

Bouncing Back: How Mothballing Curbs Prices*

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* Any views expressed here are solely those of the authors and do not represent those of the Bank of Canada, or the Bank of England or any of its committees.

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Overview

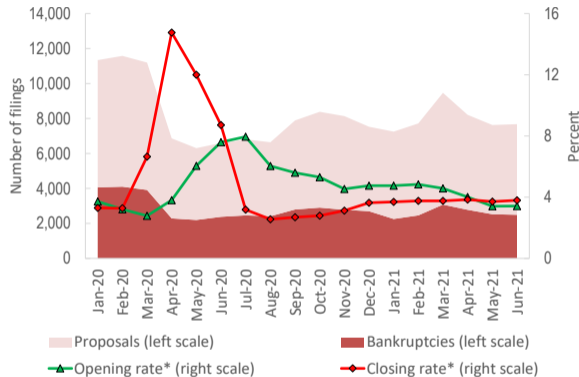
1. Business establishment dynamics using Google Places ([Duprey, Rigobon, Kotlicki, and Schnattinger, 2023](#))
 - ▶ Good way to measure temporary establishment closures in sectors catering directly to final consumers at higher than administrative frequency.
 - ▶ Temporary closures are important after a sharp drop in demand.

Overview

1. Business establishment dynamics using Google Places ([Duprey et al., 2023](#))
 - ▶ Good way to measure temporary establishment closures in sectors catering directly to final consumers at higher than administrative frequency.
 - ▶ Temporary closures are important after a sharp drop in demand.
2. Extend model of firm dynamics ([Hopenhayn, 1992](#)) with temporary closure option
 - ▶ Temporary closures allow for retaining productive capacity and by saving costs firms the cost of (re-)entry: higher supply means a lesser equilibrium price increase in a sector during the recovery from a demand drop.
 - ▶ Fiscal spending focused on keeping capacity may have counter-inflationary effects.

Business dynamics method

Measure business exit - When are firms actually operating?



* From Statistics Canada, for retail/food/accomodation sectors

Last obs: June 2021

Difficult to tell with administrative business data. Filings are usually annually and often not on time. Dormancy is hardly measured. Usually only short term or ad-hoc survey data (e.g. BICS in the UK).

Concept using data from Google Places



Data from:

- ▶ Owner: account
- ▶ Customer: reviews
- ▶ Google: google street
- ▶ Third party dataset

Figure: Around ASSA 2023 conference, New Orleans

Methodology

Search businesses with API given lat/long and a radius

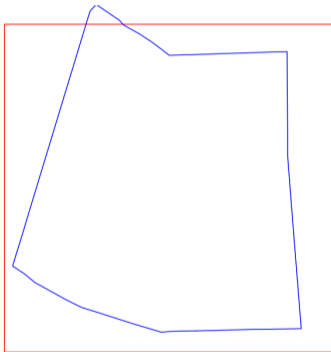



Figure: Bisection algorithm, search for "restaurants" around conference hotel

1. Start with lat/long of middle
2. Pick radius wide enough
3. 
- 4.

Methodology

Search businesses with API given lat/long and a radius

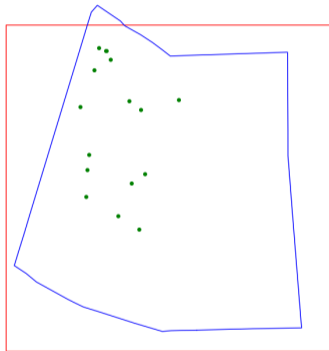


Figure: Bisection algorithm, search for "restaurants" around conference hotel

1. Start with lat/long of middle
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▶
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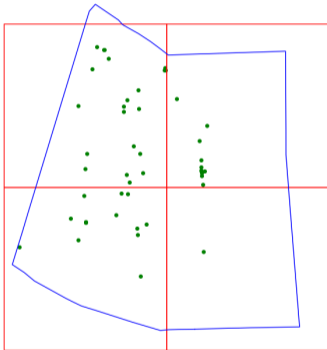


Figure: Bisection algorithm, search for "restaurants" around conference hotel

1. Start with lat/long of middle
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3. If exactly 20 results, extra results got censored!
 - ▶ Split area into four smaller areas; restart at step 1
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Methodology

Search businesses with API given lat/long and a radius

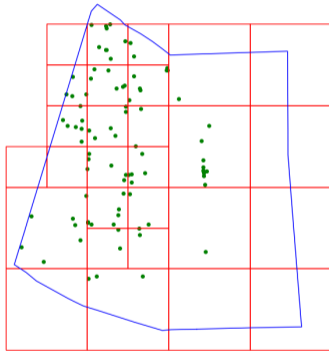


Figure: Bisection algorithm, search for "restaurants" around conference hotel

1. Start with lat/long of middle
2. Pick radius wide enough
3. If exactly 20 results, extra results got censored!
 - ▶ Split area into four smaller areas; restart at step 1
4. If less than 20 results, stop since got all businesses

