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Local Governance Quality and the Environmental Cost of Forced Migration

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Abstract

Can high-quality local governance alleviate the environmental impact of large-scale refugee migration? The recent surge in refugee flows has brought additional challenges to local governments in Europe, the Middle East and certain regions of Africa and Asia. In this paper, we focus on the case of Syrian refugees in Turkey and show that the quality of local governance plays a critical role in mitigating the environmental deterioration. We employ text analysis methods to construct a unique data set on local governance quality from the independent audit reports on municipalities. Using a quasi-experimental econometric strategy, we show that the Syrian refugee influx has worsened environmental outcomes along several dimensions in Turkey. Specifically, we find that the deterioration in environmental outcomes is almost entirely driven by provinces with poor-quality governance. Those provinces fail to invest sufficiently in waste management practices and environmental services in response to increased refugee settlements. We argue that good local governance practices can smooth out the refugee integration process and complement the efforts of central governments.

Keywords: Syrian refugees; environment; waste management; local governance; text analysis

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1 Introduction

International migration and its socio-economic effects have been a prominent and much-debated topic over the last decade. According to recent figures from United Nations (UN), the number of international migrants—including both voluntary migration and forced displacement—has grown rapidly and reached 258 million worldwide in 2017, up from 153 million in 1990. Forced displacement across international borders has also continued to rise in absolute figures: the total number of refugees increased from 17 million in 1990 to 20 million in 2017. This rise is unprecedented, at least since World War II.

According to Muggah and Abdenur (2018), more than 60 percent of all refugees and 80 percent of all internally displaced people are living in urban areas. Only 30 percent of all refugees live in rural camps. These figures imply that many cities around the world are overwhelmed by sudden mass influxes of forced migrants and face considerable pressure in providing municipal services. When the arrival of migrant flows is poorly managed, the new arrivals can exacerbate existing issues and generate new ones altogether (Brandt and Katz, 2017). Poor service provision to host communities often causes the perception that refugees are a threat to public order, which eventually leads to strong anti-migration sentiment and attitudes, making it more difficult for migrants to integrate. As policymakers try to make sense of a complex reality, it is important to understand the role of local governance practices in maintaining service standards and integrating refugees. This is the focus of our paper. In particular, we challenge the "refugee burden" myth by showing that good local governance practices can mitigate the negative environmental effects of higher population density due to mass refugee influx.

Improving the quality of local governance has been an important pillar in promoting inclusive and sustainable economic development. Local economic development is a major building block of aggregate economic development and this link is particularly important for transition economies. The recent surge in refugee concentration in the Middle East, as well as certain regions of Europe, Africa, and Asia, has brought additional challenges to local governance quality in those regions. With increased refugee settlements, the demand for locally-provided goods and services has in-

creased substantially, access to common resources has become more limited, public services have been overburdened, and municipality-level standards—such as the quality of waste management and environmental protection services have been under pressure. Therefore, the quality of local governance is likely a key determinant of refugee accommodation capacity of the corresponding locality.

We make three main contributions. First, we estimate the causal impact of refugee influx on the core municipal services. In the absence of additional municipal investment in infrastructure and other waste management facilities, a greater population density is likely to degrade environmental quality along several dimensions. This is also likely to have secondary effects on health and well-being in host communities. Our goal is to use the Syrian refugee influx as a natural experiment to estimate the impact of a population supply shock caused by a massive inflow of foreign-born individuals on various environmental outcomes—which also proxy the quality of municipal services provided—in Turkey. The quasi-experimental nature of the empirical design aims to address the underlying selectivity problem. Moreover, the analysis aims to uncover the causal impact of immigration on municipal services by estimating the change in the amount of waste water and other solid waste per capita as a consequence of higher population density.

Second, we construct a unique local governance quality (LGQ) data set using text mining methods. There is no readily-available indicator set suitable for measuring LGQ in Turkish municipalities. Existing data sets do not include satisfactory information regarding local governance practices. To overcome this difficulty, text mining techniques are used to extract information from the Turkish Court of Accounts, annual reports on province-level municipalities. Those reports include independent auditors' evaluations of a wide range of local governance practices for each province. Various measures on governance efficiency, corruption, transparency, and accountability are constructed using those reports. The reports also include annual balance sheets for the municipalities. The balance sheets offer standardized quantitative indicators, which supplement the information obtained through text mining.

Third, we study the role of LGQ in understanding the challenges faced by municipalities related

to increased refugee concentration. There is an ongoing strain on municipal infrastructure—such as water, sanitation, and solid waste—in countries like Germany, Jordan, Lebanon, and Turkey, which host a large number of refugees. The refugee influx has substantially increased the demand for higher quality infrastructure and related services in those countries. Therefore, any delayed response by the local municipalities in improving the infrastructure and waste management outcomes will aggravate the congestion in environmental services, which is a significant threat to public health. The role that LGQ plays in sustaining the delivery of those services is a key issue and needs to be investigated thoroughly. The Turkish case is used to obtain the literature's first evidence on these issues.

Using municipality-level data and an instrumental-variable (IV) design, we find that the Syrian refugee influx has increased the levels of solid waste, waste water, and distributed clean water, on average, in Turkey. However, expenditures on waste management and water supply services has not changed. These findings suggest that the refugee crisis limits the municipalities' capacity (i) to provide key local services and (ii) to respond to refugee crisis with additional investment—which may have political, environmental, and public health consequences. We go one step further and perform our empirical analysis using sub-samples with high versus low LGQ scores. We find that the deterioration in environmental outcomes in response to refugee inflows is almost entirely driven by municipalities with low LGQ, while there is no change in those variables in the municipalities with high LGQ. Our analysis suggests that additional investment in waste treatment plants in well-governed municipalities explains these results. When there is a visible worsening in some key local services, the refugee accommodation capacity of localities might decline and this may also reduce the effectiveness of macro-level refugee integration efforts. We conclude that good local governance practices can smooth out the refugee integration process and complement the efforts of central governments.

Broadly speaking, our paper can be positioned within the literature investigating the impact of forced migration on natives and host communities. This literature has grown rapidly, parallel to the increase in the number of displaced individuals all over the world. Most of the papers in this literature aim to address the labor market, product market, and human capital effects of

forced migration.[1] There is also a vast literature studying the impact of the Syrian crisis on the hosting communities along these lines.[2] To the best of our knowledge, there has been no systematic attempt to address the environmental consequences of massive refugee inflows in host countries. We aim to fill this gap by arguing that the quality of local governance practices plays important role in mitigating the negative environmental consequences of forced migration.

Our paper is also related to the literature studying the impact of immigration on environmental outcomes. The existing evidence related to the environmental consequences of greater population density mostly indicates that immigration has no significant impact on environmental pollution. There is only a handful of papers in this literature.[3] Cramer (1998) investigates the impact of population growth through internal migration on air pollution in California and reports that population growth does not negatively affect air quality. Similarly, Squalli (2009, 2010) shows that regions with higher foreign-born population in the US have lower nitrogen dioxide (NO2) and sulfur dioxide (SO2) emissions. Price and Feldmeyer (2012) also find that immigration is not associated with higher levels of environmental pollution using data from 183 Metropolitan Statistical Areas in the US. The estimates reported in this literature are likely plagued with selection bias—i.e., if immigrants self-select into regions with lower prices, which imply lower economic activity and lower environmental pollution, then the Ordinary Least Squares (OLS) estimates would be downward biased. Our paper addresses the selectivity bias using a distance-based IV strategy. After correcting for selectivity, we find that the population shock induced by the Syrian refugee influx generated environmental degradation along several dimensions in the hosting Turkish localities.

There is an extensive literature investigating the complex relationship between decentralization, local governance quality, electoral outcomes, local provision of public goods, and economic development.[4] Although the findings are mixed, the main consensus in this literature is that local

[1] Early examples include Card (1990), Hunt (1992), and Carrington and de Lima (1996).

[2] The main papers in this literature include Del Carpio and Wagner (2015), Tumen (2016), Balkan and Tumen (2016), Ceritoglu, Gurcihan Yunculer, Torun, and Tumen (2017), Akgunduz, Hassink, and Van den Berg (2018), Akgunduz and Torun (2018), Assaad, Ginn, and Saleh (2018), Balkan, Ozcan-Tok, Torun, and Tumen (2018), Malaeb and Wahba (2018), Alhawarin, Assaad, and Elsayed (2018), Altindag, Bakis, and Rozo (2018), Fallah, Krafft, and Wahba (2019), Ajzenman, Aksoy, and Guriev (2019), and Tumen (2019b). Policy implications are discussed in more detail by Zimmermann (2016), Hatton (2017), and Aksoy and Poutvaara (2019). For more detailed literature reviews, see Becker and Ferrara (2019), Verme and Schuettler (2019), and Maystadt, Hirvonen, Mabiso, and Vandercasteelen (2019).

