

The Dragon's Curse? China, the World Bank, and Perceptions of Corruption in Tanzania

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Abstract:

The rise of China as a “non-traditional” development partner has been one of the most important phenomenon in the field over the past decade but the implications of this emergence are not yet fully understood. The lack of transparency in Chinese aid programs, coupled with an apparently uninterested stance towards the governance implications of development, lead many to wonder if Chinese engagement will contribute to or undermine development efforts, particularly those of traditional donors such as the World Bank. This paper takes advantage of recent innovations in development aid data to investigate the spatial relationship between Chinese aid, World Bank aid and citizen perceptions corruption in Tanzania. The paper finds a strong association between the location of a larger number of Chinese aid projects and higher perceptions of corruption. The paper also finds evidence that the presence of a large number of Chinese aid projects may undermine the “beneficial” relationship between World Bank aid projects and perceptions of corruption. However, both of these findings are qualified by the inability to disentangle the association with these aid projects from the association with similarly co-located natural resources, which may be an alternative driver of corruption via the “resource curse.”

Keywords: Foreign Aid, Corruption, Tanzania, China, World Bank

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1. Introduction

The rise of China as a development partner has been one of the most important phenomena in the international development field over the past decade. As a “non-traditional” donor that has, to date, eschewed the OECD’s Development Assistance Committee (DAC), China is forging a new path in development assistance (Kim and Lightfoot 2011; De Haan 2011). However, the implications of this emergence are not yet fully understood. While China’s rise creates space for “South-South” or “Triangular” modes of development cooperation, concerns over the lack of transparency in Chinese aid programs, and the apparently uninterested stance towards the governance implications of development, lead many to wonder if Chinese engagement, on balance, will contribute to or undermine the efforts of traditional development partners (Zimmermann and Smith 2011; Abdenur 2014; De Haan 2011; A. Strange et al. 2014).

These concerns bring the Chinese development ascendancy directly into the ongoing debate over the relationship between good governance and positive development outcomes. As noted by (D. A. Bräutigam and Knack 2004), the World Bank (1989: 60) has argued that “underlying the litany of Africa’s development problems is a crisis of governance”. Many African states are characterised by high levels of corruption, a lack of accountability, poor institutions and a weak rule of law (D. Bräutigam 2011). In many countries with poor governance, aid contributes a large proportion of government budgets. Despite its many benefits, significant amounts of aid and problems in the way it is delivered can impede the development of good governance. Drawing renewed breadth from the seminal (Burnside and Dollar 2000), scholars have ranged from arguing that there is a “curse” of aid on institutions (Djankov et al. 2008), to there being no such political curse at all (Altincekic and Bearce 2014), to more nuanced relationships, such as a non-linear relationship between aid and governance (S. Brazys 2015). Some of the ambiguity in this relationship perhaps rests on the fact that the interaction between foreign aid and good governance may depend not only on which recipient is receiving the aid, but also on which donor is providing it (Schudel 2008). Particular donors have been explicit in their efforts to use aid to improve governance. One of the leaders in this effort is the World Bank with its system of “performance-based allocation” (Hout 2007). Indeed, recent evidence suggests that foreign aid from the World Bank is both allocated to (Winters 2010), and associated with (Okada and Samreth 2012), better governance. Thus, it may be that while foreign aid from some donors promotes good governance (or at least does not hinder it), aid from other donors may undermine governance and institutional quality. Yet little work has considered what happens if the impacts of aid on governance from different donors are at cross-purposes. Accordingly, in this paper, we add to a growing literature that examines how the emerging development actor China fits into this debate in two ways: first, by simply asking “Does Chinese aid

undermine good governance?” and second, by following up with a more nuanced evaluation of the question “Does Chinese aid undermine the governance efforts of multilateral donors, in particular that of the World Bank?”

In order to examine these questions, this paper takes advantage of recent innovations in development aid data to conduct a micro-level study between aid projects and citizen perceptions of corruption. Corruption is a particularly insidious form of poor governance for development, with evidence suggesting that increases in corruption both reduce growth and increase income inequality (Gyimah-Brempong 2002; Ugur 2014). Corruption is recognised internationally as a significant problem, with ‘grand’ corruption – the diversion of public funds meant for development – having significant impacts on welfare and political and economic reform and with ‘petty’ corruption placing a greater burden on the most vulnerable in society (Richmond and Alpin 2013). Like broader studies on the relationship between aid and governance, the evidence on the relationship between aid and corruption is inconclusive, ranging from findings that suggest official development aid (ODA) reduces corruption (Okada and Samreth 2012), to findings that ODA increases corruption (Asongu and Nwachukwu 2014), to studies that again suggest the result depends on the donor, with multilateral donor efforts associated with reduced corruption while bilateral efforts show no relationship (Charron 2011).

In order to evaluate the relationship between aid and corruption we combine geo-located data on Chinese and World Bank aid from the AidData initiative with similarly geo-referenced data from the 2013 REPOA (Research for Poverty Alleviation, Tanzania) Citizen’s Survey. These citizen surveys allow for a direct investigation on how proximity to aid projects influences citizen perceptions of corruption. We find evidence that villagers with a large number of proximate Chinese aid projects have higher perceptions of corruption than villagers with fewer (or absent) nearby Chinese projects when controlling for a host of co-determinates of corruption. The paper then compares this analysis with perceptions of corruption of villagers that are in proximity to World Bank aid projects, finding that the presence of World Bank projects does *not* diminish the corruption association with Chinese projects, but instead that the presence of Chinese projects undermines the association between World Bank projects and *lower* perceptions of corruption. These findings imply that the perceptions of corruption surrounding Chinese aid projects may “wash out” the positive impacts on corruption of projects from other donors. However, we are careful not to overstate these results. Our data has insufficient spatial variation to tease out the differential effects in the relationship with perceived corruption of the proximity Chinese and World Bank aid projects vis-à-vis the proximity of natural resources. Given the well-established “resource curse” (Busse and Gröning 2013) it could simply be that Chinese (and World Bank) aid projects are located in areas that already have high levels of corruption due to the presence of natural resources. As such, while our findings leave us

confident that Chinese aid projects are spatially *associated* with an increased likelihood of perceived corruption, we provide only modest evidence that they are *causing* perceptions of corruption.

2. Chinese Aid in Africa

A number of emerging donors, including China, have in recent years altered the landscape of aid, trade and development. Some of the discussion surrounding these donors has sounded a note of cautious optimism. The prospect of South-South cooperation has raised the possibility of changing the rhetoric and paradigm from one of “development”, “assistance”, “donors”, “recipients” and even “partners” to one of “cooperation” and “mutual benefit” (Grimm 2014; Six 2009). Beyond this, observers have seen the new donors as a potential balance to the existing OECD Development Assistance Committee (DAC) donor order, resulting in leverage for partner countries in the developing world (Kragelund 2011).

Indeed, China’s approach to engagement as a development partner has differed significantly from that of the DAC donors, with efforts often focusing on infrastructure building and providing concessional loans to countries without conditionality (F.-L. Wang and Elliot 2014). Chinese involvement in development has also largely eschewed “best practice” principles which have been established in the DAC over decades. In particular, China has paid little heed to the principals developed in the High-Level Fora on Aid Effectiveness outcomes in the Paris Declaration and Accra Accords and has been, at best, a tepid participant in the Busan cum Global Partnership for Effective Cooperation (Mawdsley et al. 2014). Beyond limited rhetorical support for the ideals of the aid effectiveness movement, evidence suggests that China has not adhered to these principles (A. Strange et al. 2014), instead advocating for ‘South-South’ cooperation without the limitations imposed by the OECD and others. While this alternative focus has been appreciated by countries who have felt unduly constrained by DAC conditionality, the approach has also been met with both local and international backlash (Zhao 2014). Several authors note that Chinese aid may be easier to exploit than that provided by other donors, for example by politicians involved in patronage politics, due to the Chinese principle of non-interference in the domestic affairs of recipient countries (Brautigam 2009; Tull 2006; Dreher et al. 2015). For the most part, emerging donors do not take part in aid reporting regimes such as the International Aid Transparency Initiative (IATI) or the OECD’s Creditor Reporting System (CRS) (Muchapondwa et al. 2014). This makes it difficult to assess the motives or impact of aid from donors such as China, or the effect on recipient countries where corruption has been identified as a significant problem.

