Do public fund windfalls increase corruption? 
Evidence from a natural disaster

Elena Nikolova and Nikolay Marinov

Summary
We show that unexpected financial windfalls increase corruption in local government. Our analysis uses a unique data set on flood-related transfers, and the associated spending infringements which the Bulgarian central government distributed to municipalities following torrential rains in 2004 and 2005. We build an index of corruption using information from the publicly available audit reports, and exploit the quasi-random nature of the rainfall shock (conditional on controls for ground flood risk) to isolate exogenous variation in the amount of funds received by each municipality. Our results imply that a 10 per cent increase in the per capita amount of disbursed funds leads to a 12.2 per cent increase in corruption. We also present suggestive evidence that while corruption had little effect on the re-election probability of the incumbent mayor, this was partly due to more corrupt mayors dropping out of the election race. Our results highlight the governance pitfalls of non-tax transfers, such as disaster relief or assistance from international organisations, in weak democracies.

Keywords: corruption, flooding, public funds, Bulgaria.

JEL Classification: D73, H7, P35.

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1 Introduction

How do financial windfalls affect governance? One strand of the literature has related non-tax wealth (mainly derived from natural resources) to weakened democratic institutions (Gervasoni, 2010; Jensen and Wantchekon, 2004; Ramsay, 2011; Ross, 2001), corruption (Ahmed, 2013; Caselli and Michaels, 2013; Vicente, 2010) and poor quality of politicians (Brollo et al., 2013). In contrast, a different body of work has questioned these effects. Several counter-arguments have been advanced: (1) some countries may in fact experience a “resource blessing” (Dunning, 2008; Haber and Menaldo, 2011); (2) a deterioration in leader accountability following a resource boom may be short-lived, particularly when institutional constraints are strong (Monteiro and Ferraz, 2010); and (3) access to information may play a key role in reversing the negative link between windfalls and governance (Guiteras and Mobarak, 2014).

Despite the growth of this literature, scholars have paid relatively little attention to the governance consequences of non-resource windfalls, such as natural disaster relief. While most of the existing work has utilised cross-country evidence, the few existing micro-level papers have focused on a limited set of large developing countries (Argentina, Bangladesh and Brazil). However, lessons from Latin America and Asia may be difficult to apply to the transition countries in central and eastern Europe, due to geographic, cultural and historical differences. These are important omissions, since both corruption and local transfers (from central governments as well as international organisations such as the European Union) in these new democracies are non-negligible and subject to much discussion.

We fill this gap by examining how intra-governmental transfers affect local corruption in Bulgaria. We use a unique data set on the amount and use of disaster aid distributed to local governments following unexpected torrential rains which led to flooding in 2004 and 2005. The awarded funds represented a non-negligible financial injection (amounting to around 15.6 per cent of municipal income for the average municipality), and local governments were the ultimate authority on how the money would be spent. Moreover, what was not known at the time of disbursement was that an independent national auditing watchdog would be summoned in 2006 to issue detailed reports on how the money was used for 227 out of 257 municipalities receiving assistance. The resulting public reports chronicle a variety of infringements including: (1) contracts not awarded to the highest bidder or no bidding; (2) money channelled for the repair of buildings experiencing no damage; and (3) money given for no work. We exploit this information to create an objective – as opposed to a perception-based – measure of corruption, which sums all the infringements recorded in a municipality between 2004 and 2005.

We use this corruption index to test an important hypothesis: do public fund transfers result in more corruption in local government? Our identification strategy exploits the quasi-random nature of the rainfall shock (conditional on several proxies for ground flood risk) to isolate exogenous variation in the amount of funds received by each municipality. Our data are very rich and include a wide range of additional municipal characteristics, such as unemployment and the

1These municipalities comprised 96.8 per cent of disbursed funds.

2Objective corruption measures similar to ours may be more accurate than perception-based variables (Olken, 2009). See also Treisman (2007).
political affiliation of the local government. According to our instrumental variable estimates, a 10 per cent rise in per capita relief funds increased corruption by 12.2 per cent in the average municipality, which is a sizeable effect.

Furthermore, suggestive evidence implies that corruption had little effect on the re-election chances of the incumbent mayor. This is partly due to the fact that mayors in high-corruption municipalities were less likely to run for re-election, with a stronger effect in municipalities in which the incumbent had previously won by a narrow margin. More tentatively, we find that the link between funds and corruption varies with municipal characteristics. The negative impact of flood assistance on governance is stronger in municipalities which are more developed economically and which have a weaker media. All in all, our suggestive evidence on mechanisms indicates that political accountability informs the decision to steal: mayors engage in corrupt behaviour when they feel they can get away with it, or when the prize of stealing more outweighs the benefit of running for office again.

Our work complements a growing literature on the drivers of corruption in developing and transition countries, particularly using non-survey measures and arguably identified designs (Bertrand et al., 2007; Ferraz and Finan, 2011; Findley et al., Forthcoming; Fisman and Miguel, 2007; Mironov and Zhuravskaya, 2014; Reinkikka and Svensson, 2005). Our study is also related to work on the impact of natural disasters on economic and political outcomes, such as Bechtel and Hainmueller (2011); Lazarev et al. (Forthcoming); Leeson and Sobel (2008) and Quiroz Flores and Smith (2013).

We contribute to earlier studies in at least three important ways. First, the unique research design we utilise, along with the richness of our data, helps us to determine the impact of intra-governmental transfers on local corruption. Second, while the analysis is circumscribed to a particular country and event, our findings may nevertheless provide useful lessons for other countries in the transition region where external transfers (such as those administered by the European Union or foreign donors) are particularly important. Bulgaria is possibly the most corrupt state in the European Union, and the target of large public fund infusions. More broadly, our results relate to the policy debate among international financial institutions as to whether weather-related insurance should be provided publicly or by the market. While the eastern European experience demonstrates that privatisation is far from a panacea, this work warns that local governments may be tempted to pocket at least some of the disaster relief, thus stalling vital reconstruction efforts.

See also Dell et al. (2014) for a review of this literature.
2 Public fund transfers and corruption incentives

Consider a municipality which receives an unexpected financial windfall, such as flood relief from the central government. First, municipalities may spend some or all of the allocated money for reconstruction. Local politicians who utilise aid effectively may be more likely to be re-elected in localities directly affected by the disaster as the population exhibits “voter gratitude” (Bechtel and Hainmueller [2011]), while corrupt leaders may be punished at the polls (Klašnja et al. [2012]). In addition, efficient handling of relief funds may serve as a signal of (local or national) government presence and competence even for voters in localities which may not have been directly affected by the disaster. In Russia, for instance, Lazarev et al. (Forthcoming) find that such “demonstration effects” are responsible for unexpectedly high levels of government approval. Importantly, political parties may be able to build on the reputation of municipal politicians to win national elections, thus improving even further the re-election chances of local bureaucrats (Brollo and Nannicini [2012]).

Alternatively, local policymakers may also pocket some or all of the money for their own benefit, even if they care about subsequent re-election. First, patronage can be distributed to particular groups of voters that may be more likely to support incumbents at the polls, such as public sector workers (Monteiro and Ferraz [2010]). Similarly, firms which obtain lucrative reconstruction contracts may “repay the favour” by financing a mayor’s re-election campaign. Second, local governments may misappropriate relief aid if they believe that the risk of being caught is low. For example, voters may not easily update their beliefs about politicians’ competence when the media is weak (Ferraz and Finan [2008]; Reinikka and Svensson [2005]). Likewise, less educated voters may find it more difficult to judge leaders’ performance and to hold them accountable. Finally, incumbents may opt to steal funds now simply because doing so is more profitable than the uncertain payoff from a future election. Sizeable and unexpected disaster relief may make corrupt activities particularly tempting compared with waiting to grab other political rents later.

In this paper, we are interested in answering the following question: does an increase in intra-governmental transfers affect corruption in local government and, if so, via what mechanisms? Credibly identifying the impact of relief funds on local government corruption raises two challenges: (1) constructing a reliable corruption measure; and (2) isolating exogenous variation in disaster aid. To deal with the first point, we exploit the fact that in early 2006 the central government commissioned an independent audit agency (the Bulgarian National Audit Agency) to conduct comprehensive inspections on how the funds had been used by each municipality. We build an index of corruption using information on the various spending infringements recorded by the agency in each municipality, in the spirit of Ferraz and Finan [2008; 2011].

The main difficulty in solving the second identification issue lies in the fact that unobservable

4It is also possible that voters in a high-corruption environment may react to corruption only when the state of the economy is also poor – see, for instance, Klašnja and Tucker (2013).

5In Romania, Pop-Eleches and Pop-Eleches (2012) show that even small amounts of targeted public spending (a €200 voucher towards the purchase of a computer) make it more likely that recipients vote for the parties of the incumbent governing coalition. See also De La O (2013) and Manacorda et al. (2011) for similar findings in Mexico and Uruguay, respectively.
characteristics may drive both the amount of disaster aid which the municipality receives and subsequent corruption. For example, charismatic mayors may be more likely to be awarded a higher amount of funds as well as to commit and get away with spending violations. A “naive” regression exploring the link between disaster aid and corruption may also suffer from reverse causality: more corrupt politicians may be able to extract a higher amount of assistance from central government.

Previous work has addressed the latter concern in several ways. In Argentina, Gervasoni (2010) studies the impact of federal transfers on sub-national democracy and instruments the former with the reciprocal of state population. A similar but more rigorous approach is undertaken by Brollo et al. (2013) and Litschig and Morrison (2013) who use a regression discontinuity design. In Brazil, intra-governmental transfers change discontinuously and exogenously at given population thresholds, with all municipalities in the same state and the same population bracket receiving the same transfers.

Although these contributions are important, they leave some questions on the table. Instrumenting intra-governmental transfers with population size is problematic because the exclusion restriction is unlikely to be satisfied. This is not only because internal (and external) migration may depend on the quality of political institutions, but also because population size may either affect local governance directly, or through omitted variables (for example, the quality of politicians). Moreover, since rule-based allocations of local transfers are rare in practice, researchers have focused predominantly on the Brazilian case. Although lessons from Latin America are important, they may not be immediately relevant for the countries in the transition region due to geographic and historical differences. At the very least, testing for effects in a different context will help validate existing insights and further the debate to issues not raised by Latin American cases.