[3] A great majority of papers in this literature instead investigate the immigration induced by long-term environmental change.

[4] See Bardhan (2002) for a review of the early literature.

economic development is a building block of aggregate economic development, and improving the quality of local governance is an important driver of more efficient allocation/provision of public resources. We contribute to this literature by arguing that increased refugee settlements in host localities impose severe challenges on local governance. In particular, we show that municipalities with higher-quality local governance handle the refugee shock more effectively and, therefore, refugee accommodation/integration capacity is higher in regions with better local governments. This means that central-level integration policies should be combined with local measures to improve the efficiency of integration policies and mitigate the negative environmental consequences of refugee shocks.

The structure of the paper is as follows. Section 2 describes the data and explains the construction of local governance indicators. Section 3 provides details of the identification strategy. Section 4 discusses the main results and policy implications. Section 5 concludes.

2 Data

In this section, we explain in detail how we construct our local governance indicators using text mining methods, we describe the data used in the empirical analysis, and we present the summary statistics for the key variables.

2.1 Construction of local governance data

The local governance indicators used in this paper are generated from a narrative-based text analysis of the Turkish Court of Accounts, (TCA) auditors' reports from 2013 to 2016 for each province.[5] The TCA is an independent supreme audit and judicial institution aiming to establish better public administration in Turkey. More specifically, Turkey is divided into 81 provinces and we use auditors' reports for each province to construct our local governance indicators. Throughout the paper we refer to each province as a "municipality". The auditors are independently assigned to provinces based on their expertise and experience. The analysis covers more than 300 reports ranging from 30 to 200 pages each. Each report presents the results/findings of the auditors'

[5]The auditors' reports can be downloaded from https://www.sayistay.gov.tr/tr/?p=2&CategoryId=103.

examination of annual activities and financial records of a municipality at the province level. Detailed balance sheets of the municipalities are also attached to the reports.

"Narrative-based text analysis" means that the reports are analyzed in detail by the authors and the indicators are constructed accordingly. Each report includes a detailed "findings" section, which highlights the auditors' specific observations, detailing the corresponding municipality's practices contrary to law and/or written rules. Following UNDP (2009) and the World Bank Governance Indicators (WGI), four qualitative and two quantitative indicators capturing various dimensions of local governance quality are constructed. The qualitative components are: (*i*) Corruption; (*ii*) Transparency; (*iii*) Governance Effectiveness (Service Delivery); and (*iv*) Accountability. Each indicator is constructed as a binary variable taking 0 if there is a governance problem for the corresponding indicator and 1 otherwise. The findings of the auditors' report are examined carefully and scored on a uniform basis by the authors. As an example, if the local bus transportation services are granted to a company without a transparent auction, then this is a sign of corruption and lack of transparency; if there is no internal auditing unit in a municipality or no internal auditor is hired, then this is a sign of lack of accountability, and so on.

Two quantitative indicators are constructed using the annual balance sheets of each municipality. The quantitative indicators used in the empirical analysis are: (*i*) ratio of interest payments to total expenditures; and (*ii*) ratio of labor cost to total expenditures.[6] It is well known that a majority of the Turkish municipalities are highly indebted (mostly in FX terms); thus, the first indicator roughly proxies financial prudence and risk exposure. These two indicators are also constructed as binary variables taking 0 if the corresponding province-level value is equal or above the median value and 1 otherwise.

Finally, the six binary local governance indicators are brought together to form an aggregate Local Governance Quality Index (LGQI). To perform this task, an equally weighted sum of the six indicators is constructed as an index ranging from 0 to 100—high values indicate better local governance quality, while low values mean bad governance. Figure (1) displays the extent of

[6] It is not possible to construct additional relevant quantitative indicators from the balance sheets due to non-standard reporting.

province-level variation in the LGQI as of 2016. Summary statistics for each sub-indicator and the LGQI are provided in the lower panel of Table (1).

2.2 Life in Transition Survey

We use data from the Life in Transition Survey (LiTS) to check the internal consistency of our local governance index. If the index is internally consistent, then one would expect a meaningful correlation between the index and the variables measuring trust in government or satisfaction with government/public services—both at local and central levels. The LiTS is carried out by the European Bank for Reconstruction and Development (EBRD) in collaboration with the World Bank. It is a nationally representative household and attitudinal survey. It collects information on the socio-economic characteristics of the respondents and interviews individuals on a wide-range of topics. In this paper, we use the LiTS III (approximately 1,500 households), which was conducted in 2016 in Turkey. Specifically, the LiTS provides detailed information on each respondent's demographic characteristics, household assets, work history, and unemployment history. Importantly, for our purposes, it also includes a raft of questions on institutional trust, satisfaction with government, and life satisfaction. These questions were completed by the head of the household or any other household member who was knowledgeable of the household characteristics and finances at the time of the interview. The LiTS only contains a face-to-face survey mode. The results of our internal consistency check exercise can be found in Section 4.1.

2.3 Other data and variables

The empirical analysis is built on six outcome variables collected at municipality level: per capita waste water (daily average, net of recycling), distributed clean water (from natural resources, such as lake or groundwater reservoirs), per capita solid waste (net of recycling), expenditure on municipal waste water management services, expenditure on municipal water supply works and services, and expenditure on municipal waste management services. These variables capture the municipality-level waste management outcomes, and also municipal expenditures (including investment) in waste management outcomes and practices. The unit of analysis is m^3/year for per capita waste water and distributed water, while it is kilogram/year for per capita solid waste. All

outcome variables enter the regressions in natural logarithms.

The data source is the Turkish Statistical Institute's (TurkStat) Environment Statistics, which are collected and compiled in line with the Eurostat and OECD guidelines on environmental statistics. The data period is 2001-2016. The province-level refugee numbers are obtained from the Ministry of Interior, Directorate General of Migration Management. The province-level refugee-to-population ratios are then constructed using the population statistics obtained from the TurkStat.[7]

3 The empirical strategy

The empirical approach employed in this paper can be labeled as a continuous-treatment diff-in-diff, where the treatment variable is endogenous and, thus, should be appropriately instrumented. This empirical setup exploits the variation in Syrian refugee settlements over time and across regions. Province-level refugee-to-population ratio is our treatment variable. It is potentially endogenous as the refugees self-select into regions/provinces based on their location preferences, and if there are unobserved factors leading to higher refugee settlements in more or less polluted areas, then the estimates would be biased. Figure (3) roughly displays Syrian refugees' location-choice patterns in Turkey. There is a clear tendency to move toward the western regions of the country over time, which is explained by Tumen (2016) in detail. The period of analysis is 2001-2016.

Based on this brief description, our baseline regression equation can be specified as follows:

$$y_{it} = \alpha + \beta R_{it} + f_i + f_t + f_r \times f_t + \epsilon_{it}, \tag{1}$$

where i and t index provinces and years, y_{it} is the outcome variable of interest, R_{it} is the refugee-to-population ratio (i.e., the refugee share), f_i, f_t, and f_r are province, year, and region-fixed effects, respectively, and ϵ_{it} is the usual error term. The region-year interaction terms capture any time-varying regional effects—such as policy changes or shocks—that may be affecting the outcome variable.[8] Inclusion of the interaction term also relaxes the common-trends assumption

[7] See also Tumen (2018) for the details of data construction.

[8] There are 81 provinces and 26 NUTS2-level regions in Turkey. Province-year interaction terms would be collinear with the treatment variable R_{it}. Instead, the region-year interaction terms are included to capture any region-specific shocks that vary over time.

inherent in the diff-in-diff method. R is the continuous treatment variable. Estimating the main coefficient of interest, β, with OLS may be subject to selection bias as we explain above.

An instrumental variable strategy—motivated by the gravity models of international trade—is implemented to address the potential selection bias. Following Del Carpio and Wagner (2015) and Tumen (2018), a weighted average of the distance between each province in Turkey to 14 Syrian governorates is used as an instrument. In particular, the IV is specified as follows:

$$IV_{it} = N_t \sum_j \pi_j \frac{1}{L_{ji}}, \tag{2}$$

where j indexes Syrian governorates, N_t is the total number of refugees in Turkey in the corresponding year t, π_j is the fraction of Syrian population living in each Syrian governorate in the pre-conflict period (2010 is used), and L_{ji} is the shortest travel distance between each Syrian governorate and Turkish province.[9] The main identifying assumption is that the average distance from each province to Syrian governorates affects the outcome variable for each province only through its impact on the refugee-to-population ratio in the corresponding province.

4 Results and discussion

4.1 Evidence that the Local Governance Index conveys meaningful information

In this paper, we are primarily interested in understanding to what extent the quality of local governance can mitigate the environmental impact of large-scale refugee migration. An issue that is key to the interpretation of any differentials is whether our measures of local governance index convey meaningful information from a normative perspective.

