

# Controlling Corruption in Development Aid: New Evidence from Contract- Level Data

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## Abstract

Following scandals about corruption in foreign aid, and in a political climate that increasingly questions the legitimacy of development assistance, donors are under pressure to control how their funds are spent. At the same time, they also face pressure to trust recipient governments to disburse project funds themselves, so as to build capacity in developing countries. This paper assesses under which conditions donor regulations are successful in controlling corruption in aid spent by national governments through procurement tenders. By mining procurement contracts funded by the World Bank in 100+ countries over the period 1998-2008 for corruption “red flags”, we create a dataset that provides an unprecedentedly accurate picture of corruption risks in the spending of aid across the developing world. Through propensity score matching and regression analysis, we find that the 2003 World Bank regulatory reform aiming to control corruption was effective in reducing corruption risks: lowering single bidding on competitive markets by 3.8-4.3 percentage points. This effect is greater in countries with low state capacity.

## INTRODUCTION

Donors are under increasing pressure to demonstrate that their money is well spent. Intellectually, they must address concerns that development aid softens the budget constraint on recipient-country governments and interferes with electoral accountability, thus making it easier for them to spend irresponsibly or siphon off funds for themselves. Politically, scandals showing how foreign aid has sometimes been embezzled have weakened the sympathies of donor countries' own electorates, particularly in a global political environment that is increasingly isolationist. Donors have responded largely by seeking to gain better control over their spending, whilst also seeking to balance this against exhortations to trust recipient governments more to help build capacity.

To formulate an appropriate response, donors need a stronger evidence base about the link between development aid and corruption. However, the findings that have emerged from this literature are contradictory, owing to serious theoretical and methodological difficulties in analysing this relationship. One problem is the lack of a sufficiently precise dependent variable. The existing literature on the aid-corruption link has relied on expert- and survey-based assessments as the generalised measure of corruption at the country level, including the World Bank's Worldwide Governance Indicators, the International Country Risk Guide's corruption variable, and Transparency International's Corruption Perceptions Index. These measures have been criticised on a number of counts, such as their reliance on subjective perceptions – rather than objective experiences – of corruption, their lack of sensitivity to change, and their bias towards the harmful effect of corruption on business (Heywood & Rose 2014; Ko & Samajdar 2010; Razafindrakoto & Roubaud 2010). Even more relevant to the discussion here, however, is the fact that these expert-based assessments *do not measure corruption in the spending of development aid*. Instead, they provide an overall country score of corruption – aggregated from experts' perceptions of corruption in a multitude of areas of political and economic activity. Existing work on the aid-corruption link therefore suffers from problems of measurement validity as the dependent variable does not explicitly differentiate corruption in the spending of aid from corruption in a host of other areas.

A second problem is that scholarship to date has failed to adequately incorporate the impact of donors' own anti-corruption mechanisms on corruption in the spending of aid. The impact of aid on corruption is likely to depend not only on the macro political economy context into which the aid is delivered, but also on the way in which aid is delivered and controlled (or not). There have been several studies on this question; however, their measurement of anti-corruption interventions has been rather imprecise. For example, Öhler et al. (2012) study the effect of bilateral US aid on corruption before and after the imposition of aid conditionality through the Millennium Challenge Corporation in 2004, while Charron (2011) takes the emergence of the global anti-corruption movement in the mid-1990s as the key intervention for a before-and-after comparison of the aid-corruption link. A related problem is that, despite a growing literature on how the political economy context of a country affects corruption, very few studies incorporate these insights into the analysis of the relationship between aid and corruption, let alone possible interactive active effects between donors' anti-corruption tools and contextual factor at recipient country level.

This paper contributes to the literature through addressing these weaknesses. First, we employ an innovative methodology that measures corruption risks in aid directly, based on analysing large administrative datasets of World Bank aid that allow us to study contract-level procurement processes and outcomes. Using this method, we analyse a dataset of World Bank aid distributed through recipient-government public procurement systems and identify patterns of corruption risks across more than 100 countries over two decades. Second, we analyse the effect of the 2003 regulatory change (which increases World Bank oversight and requires the more extensive use of online advertisement and e-procurement tools) on corruption patterns. Specifically, by exploiting a unique temporal configuration, whereby new rules only apply to new projects, with contracts simultaneously awarded according to old and new rules by the very same procuring organisations within the same countries. Third, we relate corruption risks in aid contracts to the political economy in recipient-countries, described primarily along the dimensions of state capacity and party system institutionalisation. Fourth, we investigate how donors' anti-corruption regulations interact with these local context factors. In other words, does the effectiveness of donors' anti-corruption mechanisms depend on recipient-country characteristics?

We find that the November 2003 change in World Bank goods, works and services public procurement rules decreased corruption risks overall: the share of single bidder contracts among all prior-reviewed contracts dropped from about 22% to 18%, a four percentage-point decrease, which is both statistically significant across all models estimated, and substantial in economic and policy terms. This effect is largely attributable to countries with low state capacity, with the intervention effects becoming negligible and insignificant for the highest-capacity recipient countries. The level of political party institutionalisation (PSI) does not seem to amplify the intervention effect, with the same effect size observed throughout the whole range of cases.

## AID AND CORRUPTION: A REVIEW OF THE LITERATURE

The exact nature of the link between developmental aid and corruption is far from clear. While a number of studies find that foreign aid fuels corruption (e.g. Asongu & Nwachukwu, 2016; Busse & Gröning, 2009; Bräutigam & Knack, 2004; Knack, 2001), other scholars have presented evidence that aid helps reduce levels of corruption in recipient countries (e.g. Mohamed, Kaliappan, Ismail, & Azman-Saini, 2015; Okada & Samreth, 2012; Tavares, 2003). Meanwhile, a third strand of academic work reports that there is no significant effect of foreign aid on corruption (e.g. Ear, 2007; Menard & Weill, 2016). Moving beyond the question of how aid influences the volume of stealing, other work considers incentive factors that might affect the risks of aid spending being corrupted at the country level. Kangoye (2013) argues that aid is more likely to increase corruption when it is delivered in unpredictable chunks, while Dalgaard and Olsson (2008) demonstrate that large (as opposed to small) inflows of aid tend to reduce corruption. Svensson (2000) finds that foreign aid only acts as a propellant for corruption in recipient countries that are ethnically or religiously fragmented, where the distinctions between groups prohibits cooperative action to produce public goods. Furthermore, both donor and aid proliferation can dilute the governance agenda and trigger principal-agent problems where leaders with short time horizons become less accountable for their actions and commonly engage in discretionary behaviour with donor funds (Knack & Rahman 2007; Busse & Gröning 2009).

Overall, existing work on the question of whether aid increases or reduces corruption places too much emphasis on the *sheer amount* of aid allocated to recipient countries rather than how it is disbursed or the environment into which it is delivered. Explicitly or implicitly, scholars assume that the windfall rents that accrue from development aid incentivise local elites in recipient countries to engage in corruption. However, in making this assumption, scholars ignore that corruption incentives are not just created by the amount of money available to steal but also by several other, mainly institutional, factors which shape the opportunities and constraints facing those who make decisions about spending. For example, Mungiu-Pippidi & Dadašov (2017) study the impact of a range of common anti-corruption legal and institutional reforms and find that the presence of rule of law in the recipient country is necessary for them to work. In countries without rule of law, tough anti-corruption institutions can reinforce autocracy and provide more instruments to use against political opponents; even where the rule of law is secure, anti-corruption tools are most effective where they take place in the context of an active civil society (Mungiu-Pippidi & Dadašov 2017).

To begin with, a large body of corruption work has highlighted *the risk of getting caught and punished* as an incentive for political elites to refrain from engaging in corruption. Generally, this literature argues that political elites' risk threshold is a function of the institutional setting in which political and economic activity takes place (Rose-Ackerman 2010; Kunicova 2006; Klitgaard 1991). It has spawned a range of institutional reforms aiming to increase checks and balances, on the assumption that this will lead to "good governance" and reduced corruption (Mungiu-Pippidi 2015). For example, there are various studies that claim that, in democracies, corrupt behaviour comes with higher risks attached than in autocracies – for a number of reasons: the media and civil society are provided with space to monitor politicians (e.g. Brunetti & Weder, 2003), voters have the ability to punish politicians for corrupt acts (e.g. Winters & Weitz-Shapiro, 2013), and the separation of powers ensures that judicial agencies can investigate corruption without political interference (e.g. Meagher, 2005)<sup>1</sup>.

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<sup>1</sup> For a comprehensive overview of this literature, see Rose-Ackerman (2010) Kunicová (2006).

However, it should be added that academic work has recently highlighted that such institutional efforts are less likely to be effective in situations where corruption is systemic (Persson et al. 2013; Hellmann 2017), particularist norms prevail (Mungiu-Pippidi 2005), and where individuals are socialised into a different “logic of appropriateness” (Zaloznaya 2014; March & Olsen 2004). Yet the alternative, a “values-based” or “positive” approach to promoting integrity in public service (Heywood 2012; Heywood & Rose 2016), has gained little ground and is rarely seen as appropriate for contexts of systemic corruption. Similarly, the empirical evidence of institutional interventions working in public procurement – where high-level corruption is often endemic – is weak (Fazekas & Blum 2016).

In addition to institutional risk factors, a number of studies on the political economy of rent-seeking point out that incentives for corrupt behaviour also depend to a large extent on *elites’ time horizons* (e.g. Kelsall, 2013; Khan, 2010; Rock & Bonnett, 2004; Wright, 2008). Elites with a long-term time horizon – for example, autocratic rulers who do not face significant challenges to their political authority or democratic politicians who operate in an electoral arena characterised by a high degree of predictability – face incentives to restrain corrupt activities and invest public resources toward economic growth. The reason being that this will allow them to loot more in the long run. Elites with short time horizons, in contrast, are incentivised to steal as much as they can in the immediate time window after taking office.

## THEORETICAL FRAMEWORK

### [How changes in donor regulations affect corruption](#)

When it comes to corruption in the spending of aid, one particular set of institutions that shape elites’ risk calculations in recipient countries are donors’ own anti-corruption mechanisms.