In this paper, we utilise a new instrument for disaster-related assistance, derived from the case of Bulgaria during the 2004-05 floods. While the central government did not follow pre-agreed rules for distributing the funds to the municipalities (for instance, related to the number of destroyed buildings), one of the intentions was to allocate more money to localities which experienced more flooding. We exploit this information to construct a novel instrument for flood aid: the monthly rainfall deviations (relative to a historical average) in each municipality over the period 2004-05. We argue that, conditional on controls for ground flood risk and other municipal characteristics, the instrument captures exogenous variation in the amount of flood aid received by each municipality. We describe in more detail our data and IV strategy in the next two sections.

Formally, we want to test the following hypothesis:

\textbf{Hypothesis 1. Municipalities which received more flood-related transfers experienced more corruption.}

\footnote{Exploiting further the Brazilian case, Caselli and Michaels (2013) and Monteiro and Ferraz (2010) utilise offshore oil-induced fiscal windfalls among Brazilian municipalities, arguing that such transfers are exogenous conditional on observable municipal characteristics and geographical rules for royalty distribution. See also Vicente (2010) who studies the effect of (arguably exogenous) oil discoveries on corruption using a difference-in-difference framework which compares oil-rich Sao Tome and Principe with Cape Verde.}

\footnote{See, for instance, Nikolova (Forthcoming).}
Due to the richness and granularity of our data, we are also in a position to suggest some plausible mechanisms driving the hypothesised relationship, which we discuss in more detail in Section 7.
3 Background

3.1 Floods

Between June 2004 and December 2005, Bulgaria was unexpectedly hit by several waves of torrential rain which caused extensive flooding, with an estimated cost exceeding €500 million.\(^8\) Just in August 2005 alone, nearly 1 billion litres of water fell over a total area of 6,000 square kilometres, while the capacity of existing dams was only 250 million square metres. According to hydrologists, such extreme rainfall is very rare, as the probability of its occurrence is between $1/1000$ and $1/10,000$\(^9\).

To deal with the destruction following the floods, the central government awarded nearly €67 million to 257 flood-stricken municipalities\(^10\). Each municipality had to apply for financing, specifying the particular projects, usually related to rebuilding roads, bridges or buildings, for which the awarded funds would be used. Although relatively small in absolute terms, these disbursements presented a substantial financial injection for many of Bulgaria’s impoverished local governments. The average municipality received slightly over €200,000, which amounted to approximately 15.6 per cent of its 2000 income and 21 per cent of its annual budget (using data from 2004 and 2005)\(^11\).

The media reported multiple instances of fund misuse by local governments. For example, in Belovo municipality, a major bridge connecting the two parts of the town (located on either side of a large river) was destroyed in spring 2005. On 16 August 2005, the municipality received €200,000 to deal with the damage. Within two days firms had already been contracted and paid for works that in reality had not been done, as the bridge was still not functional in 2006. In addition, €27,000 were paid for building an existing 12 km road\(^12\). Such media reports and the poor handling of the disaster by the central government created tension in parliament, which led to a subsequent investigation and audits\(^13\).

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\(^8\)Newspaper Trud, 29 May 2005.
\(^10\)Mediapool.bg at www.mediapool.bg/firmi-na-dps-usvoyavali-zle-parite-za-ukrepvane-sled-starite-poroi-poroi-
\(^11\)Nearly €150 million (including €15.2 million from the European Union) were also disbursed in 2006. Since, as we discuss below, a fund use audit was ordered by the central government in March 2006, we only focus on funds given in 2004 and 2005.
\(^12\)Newspaper Sega at www.segabg.com/article.php?id=273924.
\(^13\)In the online Appendix, we discuss more extensively the political parties comprising the government coalition which was in power at the time, as well as who controlled key ministries responsible for distributing the flood-related funds.
3.2 Audits

The central government ordered detailed audits of all municipalities which received flood-related funds in March 2006. Two different government agencies were summoned. The Bulgarian National Audit Agency (BNAA) audits entities financed by the national budget and alerts other agencies (including parliament or a court) in the instances of suspected criminal activity. The agency is non-partisan, and several pieces of evidence suggest that this is true not only on paper but also in practice.

First, BNAA has complete control over its budget which cannot be changed by parliament. Second, although its senior management (consisting of a director and 10 board members) is elected by parliament, their terms are for nine years, as compared with the four-year election cycle. Third, BNAA must follow international financial audit criteria, such as those developed by the International Organization of Supreme Audit Institutions (INTOSAI) and the European Court of Auditors (ECA). During the period studied in this paper, the European Union subjected BNAA to particularly close scrutiny over the compliance with these standards due to Bulgaria’s accession in 2007.

Even so, one may still be concerned that parliament’s involvement in the selection of BNAA’s leadership may compromise its independence. A recent report by Transparency International suggests that it is difficult for state institutions to exercise control over the agency’s activities. Moreover, the long tenures of BNAA’s directors make it less likely that it caters to narrow political interests. BNAA’s independence is also strengthened by its high transparency, as information from its audits and internal documents is readily available on its website and in the media.

BNAA audits are conducted by highly competent teams of auditors who must pass a public examination and earn very competitive salaries. Supplementary paid employment (with the exception of research activities at a university) is prohibited. BNAA staff involved in a financial inspection have access to all of the auditee’s documents and can request additional data and written or oral explanations. Once an audit is completed, auditors produce a report and recommendations for action, which are shared with the Ministry of Finance and parliament. BNAA then follows up on the execution of these recommendations, and if the actions undertaken by the audited entity are unsatisfactory, it alerts other government agencies.

The Public Financial Inspection Agency (PFIA), by contrast, can either conduct self-initiated audits of public entities, or act upon external recommendations (by BNAA or a court, for instance). The crucial difference between PFIA and BNAA is that the former can directly impose legally binding penalties. At the same time, experts agree that BNAA is very active when it comes

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14 This structure was in place from 2005 until 2011. Currently, the BNAA director is elected for a term of six years (with no re-election possible), while the eight board members are elected for a term of seven years. Elections for a new management board can take place no less than three months before the incumbents’ terms expire. None of the BNAA managers may have been involved in government or local administration positions in the last three years.

15 www.transparency.bg/media/publications/NIS%20BULGARIA%20EN%7D.pdf.

16 See www.bulnao.government.bg/bg/articles/zakon-za-smetnata-palata-876 and www.bulnao.government.bg/bg/articles/istorija-897. Unfortunately, data on the number and type of issued recommendations are not available in our data set.
to detecting misbehaviour and alerting the appropriate agency. BNAA’s reports are discussed extensively in the media and policy circles. In addition to holding responsibility for detecting irregularities in the spending of EU funds, the agency recently expanded its audits to political parties and to commercial companies in energy and pharmaceuticals, among others. This suggests that information from the BNAA audit reports is not simply “cheap talk” and should capture meaningful variation in corruption across municipalities.

The major problem with interpreting the data from the PFIA audits is that the agency is politically affiliated, as it is part of the Ministry of Finance. Its director is appointed by the Finance Minister for a four-year term, and while PFIA employees must have university-level training in economics, they are not required to pass an examination. In fact, PFIA recorded spending violations in less than a third of the municipalities in which BNAA detected corruption, and the correlation between the two corruption measures is less than 0.10. As a result, in the regressions below we focus mostly on the BNAA corruption index. We present results with the PFIA data, which are similar but very imprecisely estimated, when conducting robustness checks.

Both agencies started their audits in March 2006 and finished them in September 2006. PFIA covered all 257 municipalities which received flood-related assistance, while BNAA audited only those municipalities where the amount of funds was particularly large (227 in total). In the next section, we demonstrate that municipalities which were audited by BNAA are very similar to those which were not audited along a variety of observable characteristics (including municipal political affiliation), suggesting that selection is unlikely to drive our results.
4 Data

4.1 Measures of corruption

For each municipality, BNAA provides information on the amount of flood-related assistance, along with a description of the activities for which the funds were used. In the regressions below, we sum these amounts over 2004 and 2005 and divide them by the population of each municipality (we take the logarithm of the final quantity). Chart 1 shows the geographical distribution of per capita funds in the country.

[Chart 1]

For each of the audited municipalities, BNAA recorded all infringements related to the use of flood aid received during the period 1 January 2004 to 31 December 2005. BNAA groups infringements into four broad categories: (1) public procurement (for example, no public procurement procedure was used by the municipality to select firms); (2) use of funds (for instance, there was payment for activities not listed in the contract); (3) reporting (for instance, no reports on fund use were sent to the Ministry of Finance); and (4) accounting and control (for instance, inaccurate accounting recording of the contracts). We provide more details on these categories and sub-categories in the online Appendix. Our corruption index sums all the recorded infractions for each municipality. Charts 2 and 3 summarise the geographical distribution of infringements recorded by BNAA and PFIA, respectively (areas in striped font indicate that no audit was performed in that particular municipality).

[Charts 2 and 3]

One issue with our approach could be that the constructed corruption index may capture a mixture of “corruption” and “mismanagement”. If our dependent variable is a proxy for the latter, our results could simply indicate that municipalities which receive more flood assistance do not have the administrative capacity to deal with the increased reporting burden. There are several reasons that make this critique less convincing. First, all of the 2004-05 flood-related inspections were classified as “performance audits”, a specific type of BNAA audit which pays particular attention to public fund fraud.

While our measure includes items that have been associated with corruption in the rest of the literature, it also contains infringements related to mis-reporting and mis-classifying the disaster.

