Infrastructure Ontario

Hospital Construction Costs

February 2024

Context

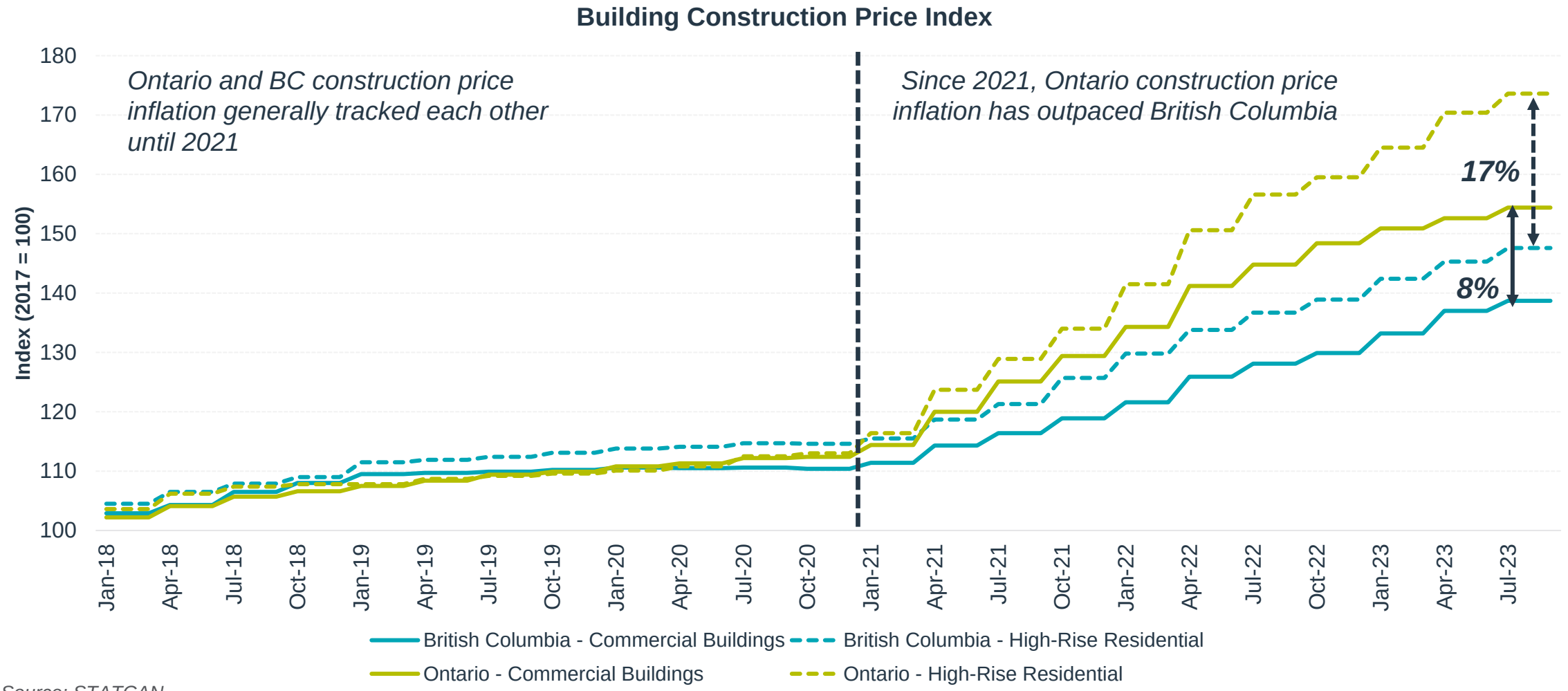
- IO Research conducted a comparative analysis of hospital costs across jurisdictions. The key research question is: **“Is Ontario paying more for hospitals than other provinces?”**
- This research leverages the existing study performed by the Transaction Structuring team (TST), comparing the construction costs of social-purpose projects across Ontario, British Columbia, and Quebec; the study concluded that IO’s construction costs are comparable to other provinces.
- This study focuses only on hospital projects in Ontario and British Columbia from 2013 to 2023 (34 projects combined). The choices of geographies and timeframe reflect data availability.
- Our research approach combines a top-down general construction market review and regression analysis of hospital costs to inform our findings.

Executive Summary – Key Findings

- ON construction prices have been rising faster than BC since Covid. Regional differences and material price inflation drive this.
- Despite Ontario's higher generation construction cost inflation, ON hospital costs have been consistently ~20% lower than BC.
- Since Covid, material price inflation explains 80% of hospital cost escalation. Reduced bidder participation explains 13% while interest rate increases explain 6%.
- Modelling suggests contractors exhibit strong recency bias in their bids; high construction costs today lead to high bids for future construction projects.
- There is insufficient evidence to conclude whether IO managed cost escalation better or worse than BC.