Donors go to considerable lengths to control how the aid that they provide is spent. Since 2003’s Rome Declaration, donors have sought to understand and address reasons surrounding aid ineffectiveness through policy and procedural initiatives that harmonize multilateral donor actions, as well as use recipient country systems to build

capacity and promote ownership (OECD 2003). Research suggests that multilateral donors can reduce corruption by tying aid to a good governance agenda that establishes strict conditions for how money is spent (Ellmers 2011; Charron 2011; Tavares 2003). However, this policy-related conditionality is typically related to aid provided as budget support (White & Dijkstra 2003), which is difficult to evaluate but seems to work better in some contexts than others (Cordella & Dell'Ariccia 2007; Dijkstra & de Kemp 2015; Caputo et al. 2011). In weak-governance and high-corruption contexts, donors prefer to use earmarked or project aid, which is subject to tighter controls (Radelet 2005), although this creates its own governance problems since donor and recipient ownership overlap, clouding accountability relationships (Kolstad & Fritz 2008).

Against this background, we focus on one particular intervention, a change in the World Bank guidance on procurement of goods, works and services that came into force on 1 November 2003. This guidance is central for the control of corruption in World Bank-financed aid as it provides the general framework for corruption control and a range of tight procedural rules and definitions for punishable misbehaviours. The guidelines are 40 pages long and, broadly speaking, seek to ensure that the procurement process is open and competitive, on the assumption that greater competition will lead to more optimal outcomes in terms of value for money. The new rules introduced in 2003 include amendments in many areas, but our coding of every provision, as well as interviews with key practitioners, find that the most significant changes relate to three areas: 1) donor oversight, 2) tender advertisement, and 3) e-procurement.

First, the rules introduce a significant increase in Bank oversight (e.g. introduction of procurement plans, obligatory prior review mechanisms for cases where all bids are rejected, new definitions of corruption and fraud, and extension of oversight to bidders through audit requirements). These efforts to increase accountability by increasing the expected costs of corruption and reducing discretionary power are in line with Klitgaard's model of corruption control and similar frameworks (Klitgaard 1991). While there is no explicit evidence for these particular measures producing better value for money in procurement, there is evidence that external audit is important. Several studies have found that the threat of external audit reduces corruption (Olken 2007;

Knack et al. 2017; Zamboni & Litschig 2013; Avis et al. 2016), and that the performance of intensive audits reduces prices paid for homogeneous goods (Di Tella & Schargrotsky 2003).

Second, the new rules introduce a wider use of electronic advertisement. The aim here is to increase bidders' awareness of tender opportunities and thereby increase competition. Research on World Bank-financed contracts has recently shown that better advertising of contract tenders increases the number of bidders (Kenny & Crisman 2016). Coviello & Mariniello (2014) find that the number of bidders for tenders in Italy which are subject to a requirement that they must be advertised is 9.3% greater than for tenders where no such requirement exists.

Third, the rules introduce e-procurement methods which standardise various aspects of the bidding process and lower transactions costs for bidders by allowing electronic submission and communication. While there is a paucity of evidence on the effectiveness of e-procurement systems in reducing corruption risks, the research that has been conducted indicates that the introduction of e-procurement can lead to an increase in the number of bidders, prevalence of non-local winners and quality of contract implementation (Fazekas & Blum 2016) as well as, in some cases, reduced prices (Singer, Konstantinidis, Roubik, & Beffermann, 2009). Government reports from Brazil, Mexico and Romania claim that e-procurement has achieved cost savings of 20% (Auriol 2006). Lewis-Faupel et al (2014) found that the introduction of e-procurement at the regional level led to improved road quality in India and reduced delays in Indonesia.

Measures to open access through wider advertisement and lower transaction costs, to the extent that they increase competition, should indirectly also have the effect of increasing scrutiny over the procurement process, by extending the group of stakeholders with an interest in holding decision-makers to account. As long as such expanded scrutiny translates into a higher likelihood of detecting corruption (e.g. through excluded bidders reporting suspicious tendering documents to the World Bank), it will represent an additional constraint on corrupt elites, hence the 2003 reform might further decrease corruption risks indirectly.

Through these three mechanisms, the 2003 reform to World Bank procurement rules is expected to decrease the opportunities and incentives that elites face to corruptly manipulate the tendering process for prior-reviewed contracts to favour certain companies (e.g. as a result of social ties or kickbacks). Hence, we hypothesize:

*H1: The 2003 reform of World Bank procurement rules decreases corruption risks in aid-funded public procurement.*

### *How the recipient country political economy affects corruption*

To characterise recipient-country political economy contexts, we focus on two key dimensions: i) political party institutionalisation; and ii) state capacity. While the first dimension shapes elites' time horizons and thus their motivations for restraining corrupt behaviour, the second dimension captures their ability to do so – that is, their capacity to enforce anti-corruption laws at all levels of government. Although these two dimensions clearly simplify the diversity of political economy set-ups across the world, they make our analysis both tractable and parsimonious.

Before outlining the specific mechanisms that connect these dimensions to the extent of corruption, we should point out that, that it is *political* elites that play the main role in our theoretical framework. While public procurement – which typically accounts for 50% or more of government spending (World Bank 2015) in the developing world, thus making it a key target for elites seeking to steal money (Ware et al. 2007) – is ostensibly controlled by bureaucrats rather than politicians, in many lower-income and transition countries, politicians exert considerable influence over the process by controlling appointments to the bureaucracy and regulatory agencies. In particular, bureaucrats are often tied into patron-client networks that are controlled by political elites, providing the latter with a mechanism to ensure the former's compliance (e.g. Hicken and Martinez Kuhonta 2011). Regulatory bodies, meanwhile, typically lack the independence to challenge political interference, while aggrieved contractors – excluded from contracts because of corruption – tend to refrain from making complaints for fear that it will prejudice their chances of winning future contracts. In short, we argue that political elites are able to control the procurement process (cf.

Dávid-Barrett & Fazekas 2016) and it is thus political elites' time horizons that drive our hypotheses.

Political parties, as key institutions through which elites can solve their collective action dilemmas (Aldrich 1995), play a particularly important role in determining political elites' time horizons. As touched on in the literature review above, longer time horizons provide elites with an incentive to curb corrupt behaviour and grow the economy (thus allowing them to steal more in the long run), while shorter time horizons incentivise elites to steal as much as they can in the immediate term.

Generally speaking, time horizons become longer as party system institutionalisation increases, with institutionalisation defined as the degree of "stability in who the main parties are and in how they behave" (Mainwaring 1998). The link between party system institutionalisation and elites' time horizons can be observed in both autocratic and democratic regimes. Regarding autocratic regimes, it has been found that dictators who can rely on a highly institutionalised party generally succeed in sustaining themselves in power for longer than dictators who only have a weakly institutionalised party at their disposal or lean on other organisations to secure their power, such as the military or a close circle of cronies (e.g. Geddes, 1999; Smith, 2005). In democratic regimes, more strongly institutionalised party systems elongate politicians' time horizons as they provide certainty of party survival and stability in electoral returns. In other words, politicians who have been voted into government can be relatively certain that their support base will not suddenly collapse and that they stand a comparatively high chance of getting elected again – if not in the short term, then in the medium or long term.

In addition to the link between party system institutionalisation and elites' time horizons, we can identify several other mechanisms through which stability in party strength and behaviour affect the extent of corruption. First, the most efficient way for a strongly institutionalised party to maintain a large support base is to "buy" electoral loyalty with public goods (such as economic growth) rather than clientelistic goods (Bueno de Mesquita et al. 2003; Haber 2006). Second, in highly institutionalised party systems – where political parties are usually characterised by high longevity – citizens can pin responsibility for government mismanagement and corruption on political

parties. In contrast, establishing responsibility is much more difficult in inchoate party systems – where parties tend to be short-lived and politicians regularly switch between parties – thus incentivising politicians to engage in corrupt behaviour (Schleiter & Voznaya 2016; Tavits 2007). Third, strongly institutionalised parties curb corruption through the provision of stable and clearly identifiable career paths. Specifically, strong parties can promote norms that reward non-corrupt behaviour through political career advancement.<sup>2</sup> In short, we expect corruption to be less of a problem in countries that feature strongly institutionalised party systems.

While there are no specific theories on how corrupt elites optimise between stealing from domestic procurement contracts versus from development-aid funded contracts, we assume that political party institutionalisation exerts a homogenous effect on both types of public spending. This assumption seems reasonable given that we analyse World Bank loans<sup>3</sup>, rather than grants; and that aid is spent through national procurement systems, in the same way that domestically-generated budget funds are spent. Hence, we suggest that the above arguments equally apply to World Bank funded public procurement contracts allowing us to hypothesize:

*H2: Higher party system institutionalisation is associated with lower corruption risks in aid-funded public procurement.*

While we expect party system institutionalisation to shape elites' incentives to engage (or not) in corruption, we also acknowledge that, when elites are incentivised to curb corruption in the spending of aid, they can only do so if they have the means to enforce anti-corruption regulations across procuring bodies. Specifically, we anticipate that elites require state capacity, defined generally as the state's ability "to implement official goals, especially over the actual or potential opposition of powerful social groups" (Skocpol, 1985: 9). We thus broadly follow Khan (2010: 65) who argues that national elites can only prevent lower-level factions from engaging in rent-seeking

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<sup>2</sup> For example, academic work on the Chinese Communist Party regularly highlights how the national leadership uses personnel management to create disincentives for corruption at the cadre level (Landry 2003).

<sup>3</sup> Even though these loans have typically below market interest rate, and some parts may be offered as grants, we consider them predominantly working as loans which recipients have to pay back hence treat them differently from grants.

behaviour when they enjoy greater “implementation and enforcement capacities” than the latter. Applied to our analysis of the aid-corruption link, assuming that World Bank funded procurement behaves similarly to national procurement, we arrive at the following hypothesis:

*H3: Higher state capacity is associated with lower corruption risks in aid-funded public procurement.*

Before moving on, we should emphasise that we acknowledge two points regarding the hypothesis just presented. For one, corruption is itself a factor that can undermine the state’s ability to implement policies; the extent of corruption may feed into the very measure of state capacity. Moreover, it has been argued that corruption may, under certain circumstances, boost state capacity (Grzymala-Busse 2008). For example, Darden (2008) claims that political leaders can decide to tolerate corruption (but also threaten to expose corruption) as a means to ensure the loyalty and obedience of state officials. However, corruption and bureaucratic loyalty are merely *two* factors in the complex theoretical framework that underpins the concept of state capacity. The state’s capabilities to enforce policies across its territory also depends on a number of other aspects of the state’s infrastructural power – such as the quality of bureaucratic staff or the allocation of government resources – as well as the state’s relations with society (Mann 1984; Migdal 1988).

