

Rapid evidence review: Public procurement

Introduction

Public sector organisations, including local and combined authorities, use public procurement to award contracts for the purchase of goods and services. Public procurement contracts may also generate wider benefits. This rapid evidence review summarises the evaluation evidence on public procurement. It covers studies that examine the effect of public procurement on business performance, as well as wider outcomes. We also include studies considering how the design of public procurement affects contract costs.

This rapid evidence review informed our evidence briefing on assessing the local economic impacts of local procurement.

Things to consider

Need for more evidence

- To address current gaps in knowledge, there is a need for more evidence on the local economic impacts of public procurement, especially on local employment and wages.
- Government and local policymakers should undertake robust impact evaluations of social value contracting, approaches to increase spend going to local firms, and supplier development initiatives. This will help improve understanding of the local economic impacts and ensure that public money is used effectively.

Policy lessons are covered in the evidence briefing.

Evaluation evidence

What is public procurement?

Public sector organisations, including local and combined authorities, use public procurement to award contracts for the purchase of goods and services. As public procurement reflects policy goals, these purchases generate economic, social, or environmental benefits. There is increasing interest in using these contracts to secure additional economic, social, and environmental benefits.

Understanding the impact of public procurement

Our evidence reviews use studies with a score of three or above on the Maryland Scientific Methods Scale (SMS), which classifies evaluations based on methodological robustness and implementation.¹ Our toolkits and rapid evidence reviews also include studies with a score of 2 or above when these add to the evidence base. The majority (16 out of 26) of the studies included in this rapid evidence review score SMS 3 or above.

Our search identified 26 evaluations. Ten were scored as SMS 2, 11 as SMS 3, and five as SMS 4. We give more weight to those with higher scores, and flag those scoring SMS 3 or 4. The annex provides a summary of each study.

No studies look at the impact of public procurement on local employment or wages. Similarly, no studies look directly at the main policy ('social value contracting') used in the UK, or the policy of increasing the number or value of contracts won by local firms promoted through community wealth building.

The findings are organised by outcome – business performance, stimulating innovation, and encouraging adoption of green practices – followed by a section on how procurement design affects costs. Some studies cover more than one outcome and are referenced more than once. Be cautious of findings based on a small number of studies.

Evidence on impacts

Business performance

Three studies look at the additional effects of winning a public procurement contract on business performance and one looks at what factors underpin improved business performance. One study scored SMS 3 and three SMS 2.

The evidence is mixed.

- Two studies look at access to finance.
 - PP-1 (SMS 3) finds an increased likelihood of receiving a bank loan in the same quarter and credit growth over the year for firms securing a public procurement contract. This is attributed to public procurement contracts increasing firm collateral.
 - PP-2 finds lower equity ratios (a measure of financial health, calculated as shareholder funds divided by total assets) for firms winning a public procurement contract. It also finds winning traditional public procurement contracts does not affect a firm's short-term debt ratio, but winning a green public procurement contract lowers it. This suggests

¹ For more information on how we rank the robustness of evaluations, see our introduction to the Scientific Maryland Scale: <http://www.whatworksgrowth.org/resources/the-scientific-maryland-scale/>

securing public procurement contracts signals creditworthiness for firms with low equity ratios, making it easier for them to borrow.

- PP-4 finds participating firms (SMEs) had higher productivity for two years after winning a contract than firms in a control group, but lower productivity after two years. As participating firms also had a higher survival rate after two years, the study suggests that public procurement may help inefficient firms survive.

PP-3 looks at the factors affecting revenue and business development in firms that are part of a large public science institution's supply chain. Development of new products and the acquisition of new clients impact on revenues, whilst improved firm reputation and market knowledge impact on business development. In both cases, the type of contract also matters – with firms receiving contracts to develop technologically novel products more likely to see increase in revenues and business development.

Stimulating innovation

Seven studies look at effects on innovation. One study scored SMS 4, two SMS 3 and four SMS 2.