To provide evidence on this, we make use of the fact that we observe responses to various questions on satisfaction with local governance, perceived corruption and personal conditions in the Life in Transition Survey, 2016 (EBRD, 2016). We use these data to estimate straightforward OLS models controlling for detailed observable characteristics such as age, education, marital status,

[9] The Google Maps is used to pin down the shortest distances. There are 14 Syrian governorates and 81 Turkish provinces, which suggests that the distance is calculated between 1,134 distinct routes.

labor market status, household wealth, and location. We present this evidence in Figure (3) and Figure (4), which show the point estimates from Equation (3) given as follows:

$$y_i = \alpha + \beta LGQI_j + \boldsymbol{\theta}' \boldsymbol{X}_i + \eta_i, \tag{3}$$

where i and j index individuals and localities, y is the outcome variable, $LGQI$ is our Local Governance Quality Index, $\boldsymbol{X}$ is a vector of controls, and η is an error term. We consider satisfaction with local government, satisfaction with municipal services, and perceived corruption as our outcomes of interest in Figure (3). In Figure (4), we consider other related measures, which are whether an individual is happy with the political situation, satisfied with the regional government, satisfied with their life, and satisfied with the economy.

The results in Figures (3) and (4) confirm that the outcomes we identify are statistically significantly associated with our local governance index and with the expected pairwise comparisons. For example, we estimate that—conditional on all other covariates—a one standard deviation fall in local governance index (i.e. fall in the local governance quality) is associated with an 11 percentage point fall in satisfaction with local government, a 15.6 percentage point fall in satisfaction with local municipal services and a 12.1 percentage point increase in perceived corruption [Figure (3)]. Finally, we also show that local governance quality is also significantly correlated with life and economic satisfaction [Figure (4)]. Thus, taken as a whole, these results confirm that our objective measure of local governance quality is strongly related to perceived measures of local governance and life satisfaction. Therefore, the index is very likely to capture the meaningful differences in local governance quality. It is important to note that sub-components of our index are also highly correlated with related measures, such as perceived corruption and satisfaction with public services.[10]

4.2 Findings on refugee influx and environmental outcomes

In this subsection, we start by analyzing the effects of mass refugee migration on two sets of outcomes: (*i*) direct measures of pollution and resource use; and (*ii*) municipal spending on relevant

[10] These results are not presented here but are available upon request.

environmental services. Table (2) presents the results from the OLS estimation where the dependent variables are: log of per capita waste water-net of recycling (Column 1); log of distributed clean water from natural resources (Column 2); and log of per capita solid waste-net of recycling (Column 3). Table (3) presents the results from the OLS estimation where the dependent variables are: log of expenditures on municipal waste water management services (Column 1); log of expenditures on municipal water supply works and services (Column 2); and log of expenditures on municipal waste management services (Column 3). All models include province-fixed effects, year-fixed effects and year-region interactions.

The results in Table (2) provide some evidence that higher refugee concentration is associated with worse environmental outcomes. Contrary to expectations, there is no sign that growth in refugee concentration correlates with municipal spending on environmental services one way or the other in Table (3).

Tables (4) and (5) present the IV estimates, in which we replicate the OLS specifications from Tables (2) and (3), respectively. We only report the coefficients on the main variables of interest. The impact of higher refugee concentration on pollution outcomes is positive and significant, with a point estimate of 0.013 for the log of per capita waste water, 0.015 for the log of distributed water, and 0.056 for the log of per capita waste collected—all net of recycling. These estimates suggest that increased refugee share predicts worse environmental outcomes with high statistical and economic significance. High refugee concentration has generated additional waste. However, IV estimates presented in Table (5) show that municipality-level investment in waste management and environmental services has not changed in a meaningful way. The findings, therefore, imply a substantial increase in the production of waste, with potentially negative implications for the health of residents in the communities hosting refugees, and for refugees themselves. Back-of-the-envelope calculations suggest that a 10 percentage point increase in the refugee-to-population ratio leads to a 5.2 percent, 6.3 percent, and 14.1 percent increase in per capita waste water, distributed water, and per capita waste collected, respectively, relative to the pre-treatment period on average across Turkey.

Taken together, the findings suggest that higher refugee concentration leads to congested municipal services and increases pressures on already-strained municipal infrastructure services such as distribution of clean water, sanitation, and solid waste. Refugee inflows do not have significant effects on municipal spending. This is consistent with revenues allocated by the central government (typically accounting for the majority of municipal revenues) being based on municipal populations and land area, which are often estimated with a lag and would thus not account for the sudden population growth due to refugee inflows. Given the structure and principles of budget determination, the quality of local governance stands out as a significant determinant of how the budget is used to accommodate the challenges caused by shocks and unexpected events such as the massive refugee influx experienced in Turkey after January 2012. We, therefore, investigate the importance of local governance quality in mitigating the environmental impact of large-scale refugee migration in the following subsection using our novel measure.

4.3 The role of Local Governance Quality

In Table (6), we seek to gain further insights into the relationship between mass migration and measures of pollution by investigating the role of local government quality. Local governments in Turkey typically have primary responsibility for providing public services such as waste collection, waste water and water supply, and have some responsibility in the areas of housing and urban public transportation. This analysis is crucial as local governments are hidden but important partners for refugee integration. It is mainly because the conditions of the place where people live have an important impact on their perception of refugees. Competition for natural resources (such as fresh water) and services (such as waste collection and recycling) are an immediate concern. If not properly addressed, pollution accompanied by degradation in municipal services can cause conflict between refugees and resident populations. Refugees, however, cannot be expected to put environmental considerations ahead of their own safety and welfare (UNHCR, 2001). This is where municipalities can play a significant role in mitigating the negative impact of mass migration on the environment.

We, therefore, estimate IV models separately for the municipalities with bad governance (LGQ

index score greater than 50) in the top panel and municipalities with good governance (LGQ index score less than or equal to 50) in the bottom panel. The sample is roughly balanced between the two categories. All models include province-fixed effect, year-fixed effects, and year by region interactions. The outcomes across the columns are as follows: log of per capita waste water (net of recycling) in Column 1; log of distributed clean water from natural resources in Column 2; and log of per capita solid waste (net of recycling) in Column 3. Each column shows coefficients on the refugee-to-population ratio.

In Table (6), we find that the worse environmental outcomes reported in Table (4) come entirely from those municipalities with worse local governance quality. In particular, the coefficients reported in the top panel can be interpreted as follows: a ten percentage-point increase in the refugee-to-population ratio in a province increases the per capita waste water (net of recycling) by 2.2 percent, the distributed water from natural resources by 2.9 percent, and the per capita solid waste (net of recycling) by 13.1 percent. For municipalities with better governance, the increased refugee share does not lead to worse environmental outcomes: the estimated effects for all outcomes are small and insignificant. It is mainly because these municipalities often involve the private sector in the design, construction and maintenance of infrastructure, introducing new technologies and improving operational efficiency, in line with the evidence on the quality of governance and economic outcomes—see, for example, Stiglitz (2002).

To understand which sub-components of local governance quality are the most significant determinants of the problems faced by municipalities in addressing the challenges caused by the massive refugee influx, we estimate separate IV models using a Corruption Index (Table 7), Transparency Index (Table 8), Governance Efficiency Index (Table 9), Accountability Index (Table 10), Interest Payment Index (Table 11), and Labor Cost Index (Table 12). The format of these tables follow Table (6) in that the top panel shows results for the municipalities with bad governance (LGQ index score greater than or equal to 50), and the bottom panel examines municipalities with good governance (LGQ index score less than 50).

The results presented in these tables suggest that the three most important qualitative sub-

components are, in the order of importance, corruption, transparency, and accountability. More specifically, environmental outcomes suffered more in municipalities with higher corruption (for instance where contracts, permits or licenses were granted without due process), lower transparency (for instance where bidding procedures were rigged) and lower accountability (for instance where municipal spending was not registered in conformity with the legal framework). When it comes to the quantitative indicators, the ratio of labor cost to total expenditure seems to play an important role.

Our findings are consistent with the findings reported by the large body of literature investigating the link between governance quality and growth (Stiglitz, 2002; Kaufmann, 2005). Turkish municipalities with low corruption, high transparency and accountability are more successful in addressing the environmental and municipal service challenges posed by increased refugee concentrations. Municipalities with better governance practices are able to mitigate the negative effects; while bad governance generates worse outcomes. This may further have (i) public health and (ii) political economy consequences in the sense that confidence in political institutions as well as the level of satisfaction with local/regional governments may change depending on the quality of municipalities' response to the refugee shock.

4.4 Why does high LGQ lead to low environmental impact of refugees?

In this sub-section, we propose a mechanism that explains the negative correlation between local governance quality and the environmental impact of refugees. Our main argument is that municipalities with high LGQ reacted quickly to the refugee crisis by installing new waste treatment plants, which increased the volume of treated waste and, therefore, mitigated the environmental effects. The available data allow us to perform this analysis only for waste water; as recycling data are not available for solid waste.

