RESTRICTIVE TENDERING:
PROTECTION FOR WHOM?

CARDUS CONSTRUCTION COMPETITIVENESS MONITOR

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Cardus Construction Competitiveness Monitor: White Paper

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ABOUT CARDUS

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EXECUTIVE SUMMARY

Infrastructure investment is all the rage these days. Whether it's the Federation of Canadian Municipalities speaking of the infrastructure deficit, oil and gas companies looking to build pipelines, or federal and provincial governments committing to massive infrastructure investments, everyone wants in.

In this context it makes sense that most of our public debate about money and infrastructure focuses on revenue. Where will we get the money? Who will pay? How? Which tax structures will be needed to build our bridges? Should we borrow to pay for our water treatment plants and subway lines? If so, how much?

But too heavy a focus on revenue can lead us to neglect sound public policy focused on cost containment. As economist and leading proponent of significant infrastructure investment Larry Summers notes, "Minimising cost should be the objective of infrastructure procurement." [1]

It is incumbent upon leaders to focus on best practices and policy that protect the public interest. And in the area of construction procurement, the vast preponderance of economic literature, empirical data, and indeed current policy supports the pursuit of open, fair, and competitive bidding on public construction projects.

Too heavy a focus on revenue can lead us to neglect sound public policy focused on cost containment.

This paper examines the literature and data that shed light on the effects of restricted tendering in government contracts in construction and, focuses on the extent to which they assist in attaining the ultimate objective of Part II of our paper – providing objective cost estimates of the impact of restrictive tendering in government construction projects. Ample direct quotes from the literature will be used throughout the paper to give a "voice" to the parties and to highlight the near unanimity that exists on so many of these issues.

Particular attention is paid to outlining methodologies that have been used to derive cost estimates and to outline methodologies that could be used if appropriate data were available. Those data requirements are outlined, with a recommendation as to the next step that could be used to provide cost estimates. Phase 2 will build on that foundation and provide cost estimates.

The paper begins with a discussion of the peculiarities of the construction industry and government construction projects. It then moves to a discussion of the legal restrictions on open tendering in Ontario that *de facto* restrict bidding. The importance of cost containment is then discussed, followed by illustrations of the recognition of an open, fair, and transparent process in public tendering so as to dissipate monopoly-type behaviours. The importance of competition in related areas (occupational licensing, unions, and fair wage policies) is then discussed since they have implications for restricted tendering. The importance of having more open bidding to increase the number of bidders and foster competition and lower prices is then documented, followed by discussion of the bid-rigging, collusion, and corruption that follows from restricted tendering. Econometric methods for estimating cause-and-effect relationships are then presented, followed by a discussion of other methodologies that could be employed to estimate the cost of restrictive tendering. The intent is that this analysis will form the bases of selecting a methodology or perhaps different methodologies for conducting such a costing exercise in part 2.

1. Summers, Larry. Building the Case for Greater Infrastructure Investment. http://larrysummers.com/2016/09/12/building-the-case-for-greater-infrastructure-investment/web.

But ultimately the goal of this series of papers is to serve as both a reminder and a spur. A reminder of the practices and data that allow governments to invest responsibly and in the public interest. Larry Summers notes that "every year that we allow our infrastructure to decay raises the burden that our generation places on the next."[2] We hope this paper will spur government, industry, labour, and others to consider that fair, open, and competitive tendering lightens that burden.

2 Ibid

RESTRICTIVE TENDERING: PROTECTION FOR WHOM?

INTRODUCTION

Restrictive tendering involves restrictions placed on tendering contracts that determine who can bid for the contract. Bidding can be restricted to specific groups such as a pre-approved list, or unionized contractors, or local contractors, or ones that have met criteria related to such factors as affirmative action, bonding, or insurance.

The restrictive tendering at issue in this analysis is the restrictions placed on construction contracts in some parts of the broader public sector in Ontario. As we detail subsequently, those restrictions, sometimes inadvertently, restrict the bidding to contractors affiliated with particular construction unions. The consequences of this restrictive tendering, and of the general effects of other restrictions related to public construction projects, are the focus of this analysis.

Governments are not under a profit-constraint to contain costs. Rather, they are under a political constraint, but the political constraint is weak because of the diffuse nature of taxpayers and the fact that they are ill-informed about the costs of restrictive tendering.

The paper builds on three previous reports as part of the Cardus Construction Competitiveness Monitor. The first paper by Brian Dijkema, *Ontario Municipal Construction Markets,* 2011 focused on how the Construction part of Ontario's Labour Relations Act, perhaps inadvertently, restricts tendering on many government contracts in cities and municipalities, school boards and Crown corporations to unionized contractors, and it discussed the implications of this restriction. The second paper by Stephen Bauld and Brian Dijkema with James Ton, *Hiding in Plain Sight: Evaluating Closed Tendering in Construction Markets,* 2014 focussed more generally on the negative aspects of the restrictions on competition associated with closed tendering and on the positive aspects of the enhanced competition associated with more open tendering, and how those positive aspects tend to be emphasised in government policies and directives throughout the world. The third paper by Brian Dijkema, T*uning Up Ontario's Economic Engine: Competitive Construction in the City of Toronto,* 2015 provides a critical assessment of a 2008 staff report for the City of Toronto that provided an estimate of only a 1.7% cost increase from the tendering that was restricted to union contracts in construction in Toronto. The Cardus paper discussed related studies that suggest the cost increase for Toronto would be more in the neighbourhood of 20% to 30%. It highlighted the wide range of cost estimates from such restrictive tendering overall to be in the neighbourhood of 1.7% to 40%, concluding (p.8) "there continues to be some disagreement on the extent to which closed tendering increases costs in construction." This concern with the wide range of estimates was also stated in their first report, Dijkema (2011, p. 11): "We do not yet know what these restriction [on tendering] cost the Ontario taxpayer. We are presented with a wide range of estimates about the increased costs –from 2% to 40% -- without any publicly available data or calculations in support of these calculations. The Ontario taxpayer and municipal governments are operating in a research vacuum."

This paper is Phase I of a two-part project intended to reduce that research vacuum by providing a review of related literature that can shed light on the effects of restricted tendering in government contracts in construction in Ontario. These different components of Part I will focus on the extent to which they assist in attaining the ultimate objective of Part II– providing objective cost estimates of the impact of restrictive tendering in government construction projects in Ontario. Particular attention is paid to outlining

methodologies that have been used to derive cost estimates and to outline methodologies that could be used if appropriate data were available. Those data requirements are outlined, with a recommendation as to the next step that could be used to provide cost estimates. Phase II will build upon that foundation and provide cost estimates.

The paper begins with a discussion of the peculiarities of the construction industry and government construction projects. It then moves to a discussion of the legal restrictions on open tendering in Ontario that *defacto* restrict bidding. The importance of cost containment is then discussed followed by illustrations of the recognition of an open, fair and transparent process in public tendering so as to dissipate monopoly-type behaviours. The importance of competition in related areas (occupational licensing, unions and fair wage policies) is then discussed since they have implications for restricted tendering. The importance of having more open bidding to increase the number of bidders and foster competition and lower prices is then documented, followed by discussion of the bid rigging, collusion and corruption that follows from restricted tendering. Econometric methods for estimating cause-and-effect relationships are then presented, followed by a discussion of other methodologies that could be employed to estimate the cost of restrictive tendering. The intent is that this analysis will form the bases of selecting a methodology or perhaps different methodologies for conducting such a costing exercise in Part II.

Ample direct quotes from the literature will be used throughout the paper so as to illustrate and document the issues. The intent is to give a "voice" to the parties and to highlight the near unanimity that exists on so many of these issues, including the benefits of competition in procurement.