Although China has maintained some level of activity in Africa throughout the post-war era, efforts have intensified in the past 20 to 25 years (F.-L. Wang and Elliot 2014). As Wang and Elliot (2014: 1012) note,

perceptions of China by African leaders, business people, and common citizens have been “diverse, complicated and evolving.” There can be no doubt that increased aid and investment from China is providing much needed infrastructure on the African continent through an approach which is mixing aid, trade and investment to maximise mutual benefits (J.-Y. Wang 2007). However, many of these efforts are focused around resource extraction as China’s demand for energy and minerals has by far exceeded supply due to a huge economic boom (Alves 2013). As Zhao (2014: 1035) highlights, this single-minded focus on business issues has led to “controvers(y) in many issue areas.” So while there is widespread appreciation for the economic opportunities brought by engagement with China there is also a strong undercurrent of “suspicion, grievances and even resentments” about China’s role on the continent (Wang and Elliot: 2014).

China’s business activities are the catalyst which undermines governance, specifically through the promotion of corrupt practices. China’s own recent history is marked by high and increasing levels of corruption in its business practices (Wedeman 2004), which (Y. Wang 2014) suggests is a substitute for weak property rights. Therefore, that Chinese businesses would bring these practices with them when engaging in Africa is perhaps unsurprising. Indeed, China has been accused of engaging with corrupt states and elites in exchange for access to resources in order to achieve energy security (Pehnelt 2007). As Zhao (2014: 1041) explains, “the lack of transparency in China’s business deals facilitates corruption.”

Many authors have expressed concern that China’s principle of non-interference, providing unconditional aid and investment regardless of human rights or governance considerations (Xiaobing Wang and Ozanne 2000), is obstructing reforms to governance and accountability in African countries (Collier 2007; Pehnelt 2007; A. M. Strange et al. 2013). There are also concerns that it may be detrimental to environmental and human rights issues (A. M. Strange et al. 2013). Dreher et al (2014) examine the relationship between Chinese aid and political support in recipient countries, finding that significant financial flows have been allocated to leaders’ birth regions and the regions where they have political support, suggesting that Chinese aid may be susceptible to exploitation and patronage politics, detrimentally affecting good governance in recipient countries and limiting aid effectiveness. (Milner et al. 2013), however, conduct a survey experiment of perceptions of foreign aid in Uganda and find that opinions of Chinese aid projects are no worse than those of World Bank and United States projects.

The demand driven aspect of Chinese aid may also influence governance outcomes. Aid effectiveness is related to the motives and governance structures of recipient countries (Dreher et al. 2013). According to the Chinese Ministry of Commerce, China’s allocation of aid is to a large extent based on requests from recipient countries. While the idea of country ownership implies that greater government control over its

own affairs will result in greater aid effectiveness, there is evidence that recipients use aid strategically and actual resource allocations may not be the most beneficial to development (Moss et al. 2006).

Despite the arguments and evidence to the contrary above, Chinese aid could be beneficial to governance in so far as it fills a gap in development left by western aid conditionality. In many countries facing corruption problems the institutions and economy are constraints to development which non-conditional Chinese aid can help to solve. Recipient countries, disillusioned with traditional forms of aid, have also welcomed the respect for sovereignty afforded by Chinese aid (Furukawa 2014). Chinese engagement can facilitate large scale projects requiring significant investment and long pay-back terms that traditional donors cannot provide (Sun 2014). This is especially important in addressing the continent's infrastructure deficit in the power, communications and transport sectors (Alves 2013). Despite this, short term benefits must be balanced with considerations of the long term negative consequences of neglecting governance and sustainability issues (Sun 2014).

Thus, while various authors have asserted that Chinese aid is detrimental to governance, there is little quantitative evidence that China and other emerging partners have worsened governance in Africa (Collier 2007; Alves 2013). The allocation, effectiveness and side effects of Chinese aid are difficult to quantitatively measure and so assertions about its impact on governance and corruption need to be informed by good data. Authors such as (Large 2008) have called for the study of Chinese engagement in Africa to develop into serious research beyond current preoccupations with a so-called 'dragon in the bush' and recognition of the complexities of the subject.

3. China in Tanzania

The Chinese experience in Tanzania is sufficiently representative of its broader post-war engagement with Africa. China first established a diplomatic relationship with Tanganyika (now mainland Tanzania) in 1961 (Sigalla 2014). Following independence, under the rule of Julius Nyerere, the country initially aimed to follow a socialist path of development and to lessen its dependence on the West, concurrently developing a closer relationship with China (Moshi et al. 2008). Today Tanzania is one of China's top ten preferred investment countries on the African continent (Hinga and Yiguan 2013). In 2011, there were over 400 Chinese enterprises and 20,000 individuals from China operating in Tanzania, and trade between China and Tanzania increased by 40% in 2010 (Sigalla 2014).

China has given extensive foreign aid to Tanzania for over 40 years, providing over two billion dollars in aid for a large number of cooperation projects, including the Urafiki Textile Factory, the Benjamin Mkapa

National Stadium, the Mwalimu Nyerere International Convention Centre and the Zambia and Tanzania railway which linked Dar es Salaam and Kapiri Moshi, one of the largest aid projects China has ever undertaken (Bailey 1975; Furukawa 2014). In addition to this infrastructure, China has provided hundreds of medical teams and constructed advanced medical facilities to improve health services and has built a number of large scale state farms and farmer training stations to promote agricultural development. It has also built a number of rural primary schools and granted scholarships to hundreds of Tanzanian university students (Furukawa 2014). Chinese military assistance to Tanzania is also significant, through provision of equipment and training to the Tanzanian army and the construction of military bases (Moshi et al. 2008). Tanzania's importance to China is due not only to its extensive endowment of natural resources but also to the gateway function it serves via the Indian Ocean to the rest of Africa.

Round 6 of the Afrobarometer survey was analysed by Mwombela (2015)¹ to see if Chinese engagement in Tanzania is considered positive or negative by Tanzanians. It was found that China's economic and political influence in Tanzania is mostly positive, and it is perceived as having more influence on Tanzania than the USA, UK, India, South Africa, the UN or the World Bank (Mwombela, 2015). The factors that were found to contribute to a positive perception of Chinese engagement in Tanzania were its investment in infrastructure and the cost of Chinese products, while Chinese economic activities taking jobs and business from local people and low quality of Chinese products led to negative perceptions (Mwombela, 2015). Yet despite this generally positive perception, corrupt practices and bribes related to procurement and natural resources have been widely reported by the media in relation to Chinese officials and projects in Tanzania, both nationally and internationally (New York Times, 2009²; Al Jazeera 2014³; The Citizen, 2014⁴). Particular areas of concern in Tanzania include smuggling of ivory and endangered species, bribing officials to access contracts for infrastructure projects and illegal resource extraction. These observations on China's interactions in both Tanzania and broader Africa lead us to expect that Chinese aid efforts are likely to undermine good governance and increase corruption. China has a well-documented history of corruption in its domestic political economy and the noted lack of transparency in its dealings in Africa make it exceedingly plausible that Chinese agents (both in firms and in official development efforts) employ the same logic of using bribery and personal relationships to substitute for the generally weak institutional regimes on the continent. Accordingly, we hypothesize that:

¹ Mwombela, Stephen (2015) What shapes Tanzanian's image of China? Findings from the Afrobarometer Round 6 Survey in Tanzania, Repoa, Policy Research for Development. [ONLINE] Available at: http://www.repoa.or.tz/images/uploads/TAN_R6_dissemination_2_Chinese_Engagement_25Feb2015.pdf [Accessed 15 August 2015]

National Bureau of Statistics, Statistics for Development. 2015. [ONLINE] Available at :<http://www.nbs.go.tz/>. [Accessed 25 August 2015].

