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Geocoding firm-level data and matching them to georeferenced household survey data, we are the first to analyze whether the presence of foreign investors is associated with changes in local corruption around foreign-owned production facilities in Sub-Saharan African countries. Applying an estimation strategy that explores the spatial and temporal variation in the data, we find that the presence of foreign firms increases bribery among people living nearby. We show this effect to work through two mechanisms, namely via increased economic activity and partly via norm transmission.

Keywords: FDI, corruption, georeferenced data, Sub-Saharan Africa

JEL classification: D1, F21, F23, O12

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1 Introduction

The African Union declared 2018 as the African Anti-Corruption Year[1] because corruption continues to be a serious problem in many (Sub-Saharan) African countries with negative implications for democratic governance, the quality of public services, inequality, and economic development. Corruption and poor institutions might also at least partly explain why the continent as a whole lags behind other world regions in terms of foreign direct investment (FDI) although the rapid economic growth of many African countries has demonstrated plenty of investment opportunities for both local and foreign investors.

In the literature there appears to be a consensus that countries willing to attract FDI need well-functioning institutions. Especially, corruption and bribery are often seen as an important obstacle to investment. However, the evidence on the impact of FDI on corruption, in turn, is ambiguous (see e.g. Dang, 2013; Zhu, 2017). In this paper, we take a closer look at the interplay of foreign investors' presence and corruption in the FDI host countries. Two main channels of how the presence of foreign investors impacts corruption are discussed in the literature (Sandholtz & Gray, 2003). First, FDI may affect corruption by means of norm transmission (Kwok & Tadesse, 2006). For example, many multinational companies commit to policies that strengthen institutions in the FDI host countries and raise awareness of problems with corruption. However, FDI might also fuel corrupt behavior if, for example, corrupt behavior is widespread in the FDI source economy. Second, FDI may impact corruption via increased economic activity (Ades & Di Tella, 1999). The presence of foreign investors in a region arguably raises local economic activity and thus rents that could be shared between investors and government officials, creating economic incentives to engage in corrupt behavior. If officials increase their demand for bribes in line with citizens' increased ability to pay, FDI-induced economic growth may negatively impact people's experiences with corruption. However, greater competition resulting from augmented economic activity could also reduce economic rents and thus decrease the demand for bribes (Pinto & Zhu, 2016).

Only very few papers examine the effects of FDI on corruption. These studies mostly use country-level data and their findings are rather ambiguous (Larrain & Tavares, 2007; Dang, 2013; Pinto & Zhu, 2016; Zhu, 2017). As FDI inflows are not evenly distributed within

[1] https://au.int/en/pressreleases/20180122/african-union-launch-2018-african-anti-corruption-year%E2%80%A6

countries and as the presence of foreign investors might have clear-cut effects on corruption in specific areas of a country, we argue that the analysis should be conducted at the micro level. Therefore, we focus on the local effects of FDI on people's everyday experience with corruption using different measures for corrupt behavior. To do so, we examine local effects of foreign investment projects on bribery in Sub-Saharan African countries using georeferenced firm and household data. We find that foreign firm presence positively affects corruption.

2 Data and empirical approach

In a first step we geocode firm-level data collected through the UNIDO Africa Investor Survey 2010 (UNIDO, 2011). In a second step we match these data to household survey data from four Afrobarometer cross-sectional survey waves conducted between 2002 and 2013 across 19 Sub-Saharan African countries.[2] Respondents from the household surveys are matched to firms from the UNIDO firm dataset according to their place of residence. To measure corruption, we employ questions on peoples' experience with corruption from the Afrobarometer. Based on these questions, our dependent variable is coded as a dummy variable equal to one if the respondent experienced corruption, or, more precisely, if the respondent had to pay a bribe to the police or to government officials in order to gain access to certain public services or documents.[3] Although neither the Afrobarometer nor the UNIDO dataset do have a panel structure, information on the year of first foreign investment from the UNIDO dataset can be used to incorporate a time dimension enabling the analysis of differences in the extent of corruption before and after the establishment of foreign firms. Fig. 1 visualizes the distribution of 5,724 firms in 187 locations and 1,981 Afrobarometer survey clusters with on average 8.56 surveyed individuals.