Computing business openings and closures

Real-time data only (no historical data) but unique identifier `place_id`

- ▶ **Closures**=exit+temporary closures
 - ▶ Exit: repeat scrape and look for `place_id` that no longer exist in data
 - ▶ Temporary closures: when status is "temporarily closed"
- ▶ **Openings**=entry+reopening
 - ▶ Reopening: when status moves back to "operational"
 - ▶ Entry: Repeat scrape and look for new `place_id`

	operational in t	temporarily closed in t	non-existent in t
operational in t-1	Continuing	Temporary closure	Exit
temporarily closed in t-1	Reopening		
non-existent in t-1	Entry		

External validation

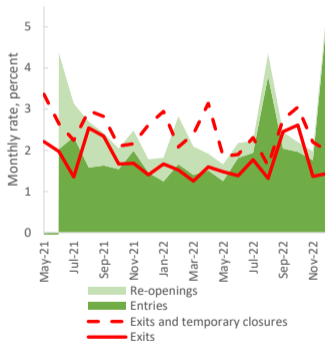
- ▶ **Entries:** validate openings in Ottawa/Gatineau over May-September 2021 by phone call/in person (200 food and retail businesses) (Duprey at al. 2022)
 - ▶ 71% of new entries in the food sector validated
 - ▶ Only 62% if count as new entries those with >10 reviews
 - ▶ 44% of new entries in the retail sector validated
- ▶ **Exits:** data for City of Westminster (UK) in Sept/Nov 2022 fuzzy matched to Companies House data (compulsory registry with fee) (Duprey at al. 2023)
 - ▶ 40% of 3300 cafes and restaurants from Google Places fuzzy matched
 - ▶ Most temporarily closed businesses are indeed still active
 - ▶ 10.5% temporarily closed in Google places
 - ▶ 9.4% in Google Places matched with Companies House

Business dynamics from Google Places - Results

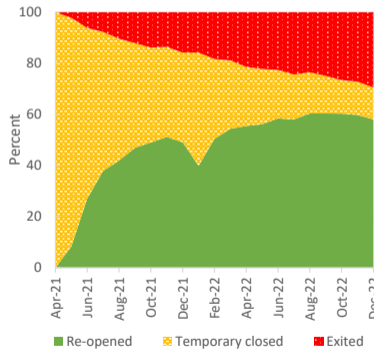
Captures well business dynamics

Toronto, Vancouver, Montreal, Ottawa: 26000/month

(a) Business opening (entry & re-opening) and closure (permanent & temporary) rates



(b) Status of businesses temporarily closed in April-May 2021



▶ Timely (no delay)

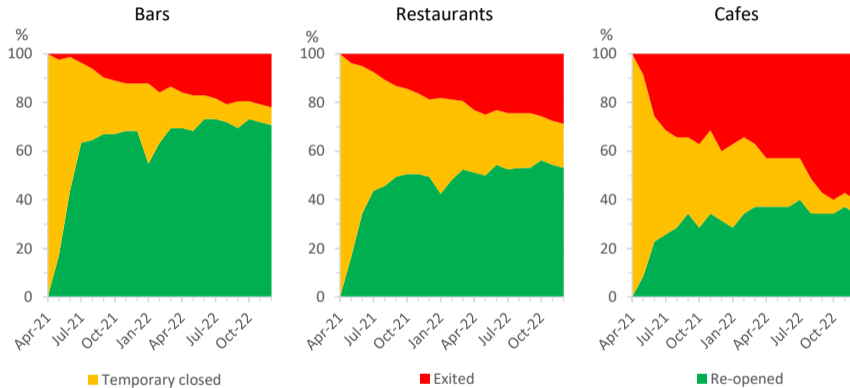
▶ Narrative of COVID

▶ Role of re-openings

▶ Captures Temporary closed

Figure: Evolution of business dynamics since the April 2021 lockdowns

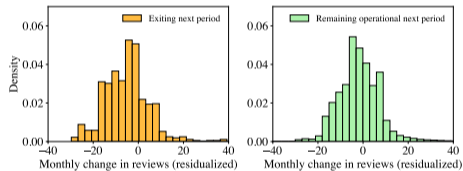
Temporary closures during April 2021 lockdown supported re-openings later



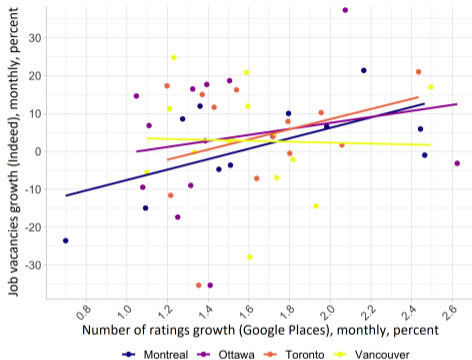
Status of businesses temporarily closed in April 2021 during lockdowns, after re-opening starts in May 2021

Establishments with higher entry costs are associated with more re-entries.