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17 Unfortunately, we have no information on the amount of funds associated with each violation.
18 In contrast, “financial audits” are conducted when the goal is to investigate whether the entity has followed the administrative regulations for financial reporting.
19 As in Ferraz and Finan (2008, 2011), our data set covers infringements related to fraud in the procurement of goods and services; diversion of funds; overinvoicing; incomplete public works (paid but in reality not finished); or (possibly) the use of fake receipts and phantom firms.
aid. At first glance, the latter type of infractions may seem benign. However, an examination of official documents outlining the BNAA audit criteria speaks to the contrary. BNAA follows specific rules designed by the European Union and the International Standards of Supreme Audit Institutions (adopted by the Bulgarian parliament in 2000) on what constitutes public fund fraud. For example, although incomplete accounting procedures may be due to misinformation and neglect, the audit guidelines explain that such omissions are usually deliberate and are therefore strong signals of fraud or corruption. Auditors are provided detailed examples (including from real-life situations) of when accounting mis-reporting indicates corruption, and instructed to investigate further if the errors are purely accidental or in fact committed purposefully. Accounting oversights which are likely to be associated with fund fraud are then recorded against each audit criterion in the report, while purely administrative infringements are described in a separate section. Importantly, we have excluded the latter as part of our dependent variable.

The audit reports provide further evidence that all infringements documented by BNAA are important indicators of fraud. For example, in Elhovo municipality, BGN 136,675 (approximately 68,000 Euros) from the funds earmarked for post-flood reconstruction were withdrawn in December 2005 even though the repair works were not completed. In the municipality’s accounts, however, this sum was not recorded as “withdrawn,” providing strong evidence that the money was misappropriated. In Straldja municipality, the files reporting on how the funds were used which the municipality was required to send to the Ministry of Finance were incomplete. In particular, no firm contract was supplied and there were no pictures showing the condition of the repaired objects once the works were completed. Once more, the auditors’ check showed that since these omissions were deliberate, they were most likely due to corrupt activities.

Since corruption in general is extremely difficult to measure, it would be difficult to claim that our dependent variable is a perfect indicator of local government fraud. Even though auditors work in teams and follow strict auditing criteria, it is possible that infringements related to corruption may be confused with those capturing only mismanagement. To the extent that this is not systematic, this should not be an overwhelming concern in our analysis. In addition, our rich set of municipal controls, which ranges from unemployment to urbanisation and media, should help remove, at least partially, any contaminating effects which may be correlated with local observable characteristics. It is also reassuring that our results survive when we calculate the corruption index using principal component analysis (in the robustness checks), suggesting that our findings are not driven by the idiosyncrasies of a particular coding approach.

### 4.2 Flood damage and risk

We obtain monthly rainfall data for 2004-05 from the Bulgarian National Institute for Meteorology and Hydrology. Since the number of municipalities is greater than that of weather stations (101), we adopt an interpolation procedure using a radius of 45 km and weights which are the inverse of the municipality’s distance to a station. To make sure that our rainfall data do not simply capture long-term precipitation patterns, we calculate the rainfall variable used in the regressions as the monthly rainfall percent change relative to a monthly historical average. The latter is based on precipitation data for the period 1931-1985 from Koleva and Peneva (1990).
interpolated using the same procedure. For example, the rainfall quantity for January is simply:

\[ \frac{\text{Rainfall}_{January, 2004} - \text{Rainfall}_{January, 1931-1985}}{\text{Rainfall}_{January, 1931-1985}}. \]

For each municipality, we then take the average rainfall value for all months in 2004 and 2005 for which the change relative to the historical value was at least 10 per cent. To give a better sense of this measure, Chart 4 plots it graphically for each month and municipality, with the red horizontal line indicating our 10 per cent cut-off value. The chart shows that the summer months of 2004 and 2005, along with February 2004, were periods of particularly heavy rainfall for many municipalities.

[Chart 4]

We include three proxies for ground flood risk. First, we control for the number of settlements that are located within 1 km of a water body (dam, lake or river), since households located close to water are more likely to experience flooding when there is extreme rainfall. Second, we control for average municipal elevation and slope, as flooding may be more intense in municipalities located at a higher altitude and with a sloping terrain. We also include controls for latitude and longitude.

### 4.3 Additional variables

In various specifications, we include controls for four categories of municipal characteristics: (1) economic conditions (log municipal income per capita, unemployment and net privatisation income); (2) media and civil society (local newspaper circulation per capita, share of population with university degree, share of urban population and voter turnout in the 2003 local elections); (3) whether the mayor and council belong to the ruling coalition, and whether the mayor and council belong to the party holding the disaster funds portfolio. In the robustness tables, we also include two mayor characteristics, margin of victory in the 2003 elections and a dummy for whether the mayor had any political experience before 2003. All of these data cover years prior to 2004, and the online Appendix provides detailed information on exact definitions and measurement.

### 4.4 Selection and summary statistics

Although the BNAA audit covered most municipalities (227 out of 257) and 96.8 per cent of disbursed funds, one concern could be that auditors selected municipalities non-randomly. In

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20 We experiment with alternative cut-off values (20 per cent, 30 per cent, 40 per cent and 50 per cent, in the robustness checks) and obtain very similar results.

21 The Movement for Rights and Freedoms (MRF), a party whose electorate comprises mainly Bulgarian Turks, controlled the ministries allocating the flood aid. See the online Appendix for more details.

22 We collected other mayor characteristics such as gender, field of education and years of political experience using an internet search. However, the data were very patchy so we do not include them in the regressions.
Table A1, we compare audited and non-audited municipalities across a variety of observable characteristics. The major difference between the two groups of municipalities is that localities which received more funds were more likely to be audited. On average, audited municipalities received assistance amounting to BGN 43.3 (around €20) per capita, while for non-audited ones the figure is around BGN 10 (around €5). This is not surprising, since official BNAA documents point out that the agency chose to audit those municipalities in which the amount of disbursed funds was particularly high.

Few additional characteristics are associated with the probability of audit. Audited municipalities are more likely to be urban and with less unemployment. The average municipality received BGN 513,285 (around €250,000), which amounted to 15.6 per cent of municipal income and 21 per cent of its average annual budget in 2004-05. Corruption infringements were recorded in 105 (47.1 per cent) of audited municipalities, and the average corrupt municipality committed 0.775 violations (see also Chart A1 for a histogram of the corruption index). Both groups of municipalities have municipal income per capita around BGN 240 (€120). Importantly, the table also shows that the audit choice was not driven by political considerations. If anything, municipalities with mayors and/or councils affiliated with MRF were more likely to be audited.


23 If anything, municipalities with mayors and/or councils affiliated with MRF were more likely to be audited.
5 Estimation strategy

Our estimation strategy exploits the unexpected nature of the natural disaster to isolate exogenous variation in the amount of flood aid received by each municipality. To identify the impact of flood-related assistance on local government corruption, we estimate an instrumental variables regression, where the second stage is given by:

\[
CorruptionIndex_{ir} = \alpha_{ir} + \beta_1 \log \text{funds}_{ir} + \beta_2 \text{FloodRisk}_{ir} + X_{ir} \beta_3 + \gamma_r + \varepsilon_{ir},
\]

For each municipality \(i\) in region \(r\), \(CorruptionIndex_{ir}\) is calculated by summing the spending infringements identified by BNAA during 2004-05, \(\log \text{funds}_{ir}\) is the total flood-related assistance received by the municipality (in logs and per capita) during 2004-05, and \(\text{FloodRisk}_{ir}\) is proxied by the number of settlements within 1 km of a water body, average elevation and slope. \(X_{ir}\) is a matrix of municipality-level characteristics that vary across specifications and include the following broad categories described above: (1) geography; (2) economic conditions (measured prior to 2004); (3) media and civil society (measured prior to 2004); (4) composition of local government since the 2003 local elections; and (5) mayor characteristics (in the robustness checks only). As a proxy for auditor effort, we also control for each municipality’s distance to the closest BNAA territorial division, since auditors may audit less thoroughly municipalities which are located further from the agency’s regional centre. Regional dummies (at the NUTS-2 level) and robust standard errors are also included.

We instrument \(\log \text{funds}_{ir}\) as follows. For each municipality, we calculate the average monthly rainfall change (relative to a historical average) for all months in 2004 and 2005 for which it exceeded the historical average by least 10 per cent, as explained above. The corresponding first stage is:

\[
\log \text{funds}_{ir} = \alpha_F + \beta_1 R \text{ainfall}_{ir} + \beta_2 \text{FloodRisk}_{ir} + X_{ir} \beta_3 + \gamma_r + \varepsilon_{ir},
\]

We do not include our proxies for flood risk as additional instruments, as the exclusion restriction is unlikely to be satisfied. In contrast to our rainfall instrument which captures short-term climatic fluctuations, fixed characteristics such as distance to water or elevation may also proxy for long-term factors which may directly affect municipal corruption.

The adopted IV strategy would be valid provided that three conditions are satisfied. First, the first-stage relationship between \(\text{Rainfall}\) and \(\log \text{funds}\) must be strong. Second, rainfall should not affect corruption directly. Third, the instrument should not be correlated with the error term in the second-stage regression. We examine the validity of each of these assumptions below.

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24 BNAA has six regional divisions, located in Burgas, Varna, Plovdiv, Vidin, Ruse and Sofia.
Our regressions below indicate that rainfall indeed explains a significant portion of the variation in funds received, with F statistics exceeding 10. Moreover, concerns about omitted unobservable characteristics are less salient, since our estimations include a wide range of municipal controls (including the three different proxies of flood risk) and mayor characteristics, along with regional dummies. More importantly, by construction, our instrumental variable parses out any historical rainfall effects and exploits essentially random precipitation fluctuations within a narrow two-year period. This particular characteristic of our IV also makes a direct effect of rainfall on corruption less likely.
6 Results

6.1 Main results

Table 1 presents results from running several variants of our estimating equation. In columns (1) and (2), we present “naive” OLS specifications. Column (1) includes controls for geography, economic conditions, and media and civil society, while column (2) also accounts for the political composition of local government. Although these estimations cannot be interpreted as causal, they serve as a useful benchmark for our IV regressions. The coefficient estimate in column (2) (0.245) suggests that a 10 per cent increase in flood-related assistance (per capita) is associated with a 0.023-unit increase in the corruption index, which is around 3 per cent relative to its mean (0.775).