² New York Times (2009) China Spreads Aid in Africa, With a Catch

³ Al Jazeera (2014), Report: Chinese smuggled ivory out of Tanzania during state visit

⁴ The Citizen(2014) Chinese bribe in Dar, admits China Envoy

Hypothesis 1: A larger number of Chinese aid projects will correlate with increased perceptions of corruption in Tanzania.

While our expectation is that stand-alone Chinese aid projects increase perceptions of corruption, we are cognizant that Chinese aid operates in a multi-donor environment. As (Berthélemy 2006) and (Kilby and Dreher 2010) have evidenced donor heterogeneity in aid allocation motivation, and (S. R. Brazys 2013) has evidenced donor heterogeneity in aid outcomes, it is plausible to assume that citizens in aid-recipient states perceive projects from different donors differently. Indeed, Milner et al. (2013) make this assumption when designing their survey experiment on aid perceptions in Uganda, using a treatment of assigning different donors to particular aid projects to tease out differential perceptions depending on the donor. Previous research has shown that aid projects from multilateral donors, and in particular the World Bank, correlate with reduced levels of corruption, particularly in the post 1997 period (Okada and Samreth 2012; Charron 2011). As (Charron 2011) explains, in that time period a number of multilateral aid donors, including the World Bank, shifted the focus of their aid to explicitly encourage good governance practices. Accordingly, we argue that more appropriate than considering the stand-alone impact of Chinese aid is to consider the conditional relationship between these projects and account for co-location. Our naïve expectation draws from the expressed motivations of each donor: while World Bank projects explicitly strive to achieve better governance, Chinese projects are silent on any governance implications. Accordingly, we would expect the “World Bank” impact to trump the “Chinese” impact. We expect that having World Bank projects in the vicinity of Chinese Aid projects will decrease the negative impact on corruption of the latter, while leaving the positive impact of the former unchanged.

Hypothesis 2: A larger number of Chinese aid projects will not change impact the relationship between the number of World Bank aid projects and decreased perceptions of corruption in Tanzania.

Hypothesis 3: A larger number of World Bank aid projects will reduce the impact of Chinese aid projects on perceptions of corruption in Tanzania.

4. Evaluating the Impact of Aid

In order to identify a relationship between citizen perceptions of corruption and Chinese and World Bank aid projects we employ a spatial strategy. This spatial identification approach has been used in several recent studies on aid (Dreher et al. 2015; Manda et al. 2014) and allows for a micro-level evaluation of aid impact. Proximity and distance are often utilized in the broader social sciences as a proxy measure to represent different social processes (Manda et al. 2014). Correlation of variables in space is based on

Tobler's 'First Law of Geography', that near places are more related than far places (Tobler 1970). In our instance, we expect that perceptions of corruption from particular projects or endeavors will be stronger for those nearer to the events. With this understanding, we refine our hypotheses by suggesting that *proximity* to more aid projects will affect perceptions of corruption.

While corruption itself is notoriously difficult to evidence, existing survey data provides a wealth of information on household perceptions of the phenomenon. Corruption is experienced in different ways by different people. Perceptions can be formed by respondents' experiences with individuals or institutions, or by external factors such as media coverage or donor interest in the issue (Afrobarometer, 2006)⁵. Thus, while perceptions of corruption are not perfect (Andersson and Heywood 2009), (Olken 2009) finds that they do indeed correlate with actual corruption and indeed they have been used in a swath of empirical studies (for examples see (Sharafutdinova 2010; Kenny 2009; Zhu et al. 2013)). Using citizen surveys to gain understanding on perceptions of foreign aid is an emerging technique that takes advantage of recent innovations of the geo-referenced and project-level AidData database (for an example see Milner et al (2013) or (Findley et al. 2015)).

Accordingly, our primary outcome variable is citizen perceptions of corruption. A survey conducted by the Front Against Corrupt Elements in Tanzania (FACEIT) and the Tanzanian Prevention and Combating of Corruption Bureau (PCCB) in 2009⁶, found that most citizens understand corruption as demand for unofficial payment (92.5%), as opposed to demand for sex (29.4%) or abuse of power (25.9%). However perception beyond these facets of corruption was limited, with respondents failing to perceive the giving of informal payments for services or embezzlement and fraud as corrupt practices (PCCB, 2009). We use household-level data on perceptions of corruption from REPOA's Citizen's Survey, which was carried out across six case councils in 2013. The dependent variable is based on citizen's responses to the question 'Is corruption a serious problem in your council?' The response categories to this question were ordinal, with "yes," "no," "maybe" and "don't know" as the permissible options. We recode the data as a binary variable coded as 1 for "yes" answers and as 0 for answers of "maybe" and "no", dropping the "don't know" responses.⁷ Our data contains a total of 1,203 household responses across 44 villages. On the corruption question, 918 households responded "yes", 195 responded "maybe", and 90 responded "no". Details on the survey's sampling and data collection can be found in Appendix I.

⁵ Afrobarometer briefing paper (2006) Combating Corruption in Tanzania: perceptions and experience. Available at: <http://www.afrobarometer.org/publications/bp33-combating-corruption-tanzania-perception-and-experience> Accessed April 5, 2016.

⁶ The Prevention and Combating of Corruption Bureau(PCCB) and Front Against Corrupt Elements in Tanzania (FACEIT)(2009), National Governance and Corruption Survey, 2009 Report, Volume 1: Analysis of main findings, conclusions and recommendations. Published by the PCCB, 16 Barabara ya Urambo, Upanga S.L.P 4865, Dar es salaam

⁷ As a robustness check we retain the ordinal nature of the data to run a multi-level, mixed-effects ordered logit model which yields substantively similar results available in Appendix I.