Sidenote: Ratings correlate with business continuation & employment



(a) More rated businesses remain in business



(b) More rated businesses hire more

Suggests online reviews and ratings matter for business dynamism

Suggestion: preventing closure of better rated businesses may support employment

$$\Delta \text{Reviews}_{it} = \text{IsFood}_i + \text{IsAccommodation}_i + \dots \\ \text{IsInToronto}_i + \text{IsInMontreal}_i + \dots \\ \mathbf{1}\{t = 1\} + \dots + \mathbf{1}\{t = 20\} + \varepsilon_{it}$$

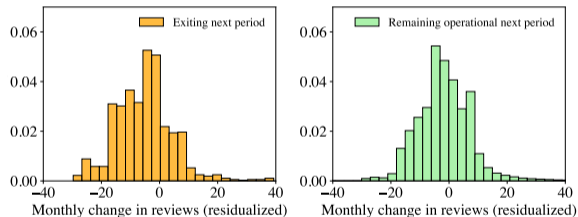


Figure: More rated businesses remain in business

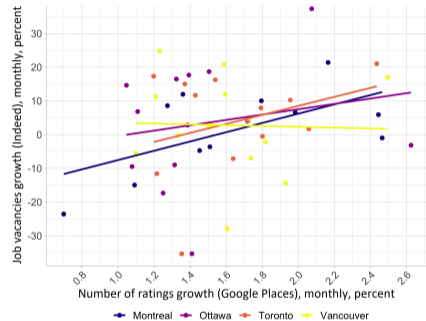
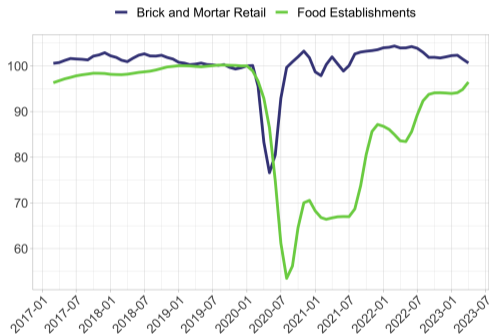


Figure: More rated businesses hire more

Suggests online reviews (unique to our dataset) matter for business dynamism

Our target series for the structural model

(a) Reduction in real consumer spending



(b) Temporary business closures

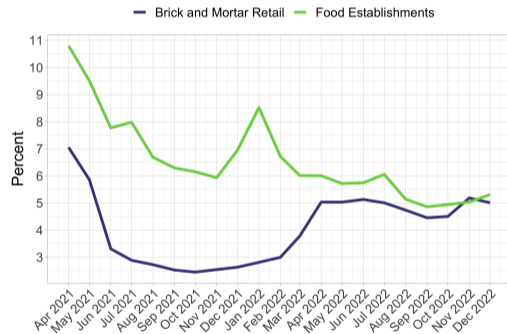


Figure: Consumer spending (Statistics Canada) and temporary closures around the pandemic

[Compare to StatsCan](#)

Model of firms dynamics

Model overview

- ▶ Extend a standard model ([Hopenhayn, 1992](#))
 - ▶ Add an option for businesses to temporarily close
 - ▶ Find the steady state equilibrium firm distribution
- ▶ Pandemic: use MIT shocks for demand ([Boppart, Krusell, and Mitman, 2018](#))
 - ▶ Demand follows normalized data (2020 to 2022) then back to long run
- ▶ Two counterfactuals:
 1. Temporary closure is impossible
 2. Temporary closure is subsidised

Firm problem

Firms are heterogeneous with individual productivity: $z' = \rho_z z + \epsilon_z$

Profit of the producing firm

$$\pi(p, z) = \max_n [p \exp(z) n^\alpha - wn - wf] \quad (1)$$

Firm value function: at beginning of period, given current productivity draw, existing firms decide to produce or not. At end of period, decide to exit or not.