The next three columns show estimates from our IV specifications. All in all, the results provide evidence in favour of Hypothesis 1. Columns (3) and (4) are the IV equivalents of column (1) and (2), respectively. The coefficients on funds per capita are positive and around four times higher compared with the OLS estimates, suggesting that omitted variables bias the coefficient on funds received downwards in the latter specification. This could be due to reverse causality in the OLS estimates: it is possible that the central government opted to give historically more corrupt municipalities less funding, knowing that a large portion of the aid would be stolen. Similarly, municipalities with more competent and honest leaders may have received more funding and experienced less corruption, which would again attenuate the OLS coefficient on funds received. The first-stage regressions are precisely estimated, with an F-statistic exceeding 10 (Chart 5 presents the first-stage relationship graphically). Crucially, the coefficient on funds per capita changes very little when we also account for whether the municipality’s mayor and/or council belong to the ruling coalition (column (4)). The coefficients on the political affiliation variables (not shown) are insignificant, suggesting that the quality of BNAA’s audits did not depend on the political sympathies of the municipality. The point estimate in column (4) implies that a 10 per cent increase in funds per capita leads to an increase in the corruption index of 0.09 points, or 12.2 per cent relative to the sample mean, which is a very strong effect.

In column (5) we relax the linearity assumption on which our previous regressions are based and run an IV-Poisson specification, which is appropriate since the corruption index takes a value of 0 for approximately half of the municipalities in our sample. The coefficient estimate on funds received (shown as a marginal effect) is slightly smaller than that obtained in column (4), though it remains strongly significant.

Results are unchanged if we instead look at whether the mayor and/or council are affiliated with MRF, or whether the municipality is controlled by an opposition party (the latter intended to proxy for swing municipalities).
In Table 2 we present results from our first-stage regressions. The table shows that our rainfall measure is a strong predictor of the amount of disbursed flood assistance. Relief slope is the only significant ground flood risk proxy, though in unreported results settlements near water becomes positive and significant once the former variable is excluded.

[Table 2]

### 6.2 Identification threats

One possible critique to our empirical approach is that local governments could have adjusted their behaviour in expectation of the audits. Four pieces of evidence suggest that the inspections were largely unforeseen. Although municipal audits were performed by both BNAA and PFIA prior to 2006, they were mostly ad-hoc and never covered a large number of municipalities. Moreover, official correspondence between the government and the two agencies characterises the audits as “emergency checks”. In addition, the law stipulates that BNAA’s work must be based on an annual plan, in which the government can request only a maximum of five additional audits, unless there are exceptional events to consider. Finally, as discussed above, newspaper publications indicate that the central government ordered the municipal audits following extensive pressure from the opposition parties as well as the media.

Second, our results could be driven by political biases in the auditing process. For example, swing municipalities (those not affiliated with the central government coalition) may be more likely to receive disaster aid and to be exposed as corrupt. This is less of a concern not only because our instrument captures only exogenous variation in the amount of received funds, but also because our results change once we include municipal political controls in our regressions. BNAA’s non-partisanship, which we discussed extensively above, also speaks against this scenario.

Even if BNAA’s audits were not politically motivated, a third critique could be that, due to pressure from the media and parliament, the agency simply audited more intensely municipalities which received more funds. However, our regressions use per capita flood assistance and control for each municipality’s distance to the closest BNAA territorial division (since inspections in municipalities located further from the agency’s regional centre may have been less thorough). Controlling additionally for total flood assistance (reported in Table A2) makes no difference to the results. Furthermore, BNAA guidelines (issued for the specific audits which we examine) specify explicitly that all auditors must follow the same criteria in all municipalities. Although auditors were not assigned randomly, they were rotated across municipalities, further alleviating concerns that some municipalities were more scrutinised than others. In addition, as we discussed above, the audits were nearly universal and covered more than 80 per cent of municipalities and 96.8 per cent of funds disbursed.

\[26\] Note that even if the audits were indeed random (as in Ferraz and Finan (2008, 2011)) ruling out completely the issue of varying auditor effort is challenging even in this case, since the latter is unobservable.
A third possibility is that historically corrupt municipalities may have been less ready for the floods, since funds earmarked for flood prevention or levee building may have been more likely to be stolen. Under this scenario, such localities could have received more disaster aid and would have experienced more flood-related corruption. This is less likely to be the case for three reasons. First, all of our regressions include different measures of ground flood risk (number of settlements within 1 km of a water body, slope and elevation), along with a wide range of municipal geographic, economic and political characteristics which may also affect flood readiness. Second, the management of water resources deteriorated throughout the country since the early 1980s, with riverbed cleaning and the upkeep of levees and other protective equipment neglected due to lack of funds. Many rivers were also diverted without any control, and the supervision of water dams was often lax, leading to water volumes frequently being increased over the legal limit. Third, monitoring and containing weather risk has been uniformly poor. Even today, no system of early warning exists, and rainfall measuring apparatus, which would have provided detailed information to generate early flood warnings, are still lacking in most dams.

A final concern relates to the possibly endogenous location of weather stations in our data set. In Table A3 we compare municipalities in which there is at least one weather station with those where we need to interpolate rainfall. On average, both groups of municipalities are similar across a variety of observable characteristics. At the same time, municipalities with interpolated rainfall have a stronger media, more unemployment, are less urban and have fewer people with a university degree. The table also shows that municipalities in which there is no weather station are no more corrupt than those in which there is a weather station. This is interesting since the first group of municipalities received more flood-related funds per capita, despite experiencing the same level of rainfall and having fewer settlements near water. This suggests that our interpolation procedure should make our first-stage estimates less precise in the pooled sample, meaning that the point estimates in Table 1 should be treated as lower bounds on the true effect of flood funds on corruption. This is exactly what we find in Table A5, which replicates the baseline specification excluding those municipalities in which rainfall is interpolated and shows that the coefficient on funds received increases.

28We further explore the endogeneity of weather station locations in Table A4, where we exploit the fact that before 1989, the number of weather stations was nearly double that of today. We examine to what extent municipalities in which weather stations were closed were different from those in which weather stations still exist today. Importantly, the table shows that while municipalities differ on some of the same observables as in Table A3, historical and contemporary rainfall patterns are very similar for both groups of localities.
7 Discussion: robustness and suggestive mechanisms

We experiment with a different coding approach for our dependent variable in Table A2. In column (1), we calculate our corruption index using principal component analysis, which makes little difference to the coefficient on funds received. In column (2), our dependent variable is a corruption index calculated using data provided by the Public Financial Inspection Agency (PFIA). As we explained above, this body is not politically independent, so its audit data may be less reliable than the BNAA reports. Indeed, the coefficient on funds received is positive but very imprecisely estimated, and the first stage is weak. This is what we would expect if the agency were shielding wrong-doers. In column (3), we account for mayor characteristics (margin with which the mayor was elected in the 2003 elections, and a dummy for whether the mayor was in politics prior to 2003), which has little effect on the results. In column (4), we employ an alternative measure of rainfall, using only those months in 2004 and 2005 for which the change in rainfall, relative to the historical average, was at least 50 per cent (in unreported specifications, we also experiment with cut-offs of 20 per cent, 30 per cent, 40 per cent, without difference to the results). The point estimate is now stronger, implying that a 10 per cent increase in funds received leads to a 0.104-point increase in the corruption index, or 13.4 per cent relative to the sample mean. Finally, our results are robust to including log of total funds along with log funds per capita (column 5, OLS).

As we discussed in Section 2, the relationship between corruption and re-election in our case is a priori ambiguous. On the one hand, corrupt politicians may be more likely to be re-elected when stolen funds are used to buy off influential groups of voters or when the punishment for misbehaviour is weak. Alternatively, as budget size increases, re-election probability may also increase as imperfectly informed voters may find it more difficult to hold politicians accountable. In addition, a larger budget may induce a decline in the average ability of the pool of individuals entering politics, making it more likely for incumbents to be re-elected, despite also experiencing more corruption (Brollo et al., 2013).

On the other hand, it is also possible that information about local corruption had a negative effect on the electoral performance of incumbent mayors, particularly since the BNAA audit reports were highly publicised. One direct implication of this hypothesis is that highly corrupt mayors will anticipate such punishment and take themselves out of the re-election race. Moreover, such an effect is likely to be stronger among incumbents who were elected with smaller margins in the previous election.

Although lack of longitudinal data and information on how politicians spent the stolen funds prevents us from distinguishing precisely among these mechanisms, we can nevertheless study to what extent corruption affected re-election of the incumbent mayor in the 2007 municipal elections in Tables 3 and 4 (using probit specifications). In both tables, we try to purge the corruption index of endogeneity by constructing its predicted value using the results in Table 1. Columns (1) and (2) of Table 3 show that mayors from more corrupt municipalities were less likely to run for re-election, possibly because they anticipated voter punishment at the polls.

\[^{29}\text{See also Ferraz and Finan (2008).}\]
\[^{30}\text{Results are similar if we simply include sequentially rainfall, funds and corruption in an OLS regression.}\]
Columns (3) and (4) demonstrate that corruption is not a significant predictor of mayor re-election (the latter measured as dummy variable), and that mayors who were in politics before 2003 were more than 70 percentage points more likely to be re-elected.

In Table 4, we replicate the results in Table 3 on the sub-sample of close elections, which we define as those in which the 2003 mayor was elected with a margin of less than 10 per cent. The effect of corruption on the decision to run for re-election is now stronger: a one-point increase in the BNAA corruption index (holding all other variables constant) makes mayors around 6 percentage points less likely to run for re-election. However, columns (3) and (4) show that those mayors who did decide to run were more likely to be re-elected. One explanation could be that these are mayors with less excessive corruption violations who use misappropriated funds to buy off key voters, although this is admittedly speculative since we lack information on how corrupt politicians spent what they stole.

In Table A6, we further investigate if the effect of flood aid on corruption is conditional on municipal characteristics. In columns 1 and 2, we rerun our baseline regression (using column (4) from Table 1) on the subsample of municipalities whose municipal income per capita is below the median (column (1)) and above the median (column (2)). In columns (3)-(6) we implement the same approach for unemployment and per-capita newspaper circulation.

Because we split the sample using endogenous variables, results should be interpreted as highly suggestive and simply as correlations. Furthermore, one needs to keep in mind that dividing the sample in this way eliminates useful variation and, in several cases, weakens our first-stage IV results. At the same time, this exercise is informative since it may shed some light on where exactly the effects identified in our baseline specifications are coming from.