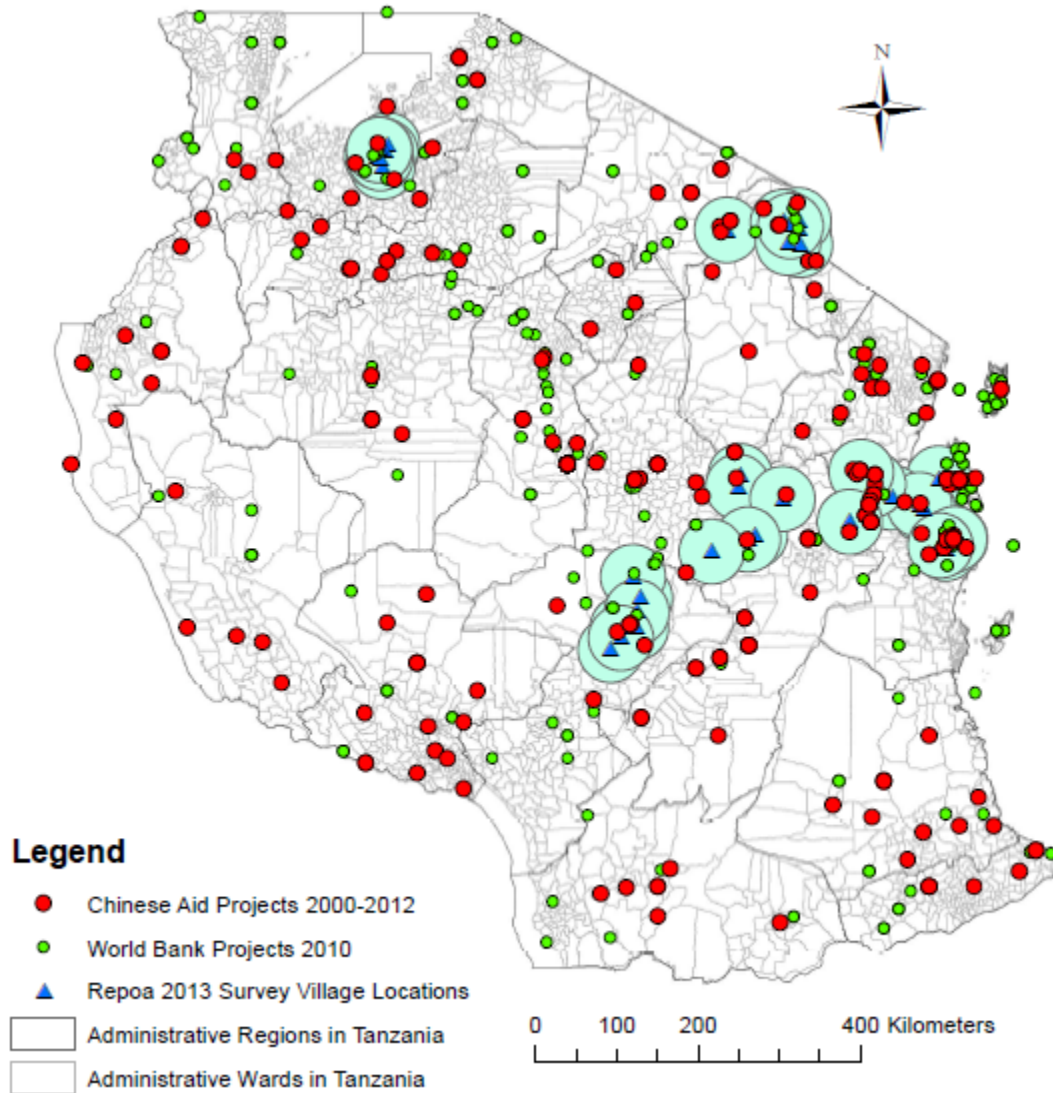
We utilize geographical information systems (GIS) technology to geo-reference the survey responses, using Google Earth Professional as a base data source for identifying the coordinates of villages and wards. Keyhole Markup language Zipped (KMZ) files from the Global Administrative Boundaries database (GADM), which contain spatial information concerning the boundaries of regions and wards in Tanzania, were imported into Google Earth and overlaid with a KMZ file containing administrative boundaries and individual village point locations recorded by the Tanzania Social Action Fund (TASAF). TASAF has recorded all of its project locations and the villages it has dispersed funds to, and this information is available for export into a number of spatial formats. The GADM boundaries were developed from the 2002 Population and Housing Census in Tanzania conducted by the Tanzania National Bureau of Statistics. Village locations were confirmed and cross checked using a number of websites, including the Tanzania National Bureau of Statistics website and Tanzania Open Street Map. Geonames and the American National Geospatial Intelligence Service (NGA) were also used as location data sources. Due to the remoteness of many of the rural areas surveyed, these provide an important complementary data source for geolocation.

In order to test Hypothesis 1, our primary indicator of Chinese involvement in Tanzania is instances of Chinese aid projects. Historically it has been difficult to assess the extent of Chinese aid efforts (in Africa and elsewhere) due both to a lack of transparency but also lack of conceptual clarity over what types of activities may be constituted as aid, trade or investment (Bräutigam 2009; Alves 2013; Sun 2014). However, this difficulty is being overcome via AidData's Tracking Under-reported Financial Flows (TUFF) effort that has compiled a database on Chinese projects in Africa between 2000 and 2012. Their geocoded dataset details 1673 projects across 50 African countries for this time period and includes a classification scheme of Chinese official and unofficial finance (A. M. Strange et al. 2013). Geocoded data for Chinese aid projects between 2000 and 2012 were checked for location and converted into separate shape files for geospatial analysis with the Citizen's Survey data. We code 297 total projects with 258 projects completed over the period. We utilize the "total projects" measures as some projects which were not completed may have been halted due to corruption issues and would contaminate our analysis.

We calculate the Euclidean distance from each village to the nearest respective location of each Chinese aid project and subsequently count the number of projects within a specified distance from each village. We have no *a priori* theoretical rationale for a specific radius other than the notion that projects must be sufficiently close for villagers to be aware of their existence and any surrounding issues of corruption. As a result, we investigated multiple radii for the "neighborhood" in which we would count aid projects, including counts of projects within 20km, 40km, and 50km of the village. The results presented in Table 1 below utilize the 40km radius, but the results are largely robust at each of the distances and these results are presented in Appendix I. Utilizing ArcGIS we represent these relationships graphically for each year

of the citizen survey in Figure 2 below. Details on the construction of the shapefiles and maps can be found in Appendix I.

Figure 1. Chinese aid projects (2000-2012), World Bank aid projects and survey villages



For hypotheses two and three, we turn to the AidData database that has assembled World Bank aid projects which were geo-referenced for 2010 and apply the same method to count the number of proximate projects to a village. Our analysis includes 501 separate point locations of World Bank aid projects in this time period.

5. Control Variables

We incorporate three household control variables from the REPOA's Citizen's Survey including level of education and age. Olken's (2009) study on perceptions of corruption suggests that those with higher levels of education will be associated with higher perceptions of corruption, while older individuals will, if anything, have lower perceptions of corruption. The survey classifies occupation into eight categories, self-employed, non-government wage-employed, government employees, students and the unemployed. Our naïve expectation is that government employees will have lower perceptions of corruption vis-à-vis the other categories. We use night time light intensity as a proxy for sub-national economic activity, the data for which is sourced from the National Oceanic and Atmospheric Administration (NOAA). A number of economists have used high resolution data on light density measured by satellites at night as a proxy for economic activity, such as Lowe (2014)⁸ and (Storeygard 2013). It has been shown to proxy well for local economic activity and correlates with other welfare proxies and has also been shown to work well for studies where a highly localized effect is being evaluated (Lowe 2014). As corruption is associated with lower levels of economic development, we expect to see lower perceptions of corruption in areas with high night-time light pixel values. The socio-economic variables related to education, age, and light intensity cannot only be expected to correlate with perceptions of corruption, low values on those indicators are also characteristic for regions where development projects are more likely to be located, thus confounding the causal relationships under investigation here. Source information and summary statistics on all data can be found in Appendix I.

Our estimation strategy uses discrete choice models because of the nature of our outcome variables. In the tables below we test the binary responses of "yes" and "maybe/no" with a probit. However, there are important reasons to expect strong spatial autocorrelation in these observations. Not only are perceptions of corruption affected by aid projects and socio-economic factors, they are also likely to be affected by perceptions of corruption in geographically proximate villages. Furthermore, the sampling strategy employed in the collection of the survey data implies that the villages included in the analysis are strongly

⁸ Lowe, M. (2014) "The Privatization of African Rail", Working Paper. Massachusetts Institute of Technology, Boston MA.

geographically clustered (as visible in Figure 2 above), such that there is significant overlap in the projects included within the count for villages within one cluster. One possibility to address this spatial autocorrelation to allow for a spatial autoregressive component in the error term, the so-called Spatial Error Model (SEM) (see (McMillen 1992; LeSage 2000)). In this data, however, the effect of the clustering will swamp the impact of a potential diffusion effect of perceptions of corruption, such that a more straightforward multilevel modelling will more appropriately address the concern of a lack of independence in the observations (A. C. Case 1991; A. Case 1992). We therefore add random intercepts for each cluster of villages to our model specification. To further address the fact that observations within villages are likely to be correlated for factors other than those included in the model, we include random intercepts for each village within each cluster. This results in a multi-level, mixed-effects probit model allowing for random effects at the village and cluster level, which is our preferred specification used in Table 1 below.