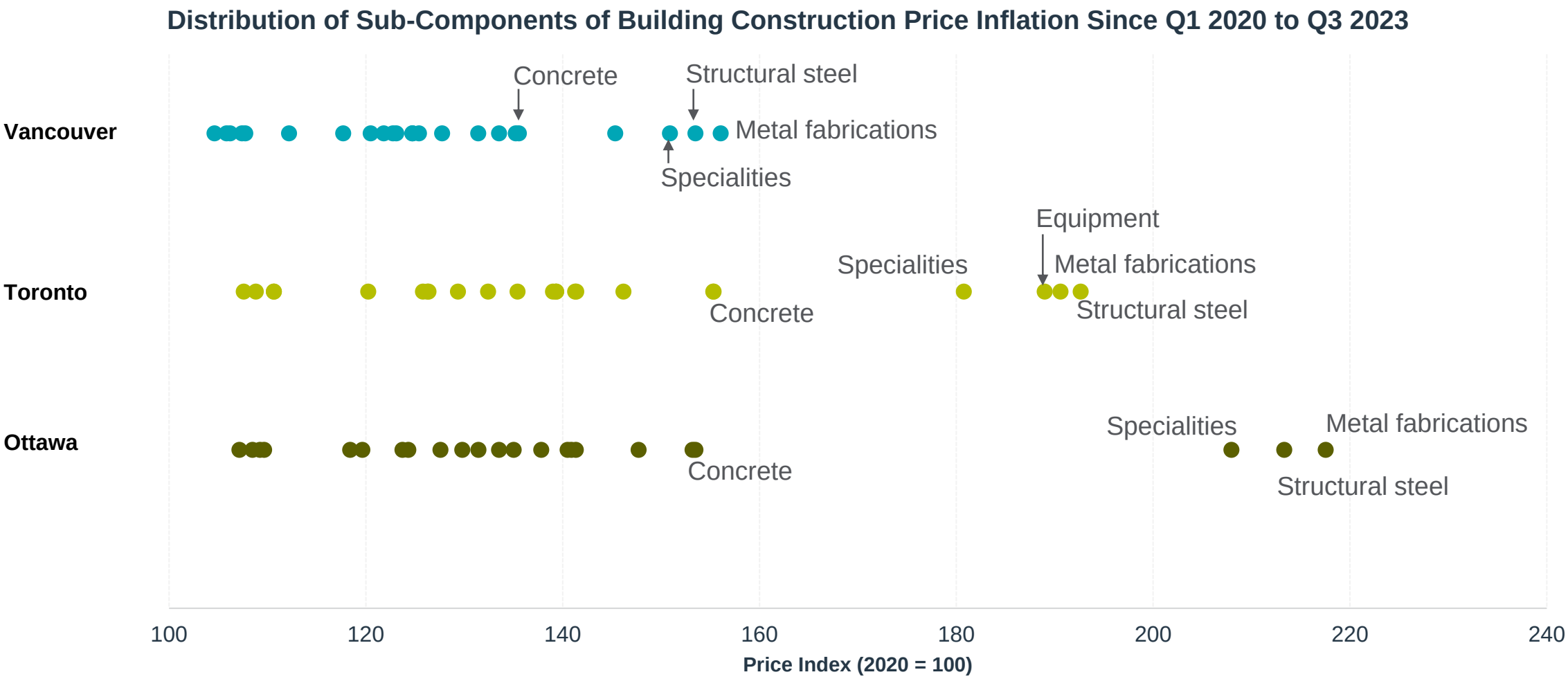
Overall Analytical Framework

Observation 1: Construction costs rose faster in ON than in BC



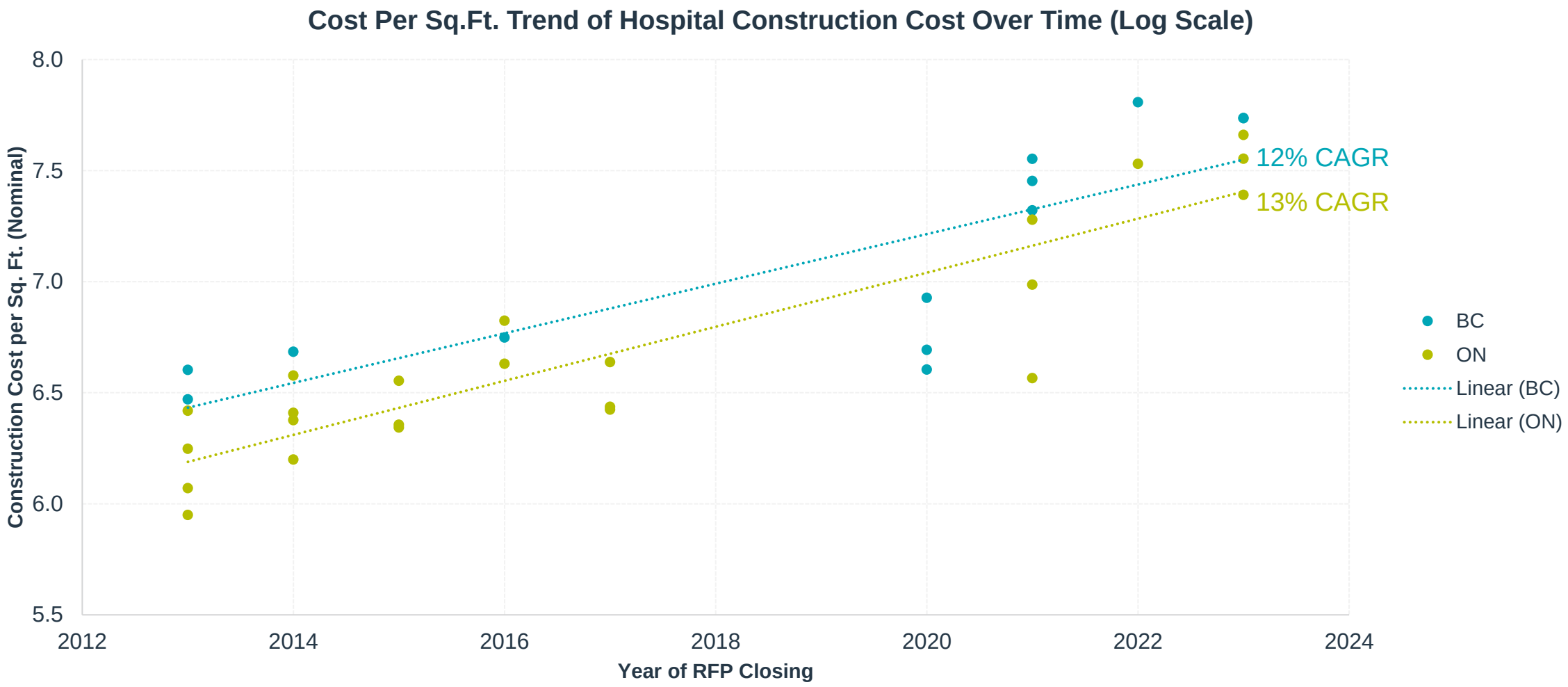
Source: STATCAN

Observation 2: Bigger spikes in materials prices in ON than BC



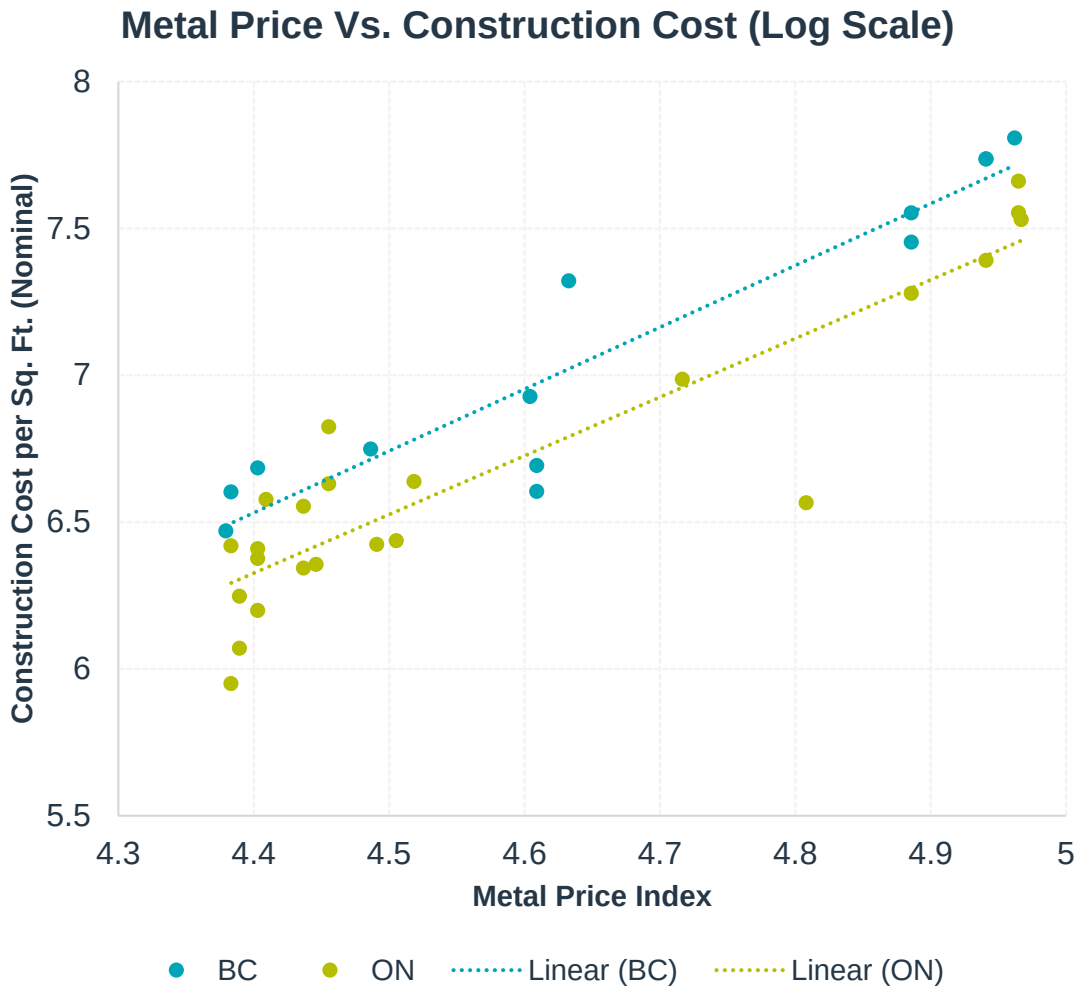
Source: STATCAN