The upper panel of Figure (5) plots the change in the number of treatment plants in municipalities with high versus low LGQ between 2008 and 2016. The figure suggests that the number of waste water treatment plants increased more rapidly in municipalities with high LGQ. The lower panel of Figure (5) plots the change in the volume of recycled water in municipalities with high versus low

LGQ between 2008 and 2016, which suggests that, again, the volume of recycled water is higher in municipalities with high LGQ than the ones with low LGQ. At face value, these two plots suggest that municipalities with higher LGQ invested more heavily into their waste treatment plants in response to the refugee influx, which increased their recycling capacity.

Next we investigate the causal link between the change in waste water treatment capacity and the change in refugee concentration between high- versus low-LGQ municipalities using our baseline empirical design. Table (13) reports the IV-2SLS results. The estimates are in line with the *prima facie* evidence shown in Figure (5). Specifically, Panel A of Table (13) reports that a ten-percentage point increase in the refugee-to-population ratio increases the number of waste water treatment plants by 2.2 percent in high-LGQ municipalities, while there is no effect in low-LGQ ones. The estimates reported in Panel B suggest that a ten-percentage point increase in the refugee-to-population ratio increases the volume of recycled water per capita by 6.9 percent in municipalities with good governance, while it declines by 19 percent in municipalities with bad governance. It should be noted that although we know the number of treatment plants per municipality, we do not know the plant-level recycling capacity—which may differ across municipalities and plants. However, this limitation is not a big concern since we can directly observe the volume (in billion m^3) of recycled water—both total and per capita—for each municipality. Both Panel A and Panel B confirm the validity of the proposed mechanism: LGQ is a strong determinant of the timeliness and effectiveness of municipalities' response to the refugee crisis.

4.5 Testing common trends

In this section, we test the common trends assumption inherent in the diff-in-diff analysis using the approach used by Autor (2003) and Tumen (2018, 2019a). This approach can also be interpreted as an event-study design, which aims to detect whether or not the refugee effect becomes effective during the post-influx period in the treated provinces.

Specifically, we construct five year dummies—2006, 2008, 2010, 2014, and 2016—equal to 1 only in the relevant year and 0 in others. Then we regress our outcome variables on the interactions between the year dummies and a dummy variable indicating the treated region. Following Tumen

(2019a), we form the treated region by using the provinces with the highest refugee concentration as of 2016—namely, Kilis, Gaziantep, Mardin, Sanliurfa, Adana, Adiyaman, Kahramanmaras, Osmaniye, Sirnak, Batman, Siirt, Diyarbakir, Mersin, and Istanbul. The regressions also control for year and province dummies. Standard errors are clustered at province level. Figures (6)-(10) plot the coefficients of the interaction terms along with the 95 percent confidence bands. The year 2006 is the omitted time category, so the coefficients should be interpreted relative to 2006. The results suggest that the coefficient estimates are significant only for the post-influx period and the trends are parallel for years before the influx. The signs and coefficients of the estimates are also fully consistent with our main results. We conclude that the common trends assumption inherent in our empirical analysis is not a bad approximation of reality.

5 Concluding remarks

The sudden inflow of refugees to Turkey after January 2012 increased pressures on already-strained municipal infrastructure services such as water, sanitation and solid waste. Indeed, we find that, on average, the Syrian refugee influx has increased solid waste, waste water, and distributed clean water levels in Turkey. However, environmental degradation is almost entirely driven by municipalities with low LGQ, while there is no change in environmental outcomes in the municipalities with high LGQ. Our analysis suggests that additional waste treatment plant investments in well-governed municipalities explain this finding.

The quality of governance varies significantly not just across countries, but also within them, reflecting local responsibilities in public good provision, as well as variation in the enforcement and implementation of national regulations. Our results are also in line with this observation: the adverse effects of refugee inflows on environmental outcomes are mainly driven by municipalities with low local governance quality. In contrast, well-governed municipalities were better at tackling the challenges from rapidly increasing population density and investing in infrastructure to keep pace with population growth. The results thus suggest that there is scope for improving local governance, even conditional on country-level institutions.

Our findings imply that part of the policy challenges and pressures generated by increased refugee concentration can be absorbed by local governments through improved quality of local governance practices along various dimensions. This could involve benchmarking the municipality's performance, identifying key constraints to growth, reducing red tape and increasing the transparency of the regulatory process. In particular, improved local governance quality can increase the refugee absorption capacity of the host regions, which might mitigate the burden on central government units. The results can be generalized to other refugee hosting countries in the Europe, the Middle East and certain regions of Africa and Asia.

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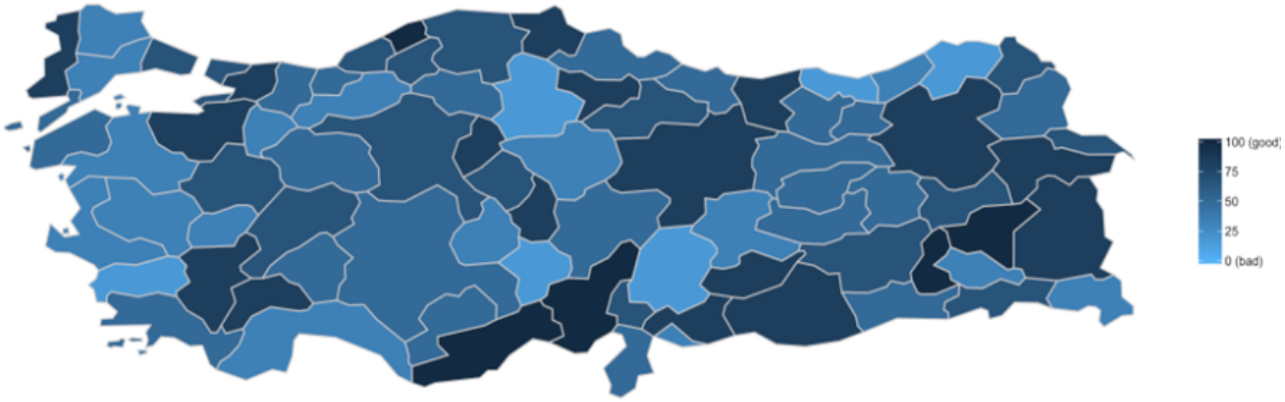


Figure 1: Local Governance Quality Index. This figure shows the variation in the Local Governance Quality Index as of 2016.

