**SUPPLEMENTARY MATERIALS**

**S1.** The expected annual return per hectare of forestland (i.e., deciduous forestland and evergreen forestland) was estimated using Soil Expectation Value (SEV), which represents the present discounted value of the rents earned by an infinite series of identical rotations with the same timber management activities (Bettinger *et al.* 2009). The SEV for forestland *f* (*f* = deciduous forestland or evergreen forestland) per hectare for county *j* in 2001, for example, was estimated as:

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whereis the stumpage price for forestland *f* in 2001,  is the harvest volume per hectare for forestland *f* in county *j* at harvest age *t*, and *r* is the discount rate of 5%. Here, the stumpage price is the price received by the landholder for the forest products after all costs of cutting, snigging and haulage have been paid. Following the conventional timber-harvesting decision rule, the harvest age *t* was determined by setting the average stumpage value equal to the annual incremental change in stumpage value for forestland *f* in county *j*. Then, was obtained by taking the average of the plot-level harvest volume per hectare for county *j* based on the Forest Inventory and Analysis (FIA) database (USDA-FS 2015).

The stumpage price for Tennessee was obtained from Timber Mart-South (2015), which is a quarterly market price survey report of the major timber products. The stumpage price for Kentucky was collected from Growing Gold (Kentucky Division of Forestry 2015). The information on harvest volume and rotation age at the county-level for deciduous forestland and evergreen forestland was from Smith *et al.* (2006).

Weighted averages in 2001 and 2006 of the SEVs for a county were calculated with the shares of the two forestland types in the county as weights. Then, the annualized weighted-average SEV per hectare for the county was calculated for each year. The SEV is annualized for the following reason: Forestland provides non-annual periodic income based on the timber harvest cycle and expected returns from the other three land uses are estimated as annual values. The expected returns from the four land uses must be in the same unit (i.e., annual US$ per hectare) because they are included as regressors for competing land uses in the multinomial logit model.

Weighted averages of the SEVs for each county *j* for year *t* (*t* = 2001 and 2006), *WSEVjt*, were calculated based on shares of the two forestland types as:

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where is the ratio of each tree type in the county and is the SEV for forestland type *f* in county *j* for year *t*. Then, the annualized weighted-average SEV per hectare () for each forestland type in each county in year *t* was calculated as:

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where *r* is the discount rate and *n* represents a period of 100 years, which can be flexible, but should be adequately long. Then, the property tax amounts, which vary by county, were subtracted from to estimate the expected annual return per hectare of forestland after tax.

County-level rent per hectare of pastureland was used as the expected net return per hectare of pastureland. County-level data for 2001 and 2006 were not available. The data were predicted using a fixed-effect model with panel data by regressing county-level pastureland rent on state-level pastureland rent and county-level cattle numbers and pastureland area for the period of 2008–2012. The latter variables were included under the premise that pastureland rent is positively related with the size of the cattle herd and the area of pastureland within a county. The pastureland rent data were from National Agricultural Statistical Service (NASS 2014) and cattle number data were from Census of Agriculture (USDA Census of Agriculture 2012). County-level pastureland area is available for 1997, 2002, 2007, and 2012 for both states from the Census of Agriculture (USDA Census of Agriculture 2012). The area data for unavailable years (i.e., 2008, 2009, 2010, and 2011) were interpolated assuming an annual average linear increase between 1997 and 2012 for the estimation of the fixed effect model and its prediction of 2001 and 2006 county-level rent per hectare of pastureland. Then, the property tax amounts were subtracted from the predicted values for 2001 and 2006 to estimate the expected annual net returns per hectare of pastureland after property tax.

A description of the steps used to estimate the expected annual return per hectare of cropland at the county level follows:

1. The ratio of livestock and poultry cash expenses to total farm production expenses was derived;
2. This ratio was multiplied by total county net cash farm income to give an estimate of net cash farm income from livestock and poultry. (Thus, net cash farm income is directly and positively correlated with farm production expenses.);
3. The estimated net cash farm income from livestock and poultry was subtracted from total net cash farm income, resulting in an estimate of net cash farm income from cropland;
4. County-level net cash farm income from cropland was divided by hectares of harvested cropland in the county; and
5. Property taxes per hectare were subtracted from net cash income from cropland per hectare for 2001 and 2006 to estimate the expected annual return per hectare of cropland after tax.