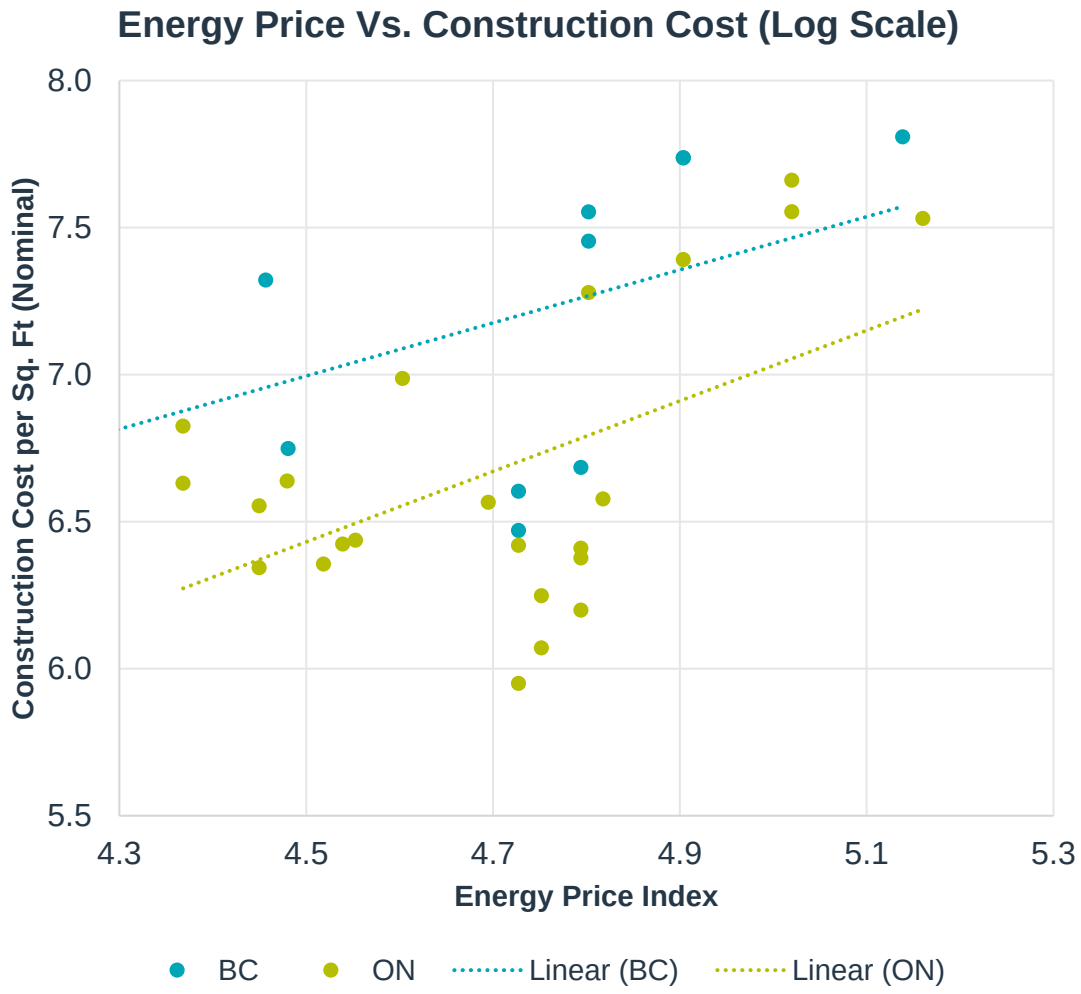
Observation 3: ON hospital costs are generally lower than BC



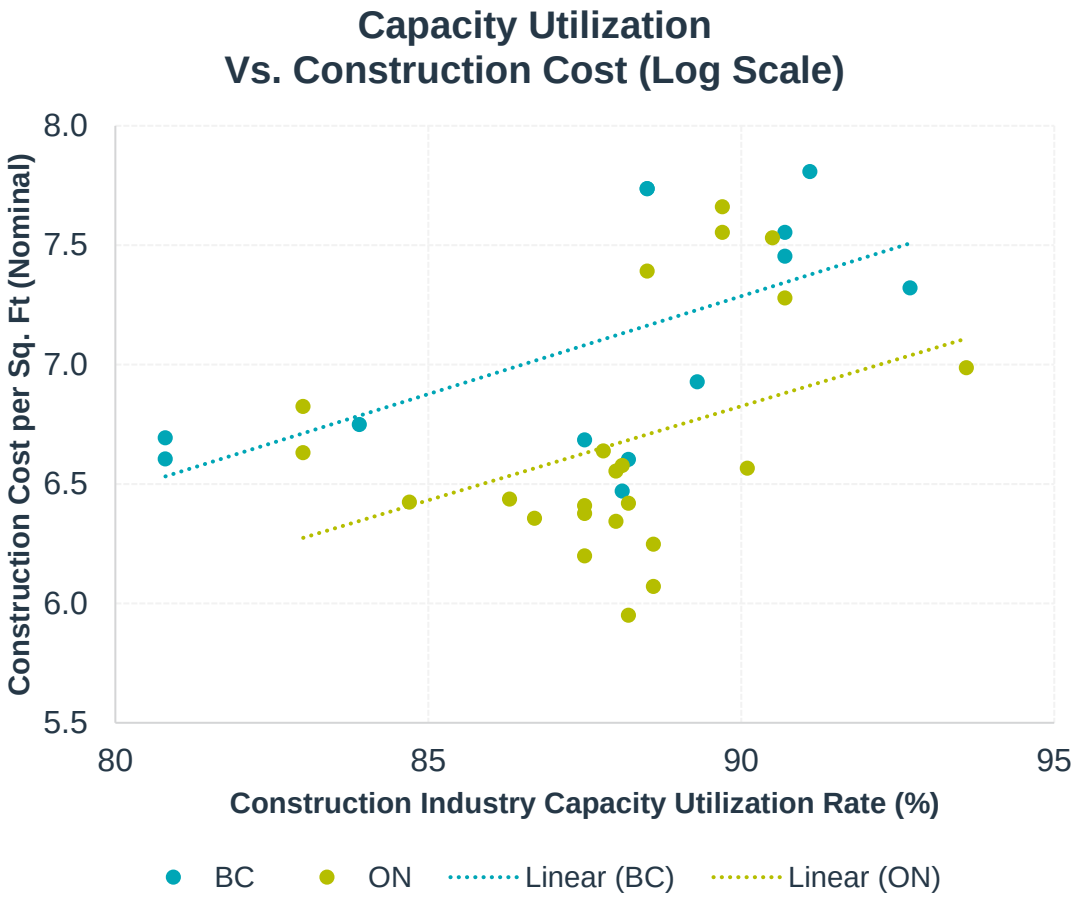
Source: ON Construction & Design cost data from IO monthly construction report supplemented by the bid database from IO Project Controls Team. BC data from InfrastructureBC website

