It Takes Two to Tango:

Complementarity of Bonding and Bridging Trust in Alleviating Corruption in Cities

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ABSTRACT

We see petty administrative corruption (bribery) as a regional phenomenon and investigate it in the spatial context. Applying Heckman selection models with instrumenting to the European Bank for Reconstruction and Development 'Life in Transition' data, we find that larger cities appear more prone to corruption. However, capital cities exhibit lower corruption, due to differences in social, political structures, and government accountability. Furthermore, we illustrate the importance of the meso-level social environment, exploring complementarity between bridging (across broader local society by institutional trust) and bonding trust (within more embedded communities) in alleviating bribery.

KEYWORDS: Corruption, city, civic capital, institutional trust, bonding, bridging

INTRODUCTION

Corruption and more specifically petty or administrative corruption (bribery) on which we will focus is a socially embedded phenomenon (Uberti, 2016); in a corrupt environment, officials realize private benefits at the cost of businesses and individuals, and this practice becomes so widely shared that it is accepted as a social norm. Corruption becomes institutionalized without gaining legitimacy, with individuals and businesses forming consistent expectations about it (Jepperson, 1991; Estrin et al., 2013). Individuals and businesses adapt their behaviour to the corresponding informal norms in order to minimize the negative effects of corruption (Choi & Thum, 2005; Tonoyan et al., 2010). Corruption is common in many emerging market economies (Ivlevs & Hinks, 2018) and is thought to hinder development by raising transaction costs and uncertainty (e.g. Gray & Kaufman, 1998). So far, much of the empirical work on the determinants of corruption is primarily based on macro-level evidence (for overviews, see: Treisman, 2007; Rose-Ackerman & Palifka, 2016; Gani, 2017), but there is a growing body of work that provides micro-level evidence, where corruption is taken as individual-specific (e.g. Hunt, 2004; Guerrero & Rodríguez-Oreggia, 2008; Lee & Guven, 2013) or firm-level phenomenon (e.g. Nguyen, Mickiewicz, & Du, 2018).

The introduction of micro dimension is important as it enables researchers to understand better the potential causation mechanisms. An even richer empirical picture emerges when macro and individual levels are supplemented with regional (meso) level, because social phenomena and informal institutions, such as corruption, are sub-national phenomena (Charron, 2013a). Yet, while regional-level research provides interesting insights on corruption, the findings are largely based on single country case studies (e.g. Del Monte & Papagni, 2007; Campante & Do, 2014), and therefore have limited generalized application. An important exception to this relates to cross-region, cross-country European empirical studies, based on the quality of government project (QoG), where corruption is considered as one of the key dimensions to be explained (see esp. Charron & Lapuente, 2013). Our study offers yet another perspective. It combines information from three levels: the

individual, the meso-level institutional environment, and the country. While controlling for country-level effects, we focus on across-regions across-individuals heterogeneity; that is on meso-micro dimensions.

Our task at hand is to explain the individual experience of corruption. First, we argue that the likelihood of encountering corruption vary across cities of different sizes and types; here we add to the literature by considering the difference between the effect of large size and that of being a capital city. Second, we recognize the role of space-based structures of trust that shape the patterns of individual behaviour (Rodriguez-Pose, 2013), paying particular attention to the role of bonding trust and institutional trust, and potential complementarities between the two. We see them as anchored at the meso level (for an overview see Malecki, 2012).

Our distinction of the two types of trust draws on Rodriguez-Pose & Storper (2006) and Storper (2013), who distinguish between the two different types of regional structures of trust, notably broader local society (bridging), and more embedded communities (bonding)**.** With respect to bridging trust we focus attention on the institutional trust; this makes our approach close to Guiso et al. (2010) concept of civic capital.

We use individual level data across European and post-Communist Asian countries from the European Bank for Reconstruction and Development (EBRD) 'Life in Transition' survey. The sample covers over 20,000 individuals across 35 countries in the year 2010, and provides detailed information on the use of various government services (e.g. to obtain documents) and on the occurrences of bribery experienced by the users. To test our hypotheses, we employ a multi-level Heckman selection probit model, and instrumental variable estimations to check for endogeneity.

Our key contribution to theory, is to develop the arguments on complementarity between bonding and institutional trust in reducing the incidence of corruption. We posit that the bridging, i.e. institutional trust, as a civic capital element should be viewed as inserting resistance to corruption into the local communities. At the same time, building on Banfield (1958), we argue that institutional

trust without bonding community trust would not do the job alone. Last but not least, we also show that even when accounting for trust, the city context remains important in explaining corruption.

We contribute to the current body of literature on corruption in three further ways. First, we investigate incidence (rather than perception) of corruption at the individual level using data that, so far as we are aware, has not been used before for that purpose. Second, the methodology we employ has rarely been used in the context of corruption. We use a multi-level Heckman selection model to account for the structure of the data and for the sampling technique employed. This allows us to distinguish between individual and environmental effects, and more specifically to look at meso-level structures within the latter. Third, by shedding some light on the relative weight of individual and environmental factors we show that the determinants of corruption should not be seen as space-blind and individual-specific; the spatial context matters, and the meso-level social environment plays a role. Fourth, it is widely recognized in the literature that trust and corruption are independent, both showing persistent spatial patterns over time, and isolating the casual linkages between the two is difficult (Charron & Rothstein, 2018). Our interest is in isolating the impact of space-based structures of trust on the individual experience of corruption while proposing some new instrumental variables models.

In the next section we introduce the theory we use to motivate our hypotheses. Next, we present the methodology and results. We complete the paper with the discussion and conclusions.

THEORETICAL ARGUMENTS AND HYPOTHESES: CORRUPTION AND ITS REGIONAL DIMENSION

We start with the definition of corruption and its different forms. Transparency International[i] defines corruption as the 'abuse of entrusted power for private gain', distinguishing further between three types of corruption, namely (a) grand corruption, defined as corruption occurring at the highest levels

of government in a way that requires significant subversion of the political, legal and economic systems; (b) political corruption, underlying manipulation of institutions, rules and policies by policy-makers to extract private gains (Costas-Pérez, Solé-Ollé, & Sorribas-Navarro 2012), and (c) administrative or petty corruption, viewed as small-scale bribery occurring on the basis of daily interactions of citizens with public institutions (Ivlevs & Hinks, 2018). Our focus is on the latter.

One strand of the literature on the determinants of corruption emphasises the role of formal political institutions as determinants of corruption, with the latter being lower in countries with established liberal democracies (Treisman, 2000; Gani, 2017). Along this line of research, among more specific determinants of corruption are freedom of press (Brunetti & Weder, 2003); property rights protection (Mocan, 2008); and higher representation of women in government (Wängnerud, 2009).

An important point to note however is that the extent of corrupt behaviour may be determined not only by inherent characteristics of the government and its administration, but also by societal attitudes towards it. Moreover, the latter may be (partly) exogenous, driven for example by historical experience, as in the former Soviet Bloc countries, where low trust in government institutions persists (Mickiewicz et al., 2017). This leads us to the second strand of literature, which looks at attitudes, values and beliefs that can be observed both at the level of individual, and also at some societal level. They determine individuals' willingness to engage in corrupt behaviour and/or the likelihood they will be approached with the intention to extort a bribe from them. These traits may also link with easily observable external demographic and other characteristics. For example, the literature suggests that the likelihood of an individual's brushing with corruption is affected by his/her wealth and level of education: wealthier and better educated individuals are found to be more likely to experience corruption (Guerrero & Rodríguez-Oreggia, 2008; Mocan, 2008). In turn, females and older people are found to be more averse to corruption and this is also the case for more frequent church attenders (Gatti et al., 2003), a clear indication that socially embedded values affect the incidence of corruption.

Some scholars have also looked at individual perception of risk, and past experience of corruption (Lee & Guven 2013) and, especially interesting for us, on the effect of social trust networks on corruption (Hunt, 2004).

Both formal institutions, and informal institutions, beliefs and values vary at the subnational level and there is a growing body of regional-level research studying cross-regional differences in determinants of corruption (e.g. Del Monte & Papagni, 2007; Campante & Do, 2014; Nguyen et al., 2018). The latter features prominently in the QoG stream of research. Here, QoG is defined as 'having impartial institutions for the exercise of public power' (Rothstein, 2013a, p.16), and 'corruption in the form of bribes clearly implies a deviation from QoG as impartiality', while 'the latter concept also excludes other types of favorism when public policies are implemented, such as clientelism, nepotism and other forms of discrimination' (*Ibid.*, p. 30-31).

Interestingly, the QoG project documents that corruption and related phenomena that undermine government impartiality are characterised by strong within-countries heterogeneity, and the extent of the latter does not correlate with the degree of government centralisation (Charron, 2013b; Kyriacou et al., 2017). While constitutional frameworks and basic features of the legal systems are by construction shared within countries, a strong variation in administrative practices and in prevalence of corruption suggest that socially embedded values and beliefs, including norms of trust may play a role as explanatory factors.

Corruption and cities

The larger the city size one lives in the more likely it is that one is exposed to corruption (Charron, 2013b). There are several possible reasons. First, large cities are centres of economic and bureaucratic activity. Most of the state and provincial offices are located in larger cities; we can therefore expect a higher concentration of bureaucrats, which will enhance opportunities for corruption. Second, large cities are more anonymous so both payers and takers may find it easier to get away with corruption.

It is harder to influence large-city officials in non-monetary ways, such as through their families or friends. In smaller towns, the population is likely to know the officials, therefore any misconduct is likely to be noticed, leading to reputational effects rippling through the community ('I see him everyday. It would not be good' - a citation from a local respondent, in: Banfield, 1958, p.123).

Further, larger cities are often fragmented in terms of power (Storper, 2013), but their social density implies that inhabitants are more likely to engage in interactive social learning as they adopt patterns that other individuals practice, including corrupt behaviour. In such contexts it is easier to become trapped in a circle of corruption, where corruption converts into a (local) social norm, and at the same time, due to the higher anonymity that comes with density, the reputational effects constraining corruption are lower.

Hunt (2004) claims that in large cities, the formation of (reputation-building) trust networks is impaired because, in developing countries in particular, cities are constantly growing. This hampers the stability of individual interactions and therefore interferes with community spirit, encouraging corruption. She (also: Mocan, 2008) argues that in stable communities, e.g. small towns and neighbourhoods, the corruption is lower as people create stable, trust-based, reputation-generating networks. We wish to separate the effect of trust, and the effect of lower anonymity that results from living in a small town. In that, we follow Banfield's (1958) logic as already cited above: in low-trust local society of 'amoral familists', there may still be some effects constraining corruption resulting from the expectation of repeated, frequent interactions between the individuals.