[2] The UNIDO data are available at http://investment.unido.org/imp/MainPage.aspx. The Afrobarometer data are available at http://www.afrobarometer.org and were geocoded by BenYishay et al. (2017).

[3] Bribes in order to a) get a document or permit; b) avoid problems with the police; c) get a school placement; d) get household services.

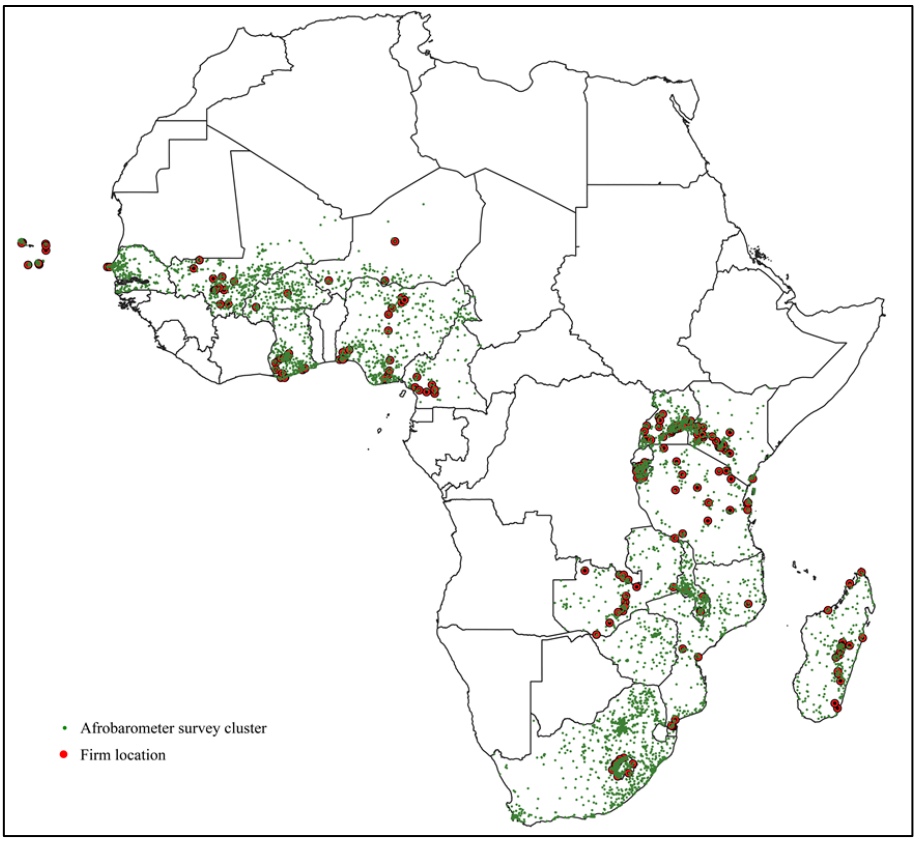

Fig. 1. Location of firms and Afrobarometer survey clusters in our sample.
Source: Own visualization based on UNIDO and Afrobarometer data.

The identification of the effect of FDI on corruption poses an empirical challenge as it is well known that FDI decisions are partly driven by host country corruption (Javorcik & Wei, 2009) and are thus not exogenous to a region's level of corruption. In order to tackle this identification problem, we use a spatial-temporal estimation approach similar to Isaksson & Kotsadam (2018): we compare the corruption experience of individuals living in regions where foreign firms are present ($treatment_{it-1}$) with the corruption experience of individuals living in regions which will be selected as locations by foreign firms in the future but where investments were yet to begin at the survey date ($futuretreatment_{it-1}$). The latter is inferred from the information on firms' year of initial investment. The reference group consists of individuals neither treated nor future-treated and living in regions for which we have firm-level information. Thus, we estimate the following regression model:

$$Y_{it} = \beta_0 + \beta_1 \times treatment_{it-1} + \beta_2 \times futuretreatment_{it-1} + \alpha_s + \delta_t + \gamma \times X_{it-1} + \epsilon_{it} \quad (1)$$

where Y_{it} denotes the corruption outcome for an individual i in year t. The lagged binary variable $treatment_{it-1}$ captures whether individual i is exposed to strong FDI presence within a