$$V(p, z) = \underbrace{\max\{\pi(p, z); \overbrace{-(1 - \tau)wf}^{\text{Cost of temporary closure}}\}}_{\text{Temporary closure decision}} + \underbrace{\beta \max\{\mathbb{E}(V(p', z')); 0\}}_{\text{Permanent exit decision}} \quad (2)$$

p : prices, w : wages, n : labour input, f : fixed cost, τ : share of fixed cost saved when exiting temporarily

Aggregate firm dynamics

Cost firms have to pay to enter the market, with E the entry rate and steady state E^* :

$$C_e = \left(\frac{E}{E^*} \right)^\xi c_e w \quad (3)$$

Firms optimally enter until the expected value of entering equals the cost:

$$\left(\frac{E}{E^*} \right)^\xi c_e w_t = \beta \mathbb{E} (\Pi_0 V(p', z')) \quad (4)$$

Law of motion of all firms in all states M is (firms with $z > z_x$ exist):

$$M' = \Pi_{z'|z} \mathbb{I}_{z > z_x} M + \Pi_0 E \quad (5)$$

M is the vector of all firms ordered along discretized states ([Tauchen, 1986](#)). $\mathbb{I}_{z > z_x}$ is a $n_z \times n_z$ matrix where rows and columns representing z above z_x form an identity submatrix and all other values are 0

Supply, prices and labour demand

Total production: of all firms in the market Y (firms with $z > z_s$ produce while firms with $z_s > z > z_x$ exist but are temporarily closed):

$$Y = \int_{\underline{z}}^{\bar{z}} (\mathbb{I}_{z > z_s} M y^*) dz = \int_{z_s}^{\bar{z}} M z \left(\frac{\alpha p \exp(z)}{w} \right)^{\frac{\alpha}{1-\alpha}} dz \quad (6)$$

Equilibrium price: p in the market is given by the exogenous demand \bar{D} over supply (Hopenhayn, 1992; Hopenhayn and Rogerson, 1993)

$$p = \frac{\bar{D}}{Y} \quad (7)$$

Total labour demand:

$$L = \int_{z_s}^{\bar{z}} \mathbb{I}_{z > z_x} M n^*(z) dz + \int_{z_x}^{z_s} (\mathbb{I}_{z > z_x} - \mathbb{I}_{z > z_s}) M (1 - \tau) f dz + \frac{EC_e}{w} \quad (8)$$

Equilibrium wage: w is a negative function of labour demand $w(L)$, $\frac{\delta w}{\delta L} > 0$. Elasticity from the data.

Equilibrium firm distribution

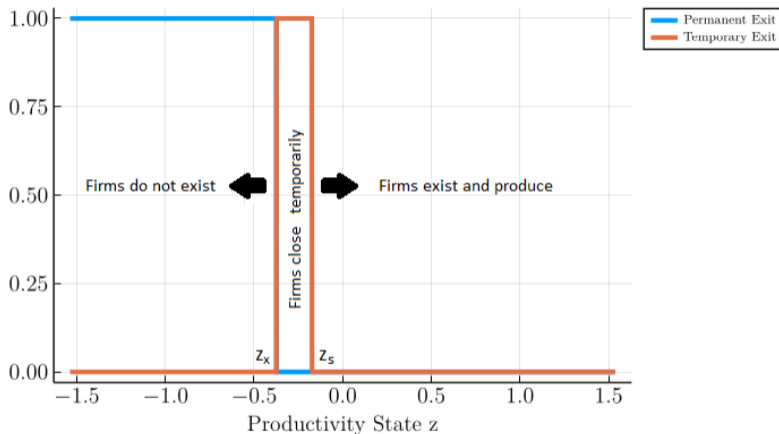


Figure: Firms status as a function of their productivity in steady state.

Calibration targets: exit rate 1% (StatsCan) and temporary closure rate of 5% (our dataset)

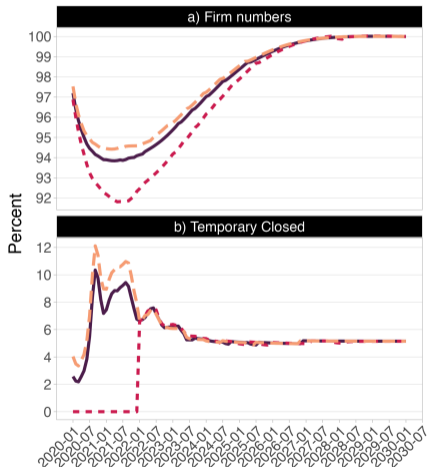
Model parameters

Parameter	Value	Description
β	0.9966	Monthly discount factor for an annual discount factor of 0.96
ψ_m	0	Idiosyncratic mean log productivity
ψ_ρ	0.95	Persistence of idiosyncratic firm productivity process
ψ_σ	0.2	Volatility of idiosyncratic firm productivity shocks
α	0.67	Exponent on labour
c_e	2.65	Equilibrium entry cost
c	0.2	Equilibrium fixed cost
ξ	2	Convex increase of entry cost
w	2	Wage
\bar{D}	100	Normalised equilibrium demand
τ – Share of the fixed cost that can be saved when temporarily shutting down		
	0.275	Baseline
	0	First counterfactual - No temporary closures
	0.3025	Second counterfactual - Subsidised temporary closures