PECULIARITIES OF CONSTRUCTION AND GOVERNMENT CONSTRUCTION PROJECTS

The construction industry and government construction projects have a number of unique or at least unusual characteristics, many of which have implications for assessing the implications of restrictive tendering. Many of these characteristics will be expanded on later, highlighting their implications for restrictive tendering:

- A bifurcation of the industry along the lines of residential and non-residential construction, with non-residential construction being the largest component and having higher-wage, generally unionized jobs, often drawing on residential construction when there are shortages. Government projects are dominated by the industrial, commercial, institutional (ICI) sector, though significant costly projects, such as those in community housing and road-building, take place outside of the ICI sector.
- Seasonal work and boom-and-bust cycles that make it expedient for governments to tender their work rather than to try to maintain an internal workforce that will be redundant in slack seasons and cycles.
- Considerable subcontracting so that major contractors are often mainly "managers" of subcontracts as opposed to direct employers.
- A substantial amount of "underground" employment especially since the introduction of the GST and on-going increases in self-employment, with underground employment being a socially undesirable alternative for workers who work for small contractors that are not able to bid on the limited projects available to small contractors because of restrictive tendering.
- An industry that is largely protected from foreign competition, so that monopoly-type pricing is feasible. Nevertheless, "competition is especially necessary in the construction field, since the amount of expenditure in that area is so disproportionate to the ordinary contracts entered into by Governments." (Bauld 2009, 58).
- The fact that governments are not under a profit-constraint to contain costs. Rather, they are under a political constraint, but the political constraint is weak because of the diffuse nature of taxpayers and the fact that they are ill-informed about the costs of restrictive tendering.
- Certain unions and companies in the construction trades function as a concentrated interest group that can benefit immensely from being protected by tendering that restricts bidding to union contractors. Thus restrictive bidding is a classic case of benefits going to a concentrated interest group while the costs are spread over a large group—in this case taxpayers. Such circumstances can often sustain inefficient practices.
- A construction industry that is more highly unionized than average and has union wage premiums that are much higher than average (Fang and Verma 2002, discussed subsequently).
- An industry that is subject to extensive regulations in a variety of areas. Besides restrictive tendering, such regulations in the labour area include occupational licensing of the trades, apprenticeship regulations, fair wage legislation, health and safety and workers' compensation, employment standards, and labour relations legislation that governs the formation and conduct of collective bargaining, with construction being a separate component of the legislation in Ontario.
- Very high risks in construction contracting, which highlights the importance of having a large number of potential contractors to spread that risk (Bauld 2009, 14).
- The common requirement of pre-qualification for bidding on contracts, especially government ones. As indicated by Bauld (2009, 6), "an inevitable effect of pre-qualification is to thin out the number of

bidders." This is in addition to the restrictions imposed by any subsequent restrictive tendering. The extent to which pre-qualification ensures the viability of those contractors to complete the project should be a sufficient quality check without the necessity of further restrictive tendering.

Clearly, the construction industry has characteristics that set it apart from other industries. As discussed subsequently, these characteristics can have important implications for the effects of restrictive tendering.

LEGAL RESTRICTIONS ON OPEN TENDERING AND ON WAGES PAID

As part of extensive regulations that permeate the construction industry, there is a less-commonly-known aspect of labour legislation in Ontario that effectively restricts tendering on government projects to contractors affiliated with a particular subset of construction unions. This particular subset consists of traditional craft unions, or Building Trades Unions, which are organized on a craft basis, and which differ from non-union firms, as well as other construction unions including those organized on an industrial, or on a "wall-to-wall" basis including, for instance, the Christian Labour Association of Canada, the Building Union of Canada, and other unions, like CUPE or Unifor which also represent workers in the trades.[3]

The latter collectively bargain for all trades within a company, and bargain on a company by company basis, while the the craft unions and their contractors are subject to separate province-wide collective agreements that prevail for each trade, and which contain centralized wage rates. Further, these province wide collective agreements contain sub-contracting clauses which prevent contractors from sub-contracting work to firms that have a different affiliation from the general contractor even if they are unionized with another union.

Certain unions and companies in the construction trades function as a concentrated interest group that can benefit immensely from being protected by tendering that restricts bidding to union contractors.

Labour relations in construction in Ontario is governed under a separate Construction section of the Ontario Labour Relations Act. As described in detail in Dijkema (2012) Labour Board decisions have interpreted the meaning of a "construction employer" broadly to include government bodies that contract-out their projects through the tendering process, as virtually all do. This allows unions to organize a government entity (i.e. a municipality like Toronto, Ontario Power Generation, the Toronto District School Board) as if it was a contractor just like, for instance, Ellis Don. This gives rise to closed tendering not simply because they are now unionized, but because they become subject to the province-wide collective bargaining agreement which contains subcontracting clauses which disallow a given contractor (e.g., the city of Toronto) from subcontracting to firms that are not associated with *that particular union.* For example, the City of Hamilton, which is organized by the Carpenters' Union, can only tender projects for which carpentry work is involved to firms affiliated with the Carpenters' Union. In effect this prevents firms whose workers affiliate with other unions like, for instance, the Labourers International Union, as well as companies whose workers affiliate with alternative construction unions like CLAC, or those whose workers choose not to affiliate with any union. The ultimate effect is that vast swathes of public construction work are placed under a monopoly that is imposed not for procurement best-practices, but because of an unrelated piece of labour law intended to achieve a separate and unrelated end. Workers who exercise their right to affiliate with other unions, or no union, are forbidden to work on a public project *because of that choice.* In effect, only a subset of the population is able to bid on work that is paid for, and built on behalf of the whole population.

3 For further reference, see Pennings, Ray "Competitively Working in Tomorrow's Construction" and "Why is Construction So Expensive in Ontario?"

IMPORTANCE OF COST CONTAINMENT IN PUBLIC TENDERING

Cost containment in public tendering has taken on increased importance for a variety of reasons. Pressures to reduce deficits obviously translate into pressures to contain costs in public tendering. Increased infrastructure spending has placed an emphasis on insuring that the expenditure goes into infrastructure construction itself rather than excessive prices paid for the inputs, including labour inputs. Recent corruption scandals in the tendering process, as illustrated by the findings of the Charbonneau Commission in Quebec, have drawn public attention to the importance of an open, transparent bidding process to offset collusive behaviour amongst contractors. Concerns over the compensation of public employees themselves, especially with respect to pensions, draws attention to the compensation of those who governments do business with through the tendering process.

The importance of cost containment in public tendering is illustrated in McGuinness and Bauld, (2010, p. 11) in their analysis of public tendering in the GTHA area:

> "The Government of Ontario's 2010 budget is based upon a commitment to cut the current deficit in half in five years and eliminate it in eight years. It will not be possible to meet this commitment without considering carefully whether the individual components of the overall approach to public procurement in the GTHA can be justified on a cost-benefit basis."

The potential for reducing the *expenditure* side of the equation receives less attention.

In his analysis of municipal cost-saving initiatives across Canada, Whittaker (2016) highlights that underfunding of projects and the need for additional *revenue* and tax powers tend to receive the most attention. The potential for reducing the *expenditure* side of the equation receives less attention. He states (p.5): "efficiency-inducing strategies pursued by municipalities do not garner the public attention they deserve." Nevertheless, there are ample opportunities for efficiencies and cost-savings on the expenditure side. Of relevance to open tendering, he states (p. 13): "Increased competition and responsiveness by city purchasers allows for tremendous efficiency gains. It insures fairness in tendering and ultimately better service provisions to citizens."

NEGATIVE CONSEQUENCES OF MONOPOLY-TYPE BEHAVIOUR

The negative consequences of restrictions on the bidding process that give monopoly or oligopoly power to a small number of bidders are well known. They can charge higher prices (i.e., higher bids) knowing that there are fewer competitors that may bid lower. These higher prices mean that consumers of the services purchase fewer of the services (e.g., construction infrastructure projects). This artificially higher price also means that there is a social or deadweight loss in that consumers (i.e., taxpayers) would be willing to pay slightly lower prices to get more services, and *potential* contractors are willing to provide those services at the lower prices, but such mutually beneficial transactions cannot occur if the potential lower-cost contractors are excluded from the bidding process.

Monopolies have other undesirable effects. They can discourage innovation because the monopolists have little incentive to innovate to cut costs since they can be awarded the contracts at their higher costs. They also have little incentive to organize their production in efficient ways or to offer a variety and diversity of products that consumers value.

A less often discussed undesirable effects of monopoly power is that monopolists are more likely to discriminate because they are under less pressure to cut costs by hiring the best people for the job. Competitive market forces, in contrast, help dissipate discrimination because it is costly to not to hire persons whose productivity exceeds their wage that is low because of discrimination. There is ample evidence that competitive market forces help dissipate discrimination (Ashenfelter and Hannan 1996; Black and Brainerd 2004; Black and Strahan 2001; Hellerstein, Neumark, and Troske 2002; Meng 2004). In the construction sector there is also ample evidence of discrimination and harassment against visible minorities, immigrants, Aboriginal persons, disabled persons and especially women in many of the conventional male-dominated trades and the apprenticeship programs (Brigham and Taylor 2006; CAF 2004; CLFDB 1995; Stoll and Baignee 1997; Sweet 2003; Sweet and Gallagher 1997). To be clear: we do not imply any particular case of discrimination against those holding monopolies due to restricted tendering. On the contrary, the construction industry as a whole has taken admirable steps to make the industry more inclusive of women, aboriginals, new immigrants and others. However, it remains true that increased competition through a more open bidding process serves as a modulating structure which dissipates opportunities for such discrimination.

Monopolists also have an incentive to devote resources toward protecting their privileged positions and deterring new entry. Their monopoly profits provide them with "deep pockets" to engage in strategic behaviour to protect the continuation of those profits. This can occur through lobbying efforts in the political process to sustain legislation and regulations that deter new entrants. They can also undertake predatory actions and temporarily lower their bids to preclude new entrants but then raise their prices once the threat of new entrants is over. In the extreme, monopolists can engage in collusive bid-rigging to "share the spoils" (discussed subsequently).