A description of the steps used to estimate the expected annual return per hectare of urban land at the county level follows:

1. Parcel-level land value ratios were obtained for counties for which parcel-level data were available by dividing assessed land value by total assessed value;
2. The parcels’ land value ratios were divided by their respective plot sizes to obtain land value ratios per hectare;
3. An OLS regression was performed with the land value ratio per hectare as the dependent variable and population density in 2010 and a vector of distance variables as explanatory variables. The regression model was specified under the premise that *(i)* the value of a parcel’s land increases relative to the value of its single-family house in more urbanized areas that are more densely populated and closer to the city center with its associated facilities (Albouy and Ehrlich, 2012) and *(ii)* the land value ratio does not fluctuate over time (Bourassa *et al.* 2011);
4. The regression coefficients and the respective census-block group data were used to estimate the average land value ratio per hectare for each census-block group;
5. The average land value ratio per hectare for each census-block group was multiplied by the respective median housing price to obtain an estimate of the median assessed land value per hectare, which was used as a proxy for the expected return per hectare of urban land for each census-block group; and
6. The estimates were annualized assuming 100 years and a 5% discount rate and the property tax amounts were subtracted from the annualized value to estimate the expected annual return per hectare for urban land after the tax.

**S2.** Landowners are assumed to make land use decisions among a set of alternative land uses to maximize utility. The simplest characterization of the land use decision is that the landowner of parcel *i* converts the parcel’s land use *m≠1* to land use *m=1* if:

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where is utility from land parcel *i* for land use *m*, which is a function of observable variables, and a random portion,. The probability that land parcel *i* is converted from land use *m≠1* to land use *m=1* is:

, for all *m=1,…, M.*

The distribution of is assumed to be multinomial logit. Under this assumption, we estimated the following multinomial logit model for land use choices in 2006 and 2011 as functions of expected annual returns for land uses in 2001 and 2006, respectively, and other factors in 17 Tennessee counties and 1 Kentucky county:

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whereare parameters for the *m*th land use to be estimated by [regression](http://en.wikipedia.org/wiki/Regression_coefficient); *j* is a 1 km2 pixel that represents land parcel *i*; *m* = 1, 2, 3, 4, 5 for other land uses, forestland, pastureland, cropland, and urban land, respectively; is average elevation of pixel *j*; is average slope of pixel *j*; is a year dummy variable (1 if the land use choice is made in 2011, 0 if the land use choice is made in 2006) for pixel *j*; and is a vector of expected annual returns from the *m*th land use for pixel *j*, 5 years lagged (i.e., 2001 and 2006, respectively, for land use choices in 2006 and 2011).

**S3.** The marginal effect of the *k*th explanatory variable associated with the *m*th land use of pixel *j*,, is calculated as:

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where is the [regression coefficient](http://en.wikipedia.org/wiki/Regression_coefficient) of the *k*th explanatory variable associated with the *m*th land use.

**S4.** The land-use area data, including the forestland areas in 2006 and 2011, were obtained from the National Land Cover Database (NLCD 2011), where 21 mutually exclusive land use classifications are available at a resolution of 30 m × 30 m. These 21 classifications were reduced to five land use categories in our study. The “cropland use” category included the cultivated cropland classification, and the “pasture land use” category included the pasture/hay and grassland/herbaceous classifications. The “urban land use” category included developed open space, developed low intensity, developed medium intensity, and developed high intensity classifications. The NLCD classifications of deciduous, evergreen, and mixed forest classifications were merged as “forestland use” for the land use model. The remaining NLCD classifications were categorized as “other land use”. Example of “other use” include open water, barren land rock/sand/clay, dwarf scrub, shrub/scrub, woody wetlands, and emergent herbaceous wetlands.

**S5.** The following processes were implemented to calculate carbon sequestration:

1. Daily minimum and maximum temperatures and precipitation levels during 1980–2013 were collected from a weather station at McGhee Tyson Airport, which is located at the center of East Tennessee. The daily weather data for 1980–2013 were used to calculate daily means of minimum and maximum temperatures and precipitation levels, which were used to proxy daily weather data for 2014–2163;
2. Soil texture data were collected for six soil types (i.e., clay loam, clay, loam, sandy clay loam, sandy loam, and sandy clay) in the 17 Tennessee counties and 1 Kentucky county. The soil type was determined by the Soil Texture Triangle Hydraulic Properties Calculator (Saxton *et al.* 1986);
3. Plant rotation schedules and management options appropriate for the study area were defined (Rotation years for oak and loblolly pine were specified to be 75 and 50 years, respectively, following the timber harvesting decision rule described in section *2.2*); and
4. Clear cutting was selected as the forest management option following the standard management option in the DayCent user’s manual (Peng *et al.* 1998).

**S6.** Following Richards and Stoke (2004), the present value of carbon (PVC) sequestered per hectare was calculated for the 2 tree types and 6 soil types in each county:

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whereis present value of carbon stock in tonnes for tree type *f* and soil type *s*; is annual carbon stock for *f* and *s* at time *t* during 1980–2163; and *r* is the discount rate. Next, the weighted average of the present values of carbon sequestration was calculated for each county based on the county’s shares of the 2 tree types and 6 soil types:

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where *WPVC* is the weighted average of the present value of carbon sequestration for a particular county,is the ratio of each tree type in the county, and is the ratio of each soil type in the county.

**Supplementary Materials-Specific References**

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