Corruption and Capital Cities

A capital city is usually a very large, if not the largest, city, where the concentration of officials and offices is the highest. Capital cities are more likely to have 'larger less fragmented, more centralized in terms of power' metropolitan governance structures; thus they have bigger, integrated yet internally

heterogeneous jurisdictions (Storper, 2013). In such integrated jurisdictions, there may be more efficient monitoring of officials, and as a consequence less scope for petty corruption (bribery).

Furthermore, given the higher concentration of media and better coverage of politics in capital cities, we see a greater accountability of government. Borcan (2013) attributes this to two features. First, national media are predominantly based in capital cities. Second, interestingly, there is a mutually reinforcing effect between the presence of media and the developed structures of local government we just discussed: 'because of the size of the city and its fragmented administration, the great flux of events attracts substantially more media coverage than any other city' (*Ibid.*, p. 213).

In contrast, in larger cities located farther away from the capital, we may observe a reduction in the degree of accountability. Using a sample of US states, Campante & Do (2014) show that state capitals located farther away from the capital, termed 'isolated capitals', exhibit a higher level of corruption since they face a lower level of scrutiny from citizens and the media: newspapers cover state politics less when their readers are farther away from the capital; voters who live far from the capital are also less knowledgeable about and less interested in state politics. Overall, we expect capital cities to exhibit less corruption, while still associating larger city size with more corruption. We postulate the following hypotheses regarding the city size and type:

Hypothesis 1a: The larger the city size, the higher the probability of corruption.
Hypothesis 1b: There is less corruption in capital cities.

The Social Basis of Corruption

There is significant literature that argues for trust to be affected by corruption and more generally by the QoG (Charron 2013a; Charron & Rothstein, 2018). We do not intend to deny this channel exist. We argue however that societal structures of trust are persistent; there is 'cultural lag', to apply Banfield's (1958) terminology (see also: Mickiewicz *et al*., 2017). It is the persistence that in the

short run gives societal trust some degree of exogeneity towards corruption and makes the analysis of the trust-to-corruption channel justified, provided we apply appropriate instrumenting.

This is the logic we will follow here, observing that the knowledge and interactive learning embedded in social capital and trust are largely localized because they are 'bound historically to local circumstances, involving unique bonds and accumulated routines' (Malecki, 2012: 1028). Consequently, social capital and trust should be seen as a meso-scale phenomenon centred on communities, playing an important role in shaping the behavioural patterns of individuals locally (Malecki, 2012; Sørensen, 2012; 2016). Below we will discuss the way in which meso-scale social structures are likely to affect corrupt practices.

Social structures: bonding communities and bridging societies

Trust is the central dimension of social capital (Guiso et al., 2010), and it plays a role in reducing the risks and transaction costs of relationships, facilitating the mutually beneficial cooperation (Nooteboom, 2007). Trust is a source of social solidarity, representing a belief and value system (Guiso et al. 2010), according to which the various groups in society accept a shared responsibility to provide public goods as well as possibilities for those who happen to be endowed with fewer resources (Uslaner, 2002).

Trust may be built on a personal basis, in particular within families (Banfield, 1958). It may also bond homogenous individuals within small, local community groups. It may also arise in wider social structures on the basis of institutions that are perceived to be fair, linking horizontally heterogeneous groups of individuals with different backgrounds, and forming group identity and affiliation (Nooteboom, 2007; Sabatini, 2008; Rothstein, 2013b). Within the regional institutional literature, these two types of trust could be viewed to reflect *community (bonding)* and broader local *society* (*bridging*) (Rodriguez-Pose & Storper, 2006; Storper, 2013). The latter corresponds closely to the concept of *civic capital* (Guiso et al., 2010).

Bonding Community relates to small social groups that engage individuals more fully, underlying, for example, strong bonds formed between friends, acquaintances and neighbours (Malecki, 2012). These strong ties are viewed as 'bonding trust' (Rodriguez-Pose & Storper, 2006; Nooteboom, 2007). They are cohesive as they enable the matching of individual and aggregate interests, providing therefore an 'institutional exoskeleton' for cooperative behaviour (Streek, 1991). Once we consider corruption as a type of collective action problem (e.g. Kossow & Kukutschka, 2017), it follows immediately that the lack of bonding trust is likely to make corruption more widespread in a local community. At the same time, as already noticed above, Banfield's (1958) seminal work provides us with a strong argument delinking communal trust from the size of the local community. We therefore posit, that it is the mutually reinforcing presence of both, (i) the small size of the community, which reduces anonymity, and (ii) the mutually consistent expectations and cooperative norms of behaviour represented by bonding trust that leads to lower likelihood of corruption.

Parallel to this, it may also be that *civic capital* (institutional trust) alleviates the effect of anonymity present in the large cities. It may help to create shared norms of conduct and inclusiveness (Nooteboom, 2007) diminishing corruption. This may be interpreted as *bridging*; it refers to a social norm under which institutions, defined by codified, formal rules are respected and supported, e.g. rule of law, property rights, legal system (Rodriguez-Pose & Storper, 2006)[ii]. In contrast, the functioning of institutions will be deficient and not fully effective without institutional legitimacy and acceptance in the eyes of the general public. This is well captured by Banfield (1958) in his description of what in our terminology is a state of low institutional trust:

'In a society of amoral familists there will be few checks on officials, for checking on officials will be the business of other officials only. /…/ The amoral familist who is an office holder will take bribes when he can get away with it. But whether he takes bribes or not, it will be assumed by the society of amoral familists that he does.' (*Ibid.*, pp. 88, 94)

Consequently, we argue that the perception of the institutional environment by individuals (i.e. institutional trust) within a local social neighbourhood is what matters. We posit that alongside bonding trust, local *institutional trust* plays an important role in bridging communities via the facilitation and the diffusion of trust and wider norms of cooperation. Following this discussion, we postulate our second set of hypotheses.

Hypothesis 2a. Meso-level institutional trust (bridging) will have a positive moderating effect, reducing corruption in larger cities.

Hypothesis 2b. Trust in acquaintances and friends within the local neighbourhood (bonding) will have a positive moderating effect, reducing corruption in larger cities.

An Interplay between 'bonding community' and 'bridging' in cities

The literature we discussed so far posits that social capital of the community and of the society type are mutually opposed forms of institutional coordination (Rodriguez-Pose & Storper, 2006). Sørensen (2016) found for Sweden that in a region where one form of capital is stronger, the other is weaker, and vice versa. Furthermore, community bonding is argued to be the second best to the society-level formal institutions and trust, and some authors argue that close-knit groups may be detrimental for long-term development due to the pervasive agency problems they generate (Durlauf & Fafchams, 2004; Olson, 1982).

Yet, other authors argue that the basis for social capital lies largely in bonding trust; that is, it is a necessary condition of the bridging trust (Newton & Zmerli, 2011). In contrast, last but not least, Banfield (1958) illustrates vividly that absence of community trust may still coincide with some degree of institutional trust (in e.g. police), yet the latter has little beneficial effect without the former. Adopting the latter perspective, we posit that both forms of trust reinforce each other, curbing corruption.

First, bonding is not a sufficient condition of effective cooperation without corruption; when it is not combined with wider trust, it 'may lock people into localized communities preventing them from opening up to wider perspectives' (Nooteboom, 2007: 31; similarly, Newton & Zmerli, 2011, and again: Banfield, 1958). More than that: negative externalities of bonding trust may arise when institutional trust is weak, and people take the option of engaging in corruptive behaviour with others they know well. Members of a group may use their ties as a means of pursuing narrow interests and lobbying against the interests of other groups for preferential administrative decisions that impose disproportionate external costs on those excluded, increasing distrust and enforcing distance between people (Sabatini, 2008; Malecki, 2012). Although the ability of groups and communities to articulate their interests is likely to be an important restraint on government, it also provides them with a way of capturing private benefits at the expense of wider society (Olson, 1982). All these processes operate at the regional and local level as much as at the national level and include bribery.

Second, distrust of institutions may undermine the trust between individuals and keep the groups based on bonding trust very narrow, leading to a vicious cycle of distrust and individuals being unwilling to cooperate for the common good to break corruptive practices ('amoral familism' in Banfield, 1958). In societies, where public officials are perceived as being partial and untrustworthy, individuals infer not only that formal government institutions cannot be trusted, but also that most other people cannot be trusted either, and so to survive in such a society, an individual will have to take part in corrupt practices, pursuing his own self-interest and/or falling back on the bonding trust that is typically limited to his/her own family. If self-interest and opportunism is the dominant factor in determining the behaviour of individuals outside family, it would be impossible to solve the problem of corruption, since individuals would always fall for the temptation to free-ride. This leads to the situation of 'social trap', similar to the prisoners' dilemma. And collectively, people would be worse off when abstaining from cooperating with others because of the lack of trust (Rothstein & Uslaner, 2005).

Consequently, a strong complementarity between various sources of reliability in institutions and in community is essential for developing beneficial cooperation between individuals, particularly in matters related to a collective response to corruption. Accordingly, we formulate our last hypothesis.

Hypothesis 3: An interplay between bridging and bonding types of trust is likely to further reduce the incidence of corruption in larger cities.

METHODOLOGY AND DATA

Data and methodology

To test our hypotheses, we employ data on individuals across localities in 35 countries, both advanced EU economies and transition countries, from the EBRD Life in Transition Survey 2010 (LiTS). We face a selection bias where the incidence of bribery (corruption) can only be observed for individuals that have had contact with government officials. We utilize the Heckman selection probit model (in the multilevel setting) to address this selection bias problem, specifying two equations: (1) the selection, predicting the determinants of contact with officials, and (2) the outcome, determining the incidence of bribery. As part of our identification strategy we argue that contact with government officials is determined by occupational categories in that business owners and the self-employed encounter it more often (Aidt, 2009). This is unlikely to be the case for those employed for wages or the unemployed (see Appendix A).