All studies find some positive effects, including increased R&D spend, and increased share of turnover from, or adoption of, new products and processes. Examples include:

- PP-5 (SMS 4) finds an increased share of turnover from new products and services when the regulatory framework allows innovative solutions and yet-to-be-developed technologies to be a requirement of the contract. The policy stimulated adoption of new-to-firm innovations, rather than new-to-market inventions.
- PP-6 (SMS 3) finds higher levels of patenting for firms in the supply chain of the Italian space agency relative to both pre-procurement and a control group.
- PP-8 finds positive effects on the adoption of sustainable manufacturing technologies.

Do these effects on innovation apply to all public contracts? Or must innovation be an explicit contractual focus for there to be innovation benefits (as in PP-5 and PP-8 above)? Two studies suggest innovation benefits are more likely if innovation is a contractual requirement.

- PP-9 finds lower R&D investment in firms winning public procurement contracts unless the contract included an innovation requirement – when R&D expenditure was similar to untreated firms. When contracts were combined with supply-push measures (including loans, grants, and tax credits), there was a positive effect which was larger than the effect from supply-push measures alone.
- PP-3 (discussed in business performance) looks at what underpins improved business performance in firms in the supply change for an Italian national scientific institute and finds a relationship between winning a contract to develop technologically novel products and increases in revenues and business development.

One study (PP-7, SMS 3) finds that public procurement contracts can help diffuse new technologies and innovations, with technologies and innovations cited in patents that arise from public procurement contracts going on to have a wider range of applications than technologies and innovations that are not.

One study (PP-10) finds increased product innovation by firms participating in public procurement, while R&D funding and other supply-side supports had no effect. In contrast, both public procurement

and other interventions increase the likelihood of process innovation.

Overall, the evaluation evidence suggests public procurement may stimulate innovation – especially if innovation is a contract requirement and is combined with other innovation policies such as R&D funding.

Encouraging adoption of green practices

Three studies look at effects of procurement on the adoption of green practices. One study scored SMS 4 and two SMS 3.

Three studies find positive effects.

- PP-11 (SMS 4) finds increased adoption of green building standards in private developments when municipalities require their contractors to meet these standards on public procurement contracts. Effects also spill over into neighbouring areas.
- PP-13 (SMS 3) finds an increase in environmentally friendly products, but not greener production processes, in firms that win green public procurement contracts. Effects are only found for small and medium-sized enterprises (SMEs).
- PP-12 (SMS 3) finds increased expenditure shares for organic food when local areas adopted green procurement goals in their food purchasing. More ambitious policies led to bigger increases.

In addition, PP-2 (discussed in earlier section on business performance) finds that SMEs are more likely to win green contracts than other firms.

Impact of procurement design on costs

Thirteen studies look at how procurement design impacts costs, with three studies scoring SMS 4, six SMS 3 and four SMS 2.

- Five studies (PP-14 (SMS 3), PP-15 (SMS 3), PP-16 (SMS 3), PP-17, and PP-18) all find reduced contract costs from centralisation. Savings vary widely, from 2 to 29 percent. PP-17 also finds centralisation lowers the cost of running procurement exercise.
- One study (PP-19, SMS 4) finds auctions lower contract prices.
- PP-20 finds that using restricted auctions (involving three-to-six invited bidders) for small contracts did not increase contract costs, despite less competition, while the cost of reviewing bids decreased.
- Four studies consider corruption.
 - PP-21 (SMS 4) finds that an extra term in office for local mayors leads to lower numbers of bidders, higher costs, and higher probability of repeat awards.
 - PP-22 (SMS 3) finds fewer contracts awarded to political donors, more bidders, and lower contract costs when there are more political parties within a local authority.
 - PP-18 (discussed earlier in relation to centralisation) finds stronger price benefits of centralisation when institutional quality is lower or corruption is higher.
 - PP-14 (discussed earlier in relation to centralisation) finds inefficiency plays a larger role in raising contract costs than corruption.
- Two studies (PP-23 (SMS 3) and PP-24) find small increases in costs (1 to 4 percent) from

preferential bidding.