The tendering process itself can increasingly be contested in the courts if it is not regarded as open, fair, and reasonable. McGuinness and Bauld (2010, 15) comment on that tendency:

> There have been hundreds of cases litigated in Canada (and many more claims brought but subsequently settled out-of-court), which have involved allegations that a Government or other public sector entity has failed to conduct its tender on a basis that is open, transparent and fair. . . . Many Governments have adopted extensive measures to avoid liability. More specifically, many Governments have adopted the practice of bulletproofing their RFP, tender and contract documents to afford a range of immunity from liability should a claim be brought against them. . . . In relation to staff training, many Governments and BPS [Broader Public Sector] entities have also become overly preoccupied with matters of process, so as to further reduce the chance of such claims. . . . Governments have focused on positioning themselves with a view towards anticipated litigation.

This defensive posturing to avoid litigation, or to provide protection in the event of litigation, has made the contracting process itself more complex, which in turn can deter smaller contractors without legal departments or "deep pockets" from bidding. It can also add more costs to the bids in anticipation of subsequent legal issues.

The negative consequences of restrictive tendering in construction is well stated by Bauld (2009, 64) in his analysis of government procurement in construction in the GTHA. His conclusions merit citing in full:

> By adopting measures which discourage competition in relation to Government construction contracts, Governments effectively put themselves in a position in which they consistently deal with Contractors in a concentrated market—that is, a handful of Contractors make up the entire supply side of the market. . . . Suppliers in such a market have the potential to influence market price, as for instance by adjusting their levels of production. In a non-concentrated market, the prospect of market entry by new suppliers deters such efforts, but by imposing a concentrated market on themselves, Governments effectively empower the Contractors who deal with them to exact higher than the competitive market prices. Suppliers in a concentrated market soon come to know the competition that they have to meet. It is easier for them to monitor each other's pricing strategy. They can gauge the existing contractual commitments of their competitors, and estimate their ability to pursue an additional contract. Thus, even in the absence of any kind of collusive activity, suppliers in a concentrated market are well placed to obtain a better than competitive return.

It is important to emphasize that while increased competition should have desirable effects on costs, innovation, product variety, discrimination, bid-rigging, and contract complexity to avoid litigation, it is only the *threat* of competition through new entrants that is necessary to deter such negative actions. As long as markets are *contestable* in that new entrants are not restricted from bidding, that threat can discipline the incumbents to behave more competitively (Baumol 1982; Baumol, Panzar, and Willig 1982; Baumol and Willig 1986). In contrast, restrictive tendering eliminates that threat and the contestability of markets, making it easier for monopolists to continue behaving as monopolists.

As stated by William Baumol and Robert Willig (1986, 22):

> Contestability theory follows the lead of Bain, Sylos-Labini and others in stressing that potential competitors, like currently active competitors, can effectively constrain market power, so that when the number of incumbents in a market is few or even where only one firm is present, sufficiently low barriers to entry may make antitrust and regulatory attention unnecessary.

And as stated by McGuinness and Bauld (2010, 56) in the context of bidding on government construction projects in the GTHA: "Perhaps more important than the actual number of bids received is the number of bids that the bidders anticipate. Construction contractors tend to base their prices on the anticipated intensity of competition." This clearly indicates that the contestability of markets through the threat of entry and competitive bidding can reduce monopoly-type pricing.

It is the case that the threat of entry is not credible if there are large sunk costs that are incurred if a new firm enters and if those costs cannot be recovered if they exit. However, construction contractors are often more like managers rather than direct employers. They put together inputs that are fungible with viable alternative uses. Such inputs include various types of labour, subcontractors, and equipment that is often leased and that can be resold or used elsewhere.

BIAS OF GOVERNMENTS TOWARD RESTRICTIVE BIDDING IN THEIR PROCUREMENT POLICIES

The tendency toward monopoly-type behaviour is fostered not only by the few contractors who benefit by restrictions on bidding but also by government procurement agencies that can find it easier to deal repeatedly with a few well-established firms. As aptly stated by Bauld (2009, 64):

> The problem of market concentration is worsened by the evident preference of Governments for dealing with larger and more established Contractors, in the selection of winning bidders in RFP and tender competitions. Not only is the supplier market concentrated by the adoption of practices that discourage Contractors from bidding, but the Government then further concentrates the market by limiting competition to those well-established firms.

The fact that these preferred few contractors may involve excessive costs, and have the other negative effects of monopoly-type behaviour as discussed previously, is not revealed in the tendering process since there are no bids from the potential new entrants given the restrictions on bidding. All that is revealed is that the winning bid beat out the bids of the other few contractors that were not restricted from bidding. In essence, a monopoly-type bid beat out other monopoly-type bids—potential competitive bids are not revealed because they do not exist. Procurement agencies cannot be accused of not accepting the best bid because such competitive bids are not revealed.

These preferred few contractors may involve excessive costs, and have the other negative effects of monopoly-type behaviour.

There is an adage that "you won't be fired for paying too high a price," but you can be fired or disciplined or subject to public scrutiny if the delivery of the project becomes problematic. As such, there is an understandable conservatism in procurement agencies in granting contracts to a concentrated set of a few established contractors. Their higher price is not public information, and even if it were it would not likely attract the attention as would a failed delivery of the contract.

Also, dealing repeatedly with a few well-established contractors can make sense if they have a reputation for delivering on budget and on time. But these are issues that can be factored in to the criteria for accepting bids. Restricting the bidding to a concentrated few firms in advance has the disadvantages of the monopoly-type behaviour discussed previously. It may also simply be easier for procurement agencies to vet a small number of bids rather than to deal with a large number. But this obviously comes at the cost of having to accept from a set of higher-priced bids.

As indicated previously, this issue is a classic example of concentrated benefits (monopoly profits) to a small interest group of a few contractors dominating the interests of a large group (taxpayers) where the benefits are dispersed. While the benefits of more competitive bidding may be substantial, when they are spread over the large group of taxpayers they are small on a per-person basis, and hence not a strong "call to action."

RECOGNITION OF AN OPEN, FAIR, AND TRANSPARENT PROCESS IN PUBLIC TENDERING TO DISSIPATE MONOPOLY BEHAVIOURS

Because of this wide range of well-known negative consequences of monopoly there is extensive recognition in public documents, procurement guidelines, and elsewhere of the importance of an open, fair, and transparent process in public tendering. Openness relates to the removal of restrictions on the tendering process so as to foster competitive bidding and the potential entry of new competitors. Fairness relates to ensuring an open bidding process so that legitimate bidders are not excluded from the process. It also ensures the public receives a fair value for money from their tax dollars. And transparency relates to being able to readily verify that the bidding process is open and fair.

For example, the introduction to the Treasury Board of Canada's annual *Purchasing Activity Report* states:

> The federal Government's Contracting Policy objective is to acquire goods and services and to carry out construction in a manner that *enhances access, competition* and fairness and results in best value or, if appropriate, the optimal balance of overall benefits to the Crown and the Canadian people. As well, contracting is to be conducted in a manner that will . . . stand the test of public scrutiny in matters of prudence, probity, *facilitate access, encourage competition* and reflect fairness in the spending of public funds. (Treasury Board of Canada 2006, emphasis added)

In their study of the price implications of government contracting practices in the GTHA, McGuinness and Bauld (2010, 66) state:

> We have looked at more than 100 public sector purchasing by-laws and directives from Ontario. In not one case has there been any suggestion that public sector buyers should disregard value for money in making procurement decisions. On the contrary, most of these documents specifically direct purchasing staff to place an emphasis on securing good value.

IMPORTANCE OF COMPETITION IN RELATED AREAS

Restrictions on tendering are not the only regulations that would benefit from more open competition. There are a number of other areas where competitive forces are restricted and that increase the cost of services. These are relevant for government construction contracting for two reasons. First, they further illustrate, and provide evidence for, the effects of more open competition. Second, they are areas that generally also apply directly to construction.

Occupational Licensing and Certification

Occupational regulation of the trades and professions is a common form of regulation. There are basically two types of such regulation. The more restrictive involves the "exclusive right to *practice*" in that only those with the licence can perform the service. In the professions this is generally termed a professional licence (e.g., surgeon); in the trades it is termed a mandatory trade (e.g., crane operator). The less restrictive form involves the "exclusive right to *title*" in that only those with the certification can use that title, but others can practice. In the professions this is generally termed a professional certification (e.g., certified accountant); in the trades it is termed a voluntary trade (e.g., carpenter).

The rationale for occupational licensing and certification is ostensibly to protect the public especially in areas where the quality of the service is difficult to judge and health and safety issues may be involved. The powers for regulating the trade or profession are generally given over to self-governing bodies in the trade or profession itself on the ground that they know the requirements of the trade or profession for delivering quality services. Because of this control, they exert considerable influence over entry into the trade or profession through such means as exams, length of training requirements, and influences over immigration policy. As such, they may have an incentive to artificially restrict supply into the profession or trade to enhance the pay of incumbents. This is compounded by the fact that they often also influence demand for their services since they often tell the customers how much of the service is needed. This ability to restrict supply and enhance demand can obviously lead to higher prices for their services. This is especially the case for licensed professionals and the mandatory trades. For certified professionals and voluntary trades, where only they can use the title but others can practice the profession or trade (i.e., more open competition), this tendency to artificially raise prices is muted if not minimal.