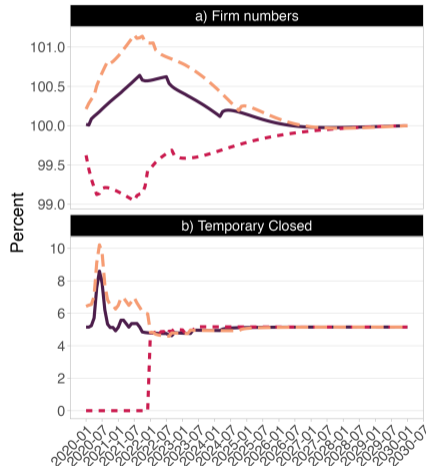
Table: Model calibration

Model simulation

Food serving establishments



Brick and mortar retail



Entries & Perm. Exit

Employment & Prices

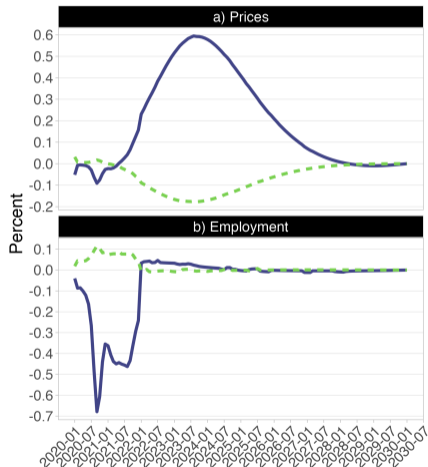
Baseline

No temporary exits

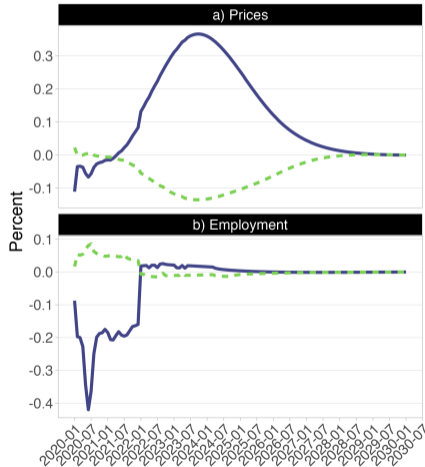
Subsidised temporary exits

Counterfactuals compared to baseline

Food serving establishments



Brick and mortar retail



Entries & Numbers

Perm. & Temp. Exits

No temporary exits
against baseline

Subsidised temporary
exits against baseline

Conclusion

Summary of the results

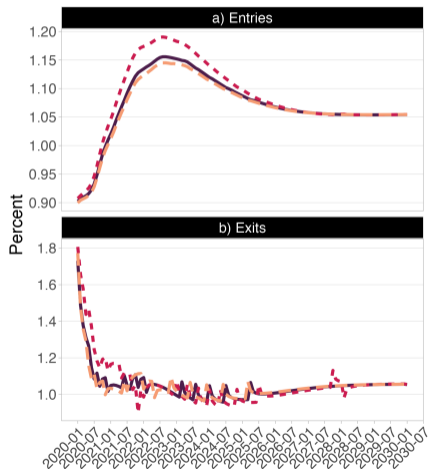
- ▶ "Business Mothballing", i.e. temporary closures increase the supply capacity after a negative demand shock (saves on entry frictions)
- ▶ Temporary closures help preserve employment demand
- ▶ Reduces price pressures in these sectors, estimated in Canada:
 - ▶ Food serving sector: $-30bpts$ each year in 2022 and 2023
 - ▶ Retail sector: $-18bpts$ each year in 2022 and 2023
- ▶ Fiscal support for temporary closures would and could have slowed inflation through this keeping capacity channel.