- Two studies look at how supplier development affects procurement costs.
 - PP-26 (SMS 3) finds that firms participating in a bidder development programme submit lower bids. Non-participating firms also submitted lower bids if they were told firms from the programme were bidding.
 - PP-25 (SMS 4) finds increasing spending on publicising a procurement auction leads to more bidders and lower procurement costs.
- One study (PP-17, discussed earlier in relation to centralisation) finds reduced costs from digitalisation of procurement processes, including both lower contract costs and lower costs of running procurement exercise.

Overall, the evidence suggests that procurement design has a strong impact on contract and transaction costs.

Are they cost effective?

Only one study (PP-26) considers cost effectiveness. The bidder training programme it studied was highly cost effective, with annual programme costs of around \$200,000 delivering savings of around \$16 million.

Annex: Evidence on public procurement

For this rapid evidence review, we looked for evaluation evidence of public procurement on economic outcomes. We searched for studies relating to ‘public procurement’ or ‘government procurement’ that included terms such as ‘design’, ‘reform’, ‘social value’, ‘local’, and ‘decentralisation’. We focused on evidence from OECD countries, published in English. We considered any study providing before-and-after comparisons or cross-sectional studies controlling for differences between areas with different procurement approaches. We also included more robust studies that compare changes in outcomes in treated areas with changes in outcomes in similar non-treated areas, or that use an instrumental variable approach.

Although initial searches found many related studies and reports, we only found 26 evaluations that met our criteria for inclusion in a rapid evidence review. Of these, ten were assessed as SMS 2, 11 as SMS 3, and five as SMS 4. In summarising the evidence, we place greater emphasis on studies that used more robust methods. None of the studies look specifically at the UK. Three studies cover multiple countries. Five studies are from the US, one from South Korea, and the rest from EU countries, mainly Italy and Germany. This annex provides a summary of each study.

Evidence on business performance

PP-1 (SMS 3, Spain) examines whether winning public procurement contracts leads to growth in firm credit or affects the probability of a new loan. The study uses administrative data on public procurement, credit, and firm outcomes from 2000 to 2013. The study estimates effects using a two-way fixed effects model. Winning a procurement contract leads to a 5.5 percent increase in annual credit growth. Winning a contract through an auction is associated with 7.3 percent increase in annual credit growth. This growth in credit is associated with growth in loans that are not backed by collateral (assets), with no growth in collateralised credit. The probability of receiving a bank loan – conditional on having applied for it – increases by around 2 percent in the quarter the firm wins a procurement contract. The study concludes that procurement contracts provide valuable collateral for firms, with firms finding banks are more willing to lend against revenues from public contracts than private sector revenues.

PP-2 (SMS 2, multiple European countries) analyses the relationship between the financial strength of SMEs and the award of traditional public procurement contracts and green public procurement contracts that include environmental criteria. The study uses a firm database covering 10 European countries between 2010 and 2019. A difference-in-difference model is used to compare indicators of firms’ financial strength in the three years after winning a contract against a control group of similar firms without a contract award over the same period. They find that a lower equity ratio (a measure of financial health, calculated as shareholder funds divided by total assets) and a higher short-term debt ratio increase the probability of a firm being successful in a public procurement exercise. They also find that SMEs are more likely to win green contracts compared to other firms. Success in both public procurement and green public procurement (i.e. winning contracts) lowers firms’ equity ratio. An award of a public procurement contract does not generally have a significant effect on a firm’s short-term debt ratio but winning a green public procurement contract has a significant effect in lowering it. The study suggests that contract awards signal creditworthiness for firms with low equity ratios, making it easier for them to borrow.