There is ample empirical evidence that the restrictions on entry into the profession or trade imposed by occupational certification and especially the more restrictive licensing lead to artificially higher prices and hence costs to consumers. Reviews of the literature place the pay premium across all licensed occupations ranging from about 12% to approximately 18% (Gittleman and Kleiner 2016; Kleiner and Krueger 2010, 2013). Similar results for Canada are found in Gomez, Gunderson, Huang and Zhang (2015), although the results are sensitive to the estimating procedure. For regulated apprenticeships, Brydon and Dachis (2013) find that extensive regulations such as requiring a high ratio of journeypersons to apprenticeships reduces entry to the trade and increases the income of incumbents. For example, income trades with a high ratio of journeypersons to apprentices have income that is 10 percent higher than in trades without a legislated ratio (p. 10).

Unions

Unions can also raise the wage of their members, either through direct bargaining or through restrictions on entry, as is in the case of craft unions. Reviews in the United States of the extensive literature on pure union wage premiums after controlling for the effects of other wage determining factors place that pure union wage premium at approximately 15 percent (Blackburn 2008; Blanchflower and Bryson 2004; Gittleman and Pierce 2007; Hirsch and Schumacher 2004; Lewis 1986). Reviews for Canada, based on about twenty-five studies, document similar effects (Benjamin et al., 2012, 466). Importantly, the union

wage premium has declined over time as a result of competitive forces from international competition, deregulation, and a growing non-union sector. In more recent years in Canada, for example, the union wage premium is more in the neighbourhood of 8 percent (Fang and Verma 2002; Gunderson, Hyatt, and Riddell 2000).

Also, importantly for the purpose of this study, the pure union wage premium after controlling for other factors that affect wages is vastly higher in construction than in other industries. Estimates from the US place the pure union wage premium in construction more in the range of 40-50% (Bilginsoy 2013; Blanchflower and Bryson 2004; Bratsberg, Bernt and Ragan 2002; and Linneman, Wachter and Carter 1990) which is around three times the average premium of around 15%. More modest estimates for the US of 26% are given in Block (2002, p. 287) and 26% in Kessler and Katz (2001, p. 271). In Canada, estimates in Fang and Verma (2002) place the union premium in the construction industry at around 19%, over twice the premium of about 8% across all industries. This higher union wage premium in construction has obvious cost implications for tendering that effectively restricts bidding to unionized contractors or contractors that have to pay a union rate. Here again it is crucial to note the difference between labour union models in Ontario's construction industry. The restriction to a subset of craft unions means that, even if one is opposed to competition on wages in a free labour market, the benefits of higher productivity, or lower non-wage costs, that might be offered by alternative unionized firms are lost. Effectively locking in the craft union wage and workplace organizational structure prevents competition even on cost items that do not accrue directly to workers, or where costs can be lowered by efficiencies in workflows, and job organization (Kale, Arditi, 2002)[4] , or on administrative aspects of the compensation package such as benefit plans, union funds, and training costs. The cost differences between unions funds (excluding pensions) for craft unions in the GTA are significant, suggesting that even were wages equal, competition would promote lower costs.[5]

Fair Wage Policies

Fair wage policies generally require the payment of a prevailing community wage in government contracts, and they exist mainly in construction. Where fair wage policies exist, the fair wage is often measured in different ways, sometimes based on wage surveys and sometimes on collective agreement rates; sometimes union wages and at other times the average of union and non-union wages; sometimes including fringe benefits and at other times not including them.

In Ontario the fair wage policy is implemented under the government's general regulatory power. Fair wage policies have been adopted by a number of cities and municipalities, notably the amalgamated city of Toronto. In Toronto, these rate schedules are updated regularly and are generally in line with collective-agreement rate increases and include fringe benefits. Fair wage legislation exists in the United States mainly through the federal Davis-Bacon Act as well as in state legislation.

There is a fairly extensive literature estimating the impact of fair wage legislation, mainly based on the United States. Earlier studies were reviewed in Kessler and Katz (2001, 261), who concluded that "although the studies agreed that Davis-Bacon increased the government's labour cost for construction, they reported a wide range of point estimates (from 4% to 38%)." The high figure of 38 percent is based on Martha Fraundorf, John Farrell, and Robert Mason (1984). Their own estimates from Kessler and Katz (2001, 267) yielded construction wages about 2 to 4 percent higher across the whole construction sector, which implies wage cost in the fair wage contracts themselves being 10 to 20 percent higher under

4 For a review of the generally conservative nature of competition, and the lack of innovation in the construction sector, see: Serdar Kale1 and David Arditi, JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT / MAY/JUNE 2002

5. Authors' calculations based on review of provincial collective agreements available at the Ministry of Labour collective agreements library.

fair wage regulations since about one-fifth of construction workers worked on fair wage projects (Bloch 2003, 287). Hamid Azari-Rad, Peter Philips, and Mark Prus (2003, 446) indicate cost increases of 15–25 percent being typically cited in legislative hearings, testimonies, and other sources in the United States when fair wage laws are being debated. Their own estimates yielded cost increases of about 3 percent based on comparisons of states with strong fair wage regulations and those without regulations. The Ohio State Legislative Service Commission (2002) found project cost savings averaging slightly over 10 percent from exempting public school construction from the state's fair wage legislation. In a study that was also able to include fringe benefits, Jeffrey Peterson (2000, 258) estimated that fair wage legislation increased total compensation costs by 12 percent. In their review of studies comparing standardized construction costs in states with fair wage laws and those without such laws, J. O'Grady, T. Armstrong, and R. Chaykowski (2006, 43–44) conclude that contract cost are generally less than 5 percent in states with fair wage legislation.

Sara Dunn, John Quigley, and Larry Rosenthal (2005, 143), however, indicate that the results of many of these earlier studies "are questionable, as the authors did not control for many of the project characteristics, and some unmeasured differences among state institutions may affect the results" (148). When they controlled for these factors, they found that "holding other factors constant, projects paying prevailing wages were about 9–11% more costly than otherwise identical projects not subject to these regulations" (149). This estimate more than doubles to between 19 and 37 percent (153, 156) when they use more sophisticated econometric procedures to control for the possibility that prevailing wage laws are more likely to be instituted in higher-cost markets.

Clearly there is a wide range of cost estimates based on US regulation going from essentially zero to 40 percent. Studies at the extreme low end or high end are unlikely to be accurate since their data limitations prevent them from properly controlling for other factors that can influence those costs. The more recent studies that better controlled for such factors tend to find estimates more in the middle of the range, at about 20 percent, albeit estimates at the extreme ends also exist.

Only a small number of Canadian studies exist on the cost increases that result from fair wage regulation. O'Grady, Armstrong, and Chaykowski (2006, 46) cite an earlier study done in 1993 that estimated the fair wage policy to add about 7 percent to construction costs in British Columbia and another that indicated fair wage policy added 2 percent to the cost of schools. It is difficult to discern from these studies, however, how much they added to the labour cost component since construction costs and the cost of schools have other cost components. Their own estimates yielded a cost increase of about 5 percent based on assuming that a fair wage policy would require paying union wages as opposed to non-union wages without such a policy. Their estimate is based on Fang and Verma's 2002 estimate of the union wage premium in construction *occupations* of 14.6 percent, multiplied by a 33 percent labour cost share on construction projects. Had they used the Fang-Verma union wage premium in the construction *industry* of 19 percent on the grounds that fair wages apply to the construction industry and not to construction occupations outside of the construction industry, this would imply a contract cost increase of 6.3 percent based on a labour cost increase of 19 percent for those workers affected by the fair wage legislation and labour cost being 33 percent of construction costs. The union wage premiums they used were based on pure union premiums after controlling for other factors that can affect the union–non-union pay differential. It is not clear as to whether it is appropriate to use that pure adjusted union premium since union and non-union contractors may use different mixes of workers, in which case the gross or unadjusted wage differential is appropriate. Had they used the 34 percent union wage premium they documented based on survey evidence, this would imply a labour cost increase of 34 percent, which would imply a contract cost increase of about 11 percent based on a 33 percent labour cost share.

Cihan Bilginsoy and Peter Philips (2000) find that standardized construction costs in British Columbia public sector school contracts were 16 percent higher when there were no controls for the other factors

that could change and influence such costs, and they were 6 to 9.4 percent higher after controlling for other factors that could affect such costs. These later estimates, however, are likely to be lower-bound estimates since one of the factors they controlled for was the number of bidders, which has a large effect on reducing costs. Fair wage policies are likely to reduce the number of bidders since non-union low bidders are unlikely to bid because they have to pay the fair wage rate, which is closer to the union rate. As well, the fair wage schedules they used were approximately 90 percent of the union rates. If they were based on the union rate, the costs would correspondingly be about 10 percent higher.