25km radius around its place of residence.[4,5] Analogously, *futuretreatment*$_{it-1}$ captures whether individual *i*'s region of residence will have strong foreign firm presence in the future. Fig. A1 and A2 in the Appendix visualize the matching of firms and individuals as well as the assignment of the individuals to the different groups. We further include country α_s and year dummies δ_t. To account for individual determinants of corrupt behavior, we include a vector of respondent control variables (X_{it-1}): the individual's present living conditions, its education, gender, age, and a dummy for urban/rural residence (Mocan, 2004).[6] Similar to difference-in-differences regressions, this estimation strategy controls for unobservable time-invariant characteristics that may influence investment decisions of foreign firms. Thus, our focus is on the parameter difference between *treatment*$_{it-1}$ and *futuretreatment*$_{it-1}$ ($\beta_1 - \beta_2$), which can be interpreted as the effect of FDI on corruption.

3 Results

Table 1 presents easy-to-interpret OLS regression results for different corruption measures with our baseline estimates in col. 2. The coefficient on *treatment*$_{it-1}$ is positive, indicating that bribe payments are more frequent in regions where foreign firms are present. *futuretreatment*$_{it-1}$ is found to be negatively correlated with corruption experience, which can be regarded as foreign firms' preference for less corrupt locations. Nevertheless, due to the potentially endogenous investment decision we focus on the difference between treated and future-treated individuals (*net effect*). Our baseline estimates in col. 2 imply that individuals living near FDI locations are 7.1 percentage points more likely to have paid a bribe compared to individuals living close to a location where foreign firm presence will be strong (i.e. above the chosen threshold) in the future but where investments were yet to begin at the survey date. This finding is robust across alternative corruption measures (col. 3-5), towards using an employment-weighted (future) treatment measure (col. 6), and an alternative cutoff distance

[4] Treatment$_{it-1}$ is coded as 1 if the share of foreign firms over all firms (foreign and domestic) within 25km around an individual's place of residence is greater than a certain threshold and 0 otherwise. The appropriate threshold, above which a region will be considered a FDI region, is an empirical question leading to a trade-off between the size of the treatment group and noise. We therefore experiment with different thresholds, choosing one third in our baseline estimations, although our core findings are robust to thresholds smaller and larger than in the baseline model. A distance of 25km is chosen considering practical commuting distances in Africa. In a robustness test below we use an alternative distance of 50km. Standard errors are clustered at the geographical clusters (i.e. village, town, or neighborhood).

[5] Arguably, an employment-weighted measure might better reflect the strength of foreign presence in a specific region. As firm-specific employment data are only available for one year in our sample we do not employ these weights throughout our analysis but instead use this employment-weighted measure in a robustness test below.

[6] Summary statistics for the main variables are presented in Appendix Table A1.

of 50km (col. 7).[7] Additionally, we evaluate a "placebo" regression as falsification test, where the dependent variable is a measure of perception of corruption at the country- rather than the local level, i.e. an outcome supposed to be unaffected by the treatment (col. 8).[8] Given that national corruption is the same for all citizens in a country, individuals in both groups (treated and future-treated) should not differ regarding perceived national corruption, which is clearly confirmed here.

Further, in Table 2 we explore the two previously discussed channels through which FDI potentially affects corruption. Although data limitations prevent us from clearly identifying these channels, we try to approximate the extent to which they play a role. First, we control for economic activity using night light intensity data merged to an individual's place of residence (col. 1).[9] We find that higher economic activity is positively associated with corruption experience at the local level, which is in line with the theoretical consideration that economic growth increases rents that could be shared. However, controlling for economic activity does not change our main finding (although the effect of FDI on local corruption decreases in size), indicating that FDI does not affect corruption exclusively via higher economic activity. Second, we use several variables to capture different drivers of norm transmission, namely via linkages with foreign suppliers (col. 2), foreign employees (col. 3), and the degree of corruption in the investors' country of origin (col. 4).[10] Both variables on the linkages with foreign suppliers and on the extent to which foreign workers are employed in foreign-owned firms are not significant, implying that they are not the main drivers of norm transmission. When examining source country heterogeneity in terms of corruption, we find that the corruption environment of investors' country of origin does indeed play a role: FDI from highly corrupt source countries increases local corruption. Given that FDI from developing and emerging countries plays a major role in most Sub-Saharan economies this finding is plausible.