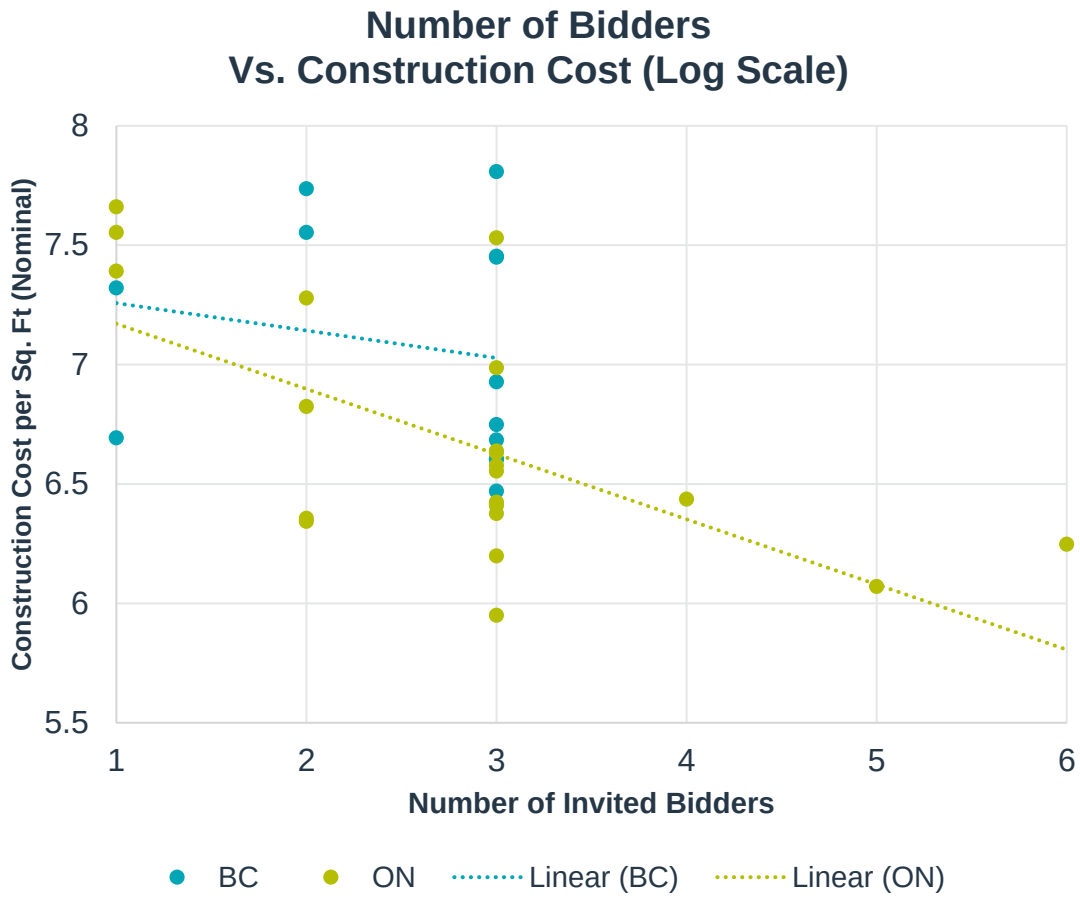
Observation 4: ON and BC share similar hospital cost structure





Observation 5: Tighter Construction Market Equals Higher Costs





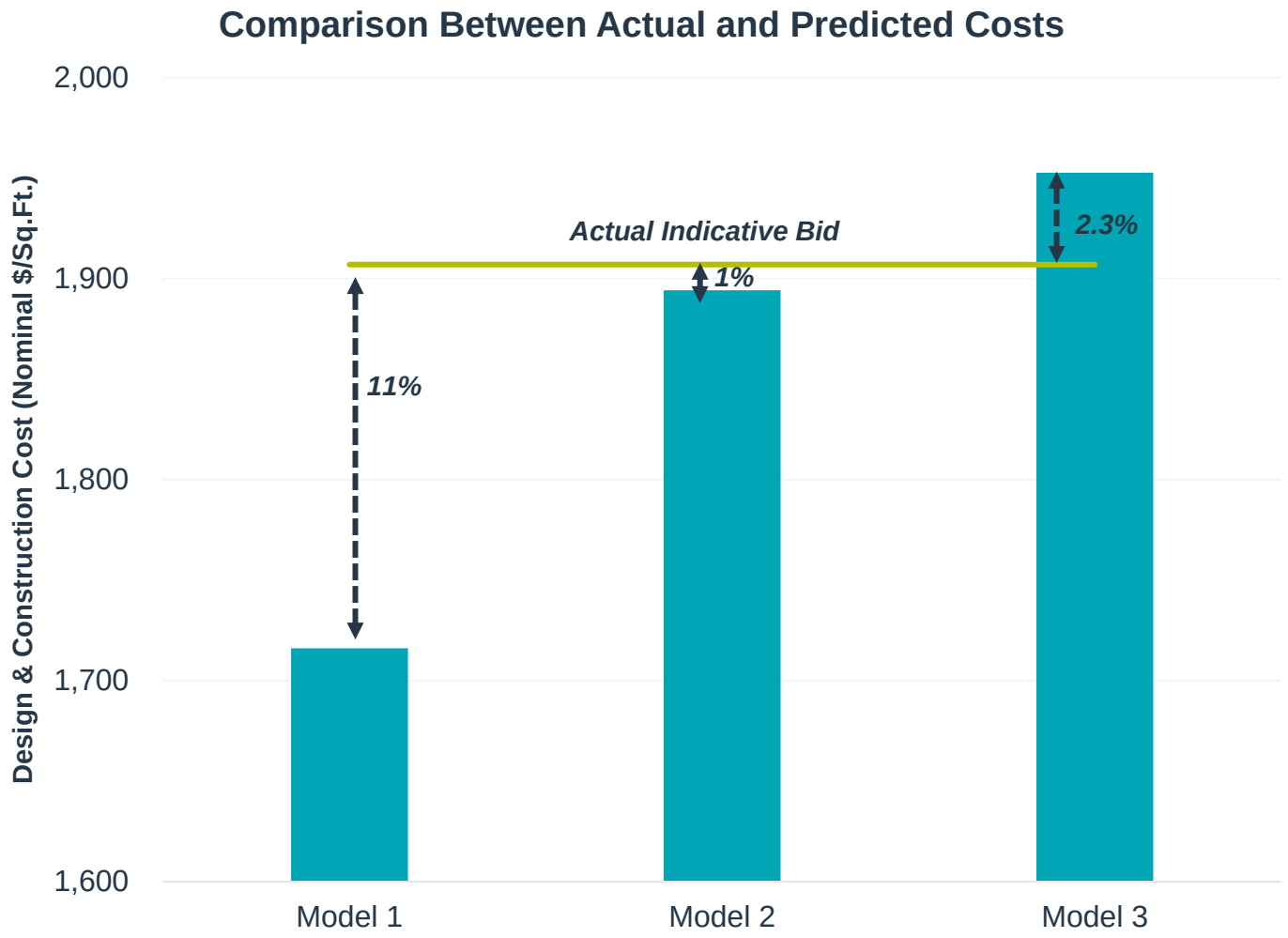
Three Emerging Hypotheses from the Data Review

- Hypothesis 1: Hospital costs are lower in ON than in BC.
- Hypothesis 2: Hospital construction costs in ON and BC are sensitive to metal and energy prices.
- Hypothesis 3: Hospital construction costs rise when construction industry capacity utilization is high and bidder participation is low.

Regression analysis is used to test the hypotheses

- Key question: I**s Ontario paying more for hospitals than BC?**
- Create a long list of 13 potential cost drivers across 3 groups
  - Group 1: Hospital Complexity
  - Group 2: Material Price Indices
  - Group 3: Macroeconomic Variables
- Run regression with different combinations of cost drivers to find models that:
  - Best fit the data
  - Align with economic principles
- Three candidate models are identified

Of the three models, the second model performs best



- THP-M (Trillium – Mississauga Site) is chosen to illustrate the model performance in predicting actual bids based on the identified cost drivers.
- Model 2 has the highest R^2 statistics and performs best at predicting THP-M actual bid.

Candidate Model 2: Disaggregated Cost Model

Modelled Variable: Nominal $/sq.ft design & construction costs

Driver	Interpretation	95% CI Low	Expected Impact	95% CI High
Intercept	NA	-5.75	**-3.48**	-1.11
Metal	1% increase impact	1.40	**1.74***	2.20
Interest Rate	1% point increase impact	-3.81	**2.13***	6.81
Bidders	1 more bidder	-11.01	**-5.20**	-0.48
Utilization	1% point increase impact	-0.95	**2.95**	4.75
Ontario	Ontario premium	-28.86	**-19.51**	-5.45
Ontario_2020	Ontario Covid impact	-18.88	**-1.28**	20.09

Observations	*34 (13 BC; 21 ON)*
Adjusted R^2	*92.64%*
Cross-Validated R^2 (5 folds)	*92.13%*
Bootstrapped R^2 (100 reps)	*89.55%*

Statistically Significant at 10% Significance Level

*Note: *Jointly significant at 10% significance level*

Key insights:

- Material price, interest rate, and capacity utilization drive hospital cost escalation
- Each extra bidder (between 1 and 3 bidders) reduces cost/sq.ft. by around 5%
- On average, ON hospitals have been 20% cheaper per sq. ft. than BC hospitals.
- ON *might* have managed cost escalation since Covid better than BC, but the estimate is not statistically significant.