- BOPPART, T., P. KRUSELL, AND K. MITMAN (2018): “Exploiting MIT shocks in heterogeneous-agent economies: the impulse response as a numerical derivative,” *Journal of Economic Dynamics and Control*, 89, 68–92.
- DUPREY, T., D. E. RIGOBON, A. KOTLICKI, AND P. SCHNATTINGER (2023): “Timely Business Dynamics Using Google Places,” in *AEA Papers and Proceedings*, American Economic Association, vol. 113, 135–139.
- HOPENHAYN, H. AND R. ROGERSON (1993): “Job turnover and policy evaluation: A general equilibrium analysis,” *Journal of Political Economy*, 101, 915–938.
- HOPENHAYN, H. A. (1992): “Entry, exit, and firm dynamics in long run equilibrium,” *Econometrica: Journal of the Econometric Society*, 1127–1150.
- TAUCHEN, G. (1986): “Finite state markov-chain approximations to univariate and vector autoregressions,” *Economics letters*, 20, 177–181.

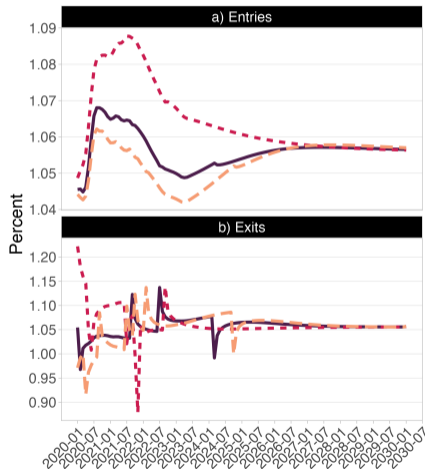
Appendix

Further Simulations 1

Food serving establishments



Brick and mortar retail


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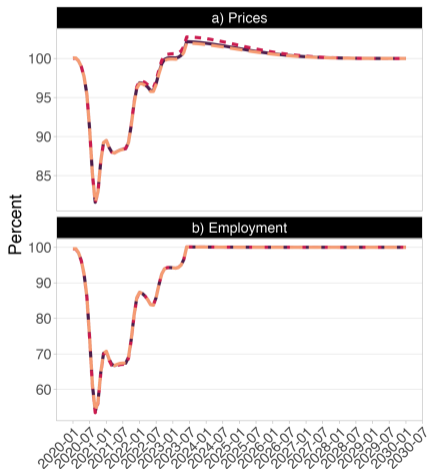
Baseline

No temporary exits

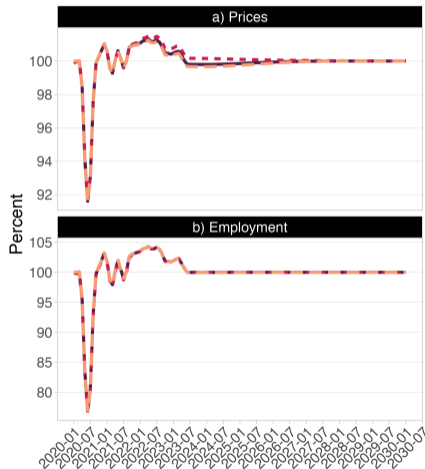
Subsidised temporary exits

Further Simulations 2

Food serving establishments



Brick and mortar retail



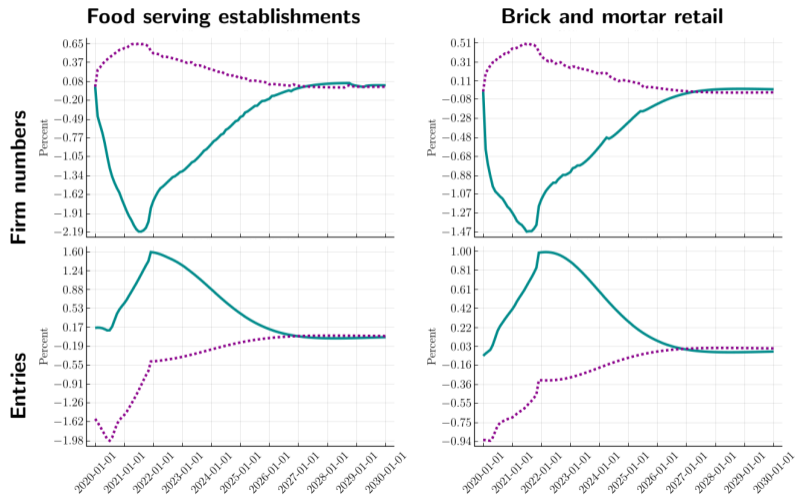
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Baseline (plain)

No temporary exits
(crossed)

Subsidised temporary
exits (dotted)