The formal Heckman selection model's equations can be denoted as follows. Outcome equation:

$$y_{1i} = x_i'\beta + u \quad (1)$$

Here, it is assumed that y_i is observed only if an unobserved latent variable exceeds a particular threshold, which leads to the selection equation:

$$y_{2i}^{*} = w_i'\alpha + e_i \quad (2)$$

$$y_{2i} = \begin{cases} 1 \text{ if } y_j^{*} > 0 \\ 0 \text{ if } y_j^{*} \leq 0 \end{cases}$$

Due to the nature of our variables, we use a bivariate probit model with selection, where we have two probit models with correlated error terms. We have two independent binary outcome variables: y_j, where *j*=1, 2. These represent two interrelated decisions by the same actor (to contact an official, to bribe). Therefore, in the following model:

$$y_1^{*} = x_1\beta_1 + \epsilon_1$$

$$y_2^{*} = x_2\beta_2 + \epsilon_2$$

y_j^{*} is unobservable and related to the binary dependent variable y_j by the following rule:

$$y_j = \begin{cases} 1 \; if \; y_j^{*} > 0 \\ 0 \; if \; y_j^{*} \leq 0 \end{cases}$$

If the standard errors of the two probit models are uncorrelated, the models can be estimated separately. However, in our case the errors are related in the following way:

$$\epsilon_{1i} = \eta_{1i} + u_{1i}$$

$$\epsilon_{2i} = \eta_{1i} + u_{2i}$$

Therefore, the errors in each model consist of the unique part u_i and the part that is common to both η_{1i} making the error terms related to each other. We have complicated the model further by introducing a multilevel framework whereby individuals represent level 1 and the Primary Survey Unit (PSU) regional areas represent level 2. This is in the spirit of multilevel modelling, because the sampling technique employed in LiTS is 2-stage; first, 50 PSUs are selected in each country and then approximately 20 households from each PSU. Because of the hierarchical design of the survey, individuals are not randomly distributed across and within countries; rather, individuals living in the same neighbourhoods are more likely to exhibit similar characteristics or patterns of behaviour. Failure to account for the structure of the data may lead to unreliable coefficients and error terms. A multilevel approach has increasingly been utilized across different discipline areas, including regional

studies (Chasco & Gallo, 2013). To best account for the multi-level structure of our data we use the STATA module to implement conditional mixed process estimator (CMP) devised by Roodman (2018). A two-level (individuals; PSUs) model for individual *i* in area *g* is specified as:

$$\Pr(Y_{1gi} = 1 | X_{1g}, U_{1g}, V_{1gi}) = X_{1gi}\beta + U_{1g} + V_{1gi}$$

Y_{1gi} is only observed if $Y_{2gi} = 1$

$$\Pr(Y_{2gi} = 1 | X_{2g}, U_{2g}, V_{2gi}) = X_{2gi}\alpha + U_{2g} + V_{2gi}$$

We assume that in both equations, $U_g = (U_{1g,}U_{2g})$ follows a bivariate normal random variable with a mean 0 and standard deviations (τ_1 , τ_2), and a correlation coefficient $\theta, g = 1, \dots, G$, where G is the number of PSU clusters. θ is therefore the PSU level coefficient. $V_{gi} = (V_{1gi,}V_{2gi})$ is also assumed to be a zero-mean bivariate normal variable with standard deviation (σ_1 , σ_2) and an individual level correlation coefficient ρ. Thus, our baseline selection and outcome equations can be written as follows:

$$\begin{aligned} Contact\_with\_officials_{ij} &= \alpha_{0j} + \alpha_{1j} employed\_for\_wages_{ij} + \alpha_2 psu\_employed\_for\_wages_j \\ &+ \alpha_{3j} self\_employed_{ij} + \alpha_4 psu\_self\_employed_j + \alpha_{5j} business\_owner_{ij} \\ &+ \alpha_6 psu\_business\_owner_j + \alpha_{7j} technological\_access_{ij} \\ &+ \alpha_8 psu\_technological\_access_j + \alpha_{9j} LN\_city\_size_{ij} + + \alpha_{10j} capital_{ij} \\ &+ \alpha_{11} psu\ bridging\ trust_j + \alpha_{12} psu\ bonding\ trust_j + \alpha_{13j} consumption_{ij} \\ &+ \alpha_{14} psu\_consumption_j + \alpha_{15j} gender_{ij} + \alpha_{16} psu\_gender_j + \alpha_{17j} age_{ij} \\ &+ \alpha_{18j} age\_squared_{ij} + \alpha_{19} psu\_age_j + \alpha_{20j} higher\_education_{ij} \\ &+ \alpha_{21} psu\_higher\_education_j + e_{ij} + g_j \end{aligned}$$

$$Experience\_of\_corruption_{ij}$$

$$= \beta_{0j} + \beta_{1j} technological\_access_{ij} + \beta_2 psu\_technological\_access_j$$

$$+ \beta_{3j} LN\_city\_size_{ij} + \beta_{4j} capital_{ij} + \beta_5 psu\ bridging\ trust_j$$

$$+ \beta_6 psu\ bonding\ trust_j + \beta_{7j} consumption_{ij} + \beta_8 psu\_consumption_j + \beta_{9j} gender_{ij}$$

$$+ \beta_{10} psu\_gender_j + \beta_{11j} age_{ij} + \beta_{12j} age\_squared_{ij} + \beta_{13} psu\_age_j$$

$$+ \beta_{14j} higher\_education_{ij} + \beta_{15} psu\_higher\_education_j + u_{ij} + v_j$$

In the model, alongside all our independent individual-level variables, we include means calculated at the PSU level to allow for peer-group effects. Please note that that this also makes adding similar effects at country level spurious, as each country set of PSU effects is perfectly multicollinear with a country effect.

Robustness checks

While we expect meso-level bonding and bridging trust to affect corruption, still we cannot, in light of the earlier discussion of the reciprocal nature of corruption and trust, rule out that causality may run in the opposite direction. Therefore, we employ the control function estimator approach where we first estimate the model of endogenous regressors as a function of instruments, like the 'first stage' of 2SLS (the results are available upon request), and then we use the errors from this model as additional regressors in the main models estimating the incidence of corruption (Wooldridge, 2015).

Consequently, at the first stage we separately instrument both ***bridging*** and ***bonding*** trust variables. We use the PSU-averaged level of the urban born residents (LiTS Q707c 'Where were you born: urban/rural location?') to instrument the ***bridging trust***; this is consistent with the logic of Sørensen (2016). To instrument ***bonding trust*** we utilize the PSU prevalence rate of permanent residents (based on Q705, answer option 'Lived here for my whole life'). All selected instruments are correlated with the respective social institutional structures but do not empirically matter for explaining the incidence of corruption. The predicted residuals that enter the second stage of the

Heckman probit regressions to determine the incidence of corruption are insignificant. That validates the choice of instruments.

Becker et al. (2009) argue that corruption tends to spill across national borders into neighbouring countries; motivated by this, we also considered the spatial contagion of corruption. Unfortunately, for a number of our locations we do not have data on neighbours; this precludes the use of spatial econometric techniques. Instead, we have considered controlling for the distance to capital city calculated based on the longitude and latitude of the locations. Our results remain robust to the introduction of this control. The latter appears to be statistically insignificant across all outcome equations[iii].

Dependent variable

The survey data from EBRD LiTS we use includes unique self-reported information about the actual incidence of bribery. Following the estimation method we just discussed, our dependent variable is constructed as twofold:

(1) the selection equation dependent variable denotes contact with government bureaucracy for obtaining documents, licenses etc. The variable is based on the following LiTS question: 'During the past 12 months have you or any member of your household requested official documents (e.g. passport, visa, birth or marriage certificate, land register, etc.) from authorities?'

(2) The outcome equation dependent variable denotes the incidence of bribery, or petty/administrative corruption, and it is based on the following LiTS question: 'During the past 12 months have you or any member made an unofficial payment or gift when using these services over the past 12 months?' (for cross-country data see Appendix B).

Independent variables

The key explanatory variables relate to our hypotheses on the impact of city size and type, and on *bonding* and *institutional* trust. The city size, which was not originally identified in the LiTS survey, has been manually added, based on the city names and regions provided in the dataset. After collecting and cleaning the data, we transformed city size variable into natural logarithmic to get the distribution of city size data closer to normal. We have also included a dummy denoting a capital city.

The trust variables *Community trust (bonding)* and *Institutional trust (bridging)* are constructed based on the EBRD LiTS data. The *Community* variable is defined based on the LiTS survey question 'To what extent do you trust friends and acquaintances', aggregated to a PSU-level. The *Institutional trust* variable is defined based on the question 'To what extent do you trust the following institutions: (a) The Presidency; (b) The Government/Cabinet Ministers; (c) regional Government; (d) local Government; (e) the Parliament; (f) Courts; (g) Political Parties; (h) Armed Forces; (i) The Police. The scale of all these questions is constructed (with Cronbach Alpha reliability test statistic equal to 0.91), and the variable is again aggregated to the PSU-level.

Control variables

We have used several standard control variables that have been previously used by Hunt (2004) and Mocan (2008). These include individual level as well as PSU averages to control for the neighbourhood effect.

The list of controls starts with the measure of consumption. LiTS provides consumption figures in local currency for: a) food, beverage and tobacco; b) utilities (electricity, water, gas, heating, fixed line phone); and c) transportation (public transportation, car fuel). The expenditure for all categories has been added up and converted into dollars at the average 2010 rate. The reasoning behind the use of a consumption measure is that people who are more affluent are more likely to bribe, both because they have resources to do it, and because they may be targeted by corrupt officials. We also use a mean consumption indicator at the PSU-level to capture the level of socio-economic

development of the local economy, likely to correlate with corruption. Capital cities tend to be much richer than the rest of the country, especially in transition and developing economies, and controlling for the level of development will help us to isolate the effect of capital city.

Gender and age were also added as it has been confirmed in the literature that females, as well as young and old people, tend to bribe or be asked for a bribe less (Hunt 2004; Mocan 2008; Wängnerud 2009). Hunt (2004) further argued that older people are more likely to have more extensive networks and are therefore able to rely on these to get things done rather than having to resort to bribery. We have also included level of education both at the individual and the PSU level. Areas with higher concentration of educated middle class are likely to exhibit lower levels of corruption.

We expect corruption to be negatively associated with access to technology due to an increase in information transparency; improvement in government accountability with information and communication technology enables easier tracking of the decisions and actions of the officials, wider use of e-government (Andersen, 2009; Goel et al., 2012), and facilitating civil society (Kossow & Kukutschka, 2017). The household roster of the LiTS survey asks household heads questions about ownership and access to particular items that are often subsequently used in the wealth indices. These include: a car, bank account, computer, secondary residence, mobile phone, access to internet etc. Out of those, we have selected three items that we believe reflect the level of access to technology in each household. These are: ownership of a computer, a mobile phone, and access to the internet. We have then created a scale that includes these. The Cronbach-Alpha test confirmed the scale reliability to be 0.74. We have also included PSU-level averages of the index, to account for the neighbourhood effect. We would expect that even if an individual scores low on the scale but lives in a neighbourhood that scores high, he/she will still benefit, being likely to have easier access to technology through family, friends and neighbours.