As a robustness check, we also employ an approach that tests and accounts for spatial auto-correlation in the error term directly. This specification employs the spatial ordered probit model proposed by (Xiaokun Wang and Kockelman 2009), which utilizes Markov chain Monte Carlo (MCMC) sampling within a Bayesian framework to incorporate a regional effect spatial error model (SEM) into a probit model (Wang and Kockelman 2009: 883).⁹ This “regional effect” refers to the fact that in their model, as in our data, the spatial clustering is at a higher level of aggregation – the village level – than the level at which most data is collected – the individual respondent. Following (Xiaokun Wang and Kockelman 2009) we use a connectivity matrix where neighbours are identified using the same distance criteria as used to count aid projects described above, i.e. villages within a 40km radius are identified as neighbours. This matrix is subsequently normalized such that all rows add to one. For these models we perform 3,000 draws of the MCMC, omitting the first 500 as the burn-in phase. These results are substantively consistent for both the non-interactive and interactive specifications and can be found in Appendix I.

⁹ With thanks to Professors Wang and Kockelman for the generous sharing of their replication code and data.

Table 1. Perceptions of corruption in Tanzania

	I	II	III	IV
Count Chinese Aid projects	0.023** (3.02)	0.038** (3.35)	0.015 (0.95)	
Count World Bank projects		-0.014 (-1.46)	-0.046** (-2.67)	
Near resources				0.744* (2.43)
Education	0.038 (0.53)	0.039 (0.54)	0.043 (0.59)	0.042 (0.58)
Age	0.006† (1.74)	0.005† (1.66)	0.006† (1.81)	0.006† (1.84)
Light intensity	0.002 (0.10)	0.004 (0.19)	-0.003 (-0.14)	-0.002 (-0.01)
Self-employed commerce	0.330* (2.24)	0.353* (2.38)	0.374* (2.51)	0.316* (2.14)
Self-employed other	0.268† (1.95)	0.293* (2.11)	0.309† (2.22)	0.252† (1.83)
Wage-employed private	0.079 (0.28)	0.113 (0.40)	0.123 (0.44)	0.053 (0.19)
Wage-employed government	0.416 (1.08)	0.438 (1.14)	0.423 (1.10)	0.387 (1.00)
Wage-employed other	5.36 (0.01)	5.41 (0.01)	5.28 (0.01)	4.88 (0.02)
Student	-0.086 (-0.30)	-0.067 (-0.23)	-0.071 (-0.24)	-0.108 (-0.37)
Unemployed	0.092 (0.43)	0.132 (0.61)	0.141 (0.65)	0.066 (0.30)
Count Chinese*Count WB			0.002* (2.17)	
Constant	0.168 (0.66)	0.193 (0.241)	0.450† (1.71)	0.254 (0.97)
σ^2 Region	0.022 (0.030)	0.000 (0.000)	0.000 (0.000)	0.044 (0.041)
σ^2 Village	0.109 (0.046)	0.119 (0.044)	0.101 (0.040)	0.101 (0.042)
Observations	1203	1203	1203	1203
Log likelihood	-610.31	-609.75	-607.47	-610.00
χ^2	21.05	31.14	37.38	18.71
Pr > χ^2	0.0329	0.0019	0.0004	0.0665

z score in parentheses for β , standard error in parentheses for σ^2 . †significant at 10% level,
* significant at 5% level, ** significant at 1% level

Table 1 provides the regression results. The results in Model I suggest strong support for the unconditional hypothesis – proximity to more Chinese aid projects is associated with increased perceptions of corruption at the household level. A review of correlation coefficients suggests that locational counts of Chinese and World Bank aid projects are highly correlated.¹⁰ However, as Variance Inflation Factors (VIFs) and condition numbers suggest that this correlation does not lead to problematic levels of multicollinearity, we estimate specifications using including counts of both Chinese and World Bank projects in Model II.¹¹ Given that unobserved factors that drive the presence of aid projects, regardless of donor country, might correlate with factors that drive the perceptions of corruption, it is important to control for World Bank projects when estimating the impact of Chinese aid projects – we therefore consider Model II the “fully-specified”, and preferred, model. These results show the relationship between proximity to more World Bank projects and perceptions of corruption is negative, but statistically insignificant, when accounting for the presence of Chinese projects. Conversely, the relationship between proximity to more Chinese projects remains positive and statistically significant when controlling for similarly proximate World Bank projects, again providing support for Hypothesis 1.

In order to test the interactive hypotheses two and three, we add an interaction term in Model III. We plot the interaction terms to more clearly evaluate the results. In order to evaluate Hypothesis 2, we plot the coefficient of the impact of World Bank projects on perceptions of corruption by the count of Chinese aid projects. Similarly, to evaluate hypothesis three, we plot the Chinese coefficient by the number of World Bank projects. These interactions are presented in figures 2.1 and 2.2, below:

¹⁰ Correlation coefficient of 0.8347

¹¹ As calculated from a linear regression of Model II. The mean VIF is 1.55 with a maximum VIF of 3.73 on the Count World Bank variable and a condition number of 14.13, well below the “rule of thumb” thresholds for severe multicollinearity of 10 for VIF and 30 for condition number, respectively.