Clearly, the US and Canadian studies yield a wide range of cost increases from fair wage policies, ranging from effectively zero to 40 percent, although estimates in the middle of that range are likely to be more realistic. As a crude approximation, the union wage premium in construction of approximately 19 percent (after controlling for other factors that can determine wages) to 34 percent (without controlling for those other factors) would imply a wage cost increase of about 19 to 34 percent if fair wage policies required paying the union wage rate. This would imply a contract cost increase of about 6 to 11 percent based on a 33 percent labour cost share. These are within the range of estimates based on other methodologies as discussed previously, albeit likely at the lower end.

The implications of these estimates for the current study are twofold. First, they highlight the cost implications that arise from restricting competition—in this case not allowing open bidding, but requiring the bidding be based on so-called fair wages. Second, they highlight that more open bidding, for example, allowing non-union contractors to bid, will not have a full effect on cost saving if fair wage laws require them to pay union wages or wages that are above competitive market rates.

Privatization

Privatization opens up an otherwise monopoly-type situation to the forces of competition, often through open bidding for contracts. The international and Canadian evidence generally shows substantial gains in efficiency so that the services are provided at lower cost. Reviews of that substantial evidence are provided in Anthony Boardman, Claude Laurin, and Aidan Vining (2002), Boardman and Vining (2012), Dachis (2010), and William Megginson and Jeffry Netter (2001).

In one of the areas of privatization that is most studied—municipal garbage collection—cost savings of 20 percent or more have been documented from private tendering as opposed to municipal collection (McDavid 2000; 2001). Based on international evidence, Germa Bel and Mildred Werner (2008) document substantial cost savings in twelve of eighteen studies. In a recent study for Ontario, Dachis (2010) estimates costs from the contracting out of municipal collection and disposal services to be in the neighbourhood of 31 to 34 percent per household. Importantly, he emphasizes that it is not privatization per se that affects cost savings. Rather it is the existence of a competitive tendering system that results in cost savings since public employees from the previous public system can also bid on contracts (Dachis 2010, 7–8). Their bids, of course, will be disciplined by the bids of other contractors.

There are groups who are ideologically opposed to privatization and will oppose open-tendering for those reasons. However, it is important to note that public infrastructure projects are *already* constructed by private firms. As noted above, governments– almost without exception– tender major construction projects to private construction firms due to factors unique to the industry. The result is a situation where a select group of *private* firms experience and benefit from the same lack of competition that often applies to *public* employers. Those ideologically opposed to privatization should not, therefore, confuse closed tendering with delivery of construction services by the state and state employees.

MORE BIDDERS, MORE COMPETITION, LOWER PRICES

The economic literature on bidding and auctions clearly indicates that the greater the number of bids on a tender, the lower the price that results. This obviously highlights that artificial restrictions on the bidding process reduces competition and leads to higher prices on construction projects.

In their thorough analysis of the price implication of government contracting practices in the GTHA, McGuinness and Bauld (2010, 56) highlight the importance of a large number of bidders to keep bid prices low. Again, their statement bears repeating in full.

> There is a considerable amount of theoretical literature in the field of economics dealing with the association between the number of bidders and the expected price at an auction or tender [e.g., Vickrey 1961 for an early statement]. Indeed, it seems a fairly elementary proposition that a higher turnout will lead to what is (from the buyer's perspective) a positive tender outcome. Conversely, the lower the number of bidders, the poorer the tender is likely to be in tapping into each bidder's valuation or reserve price. All other factors being equal, a low number of bidders is symptomatic, and such a market is unlikely to attract the best price. For these reasons, as a general rule, a party conducting tender is well advised to structure it to attract the maximum number of bidders, not just four. The price secured through the tender process is optimized for the following reasons. First, as the number of bidders increases, each participant in the process has an incentive to offer a better price, because it becomes harder for the bidders participating in the process to anticipate each other's behaviour. Second, a higher number of bids can increase the chance of receiving a bid from a party who will place a high value on securing the contract. Such a party is likely to offer the most competitive price. Third, an increase in the number of bids makes it more difficult for the bidders to organize on a collusive basis. (see, e.g., Ooi, Turnbull, and Sirmans 2006)

In his review, Willard Mueller (1988, 64) states:

> Virtually all auction market theory points to higher buying prices and lower selling prices as the number of bidders grow. The theory is supported by empirical studies in municipal bond underwriting, bidding for offshore oil, and bidding for national forest timber. Other concentration price studies have been made in such diverse industries as life insurance, newspaper and television advertising, gasoline retailing, prescription drugs, cement, and microfilm. All of these studies found a positive relationship between market concentration and prices."

And in his review, Lawrence White (2010, 230) states:

> Increases in the market concentration of suppliers lead inexorably to higher pricing. Studies have shown that constraints upon the number of bidders in auctions and tenders—or on the number who voluntarily participate in auctions and tenders—can have the same type of effect on prices as actual market concentration.

The cost saving from additional bidders is illustrated in a number of specific studies. James McDavid (2000; 2001), for example, found that municipal waste contracts with at least five bidders had costs that were 29 percent lower per household than contracts with only one or two bidders. Based on data on bids for projects around the world, Martin Skitmore (2002) estimates that bid prices fell by 20 to 25 percent as the number of bidders increased from two to fifteen. Based on a simulation model, Ivan Damnjanovic et al. (2009, 20) estimate a strong negative relationship between the number of bids and the final project price. The relationship is non-linear, with a reduction in the price of about 8 percent in going from two to three bids, 14 percent for four bids, 18 percent for five bids, 21 percent for six bids, 23 percent for seven bids, and 25 percent for eight bids.

In reference to the specific situation in the GTHA, McGuinness and Bauld (2010, 50–51) state:

> A number of municipalities have recently published data to support their claim that their tenders are competitive because they attract, on average, five or six bids. . . . It should be noted that an average of five or six bids per construction contract is low by international standards. For instance, in one 2008 study of 211 tenders relating to 69 infrastructure projects in 29 countries, the average number of bids per contract was 23.6. In comparison to that average, the claimed average of five to six bids per construction contract is not especially good evidence of strong competition.

BID-RIGGING, COLLUSION, AND CORRUPTION

The negative effect of restricted bidding on contracts is through not only its direct effect on raising costs on those contracts but also its indirect effect on facilitating bid-rigging, collusion, and corruption. This can have a cumulative effect on facilitating monopoly-type pricing throughout the contracting process and lead to even more long-run costs. This negative effect of bid-rigging, collusion, and corruption is well recognized in the literature.

As stated by McGuinness and Bauld (2010, 59) in their discussion of construction contracting in the GTHA:

> There is good reason to believe that Governments and even private sector owners may become prey to bid-rigging. There is also good reason to be especially concerned in relation to construction. In 2009, the Office of Fair Trading in Great Britain concluded an extensive investigation and prosecution of bid-rigging in the U.K.'s construction industry, imposing fines of £129.5 million on some 103 firms (86 of which received reduced fines by admitting responsibility). In the United States, there have been a large number of prosecutions for bid-rigging in relation to Government contracts, with construction being an area of prime concern. Many of the companies involved in these U.K. and American prosecutions have Canadian affiliates. Moreover, there are also homegrown Canadian examples of bid-rigging in relation to construction. For instance, in the Electrical Contractors case, it was determined that Pearson Airport, Skydome Hotel, BCE Place, and other projects had all been targeted by bid-rigging schemes involving electrical contract work during construction or renovation. At least 24 bidding competitions were found to have been rigged during a five-year period. Eight electrical contracting firms and one general contractor were convicted, and fines of more than $3 million were levied. Moreover, the tendency toward cartelization in the Canadian construction industry has been documented in academic studies. [Kleit and Palsson 1999] It is known that the benefits of a RFT or RFP in securing price competition falls sharply as the numbers of bidders decreases. One of the main reasons is that contract competitions which attract a small number of bidders invite bid-rigging schemes.

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In their guidelines for fighting bid-rigging in public procurement, the Organization for Economic Co-operation and Development (OECD) (2009, 2–3) mentions as their first two criteria items that relate to the removal of restricted tendering:

> *Small number of companies.* Bid-rigging is more likely to occur when a small number of companies supply the good or service. The fewer the number of sellers, the easier it is for them to reach an agreement on how to rig bids.
>
> *Little or no entry.* When few businesses have recently entered or are likely to enter a market because it is costly, hard or slow to enter, firms in that market are protected from the competitive pressure of potential new entrants. The protective barrier helps support bid-rigging efforts.

The OECD recommendation of the OECD council on fighting bid-rigging in public procurement clearly recognizes the wide range of benefits that arise through the role of competition fostered by open tendering. They state:

> RECOGNISING that, in public procurement, competition promotes efficiency, helping to ensure that goods and services offered to public entities more closely match their preferences, producing benefits such as lower prices, improved quality, increased innovation, higher productivity and, more generally, "value for money" to the benefit of end consumers, users of public services and taxpayers;
>
> RECOMMENDS that Members assess the various features of their public procurement laws and practices and their impact on the likelihood of collusion between bidders. Members should strive for public procurement tenders at all levels of government that are designed to promote more effective competition and to reduce the risk of bid rigging while ensuring overall value for money. (OECD 2012, 2)

They specifically recommend the promotion of "competition by maximising participation of potential bidders by . . . establishing participation requirements that are transparent, non-discriminatory, and that do not unreasonably limit competition."