Finally, we also include variables related to the occupational categories for the selection equation. These are differentiated thus: paid employees; the self-employed who are, in essence, sole traders; and business owners who employ at least one person who is not a family member. Appendix C presents a summary of all variables used in this study.

EMPIRICAL RESULTS

Models without accounting for potential endogeneity

Appendix D (Table D1) reports the results of a base Model 1, excluding PSU-averaged peer-group effects for higher education, consumption, and access to technology, and next Model 2, allowing for the latter effects. We use these two models to test our Hypotheses 1a and 1b on the differences in the effects between larger and capital cities. Model 2 is a more demanding test; corruption is likely to be lower in areas with higher socio-economic development and higher concentration of educated middle class, which are also more frequently found in capital cities. Besides, capital cities exhibit higher level of accountability via individuals' better access to internet (Campante & Do, 2014). Model 2 allows us to shed some light on the extent to which city size and capital city effects differ from each other, possibly as a result of the variation in accountability mechanisms and effectiveness of administrative structures, as already argued.

In each model, both the first stage selection equation and the second stage equation are reported. The results from the selection equations suggest that some individuals, business owners in particular, are more likely to be in contact with government administration. Contact with government bureaucracy is also more likely in capital cities but less likely in other large cities.

The results reported in Model 1 (Appendix D, Table D1) for outcome equations clearly show that the probability of corruption is higher in larger cities (Hypothesis 1a), whilst, as expected, we find that capital cities are different from larger cities in that they seem to exhibit lower corruption levels of officials (Hypothesis 1b).

Next, when controlling for PSU-averaged level of education, wealth and access to internet in Model 2, we observe a reduction in significance of city size and capital city effect. Thus, these controls explain partly the variation in corruption in larger and capital cities.

Appendix E (Table E1) reports the interactive terms models to test hypotheses 2 and 3. Models 3 and 4 respectively report how the two types of trust, bridging (institutional) and bonding (community), moderate the effect of city size (Hypotheses 2a and 2b), and these equations include the interactive effect of trust with capital city dummy as well. Finally, Model 5 reports a joint effect of the two types of trust (Hypothesis 3). Appendix F presents the average marginal effects of city size and predictive margins of a capital city effect on the probability of corruption (Models 1-2), reporting also the average marginal effect of the city size conditional on the mean value of bridging (Model 3), bonding (Model 4), and bridging and bonding jointly (Model 5).

We also illustrate such marginal effects graphically, taking each type of trust at their different values of distribution (10^{th}, 30^{th}, 50^{th}, 70^{th}, 90^{th} centiles). First, in Figure 1a one can see that a one-percent change in city size in locations where institutional (bridging) trust is low (at the 10^{th} centile of distribution) leads to 0.014% change in the probability of corruption. Second, with increase in the institutional trust, we observe its positive moderating effect on reducing the probability of corruption for every unit of change in city size. That renders support for Hypothesis 2a. When institutional trust rises to the value corresponding to the 70^{th} centile of its distribution, one-percent increase in city size leads to proportionally smaller change in the probability of corruption (0.006%). When institutional trust is at its highest level (90% centile of distribution), the average marginal effect of city size on corruption is the smallest and statistically insignificant.

[FIGURE 1a]

Similarly, Figure 1b provides support for Hypothesis 2b. We observe a decrease in the probability of corruption from 0.012% for a unit change in city size at the level of bonding trust being at its lowest (10^{th} centile) to 0.005% when bonding trust is at the 70^{th} centile of its distribution.

[FIGURE 1b]

Finally, in Model 5 we show that it is the combination of both bonding (community trust) and bridging (institutional trust) that has the most significant corruption-alleviating effect, in line with Hypothesis 3. Our results suggest that where bonding and bridging are both present, their moderating effect on the impact of city size on corruption is reinforced (see Figure 1c). The average marginal effects of city size are statistically significant for all values of each type of trust except for the top 90th centile of distribution.

[FIGURE 1c]

Table 1 also reports the predictive margins of corruption for various combinations of bridging and bonding trust (based on Model 5, Appendix E, Table E1), providing further support for our results on the reinforcing joint effect of both types of trust reducing corruption in larger cities. These results should be read in pairs (e.g. the combinations of bridging and bonding trust, MH-L and MH-H etc.). One can see that for larger cities (70th centile of distribution) there is a significant reduction of the probability of corruption from the value of 0.071 per cent where bridging trust is fairly high (70th centile of distribution) but bonding is low (10th centile of distribution) to the value of 0.024 per cent where both bridging and bonding are fairly high (70 and 90th centile of their distributions respectively).

[TABLE 1]

Finally, in addition to our main set of results, we find that in neighbourhoods where individuals have, on average, higher access to elements of information and communication technology, the corruption of officials is significantly lower.

Models that account for potential endogeneity

The robustness checks to account for potential endogeneity are reported in Appendix G. All three models provide clear support for Hypotheses 1a and 1b. Next, results from Models 6 and 7 are

in line with those in Models 3 and 4, giving us some support for the effect of bridging trust in alleviating corruption in large cities (confirming Hypothesis 2a), but showing a weaker effect of bonding trust in large cities (Hypothesis 2b), as evidenced by the average marginal effects reported in Appendix H.

Figures I2a and I2b (Appendix I) plot the average marginal effects of city size for different values of distribution of both types of trust. This enables us to see how the strength of the effects varies with the range of trust in each type of city. From Figure I2b we can clearly see that the average marginal effect of bonding is only statistically significant for the median value of bonding through to the 70th centile of its distribution (see Figure I2b, Appendix I).

We now turn to the discussion of the interactive effect between the *bridging* and *bonding* types of trust (Hypothesis 3, Figure I2c). After addressing a possible endogeneity bias, the average marginal effect of the interplay between the two types of trust becomes weaker, though this masks some interesting patterns that become clear once we look at the effects alongside the distribution of the trust variables (see Appendix I, Figure I2c). Interestingly, we observe both: some substituting effect by bonding when bridging is low (10th centile of distribution), and complementarity effect from bonding when the level of bridging increases up to the 70th centile of its distribution. This clearly shows the reinforcing effect of two types of trust, where one type of social trust supports another, provided both are at a level high enough to make a difference.

DISCUSSION AND CONCLUSIONS

Within the context of QoG research, Charron (2013b) demonstrates that it is especially the incidence of corruption which exhibits strong within-country heterogeneity; thus, it is a regional phenomenon, and we therefore expect to see variation in corruptive practices across cities as well. In this study, using LiTS data for 2010, we argue that meso-level, regional factors play at least as

important a role as do individual-level and nation-wide factors in explaining differences in corruption. More specifically, we show that the incidence of bribery largely depends on the size and type of agglomeration. While the results of our multi-level study suggest that larger cities are more prone to bribery, we find that capital cities are different in this respect, exhibiting lower corruption levels. We explain such differences in terms of stronger social and political structures, and government accountability mechanisms that work to reduce corruption in capital cities as opposed to other large-sized cities. Capital cities are typically less fragmented, even if they have bigger, more internally heterogenous jurisdictions. This makes the administration more transparent and effective. Furthermore, there is a higher level of government accountability and control in capital cities, due to greater visibility and media coverage (Borcan, 2013).

Knowledge and interactive learning embedded in social contacts and relationships is regionally embedded and tends to evolve in meso-scale structures of local communities (Ostrom, 2005). Until recently, much of the institutional discussion at the level of locality focused on the alternative advantages of bonding (community) versus bridging (society). However, building on Rodríguez-Pose & Storper (2006) and Storper (2013) we develop a theoretical argument on the importance of the interplay between both of these social institutional structures. We posit that the interplay between bonding and institutional trust matters for corruption, and our results support and extend the insights of earlier research.

The line of theorizing on trust that we build upon is that of Banfield (1958). While Newton and Zmerli (2011) argue that bridging trust extends bonding trust, we allow for a possibility where there is no bonding trust ('amoral familism' in Banfield, 1958), even if some elements of institutional trust are present; that is they can be seen to some extent independently, not as a hierarchy. This may be interpreted as consistent with our argument and findings, because it makes the interplay between the two types of trust meaningful. Bridging trust plays an important role by reinforcing the role of bonding trust in the community, promoting cooperation and reduces opportunism on the part of

individuals. In other words, bridging trust prevents 'social trap' or the locking-in of individuals within their kinship and friendship relationships, which in the absence of adequate institutional frameworks are likely to evolve into Olson-type rent-seeking ties (Olson, 1982; Knack & Kniffer, 1997). In complementing bonding trust, institutional trust widens the basis for cooperation, therefore creating capacity in the local communities for resisting the reciprocity between corruption and trust.

Finally, we need to declare the limitations of our research. We do not have the temporal structure to apply panel methods. Also, from the regional science perspective, it would be very interesting to look at the spatial spillover effects, yet as signalled, our data would not allow us to evaluate those. Furthermore, our focus has been on the interplay between informal institutions, yet that needs to be complemented both by insights from political science and from regional policy analyses. The role of political ideology and party affiliation has been successfully applied to explain aspects of administrative behaviour (e.g. Solé-Ollé & Viladecans-Marsal, 2013), and could be applied to the question of corrupt practices. Furthermore, regional policy analyses of anticorruption strategies could build on our tentative results, and take the role of strengthening local trust seriously. This conclusion should not come as a surprise to anybody who read Jacobs (1961) and accepts that the key objective of regional and city planning should be to enhance societal linkages, building both strong communities and robust societies.

Notes:

[i] https://www.transparency.org/what-is-corruption#define

[ii] We follow Rodriguez-Pose & Storper (2006) in considering institutional trust and generalised trust as closely related, mutually dependent phenomena, focusing on the former. Similar to them, Guiso et al. (2010) emphasise trust as a key component of 'civic capital'. An alternative view is represented by Newton & Zmerli (2011) who see bonding trust as a necessary but not sufficient condition of generalized trust, and the latter as a prerequisite of institutional trust.

[iii] These results are available upon request from the authors.