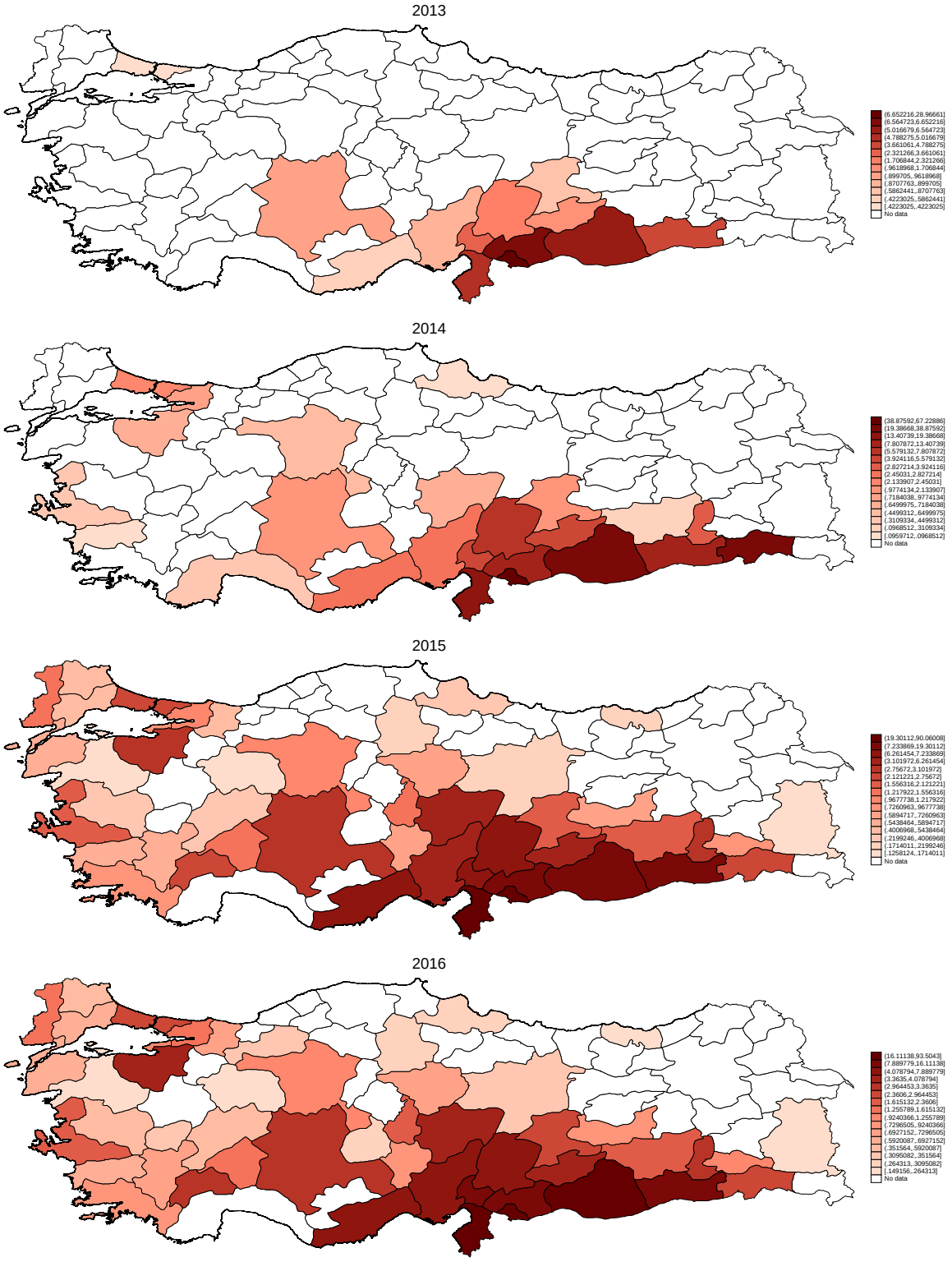


Figure 2: Province-level refugee concentration. The figures display the refugee-to-population ratios in Turkish provinces from 2013 to 2016. To increase the visual accuracy of the figures, provinces with fewer than 1,000 refugees are assumed to have zero refugee-to-population ratio, although the estimations are performed based on full data. Zero refugee-to-population ratio is indicated with white color. *Source:* Tumen (2018).

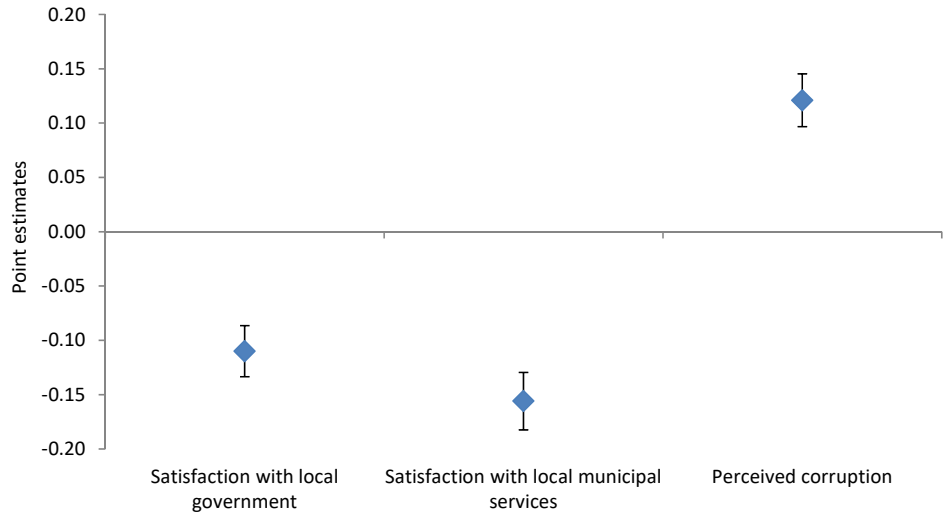


Figure 3: Perceived corruption indicators. Based on 12 metropolitan provinces of Turkey. The level of analysis is individual-level. Each diamond shows the point estimate from Equation (3), which controls for demographic characteristics, labor market outcomes, and household assets. Standard errors are clustered at the locality level. *Source:* Life in Transition Survey (2016), Turkish Court of Accounts (2016), and authors' calculations.

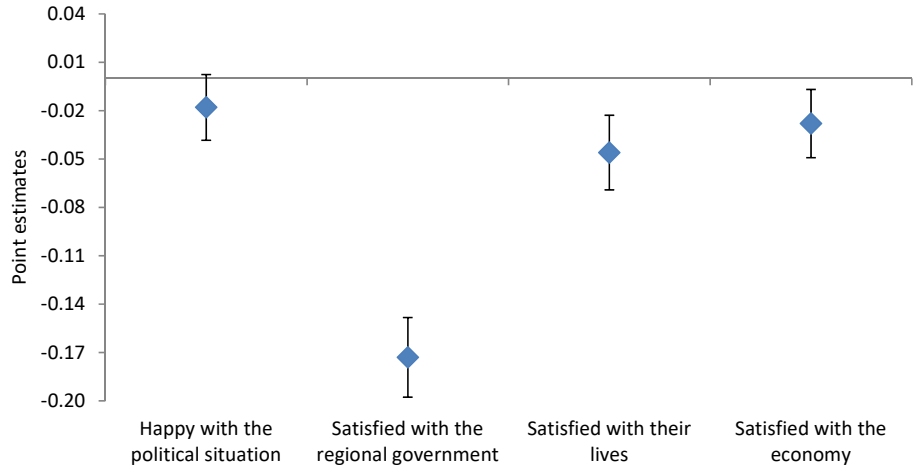
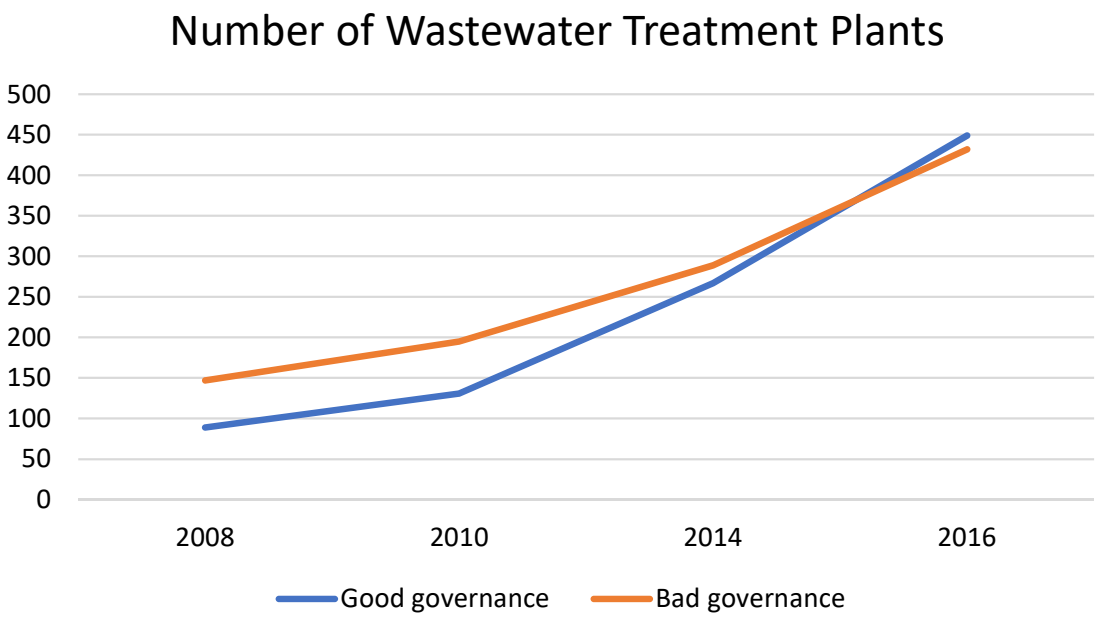


Figure 4: Satisfaction indicators. Based on 12 metropolitan provinces of Turkey. The level of analysis is individual-level. Each diamond shows the point estimate from Equation (3), which controls for demographic characteristics, labor market outcomes, and household assets. *Source:* Life in Transition Survey (2016), Turkish Court of Accounts (2016), and authors' calculations.