[7] Using logit regressions and calculating marginal effects does not qualitatively change our results.

[8] National corruption is proxied by perceived corruption concerning national government officials' involvement in corruption (also taken from the Afrobarometer). See Rosenbaum (2002) for a discussion of placebo tests.

[9] We thank Julian Hinz for providing these data.

[10] Where higher values imply less corruption. These country-level data are taken from the Worldwide Governance Indicators available at http://info.worldbank.org/governance/wgi/#home.

4 Conclusion

We investigate the impact of FDI on local corruption in Africa using a spatial-temporal estimation technique. Our results show that the presence of foreign firms positively impacts host countries' local corruption measured by individuals' corruption experience. When examining two potential channels, the results provide first evidence that FDI affects corruption partly via increased economic activity. In contrast, norm transmission via foreign supplier or foreign employee linkages seems to play a minor role, whereas it makes a difference whether foreign investors come from relatively corrupt countries or not. Our findings suggest that FDI host countries should 1) be aware of potentially negative effects of investments from relatively corrupt source countries, and 2) emphasize the fight against corruption and the development of good governance/institutional quality in order to deploy potentially positive effects of FDI.

Table 1 Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	25km			50km			Placebo	
	bribe document	bribe document	bribe police	bribe school	bribe household	bribe document	bribe document	corruption government
treatment (no. of firms)	0.036***	0.024**	0.011	0.008	0.025***		0.010	0.005
	(0.011)	(0.011)	(0.011)	(0.008)	(0.007)		(0.010)	(0.009)
futuretreatment (no. of firms)	-0.040**	-0.047***	-0.046**	-0.064***	-0.015		-0.039***	0.009
	(0.016)	(0.015)	(0.020)	(0.017)	(0.014)		(0.013)	(0.020)
treatment (employment)						0.025**		
						(0.011)		
futuretreatment (employment)						-0.017		
						(0.011)		
ln(age)		-0.016*	-0.012	-0.000	0.009*	-0.016*	-0.011	-0.018**
		(0.008)	(0.008)	(0.006)	(0.005)	(0.008)	(0.007)	(0.008)
female		-0.055***	-0.086***	-0.012***	-0.020***	-0.055***	-0.052***	-0.007
		(0.006)	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)
urban		0.034***	0.049***	0.024***	0.032***	0.034***	0.041***	0.029***
		(0.008)	(0.008)	(0.006)	(0.005)	(0.008)	(0.007)	(0.009)
education		0.017***	0.013***	0.002	0.007***	0.016***	0.017***	0.018***
		(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
living conditions		-0.016***	-0.013***	-0.012***	-0.007***	-0.016***	-0.015***	-0.012***
		(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Constant	0.161***	0.199***	0.194***	0.156***	0.019	0.189***	0.160***	0.910***
	(0.022)	(0.040)	(0.038)	(0.030)	(0.025)	(0.039)	(0.034)	(0.038)
Observations	14,383	14,214	12,862	13,079	16,522	14,214	19,642	13,072
R-squared	0.072	0.089	0.134	0.060	0.701	0.088	0.081	0.096
net effect	0.076***	0.071***	0.057***	0.072***	0.039***	0.042***	0.049***	-0.004
F-test	24.15	23.57	8.68	16.87	7.54	10.16	13.69	0.04
p-value (*F*-test)	9.66e-07	1.30e-06	0.00326	4.21e-05	0.00610	0.00146	0.000220	0.842

Notes: Time and country dummies included in all estimations. The dependent variable is coded as 0 if the respondent did not pay a bribe or 1 if the respondent paid a bribe at least once. The effect of FDI on corruption is given by the parameter difference *net effect* and associated *F*-tests and *p*-values below. Robust standard errors (in parentheses) are clustered by the survey clusters: * p<0.1, ** p<0.05, *** p<0.01.