*Interactions: donor regulatory change meets recipient country political economy*

So far, we have argued that the impact of aid on corruption depends, on the one hand, on donor corruption control regulations; and on the other hand, on recipient-country political economy in terms of political party institutionalisation and state capacity. Further, we propose that these two sets of factors interact with each other, creating yet more complex relationships between aid and corruption. This interaction is best understood as recipient-country political economy mitigating the impact of the 2003 World Bank regulatory intervention, by either increasing or decreasing its effectiveness. This argument draws on literature about the importance of “thinking and working politically” (Rocha Menocal 2014). Attention to the political economy of a

country is increasingly regarded as vital to the effectiveness of aid programmes and is one of the drivers of new problem-driven iterative approaches (Andrews et al. 2012; Carothers & de Gramont 2013; Grindle 2007).

We argue for two distinct sets of interactions, one between the donor regulatory change and recipient-country party institutionalisation; the other between the donor regulatory change and recipient-country state capacity.

First, recipient-country party system institutionalisation can mitigate the impact of donor regulatory change through two major channels. High party institutionalisation implies that political elites are more disciplined and better able to organise collective action. Hence, recipients with highly institutionalised party systems may be better able to respond strategically to increased corruption controls by donors, so as to organise their corrupt activities in ways which evade the new controls. However, the strategic calculations of corrupt elites are also influenced by their time horizons and the corresponding discount rates. As any new World Bank procurement regulation is expected to remain in force over many years, the optimisation between extracting corrupt rents in the short versus long term will change. Parties with different time horizons may decide to shift corruption between time periods depending on the discount rate, perceived probability of detection, and the expected punishment. The mitigating effect of party system institutionalisation on the impact of donor regulatory change is ambiguous and eventually remains an empirical question. However, it is possible in some scenarios that the introduction of tougher controls could change the calculations of elites such that short-term corruption becomes less appealing and is trumped by the attraction of long-term benefits (achieved through exercising restraint). We hypothesize the following while acknowledging the uncertainty of theoretical predictions in this complex situation:

*H4: The 2003 reform of the World Bank procurement rules decreases corruption risks most where party system institutionalisation is high.*

Second, domestic state capacity can mitigate the impact of donor regulatory change through three major channels. In high state-capacity recipient countries, the gap between the controls imposed by World Bank and domestic public procurement

systems is considerably narrower, in many cases negligible. For example, there may already be a widely-used e-procurement and electronic tender advertisement system in place, hence the additional benefit of the Bank requiring greater use of such tools is negligible. However, high state-capacity public administrations are staffed with bureaucrats with greater professional expertise of public procurement rules and tendering processes. Hence, if corrupt elites intend to comply with the new rules but nevertheless strategically substitute corrupt techniques with new ones, while leaving the total amount of corruption unchanged, they would have better tools at hand. This is amply evidenced by the fact that, in a range of high state-capacity countries with advanced e-procurement systems like the UK, Sweden, or the Czech Republic, extensive corruption in procurement still occurs (Broms et al. 2017; David-Barrett & Fazekas 2016; Fazekas et al. 2014). The World Bank's use of criteria to select contracts for prior review based on domestic state capacity also implies that, in high state-capacity recipient countries, the new rules might have a lesser financial impact. All three mechanisms point towards the same hypothesis:

*H5: The 2003 reform of World Bank procurement rules decreases corruption risks least where state capacity is high.*

## METHODS, DATA, AND INDICATORS

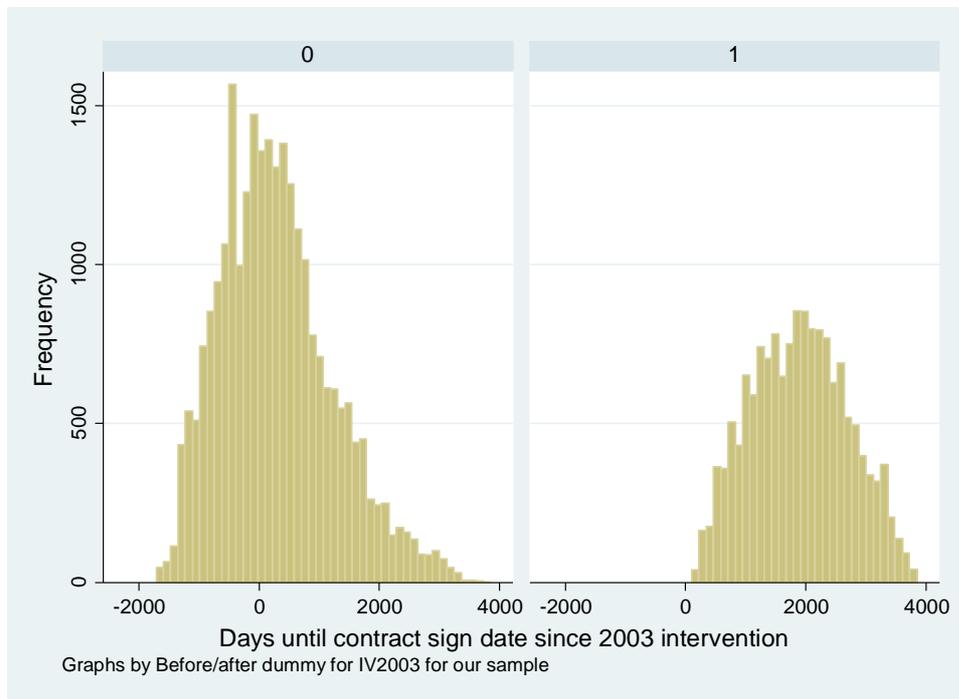
### *Methods*

We employ a quantitative research design which exploits the distinct break in the application of the new 2003 rules to World Bank-financed projects, and the time lag in issuing tenders and awarding contracts in control and treatment projects (projects governed by the old and new rules, respectively). We matched contracts according to similarities in country, year, market, buyer organisation, and contract value, such that matched pairs differ only by the regulatory regime governing their projects, allowing us to identify the causal impact of the intervention. In other words, in the years following the 2003 regulatory change, we exploit the fact that the same or very similar countries, buyers, and markets see similar contracts awarded from projects which are either treated or not depending on the project approval date (Figure 1). We find particularly powerful the matching based on average corruption risks (our dependent variable) prior to the intervention on the country as well as procuring entity levels.

These control variables are superior to traditional confounding factors controlled for in the literature such as ethnic fractionalisation or democracy because they are much more fine-grained and use variables more directly relevant for causal identification on the contract level. We also carry out traditional binary logistic regressions on the entire 2000-08 period controlling for country, continent, year, economic sector, and log contract value. While these regressions are arguably less appropriate for identifying causal impacts, they allow for a detailed exploration of the impact of state capacity and PSI, and the interactions between these variables and the intervention.

Because the date at which the new rules apply is imposed by the World Bank, and because designing, negotiating, and approving projects is a lengthy exercise, we expect no gaming around the temporal cut-point (e.g. project approval dates are not brought forward artificially to avoid using the new regulatory regime). This is also supported by statistical test of observed project distributions (see Appendix C).

**Figure 1.** Frequency distribution of control (0) and treatment (1) contracts according to the time elapsed since the 2003 intervention, World Bank, Goods, works and services



Comprehensive qualitative coding of the World Bank's procurement guidelines for goods, works and services was completed in June 2017. The coding frame was theoretically underpinned by the literature on corruption control, distinguishing between interventions that target behavioural change on the part of buyers or suppliers, and which seek to constrain opportunities or build capacity. Coding was completed by conducting in-depth year-on-year comparison of guidelines to ascertain changes. Each element was coded and entered into a spreadsheet, making it possible to track year-on-year changes to the documentation. From this, a narrative account was developed where major changes were highlighted and compared, to identify key themes. Interviews were also carried out with staff from the World Bank procurement team to clarify what various interventions aimed to achieve and how they were implemented in practice.

*Data*

Our database contains all major contract awards of World Bank-financed projects for the fiscal years 1998-2013.<sup>4</sup> Major contract awards refer to all “prior-reviewed” contracts, i.e. the contracts awarded in tendering processes that were reviewed by the World Bank before they were awarded and at key stages throughout the project cycle. Only contracts with an estimated value above a certain, context-specific, threshold undergo the prior-review process<sup>5</sup>. The other tendering processes, the so-called post-reviewed tenders, are managed completely by the recipients of World Bank loans with World Bank staff reviewing and auditing projects only after the end of the loan contract. Thresholds for prior review are set in a complex process and are reviewed regularly. The World Bank first decides to what degree a recipient country can be trusted to manage aid funded procurement on its own through the Country Procurement Assessment Review (CPAR).<sup>6</sup> Based on this assessment a project risk level, or review threshold, is established based on the risks associated with the economic sector, the implementing agency, and the procurement method. The World Bank provides an indicative list of thresholds for each country, but the risk assessment is outlined and the exact thresholds are determined in the procurement plans which are subject to the World Bank’s “no objection” at key stages throughout.

As our dataset only contains such high-risk tenders with greater World Bank controls, our findings are not representative of all aid spending financed by the World Bank, but only the part where risks are higher, hence the need for greater controls. For the rest of the World Bank-financed procurement tenders, we assume that donor corruption controls are of lesser importance as oversight is much more light touch and risks are lower (at least in principle).

