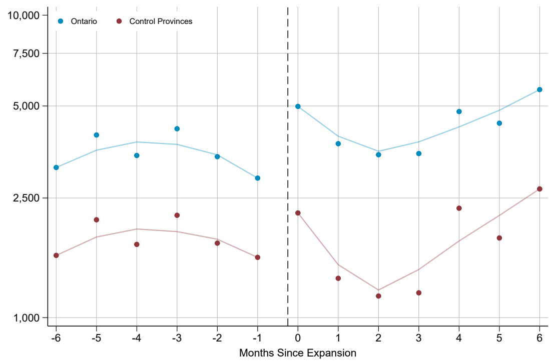
(e) Quantile 5 (Most Disadvantaged)



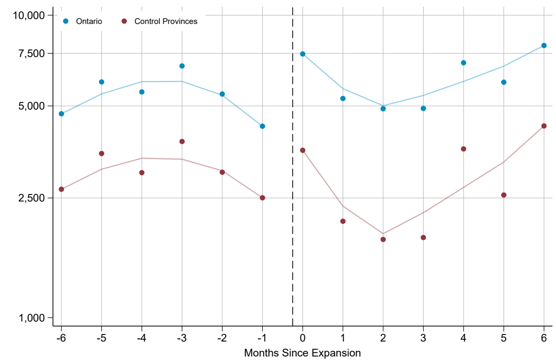
Notes: This figure plots estimates of the LP-DID coefficients that track the months since the SOP expansion in January 2023. Sample is stratified by neighborhoods (DAs) based on their assigned quintile of "Race and Newcomer-Based" marginalization from the ON-Marg. The outcome of interest is the median distance traveled to reach a pharmacy in a month (from a visitor's home), measured in kilometers. The error bars plot 95-percent confidence intervals based on standard errors clustered at the province level. The estimation includes calendar-time fixed effects and pharmacy-specific fixed effects. Compare with pooled estimates presented in Table A4.

Appendix Figure A18. Raw Data Variation, Foot Traffic to Medical Institutions

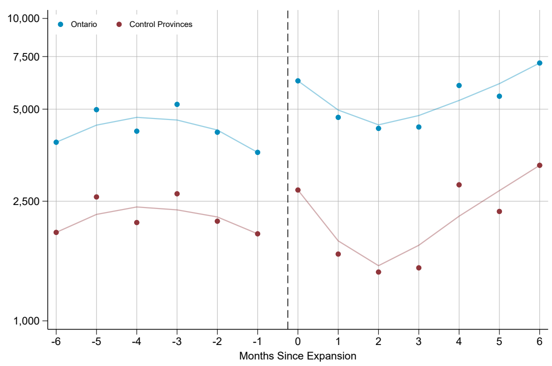
(a) All Non-Pharmacy Medical Visits



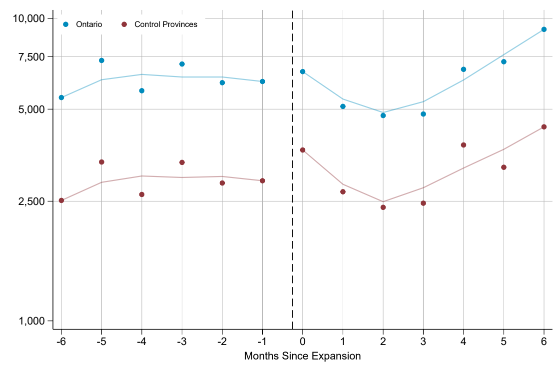
(b) Hospital & Emergency Visits



(c) Outpatient, Lab, & Walk-in Visits



(d) All Other Medical Visits



Notes: This figure plots the variation in the raw data for each of the outcomes shown in Figure 2. The outcome of interest in each panel is the natural logarithm of total visitors to non-pharmacy medical institutions, including all institutions, hospitals (including emergency departments and ambulatory surgical centers), outpatient clinics (including diagnostic labs, walk-in clinics, and urgent care centers), and all other medical visits (including skilled nursing facilities and dental care, among others). Scatter plots indicate raw average levels at the institution-month level, respectively; lines indicate smoothed trends using local nonlinear regression estimated separately before and after the policy expansion. Results in each panel are stratified by treatment province (Ontario) and control provinces to ease comparison. Compare with Appendix Figure A2.