Figure 2.1: Coefficient on Count World Bank by Count Chinese Aid at 40km

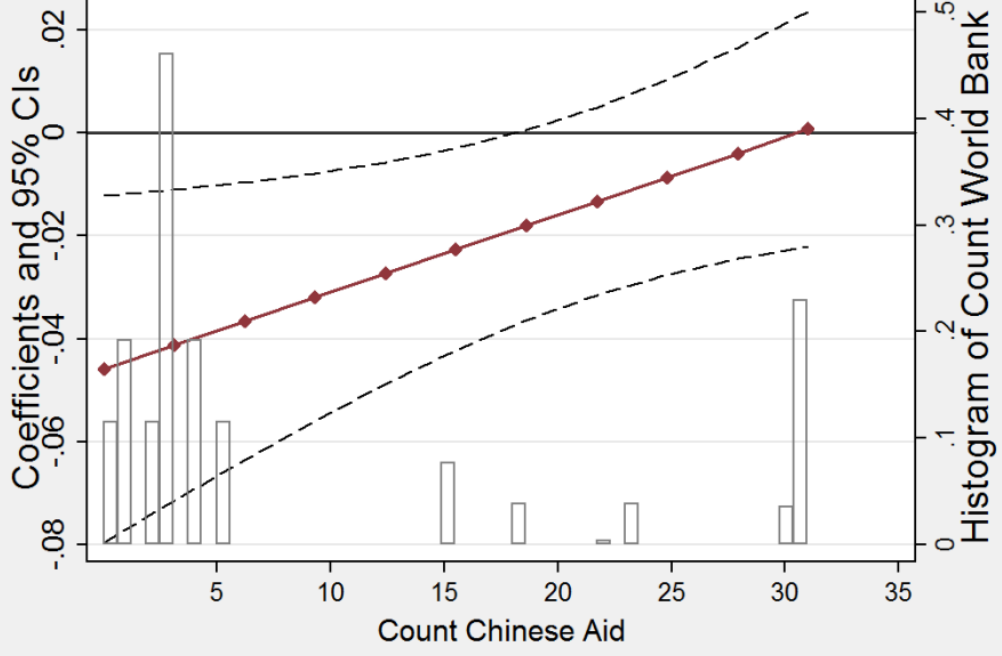
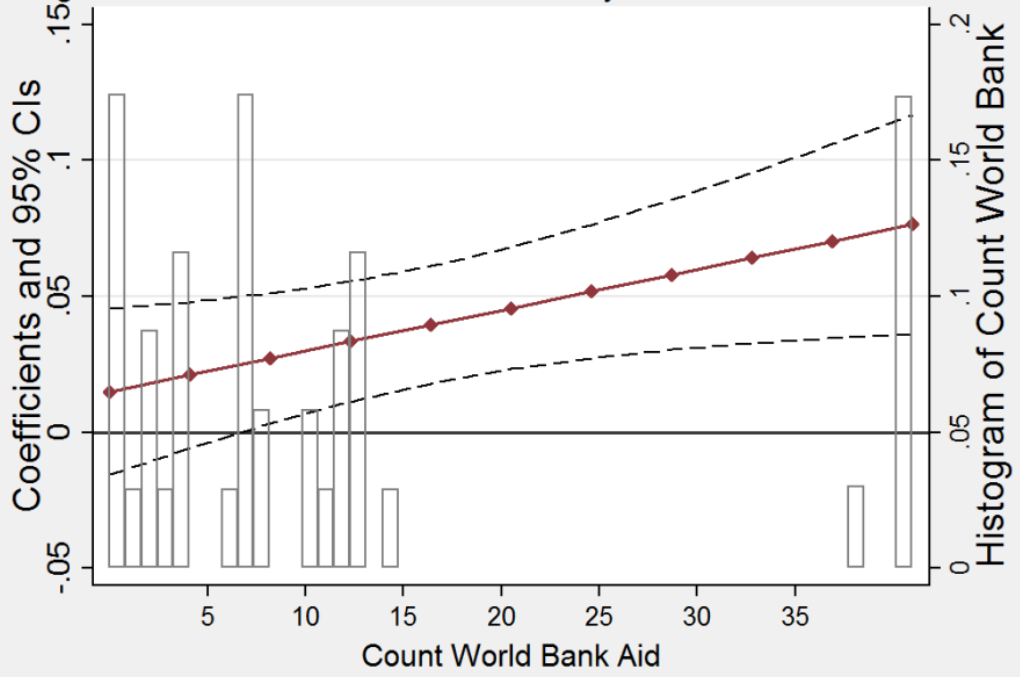


Figure 2.2: Coefficient on Count Chinese by Count World Bank at 40km



When considering only projects that are within a 40km radius of the villages our hypotheses are not supported, and indeed, the relationship is opposite of what we expected, the interaction term is *positive* and significant, suggesting the larger the number of Chinese or World Bank projects, the larger the impact of the others' projects on perceptions of corruption. In other words, while World Bank projects are associated with lower levels of corruption at a statistically significant level for a low number of co-located Chinese aid projects, as the number of Chinese aid projects increases, this relationship disappears. Inversely, as the number of World Bank projects increases, the relationship between Chinese aid projects and perceptions of corruption *increases*. This relationship suggests that, if anything, when considering projects with the 40km radius, World Bank projects do not impart any "beneficial" impact on corruption to their Chinese counterparts and, in fact, the opposite may be occurring.

However, we are careful not to overstate this result. While Hypothesis 1 is firmly supported at other radii for counting the projects as evidenced in Table A2.1 in Appendix I, there is some indication that this interaction effect is sensitive to the distance of the radius. The same substantive relationship as above is also evidenced when using a 50km radius but is not statistically significant, and the interaction is not present when using a 20km radius. These can be seen in the figures A1.1-A1.4 in Appendix I. We posit that the relationship between this interactive relationship and the distance used to count projects may be based on the respondents' ability to accurately identify project ownership. As has been shown in recent studies, individuals may often be able to identify the actual sponsor of a given project (Dietrich et al. 2015; Cruz and Schneider 2014). When only considering near projects, respondents may be able to more accurately separate World Bank and Chinese projects and as such do not conflate the corruption impacts of the two. As the distance increases, respondents may be less able to accurately identify the donor, and as such, may confuse Chinese and World Bank projects (assigning the perceived corruption associated with the former to the latter).

6. Dragon's Curse or Resource Curse?

As identified in the literature review, Chinese aid project locations may be related to access to natural resources. Given the well-established relationship between natural resources and poor governance, especially corruption (Busse and Gröning 2013), we are concerned that the location of natural resources may impact our results. In order to address this concern, the locations of various types of natural resources were identified and coded as the distance to the nearest natural resources for each village. We then utilized this information to create a binary variable if a village location was within 40km of a major natural resource. We would expect proximity to resources to heighten perceptions of corruption. Unfortunately, however, we are not able to incorporate this variable directly into our preferred

specifications as the degree of multicollinearity with our aid variables is exceedingly high, with a simple correlation coefficient of 0.90 between resources and Chinese projects and 0.94 between resources and World Bank projects.¹² Simply put, there is insufficient variation in the co-location of Chinese projects, World Bank projects, and natural resource locations to identify the distinct effects of each variable. As such, we consider a specification that only includes the natural resources variable in Model IV in Table 1 above, finding a strong relationship between proximity to natural resources and perceptions of corruption. The implications of this finding are discussed further below.

7. Limitations and Avenues for Further Research

A major limitation of the study is that we have not been able to satisfactorily disentangle the relationship between proximity to Chinese and World Bank projects compared to proximity to natural resources, when considering perceptions of corruption. As such, we cannot make bold claims that it is Chinese (or World Bank) projects that are the causal drivers of high perceptions of corruption. In all likelihood, there are interactions, endogeneity and feedback mechanisms between aid projects, natural resources, and perceptions of corruption that complicate identification of these effects. However, our research clearly suggests that there is some relationship between these variables which in and of itself is a noteworthy result, and one that suggests the need for further research. Data collected over a broader range of spatial locations would likely provide sufficient locational variation to disentangle these effects and would be an important advance on our findings.

The broader limitations of geo-referencing aid after a project or survey has taken place and using secondary data have been described in AidData's codebook on geo-locating aid (A. M. Strange et al. 2013). Multiple references were used to identify villages where the Citizen's Survey has taken place but not all cases could be verified completely. A solution to this for future studies would be to take Global Positioning System (GPS) coordinates of each survey village or ward to be included in the dataset. The AidData methodology for TUFF, uses open source information to track development finance by non-transparent donors such as China, which may also have a number of inaccuracies. However, a study by (Muchapondwa et al. 2014) ground-truthed some of aid data's open source data on Chinese development finance in South Africa and Uganda, and found a close agreement between the open-source data and site visit results.

¹² Likewise, the VIF on resources when considering Chinese and World Bank projects is 14.25, well above the "10" rule of thumb value for concerns on multicollinearity.

A final limitation with the study is the timing of both the aid projects and the citizen surveys. Aid projects are committed and implemented over a number of years. Likewise, while we have the year of the citizen surveys we do not have the precise timing of when the surveys were conducted. Accordingly, it is impossible given this data to establish temporal causality. While we believe there is a strong theoretical basis for considering that more Chinese aid projects will cause increased perceptions of corruption, we cannot directly evaluate this. Instead, the timing could be reversed and it could be that Chinese aid projects locate in areas that already have higher perceptions of corruption. While we argue that the relationship is a troubling one either way – Chinese projects locating to areas of poor governance is disconcerting given the well-documented concerns regarding the transparency of these efforts – it would be an improvement if we could more definitively establish the direction of causality. To this end, a quasi-experimental design could be a useful avenue forward for this research, one that engages in both pre and post “treatment” surveys of corruption perceptions, where the presence of additional aid projects are the treatment. Experimental research designs have been gaining increased use in studies of foreign aid and could well be applicable here (Dietrich et al. 2015). An additional interesting avenue for further research would be to compare the results of this study to a similar study using geo-located DAC donor aid or aid projects from other emerging donors in Tanzania for the same time period. Unfortunately while such information is available for a small number of countries, such as Uganda and Malawi, this information is not yet available for Tanzania.