Prior-review contracts represent a significant, albeit fluctuating, share of total lending (see Figure 2). This fluctuation is due to the constantly changing country, sector, and organisational composition of spending and project start and completion dates. While we cannot fully rule out a range of sample biases such as gaming of prior review thresholds for bureaucratic cost avoidance reasons, our interviews and process review

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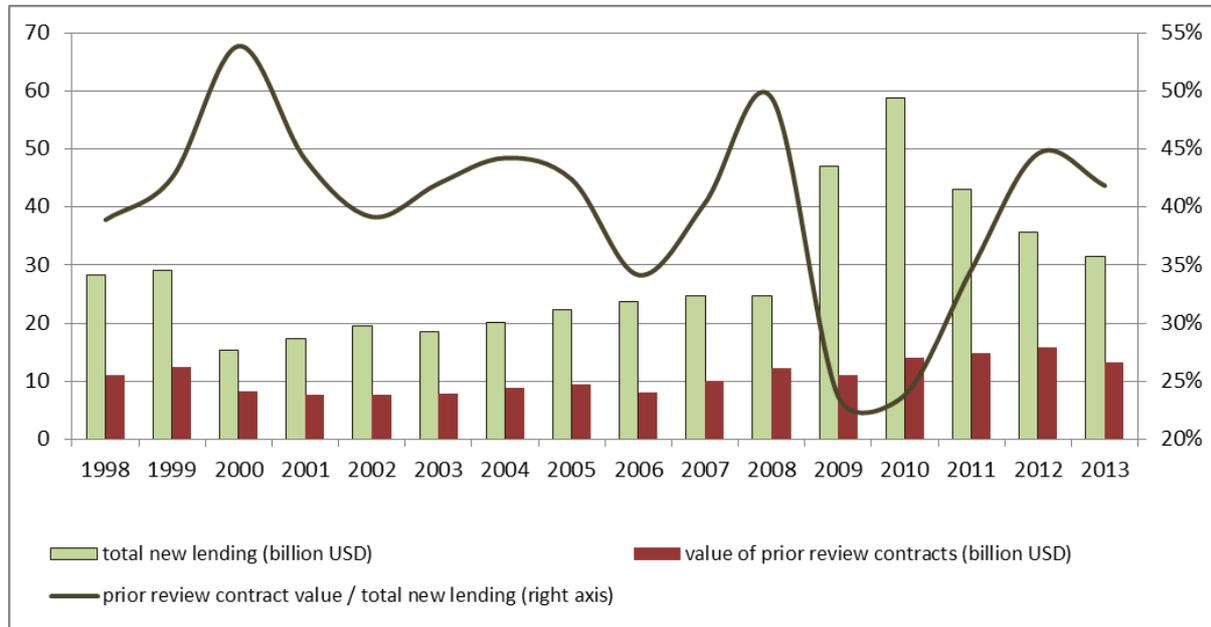
<sup>4</sup> A fiscal year begins in July and ends with June the next year, so in fact we observe each major contract award between July 1997 – Jun 2014.

<sup>5</sup> See Appendix 1 of World Bank Procurement Guidelines: <http://bit.ly/2wuj2a9>.

<sup>6</sup> Details of how the bank assesses projects: <http://bit.ly/2wa6Qc1>.

(e.g. number and range of people required to approve changes in thresholds) suggest that any gaming is likely to be of minor importance.

**Figure 2.** Share of prior review contracts compared to total new lending by the World Bank (1998-2013)



Source: Own calculation based on World Bank data

We compiled a dataset from data scraped or downloaded directly from the World Bank’s public website to have the most up-to-date data (for a full description of data sources, see Appendix A). In addition, for the analysis in this paper we also used an internal database of the World Bank which includes a slightly richer set of variables for the major contract awards dataset, allowing us to construct one of our key variables: the share of contracts in which there is only one bidder, hereafter “single bidding”. This particular variable is only available for contracts awarded in 1998-2008.<sup>7</sup>

We focus on changes introduced by the November 2003 update of the rules for contract tenders of goods, works and services. The new rules apply to projects where the project concept note is approved after the new rules became effective; the regulations to follow are specified in the financial agreement in each project. For projects approved prior to the introduction of the new rules, contracts continue to be

<sup>7</sup> The full dataset is downloadable at <http://bit.ly/2wE2HAc>.

awarded according to the old regulatory regime. Although in theory the borrower may request a switch to the new rules in an already ongoing project and the Bank may agree, the World Bank procurement expert we interviewed told us that, “Most Borrowers and Bank staff would rather not go through a formal restructuring if the only modification is the change of procurement rules” (email correspondence with World Bank procurement specialist, 18 May 2017). Thus, in the majority of cases, projects follow new regulations only if the project approval date is later than the effective date of the new rules. This means that tendering processes that occur at the same time may operate under different regulations, depending on whether their project’s approval date is before or after the effective date of the new regulation. This is critical to our identification strategy, and hence we have fully investigated the possible exceptions. A key concern is whether the new or the old regulations are applied when additional financing takes place, which occurs in about 25% of projects. Although the new regulations apply by default, most Borrowers request to remain with the old rules and the Bank has approved these requests in all cases (email correspondence with World Bank procurement specialist, 18 May 2017).

In Table 1, the number of contracts in the control and treatment group is summarized on a yearly basis, where the control group consists of projects approved before 1 November 2003 and the treatment group consists of projects approved after.

**Table 1.** Number of contracts awarded in the treated and control groups, 2000-2008

	Contract award year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
control	1,307	2,434	3,572	4,062	4,060	3,432	2,160	1,505	690	23,222
treated	0	0	0	0	319	1,133	1,496	1,601	1,047	5,596
Total	1,307	2,434	3,572	4,062	4,379	4,565	3,656	3,106	1,737	28,818

### *Indicators*

All five hypotheses take corruption risk as a dependent variable. One of the innovations of this article is identifying objective proxy indicators of corruption in aid-funded public procurement based on a methodology widely applied to national public procurement datasets (Klasnja 2016; Charron et al. 2017; Fazekas & Kocsis 2017; Fazekas et al. 2016). This work contributes to a growing literature which seeks to

develop objective corruption indicators from administrative data around the world (Escresa & Picci 2016; Cordis & Milyo 2016). Public procurement is assumed to be least prone to corruption where the process is open and competitive, and procurement regulations have been developed to set a number of maxims intended to ensure openness. To the extent that the process deviates from these maxims, those deviations may indicate a deliberate manipulation of the process by a corrupt public official (or network of public and private actors) to favour a particular company and gain a private advantage. The outcomes of the public procurement process serve as the best indicators of corruption risk (Kenny & Musatova 2010; Fazekas & Kocsis 2017). In particular, where only one company submitted a bid even though the process should have been open to competition, international or domestic, the risk of corruption is particularly high. A single bid submitted thus serves as our prime dependent variable capturing risks of corruption in public procurement. This proxy does not prove that corruption occurred, but is an indicator of risk, which – when analysed in the context of large datasets – can point to overall patterns that warrant investigation. Statistical evidence of the validity of single bidding as a corruption proxy can be found in Appendix B.<sup>8</sup>

Hypotheses 1, 4 and 5 employ the November 2003 regulatory change as the main dependent variable. This indicator is defined as a 0-1 binary variable taking the value of 0 if the project concept note approval date was before this date (control group) and 1 if it was after (treatment group). As there were other regulatory changes both before and after the 2003 change, we restricted the treatment and control groups to projects approved in the 2000-08 time window between January 1999 and September 2006, inclusive.

To operationalise the independent variables in hypotheses 2-5 (recipient-country political economy), we make use of two widely used cross-country indicators: (i) V-Dem's party system institutionalisation score (v2xps\_party of V-Dem) and (ii) Hanson and Sigman's (2013) state capacity indicator

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<sup>8</sup> Single bidding in competitive tenders, nevertheless, only captures one particular form of high-level corruption closely aligned with closed access and institutionalised corrupt relationships between public and private elites. There are other types of corruption where competition occurs among oligarchic groups, with multiple firms competing on official tendering criteria as well as bribes.

The party system institutionalisation score is composed of six indicators from the V-Dem dataset, with party strength measured as the extent to which parties have (1) permanent national party organizations, (2) permanent local party branches, (3) centralized mechanisms of candidate selection, (4) legislative cohesion, (5) minimal party switching, and (6) programmatic (rather than clientelist) linkages to their social base. Indicators are aggregated through simple addition.

The state capacity indicator is combined from 20 indicators, using Bayesian latent variable analysis. The indicators represent three core dimensions of state capacity: extractive (the ability to collect information and taxes from their populations), coercive (the ability to preserve borders and protect against external threats), and administrative (the ability to efficiently create public goods and regulate economic activity). This indicator is the best standardized state capacity measure available for a long enough time period for our country sample our analysis (1960-2010).

## RESULTS

### *Main effect of the intervention*

We carried out four comparisons of the treatment and control groups to determine the impact of the intervention on the share of single-bidder tenders, each leading to the same substantive conclusion with only minor variation in effect sizes (Table 2). Our initial analysis, a raw comparison without matching, suggests that the intervention had its intended effect, leading to a 3.6 percentage point decrease in share of single bidding. However, as the two samples are rather uneven on several dimensions, we also implemented three different propensity score matching exercises with gradually increasing covariate sets, at the expense of shrinking the sample sizes (matching 1-3 in Table 2).

The first matching exercise balanced the two groups according to log contract value, main sector, country, continent, and year of contract award. In the second, corruption risk (single bidder %) prior to the intervention – on the country and buyer levels – were added to matching covariates (country and continent covariates were removed to avoid overrepresentation of country characteristics in the matching). The third method

also matched on country-level state capacity and PSI (goodness of fit statistics for the most complete, preferred matching are in Appendix E).

In all the matching exercises, the impact of the intervention was consistently negative and significant, with the magnitude ranging between 3.8 and 4.3 percentage points. In addition, a binary logistic regression, making use of the whole sample from 2000 onwards, delivers very similar results: the average marginal effect of the intervention ranges between -2.7 and -3.5 percentage points (Table 3). Hence, we find strong and consistent support for H1, demonstrating that the November 2003 intervention (which strengthened oversight, increased publicity requirements, and lowered transaction costs through e-procurement in World Bank-funded public procurement of goods, works and services) decreased corruption risks.