PP-3 (SMS 2, Italy) evaluates how being part of the supply chain for a government-funded science organisation, the Italian Institute for Nuclear Physics (INFN), affects firm performance. This study uses a mixed-methods approach using both quantitative and qualitative methodologies, including

cross-sectional regression. Surveys were used to collect data from 150 INFN supplier firms in 2016 and 2017, with this supplemented with firm data from the AIDA and ORBIS online datasets. The study looks at what affects revenues, business development and employment in supplier firms. Development of new products and the acquisition of new clients affects revenues, whilst improved firm reputation and market knowledge from the collaboration affect business development. Another important factor is the type of contract, with firms receiving contracts to develop technologically novel products more likely to see increase in revenues and business development. The study also looked at employment but no statistically significant relationships (at the 5 percent level) were identified.

PP-4 (SMS 2, South Korea) examines the impact of public procurement on firm productivity and survivability of SMEs in the mining and manufacturing sectors in South Korea. The study uses public procurement data from 2009, and firm-level data for 2007, 2008, 2009, and 2011. The study uses propensity score matching estimation to compare the total factor productivity of SMEs participating in public procurement in 2009 against non-participants using firm data from 2008 and two years later in 2011. They find that participating SMEs have a 10.67 percent higher productivity growth for the first two years compared to a control group of non-participating firms, but after those two years their productivity growth is 6.63 percent lower than the control group. Participating SMEs' survival rate was 3.45 percent higher than the control group after two years. These results suggest procurement distorted the market in favour of inefficient SMEs, and the study suggests that this is due to recipients of procurement lowering their efforts to increase productivity because they face less competition.

Evidence on stimulating innovation

PP-5 (SMS 4, Germany) evaluates the effect of a 2009 reform that allowed government agencies to specify innovative solutions or yet-to-be-developed technologies as requirements in procurement exercises (referred to in the study as 'public procurement with contracted innovation', PPCI). The study draws on data for 3,410 German firms that participated in the 2013 European Community Innovation Survey that covered the period 2010 to 2012. Effects are estimated using a range of methods including cross-sectional regression, nearest-neighbour matching, instrumental variables, and difference-in-differences. Using the estimates from the cross-sectional regression, the study finds that PPCI increases firms' share of turnover from selling new products and services by 8.7 percentage points, adding €13 billion (or 0.37 percent of GDP) to the German economy. The impact of PPCI is restricted to new-to-firm innovations (with PPCI increasing share in turnover by 7.0 percentage points) increase in turnover), with PPCI having no effect on the share of turnover from new-to-market innovations. Other specifications find similar effects.

PP-6 (SMS 3, Italy) investigates how space policy drives innovation through procurement of technological products and services. The study uses a difference-in-difference approach and draws on the Italian space agency's procurement database which includes information on 15,208 technological contracts to 739 suppliers between 2004 and 2018. Propensity score matching was used to create a control group. The study finds an increase in patent activity amongst firms winning technological contracts, both compared to their pre-procurement level and the control group.

PP-7 (SMS 3, US) uses the US patent system to evaluate the effect of public procurement on technological development. Patent citations set out the level of novelty of the innovation covered by patent, and the extent of the property rights allocated to the patent. This allows citations to act as a 'paper trail' that links innovations to their technological predecessors (backward citations) and descendants (forward citations). The study uses citations to look at the level of 'generality' of the technologies or innovations – i.e. whether they are applied across different contexts and sectors. The study uses patent data and patent citations from the 2006 NBER patent database from 1993 to 1997,

combined with the U.S. Federal Procurement Data System, the USPTO database and the Compustat North America database. The final sample consists of 71,438 patents, representing all 1993 to 1997 patents that received at least 10 forward patent citations by the end of 2006.² The study uses a conditional difference-in-differences estimation. A patent is assigned to the treatment group if it receives a forward citation from a patent related to a public procurement contract in 1999 or 2000, otherwise it is assigned to the control group. The generality of patents is measured as an index that get closer to 1 as a patent's forward citations are spread across many different technological classes and approaches 0 as forward citations are concentrated in a few classes over time. The study finds that receiving a citation from a patent related to public procurement contract has a positive effect on the generality of a patent, increasing the generality level by 4.1 percentage points. This suggests that public procurement can increase the likelihood of diffusion of technologies across different sectors.