Model Results Summary

Seven key insights below are collated from the three econometric models. Each insight is ranked based on our degree of confidence.

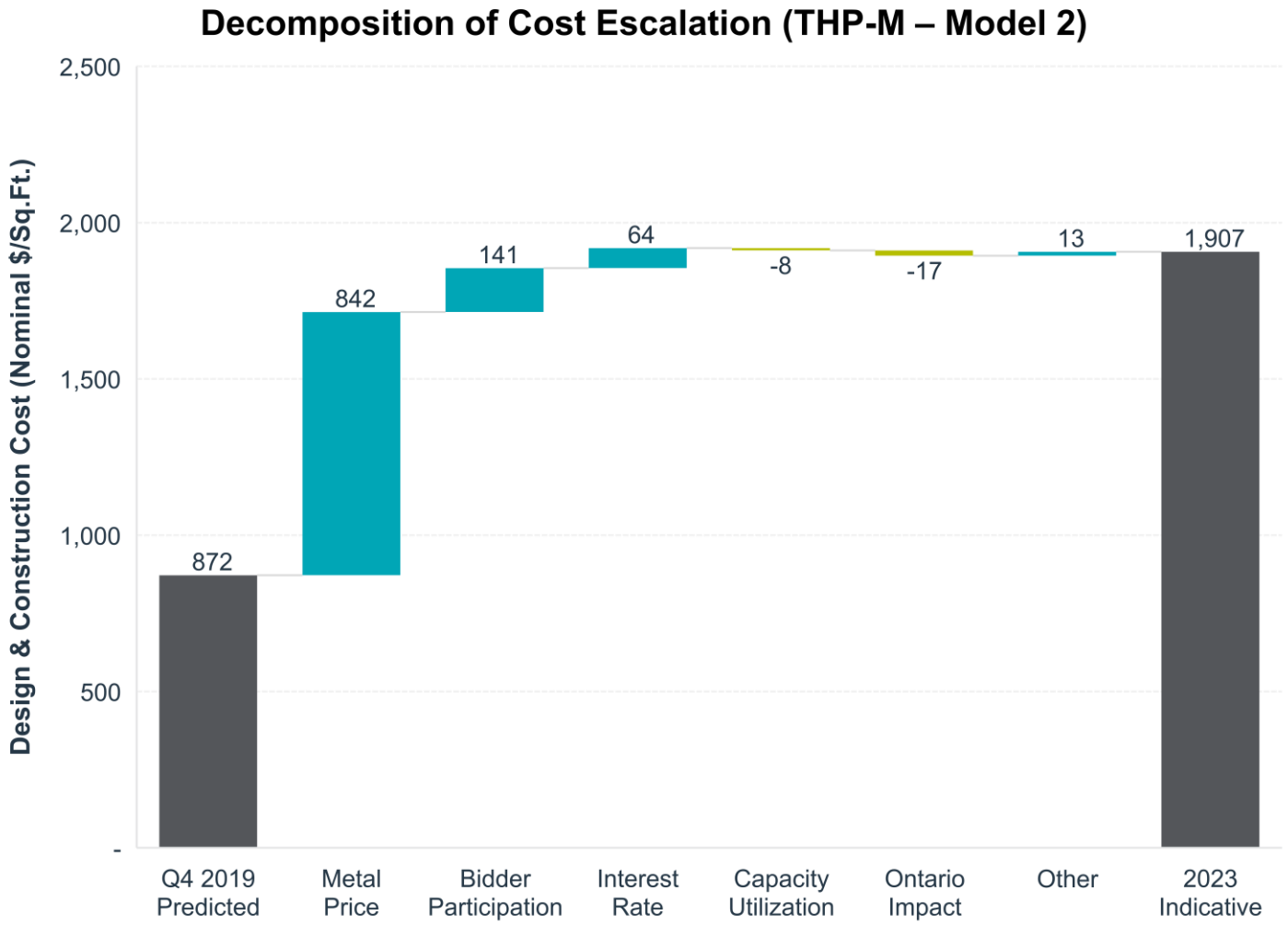
Insights	Size of Impact	Degree of Confidence
Bidders use information near RFP deadline to form the bid	NA	High
On average, hospital costs are lower in ON than BC	19.5 – 24.2%	High
Hospital costs are sensitive to material prices	1.7% per 1.0% price increase	High
More bidder participation reduces hospital costs	5.2 – 5.4% cost reduction per additional bidder between 1 and 3 bidders	High
Hospital costs are sensitive to macroeconomic environment	0.3% per 1.0% energy price increase	Medium Low
	2.1% per 100 bps interest rate increase	Medium Low
ON has managed cost escalation since Covid better than BC	Not statistically significant	Low

Significant changes in hospital cost drivers since Q4 2019

We use Model 2 to estimate THP-M construction costs if it were put to tender in Q4 2019 instead of Q1 2023. The table below shows hospital cost sensitivity to each cost driver and how the individual cost drivers have changed over the period.

Cost Driver	Sensitivity to Cost Driver (Model 2)	Change in Cost Driver Since Q4 2019
Metal Price	1% metal price increase = 1.74% hospital cost increase	+44.5%
Interest Rate	100 basis points interest rate increase = 2.13% hospital cost increase	+160 bps
Number of Bidders	1 fewer bidder = 5.20% hospital cost increase	-2 (Assumed 3 bidders in 2019)
Construction Capacity Utilization	100 basis points utilization rate increase = 2.95% hospital cost increase	-20 bps
Ontario Premium	-19.51% cost premium for Ontario hospitals	No Change
Ontario Premium After 2020	-1.28% additional cost premium for Ontario hospitals with RfP deadline after 2020	Applied

Material Cost Inflation is the Main Cost Driver



- Model 2 predicts that THP-M would have cost 54% less if it were put to tender in Q4 2019.
- Material price inflation (metal as a proxy) is the largest cost driver.
- THP-M is a single-bid project; the cost would have been $141/sq.ft. lower assuming 3 bidders in Q4 2019.
- Interest rate has the third biggest impact, presumably through passing through of financing costs along the supply chain.