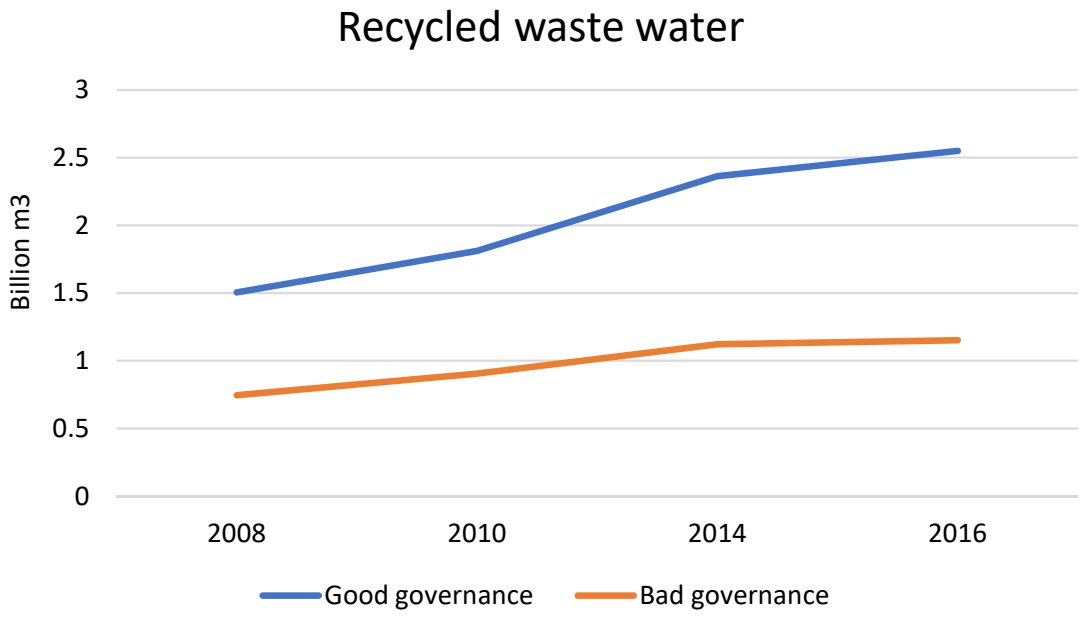


Figure 5: Number of waste water treatment plants and volume of recycled water. The figures display the trends in the number of waste water treatment plants and the volume of recycled waste water from 2008 to 2016. *Source:* TurkStat.

Sample characteristics

Variables	Mean (Standard deviation)
Dependent variables	
Waste water/day (litre per person/day)	151.67 (61.79) – N: 729
Distributed water (million m^3/year)	33.90 (7.33) – N: 486
Municipal waste (tons/year)	323,936.5 (675,774.9) – N: 729
Expenditures on waste management services (million TRY/year)	35.90 (13.30) – N: 1,125
Expenditures on waste water management services (million TRY/year)	18.40 (6.85) – N: 986
Expenditures on water supply works and services (million TRY/year)	37.50 (12.40) – N: 1,113
Local governance index characteristics	
Composite index score (0-100)	57.61 (22.84)
Accountability index score (0-100)	76.54 (42.39)
Corruption index score (0-100)	49.38 (50.01)
Governance efficiency index score (0-100)	56.79 (49.55)
Interest payment index score (0-100)	50.61 (50.01)
Labor cost index score (0-100)	53.08 (49.92)
Transparency index score (0-100)	59.25 (49.15)
N	1,215

Table 1: Means (standard deviations). This table provides aggregate-level variables averaged across the 16 years (2001-2016) used in the analysis. The sample sizes for some variables are different due to missing data.

OLS Estimation: Impact of refugee influx on environmental outcomes

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Refugee/population ratio	0.007	0.014**	0.032*
	(0.007)	(0.007)	(0.016)
# of obs.	729	486	729

Table 2: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, and authors' calculations.

OLS Estimation: Impact of refugee influx on municipal expenditures

	Log of expenditures on municipal waste water management services	Log of expenditures on municipal water supply works and services	Log of expenditures on municipal waste management services
Refugee/population ratio	-0.006	-0.006	-0.000
	(0.030)	(0.022)	(0.005)
# of obs.	986	1,113	1,125

Table 3: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Refugee/population ratio	0.013**	0.015**	0.056**
	(0.006)	(0.007)	(0.029)
First-stage coefficient	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
First-stage F stat	23.18	18.70	23.18
# of obs.	729	486	729

Table 4: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, and authors' calculations.

IV Estimation: Impact of refugee influx on municipal expenditures

	Log of expenditures on municipal waste water management services	Log of expenditures on municipal water supply works and services	Log of expenditures on municipal waste management services
Refugee/population ratio	-0.002	0.062	0.008
	(0.092)	(0.079)	(0.010)
First-stage coefficient	0.002***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)
First-stage F stat	42.26	51.03	27.39
# of obs.	986	1,113	1,125

Table 5: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by LGQI

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.022***	0.029**	0.131***
	(0.005)	(0.012)	(0.029)
First-stage F stat	12.14	11.62	12.14
# of obs.	342	228	342
Municipalities with good governance (index score≤50)			
Refugee/population ratio	0.008	0.007	-0.001
	(0.006)	(0.008)	(0.007)
First-stage F stat	33.23	41.58	33.23
# of obs.	387	258	387

Table 6: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Corruption Index

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.022***	0.027***	0.133***
	(0.004)	(0.010)	(0.030)
First-stage F stat	12.88	12.61	12.88
# of obs.	360	240	360
Municipalities with good governance (index score≤50)			
Refugee/population ratio	0.010	0.010	-0.002
	(0.006)	(0.007)	(0.007)
First-stage F stat	38.68	50.10	38.68
# of obs.	369	246	369

Table 7: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Transparency Index

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.019***	0.018	0.081**
	(0.005)	(0.011)	(0.039)
First-stage F stat	25.30	20.12	25.30
# of obs.	432	288	432
Municipalities with good governance (index score≤50)			
Refugee/population ratio	0.007	-0.003	0.015
	(0.020)	(0.003)	(0.015)
First-stage F stat	2.59	2.22	2.59
# of obs.	297	198	297

Table 8: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Gov. Efficiency Index

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.012*	0.010	0.063*
	(0.007)	(0.010)	(0.034)
First-stage F stat	16.90	12.11	16.90
# of obs.	414	276	414
Municipalities with good governance (index score≤50)			
Refugee/population ratio	-0.010	0.090*	0.216
	(0.095)	(0.054)	(0.304)
First-stage F stat	5.29	5.19	5.29
# of obs.	315	210	315

Table 9: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Accountability Index

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.019***	0.023**	0.053
	(0.005)	(0.009)	(0.034)
First-stage F stat	32.39	27.88	32.39
# of obs.	558	372	558
Municipalities with good governance (index score≤50)			
Refugee/population ratio	-0.007	-0.008	0.060
	(0.005)	(0.005)	(0.049)
First-stage F stat	3.85	4.40	3.85
# of obs.	171	114	171

Table 10: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Interest Index

	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.016***	0.012*	0.036
	(0.005)	(0.007)	(0.032)
First-stage F stat	20.99	17.89	20.99
# of obs.	360	240	360
Municipalities with good governance (index score≤50)			
Refugee/population ratio	0.006	0.020	0.082*
	(0.010)	(0.018)	(0.043)
First-stage F stat	6.88	5.33	6.88
# of obs.	369	246	369

Table 11: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

IV Estimation: Impact of refugee influx on environmental outcomes by Labor Cost Index

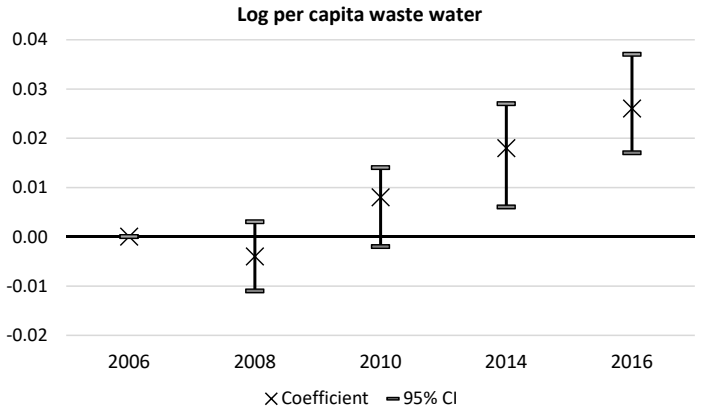
	Log of per capita waste water	Log of distributed water	Log of per capita waste collected
Municipalities with bad governance (index score>50)			
Refugee/population ratio	0.033***	0.012	0.085**
	(0.009)	(0.011)	(0.034)
First-stage F stat	6.81	6.13	6.81
# of obs.	387	258	387
Municipalities with good governance (index score≤50)			
Refugee/population ratio	0.012*	0.009	0.035
	(0.006)	(0.009)	(0.035)
First-stage F stat	18.13	13.34	18.13
# of obs.	342	228	342

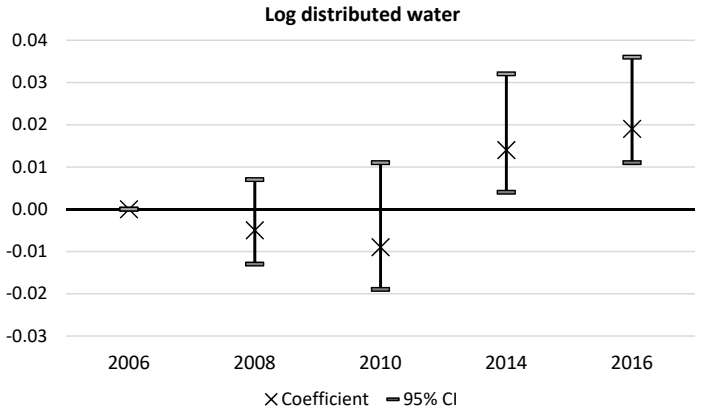
Table 12: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.