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Figure 1a: The marginal effect of city size conditional on institutional trust (bridging) on corruption with 95% confidence intervals

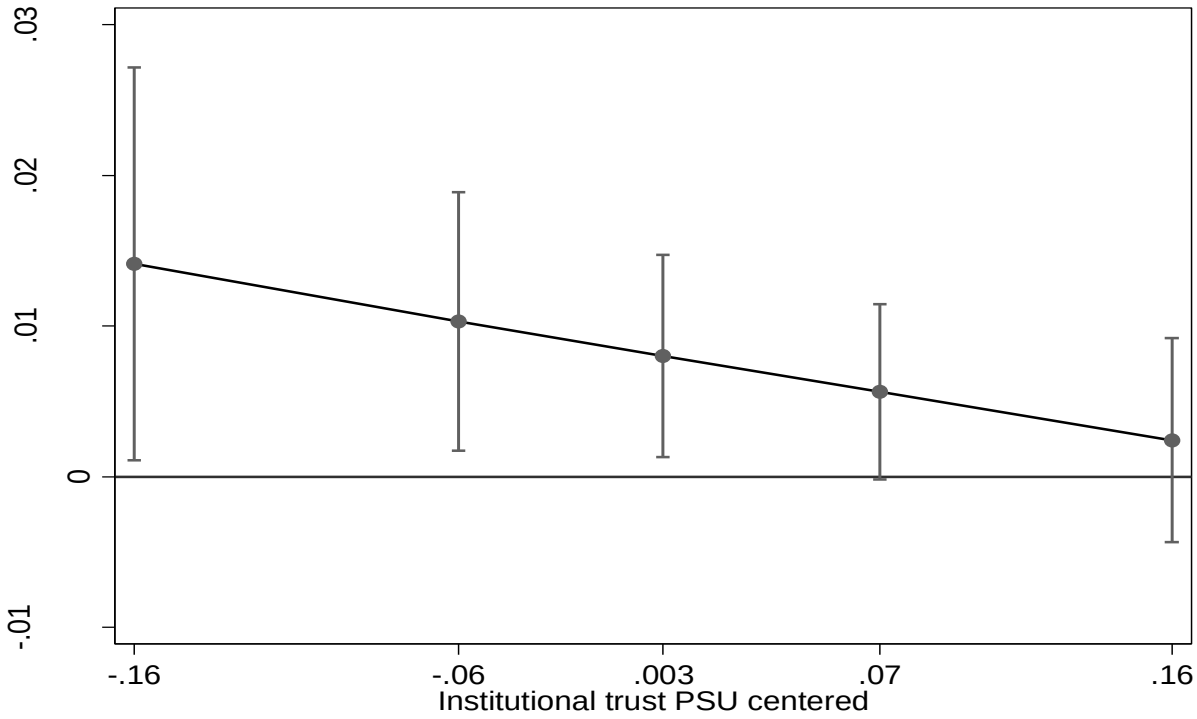


Figure 1b: The marginal effect of city size conditional on trust in friends (bonding) on corruption with 95% confidence intervals

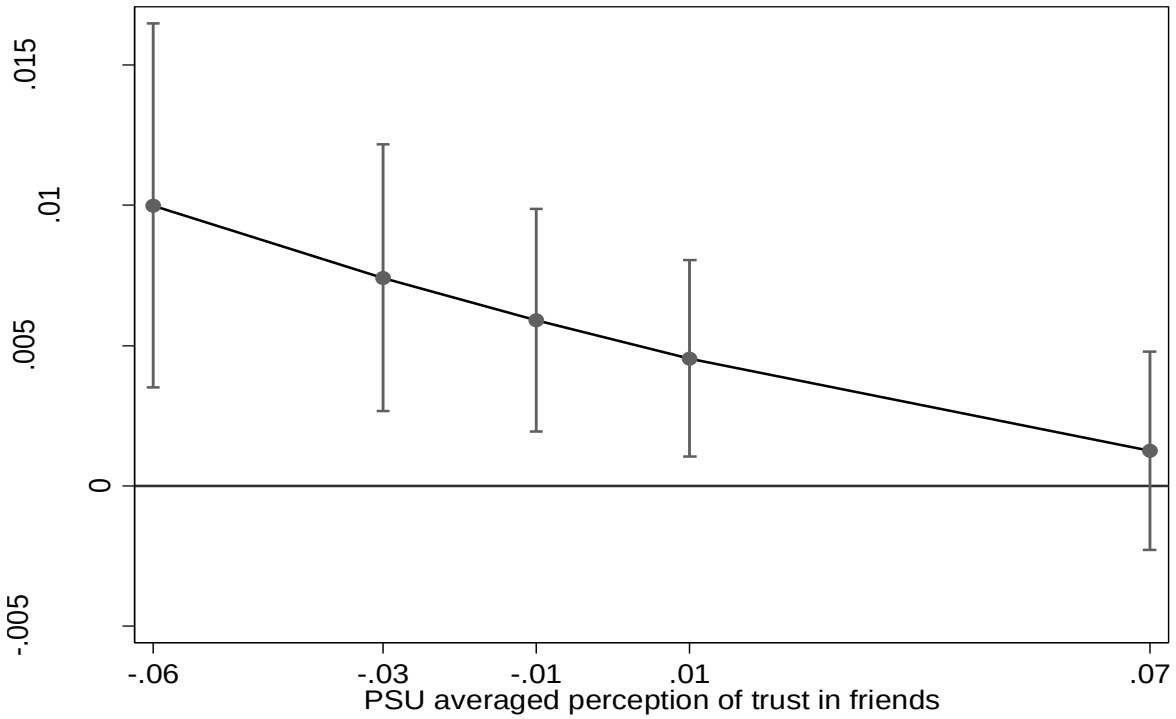


Figure 1c: The marginal effect of city size conditional on bridging-bonding trust jointly on corruption with 95% confidence intervals

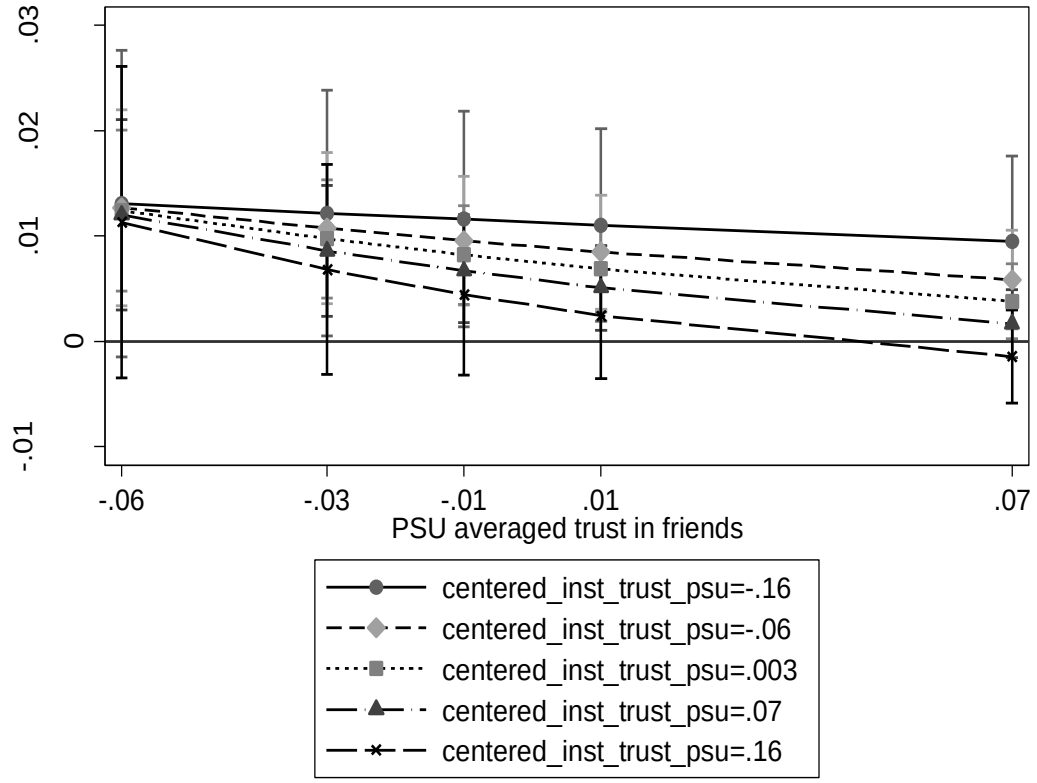


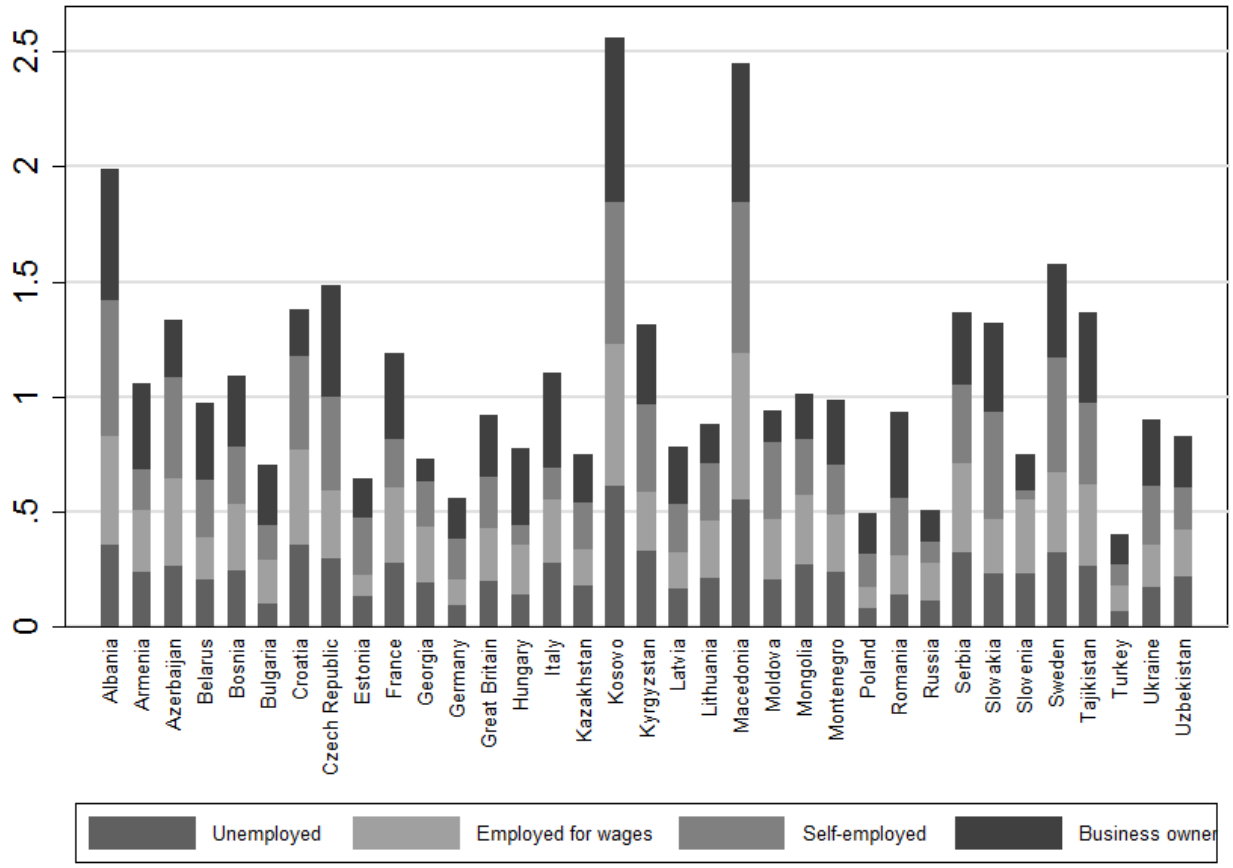
Table 1. Summary of margins of interactions results, Model 5, Appendix 5