PP-8 (SMS 2, EU, Switzerland and US) looks at the impact of innovative public procurement on the adoption of sustainable manufacturing technologies, in particular environmental innovations. Innovative public procurement is defined as public procurement that involves the development of new products or services and stimulates innovation. The study uses Innobarometer data, a survey carried out across 3,001 EU, Switzerland and USA manufacturing enterprises. The study matches a treated group of 308 firms with a pool of 2,693 control firms based on whether firms win an innovative public procurement contract. It finds innovative public procurement has a positive effect on adoption of sustainable manufacturing technologies. The number of firms that are environmentally innovative is 12 percentage points higher amongst firms with innovative public procurement contracts than in the control group after controlling for environmental regulation.

PP-9 (SMS 2, Italy) analyses the impact of public procurement and innovation supply-push measures (such as loans and grants for R&D) on business R&D expenditure. It distinguishes between regular public procurement and innovation-inducing procurement, where innovation requirements are included in contracts. The study uses survey data from 4,206 manufacturing firms which have introduced at least one technological innovation (either in products or production processes) between 2010 and 2014. Propensity score matching based on pre-treatment characteristics of firms is used to create a control group of untreated firms. The study finds that firms winning regular public procurement contracts have lower investment in R&D in relative to control group, while those winning innovation-inducing public procurement contracts have similar levels of R&D expenditure to control firms. Supply-push measures (such as loans and grants) have a positive effect on business R&D expenditure, and when combined with innovation-inducing procurement the effect is larger.

PP-10 (SMS 2, EU and US) compares the effectiveness of public procurement as a demand-side intervention against public funding of R&D and innovation collaboration as supply-side interventions in stimulating firm-level innovation in the manufacturing and service industry. The study looks at the impact on both product innovation, and production process innovation. The study uses the Flash Eurobarometer survey which covers 28 EU Member States, Switzerland, and the USA, using data from between 2011 and 2014 for 6,719 innovative firms. The study combines cross-sectional regression with propensity score matching. Participating in public procurement increases a firm's probability of introducing product innovation by 10.6 percentage points in goods and 12.4 percentage points in services, while R&D supply-side policy measures have no impact on product innovation in either goods or services. Participating in public procurement increases the probability of process innovation adoption by 6.3 percentage points and receiving public R&D support increases the likelihood of process innovation by 7.2 percentage points.

2 As the outcome variable is based on the concentration of forward citations, looking at patents receiving only few references could introduce bias, and the fewer the citations, the larger the bias. The 10 patents citations threshold was selected based on literature.

Evidence on encouraging adoption of green practices

PP-11 (SMS 4, US) evaluates whether adoption of policies at the municipal level that require municipal buildings to be constructed to specified environmental standards accelerates the adoption of the US Green Building Council's Leadership in Energy and Environmental Design (LEED) standard for private-sector developments. The study uses data for 735 Californian municipalities from 2001 to 2008, drawing on range of sources including LEED diffusion data from the USGBC, non-residential construction starts data from McGraw Hill, city-level demographic data from the US Census and data on the adoption of green building procurement policies by municipalities that was collected by the research team.³ The study estimates effects using a range of approaches including cross-sectional regression, 'before and after' analysis of panel data, and instrumental variables, having used matching to establish a robust control group. The cross-sectional analysis finds municipalities that have adopted a green building procurement policy had 2.1 more private-sector LEED registrations per year compared to the matched control, equivalent to a 30 percent increase. Adopting a green building procurement policy also had a spillover effect with 0.15 more private-sector LEED registrations per year in municipalities that neighboured those adopting a green building policy compared to a matched control group. The instrumental variable model finds two causal relationships - an increase in the supply of LEED accredited professionals increases the number of private-sector LEED registrations and an increase in the number of private-sector LEED registrations increases the number of LEED accredited professionals. This suggests that green building procurement policies might solve a coordination problem in the market for green buildings – i.e. without this policy, developers will wait for key suppliers to develop their green building expertise, whilst suppliers will wait for evidence of demand before investing in developing expertise.