8. Conclusions

Chinese aid brings both opportunities and challenges to Tanzania, the broader African continent, and the entire developing world, directly but also via interaction with other development actors. The models above suggest that proximity to more Chinese aid projects is associated with increased perceptions of corruption. Perhaps more striking is the relationship between Chinese and World Bank aid projects. When controlling for the presence of Chinese projects we replicate earlier work that finds a relationship between World Bank projects and reduced levels of corruption. However, an interaction model demonstrates that the World Bank projects’ beneficial relationship with corruption *disappears* as the number of Chinese projects in the vicinity increases. Likewise, the presence of World Bank projects appears to do little to mitigate the relationship between more Chinese aid projects and higher levels of corruption. This is a disconcerting result that suggests that gains that may have been made in governance over the past 20 years could be at risk of being undermined by the presence of Chinese aid. However, these results may be confounded by our inability to satisfactorily control for proximity to natural resources in our general specification. It could very well be that Chinese (and World Bank) projects locate near existing natural resources (indeed to develop them) and that it is the presence of these resources,

rather than the aid projects, that drives the relationship with perceived corruption. Accordingly, while we are confident that the location of Chinese aid projects is *associated* with higher levels of perceived corruption, we would make no claim that they are necessarily *causing* that perceived corruption.

Much of the literature on Chinese development finance in particular is founded on untested assumptions, case studies and incomplete data (A. M. Strange et al. 2013). Considering the potentially large effects of aid on governance this is a pertinent area for further study. This research study can be said to serve as a proof of concept for the utility of using spatial statistics and open source data to try to measure one dimension of the impact of Chinese aid. Yet, we do not claim to provide definitive answers on whether Chinese aid has been detrimental to Tanzania's corruption performance overall or indeed that of the wider African continent. However it is hopefully a useful addition to the literature on the political economy and impacts of such aid, and adds to the discussion on how we can go about measuring such impacts.

Appendix

Data on our main independent variables came from the AidData project, with the base data for CountChineseAid from china.aiddata.org version 1.2 available at <http://china.aiddata.org/datasets/1.2> and the base data for CountWorldBankAid from aiddata.org version 1.4 available at https://github.com/AidData-WM/public_datasets/raw/master/geocoded/WorldBank_GeocodedResearchRelease_Level1_v1.4.zip.

Our outcome variables, perceptions of corruption, and many of our control variables including age, education, and occupation come from survey data based on research carried out by Repoa (<http://www.repoa.or.tz/>) which initially focused on citizens' views of local government reform in Tanzania. The Local Government Reform Programme (LGRP) began in 1997 as a process by which to devolve powers from the central government to the local level, and improve citizen participation, service delivery and governance (Fjeldstad et al, 2005¹³). REPOA (Research for Poverty Alleviation), an independent research-based NGO, followed the process of reform over a ten-year period with the Citizen's Survey (Fjeldstad et al, 2005). . This study uses a number of data points from REPOA's Citizen's Survey, which was carried out across six case councils in and 2013.

The locations of various types of natural resources were identified and added as new map layers, and the 'Near' tool in ArcGIS was used for each survey year to create new variables based on the distance to the nearest natural resources.

1	The USGS has a spatial database of the locations of mineral resource operations for each country (USGS, 2015) ¹⁴ . A shapefile of the point locations of mineral operations and their details in Tanzania was downloaded and added as a layer to the map.
2	The WorldMap ¹⁵ application, funded by the New York Public Library and hosted by MIT, was used as a data source for a shapefile containing the locations of petroleum fields around the world. This gives low resolution outlines of all known oil and gas deposits and was clipped to the border extent of Tanzania.
3	The World Port Index ¹⁶ was also downloaded as a shapefile. This contains the location and physical characteristics of major ports and terminals world-wide in a tabular format. This was also clipped to the border extent of Tanzania.

¹³ Fjeldstad et al (2005), Local governance, finances and service delivery in Tanzania, a summary of findings from six councils, CHR. Michelsen Institute.

¹⁴ U.S. Geological Survey (2005), Mineral Resources Data System: U.S. Geological Survey, Reston, VA

¹⁵ World Map, 2015. Available at: <http://worldmap.harvard.edu/maps/oilandgasmap> [Accessed 25 August 2015]

¹⁶ World Port Index, Available at:

http://msi.nga.mil/NGAPortal/MSI.portal?_nfpb=true&_pageLabel=msi_portal_page_62&pubCode=0015 [Accessed 25 August 2015]

4	A shapefile containing the locations of game reserves in Tanzania was also added to the map, sourced from the Tanzania GIS user group ¹⁷ .
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Finally, our data on light was sourced from the National Oceanic and Atmospheric Administration (NOAA)¹⁸ available at http://ngdc.noaa.gov/eog/night_sat/nightsat.html. Summary statistics of all of the indicators used in tables 1 and A2.1 are available in table A1.1 below.

Table A1.1. Summary statistics

	Mean	Variance	Minimum	Maximum	Observations
Corruption (Binary)	2.69	0.60	1	3	1203
Corruption (Ordinal)	0.76	0.43	0	1	1203
CountChinaAid_10km	2.88	6.29	0	27	1260
CountChinaAid_20km	5.87	10.02	0	29	1260
CountChinaAid_30km	7.48	10.43	0	30	1260
CountChinaAid_40km	8.77	10.89	0	31	1260
CountChinaAid_50km	10.22	10.90	0	31	1260
CountWBAid_10km	3.77	6.06	0	24	1260
CountWBAid_20km	7.22	10.49	0	34	1260
CountWBAid_30km	9.71	12.39	0	38	1260
CountWBAid_40km	12.07	13.43	0	41	1260
CountWBAid_50km	15.27	13.79	0	45	1260
Education	2.14	0.69	1	4	1260
Near Resources	0.16	0.37	0	1	1260
Age	38.50	14.61	18	90	1260
Light	4.82	3.42	0	24.31	1260
Self-Employed, Agriculture	0.57	0.25	0	1	1260
Self-Employed, Commerce	0.13	0.12	0	1	1260
Self-Employed, Other	0.16	0.13	0	1	1260
Wage-Employ, Private Sector	0.03	0.03	0	1	1260
Wage-Employ, Government	0.02	0.02	0	1	1260
Wage-Employ, Other	0.01	0.01	0	1	1260
Student	0.03	0.03	0	1	1260
Unemployed	0.05	0.05	0	1	1260

Regressions in the main text were run in STATA 13. Regressions in Appendix I were run with STATA 13 and Matlab R2014a. Do files available upon request.

¹⁷ Tanzania GIS user group [ONLINE] Available at: <http://www.tzgisug.org>. [Accessed 25 August 2015].

¹⁸ The lights data can be downloaded here: <http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html>.