The effect of refugees on waste water treatment capacity

	Total	Good governance	Bad governance
Panel A: Log of number of waste water treatment plants			
Refugee/population ratio	0.022*	0.048***	0.007
	(0.011)	(0.013)	(0.012)
First-stage F stat	23.18	33.23	12.14
# of obs.	729	387	342
Panel B: Log of per capita recycled water (billion m^3)			
Refugee/population ratio	0.014	0.069*	-0.190***
	(0.024)	(0.033)	(0.055)
First-stage F stat	23.18	33.23	12.14
# of obs.	729	387	342

Table 13: ***, **, *, indicate 1%, 5%, and 10%, significance levels, respectively. Standard errors are clustered at province level. Controls include year-fixed effects, province-fixed effects, and the year-region interactions. The period of observation is 2001-2016. *Source:* TurkStat, Turkish Directorate General of Migration Management, Google Maps, Turkish Court of Accounts (TCA) auditors' reports, and authors' calculations.





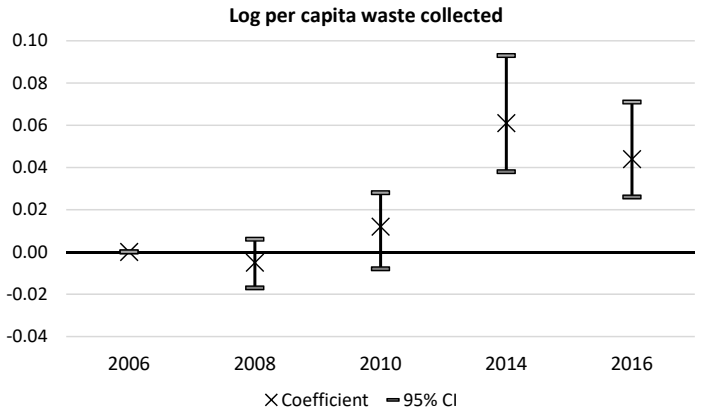
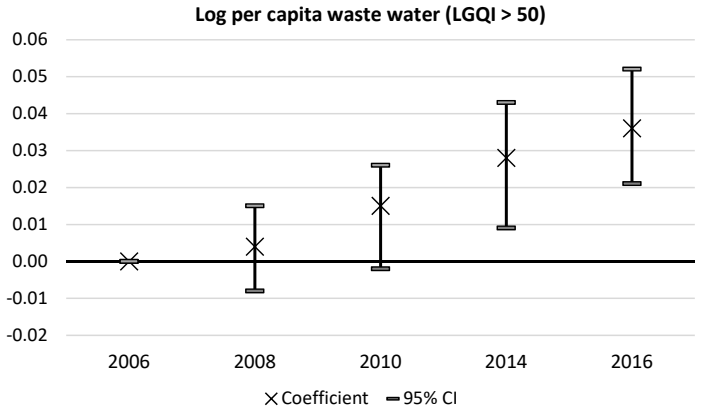
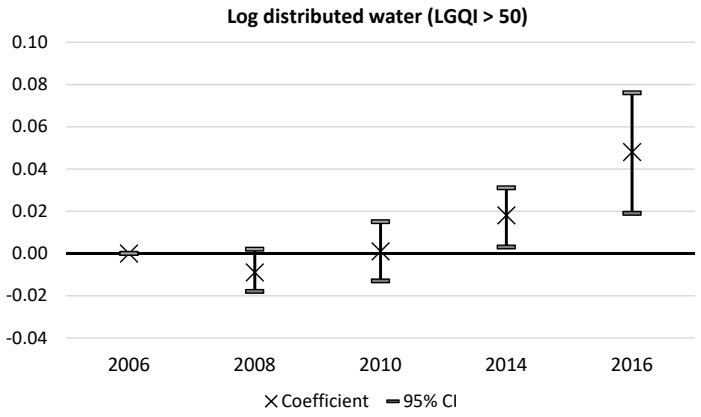


Figure 6: Testing for common trends I. The figures display the tests of common trends for three outcome variables: waste water, distributed water, and waste collected (for the entire sample). Estimated coefficients of the interaction between treatment and year dummies are plotted together with the 95 percent confidence intervals. Standard errors are clustered at province level. The estimation procedure is described in Section 4.





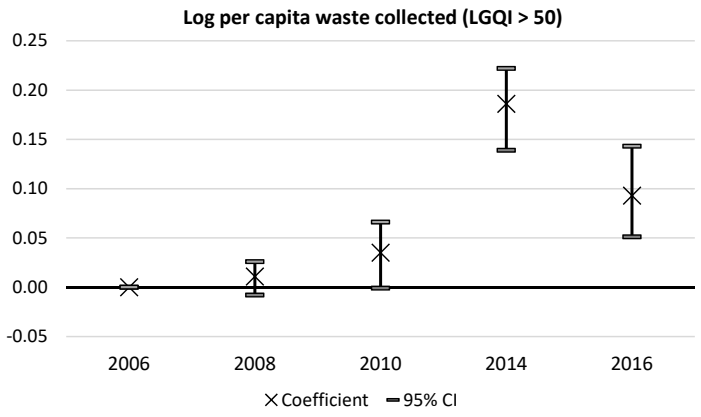
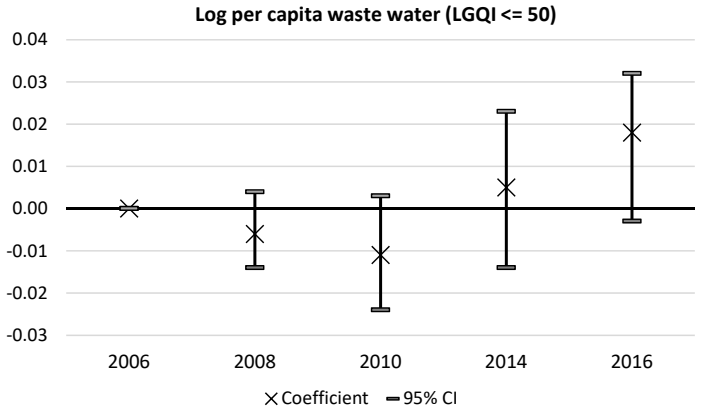
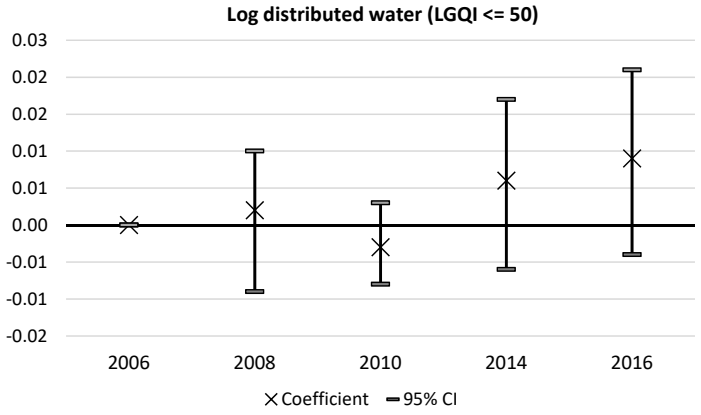


Figure 7: Testing for common trends II. The figures display the tests of common trends for three outcome variables: waste water, distributed water, and waste collected (for provincial municipalities with good governance practices, i.e., LGQI $>$ 50). Estimated coefficients of the interaction between treatment and year dummies are plotted together with the 95 percent confidence intervals. Standard errors are clustered at province level. The estimation procedure is described in Section 4.





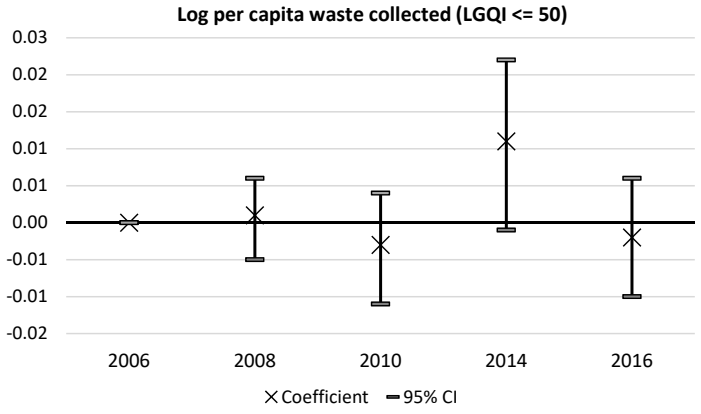


Figure 8: Testing for common trends III. The figures display the tests of common trends for three outcome variables: waste water, distributed water, and waste collected (for provincial municipalities with bad governance practices, i.e., LGQI $\leq$ 50). Estimated coefficients of the interaction between treatment and year dummies are plotted together with the 95 percent confidence intervals. Standard errors are clustered at province-level. The estimation procedure is described in Section 4.

