Appendix 3. Covariate Data Sources

Table A3.1: Sources and brief justification for covariate data. Where possible, covariate information was drawn from data that pre-dated the implementation of the LSLTs.

Covariate	Resolution (m)	Year	Source	Notes / justification
Elevation	30	n/a	SRTM 30m [1]	Elevation varies widely over Ethiopia and is associated with climate and agricultural suitability and productivity. As such, elevation may influence both LULCC and the location of a land transaction. For example, areas with more favorable climatic conditions (proxied by elevation) are both more likely to be converted into smallholder agriculture and sold to an investor (LSLT).
Slope	30	n/a	SRTM 30m [1]	Areas of low slope are more suitable for agriculture, so are more likely to be developed for agriculture, whether as a part of an LSLT or not.
Soil productivity	250	n/a	Schaetzl et al 2012	Similar to above, areas of high potential productivity are more likely to be developed for agriculture. Method: Soil Productivity Index introduced by Schaetzl et al (2012). This methodology was introduced for the United States and was simplified to apply to data available for Ethiopia. Values range from 1 to 18 with higher values representing high productivity.
Population density	100	2010	AfriPop (Linard et al. 2012)	Population density can influence LULCC (e.g., population pressure can lead to agricultural expansion) as well as the selection of sites for transaction (Messerli et al., 2014).
Forest cover	30	2010	GlobCover 2009 [2]	Land transactions are known to occur in forested areas (Dell'Angelo et al., 2017; Magliocca et al., 2019; Messerli et al., 2014) and initial forest cover will also influence rates of agricultural expansion and abandonment. Method: Global Forest Cover "forestcover2000" and "lossyear" layers were combined to create a 2010 forest cover. It was assumed anywhere where loss occurred up to 2010 was a complete reduction of forest cover (i.e. value of 0). Finally, a 25% tree cover threshold was applied to provide a forest cover estimate.
Distance to road [3]	30	2017	OpenStreetMap [4]	LSLTs often occur in more accessible regions (Messerli et al., 2014). Additionally, points closer to roads are more suitable for agriculture as products can be more easily transported to market. Method: Selected OSM roads of type: ['motorway', 'primary', 'primary_link', 'residential', 'secondary', 'secondary_link', 'tertiary', 'tertiary_link'] and applied Euclidean Distance. Snapped to forest cover estimate.
Night-time lights	467	2015	VIIRS Nighttime lights (Elvidge et al. 2017)	Night-time lights are used as a proxy for development. Method: VIIRS Nigthtime Lights product, avg_rad (nanoWatts/cm2/sr)

[1] (USGS, n.d.)
[2] http://due.esrin.esa.int/page_globcover.php
[3] We excluded this covariate in the second stage matching for BG4, GM1, OR2, and OR4 because of limited overlap in these covariate distributions between the Treatment and Control sites.
[4] https://www.openstreetmap.org/

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