Table 2 Robustness and possible mechanisms

	(1) Channel 1: economic activity (night light)	(2) Channel 2: norm transmission (foreign suppliers)	(3) Channel 2: norm transmission (foreign employees)	(4) Channel 2: norm transmission (investor origin)
	bribe document	bribe document	bribe document	bribe document
treatment (no. of firms)	0.012	0.020	-0.002	-0.007
	(0.019)	(0.014)	(0.014)	(0.014)
futuretreatment (no. of firms)	-0.055*	-0.053***	-0.071***	-0.088***
	(0.028)	(0.020)	(0.020)	(0.020)
ln(age)	-0.015	-0.014	-0.017*	-0.017*
	(0.012)	(0.010)	(0.010)	(0.010)
female	-0.062***	-0.067***	-0.062***	-0.063***
	(0.008)	(0.007)	(0.007)	(0.007)
urban	0.035***	0.038***	0.036***	0.037***
	(0.013)	(0.011)	(0.010)	(0.010)
education	0.012***	0.016***	0.016***	0.016***
	(0.003)	(0.002)	(0.002)	(0.002)
living conditions	-0.017***	-0.015***	-0.016***	-0.015***
	(0.004)	(0.004)	(0.004)	(0.004)
night light	0.001***			
	(0.000)			
foreign suppliers (regional share)		-0.004		
		(0.017)		
foreign employees (regional share)			-0.013	
			(0.092)	
corruption investor origin (regional avg.)				-0.020*
				(0.012)
Constant	0.146**	0.212***	0.239***	0.257***
	(0.058)	(0.048)	(0.045)	(0.046)
Observations	6,833	10,125	11,038	11,075
R-squared	0.099	0.090	0.087	0.089
net effect	0.066**	0.073***	0.069***	0.081***
F-test	4.048	15.24	14.60	20.61
p-value (*F*-test)	0.0445	9.91e-05	0.000138	6.07e-06

Notes: Time and country dummies included in all estimations. The dependent variable is coded as 0 if the respondent did not pay a bribe or 1 if the respondent paid a bribe at least once. The effect of FDI on corruption is given by the parameter difference *net effect* and associated *F*-tests and *p*-values below. Robust standard errors (in parentheses) are clustered by the survey clusters: * p<0.1, ** p<0.05, *** p<0.01.