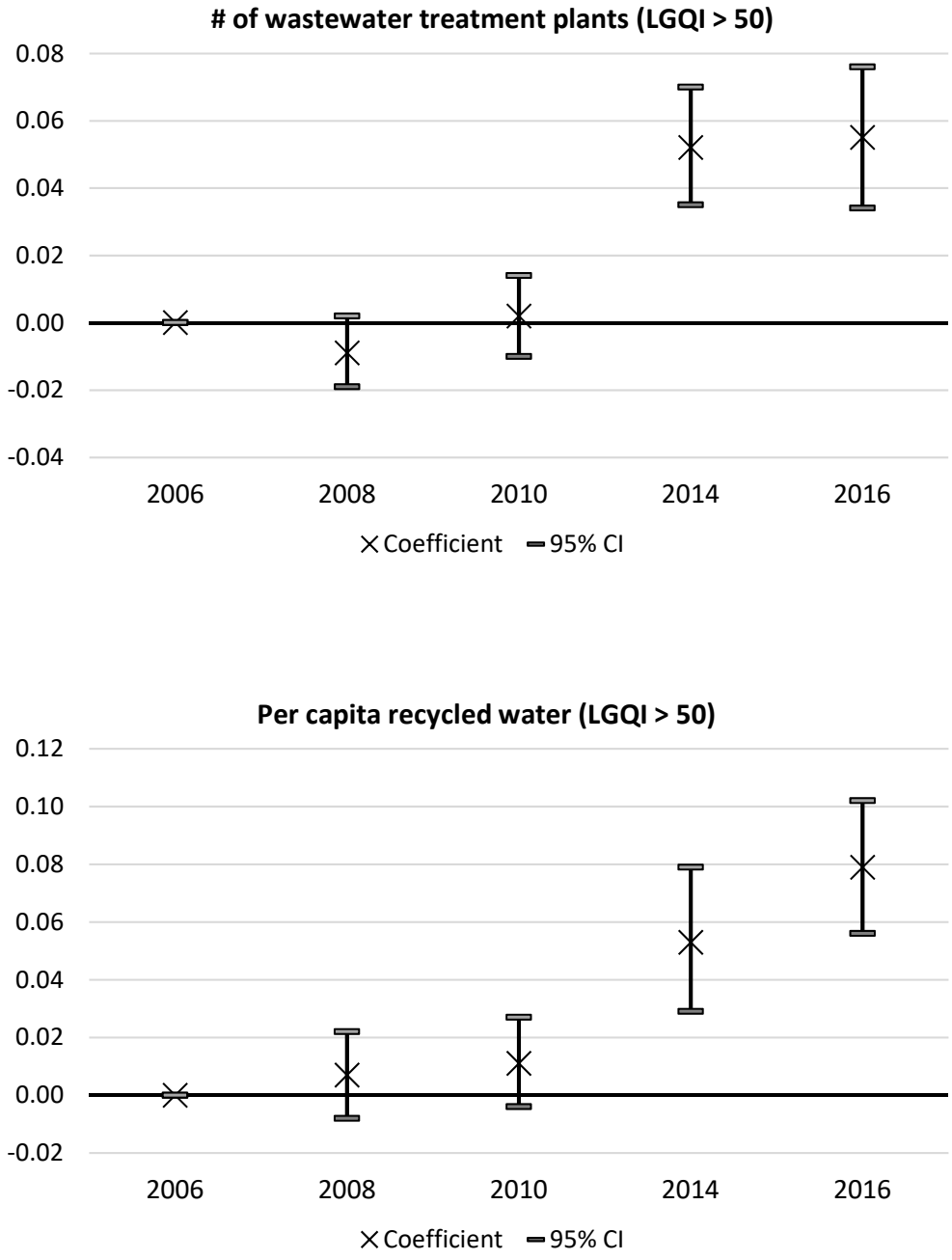


Figure 9: Testing for common trends IV. The figures display the tests of common trends for two outcome variables: number of waste water treatment plants and recycled water (for provincial municipalities with good governance practices, i.e., LGQI $>$ 50). Estimated coefficients of the interaction between treatment and year dummies are plotted together with the 95 percent confidence intervals. Standard errors are clustered at province-level. The estimation procedure is described in Section 4.

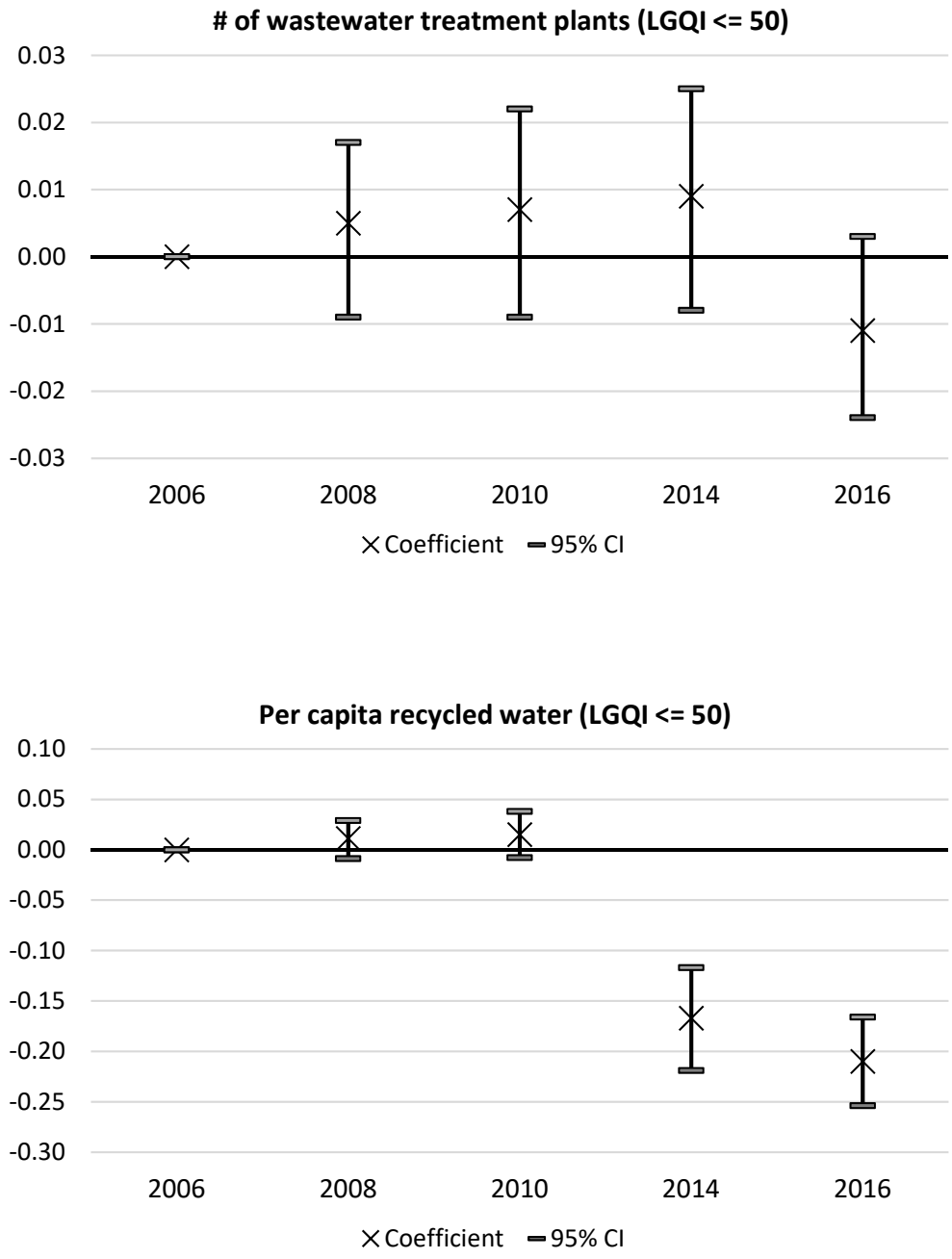


Figure 10: Testing for common trends V. The figures display the tests of common trends for two outcome variables: number of waste water treatment plants and recycled water (for provincial municipalities with bad governance practices, i.e., LGQI $\leq$ 50). Estimated coefficients of the interaction between treatment and year dummies are plotted together with the 95 percent confidence intervals. Standard errors are clustered at province-level. The estimation procedure is described in Section 4.