**Table 2.** Simple and matched comparisons of treatment and control groups, single bidder %, World Bank public procurement, goods, works and services, 2003-2014

	raw comparison	matching(1)	matching(2)	matching(3)
<b>control</b>	21.7%	22.1%	22.4%	22.8%
<b>treatment</b>	18.2%	17.9%	18.7%	18.5%
diff(treatment - control)	<b>-3.6%***</b>	<b>-4.2%***</b>	<b>-3.8%*</b>	<b>-4.3%**</b>
<b>95% c.interval: lower bound</b>	-2.3%	-5.7%	-6.8%	-7.3%
<b>95% c.interval: upper bound</b>	-4.8%	-2.7%	-0.8%	-1.3%
<b>N control</b>	12,610	5,380	1,409	1,375
<b>N treatment</b>	5,778	5,380	1,409	1,375
<b>matching variables</b>				
<b>log contract value</b>		Y	Y	Y
<b>main sector</b>		Y	Y	Y
<b>country</b>		Y		
<b>continent</b>		Y		
<b>year</b>		Y	Y	Y
<b>country prior single bidder %</b>			Y	Y
<b>buyer prior single bidder %</b>			Y	Y
<b>country capacity</b>				Y
<b>country PSI</b>				Y

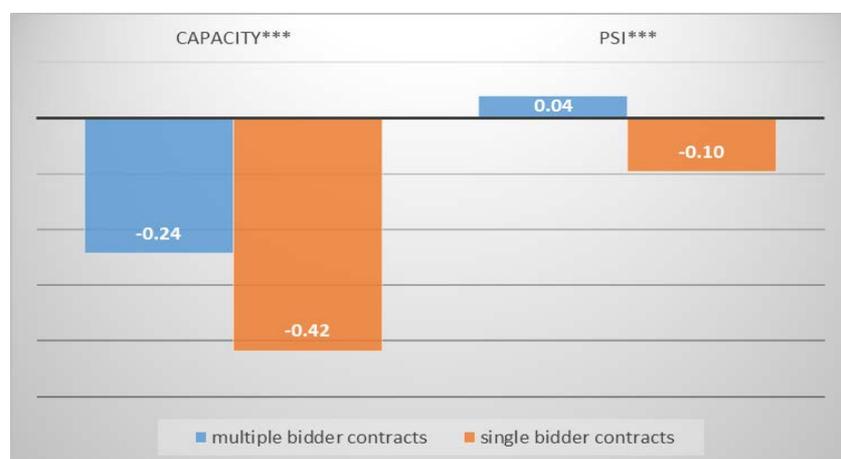
Significance levels: \*\*\*<0.1%; \*\*<1%; \*<5%

### *Effects of party system institutionalisation and state capacity*

After establishing the overall effect of the November 2003 intervention, we turn to the independent effects of PSI and state capacity (H2 and H3). On a bivariate, most basic level, contracts awarded in single bidder tenders tend to be located in countries with lower state capacity score as well as lower PSI scores (Figure 3).

Both differences between single and multiple bidder contracts are statistically significant and substantial: in our data, an increase in PSI score from -0.10 to 0.04 is equivalent to moving from Uganda to Moldova; while a change from a state capacity score of -0.42 to -0.24 is roughly the equivalent of moving from Kenya to Georgia.

**Figure 3.** Simple comparisons of single and multiple bidder contracts according to country average state capacity and party system institutionalisation (PSI)



Significance levels: \*\*\*<0.1%; \*\*<1%; \*<5%

These simple bivariate relationships are further confirmed by binary logistic regressions controlling for a range of country and contract characteristics (Table 3). A one-unit increase in PSI (1.2 standard deviation) decreases single bidding by 6.3 percentage points in model 2 on average; while a one-unit increase in state capacity (or 1.5 standard deviation in our sample) decreases single bidder prevalence by 8.9 percentage points in model 3 on average. All this evidence points at the validity of H2 and H3. However, the empirical evidence presented is only correlational, albeit backed-up by a strong theoretical literature. In the absence of high impact and discrete policy changes, we are unable to precisely identify the causal effects. This is due to the fact that both party institutionalisation and state capacity are thought to change only very slowly over time within a given country (Rueschemeyer 2005; Hicken & Martinez Kuhonta 2011).

**Table 3.** Binary logistic regressions explaining single bidder contracts, 2001-2006, World Bank, Goods, works and services (log-odds coefficients and p-values are reported)

Model	(1)	(2)	(3)	(4)	(5)
Single bidder dummy					
2003 GWS intervention	-0.195** (0.005)	- 0.202** (0.004)	-0.247*** (0.000)	-0.198** (0.005)	-0.166* (0.037)
Party system institutionalization		-0.449* (0.036)		-0.440* (0.040)	
State capacity			-0.628*** (0.000)		-0.648*** (0.000)
2003 GWS intervention=1 # State capacity					0.209* (0.029)
2003 GWS intervention=1 # Party system institutionalization				0.0651 (0.355)	
Control variables					
Log contract value	Y	Y	Y	Y	Y
Main sector	Y	Y	Y	Y	Y
Country	Y	Y	Y	Y	Y
Continent	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y
Observations	22,393	21,869	21,434	21,869	21,434
$R^2$	0.187	0.188	0.188	0.188	0.188

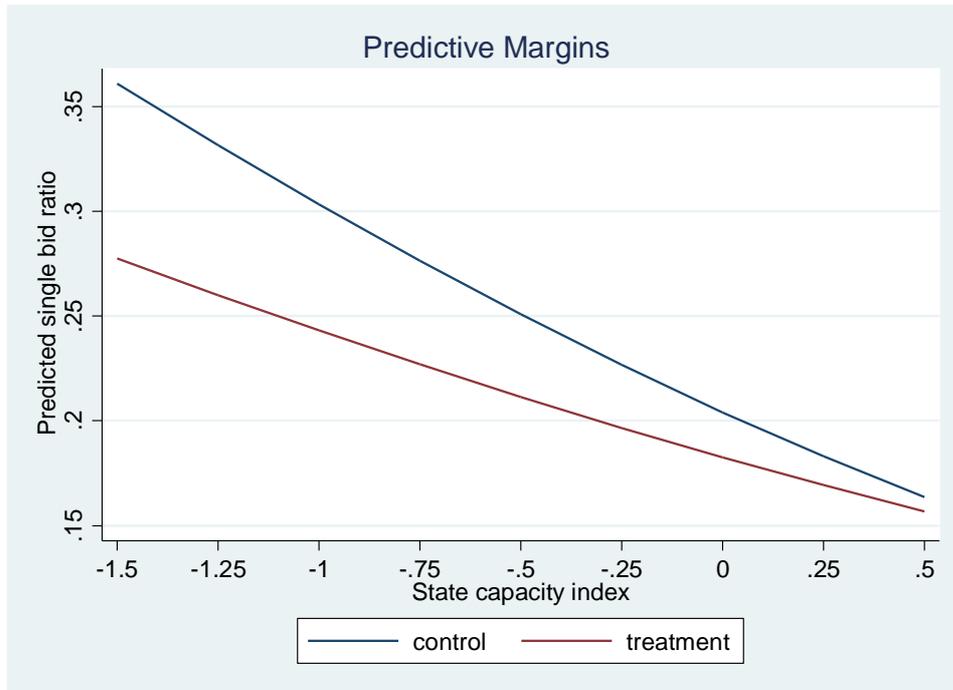
Significance levels: \*\*\*<0.1%; \*\*<1%; \*<5%

### Interaction effects

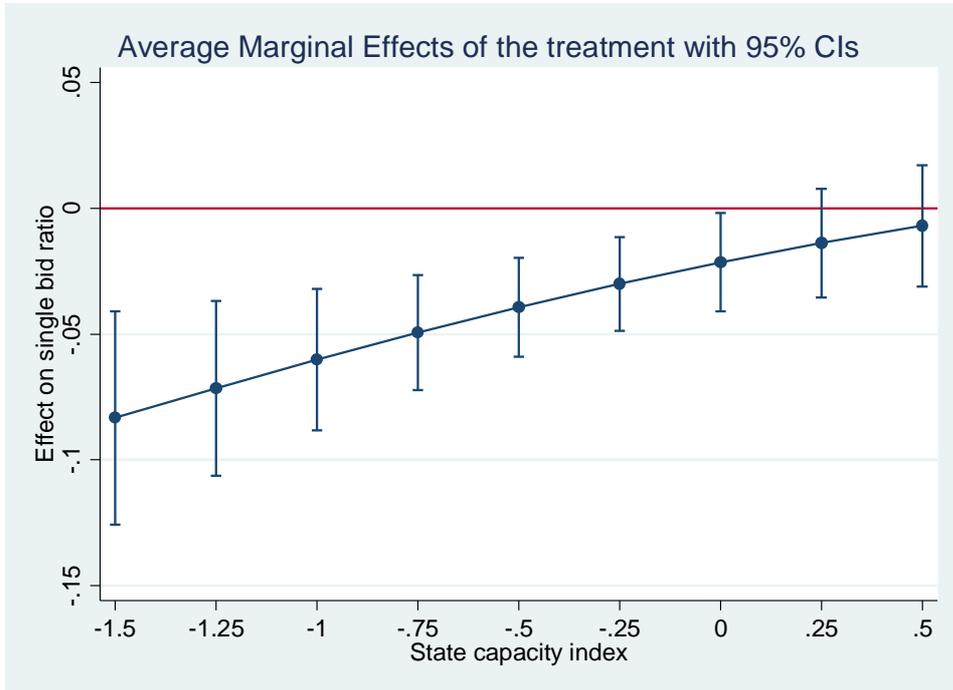
Now we turn to H4 and H5 by investigating the mediating role of party institutionalisation and state capacity in the effect of the 2003 regulatory change on corruption risks. Contrary to our expectations (H4), party system institutionalisation does not mitigate the effect of the intervention in our regression model (model 4 in Table 3). While propensity score matching is less amenable to tracking interaction effects, as a robustness test, we include matching specifically for high and low PSI and state capacity, with essentially the same conclusions (Appendix F). Using the binary logistic set-up described above, the interaction effect between state capacity and the 2003 intervention is found to be positive and significant in model 5 (Table 3). Hence, we found evidence supporting H5 – that is, the November 2003 intervention

predominantly had an effect in countries with low state capacity, while the effect is insignificant in high-capacity countries (Figure 4 and Figure 5).