Recommendations

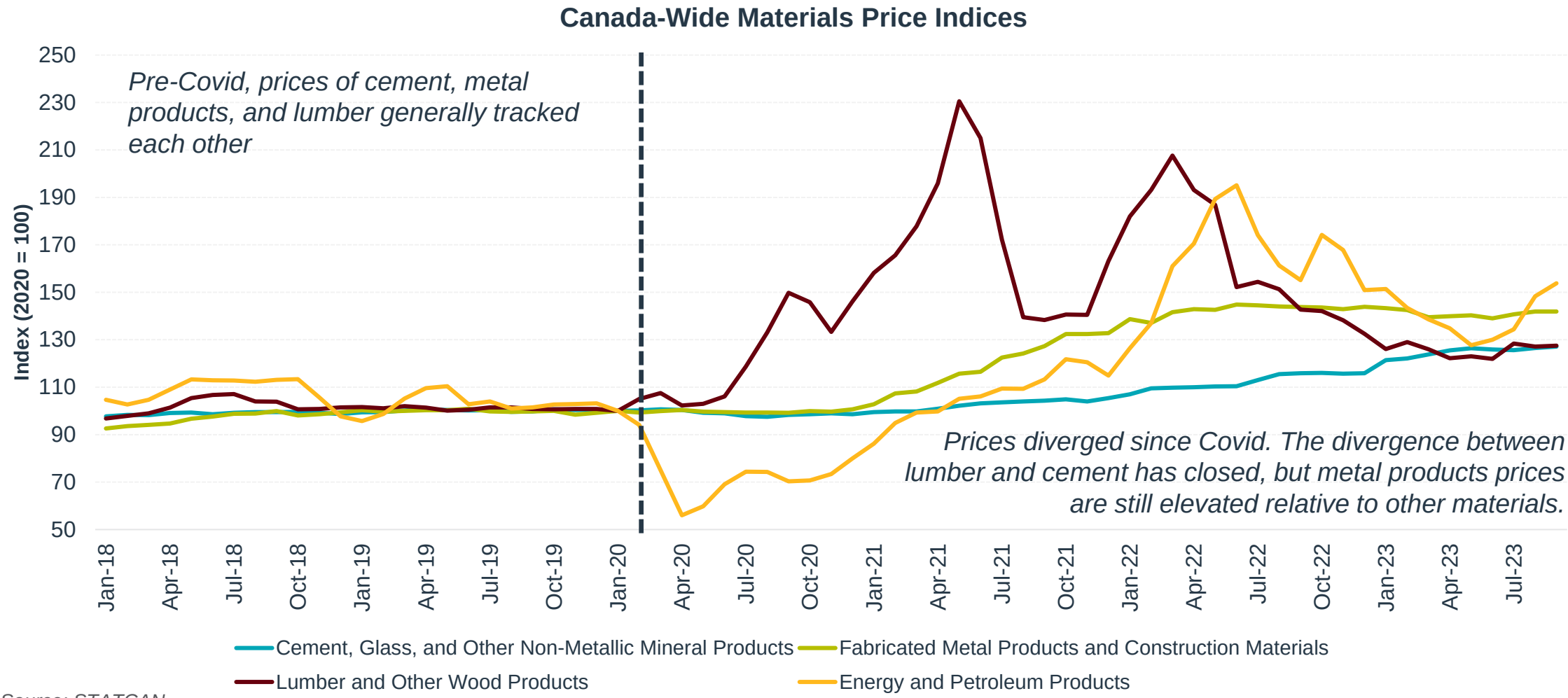
- Based on our findings, we make two recommendations for future hospital procurements at IO:
  - Recommendation 1: To reduce the impact of recency bias in bids, consider allowing bids with two-sided indexation for materials that have a) recently experienced rapid cost escalation; and b) highly uncertain future pricing outlooks
  - Recommendation 2: To increase bidder participation and reduce the impact of high interest rates in bids, consider payment mechanisms that can reduce suppliers' working capital requirements. An additional bidder reduces hospital construction costs by 5%, while a 1% reduction in interest rates reduces hospital construction costs by 2%.

APPENDIX

Definition of 13 Cost Drivers

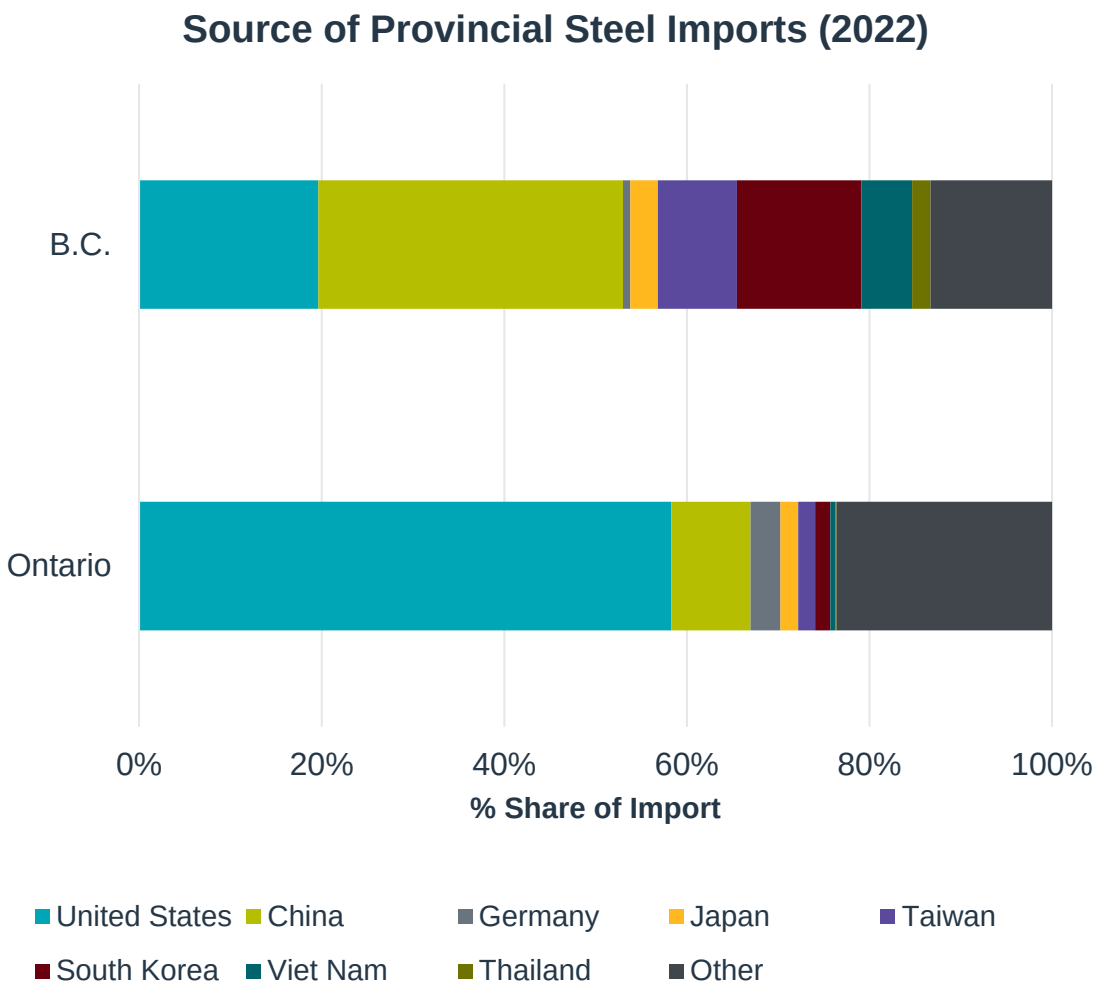
Group	Variable	Definition
Hospital Characteristics	Acute Care	Variable = 1 if the hospital provides acute care and 0 if not
	% Renovation	% of total project square feet that is renovated
	Rurality	Index of rurality on a 0 to 1 scale with 0 being the most urban and 1 the most rural
	Ontario	Variable = 1 if the hospital is in Ontario and 0 otherwise
Material Price Indices (At the time of RFP Deadline)	Lumber	Industrial Product Price Index (IPPI) – Lumber and other wood products
	Energy	IPPI – Energy and petroleum products
	Metal	IPPI – Fabricated metal products and construction materials
	Cement	IPPI – Cement, glass, and other non-metallic mineral products
	Wage	Construction Union Wage Index (Province-specific)
	BCPI	Regional Building Construction Price Index (Province-specific)
Macro-economic	Interest Rate	Interest rate on 1 – 3 year Canadian government bonds
	Utilization	% capacity utilization of the Canadian construction industry
	Bidder	Number of Bidders Invited to Participate at the RfP Stage