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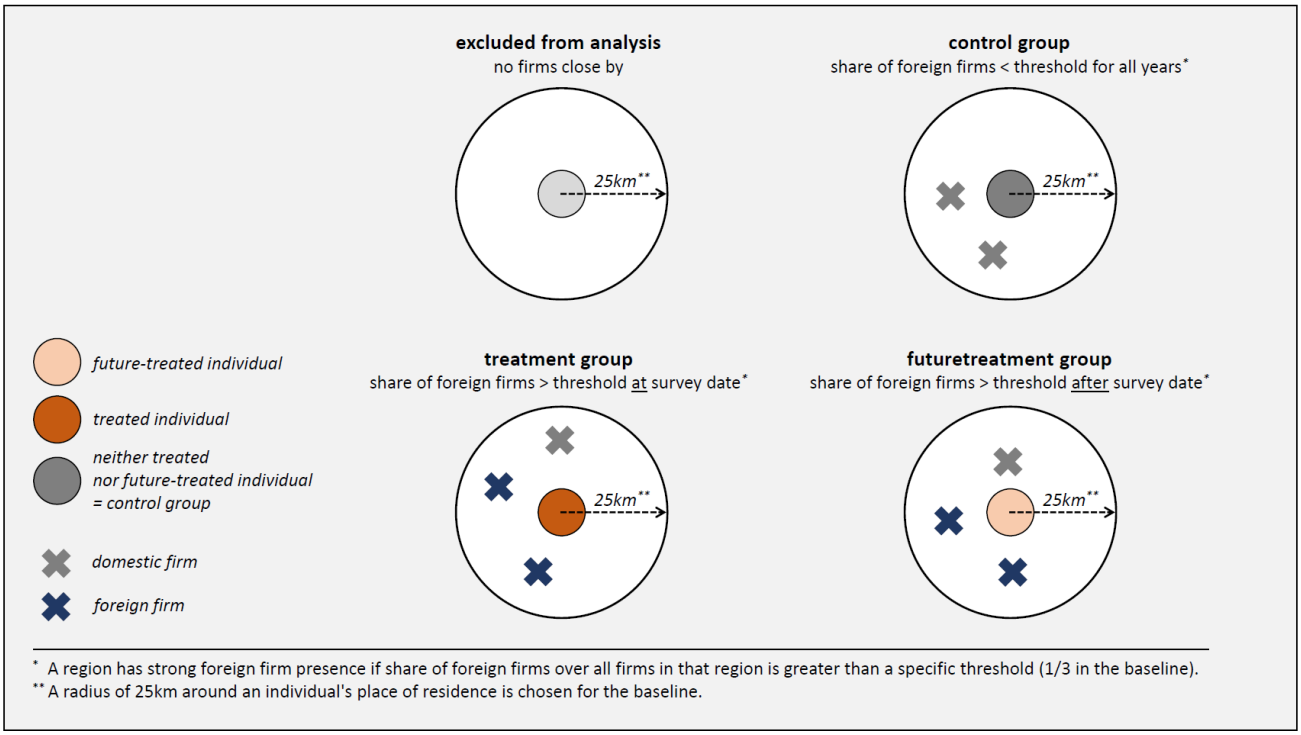
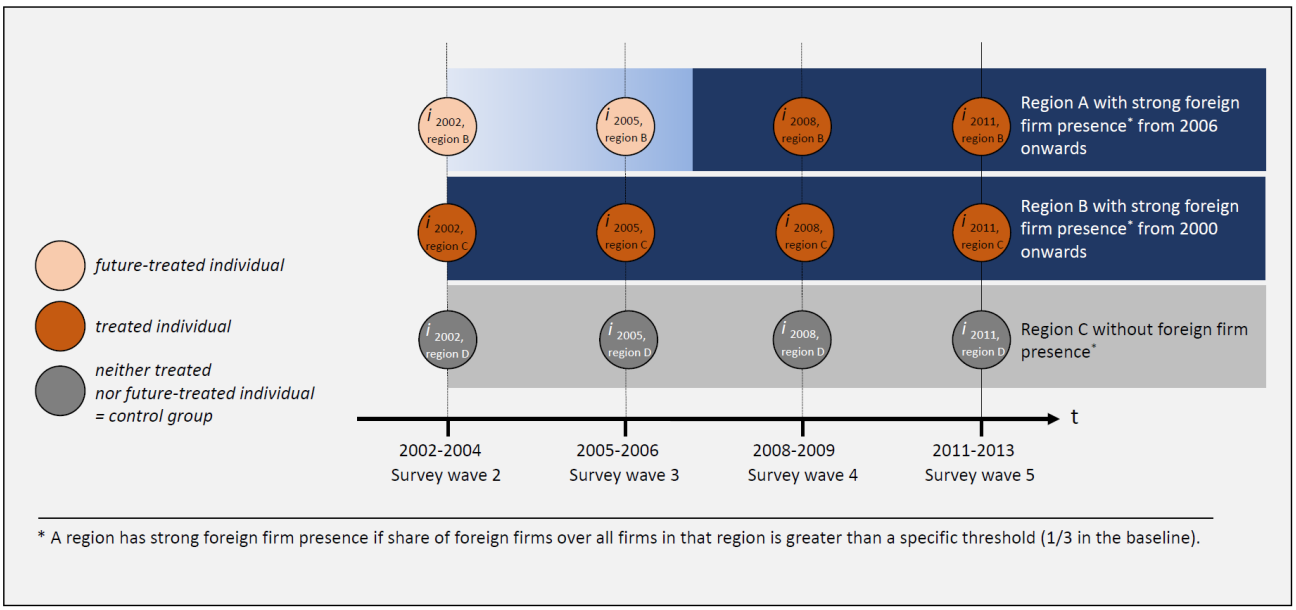
Appendix

Fig. A1. Stylized visualization: Assignment of treated and future-treated status to individuals *i*



Source: Own visualization.

Fig. A2. Stylized visualization: Time variation of treated and future-treated individuals *i*



Source: Own visualization.

Table A1 Summary statistics

	Observations	Mean	Std. dev.	Min	Max
bribe document	14,214	0.185	0.388	0	1
treatment (no. of firms)	14,214	0.370	0.483	0	1
futuretreatment (no. of firms)	14,214	0.051	0.221	0	1
ln(age)	14,214	3.497	0.390	2.890	4.605
female	14,214	0.490	0.500	0	1
urban	14,214	0.658	0.474	0	1
education	14,214	3.614	1.994	0	9
living conditions	14,214	2.679	1.098	1	5

Notes: Summary statistics are based on the sample and variables in col. (2) of Table 1.