PP-12 (SMS 3, Sweden) evaluates the effect of political goal setting on the uptake of voluntary green procurement policy in food purchasing in Sweden. The study uses panel data from 290 Swedish municipalities from 2003 to 2016. Uptake of green procurement policy is measured as the share of expenditure on organic food and the organic food expenditures per capita. Three different specifications are used to categorise the policy approach – specification one uses a continuous variable with a value between 0 and 100 percent reflecting the share of expenditure on organic food goal, specification two uses a binary variable with a value of 1 if the municipality has adopted a goal of at least 10 percent and 0 if it is lower, and specification three uses a ranked categorical variable that groups municipalities into three groups based on their goal (below 10 percent or no goal; 10 to 29 percent; 30 percent or over). The study controls for selection bias by using a two-staged procedure which removes unobserved heterogeneity through the inclusion of fixed effects. The adoption of political goals promoting green procurement policy has a positive effect on a municipality's share of organic food purchases and that this effect increases with the ambition level. Specification one finds 0.3 percent increase in the share of organic food purchased for every 1 percent increase in the policy goal. Specification two finds the share of organic food is 4 percent higher in municipalities with a goal of at least 10 percent than in those with no goal or a goal below 10%. Specification three finds that compared to the bottom category (municipalities with no goal or a goal of less than 10 percent), spend in municipalities with a policy target of 10 to 29 percent was 4 percent higher and spend in municipalities with a target of 30 percent or more was 8 percent higher.

PP-13 (SMS 3, Germany) examines the impact of public procurement exercises that include additional environmental criteria on firms' probability of introducing environmentally-friendly innovations. The study uses a panel dataset for 2008 to 2014 containing 6,373 firms. The study uses

³ The municipalities are referred to as 'cities' in study, reflecting Californian law which allows municipalities to choose whether to use city or town in their name. City size varies dramatically, with the smallest cities having populations of under 1,000. The instrumental variable model is restricted to cities with populations of over 20,000.

a cross-sectional difference-in-difference approach. Winning at least one green public procurement contract within the last three years increases the probability of a firm adopting new and more environmentally-friendly products in the same period by 20 percentage points, but has no impact on the adoption of environmentally-friendly processes in production. This is possibly because environmental criteria in procurement tends to focus on products over processes. This effect is driven by SMEs and is not significant for larger firms. Non-green public procurement has a weak negative impact on environmental product innovations.

Evidence on costs

Centralisation

PP-14 (SMS 3, Italy) examines whether corruption or inefficiencies are more prevalent in purchasing decisions made by public bodies in Italy. The study assesses the impact of Consip, a central procurement agency, whose purpose is to coordinate the procurement of commonly purchased standardised goods. Public bodies can choose whether to buy from Consip or on the open market, allowing the study to differentiate between corruption and inefficiencies, as they theorise that the opportunity for corruption within Consip is very small. The data covers 6,068 procurement purchases of 21 goods made by 208 public bodies between 2000 and 2005. The study finds prices paid by different Italian public bodies vary substantially but, on average, at least 82 percent of estimated waste (i.e. higher cost of public services) is inefficiency. The key driver of inefficiencies appears to be the mode of governance, with central government bodies performing worst and buying the least through Consip, local authorities in the middle, and autonomous agencies performing best.

PP-15 (SMS 3, Italy) also analyses the effect of the Italian central purchasing agency Consip. The study uses data on 3,794 purchases of 13 generic goods by 208 public bodies. The study employs a difference-in-difference approach with a treatment variable that corresponds to Consip's entry into the relevant market. The results indicate that Consip enables public bodies to save 29 percent of the purchase price. Consip's entrance into the market also led to reduction in prices of 18 percent for public organisations that did not purchase through Consip.