**Figure 4.** Predicted single bidder ratio as a function of state capacity and the 2003 GWS intervention, 2001-2006, World Bank, Goods, works and services



**Figure 5.** Average marginal effects of the 2003 GWS intervention as a function of state capacity, 2001-2006, World Bank, Goods, works and services



Note: the red zero line shows the value at which the coefficient becomes insignificant.

## DISCUSSION AND CONCLUSIONS

We find that World Bank efforts to control corruption in aid spending through national procurement systems by tightening oversight and increasing market openness are effective in reducing corruption risks. This suggests that theories of corruption control based on reducing opportunities and increasing constraints on the power of public administrators have merit. We also find support for our hypotheses that the political context in recipient countries affects patterns of corruption in aid. In countries with high party system institutionalisation, a proxy for elites having longer time horizons, the prevalence of single bidding is lower. The same is true for countries with greater state capacity.

When looking at the interactions between institutional controls and political context, we find that the corruption-risk-reducing effect of the 2003 reform of World Bank rules regarding aid spent through national procurement systems is larger in countries with low state capacity. This result is a likely consequence of several causal mechanisms.

First, in countries with low state capacity, donor controls effectively substitute for weaknesses in state control over funds by increasing their own oversight. This helps to ensure that aid reaches the right destinations (although it also raises a question as to whether this will have negative implications in the long term, because it does not allow local institutions to build up capacity to monitor and control funds themselves). Second, elites in high state-capacity countries are potentially better able to respond strategically to efforts to curb their opportunities for corruption, using hierarchically organised and professional public administrations for corrupt ends. Thus, reforms in controls have less effect because these elites are better able to adapt their practices and find new and more sophisticated ways to manipulate the system to their advantage, which are not captured by our corruption risk outcome indicator. The opposite would be true in low state-capacity countries.

We find no evidence that higher levels of party system institutionalisation amplify the effect of the 2003 World Bank reform. To explain this, it might help to look at two cases of successful late industrialisation: South Korea and Malaysia. After World War II, political power became highly centralised in both countries – under a military regime in South Korea and a dominant-party dictatorship in Malaysia. In these cases, long time horizons incentivised elites to invest in economic development and industrialisation. However, rather perplexingly, dramatic growth in the 1960s and 1970s co-existed with systemic political corruption, which was a key source of income for the respective regime parties, the Democratic Republican Party (DRP) and the United Malays National Organisation (UMNO). Crucially for our discussion here, a common way to organise corruption in these countries was through the mechanism of single bidding: in South Korea, the DRP allocated public loans to carefully selected companies in exchange for large bribes (Kang 2002; Wedeman 1997), while in Malaysia the government regularly funnelled public contracts to UMNO-owned enterprises as a way to bolster the party (Gomez & Jomo 1999; Khan 1998).

In short, these extensively researched cases tell us two things. First, corruption organised through single bidding is not necessarily incompatible with economic growth. In other words, elites with long time horizons might work towards growing the economy while at the same time engaging in corruption through manipulation of procurement to ensure single bidding. Second, corrupt forms of single bidding can be

an important source of funding for institutionalised parties – both in authoritarian regimes (such as South Korea and Malaysia in the 1960s and 1970s) and in democratic political systems. Thus, party elites in recipient countries may face disincentives to implement aid donors' anti-corruption regulations, as their political survival depends on funds that they gain through uncompetitive bidding processes.

For the sake of simplifying a complex question, the analysis in this paper uses only one simple indicator of corruption risk. In reality, corruption is likely to be varied and complex, and this indicator may fail to capture a number of important forms of corruption. However, our method of analysing red flag indicators in procurement processes and outcomes carries the potential that, by developing and monitoring more indicators and studying how patterns change over time, we could identify the strategic responses of elites and hone down our analysis of these dynamics. Further, such analysis might enable us to observe displacements effects, whereby increased controls in some areas lead to a shift in patterns of corrupt rent extraction to other areas such as non-World Bank aid, national public procurement, natural resource rents and so on.

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## Appendices

### Appendix A. Description of datasets

**Major contract awards** <https://finances.worldbank.org/Procurement/Major-Contract-Awards/kdui-wcs3>

Contains "prior-reviewed" contracts by World Bank, i.e. the contract award commitments that were reviewed by the World Bank before they were awarded. Each contract is being prior-reviewed in case their value is above a certain threshold. Thresholds vary by country and the type of contract (goods, works, services) and are defined in the procurement plans.

**World Bank Projects and Operations** <http://data.worldbank.org/data-catalog/projects-portfolio>

Includes basic information of all World Bank projects, such as the project title, task manager, country, project id, sector, commitment amount and financing. It also provides links to publicly disclosed online documents.

**Notices and Contracts (WB website)**

<http://projects.worldbank.org/procurement/procurementsearch?lang=en&srce=both>

Contract notices and contract awards are continuously published here, so the website provides the potential for building a self-updating database.

**Internal World Bank Database**

Internal database of World Bank that contains a wider range of variables than the publicly available data. Our key variable, single bidding is from this database.

## Appendix B. Single bidder validity

As macro validation, we checked the correlations with some well-established perception-based corruption indicators on country-level (similarly to (Fazekas & Kocsis 2017)): World Governance Indicators' Control of Corruption, Transparency International's Corruption Perception Index, and Global Competitiveness Index's Favoritism in decisions of government officials (indicator 1.07<sup>9</sup>). All three perception indices indicate lower corruption with higher values, so we expect to see negative correlations (Kaufmann et al. 2009; Transparency International 2012; World Economic Forum 2010). This strategy has been originally used for national procurement data and for procurement notices published on Tender Electronic Daily (TED), the procurement page of the European Union; however, the corruption risks of procurement from development aid sources might not go hand in hand with the corruption patterns of national procurement. Furthermore, following from the regulations of the donor institutions (Fazekas & Tóth 2014) contracts below country-specific thresholds are not published on donor websites, thus we cannot even track the full amount of development aid spent through corruption (*Figure 2*). It might be the case that suspicious transactions are managed below the threshold value and larger contracts are kept transparent. Consequently, we do not necessarily expect to see strong correlations with these indicators, but still, some level of correlation would strengthen the validity of our red flags.

The correlations with perception-based indicators for our most important red flag, single-bidding, are presented in *Table 4*. Single bidding is our most straight-forward red flag. In order to secure that resources are allocated to specific favoured individuals other competitors should be somehow ruled out from competition. Unless fake competitors are commissioned single bidding is necessary, but not sufficient sign of a tender.

*Table 4 Correlation of single bidding and perception-based corruption indicators*

	TI - CPI (2009)	WGI - CoC (2009)	GCI - Fav (2009)
Weighted with number of contracts	-0.20	-0.15	-0.20
Weighted with sum of contract values	-0.18	-0.11	-0.15

*Note: Only countries with more than 100 contracts are considered*

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<sup>9</sup> In your country, to what extent do government officials show favoritism to well-connected firms and individuals when deciding upon policies and contracts? [1 = always show favoritism; 7 = never show favoritism]

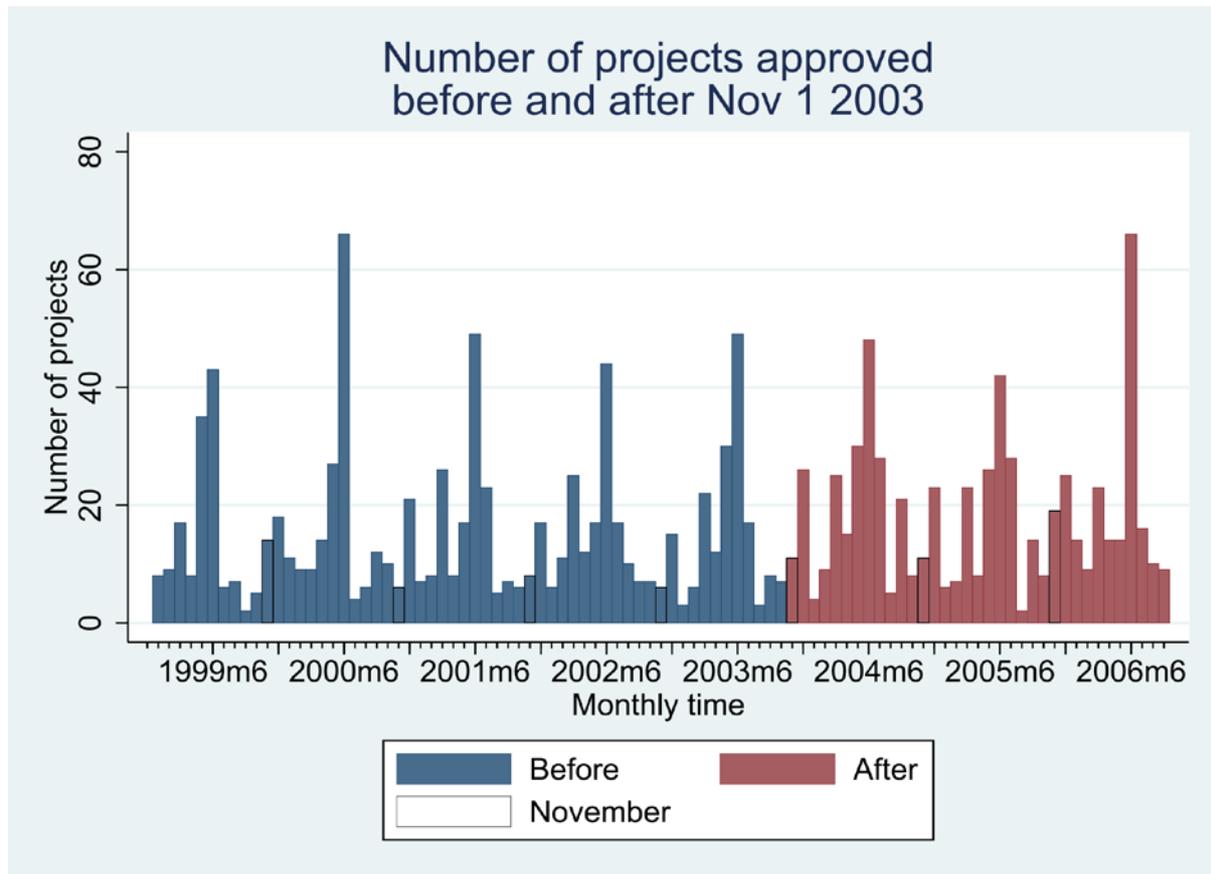


### Appendix C. Evidence for the absence of manipulation around the threshold

The main question is whether there was gaming in project approvals, i.e. artificially postponing or bringing forward the approval in order to fall under the desired regulations. If actors follow such practices, our identification strategy would not be credible as we could not assume a quasi-random timing of project approvals around the intervention.