Bid-rigging, its prevalence when competition is restricted, and its negative effects have been documented in a wide range of academic studies including Robert Porter and J. Douglas Zona (1993) and Srabana Gupta (2001), who also review numerous other studies. Weishaar (2013) provides more current international evidence as well as reviews of numerous other studies.

ECONOMETRIC METHODOLOGIES FOR ESTIMATING CAUSE-AND-EFFECT RELATIONSHIPS

As a first step in outlining potential methodologies for estimating the effect of restricted tendering on construction costs, it is useful to outline the methodologies that have been advanced in econometrics for estimating the *causal* relationship between an intervention or treatment (restrictive tendering in this case) and outcomes (cost of contracts in this case). The emphasis in these methodologies is to estimate the extent to which the relationship is *causal* (i.e., restrictive tendering causes an increase in costs) rather than simply correlational or associative. A variety of econometric methods have been used to estimate underlying causal relationships. Understanding these methodologies may trigger ideas that can be useful for designing methodologies for estimating the cost implications of restrictive tendering.

Establishing the underlying causal relationship is important for policy purposes so that policy interventions (e.g., removing the restrictions on bidding) can deal with the causes and not just the symptoms. If the relationship is simply correlational, then removing the restrictions may not lead to lower costs. Establishing the underlying causal relationship is also important for predicting the future. Higher construction costs may not continue in the future unless the underlying cause (restrictive tendering) continues. Note that this assumes a differentiation between economic outcomes (i.e. the costs of contracts) and other non-economic outcomes which, in their own right, might be legitimate rationale for policy change. As Ray Fisman and Tim Sullivan note, "democracy wasn't designed to be as smooth, as fast, as profitable, or as efficient as possible."[6] Issues of democratic responsibility, respect for and protection of freedom of association are matters that are at least equally, if not more, important for government policy. The purpose of this paper is to examine one factor – economic outcomes. It is the responsibility of public official holders to appropriately understand these competing factors in pursuit of responsible public governance , and indeed, even in the highly unlikely case that empirical evidence on closed tendering pointed to *lower* costs, it might still be incumbent upon government to open tendering for democratic reasons.

Random Assignment

Randomly assigning units to a treatment group and others to a control group, as is common in medical trials, is generally considered the gold standard for estimating the effect of a treatment on outcomes. If the assignment is truly random, then the effect of the intervention is simply the mean difference in outcomes between the treatment group and the comparison group.

Randomly assigning restricted or open tenders is not feasible. Nevertheless, this procedure can serve as a benchmark for judging other procedures that may approximate random assignment.

Natural Experiments

Natural experiments involve what could be considered an "act of nature" that approximates randomly assigning some to a treatment group (e.g., restricted tendering) and others to a control group (open tendering). The act of nature is simply some event that is generally regarded as exogenous in the assignment to the treatment or intervention. If, for example, restricted tendering were the norm, but some open tendering occurred "by accident," then this could be considered the equivalent of random assignment, and mean cost differences could be compared. It is not obvious, however, that such "accidents" have occurred whereby some construction tenders are restricted while others are open.

Comparisons across contiguous regions are sometimes used as natural experiments, if the regions are otherwise similar but differ mainly in the extent of the treatment or intervention. Other differences can

6 Fisman, Ray and Sullivan, Tim. *The Inner Lives of Markets.* Pg. 15

be controlled for by the use of regression analysis. Where tenders are restricted in one region but open in a contiguous region will have to be explored in greater detail.

Before-and-After Comparisons

Before-and-after comparisons are often used to estimate the effect of a policy change. In this case, it would involve a change from restricted tendering to open tendering or from open tendering to restrictive tendering. If no other factors are changing to influence outcomes, then comparisons of mean outcomes in the "after" period minus the "before" period provides an estimate of the effect of the policy change. In effect, the "before" period serves as the control group. If other variables are changing that can affect the outcomes, then they can be included as explanatory control variables. The estimates are more reliable if longer periods around the policy change are available, although the longer the periods the more likely other factors are changing.

To the extent that Ontario has had periods of time when restrictive tendering was in place and other periods when it was not in place, then such before-and-after comparisons of construction costs could be made. The cost estimates, however, would have to be for uniform or standardized construction projects to control for the possibility that the product itself was changing over time. The estimates would also have to control for other factors that could affect construction costs over time such as technological change or changes in the cost of other inputs.

Difference-in-Difference Estimates

A better comparison can be made if, in the before-and-after period, a control group is also included that is not affected by the event or treatment at all. Any change in their behaviour around the event will be picking up and controlling for the effect of other factors that may also be changing and that would otherwise contaminate the before-and-after comparisons. Their *change* in behaviour or outcomes can then be subtracted from the treatment group to get the net or causal effect of the treatment, purged of the effect of contaminating factors that are affecting the control group. That is, the difference in the before-and-after behaviour of the control group is subtracted from the difference in the before-and-after behaviour of the treatment group—hence the phrase difference-in-difference. Regression analysis can also be used to control for other variables that may change differently across the treatment and control groups.

It is desirable if there are common trends in the outcome measure (e.g., construction costs) between the treatment and comparison group prior to treatment. It is also desirable if the treatment and control groups have similar values of the control variables (i.e., common support) prior to the treatment or policy intervention.

For estimating the effect of restrictive tendering on construction projects in Ontario, the difference-in-difference procedure essentially requires information on standardized construction costs before-and-after the introduction of restrictive tendering compared to open tendering, or vice versa, as well as standardized construction costs in a jurisdiction or industry where open tendering prevailed throughout the same time period. It would also require information on other factors that can affect changes in construction cost so as to control for the effect of changes in such factors.

Regression Analysis

If some contracts in construction involved restricted tendering and others involved open tendering, then an approximation to the cost effect of restricted tendering could be estimated by simply comparing the average standardized construction costs in the two regimes. The product or services would have to be homogenous or converted to homogenous units. Regression analysis could be used with a dummy variable coded one for restricted contracts and zero for open contracts. Control variables could be added to control

for the effect of other factors that may influence the costs, provided that data is available on those factors. The regression coefficient on the restricted tendering dummy would give the effect on costs of restricted as opposed to open tendering.

This procedure essentially requires information on whether the tendering was restrictive or open as well as the cost of a homogenous or standard construction project and information on other variables that may affect construction costs.

A problem with this procedure is that the treatment, in this case restrictive tendering, may not be exogenously determined (i.e., akin to being random). The decision to allow a contract to be subject to restrictive as opposed to open tendering may be based on other unobservable factors that cannot be controlled for in any regression analysis, but that nevertheless affects the cost outcome. For example, restricted contracting may be used in situations where the contract is risky in the sense that it is difficult for the contractor to make an appropriate bid—they may overestimate or underestimate by substantial amounts. In such circumstances, all bids may contain a risk premium. Any higher cost for restricted contracts could reflect this risk premium, not an excess payment because of the restrictive tendering.

Instrumental Variable Analysis and Selection Correction Procedures

Instrumental variable analysis is designed to deal with this problem. It essentially involves a two-stage procedure where the first stage involves estimating the probability of being in the treatment group (e.g., restrictive tendering) compared to the control group (e.g., open tendering). This would require finding a variable or variables that affect the probability of receiving the treatment (e.g., restrictive tendering) but that do not affect the outcome (e.g., construction costs). In the treatment effect literature, such variables (termed exclusion restrictions) are generally extremely difficult to find, and the analysis often flounders on this difficulty.

If such a first-stage estimate turns out to be feasible, then the predicted value from this estimate is included in a second-stage outcome equation and estimated by two-stage least squares. The resultant coefficient from this estimate gives the causal effect of the treatment (e.g., restrictive tendering) on the outcome (e.g., construction costs).

A variant of this procedure is the Heckman two-step procedure. It involves a similar estimate of the first-stage equation. The predicted value of this is then used to construct a sample selection correction term (inverse Mills ratio) that is included in the second-stage outcome equation. The coefficient on the restricted-versus-open-tendering dummy variable would give the cost effect of restricted as opposed to open tendering after controlling for the effect of other variables that can affect costs, including unobservable factors that may influence the choice of restricted versus open tendering.

Separate Treatment and Control Equations

The regression procedure described above with a dummy variable for restricted contracts versus open contracts assumes that the other control variables have the same effect on the outcome (e.g., costs) for restricted contracts versus open contracts.

As an alternative or complementary procedure, separate regressions can be run on the restricted-contracts sample and the open-contracts sample. The mean difference in the outcomes (e.g., costs) can then be decomposed into two component parts. The first is differences in the characteristics (explanatory variables) that affect the outcomes. The second component is differences in the outcomes, costs in this case (regression coefficients), that are associated with the different characteristics.