Steel Prices Have Risen Faster Than Cement, but Gap is Closing



Source: STATCAN

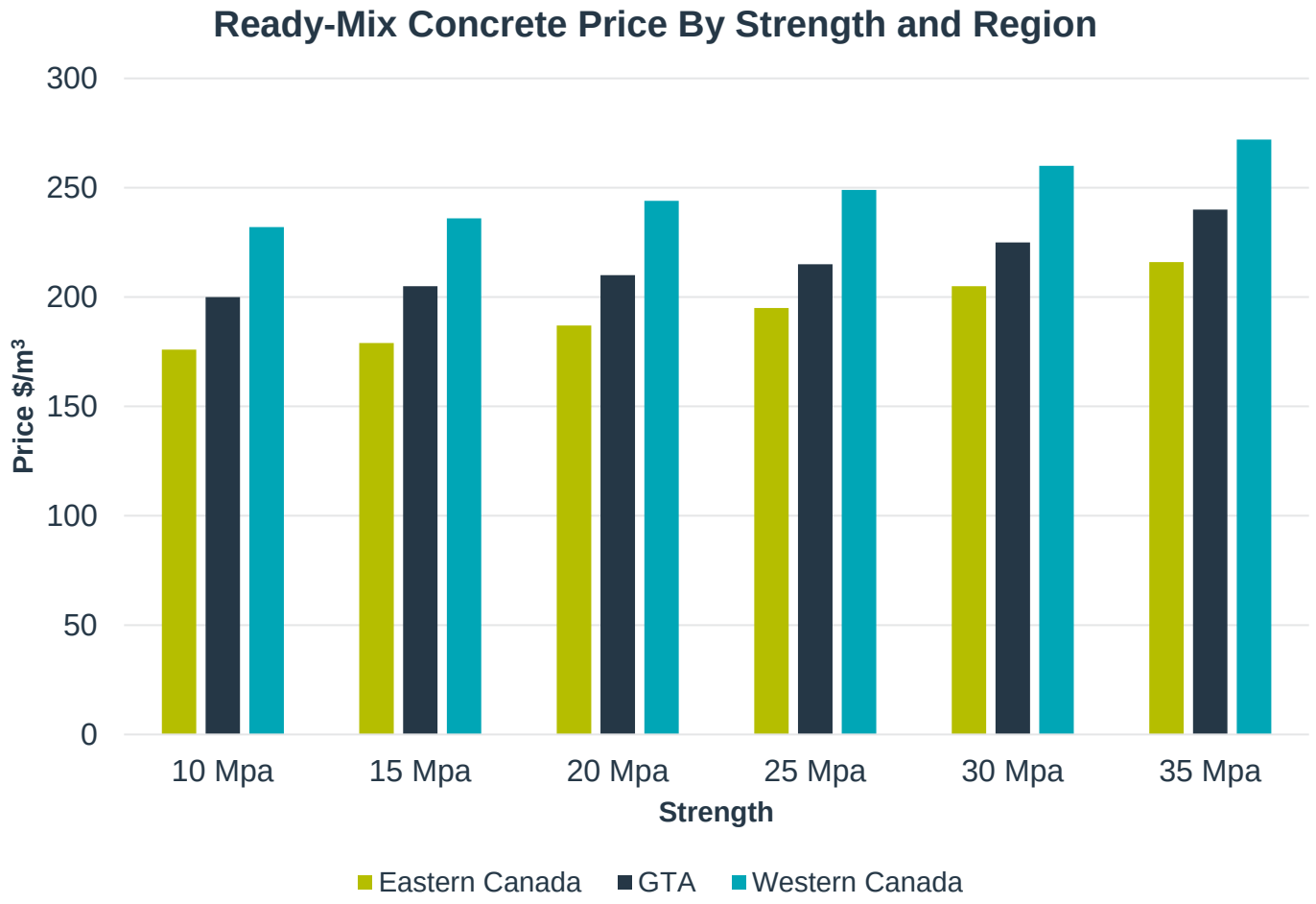
BC Location Allows It to Use Asian & Middle East Steel Imports



Source: STATCAN

- Steel is cheaper in BC than ON
- BC sources most of the steel from Asian countries including China, South Korea, Taiwan, Vietnam, and Thailand
- Ontario relies primarily on domestic-made and US imports
- The U.S. steel tariffs and high infrastructure spending have kept US steel prices elevated at ~$C1,200 per tonne of hot-rolled coil steel

Concrete Prices Are Lower in ON than BC



Source: Canadabuildingmaterials.com

- While ON experiences higher steel prices than BC, concrete prices are lower in ON
- GTA concrete price is higher than Eastern Canada as a whole, but still lower than Western Canada
- Dufferin Concrete 2024 price list for Ontario shows ~5% price increase for next year

Ontario Hospital Construction Costs

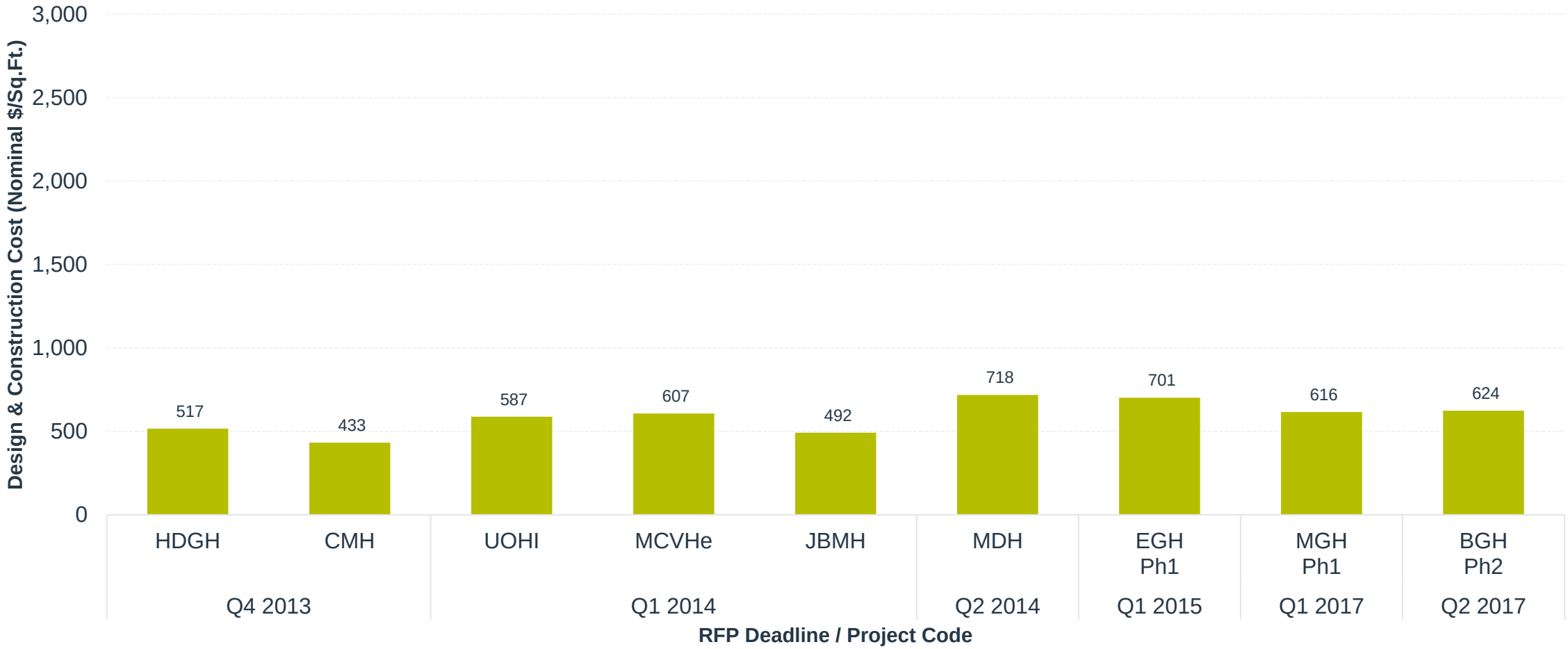
Excluding Projects Involving Renovated Space

Source: Project Monthly Construction Reports and Data Received From Transaction Structuring