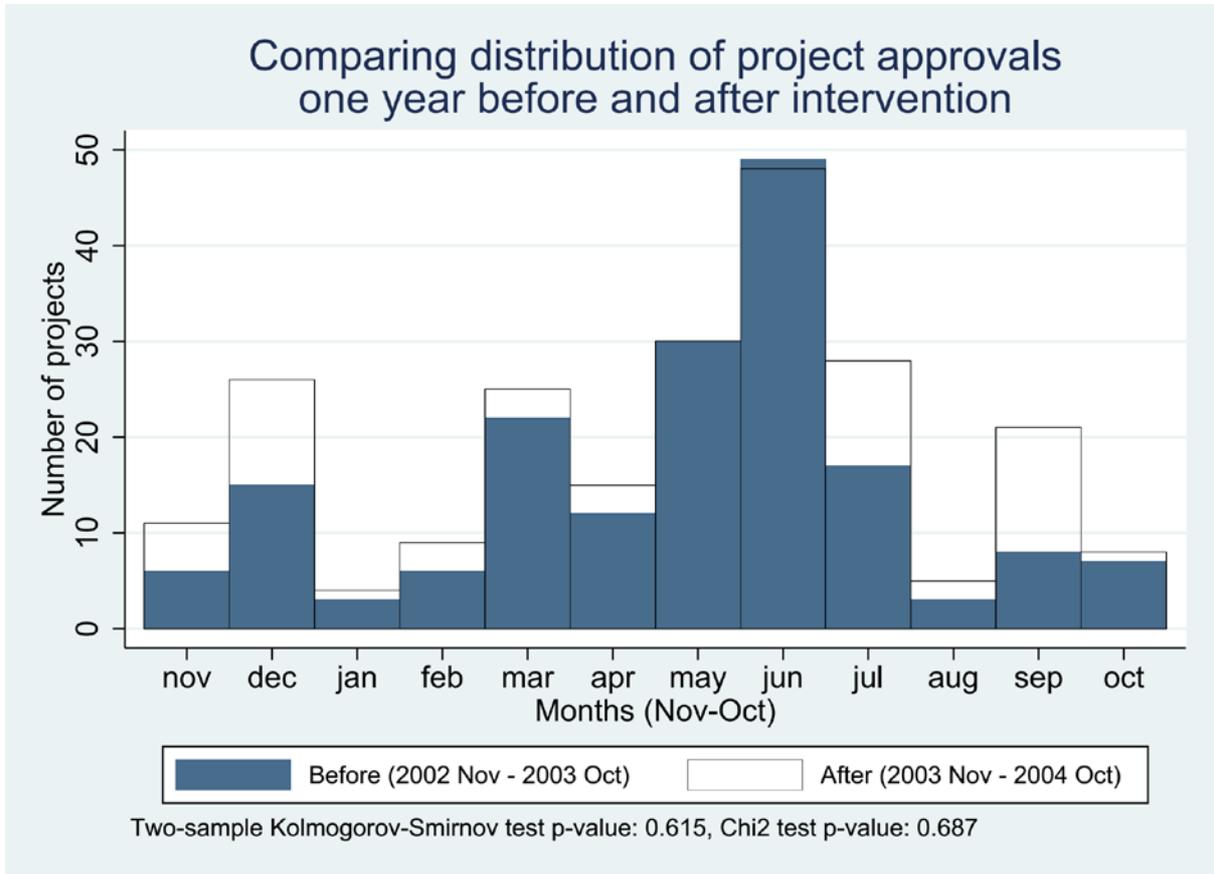
To test whether there was gaming we first plotted the number of projects launched monthly in the years before and after the November 2003 intervention (Figure 7) beginning with the latest and ending with the next intervention in WB regulations. We can see a strong seasonality in this graph with peaks in June each year that is the last month of a fiscal year at World Bank. According to this graph there was no extraordinary pattern around November 2003.

Figure 7. Seasonal distribution of project approvals by months (Jan 1999 - Sep 2006)



We also made some formal tests to make sure there is no irregular pattern in the timely distribution of project approvals around the intervention. On Figure 8, we show the overlapping histograms of project approval dates monthly for the years preceding and following Nov 2003. The two distributions look very much alike and we did not find any significant differences between them with the two-sample Kolmogorov-Smirnov test and simple chi2 tests, either. We also tested the differences in distributions for broader time periods and for periods with November in the middle and we also did not find any significant differences in these versions.

Figure 8. Overlapping histograms of project approvals (monthly) for the years preceding and the following year of Nov 1 2003



## Appendix D. Further descriptive statistics

Table 5. Simple statistics about the variables used in the estimations

Variable	Obs	Mean	Std. Dev.	Min	Max
Single bidding	18,388	0.21	0.40	0	1
ANB-level single bidding before intervention	17,797	0.09	0.24	0	1
Country-level single bidding before intervention	29,462	0.24	0.22	0	1
Contract value	30,290	4,451,153	22,600,000	35,125	2,130,000,000
Log of contract value	30,290	13.81	1.52	10.47	21.48
Party System Institutionalization	29,177	0.07	0.74	-2.31	1.25
State Capacity	28,801	-0.31	0.61	-2.58	1.73
<i>Sectors:</i>					
Agriculture	30,289	0.10	0.30	0	1
Education	30,289	0.11	0.31	0	1
Finance	30,289	0.13	0.33	0	1
Energy & mining	30,289	0.01	0.12	0	1
Finance	30,289	0.18	0.38	0	1
Industry and trade	30,289	0.03	0.16	0	1
Info & communication	30,289	0.01	0.10	0	1
Public admin, Law	30,289	0.11	0.32	0	1
Transportation	30,289	0.18	0.38	0	1
Water, sanitation, flood protection	30,289	0.16	0.36	0	1

Table 6. List of countries and the number of contracts per country in the sample

Country name	Freq.	Percent	Cum.
Afghanistan	427	1.43	1.43
Albania	329	1.1	2.53
Algeria	18	0.06	2.59
Angola	56	0.19	2.78
Argentina	373	1.25	4.02
Armenia	314	1.05	5.07
Azerbaijan	272	0.91	5.98
Bangladesh	1,138	3.81	9.79
Barbados	2	0.01	9.8
Belarus	195	0.65	10.45
Belize	6	0.02	10.47
Benin	128	0.43	10.9
Bhutan	48	0.16	11.06
Bolivia	119	0.4	11.45
Bosnia and Herzegovina	723	2.42	13.87
Brazil	373	1.25	15.12
Bulgaria	459	1.54	16.65
Burkina Faso	190	0.64	17.29
Burundi	199	0.67	17.96
Cambodia	205	0.69	18.64
Cameroon	40	0.13	18.78
Cape Verde	34	0.11	18.89
Central African Republic	14	0.05	18.94
Chad	90	0.3	19.24
Chile	13	0.04	19.28
China	1,611	5.39	24.67
Colombia	127	0.42	25.09
Comoros	24	0.08	25.17
Congo	80	0.27	25.44
Costa Rica	28	0.09	25.53
Cote d'Ivoire	1	0	25.54
Croatia	355	1.19	26.72
Democratic Republic of the Congo	369	1.23	27.96
Djibouti	97	0.32	28.28
Dominica	7	0.02	28.31
Dominican Republic	117	0.39	28.7
Ecuador	36	0.12	28.82
Egypt	197	0.66	29.48
El Salvador	74	0.25	29.72
Eritrea	91	0.3	30.03
Ethiopia	299	1	31.03
Gabon	8	0.03	31.06
Gambia	61	0.2	31.26
Georgia	527	1.76	33.02

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Ghana	468	1.57	34.59
Grenada	82	0.27	34.86
Guatemala	178	0.6	35.46
Guinea	176	0.59	36.05
Guinea-Bissau	28	0.09	36.14
Guyana	45	0.15	36.29
Haiti	78	0.26	36.55
Honduras	212	0.71	37.26
Hungary	12	0.04	37.3
India	1,690	5.65	42.95
Indonesia	451	1.51	44.46
Iran, Islamic Republic of	460	1.54	46
Iraq	327	1.09	47.09
Jamaica	20	0.07	47.16
Jordan	71	0.24	47.4
Kazakhstan	92	0.31	47.7
Kenya	154	0.52	48.22
Kiribati	3	0.01	48.23
Kosovo	37	0.12	48.35
Kyrgyzstan	225	0.75	49.11
Lao People's Democratic Republic	208	0.7	49.8
Latvia	9	0.03	49.83
Lebanon	224	0.75	50.58
Lesotho	105	0.35	50.93
Liberia	23	0.08	51.01
Lithuania	51	0.17	51.18
Macedonia, the Former Yugoslav Republ..	216	0.72	51.9
Madagascar	341	1.14	53.04
Malawi	166	0.56	53.6
Maldives	12	0.04	53.64
Mali	134	0.45	54.09
Mauritania	211	0.71	54.79
Mexico	361	1.21	56
Moldova, Republic of	273	0.91	56.91
Mongolia	156	0.52	57.43
Montenegro	60	0.2	57.63
Morocco	68	0.23	57.86
Mozambique	291	0.97	58.83
Nepal	480	1.61	60.44
Nicaragua	625	2.09	62.53
Niger	136	0.45	62.98
Nigeria	777	2.6	65.58
Pakistan	445	1.49	67.07
Panama	35	0.12	67.19
Papua New Guinea	135	0.45	67.64
Paraguay	47	0.16	67.8