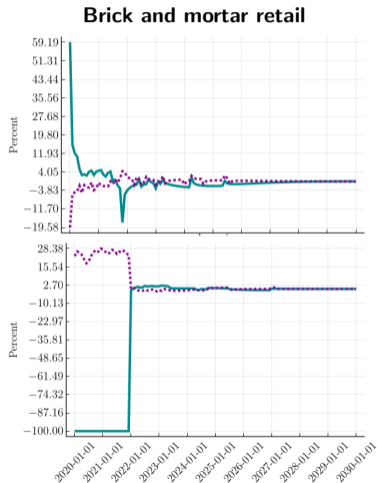
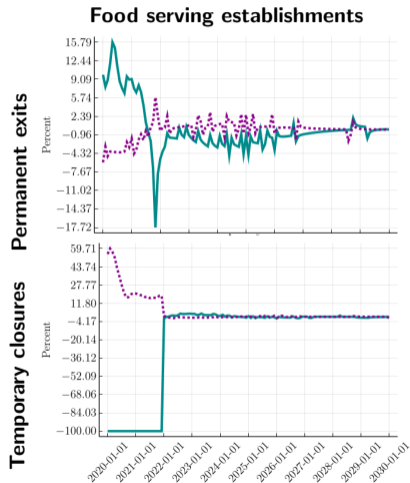
Further Counterfactuals 1



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- ▶ Cyan line - no temporary exits
- ▶ Purple line - subsidised temporary exits

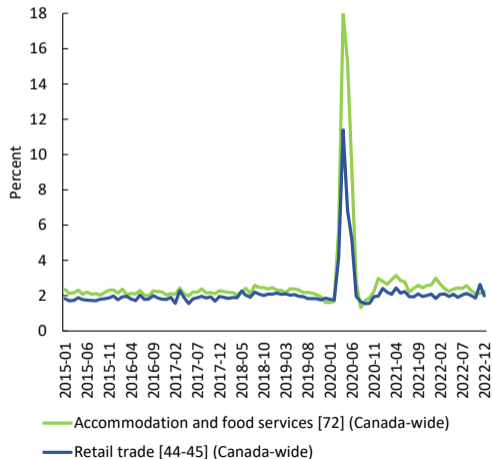
Further Counterfactuals 2


[Back](#)

- ▶ Cyan line - no temporary exits
- ▶ Purple line - subsidised temporary exits

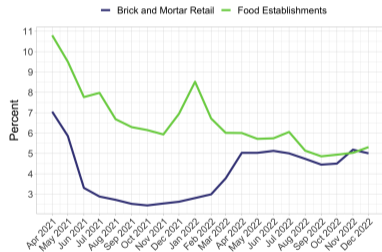
Temporary business closures: Statistics Canada versus our dataset

Figure: Experimental estimates Statistics Canada



- ▶ Statistics Canada not at both the city and sector level; no change over 2021 lockdown

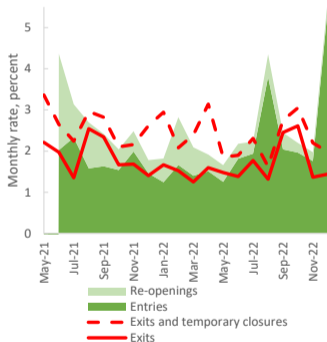
Figure: Our data derived from Google Places



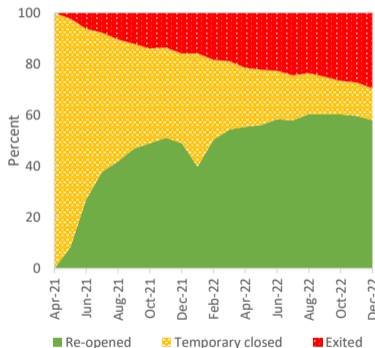
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Captures well business dynamics Toronto, Vancouver, Montreal, Ottawa: 26000/month

(a) Business opening and closure rates



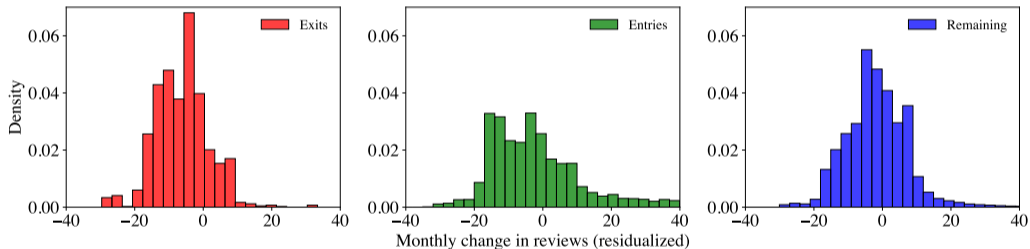
(b) Status of businesses temporarily closed in April-May 2021