In the case of construction contracts, this would seem useful mainly if one wanted to drill deeper and explain the cost difference between winning contracts for standardized construction projects under restricted versus open tendering. If the purpose is just to compare costs between winning contracts for standardized construction projects under restricted-versus-open tendering, then the regression analysis with a simple dummy variable for restricted versus open tendering would be adequate.

Regression Discontinuity Procedures

Another methodology for approximating random assignment is to use regression discontinuity (RD) procedures. The RD design basically requires a cutoff score such that those just above the score get the treatment (e.g., are awarded the contract) while those just below the score do not get the treatment (e.g., are not awarded the contract) and are in the control group. Such individuals just below and just above the cutoff are so close to each other in terms of getting the contract that being awarded the contract can be considered the luck of the draw (i.e., randomly assigned to the treatment). Such a procedure requires a large number of observations around the cutoff point. Observations away from the cutoff can be included with lower weights attached to them, but this comes at the expense of starting to compare "apples and oranges." Control variables can be added to control for other factors that may affect the outcomes.

Such a procedure would not seem viable for construction projects since there are typically only a few bidders, with only one winning bid. There is simply not a large number of bids with some that just won and others that just lost, and with a clustering of bids around the won-lost cutoff.

Propensity Score and Other Matching Procedures

Propensity score and other matching procedures have been used to control for unobservable factors that can affect outcomes between two regimes (e.g., restricted versus open tendering) and that cannot be controlled for by including as control variables in a regression context.

The procedure basically involves estimating the probability of being in a treatment regime (e.g., restricted tendering) versus a control or comparison group regime (e.g., open tendering). The predicted probability of being in the treatment regime (e.g., restricted tendering) is then estimated (i.e., the propensity score). Those observations in the treatment regime (e.g., restricted tendering) are then matched to observations in the control group (e.g., open tendering) that have the same or similar probabilities (propensity score). Mean differences in the outcomes (e.g., costs) are then compared. They are considered causal estimates since both the treatment and comparison groups have the same probability of being treated; the treated groups just happened to receive treatment (by random chance). The assumption underlying this analysis is that selection on the observables (the variables that affect being in the treatment versus the control group) controls for selection on the unobservables. Such an analysis requires data on contracts that were awarded under restrictive tendering and those awarded under open tendering, for the same homogenous or standardized construction projects.

Synthetic Control Method

The synthetic control method is a matching procedure that basically involves synthetically or artificially finding a comparison group from a "donor pool" of potential comparison groups that most closely resembles the treatment group (in terms of covariates that can affect the outcome) in the time period prior to the treatment. The pre-treatment variables can also include the outcome measure in the period prior to the treatment. The unit of observation is typically a country, region, state or firm, with the synthetic comparison group constructed from the donor pool of other countries, regions, states or firms that did not implement restrictive tendering. The difference between the outcomes between the treatment group and the synthetic comparison group before the treatment and after the treatment (i.e., a difference-in-

difference type comparison) is then made to yield the treatment effect. Essentially this procedure refines the difference-in-difference procedure by restricting the comparison group to a set of observations that most closely resembles the treatment group in terms of factors that can affect the outcomes.

As applied to the issue of estimating the effect of restricted tendering on contract costs, jurisdictions (e.g., cities or municipalities) that implemented restrictive tendering would form the treatment group. The change in their contract costs after the implementation of restrictive tendering would then be compared to a synthetic comparison group of other jurisdictions that did not implement restrictive tendering. That synthetic comparison group would be selected from the donor pool of all jurisdictions on the basis of most resembling the treatment group in terms of factors that can affect the cost of contracts, including the outcome (cost of contracts) in the period prior to the implementation of restrictive contracts in the treatment group.

OTHER METHODOLOGIES FOR ESTIMATING COST OF RESTRICTIVE TENDERING

The econometric methodologies for estimating the causal effect of restricted versus open tendering tend to have data requirements that are not likely to prevail in the construction contracting area. The previous discussion of the literature often highlights points that have implications for methodologies for estimating the cost of restrictive tendering in public construction projects in Ontario. Potential methodologies are outlined in this section with the intent of providing information for narrowing down such methodologies and highlighting additional information that would be needed to arrive at cost estimates.

Simulations Based on the Union Wage Impact and Ratio of Labour Cost to Total Cost

An estimate of the cost effect of restrictive tendering could be made if it is reasonable to assume that restrictive tendering involves the union wage rate and open tendering involves the non-union wage rate. Adjustments could be made for the fact that if tendering were open then unionized contractors would obviously still bid, but they would likely have to bid closer to the non-union wage rate to compete with the non-union contractors. How close to the non-union wage they would have to bid is an open question.

A decision would also have to be made as to whether it is appropriate to use the gross union-nonunion wage differential in ICI construction, which is simply the difference between the average union-nonunion wage in ICI construction, or the *net* union-nonunion wage differential after using regression analysis to control for the effect of other factors that affect that differential (e.g., age, education, training etc). The net differential is generally regarded as the pure union wage effect. However, non-union contractors are likely not only to not pay the union wage but also to use a different mix of workers.Providing that the mix was appropriate for meeting the requirements of the contract, then the gross union-non union wage differential would be appropriate to use. Perhaps a reasonable strategy would be to use the net union-nonunion wage differential as a lower bound and the gross differential as an upper bound of the cost differential.

Fang and Verma (2002) estimate the net union–non-union wage differential in construction in Canada as 19 percent after using regression analysis to control for other factors. Their estimate is for the construction industry in general and not for ICI separate. They also do not report a gross wage differential. However, based on a special request we made to Fang, he estimated the gross differential of 22.1 percent, similar to the net differential of 19 percent, suggesting that the cost implications will not be sensitive to the use of a gross or net union wage premium in construction.

Using the union–non-union wage differential as an estimate of the wage cost difference between restricted tendering (union wages) and open tendering (non-union wages) would imply that the *labour cost* saving is between 19 and 22 percent depending on whether the net or gross union wage premium is used. O'Grady, Armstrong, and Chaykowski (2006, 37) estimate that labour costs are about 33 percent of total contract costs in construction in Canada. This would imply that the *contract cost* saving would be between 6.3 and 7.3 percent depending on whether the net or gross union wage premium were used. This difference between labour cost and contract cost savings based on the share of labour cost to total cost in construction is one reason why reports of cost saving can vary so much—they are sometimes expressed as a percent of labour cost and sometimes of contract cost.

If this procedure is followed, then a wide range of adjustments and judgment calls would have to be made. Updated estimates of the union–non-union wage differential in ICI construction in Ontario would be necessary, preferably on both gross and net bases, the latter requiring regression estimates to control for the effect of other variables that can affect wages. Estimates from the literature could also be used, but

it is not clear how relevant they are for ICI in construction in Ontario. As indicated earlier, estimates from the United States place the pure union wage premium in construction more in the range of 40–50 percent (Bilginsoy 2013; Blanchflower and Bryson 2004; Bratsberg and Ragan 2002; and Linneman, Wachter, and Carter 1990), although more moderate estimates for the United States of 26 percent are given in Bloch (2002, 287) and 26 percent in Kessler and Katz (2001, 271). O'Grady, Armstrong, and Chaykowski (2006, 37) estimate the union pay premium in construction to be 34 percent in Canada.

In addition to estimates of the union–non-union pay differential in ICI construction in Ontario, it would be necessary to have estimates of the share of labour cost to total cost in government construction contracts in Ontario. As indicated previously, an estimate of 33 percent was provided in O'Grady, Armstrong, and Chaykowski (2006). Based on different US studies, Lyons (1998, 82) reports wage costs as a share of total construction costs as 25–40 percent in one study, 30–40 percent in another study, 33.3 percent in another, and 33.6 percent in a fourth study.

Since the results depend on the union–non-union pay differential and the share of labour cost to total cost in government construction projects in Ontario, and a range of these estimates are likely to prevail, a sensitivity analysis could be portrayed. A grid could be constructed with the union–non-union pay gap on one axes and the share of labour to total cost in the other axis. The cell entries would indicate the additional costs of paying the union rate as opposed to the non-union rate for each assumed ratio of labour cost to total cost. For example, the cell entry for a union wage premium of 30 percent and an assumed ratio of labour cost to total cost of 33 percent would imply an additional contract cost of 10 percent. The grid would give the likely range of cost estimates depending on the union wage premium and the ratio of labour cost to total costs. Preferred estimates could be highlighted on the grid.

A version of this procedure was used by Max Lyons (1998) when he estimated the cost of US federal Project Labour Agreements that required paying union wages on large construction projects. He estimated union wages to be 19–24 percent higher than the alternative wage that would have been paid, which was the Davis-Bacon wage. For labour cost as a share of total construction cost he used a figure of 33.6 based on National Income and Product Accounts estimate of labour's factor share of the value of production for the construction industry. This would yield an estimate of the additional cost of the PLA over and above the Davis-Bacon wage of 6.4 to 8.1 percent based on the union premium of 19 or 24 percent respectively.