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Peru	232	0.78	68.57
Philippines	330	1.1	69.68
Poland	52	0.17	69.85
Romania	475	1.59	71.44
Russian Federation	658	2.2	73.64
Rwanda	136	0.45	74.09
Saint Kitts and Nevis	23	0.08	74.17
Saint Lucia	54	0.18	74.35
Saint Vincent and the Grenadines	39	0.13	74.48
Samoa	52	0.17	74.66
Sao Tome and Principe	8	0.03	74.68
Senegal	269	0.9	75.58
Serbia	296	0.99	76.57
Seychelles	1	0	76.58
Sierra Leone	176	0.59	77.16
Slovakia	3	0.01	77.17
Solomon Islands	3	0.01	77.18
South Africa	17	0.06	77.24
South Sudan	61	0.2	77.45
Sri Lanka	84	0.28	77.73
Sudan	23	0.08	77.8
Syrian Arab Republic	2	0.01	77.81
Tajikistan	393	1.31	79.12
Thailand	26	0.09	79.21
Timor-Leste	139	0.46	79.68
Tonga	13	0.04	79.72
Trinidad and Tobago	20	0.07	79.79
Tunisia	203	0.68	80.47
Turkey	176	0.59	81.05
Uganda	271	0.91	81.96
Ukraine	189	0.63	82.59
United Republic of Tanzania	284	0.95	83.54
Uruguay	47	0.16	83.7
Uzbekistan	196	0.66	84.36
Venezuela	4	0.01	84.37
Viet Nam	3,828	12.8	97.17
West Bank and Gaza	171	0.57	97.74
Yemen	456	1.53	99.27
Zambia	219	0.73	100
Total	29,901	100	

### Appendix E. Goodness of fit for propensity score matching

Figure 9. Comparison of propensity scores in the control and treatment groups

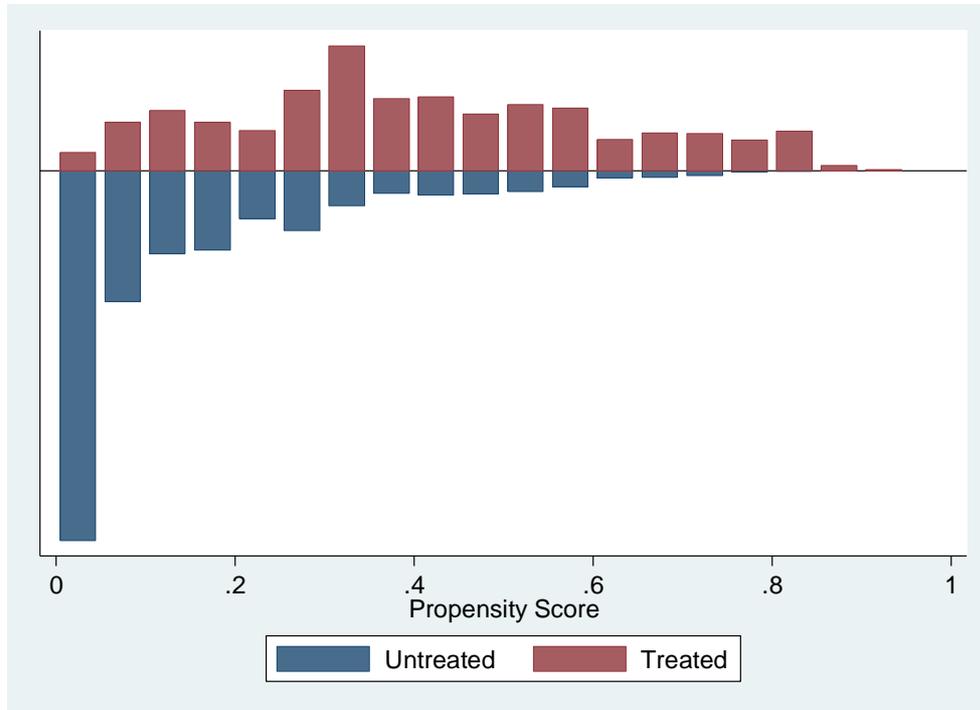


Figure 10. Variable level balance in the matched and unmatched comparisons

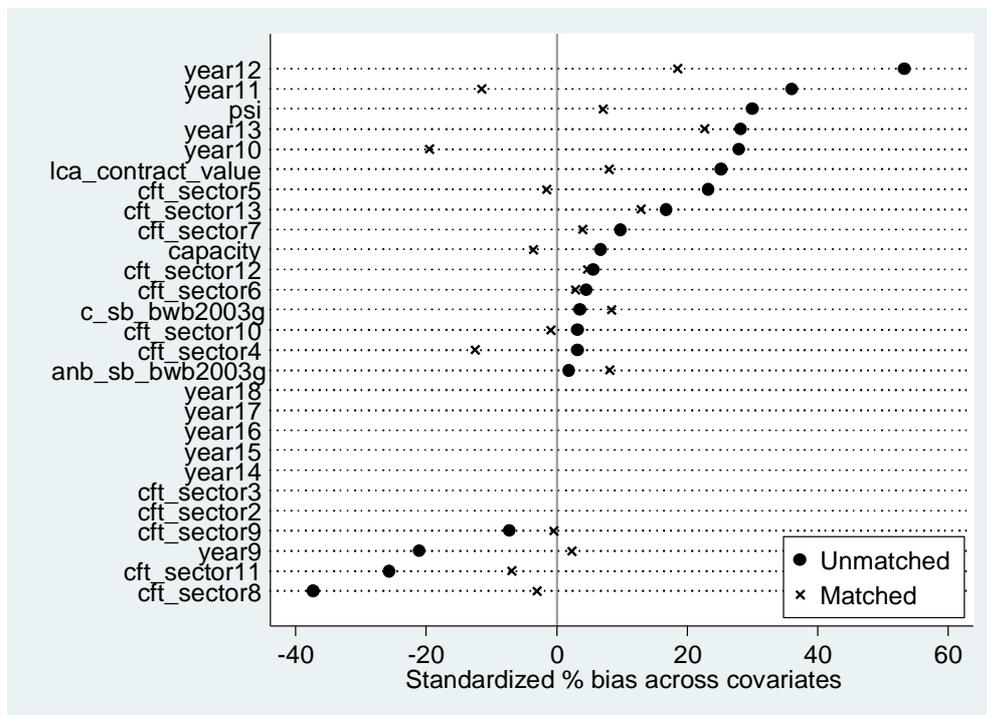


Table 7. Summary of balance before and after matching

Sample	Ps R2	LR chi2	p>chi2	Mean Bias	Median Bias	B	R	% Var
Unmatched	0.256	1721.74	0	18.5	18.9	142.6*	0.57	60
Matched	0.025	95.22	0	8	7	37.2*	1.96	60

## Appendix F. Robustness tests - Matching estimation and interactions

Figure 11. Comparison of control and treatment group single bidder ratios, low vs high state capacity subsamples, propensity score matching (Table 2, matching(3)), World Bank public procurement, goods, works and services, 2003-2014

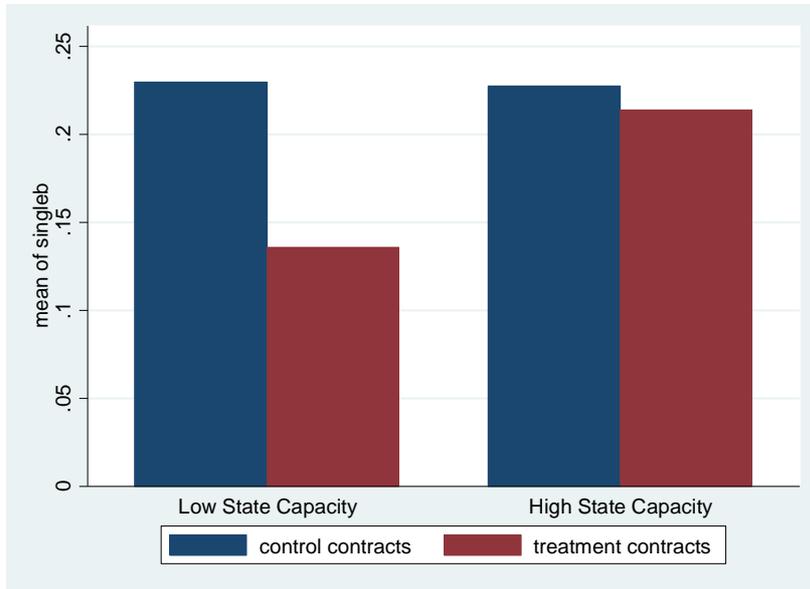
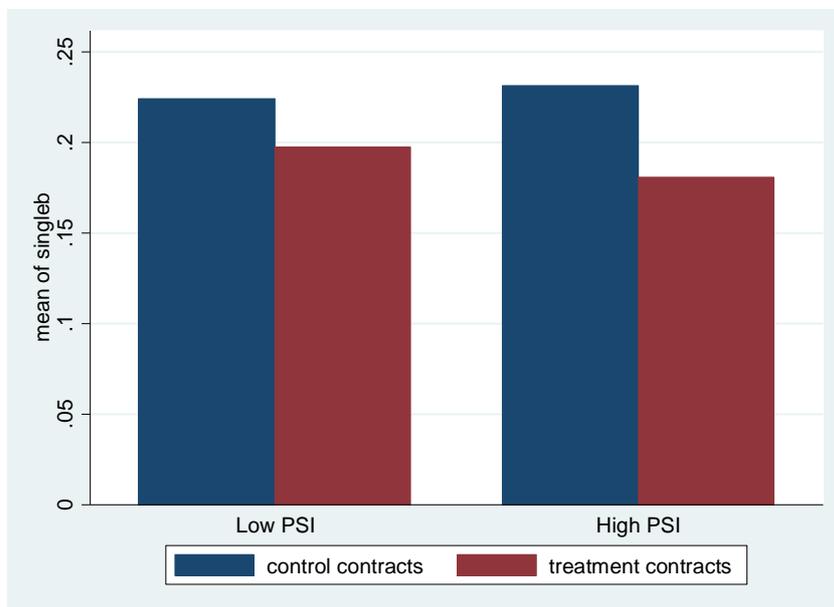


Figure 12. Comparison of control and treatment group single bidder ratios, low vs high PSI subsamples, propensity score matching (Table 2, matching(3)), World Bank public procurement, goods, works and services, 2003-2014



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