City size distribution	Marginal effects of various combinations of bridging & bonding trust							
	L-L	L-H	ML-L	ML-H	M-L	M-H	MH-L	MH-H
10th centile	.01 (.006)	0.003 (0.003)	0.014** (0.006)	0.006 0.004	0.017*** (0.005)	0.015*** (0.004)	0.022*** (0.007)	0.016** (0.007)
30th centile	0.024*** (0.007)	0.009* (0.005)	0.030*** (0.006)	0.0129** (0.005)	0.035*** (0.007)	0.029*** (0.005)	0.04*** (0.008)	0.019*** (0.006)
50th centile	0.04*** (0.011)	0.017*** (0.007)	0.046*** (0.009)	0.018*** (0.006)	0.051*** (0.009)	0.041*** (0.007)	0.056*** (0.011)	0.020*** (0.006)
70 centile	0.06*** (0.019)	0.030*** (0.009)	0.063*** (0.014)	0.027*** (0.007)	0.067*** (0.014)	0.054*** (0.01)	0.071*** (0.016)	0.024*** (0.006)
90 centile	0.10** (0.048)	0.064** (0.025)	0.103*** (0.031)	0.045*** (0.014)	0.11*** (0.026)	0.08*** (0.019)	0.106*** (0.031)	0.028*** (0.009)

Note: L -10th centile; ML- 30th centile; M-50th centile; MH- 70th centile; H -90th centile. Left-hand side letter notations denote the distribution of 'bridging' trust, and right-hand side notations denote 'bonding' trust: for example, M-H means 'bridging' trust is taken at the median, whereas 'bonding' trust is taken at the 90th centile of the distribution. Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.10. Ln city size, bridging and bonding trust variables are centered.

Appendix A

Table A1: Contact with government bureaucracy by employment category in percentages



Source: EBRD LiTS 2010, authors' calculations.

Appendix B

Table B1: Incidence of corruption by country and occupational status

	Incidence of corruption (% of the occupational category)			
Country	**Unemployed**	**Employed**	**Self-employed**	**Business owner**
Albania	39.60	34.09	36.17	47.83
Armenia	12.40	3.28	0.00	66.67
Azerbaijan	67.09	62.24	52.94	60.00
Belarus	5.88	5.94	0.00	25.00
Bosnia and Herzegovina	7.25	3.70	25.00	0.00
Bulgaria	0.00	4.41	0.00	16.67
Croatia	0.79	2.27	0.00	0.00
Czech Republic	5.88	4.24	2.94	0.00
Estonia	4.76	2.94	0.00	0.00
France	2.56	2.63	20.00	0.00
Georgia	2.33	0.00	0.00	0.00
Germany	15.00	11.29	16.67	50.00
Great Britain	8.89	4.72	0.00	0.00
Hungary	0.00	0.00	0.00	11.11
Italy	1.02	0.00	0.00	0.00
Kazakhstan	20.31	31.51	0.00	33.33
Kosovo	5.01	6.45	8.33	0.00
Kyrgyzstan	72.81	46.00	90.48	66.67
Latvia	6.52	5.88	0.00	0.00
Lithuania	7.94	6.98	33.33	0.00
Macedonia	8.97	5.46	0.00	11.76
Moldova	24.14	18.39	33.33	66.67
Mongolia	21.77	21.33	17.39	14.29
Montenegro	10.23	13.64	40.00	16.67
Poland	2.27	3.70	0.00	22.22
Romania	12.73	7.27	16.67	33.33
Russia	6.12	8.96	0.00	20.00
Serbia	7.41	13.55	10.00	7.14
Slovakia	9.38	5.88	3.70	0.00
Slovenia	8.33	1.63	0.00	0.00
Sweden	1.72	0.54	0.00	0.00
Tajikistan	46.88	44.23	41.38	33.33
Turkey	4.76	0.00	0.00	0.00
Ukraine	25.27	37.84	0.00	61.90
Uzbekistan	42.77	37.35	61.54	35.71
Mean	**14.82**	**13.10**	**14.57**	**20.01**

Appendix C

Table C1: Definitions of the variables and descriptive statistics

Variable	LiTS question	Obs.	Mean	Std. Dev.	Min	Max
Dependent						
Contact with government bureaucracy	Q6.02: During the past 12 months have you or any member of your household used these services: request official documents (e.g. passport, visa, birth or marriage certificate, land register, etc.?) from authorities? (=1 if answered 'yes', =0 otherwise)	38118	0.232	0.422	0	1
Corruption	Q6.04: During the past 12 months have you or any household member made an unofficial payment or gift when using these services? (=1 if answered 'yes', =0 otherwise)	8560	0.166	0.372	0	1
Independent						
Employed for wages	Q5.08: In this job, did you work…? 1) For wages; 2) As self-employed; 3) As independent farmer (= 1 if first answer, =0 otherwise)	32133	0.436	0.496	0	1
Employed for wages (PSU mean)		38709	0.435	0.079	0	1
Self-employed	Q5.08: In this job, did you work…? 1) For wages; 2) As self-employed; 3) As independent farmer Q5.13: How many people do you employ, excluding any household members? (= 1 if first answer to Q5.08 & zero employees reported to Q5.13, and =0 otherwise)	32133	0.043	0.203	0	1
Self-employed (PSU mean)		38709	0.043	0.024	0	0.5
Business owner	Q5.08: In this job, did you work…? 1) For wages; 2) As self-employed; 3) As independent farmer Q5.13: How many people do you employ, excluding any household members? (= 1 if first answer to Q5.08 & more than zero employees reported to Q5.13, and =0 otherwise)	32133	0.035	0.185	0	1

Business owner (PSU mean)		38709	0.036	0.020	0	0.25
Technological access	Q2.25: Do you or anyone in your household own any of the following? mobile phone; computer; access to Internet at home. (A scale of all three questions is constructed)	38705	0.599	0.371	0	1
Technological access (PSU mean)	Averaged at PSU level	38709	0.599	0.085	0.33	1
LN city size	Population based on data in Wikipedia	38399	10.6	2.5	2.83	16.5
Capital	Capital city	38709	0.136	0.343	0	1
Institutional trust (Society) (PSU mean)	Q3.03: To what extent do you trust the following institutions… (a) The Presidency; (b) The Government/Cabinet Ministers; (c) Regional Government; (d) Local Government; (e) The Parliament; (f) Courts; (g) Political Parties; (h) Armed Forces; (i) The Police (A scale of all these questions is constructed, and the variable is aggregated to the PSU-level)	38709	2.93	.15	1.69	3.81
Bonding trust (Community) (PSU mean)	Q3.04: To what extent do you trust friends and acquaintances (=1 ‘complete distrust’ thought to 5=’complete trust’), aggregated to a psu-level.	38709	0.79	0.06	.43	1
Controls						
Consumption	Q2.22: Approximately how much does your household spend on each of these items per month: Food, beverage, tobacco; Utilities; Transportation (added together)	32647	2627	10442	0	181818
Consumption (PSU mean)	Consumption variable aggregated to a psu-level	38709	2816	1771	221	12034
Gender	Q1.02: Gender of each member of the family (=1 if ‘female’, and 0=‘male’	38665	0.604	0.489	0	1
Gender (PSU mean)	Gender variable aggregated to a psu-level	38709	0.604	0.046	0	1
Age	Q1.04: How old was … at the last birthday?	38697	45.870	17.374	16	99
Age squared	Age variable squared	38697	2406	1712	256	9801
Age (PSU mean)	Age variable aggregated to a psu-level	38709	45.889	2.394	22.75	64.714
Higher Education	Q5.15: What is the highest level of education you already completed?	38699	0.202	0.402	0	1

Higher education (PSU mean)	Higher education variable aggregated to a psu-level	38709	0.202	0.0507	0	1

Appendix D
Table D1: City size, residing in capital city and trust: core regression results

Variables	Model 1		Model 2	
	Corruption	Contact with government	Corruption	Contact with government
Employed for wages	-	-0.0225 (0.0324)	-	-0.0230 (0.0323)
Employed for wages (PSU mean)	-	-0.742** (0.333)	-	-0.381 (0.411)
Self-employed	-	0.0429 (0.0553)	-	0.0416 (0.0552)
Self-employed (PSU mean)	-	-0.163 (0.639)	-	0.306 (0.696)
Business owner	-	0.181*** (0.0578)	-	0.179*** (0.0577)
Business owner (PSU mean)	-	-0.681 (0.797)	-	-0.499 (0.809)
LN city size	0.0996*** (0.0248)	-0.0383*** (0.00944)	0.0926*** (0.0263)	-0.0388*** (0.00958)
Capital city	-0.442*** (0.153)	0.248*** (0.0891)	-0.450** (0.180)	0.224*** (0.0696)
Institutional trust (PSU mean)	0.291 (0.373)	-0.0250 (0.135)	0.158 (0.389)	-0.0699 (0.137)
Trust in friends (PSU mean)	-4.080*** (0.849)	-0.151 (0.389)	-2.155* (1.193)	0.254 (0.434)
Control variables				
Technological access	-0.718*** (.0986)	0.398*** (0.0446)	-0.691*** (0.101)	0.405*** (0.0448)
Technological access (PSU mean)	-	-	-2.107*** (0.798)	-0.569* (0.309)
Consumption	-3.94e-06	6.52e-06*** (1.51e-06)	-1.61e-06 (3.96e-06)	6.97e-06*** (1.53e-06)
Consumption (PSU mean)	-	-	5.00e-07 (3.14e-05)	-1.92e-05 (1.21e-05)
Gender	-0.0321 (0.0564)	-0.0231 (0.0243)	-0.0273 (0.0567)	-0.0226 (0.0242)
Gender (PSU mean)	0.898 (1.135)	0.0541 (0.415)	0.105 (1.244)	0.0429 (0.409)
Age	0.00810 (0.0100)	0.0120** (0.00581)	0.00737 (0.0102)	0.0121** (0.00581)
Age squared	-0.000186 (0.000113)	-0.000196*** (6.89e-05)	-0.000174 (0.000115)	-0.0002*** (6.89e-05)