More precisely, the estimates in Table A6 indicate that the negative link between funds and governance identified earlier is stronger in municipalities which are richer, with less unemployment, and with fewer newspapers. One potential explanation could be that such municipalities may be less likely to hold governments accountable to spending infringements. Corruption may become less salient for voters when the size of the pie is bigger as in Brollo et al. (2013), while imperfectly informed voters may be less likely to punish dishonest politicians.

Finally, we use additional data from the the Life in Transition Survey (LiTS), a household survey which includes questions on subjects ranging from demographics and income to attitudes

31 Unfortunately, smaller cut-offs shrink our sample considerably.
32 In unreported results, we also investigated whether municipal corruption affected the mayor’s party’s electoral performance in the 2009 general elections and found no significant effects. Neither did we find that voters with more education or those located in municipalities with a stronger media were more likely to punish corrupt mayors.
and perceptions of institutions, to further probe the effects of the natural disaster and associated transfers on corruption perceptions. We exploit the fact that the survey was conducted in Bulgaria in late September 2006, shortly after the BNAA and PFIA audit reports were publicised extensively in the media. The regressions are reported in Table A7 in the online Appendix, though results should be interpreted as suggestive only due to the very small number of municipalities covered in the LiTS (37). Using the same instrumentation strategy as in our baseline specification, we find some evidence that respondents reported higher perceived corruption in municipalities which received more flood-related assistance. These results help confirm the validity of our corruption measures from a perception-based perspective. In addition, they suggest that fraud may result not only in the immediate deflection of public resources but also in lingering perceptions of heightened local corruption more generally. Moreover, we find no evidence that people living in municipalities which received more flood-related assistance are more trusting of (local or national) institutions. Even if politicians distributed at least some of the proceeds to those affected by the floods or to key groups of voters, this does not seem to have led to a more satisfied electorate.

\[\text{33This table also includes two additional robustness checks (described in more detail in the online Appendix).}\]
8 Conclusion

In this paper, we exploit a unique corruption-related policy outcome – transfers from Bulgaria’s central government to municipalities intended to aid reconstruction following torrential rain in 2004 and 2005. We leverage exogenous variation in allocated funds to demonstrate that unexpected windfalls were not merely allocated to more corrupt places, but rather that increased disaster aid led to more corrupt spending by local governments.

Our analysis has three additional strengths. First, we utilise publicly available audit data on how the transfers were spent by municipalities to build an objective measure of corruption. Second, we control for several proxies for ground flood risk (distance to water body, elevation and slope) and show that flood prevention was neglected throughout the country even before the fall of communism in 1989. Third, we include a wide range of observable municipal characteristics, such as unemployment, media and political affiliation of the different layers of government.

Our results suggest that potentially welfare-enhancing transfers such as disaster relief or aid from international organisations may unintentionally deteriorate governance in weak democracies. Although our analysis is focused on a single country and covers a relatively narrow time period, we believe that our findings are relevant for a much broader set of developing and transition countries in which financial windfalls, whether derived from natural resources or not, are particularly high. Many countries, Bulgaria included, redistribute public funds, such as foreign aid or budgetary transfers, to the local level. Our findings imply that continuing such transfers without strengthening mechanisms of control, such as the judiciary, can create and deepen tendencies to engage in fraud. We also highlight the value of creating independent budgetary watchdogs. Agency control matters, and can generate the kind of transparency that constitutes a necessary condition for public control over local politicians.
References


Y. Lazarev, A. Sobolev, I. Soboleva, and B. Sokolov (Forthcoming), “Trial by fire: a natural disaster’s impact on support for the authorities in rural Russia”, *World Politics.*


D. Treisman (2007), “What have we learned about the causes of corruption from ten years of cross-national empirical research?”, Annual Review of Political Science, 10, 211–244.


Chart 1: Geographical distribution of flood funds (per capita)

Source: Bulgarian National Audit Agency
Chart 2: Geographical distribution of infringements

Source: Bulgarian National Audit Agency
Chart 3: Geographical distribution of infringements

Source: Public Financial Inspection Agency
Chart 4: Precipitation deviations (relative to a historical average), by month and municipality, 2004-05

Source: National Institute for Meteorology and Hydrology
Chart 5: Baseline specification: relationship between Rainfall and Funds in the first stage
**Table 1: Baseline specification**

<table>
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<tr>
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<th>OLS</th>
<th>IV</th>
<th>IV-Poisson</th>
</tr>
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<td></td>
<td>(1) BNAA</td>
<td>(2) BNAA</td>
<td>(3) BNAA</td>
</tr>
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<td>Log funds per cap</td>
<td>0.257***</td>
<td>0.245***</td>
<td>0.975**</td>
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<tr>
<td></td>
<td>(0.0899)</td>
<td>(0.0889)</td>
<td>(0.398)</td>
</tr>
<tr>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Economic conditions</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Civil society</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Composition of local gov.</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>F-stat.</td>
<td>9.352</td>
<td>10.17</td>
<td></td>
</tr>
<tr>
<td>Rainfall % deviation, 10% cutoff</td>
<td>1.149***</td>
<td>1.179***</td>
<td>(0.376)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>225</td>
<td>225</td>
<td>225</td>
</tr>
</tbody>
</table>

Notes: Regional dummies included in all specifications. Robust standard errors are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 
### Table 2: Baseline specification: first-stage results

<table>
<thead>
<tr>
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<th>Column (1)</th>
<th>Column (2)</th>
<th>Column (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rainfall % deviation, 10% cut-off</strong></td>
<td>1.149***</td>
<td>1.179***</td>
<td>1.166***</td>
</tr>
<tr>
<td></td>
<td>(0.376)</td>
<td>(0.370)</td>
<td>(0.380)</td>
</tr>
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<td><strong>Distance to BNAA regional center</strong></td>
<td>$-0.00327^*$</td>
<td>$-0.00338^*$</td>
<td>$-0.00325^*$</td>
</tr>
<tr>
<td></td>
<td>(0.00188)</td>
<td>(0.00193)</td>
<td>(0.00192)</td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td>0.000208</td>
<td>0.000293</td>
<td>0.000207</td>
</tr>
<tr>
<td></td>
<td>(0.000364)</td>
<td>(0.000366)</td>
<td>(0.000367)</td>
</tr>
<tr>
<td><strong>Relief slope</strong></td>
<td>0.0476**</td>
<td>0.0416*</td>
<td>0.0472**</td>
</tr>
<tr>
<td></td>
<td>(0.0220)</td>
<td>(0.0228)</td>
<td>(0.0220)</td>
</tr>
<tr>
<td><strong>Longitude</strong></td>
<td>0.144</td>
<td>0.154</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td>(0.187)</td>
<td>(0.192)</td>
<td>(0.190)</td>
</tr>
<tr>
<td><strong>Latitude</strong></td>
<td>0.136</td>
<td>0.171*</td>
<td>0.127</td>
</tr>
<tr>
<td></td>
<td>(0.0898)</td>
<td>(0.0924)</td>
<td>(0.0929)</td>
</tr>
<tr>
<td><strong>Settlements near water</strong></td>
<td>0.00237</td>
<td>0.00470</td>
<td>0.00239</td>
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<tr>
<td></td>
<td>(0.00664)</td>
<td>(0.00675)</td>
<td>(0.00673)</td>
</tr>
<tr>
<td><strong>Log municipal income per capita</strong></td>
<td>0.738***</td>
<td>0.774***</td>
<td>0.748***</td>
</tr>
<tr>
<td></td>
<td>(0.236)</td>
<td>(0.239)</td>
<td>(0.239)</td>
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<td><strong>Unemployment</strong></td>
<td>0.00273</td>
<td>0.00338</td>
<td>0.00203</td>
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<tr>
<td></td>
<td>(0.00777)</td>
<td>(0.00775)</td>
<td>(0.00801)</td>
</tr>
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<td><strong>Net privatisation income</strong></td>
<td>0.00475</td>
<td>0.00529</td>
<td>0.00464</td>
</tr>
<tr>
<td></td>
<td>(0.00572)</td>
<td>(0.00560)</td>
<td>(0.00591)</td>
</tr>
<tr>
<td><strong>Newspaper circ. per capita</strong></td>
<td>0.000272</td>
<td>0.000185</td>
<td>0.000290</td>
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<tr>
<td></td>
<td>(0.000246)</td>
<td>(0.000234)</td>
<td>(0.000254)</td>
</tr>
<tr>
<td><strong>Share university degree</strong></td>
<td>$-12.26^{***}$</td>
<td>$-12.99^{***}$</td>
<td>$-12.23^{***}$</td>
</tr>
<tr>
<td></td>
<td>(1.795)</td>
<td>(1.882)</td>
<td>(1.797)</td>
</tr>
<tr>
<td><strong>Share urban population</strong></td>
<td>$-0.272$</td>
<td>$-0.269$</td>
<td>$-0.261$</td>
</tr>
<tr>
<td></td>
<td>(0.292)</td>
<td>(0.286)</td>
<td>(0.297)</td>
</tr>
<tr>
<td><strong>Voter turnout 2003</strong></td>
<td>$-0.0746^{**}$</td>
<td>$-0.0656^*$</td>
<td>$-0.0739^{**}$</td>
</tr>
<tr>
<td></td>
<td>(0.0348)</td>
<td>(0.0346)</td>
<td>(0.0353)</td>
</tr>
<tr>
<td><strong>Mayor triple coal.</strong></td>
<td>$-0.142$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.157)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Council majority triple coal.</strong></td>
<td>$-0.147$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.225)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mayor &amp; council triple coal.</strong></td>
<td>$-0.00324$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.259)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mayor MRF</strong></td>
<td></td>
<td>$0.0907$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.155)</td>
<td></td>
</tr>
<tr>
<td><strong>Council majority MRF</strong></td>
<td></td>
<td>$0.00162$</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.300)</td>
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<tr>
<td><strong>Mayor &amp; council MRF</strong></td>
<td></td>
<td>$-0.0226$</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.348)</td>
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<td><strong>Number of observations</strong></td>
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Notes: Regional dummies included in all specifications. Robust standard errors are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 
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<td>Predicted BNAA</td>
<td>$-0.0370^*$</td>
<td>$-0.0424^{**}$</td>
<td>$0.0400$</td>
<td>$0.0274$</td>
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<tr>
<td></td>
<td>(0.0212)</td>
<td>(0.0207)</td>
<td>(0.0353)</td>
<td>(0.0368)</td>
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<tr>
<td>Voter turnout 2007</td>
<td>0.231</td>
<td>0.243</td>
<td>0.134</td>
<td>0.144</td>
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<tr>
<td></td>
<td>(0.197)</td>
<td>(0.191)</td>
<td>(0.264)</td>
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<td>Margin elected 2003</td>
<td>$-0.108$</td>
<td>$-0.114$</td>
<td>0.333</td>
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<td>(0.252)</td>
<td>(0.253)</td>
<td>(0.330)</td>
<td>(0.332)</td>
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<td>In politics before 2003</td>
<td>0.181^{***}</td>
<td>0.193^{***}</td>
<td>0.700^{***}</td>
<td>0.717^{***}</td>
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<tr>
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Notes: Regional dummies included in all specifications. Average marginal effects are reported. Robust standard errors are in parentheses. Significance levels: $^* p < 0.1$, $^{**} p < 0.05$, $^{***} p < 0.01$. 
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<td>Candidate in 2007</td>
<td>Predicted BNAA</td>
<td>0.0621***</td>
<td>0.0560***</td>
<td>0.116***</td>
</tr>
<tr>
<td></td>
<td>(0.0210)</td>
<td>(0.0158)</td>
<td>(0.0366)</td>
<td>(0.0465)</td>
</tr>
<tr>
<td>Candidate in 2007</td>
<td>Voter turnout 2007</td>
<td>0.618**</td>
<td>0.641***</td>
<td>0.252</td>
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<tr>
<td></td>
<td>(0.257)</td>
<td>(0.242)</td>
<td>(0.284)</td>
<td>(0.283)</td>
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<tr>
<td>Reelected in 2007</td>
<td>Margin elected 2003</td>
<td>−0.967*</td>
<td>−0.920*</td>
<td>1.664*</td>
</tr>
<tr>
<td></td>
<td>(0.580)</td>
<td>(0.549)</td>
<td>(0.962)</td>
<td>(0.943)</td>
</tr>
<tr>
<td>Reelected in 2007</td>
<td>In politics before 2003</td>
<td>0.208***</td>
<td>0.221***</td>
<td>0.701***</td>
</tr>
<tr>
<td></td>
<td>(0.0404)</td>
<td>(0.0386)</td>
<td>(0.0725)</td>
<td>(0.0752)</td>
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<tr>
<td></td>
<td>Economic conditions</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Civil society</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Composition of local gov.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Number of observations</td>
<td>162</td>
<td>162</td>
<td>145</td>
</tr>
</tbody>
</table>