Simulations from Models That Relate Costs to the Number of Bids

As discussed previously, there is an extensive literature that highlights that the costs of contracts falls as the number of bids increase. To the extent that this relationship can be established and deemed relevant to the situation for Ontario, then it could be used to predict the expected cost increase of the reduction in the number of bids that result from the restrictive tendering in Ontario. This, of course, would require information on the expected reduction in the number of bids that results from the restrictive tendering in Ontario. This is not straightforward since information likely only exists on the number of bids received for each contract, not on the counterfactual or the number that would have prevailed if there was not restrictive tendering. That counterfactual or hypothetical number could perhaps be estimated from a comparison group of jurisdictions that did not have the restrictive tendering.

In addition to providing the relationship between contract costs and the number of bids, this procedure would require an estimate of the expected number of bids that would prevail if restrictive tendering became open to more competition.

An example may illustrate. Based on US data, Damnjanovic et al. (2009, 20) estimate a strong negative relationship between the number of bids and the final project price. The relationship is non-linear, with

a reduction in the price of about 8 percent in going from two to three bids, 14 percent for four bids, 18 percent for five bids, 21 percent for six bids, 23 percent for seven bids and 25 percent for eight bids. If such a bid-price relationship prevailed for government construction contracts in Ontario and if it were established, for example, that open contracting would increase the number of bids from four to eight, the cost of the restrictive tendering would be about 11 percent (i.e., 25 percent minus 14 percent). Even if precise numbers of the expected increase in the number of bids could not be established, a range of estimates from those familiar with the bidding process could be used and a sensitivity analysis applied where the cost savings could be illustrated for different hypothetical increases in the number of bids.

Cost Comparisons in Proxies for Restricted and Open Tendering

Comparing the costs of standardized projects that are conducted under restricted and open bidding could provide an estimate of the cost implications of restricted tendering. In their analysis of the cost implications of government contracting practices in the GTHA, McGuinness and Bauld (2010, 25) compare the per-square-foot construction costs of government versus private commercial offices, based on standard industry pricing reference books such as the Canadian edition of *Hanscomb's Yardsticks for Costing*. They show that government construction costs relative to those of the private sector have been trending upward, so that by 2008 they were 23 percent higher.

An obvious problem with such comparisons is that government and private sector buildings can be different in other dimensions, so it is not clear that "apples are being compared to apples." McGuinness and Bauld (2010, 26) recognize this when they say:

> Comparing absolute costs of Government and private-sector buildings can be difficult, because with a few exceptions (such as public administration and commercial office buildings) the types of construction being carried out tend to be very different.

If it were feasible to compare government and private-sector projects that are considered similar or homogenous—they suggest public administration and commercial office buildings in the above quote—then such cost differences could reflect higher government costs for the same output. This would shed light on the cost of restricted versus open tendering only if the government projects involved restricted tendering and the private ones involved open tendering.

Prism Economics (2001) provides a guide to construction cost sources, describing twelve such sources that can be used for different purposes.

Municipal Financial Information Return and Regression Procedures

Our research suggests that the following information is available from Ontario's Financial Information Return program and other sources.

1. Municipal capital budgets—available data includes aggregate expenditures, as well as detailed expenditures that show approved expenditures on a project-by-project basis. Significant time horizon available, depending on municipality. Acquired through the province of Ontario's Financial Information Return program (https://efis.fma.csc.gov.on.ca/fir/ViewFIR2015.htm)

2. Project-specific information, including:

    a. Number and name of bidders
    b. Whether bidding is open or restricted
    c. Union affiliation of bidders
    d. Labour costs/hour of most bidders

e. Dollar amount of bids
f. Type of project (e.g., public housing, school, water treatment plant)
g. Scope of project
h. It is currently unclear whether or not final cost of projects can be attained.
i. The number of firms pre-qualified to compete in various jurisdictions.

3. The number of firms qualified to compete in various jurisdictions over time. And potentially entrance of new firms over time.

4. Municipal data, including number of citizens, CPI, tax rates, etc.

5. Municipal infrastructure data, including

a. Useful life of capital assets such as roads and water treatment plants
b. Average age of capital stock (e.g., age of water treatment plants) as objective measure and as percentage of useful life
c. Development charge rates (Cardus project framework memo)

Such data could be amenable to being used by some of the methodologies previously outlined. They include the following:

A. Comparison of the number of bids between open and restricted contracts.

Open contracts should obviously lead to more bids (and the literature clearly indicates that the greater the number of bids the lower the price). But the question becomes: How many more bids tend to occur with open bidding? This could involve a simple tabulation of the average number of bids in projects with open tendering versus closed tendering. The unit of observation would be a project. In a simple regression of the number of bids and a dummy variable for open versus restricted contracts, the coefficient on the dummy variable would also give the mean difference, with the standard error also enabling determining if that difference were statistically significant.

A potential issue with this procedure is that projects may differ in other characteristics that also affect the number of bids. For example, large projects may attract fewer bidders because of the resources required to complete the contract. Two possible ways to deal with this are as follows: (1) include other characteristics such as bid size as control variables in a regression, or (2) restrict the comparisons to relatively homogenous types of projects. Once the effect of the restricted contracts on the number of bids is estimated, then the cost implications could be estimated from (1) external information on the bid-price relationship, or (2) possibly estimating the bid-price relationship from the Financial Information Return data.

B. Regression with a dummy variable for restricted versus open bidding

It is obviously not possible to compare the cost of restricted versus open bidding *within* a project since the projects themselves are designated as restricted versus open bidding. However, it is possible to compare the cost of restricted versus open bidding *across* projects. The dilemma is that project costs depend on numerous other factors besides open and closed bidding. Three possible ways to deal with this are as follows: (1) include other characteristics such as bid size as control variables, (2) restrict the comparisons to relatively homogenous types of projects, and perhaps adding further controls, and (3) use a standardized measure such as labour cost/hour. These different ways are not mutually exclusive but can be combined in various fashions.

C. Union–non-union as proxy for restricted versus open bidding

As indicated, it is obviously not possible to compare the cost of restricted versus open bidding *within* a project since the projects themselves are designated as restricted versus open bidding. However, within the set of projects with open bidding, there will likely be union and non-union bids. The average gap between union and non-union bids within projects may serve as a proxy for the cost of restricting bids to union contractors. This would be a conservative estimate, however, since union bids are likely to be restrained downward by the threat of non-union bidding in such contestable markets. There may also be non-credible bids that could distort the averages, and those may have to be omitted as outliers.

D. Regression discontinuity (RD)–type union–non-union comparison

A way around the fact that average union and non-union bids may not all be credible bids would be to compare winning bids with the next closest bid in situations of open contracting based on the subset of projects where the winning bid was a union bid and the next closest bid was non-union, or vice versa. This could also be restricted to projects where those two bids were close. As in a RD design, the assumption would be that the bids are so close that winning could be considered the "luck of the draw"—that is, approximating random assignment, yielding causal estimates of the effect of restricted tendering. Again, this would be a conservative estimate since union bids are likely to be restrained downward by the threat of non-union bidding in such contestable open bidding markets.

Delphi Technique

If the quantitative methodologies discussed above do not prove feasible, a more qualitative method—the Delphi technique—may merit consideration. It could also be used to supplement any of the more quantitative methods.

Damnjanovic et al. (2009, 20) use a Delphi technique to provide information from experts on factors that could be used to reduce cost on government construction contracts. While their work involved cost reduction techniques, it could potentially be applied to getting expert opinion on the potential cost saving from open bidding on projects. This is especially the case if more quantitative methods are not feasible. Their description of the method merits quoting in full.

The objective of this method [the Delphi technique] is to provide a procedure that is able to provide more reliable results for complex problems that are difficult to analyze quantitatively, compared to subjective decision-making by individuals. The Delphi technique involves an iterative process in which expert opinions are processed and used as a feedback for further refinement of opinions generated in the earlier round. . . . The Delphi technique is not intended to replace or substitute for statistical and model-based techniques or human judgment, but it is intended for use where objective decisions are not possible in the absence of historic, economical, or technical data pertinent to the subject. . . . Delphi analysis allows synthesis of the collective opinion of experts when the issues are more of strategic nature and difficult to numerically quantify.

CONCLUSION AND NEXT STEPS

The overwhelming consensus taken from economic literature and from existing policy in government procurement processes suggests that open tendering will lead to lower – and perhaps significantly lower – costs for governments as they build the infrastructure projects they have committed to build. But when it comes to determining the exact nature of those cost implications, clearly there are a wide range of potential methodologies, each with their pros and cons, which could be used to estimate the cost implications of restrictive bidding. The Phase II part of this analysis will sift through these different methodologies, eliminating some as non-starters. Potential "starters" will then be identified and one or more methodologies selected in part also based on availability of the requisite data.

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