Age (PSU mean)	-0.00765 (0.0219)	-0.0166* (0.00873)	-0.0196 (0.0261)	-0.0167* (0.00892)
Higher Education	-0.0187 (0.0673)	0.223*** (0.0286)	-0.00507 (0.0688)	0.216*** (0.0282)
Higher education (PSU mean)	-	-	0.434 (1.092)	0.540 (0.373)
Constant	-1.478 (1.159)	-0.0530 (0.500)	0.573 (1.521)	-0.0394 (0.517)
Level 2: PSU				
St dev (Corruption)	1.39*** (0.06)		1.49*** (0.08)	
St dev (Contact with government)	0.75*** (0.02)		0.75*** (0.02)	
Cross-eq correlation	0.127*** (0.06)		0.143*** (0.05)	
Level 1: Individuals				
Cross-eq correlation	-0.039 (0.055)		-0.02 (0.06)	
Observations	20504		20504	
Log Likelihood	-11553		-11540	
df	30		36	

Appendix E

Table E1: City size, residing in capital city and trust: interaction regression results

Variables	Model 3		Model 4		Model 5	
	Corruption	Contact with government	Corruption	Contact with government	Corruption	Contact with government
Employed for wages	-	-0.022 (0.032)		-0.022 (0.032)		-0.0223 (0.0324)
Employed for wages (PSU mean)	-	-0.309 (0.408)		-0.342 (0.409)		-0.340 (0.410)
Self-employed	-	0.045 (0.055)		0.0454 (0.0552)		0.0442 (0.0553)
Self-employed (PSU mean)	-	.346 (0.693)		0.299 (0.694)		0.191 (0.699)
Business owner	-	0.182*** (0.058)		0.183*** (0.0577)		0.182*** (0.0578)
Business owner (PSU mean)	-	-0.422 (0.807)		-0.403 (0.813)		-0.264 (0.825)
LN city size	0.095*** (.034)	-0.039*** (.009)	0.076*** (0.0237)	-0.0395*** (0.0094)	0.109*** (0.0276)	-0.0387*** (0.00952)
Capital city	-0.578*** (.208)	0.246*** (.067)	-0.472*** (0.146)	0.251*** (0.0681)	-0.544*** (0.158)	0.258*** (0.0685)
Institutional trust (PSU mean)	0.114 (.391)	-0.051 (.145)	-	-	0.602 (0.460)	-0.0373 (0.162)
Trust in friends (PSU mean)	-	-	-2.045** (1.004)	0.307 (0.438)	-3.481*** (1.107)	0.336 (0.451)
Interaction results						
LN city size x Institutional trust (PSU)	-0.420* (0.251)	-0.169 (.064)	-	-	-0.408 (0.266)	-0.0267 (0.0738)
Capital city x Institutional trust (PSU)	0.339 (1.37)	0.015 (.490)	-	-	-0.0757 (1.496)	0.351 (0.565)
LN city size x Trust in friends (PSU)	- -	- -	-0.746** (0.318)	0.0709 (0.158)	-0.380 (0.337)	0.0927 (0.164)
Capital city x Trust in friends (PSU)	- -	- -	4.57 (2.881)	-0.235 (1.272)	4.709 (3.182)	-0.119 (1.278)
Institutional Trust x Trust in friends (PSU)	- -	- -	-	-	-3.151 (4.139)	-0.625 (1.360)
LN city size_x_Instit Trust_x_ Trust in friends (PSU)	-	-	-	-	-3.823 (2.499)	0.0929 (0.786)
Capital city_x_Instit Trust_x Trust in friends (PSU)	-	-	-	-	12.00 (19.37)	-7.061 (5.605)

Control variables						
Technological access	-0.8***	0.403***	-0.736***	0.403***	-0.721***	0.406***
	(.0.099)	(.045)	(0.0972)	(0.045)	(0.0974)	(0.0447)
Technological access (PSU mean)	-2.8***	-0.498*	-2.34***	-0.588*	-1.862**	-0.564*
	(.769)	(.281)	(0.75)	(0.309)	(0.759)	(0.312)
Consumption	-2.89e-06	6.8e-06***	-3.66e-06	6.8e-06***	-3.29e-06	6.8e-06***
	(4.8e-06)	(1.52e-06)	(4.49e-06)	(1.52e-06)	(4.64e-06)	(1.52e-06)
Consumption (PSU mean)	-.000	-0.000	-2.33e-05	-1.74e-05	-1.41e-05	-1.87e-05
	(.000)	(.000)	(3.00e-05)	(1.20e-05)	(3.12e-05)	(1.21e-05)
Gender	-0.049	-0.022	-0.0448	-0.0224	-0.0424	-0.0222
	(.057)	(.024)	(0.0564)	(0.0242)	(0.0560)	(0.0242)
Gender (PSU mean)	-.136	-0.066	0.566	-0.0116	0.509	0.00682
	(1.41)	(.402)	(1.034)	(0.405)	(1.042)	(0.406)
Age	0.011	0.012**	0.0106	0.0119**	0.00851	0.0120**
	(.010)	(.006)	(0.01)	(0.0058)	(0.0100)	(0.00580)
Age squared	-0.00**	-0.000***	-0.00022*	-0.0002***	-0.000192*	-0.0002***
	(.000)	(.000)	(0.00011)	(6.89e-05)	(0.000113)	(6.89e-05)
Age (PSU mean)	-0.037	-0.016*	-0.0151	-0.0181**	-0.0123	-0.0182**
	(.027)	(.008)	(0.0222)	(0.0087)	(0.0222)	(0.00887)
Higher Education	-0.024	0.218***	-0.0295	0.219***	-0.0186	0.219***
	(.069)	(.028)	(0.0692)	(0.0282)	(0.0677)	(0.0282)
Higher education (PSU mean)	1.27	0.588	1.052	0.637*	0.490	0.612*
	(1.16)	(.361)	(1.001)	(0.367)	(1.028)	(0.370)
Constant	2.0	-.092	0.319	0.0192	0.0354	0.00490
	(1.40)	(.494)	(1.357)	(0.511)	(1.335)	(0.517)
St dev (Corruption)	1.44*** (0.09)		1.48*** (0.07)		1.44*** (0.07)	
St dev (Contact with government)	0.75*** (0.02)		0.75*** (0.02)		0.75*** (0.02)	
Cross-eq correlation	0.09*(0.05)		0.08*(0.05)		0.108** (0.0499)	
Cross-eq correlation	-0.06 (0.05)		-0.06 (0.05)		-0.04(0.05)	
Observations	20504		20504		20504	
Log Likelihood	-11545		-11542		-11537	
df	38		38		50	

Appendix F

Table F1: Average marginal effects results (based on models in Appendices D and E)

Core Independent variables	Model 1 dy/dx	Model 2 dy/dx	Model 3 dy/dx	Model 4 dy/dx	Model 5 dy/dx
LN city size	0.008*** (0.002)	0.006*** (0.002)	.008** (.004)	.007*** (.002)	.009*** (.003)
Capital city=0	0.046*** (0.008)	0.035*** (0.008)			
Capital city=1	0.018*** (0.006)	0.013** (0.005)	-	-	-
LN city size conditional on Institutional trust (PSU)	-	-	.008** (0.003)	-	-
LN city size conditional on Trust in friends (PSU)	-	-	-	.006*** (.002)	-
LN city size conditional on Institutional Trust & Trust in friends (PSU)	-	-	-	-	0.008*** (0.002)

Note: Ln city size, bonding, and bridging trust variables are centered. The 'dy/dx' indicates the average marginal effect of the respective variable (i.e. margins of derivative) on the change in the probability of corruption. In case of interaction terms, this shows the marginal effect of city size conditional on a mean value of the respective trust variable. Note for models 1 and 2 we report the margins for capital city=0 and capital city=1.

Appendix G

Table G1: City size, residing in capital city and trust: robustness checks

Variables	Model 6		Model 7		Model 8	
	Corruption	Contact with government	Corruption	Contact with government	Corruption	Contact with government
Employed for wages	-	-0.0223 (0.0324)		-0.0222 (0.0324)		-0.0220 (0.0324)
Employed for wages (PSU mean)	-	-0.298 (0.415)		-0.344 (0.409)		-0.324 (0.417)
Self-employed	-	0.0440 (0.0553)		0.0455 (0.0552)		0.0433 (0.0553)
Self-employed (PSU mean)	-	0.189 (0.723)		0.278 (0.695)		-0.0163 (0.731)
Business owner	-	0.182*** (0.0577)		0.183*** (0.0577)		0.182*** (0.0578)
Business owner (PSU mean)	-	-0.435 (0.818)		-0.379 (0.811)		-0.219 (0.839)
Ln city size	0.0904*** (0.0330)	-0.0389*** (0.00947)	0.0793*** (0.0241)	-0.0385*** (0.00963)	0.119*** (0.0308)	-0.0371*** (0.00980)
Capital	-0.611*** (0.201)	0.247*** (0.0681)	-0.544*** (0.177)	0.234*** (0.0765)	-0.683*** (0.193)	0.237*** (0.0781)
Institutional Trust (PSU mean)	-4.096 (3.661)	1.050 (1.304)	-	-	-2.446 (3.151)	1.015 (1.311)
Trust in friends (PSU mean)		-	-13.17 (15.55)	-2.322 (5.488)	-22.68 (15.90)	-2.952 (5.747)