Notes: Regional dummies included in all specifications. Average marginal effects are reported. Robust standard errors are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 
A Political background and distribution of flood-related funds

Bulgaria is a parliamentary republic, whose central government is usually run by coalitions (by virtue of its closed-list proportional system). Until August 2005, flood-relief funds were managed by the Ministry for Agriculture and Forestry and a floating ministry (“without portfolio”) controlled by the Movement for Rights and Freedoms (MRF), a party whose electorate comprises mainly Bulgarian Turks. From 2001 to 2005, MRF was part of a ruling coalition led by National Movement Simeon II (NDSV, the party run by Bulgaria’s former king, Simeon Sakskoburgotski) which also included the Bulgarian Socialist Party (BSP). Following the 2005 general elections, a “triple” coalition government comprising the same partners but led by the Socialists was formed. In addition to the Ministry for Agriculture and Forestry, MRF also gained control of the Ministry for Environment and Water as well as of a newly formed Ministry for Disasters. All of the latter ministries played a central role in the control and management of flood-related aid disbursed from central government to municipalities.

At the local level, municipal finances are controlled by an elected council (holding the highest authority) which operates along an elected mayor. There are no term limits for either the mayor or the councillors, and local elections, conducted every four years, are usually held two years before general elections (local governments dealing with the 2004-05 floods were elected in 2003) (Soos et al., 2002).

B Additional robustness checks

We further probe the robustness of our results in Table A7. To conserve space, we only present the inclusive version of the model, that is column (4) in Table 1. In Table 1, we did not find evidence that the positive relationship between funds received and corruption can be explained by whether the local government is affiliated with the triple coalition or with MRF. To probe this further, in column (1) of Table A7 we include a triple interaction between local newspapers per capita, and dummies for whether the mayor and the council are affiliated with the triple coalition. The coefficient on log funds per capita remains unchanged from that in Table 1, but there is some evidence that mayors belonging to the triple coalition stole more in municipalities with a stronger media. In addition, municipalities in which the majority of the council was controlled by the ruling coalition were more likely to be corrupt, while higher newspaper circulation is associated with less corruption.\footnote{Unreported coefficients for column (1): newspapers circ. per capita: -0.000873**; mayor triple coal. -0.0870; council majority triple coal: 0.786**; mayor& council triple coal: -0.735. In unreported results, we instead included controls for whether the local government is affiliated with MRF (rather than the broader triple coalition), along with its interaction with newspapers. We obtained very similar results.} In column (2), we control for a municipality’s distance to one
of the nearest 28 province (also called oblast) centres, which is at the NUTS-3 level, with little change to the results.

In columns (3) and (4), we exploit the fact that, for a small number of municipalities, we also have information on corruption perceptions from a household survey conducted by the EBRD and the World Bank in late September 2006 (the Life in Transition Survey), shortly after the BNAA and PFIA audit reports were publicized extensively in the media. LiTS respondents (in Bulgaria and in the rest of the transition region, excluding Turkmenistan) were drawn randomly, using a two-stage sampling method with primary and secondary sampling units. Secondary Sampling Units are households, while Primary Sampling Units (for the case of Bulgaria) are electoral districts. We match each of the 50 PSUs to their respective municipality and obtain 37 unique municipalities. Our dependent variable is a corruption index which sums positive answers from the following question: “In your opinion, how often is it necessary for people like you to have to make unofficial payments/gifts in these situations?” (including eight options, such as “Interact with the road police,” or “Request unemployment benefits” with answer options 1 (never) to 5 (always)).

Although this exercise is informative, results should be interpreted as suggestive only due to the small number of municipalities covered in the LiTS. Moreover, our dependent variable in this case captures corruption perceptions. Even with these caveats in mind, column (3) shows that the positive coefficient on funds received still survives, although it is smaller and less precisely estimated.

Even though our analysis thus far has shown that more money was stolen in municipalities which received more funds, as we discussed in Section 2, politicians may have also distributed at least some of the proceeds to those affected by the floods, or to key groups of voters in order to maximise re-election chances. As a result, municipalities with more disbursed funds may also have a more satisfied electorate. However, column (4) suggests that this is not the case: people living in municipalities which received more flood-related assistance are no more trusting of (local and national) institutions.

[Table A7]


36We use the 50 per cent rainfall cut-off in the LiTS specifications as otherwise our first-stage estimates are weak.
C Additional charts and tables

Chart A1: Histogram of BNAA corruption index

Source: Bulgarian National Audit Agency
Table A1: Comparison between audited and non-audited municipalities

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Audited by BNAA</td>
<td>Not Audited by BNAA</td>
</tr>
<tr>
<td>BNAA</td>
<td>0.775</td>
<td></td>
</tr>
<tr>
<td>Funds per capita</td>
<td>43.396</td>
<td>10.022</td>
</tr>
<tr>
<td>Rainfall % deviation, 10% cutoff</td>
<td>0.820</td>
<td>0.901</td>
</tr>
<tr>
<td>Rainfall % deviation, 50% cutoff</td>
<td>1.393</td>
<td>1.446</td>
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<tr>
<td>Historical rainfall, mm</td>
<td>670.608</td>
<td>645.630</td>
</tr>
<tr>
<td>Geography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to BNAA regional centre</td>
<td>72.110</td>
<td>72.050</td>
</tr>
<tr>
<td>Elevation</td>
<td>505.593</td>
<td>248.838</td>
</tr>
<tr>
<td>Relief slope</td>
<td>7.534</td>
<td>4.380</td>
</tr>
<tr>
<td>Longitude</td>
<td>42.765</td>
<td>42.931</td>
</tr>
<tr>
<td>Latitude</td>
<td>25.198</td>
<td>24.407</td>
</tr>
<tr>
<td>Settlements near water</td>
<td>7.177</td>
<td>4.973</td>
</tr>
<tr>
<td>Economic conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal income per capita</td>
<td>244.627</td>
<td>235.590</td>
</tr>
<tr>
<td>Unemployment</td>
<td>19.946</td>
<td>25.294</td>
</tr>
<tr>
<td>Net privatisation income</td>
<td>4.384</td>
<td>2.644</td>
</tr>
<tr>
<td>Civil society</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspaper circ. per capita</td>
<td>139.237</td>
<td>205.978</td>
</tr>
<tr>
<td>Share university degree</td>
<td>0.069</td>
<td>0.062</td>
</tr>
<tr>
<td>Share urban population</td>
<td>0.467</td>
<td>0.336</td>
</tr>
<tr>
<td>Voter turnout 2003</td>
<td>0.569</td>
<td>0.477</td>
</tr>
<tr>
<td>Composition of local gov.</td>
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<td></td>
</tr>
<tr>
<td>Mayor triple coal.</td>
<td>0.674</td>
<td>0.757</td>
</tr>
<tr>
<td>Council majority triple coal.</td>
<td>0.432</td>
<td>0.541</td>
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<tr>
<td>Mayor&amp;council triple coal.</td>
<td>0.348</td>
<td>0.432</td>
</tr>
<tr>
<td>Mayor MRF</td>
<td>0.163</td>
<td>0.027</td>
</tr>
<tr>
<td>Council majority MRF</td>
<td>0.119</td>
<td>0.027</td>
</tr>
<tr>
<td>Mayor&amp;council MRF</td>
<td>0.106</td>
<td>0.027</td>
</tr>
<tr>
<td>Mayor characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margin elected 2003</td>
<td>0.078</td>
<td>0.066</td>
</tr>
<tr>
<td>In politics before 2003</td>
<td>0.712</td>
<td>0.703</td>
</tr>
<tr>
<td>Total observations</td>
<td>227</td>
<td>37</td>
</tr>
</tbody>
</table>