PP-16 (SMS 3, Italy) explores how centralisation of procurement reduces health service expenditures. A dataset was created at the local hospital level for 2003 to 2012. A difference-in-differences method was implemented, to compare hospitals operating in regions and autonomous provinces which adopted its regional health Central Purchasing Bodies (CPB), to those that did not. CPB carry out centralised purchasing and were introduced within the regional health care systems in Italy in the first decade of 2000s, as a way to reduce costs in the publicly-funded health sector. Costs were reduced by between 2 and 4 percent after the introduction of CPBs, without affecting the level of service. Lower costs for services underpinned the savings, not lower costs for goods. The savings persist for seven years.

PP-17 (SMS 2, Italy and United States) investigates how public procurement design (centralisation, standardisation, digitalisation) affects costs, quality, and demand management. Data was collated from 151 local governments from large municipalities in Italy and the United States. Centralisation and digitalisation of procurement processes are associated with lower contract costs, lower costs of running the procurement exercise (referred to as 'process efficiency' in the study), and demand rationalisation (the ability to bundle together contract requirements from multiple buyers). Only decentralisation has a positive relationship with purchase quality (the ability to acquire goods and services that satisfy needs). There is no association between standardisation of procurement and any of the outcomes examined.

PP-18 (SMS 2, Italy) evaluates the impact of public procurement centralisation on pharmaceutical procurement prices. The data consists of 2,343 tender drug prices provided by health service providers from 2009 to 2012. The study determines these effects by regressing paid prices on indicators for centralised, decentralised, and hybrid procurement, controlling for time-varying procurer and area variables. The study finds that centralised procurers pay about 20 to 23 percent less than decentralised agencies, and hybrid procurers pay 7 to 9 percent less. In areas where institutional quality is lower or corruption is higher, the effect of centralisation is much stronger, with savings of up to 60 percent.

Auctions

PP-19 (SMS 4, Germany) compares the relative advantages of auctions and direct negotiations in public procurement of regional passenger railway services, drawing on data for 551 regional passenger railway lines. The study uses agency dummies as instruments to determine the effect of auctions on procurement prices. Costs are 25 percent lower on auctioned lines than on those with direct negotiations. Railway lines that were auctioned also have 16 percent higher frequency of service compared to lines that were negotiated.

PP-20 (SMS 2, France) looks at the impact of restricted auctions for public procurement for small contracts. The data considers 180 small (average value €43,234) and short-term construction service contracts awarded via restricted auctions between 2006 and 2009 in Paris. The auctions involved 3-to-6 invited bidders selected from a list of pre-qualified candidates. Using a fixed effects model, the study estimates the probability of receiving an invitation and the value of received bids, after controlling for firm and structural characteristics. It finds that the restriction auction reduced transaction costs (the administrative costs of managing auctions) and did not result in higher contract prices (despite reduced competition).

Corruption

PP-21 (SMS 4, Italy) studies the impact of politicians' tenure on public procurement outcomes. The study examines four outcomes – number of bidders per auction, winning rebate (the percentage discount on the auction reserve price), probability that the winner is local, and probability that the same firm is awarded repeated auctions. The study compares the outcomes of procurement auctions for public works administered by mayors between 2000 and 2005, using data consisting of 28,058 auctions across 3,947 cities and 5,481 mayoral terms. The study uses regression discontinuity design and instrumental variables, comparing elections where the incumbent mayor won another term by a small margin with elections where they lost by a small margin and a new mayor took over. Assuming that mayors elected in such close races would be almost identical on observable and unobservable characteristics, the study uses this to measure the effect of an additional term in office. They also cross-validate this by comparing two groups of mayors – those elected before and after the introduction of a two-term limit on office. Those elected before could run for two additional terms, but those elected after could run for only one more term. They find that one additional term in office decreases the number of bidders by between 11.48 and 16.7 percent, and the winning rebate by between 9.9 and 5.7 percent. An extra term increases the probability of a local firm winning the contract by 5 percent, and the same firm winning repeatedly by 25.6 percent. The study considers these results to suggest that longer tenure in office increases the likelihood of collusion between mayors and local contractors, as it takes time for contractors to establish a preferential relationship with the mayor.