Table A2.1. Robustness checks on perceptions of corruption in Tanzania

		I (20km)	II (20km)	III (50km)	IV (50km)	V (ordered logit)	VI (ordered logit)	VII (SEM probit)	VIII (SEM probit)
Count Chinese		0.072**	0.078†	0.031**	0.020	0.065**	0.034**	0.089	-0.002
Aid		(2.61)	(1.86)	(2.57)	(1.48)	(3.21)	(1.22)	(1.43)	(-0.06)
Count World		-0.043	-0.040	-0.004	-0.018	-0.018	-0.057†	0.018	-0.210
Bank		(-1.62)	(-1.27)	(-0.37)	(-1.41)	(-1.08)	(-1.93)	(0.34)	(-1.51)
Education		0.042	0.042	0.033	0.031	0.084	0.089	0.525	0.512
		(0.58)	(0.57)	(0.46)	(0.43)	(0.67)	(0.72)	(0.69)	(1.24)
Age		0.006†	0.006†	0.005	0.005	0.010†	0.011*	0.028	0.018
		(1.82)	(1.81)	(1.57)	(1.61)	(1.86)	(1.98)	(0.95)	(1.46)
Light		-0.004	-0.004	0.001	-0.003	0.009	-0.002	-0.131	-0.112
		(-0.17)	(-0.17)	(0.03)	(-0.13)	(0.21)	(0.04)	(-0.69)	(-1.31)
Self-employed commerce		0.343*	0.344*	0.330*	0.331*	0.596*	0.617*	0.928	0.547
		(2.31)	(2.32)	(2.23)	(2.23)	(2.32)	(2.40)	(1.19)	(1.48)
Self-employed other		0.272*	0.272*	0.268†	0.275*	0.431†	0.445†	0.830	0.787†
		(1.96)	(1.96)	(1.92)	(1.97)	(1.80)	(1.86)	(1.40)	(1.79)
Wage-employed private		0.074	0.074	0.092	0.093	0.212	0.221	-0.506	-0.499
		(0.27)	(0.26)	(0.33)	(0.33)	(0.43)	(0.44)	(-0.41)	(-0.44)
Wage-employed government		0.419	0.419	0.421	0.417	0.601	0.568	1.107	1.124
		(1.08)	(1.08)	(1.09)	(1.08)	(0.89)	(0.84)	(0.98)	(1.10)
Wage-employed other		5.00	5.23	11.61	5.02	17.82	16.39	1.258	1.489
		(0.02)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)	(1.08)	(1.22)
Student		-0.090	-0.089	-0.078	-0.084	-0.280	-0.284	-0.814	-1.333
		(-0.31)	(-0.30)	(-0.27)	(-0.29)	(-0.58)	(-0.59)	(-0.79)	(-1.29)
Unemployed		0.091	0.091	0.099	0.102	0.126	0.134	0.353	0.368
		(0.42)	(0.42)	(0.45)	(0.47)	(0.33)	(0.35)	(0.53)	(0.54)
Count Chinese *			-0.000		0.001		0.002		0.010†
Count WB			(-0.18)		(1.27)		(1.57)		(1.88)
Constant		0.273	0.260	0.152	0.323			0.841	1.275
		(1.10)	(1.01)	(1.10)	(1.20)			(0.53)	(0.98)
Cut 1						-1.654**	-1.975**		
						(-3.91)	(-4.23)		
Cut 2						-0.197	-0.519		
						(-0.47)	(-1.13)		
σ^2 Region		0.014	0.014	0.005	0.000	0.000	0.000		
		(0.024)	(0.025)	(0.024)	(0.000)	(0.000)	(0.000)		
σ^2 Village		0.098	0.097	0.109	0.107	0.336	0.311		
		(0.042)	(0.042)	(0.047)	(0.041)	(0.129)	(0.122)		
ρ								0.222	0.521
								(0.22)	(1.22)
Observations		1203	1203	1203	1203	1203	1203	1203	1203
Log likelihood		-608.06	-608.05	-609.08	-608.30	-787.09	-785.88		
χ^2		28.12	28.29	34.55	34.72	31.46	34.16		
Pr > χ^2		0.0053	0.0082	0.0012	0.0009	0.0017	0.0011		

z score in parentheses for β , standard error in parentheses for σ^2 . †significant at 10% level, * significant at 5% level, ** significant at 1% level

Figure A1.1: Coefficient on Count World Bank by Count Chinese Aid at 20km

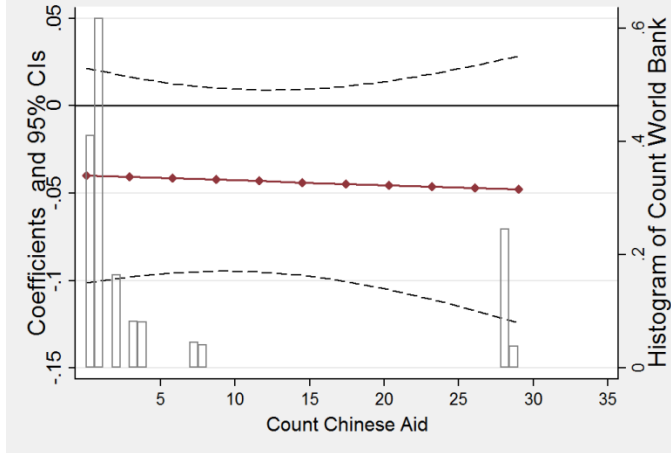


Figure A1.2: Coefficient on Count Chinese by Count World Bank at 20km

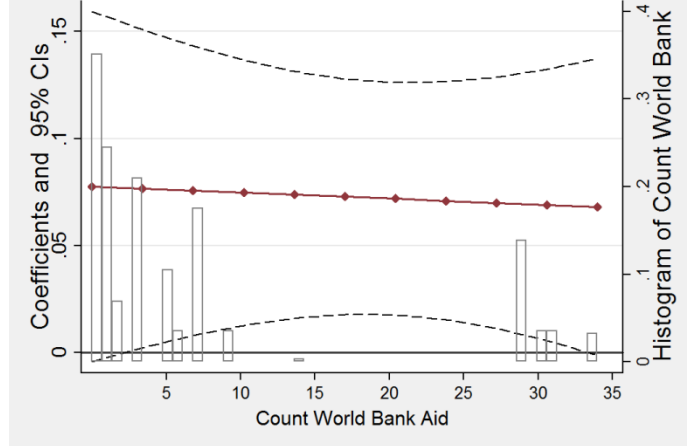


Figure A1.3: Coefficient on Count World Bank by Count Chinese Aid at 50km

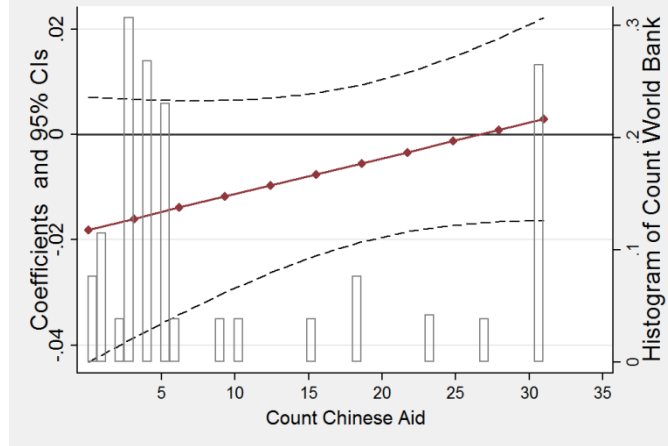
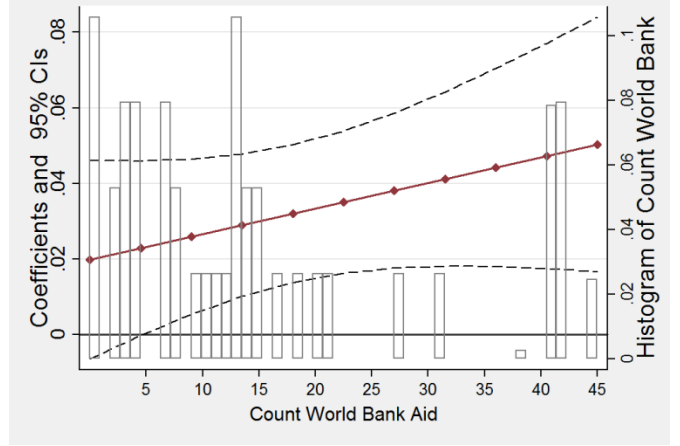


Figure A1.4: Coefficient on Count Chinese by Count World Bank at 50km



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