Notes: The table compares municipalities which were audited by BNAA with those which were not audited by BNAA. Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.01.
Table A2: Public funds and corruption: robustness 1

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<th>IV (1)</th>
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<th>IV (3)</th>
<th>IV (4)</th>
<th>OLS (5)</th>
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<td>BNAA through pca</td>
<td>PFIA</td>
<td>BNAA</td>
<td>BNAA</td>
<td>BNAA</td>
</tr>
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<td>Log funds per cap</td>
<td>0.863**</td>
<td>4.137</td>
<td>0.949**</td>
<td>1.093**</td>
<td>0.257*</td>
</tr>
<tr>
<td></td>
<td>(0.409)</td>
<td>(2.940)</td>
<td>(0.377)</td>
<td>(0.502)</td>
<td>(0.149)</td>
</tr>
<tr>
<td>Margin elected 2003</td>
<td>−1.844*</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(1.059)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In politics before 2003</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>(0.124)</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Economic conditions</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Civil society</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Composition of local gov.</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>F-stat.</td>
<td>10.18</td>
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<td>10.74</td>
<td>10.17</td>
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</tr>
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<td>Rainfall % deviation, 10% cutoff</td>
<td>1.179***</td>
<td>0.708**</td>
<td>1.208***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.370)</td>
<td>(0.363)</td>
<td>(0.369)</td>
<td></td>
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<td>0.511***</td>
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<td></td>
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<td></td>
<td>(0.160)</td>
<td></td>
</tr>
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<td>225</td>
<td>254</td>
<td>225</td>
<td>225</td>
<td>225</td>
</tr>
</tbody>
</table>

Notes: Regional dummies are included in all specifications. Robust standard errors are in parentheses. Significance levels: * \( p < 0.1 \), ** \( p < 0.05 \), *** \( p < 0.01 \).
Table A3: Comparison between municipalities with and without weather stations

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<th><strong>Variable</strong></th>
<th><strong>Interpolation</strong></th>
<th><strong>No interpolation</strong></th>
<th><strong>t-stat</strong></th>
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<tbody>
<tr>
<td><strong>BNAA</strong></td>
<td>0.691</td>
<td>0.909</td>
<td>-1.543</td>
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<td><strong>Funds per capita</strong></td>
<td>44.084</td>
<td>29.174</td>
<td>2.151**</td>
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<td><strong>Rainfall % deviation, 10% cutoff</strong></td>
<td>0.817</td>
<td>0.857</td>
<td>-1.539</td>
</tr>
<tr>
<td><strong>Rainfall % deviation, 50% cutoff</strong></td>
<td>1.386</td>
<td>1.427</td>
<td>-0.816</td>
</tr>
<tr>
<td><strong>Historical rainfall, mm</strong></td>
<td>670.666</td>
<td>660.776</td>
<td>0.887</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to BNAA regional centre</td>
<td>70.868</td>
<td>74.295</td>
<td>-0.792</td>
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<tr>
<td>Elevation</td>
<td>466.542</td>
<td>474.653</td>
<td>-0.166</td>
</tr>
<tr>
<td>Relief slope</td>
<td>7.110</td>
<td>7.054</td>
<td>0.093</td>
</tr>
<tr>
<td>Longitude</td>
<td>42.793</td>
<td>42.778</td>
<td>0.159</td>
</tr>
<tr>
<td>Latitude</td>
<td>24.997</td>
<td>25.248</td>
<td>-1.249</td>
</tr>
<tr>
<td>Settlements near water</td>
<td>5.381</td>
<td>9.495</td>
<td>-3.904***</td>
</tr>
<tr>
<td><strong>Economic conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal income per capita</td>
<td>247.016</td>
<td>237.002</td>
<td>1.145</td>
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<tr>
<td>Unemployment</td>
<td>21.866</td>
<td>18.635</td>
<td>2.596***</td>
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<td>Net privatisation income</td>
<td>4.170</td>
<td>4.087</td>
<td>0.085</td>
</tr>
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<td><strong>Civil society</strong></td>
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<td></td>
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<td>Newspaper circ. per capita</td>
<td>192.707</td>
<td>70.110</td>
<td>3.951***</td>
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<td>Share university degree</td>
<td>0.055</td>
<td>0.091</td>
<td>-8.045***</td>
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<tr>
<td>Share urban population</td>
<td>0.380</td>
<td>0.572</td>
<td>-5.625***</td>
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<td>Voter turnout 2003</td>
<td>0.629</td>
<td>0.426</td>
<td>1.372</td>
</tr>
<tr>
<td><strong>Composition of local gov.</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mayor triple coal</td>
<td>0.710</td>
<td>0.642</td>
<td>1.140</td>
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<tr>
<td>Council majority triple coal.</td>
<td>0.462</td>
<td>0.421</td>
<td>0.633</td>
</tr>
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<td>Mayor&amp;council triple coal.</td>
<td>0.391</td>
<td>0.305</td>
<td>1.385</td>
</tr>
<tr>
<td>Mayor MRF</td>
<td>0.160</td>
<td>0.116</td>
<td>0.975</td>
</tr>
<tr>
<td>Council majority MRF</td>
<td>0.124</td>
<td>0.074</td>
<td>1.280</td>
</tr>
<tr>
<td>Mayor&amp;council MRF</td>
<td>0.112</td>
<td>0.063</td>
<td>1.312</td>
</tr>
<tr>
<td><strong>Mayor characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margin elected 2003</td>
<td>0.077</td>
<td>0.075</td>
<td>0.317</td>
</tr>
<tr>
<td>In politics before 2003</td>
<td>0.720</td>
<td>0.695</td>
<td>0.437</td>
</tr>
<tr>
<td><strong>Total observations</strong></td>
<td>169</td>
<td>95</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The table compares municipalities with and without weather stations. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 


### Table A4: Endogeneity of weather stations

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Closed after 89</td>
<td>Exists today</td>
</tr>
<tr>
<td><strong>BNAA</strong></td>
<td>0.686</td>
<td>0.926</td>
</tr>
<tr>
<td>Funds per capita</td>
<td>39.093</td>
<td>30.309</td>
</tr>
<tr>
<td>Rainfall % deviation, 10% cutoff</td>
<td>0.820</td>
<td>0.863</td>
</tr>
<tr>
<td>Rainfall % deviation, 50% cutoff</td>
<td>1.396</td>
<td>1.449</td>
</tr>
<tr>
<td>Historical rainfall, mm</td>
<td>672.231</td>
<td>662.141</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to BNAA regional centre</td>
<td>71.106</td>
<td>74.731</td>
</tr>
<tr>
<td>Elevation</td>
<td>476.988</td>
<td>488.713</td>
</tr>
<tr>
<td>Relief slope</td>
<td>7.427</td>
<td>7.250</td>
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<tr>
<td>Longitude</td>
<td>42.886</td>
<td>42.759</td>
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<tr>
<td>Latitude</td>
<td>24.896</td>
<td>25.177</td>
</tr>
<tr>
<td>Settlements near water</td>
<td>5.860</td>
<td>9.505</td>
</tr>
<tr>
<td><strong>Economic conditions</strong></td>
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<td></td>
</tr>
<tr>
<td>Municipal income per capita</td>
<td>230.796</td>
<td>236.764</td>
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<tr>
<td>Unemployment</td>
<td>21.990</td>
<td>18.310</td>
</tr>
<tr>
<td>Net privatisation income</td>
<td>4.094</td>
<td>3.939</td>
</tr>
<tr>
<td><strong>Civil society</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspaper circ. per capita</td>
<td>166.450</td>
<td>74.465</td>
</tr>
<tr>
<td>Share university degree</td>
<td>0.060</td>
<td>0.089</td>
</tr>
<tr>
<td>Share urban population</td>
<td>0.414</td>
<td>0.574</td>
</tr>
<tr>
<td>Voter turnout 2003</td>
<td>0.751</td>
<td>0.430</td>
</tr>
<tr>
<td><strong>Composition of local gov.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mayor triple coal.</td>
<td>0.674</td>
<td>0.644</td>
</tr>
<tr>
<td>Council majority triple coal.</td>
<td>0.477</td>
<td>0.426</td>
</tr>
<tr>
<td>Mayor&amp;council triple coal.</td>
<td>0.395</td>
<td>0.307</td>
</tr>
<tr>
<td>Mayor MRF</td>
<td>0.140</td>
<td>0.119</td>
</tr>
<tr>
<td>Council majority MRF</td>
<td>0.128</td>
<td>0.079</td>
</tr>
<tr>
<td>Mayor&amp;council MRF</td>
<td>0.105</td>
<td>0.069</td>
</tr>
<tr>
<td><strong>Mayor characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margin elected 2003</td>
<td>0.071</td>
<td>0.079</td>
</tr>
<tr>
<td>In politics before 2003</td>
<td>0.729</td>
<td>0.685</td>
</tr>
</tbody>
</table>

**Total observations:** 86 101

Notes: The table compares municipalities in which there was a weather station before 1989 (which no longer exists) with those in which there was a station both before and after 1989. Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.01.
### Table A5: Public funds and corruption: excluding municipalities in which rainfall is interpolated