PP-22 (SMS 3, Czech Republic) analyses the impact of new political parties in municipal councils on public spending from public procurement. The study uses data from the Czech public register on procurement, combined with information on political parties running for the 2006 elections and covers 1,198 legislatures. The study uses a fuzzy regression discontinuity design exploiting the threshold in the electoral vote share required for parties to be represented in municipal councils. The results indicate that councils with more political parties allocate fewer procurements to suppliers which are also political donors. These councils also achieve higher price savings and attracted more bidders, increasing competition.

Preferential bidding

PP-23 (SMS 3, US) studies the effect of the California Small Business Preference programme, which grants small firms a 5 percent bid discount on public procurement costs. The study uses data on highway and street maintenance projects auctioned by the California Department of Transportation between 2002 and 2005, comprising 697 projects. They find that the programme increases the aggregate cost of procurement by 1.4 percent, while redistributing between 5 and 12 percent of profits from large to small firms, with this mainly explained by small firms being more likely to enter bids as a result of the programme and larger ones being less likely. The study finds that a lump-sum entry fee is more effective than a bid discount at reducing procurement costs.

PP-24 (SMS 2, US) evaluates the impact of the California Department of Transportation (Caltrans) programme, which provides bid preferences for small businesses in auctions for road construction contracts, on procurement costs. The study uses data on 4,136 highway construction contracts awarded by Caltrans between 1996 and 2002. Caltrans provides a 5 percent bid preference in auctions only where projects are using state funds. There is no preferential treatment in projects using federal aid. The study uses this to determine the impact of preferential treatment, by regressing the winning bid on whether the auction used preferences, controlling for auction-specific variables. Procurement costs are 3.8 percent higher on auctions using preferences, and firm profits are 3.1 percent lower under bid preferences. The study concludes that higher procurement costs in preferential auctions is mostly attributed to reduced participation in those auctions by large firms who can provide works at lower cost, who instead substitute their participation in preferential auctions by moving to non-preferential ones.

Supplier development

PP-25 (SMS 4, Italy) evaluates the effect of publicising a public procurement auction on firm entry into the auction, and the costs of procurement. The study analyses data on 31,610 auctions in Italy between 2000 and 2005 with minimum values of above €150,000. The study uses a regression discontinuity design, exploiting the fact that auctions with values exceeding €500,000 are required by law to be publicised more broadly. An increase in publicity increases the number of bidders participating in the auctions by 9.3 percent and increases the winning rebate (the percentage discount offered below the auction's reserve price by the successful bidder) by 7 percent. Using the findings, the study estimates that a hypothetical public procurement contract with a value of €500,000 costs the government about €35,000 more if it is publicised at the local level compared to the regional level.

PP-26 (SMS 3, US) evaluates the impact of a bidder training programme, the Texas Department of Transportation's Learning, Information, Networking, Collaboration (LINC) training programme, introduced in 2000, on bidder behaviour, project costs, and ability of firms to compete in bids. The study uses data on Texas highway procurement auctions conducted between 1997 and 2007,

involving 1,749 firms. The likelihood of a firm participating in LINC is used as an instrument. The study finds participating firms submit more competitive tenders, 2 percent lower in price than those from firms that are ineligible or have yet to train. In auctions where the presence of trained firms is flagged before the auction begins, ineligible firms also lower their bids. The bidder training has no effect on business survival. Using expense data from the 2005 to 2012, the study estimates programme costs of roughly \$200,000 per year. Since firms that received training have lower bids than all other firms and given that the winning bid is lower when firms that received training participate in auctions, the study concludes that the programme generates substantial savings – estimated at over \$16 million per year – at low cost.

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