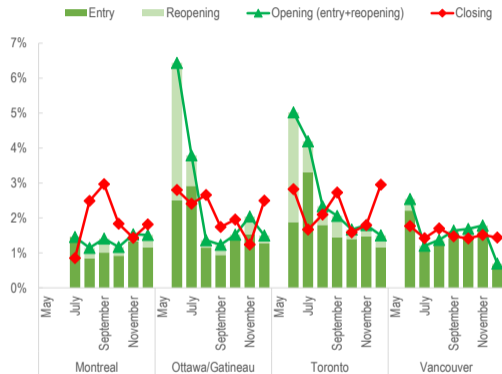
- ▶ Timely (no delay)
- ▶ Narrative of COVID
- ▶ Role of re-openings
- ▶ Captures Temporary closed

Figure: Evolution of business dynamics since the April 2021 lockdowns

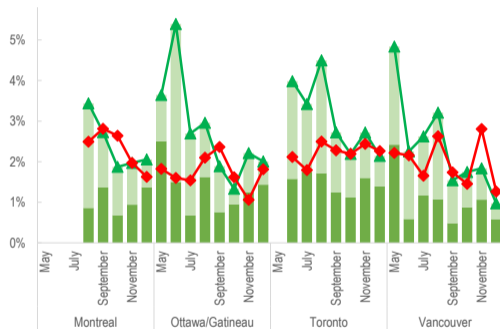
Entries (exit) accrue more (less) reviews than remaining businesses



Phased re-opening after the April 2021 lockdowns, across sectors and cities

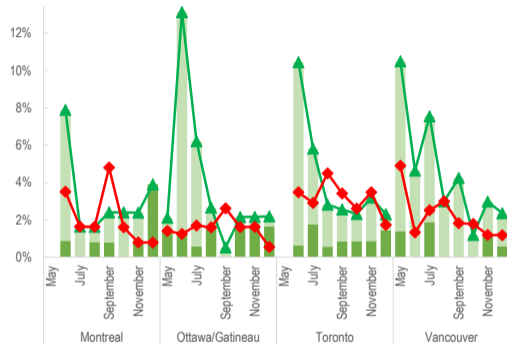


(a) Retail sector, NAICS 44-45

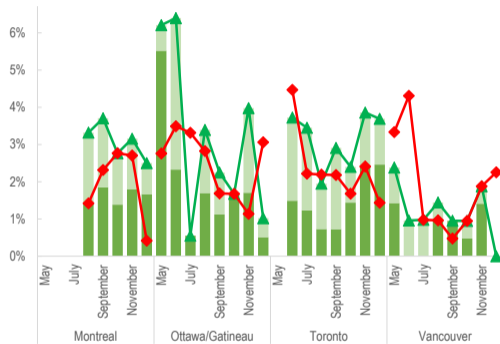


(b) Food sector, NAICS 722

Phased re-opening after the April 2021 lockdowns, across sectors and cities



(a) Bar

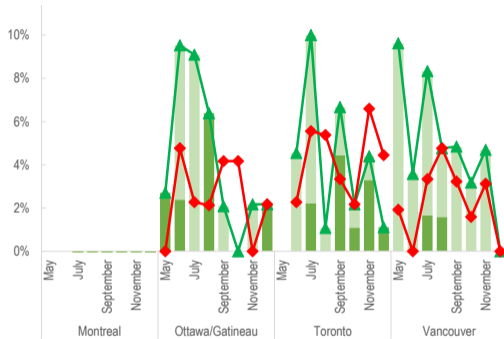


(b) Cafe

Phased re-opening after the April 2021 lockdowns, across sectors and cities



(a) Restaurant



(b) Night club

Timeline of changes in COVID-19 restrictions

Month	British Columbia	Ontario
April		3-Apr. Four-week lockdown for the entire province 8-Apr. Stay-at-home order for the entire province
May	25-May. Phase 1 reopening: indoor and outdoor dining with capacity limits	
June	15-Jun. Phase 2 reopening: maximum of 50 people for outdoor social gatherings and 50 people for seated indoor organized gatherings	2-Jun. Ontario's stay-at-home order expired 11-Jun. Step 1 of reopening: outdoor dining with up to four people per table, non-essential retail at 15% capacity, essential retail at 25% capacity; retail stores in malls remain closed unless they have a street-facing entrance 30-Jun. Step 2 of reopening: outdoor dining with up to six people per table, non-essential retail at 25% capacity, essential retail at 50% capacity
July	1-Jul. Phase 3 reopening; night clubs reopen with capacity limits; return to normal hours for liquor service at restaurants and bars	16-Jul. Step 3 of reopening: indoor dining with no limits per table, essential and non-essential retail with capacity limited to the number of people that can maintain physical distancing, night clubs at up to 25% capacity or up to 250 people
September		24-Sep. Capacity limits eased for settings where proof of vaccination is required