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>OLS (2)</th>
<th>IV (3)</th>
<th>IV (4)</th>
<th>IV-Poisson (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BNAA</td>
<td>BNAA</td>
<td>BNAA</td>
<td>BNAA</td>
<td>BNAA</td>
</tr>
<tr>
<td>Log funds per cap</td>
<td>0.435***</td>
<td>0.453***</td>
<td>1.016**</td>
<td>1.139**</td>
<td>0.746**</td>
</tr>
<tr>
<td></td>
<td>(0.162)</td>
<td>(0.169)</td>
<td>(0.468)</td>
<td>(0.515)</td>
<td>(0.297)</td>
</tr>
<tr>
<td>Geography</td>
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<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Economic conditions</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Civil society</td>
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<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Composition of local gov.</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>F-stat.</td>
<td>12.26</td>
<td>11.64</td>
<td>1.236***</td>
<td>1.291***</td>
<td></td>
</tr>
<tr>
<td>Rainfall % deviation, 10% cutoff</td>
<td>(0.353)</td>
<td>(0.378)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
</tr>
</tbody>
</table>

Notes: Regional dummies are included in all specifications. Robust standard errors are in parentheses. Last column reports marginal effects from an IV-Poisson regression. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 
<table>
<thead>
<tr>
<th>Table A6: Public funds and corruption: heterogeneous effects</th>
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</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Municipal income per cap</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>&lt; median (1) BNAA</td>
</tr>
<tr>
<td>&gt;= median (2) BNAA</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Unemployment</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>&lt; median (3) BNAA</td>
</tr>
<tr>
<td>&gt;= median (4) BNAA</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Newspapers circ.</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>&lt; median (5) BNAA</td>
</tr>
<tr>
<td>&gt;= median (6) BNAA</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Log funds per cap</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>0.479 (0.624) &lt; median (1) BNAA</td>
</tr>
<tr>
<td>0.877*** (0.334) &gt;= median (2) BNAA</td>
</tr>
<tr>
<td>1.322** (0.653) &lt; median (3) BNAA</td>
</tr>
<tr>
<td>0.106 (0.257) &gt;= median (4) BNAA</td>
</tr>
<tr>
<td>1.150** (0.484) &lt; median (5) BNAA</td>
</tr>
<tr>
<td>-0.204 (0.418) &gt;= median (6) BNAA</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Geography</strong></td>
</tr>
<tr>
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<tr>
<td><strong>Economic conditions</strong></td>
</tr>
<tr>
<td>✓</td>
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<tr>
<td><strong>Civil society</strong></td>
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<td>✓</td>
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<td>✓</td>
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<tr>
<td><strong>Composition of local gov.</strong></td>
</tr>
<tr>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
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<td>✓</td>
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<tr>
<td>✓</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>F-stat.</strong></td>
</tr>
<tr>
<td>3.064</td>
</tr>
<tr>
<td>8.795</td>
</tr>
<tr>
<td>4.538 (0.515)</td>
</tr>
<tr>
<td>5.696 (0.565)</td>
</tr>
<tr>
<td>8.281 (0.493)</td>
</tr>
<tr>
<td>3.508 (0.418)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Rainfall % deviation, 10% cutoff</strong></td>
</tr>
<tr>
<td>0.902* (0.515)</td>
</tr>
<tr>
<td>1.675*** (0.565)</td>
</tr>
<tr>
<td>0.890** (0.418)</td>
</tr>
<tr>
<td>1.673** (0.701)</td>
</tr>
<tr>
<td>1.618*** (0.562)</td>
</tr>
<tr>
<td>0.923* (0.493)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Number of observations</strong></td>
</tr>
<tr>
<td>113</td>
</tr>
<tr>
<td>112</td>
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<td>117</td>
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<td>108</td>
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<tr>
<td>118</td>
</tr>
<tr>
<td>107</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Notes: Regional dummies are included in all specifications. Robust standard errors are in parentheses. Significance levels: * ( p &lt; 0.1 ), ** ( p &lt; 0.05 ), *** ( p &lt; 0.01 ).</td>
</tr>
</tbody>
</table>
Table A7: Public funds and corruption: robustness 2

<table>
<thead>
<tr>
<th></th>
<th>(1) BNAA</th>
<th>(2) BNAA</th>
<th>(3) Frequency of unofficial payments</th>
<th>(4) Trust in institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log funds per cap</td>
<td>1.052***</td>
<td>0.915**</td>
<td>0.481*</td>
<td>0.455</td>
</tr>
<tr>
<td></td>
<td>(0.395)</td>
<td>(0.370)</td>
<td>(0.246)</td>
<td>(0.281)</td>
</tr>
<tr>
<td>Newspapers per cap. * mayor triple coal.</td>
<td>0.00182*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00104)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspapers per cap. * council majority triple coal.</td>
<td>−0.00394</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00246)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspapers per cap. * mayor &amp; council triple coal.</td>
<td>0.00236</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00269)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to province centre</td>
<td></td>
<td>0.00488</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00409)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respondent characteristics</td>
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<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Geography</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Economic conditions</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Civil society</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Composition of local gov.</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>F-stat.</td>
<td>9.673</td>
<td>10.32</td>
<td>40.61</td>
<td>43.39</td>
</tr>
<tr>
<td>Rainfall % deviation, 10% cutoff</td>
<td>1.174***</td>
<td>1.202***</td>
<td>0.871***</td>
<td>0.893***</td>
</tr>
<tr>
<td></td>
<td>(0.378)</td>
<td>(0.374)</td>
<td>(0.137)</td>
<td>(0.136)</td>
</tr>
<tr>
<td>Rainfall % deviation, 50% cutoff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>225</td>
<td>225</td>
<td>945</td>
<td>924</td>
</tr>
</tbody>
</table>

Notes: Regional dummies included in all specifications (except last two columns). Robust standard errors are in parentheses. Significance levels: * \( p < 0.1 \), ** \( p < 0.05 \), *** \( p < 0.01 \).
D Data information

Dependent variable

Corruption Index (from the BNAA audit report data). Sums dummies for the spending violations committed by each municipality in 2004 and 2005. BNAA groups the infractions in the following categories:

1. Infringements related to following the procedures and laws for public procurement
   - no public procurement procedure (number of municipalities in which recorded: 38)
   - no provision for guarantees, no control procedures or building control (number of municipalities in which recorded: 11)
   - not following the system of double signature (both the mayor and chief accountant need to approve contracts) (number of municipalities in which recorded: 10).

2. Infringements related to fund use and reporting:
   - payment for activities not listed in the contract (number of municipalities in which recorded: 1)
   - final payment prior to issuing documents certifying that the work has been completed (number of municipalities in which recorded: 6)
   - using the funds for unauthorised works (number of municipalities in which recorded: 3)
   - not returning on time funds that have not been used (number of municipalities in which recorded: 7)
   - the value of the building and repair activities exceeds the funds disbursed by the Commission (number of municipalities in which recorded: 2)
   - no control procedures related to using the funds from the Commission (number of municipalities in which recorded: 8)
   - no building control; payment without works completed; pre-payment of building and repair activities (number of municipalities in which recorded: 7).

3. Infringements related to reporting how funds were used and preparing reports for each of the repaired objects:
   - no files were prepared and sent to the Commission and the Ministry of Finance about how the funds were used or returned (if not used); or these files were incomplete (number of municipalities in which recorded: 28)
   - three-month reports to the Commission and the Ministry of Finance were not sent; or were not complete; or were not sent to the oblast governor (number of municipalities in which recorded: 31).
4. Infringements related to following the municipal procedures in relation to the laws about reporting the incurred expenses:

   - no system for financial management and control exists; infringements related to this system; no financial controller used (number of municipalities in which recorded: 12)
   - inaccurate accounting recording of the funds (number of municipalities in which recorded: 12).

**Independent variables**

*Log funds per capita.* Total funds received (in 2004 and 2005) is from the BNAA audit reports. Population is from the 2001 census.

*Rainfall.* Monthly rainfall (in mm) for all 101 weather stations for 2004 and 2005 from the National Institute for Meteorology and Hydrology. The interpolated value for each municipality is the inverse distance weighted average of all values measured in stations within a 45 km radius from the centroid of the municipality. Monthly historical rainfall values are from Koleva and Peneva (1990). See text on how the rainfall variable used in the regressions is calculated.

*Ground flood risk.* Number of settlements within 1 km of a water body (river, lake or dam; from GIS); elevation (in metres; from National Statistical Institute), slope (from the National Statistical Institute).

*Geography.* Latitude, longitude (both from NSI) and distance to a BNAA regional centre (calculated by authors and using data from BNAA).

*Economic conditions.* Log municipal income per capita (in 2000; from UNDP (2002)); unemployment (in 2003, from NSI); net privatisation income (in 2003, from NSI).

*Media and civil society.* Local newspaper circulation per capita (in 2004; only available at the oblast level from NSI); share of population with university degree (2003; from NSI); share of urban population (2003; from NSI); voter turnout (voter turnout at the 2003 local elections from the Central Electoral Commission).

*Composition of local government and re-election.* Political affiliation of the mayor and council are from 2003 election data from the Central Electoral Commission. Re-election is from 2007 data from the Central Electoral Commission. One caveat to interpreting the political affiliation data is that some mayors either switched parties after the 2003 elections (mostly from a relatively small party to one of the large parties) or, while independent on paper, were actually supported by a political party. In the former case, we have coded the mayor’s most recent political affiliation, while in the latter case, being endorsed by a party was taken as equivalent to party membership. For instance, 127 mayors belonged to the triple coalition on paper, while following our adjustment their numbers increases to 181 (the respective figures for MRF affiliation are 35 and 38, respectively). The results presented in the main text are robust to using the original mayor affili-
tion.

*Mayor characteristics.* Margin elected (2003; Central Electoral Commission); dummy for whether the mayor has any political experience prior to 2003 (internet search).

**Additional variables**

*Corruption from the PFIA audit reports.* Sum of PFIA infringements recorded in each municipality. Unlike BNAA, PFIA does not group infractions in categories.

*Corruption from LiTS 2006.* Index constructed from the following question: “In your opinion, how often is it necessary for people like you to have to make unofficial payments/gifts in these situations?” (including eight options, such as “Interact with the road police”, or “Request unemployment benefits” with answer options 1 (never) to 5 (always)).

*Control variables from LiTS 2006.* Respondent age, age squared, household income (proxied by the share of household resources spent on food, an asset index, and the household self-perceived position on a 10-step income ladder), whether the respondent is employed, respondent’s education, respondent’s father’s education, and whether the respondent or any members of his family were part of the former Communist Party.