See slide 5 for list of project acronyms and delivery model

Ontario Hospital Construction Costs

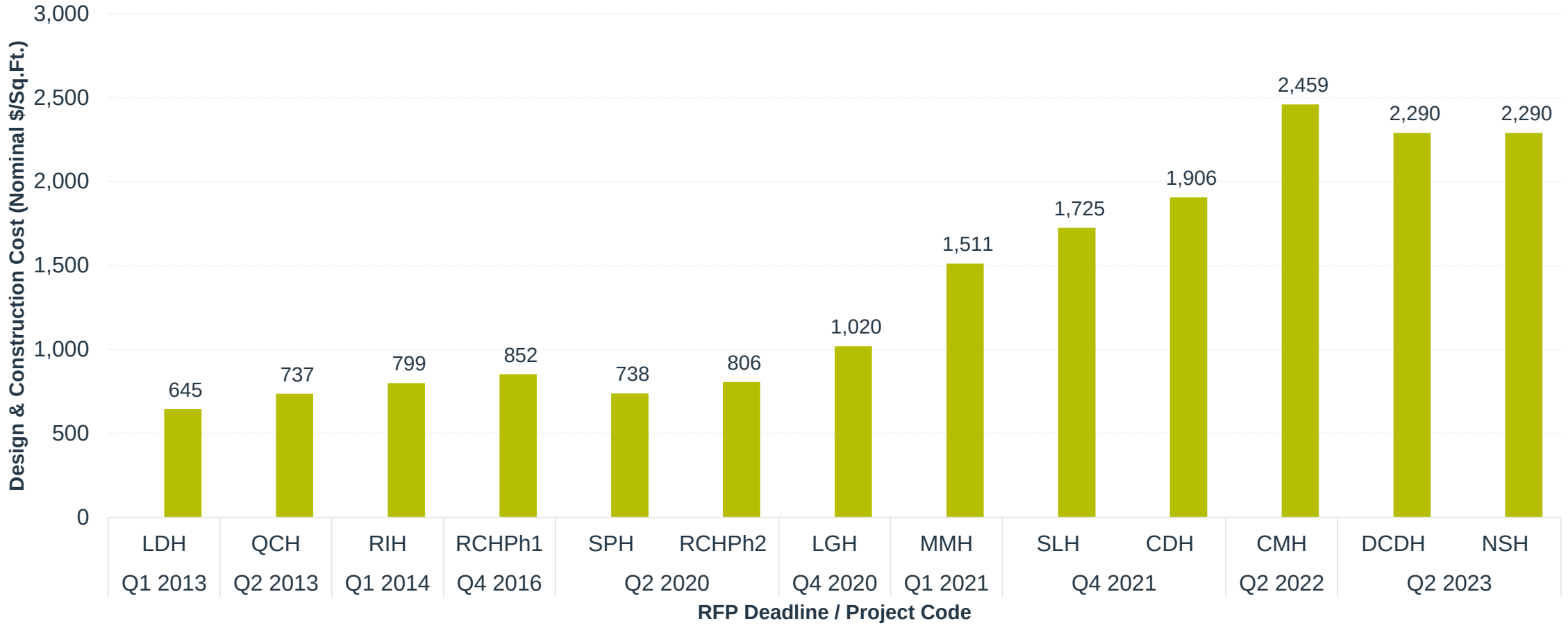
Projects with Renovated Space Only



Source: Project Monthly Construction Reports Data Received From Transaction Structuring

See slide 5 for list of project acronyms and delivery model

British Columbia Hospital Construction Costs



Source: Data Received From Transaction Structuring and additional data from InfrastructureBC website

See slide 5 for list of project acronyms and delivery model

Project Code - Ontario

Projects with no renovation

Code	Name	Model
MCHC	McMaster Children's Health Centre	DBF
PMC Ph1	Peel Memorial Centre Phase 1	DBFM
SEGH	St. Thomas Elgin General Hospital	BF
NVH	New Vaughan Hospital	DBFM
GMCH	Groves Memorial Community Hospital	DBF
WPHC	West Park Healthcare Centre	DBFM
OHH	Orleans Health Hub	BF
GCTC	Grandview Children's Treatment Centre	DBF
WLMH	West Lincoln Memorial Hospital	DBF
SNH	South Niagara Hospital	DBFM
WAHA	Weeneebayko Area Health Authority Hospital	PDBFM
THPm	Trillium Health Partners – Mississauga	PDBFM
THPq	Trillium Health Partners - Queensway Health Centre	BF
CAMPh1D	Centre for Addiction and Mental Health (CAMH) Phase 1D	DBF

Projects with renovation

Code	Name	Model
HDGH	Hawkesbury and District General Hospital	BF
CMH	Cambridge Memorial Hospital	BF
MCVHe	Mississauga Credit Valley Hospital Expansion	BF
UOHI	University of Ottawa Heart Institute	BF
JBMH	Joseph Brant Memorial Hospital	DBF
MDH	Milton District Hospital	DBFM
EGH Ph1	Etobicoke General Hospital Phase 1	DBFM
MtSH Ph3A	Mount Sinai Hospital - Phase 3A	BF
MGH Ph1	Michael Garron Hospital - Phase 1	DBF
BGH Ph2	Brockville General Hospital - Phase 2	BF

Project Code – British Columbia

Code	Name	Model
LDH	Lake District Hospital	DB
QCH	Queen Charlotte/ Haida Gwaii Hospital	DB
RIH	Royal Inland Hospital Clinical Services	DB
RCHPh1	Royal Columbian Hospital Phase 1	DB
SPH	St Paul’s Hospital	Unknown
RCHPh2	Royal Columbian Hospital Phase 2/3	DB
LGH	Lions Gate Hospital Acute Care	DB
MMH	Mills Memorial Hospital (Terrace)	Modified DB
SLH	Stuart Lake Hospital (Fort St James)	PDB
CDH	Cowichan District Hospital	Alliance
CMH	Cariboo Memorial Hospital (Williams Lake)	PDB
DCDH	Dawson Creek District Hospital	PDB
NSH	New Surrey Hospital	TBD

Candidate Model 2: Disaggregated Cost Model – 2011/2020

Modelled Variable: Nominal $/sq.ft design & construction costs

Driver	Interpretation	95% CI Low	Expected Impact	95% CI High
Intercept	NA	-18.62	**-1.34**	19.67
Metal	1% increase impact	-2.38	**1.49**	3.72
Interest Rate	1% increase impact	-52.61	**-0.13**	82.14
Bidders	1 more bidder	-12.87	**-3.04**	6.61
Utilization	1% point increase impact	-6.17	**1.66**	10.78
Ontario	Ontario premium	-29.65	**-19.80**	6.04
Ontario_2020	Ontario Covid impact	NA	**NA**	NA

Observations	*23 (7 BC; 16 ON)*
Adjusted R^2	*45.39%*
Cross-Validated R^2 (5 folds)	*62.57%*
Bootstrapped R^2 (100 reps)	*33.07%*

Statistically Significant at 10% Significance Level

*Note: *Jointly significant at 10% significance level*

Key insights:

- On average, ON hospitals have been 20% cheaper per sq.ft than BC hospitals.
- Costs appear slightly less sensitive to metal prices, number of bidders, and capacity utilization than with the full dataset
- Limited variations in interest rates (0.3% - 1.3%) during this period, making project costs insensitive to interest rates

Candidate Model 3: Disaggregated Material Prices Model – 2011/2020

Modelled Variable: Nominal $/sq.ft design & construction costs

Driver	Interpretation	95% CI Low	Expected Impact	95% CI High
Intercept	NA	-22.06	**-3.30**	10.06
Energy	1% increase impact	-0.55	**0.28**	1.49
Metal	1% increase impact	-0.41	**1.96**	4.95
Bidders	1 more bidder	-11.96	**-3.23**	7.40
Ontario	Ontario premium	-28.43	**-19.46**	-0.51
Ontario_2020	Ontario Covid impact	NA	**NA**	NA

Observations	*23 (7 BC; 16 ON)*
Adjusted R^2	*48.03%*
Cross-Validated R^2 (5 folds)	*56.80%*
Bootstrapped R^2 (100 reps)	*42.96%*

Statistically Significant at 10% Significance Level

Key insights:

- Similar sensitivities to energy prices, and metal prices as in Model 3 with the full dataset
- Costs are less sensitive to the number of bidders during this period (3.2% vs 5.4%)
- Similar estimated impact of Ontario premium as Model 2.