Interactive effects with trust variables						
Ln city size_x Institutional Trust	-0.351 (0.250)	-0.0143 (0.0649)	-	-	-0.453 (0.293)	-0.0223 (0.0752)
Capital city_x Institutional Trust	-0.157 (1.429)	0.0115 (0.494)	-	-	0.207 (1.584)	0.336 (0.576)
Ln city_size_x_ Trust in friends	-	-	-0.745** (0.317)	0.0700 (0.158)	-0.347 (0.340)	0.101 (0.165)
Capital city_x Trust in friends	-	-	4.369 (2.842)	-0.258 (1.266)	4.271 (3.269)	-0.135 (1.284)
Institutional Trust_ x_Trust in friends	-	-	-	-	-2.238 (4.462)	-0.804 (1.501)
Ln_city_size_x Institut. Trust_x Trust in friends	-	-	-	-	-4.050 (2.652)	-0.00833 (0.812)
Capital city_x Institut. Trust_x Trust in friends	-	-	-	-	9.059 (19.84)	-6.650 (5.765)
Fitted Residuals from Stage one (institution. trust)	4.323 (3.758)	-1.111 (1.313)	-	-	2.969 (3.173)	-1.059 (1.314)
Fitted Residuals from Stage one (trust in friends)	-	-	11.25 (15.68)	2.657 (5.526)	19.26 (15.87)	3.334 (5.801)
Technological access	-0.750*** (0.0986)	0.402*** (0.0449)	-0.735*** (0.0970)	0.403*** (0.0448)	-0.716*** (0.0972)	0.405*** (0.0448)
Technological access (PSU mean)	-1.892* (0.984)	-0.745* (0.383)	1.503 (5.387)	0.308 (1.889)	5.544 (5.546)	0.328 (1.999)
Consumption	-2.38e-06 (4.76e-06)	6.76e-06*** (1.52e-06)	-3.29e-06 (4.54e-06)	6.86e-06*** (1.54e-06)	-2.58e-06 (4.65e-06)	6.90e-06*** (1.54e-06)
Consumption (PSU mean)	-6.27e-05 (5.47e-05)	-6.62e-06 (1.84e-05)	-2.79e-05 (3.08e-05)	-1.85e-05 (1.22e-05)	-5.72e-05 (4.85e-05)	-9.17e-06 (1.86e-05)
Gender	-0.0480 (0.0565)	-0.0217 (0.0243)	-0.0436 (0.0565)	-0.0223 (0.0242)	-0.0409 (0.0561)	-0.0210 (0.0243)
Gender (PSU mean)	-0.926 (1.643)	0.133 (0.473)	-0.916 (2.311)	-0.391 (0.888)	-2.402 (2.371)	-0.281 (0.950)
Age	0.00751 (0.0105)	0.0126** (0.00586)	0.00903 (0.0102)	0.0115** (0.00585)	0.00440 (0.0104)	0.0123** (0.00591)
Age squared	-0.000185 (0.000117)	-0.000202*** (6.94e-05)	-0.000202* (0.0001)	-0.000191*** (6.92e-05)	-0.0002 (0.0001)	-0.000199*** (6.98e-05)
Age (PSU mean)	-0.00579 (0.0457)	-0.0256* (0.0154)	0.0507 (0.0937)	-0.00283 (0.0328)	0.125 (0.0989)	-0.00768 (0.0365)
Higher Education	-0.0196 (0.0688)	0.216*** (0.0283)	-0.0297 (0.0692)	0.219*** (0.0282)	-0.0160 (0.0679)	0.217*** (0.0282)

Higher education (PSU mean)	1.999 (1.261)	0.480 (0.401)	-0.680 (2.631)	0.224 (0.935)	-2.198 (2.687)	0.00290 (0.973)
Constant	0.540 (1.975)	0.340 (0.752)	-3.699 (5.717)	-0.888 (1.952)	-8.185 (5.964)	-0.742 (2.132)
Level 1						
St dev (Corruption)	1.44*** (0.081)		1.48*** (0.071)		1.44*** (0.074)	
St dev (Contact)	.752*** .022		.752*** .022		.752*** .022	
Cross-eq correlat.	0.0940* (0.0531)		0.0833* (0.0494)		0.108** (0.05)	
Level 2						
Cross-eq correlation	-0.0554 (0.0553)		-0.0582 (0.0539)		-0.0421 (0.0549)	
Observations	20479		20479		20479	
Log Likelihood	-11528		-11528		-11521	
Df	40		40		54	

Appendix H

Table H1: Summary of the core set of the marginal effect results based on Appendix G

Core Independent variables	Model 6 dy/dx	Model 7 dy/dx	Model 8 dy/dx
LN city size	.008** (.003)	.007*** (.004)	.010*** (.003)
LN city size conditional on Institutional trust (PSU)	.009** (0.004)	-	-
LN city size conditional on Trust in friends (PSU)	-	.007* (.004)	-
LN city size conditional on Institutional Trust & Trust in friends (PSU)	-	-	0.012*** (0.003)

Note: Ln city size, bonding and bridging trust variables are centered. The 'dy/dx' indicates the marginal effect of the respective variable (i.e. margins of derivative). In case of interaction terms, this shows the marginal effect of city size conditional on a mean value of the respective trust variable.

Appendix I: Robustness checks. Plotting marginal effects of city size on corruption conditional on bonding and bridging trust (based on Appendix G) with 90% confidence intervals

Figure I2a: The marginal effect of city size conditional on institutional trust (bridging) on corruption

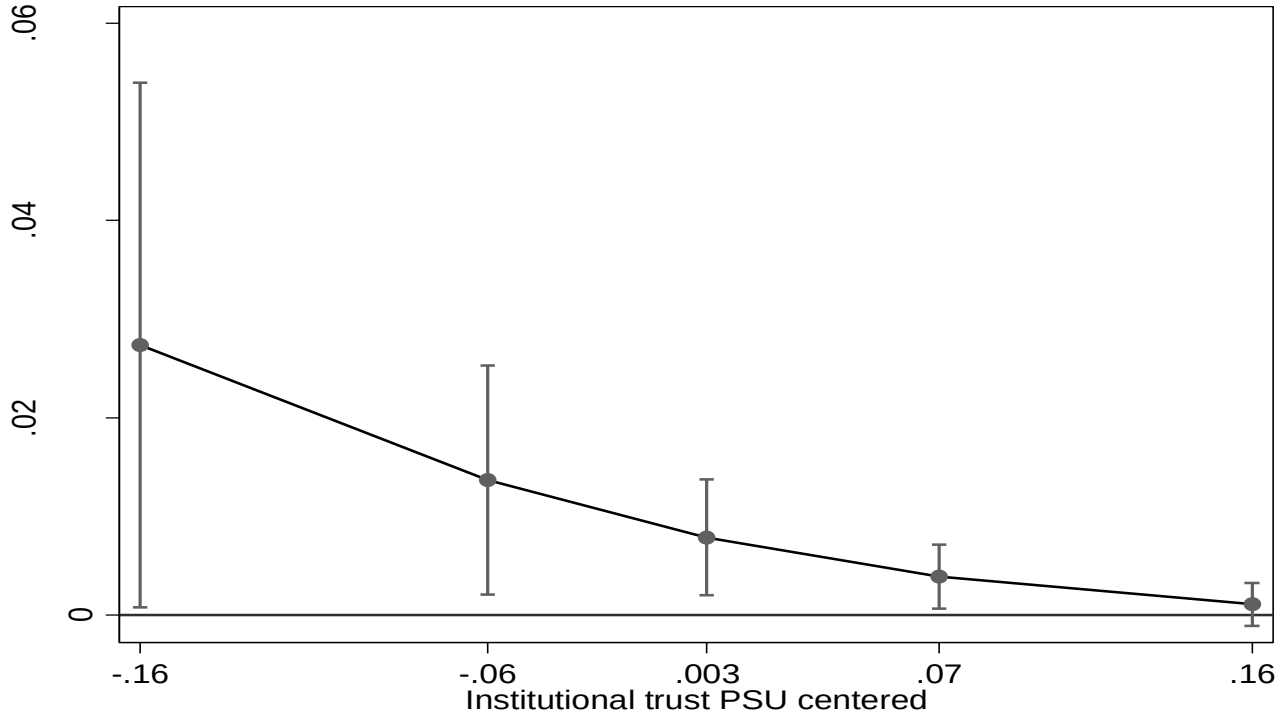


Figure I2b: The marginal effect of city size conditional on trust in friends (bonding) on corruption with 90 % confidence interval

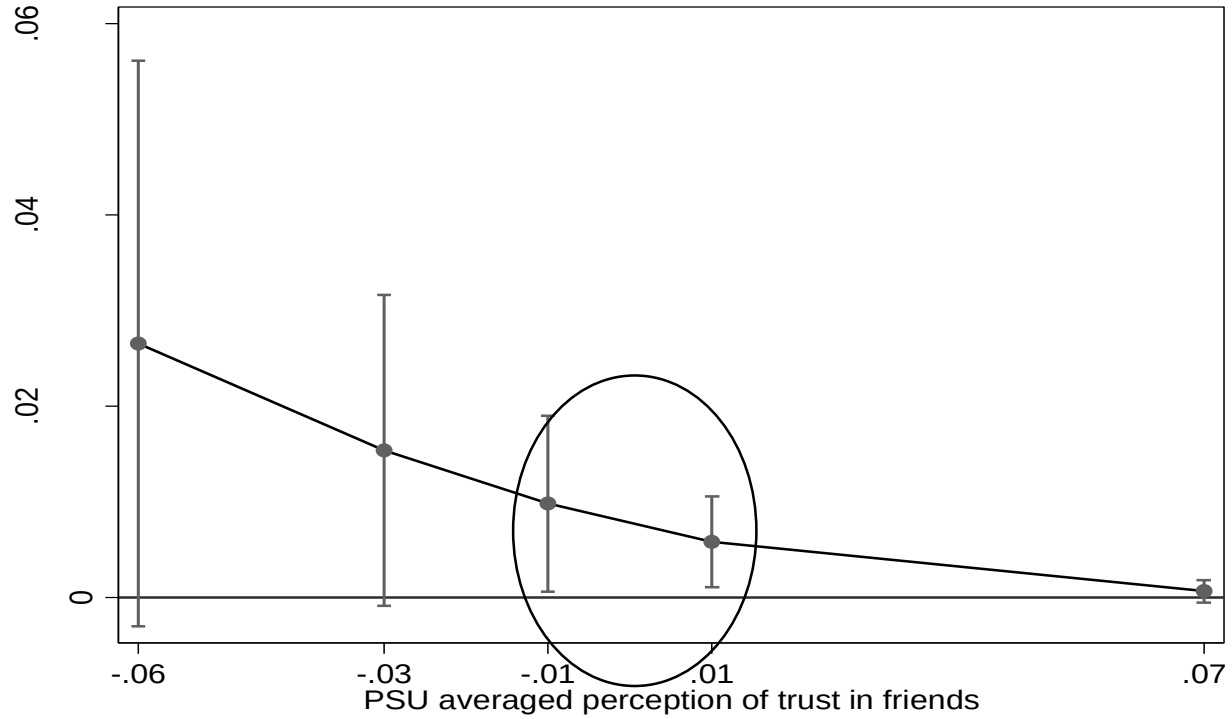


Figure I2c: The marginal effect of city size conditional on bridging-bonding trust jointly on corruption with 90% confidence interval