Modeling and Forecasting Effects of Land-Use Change in China Based on Socioeconomic Drivers

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Introduction

- Questions
  - How rapidly is agricultural land being lost?
  - How rapidly are urban areas growing?
  - How is land-use change related to economic activity?
- Goals
  - Quantify rate and amount of land conversion.
  - Quantify socioeconomic drivers of land-use change.
  - Quantify effects of land-use change on biophysical properties and biogeochemical processes.
- Approach
  - Quantify land-use change from satellite images.
  - Model relation between land-use and socioeconomic variables.
  - Explore the effect of land-use change on biophysical attributes and biogeochemical processes.
  - Forecast land-use change under various scenarios for economic development.

Results

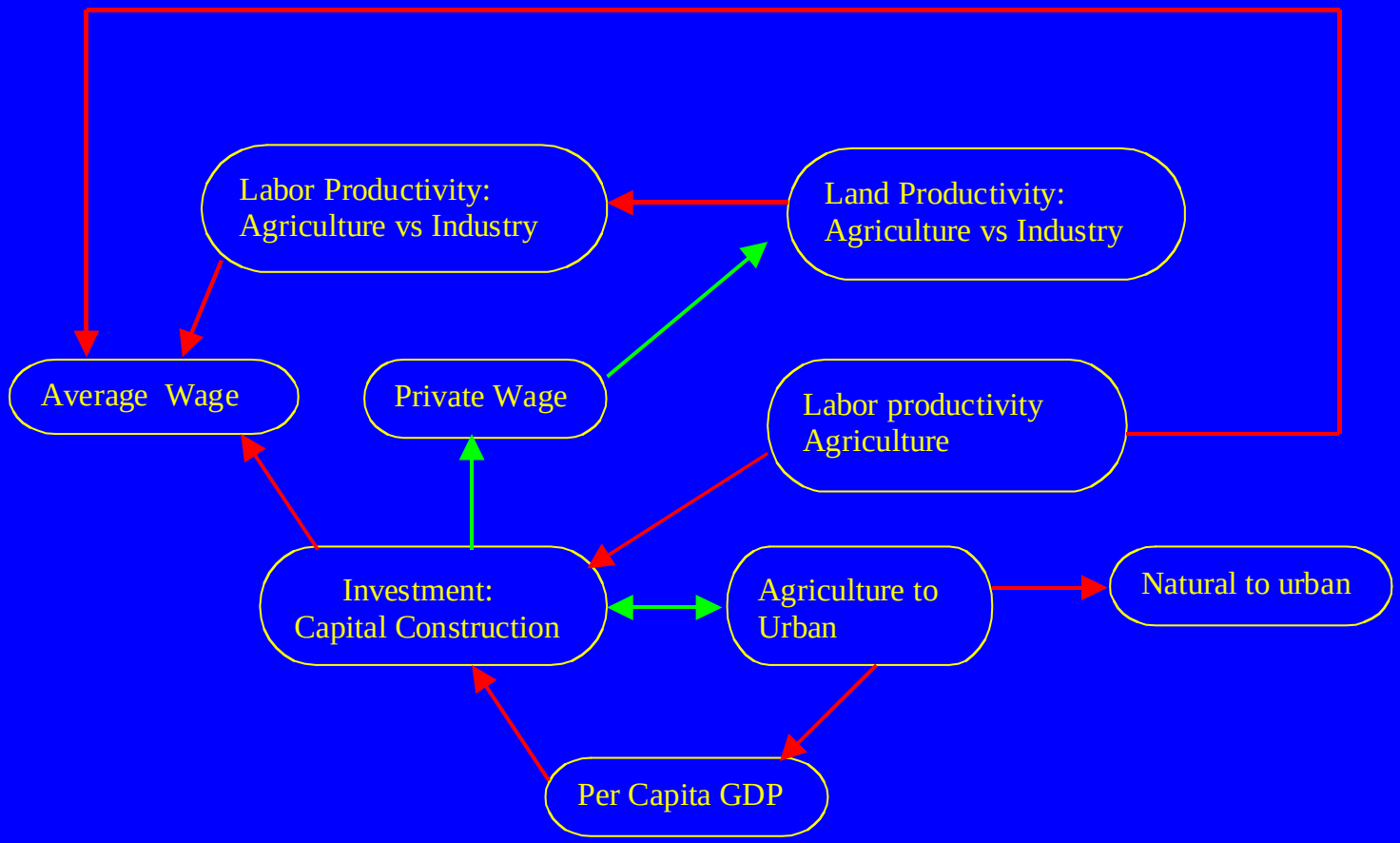
- For classification and change detection applications, complicated atmospheric correction techniques do not always outperform simpler algorithms.
- Map land-use change with high accuracy (93.5%), particularly with respect to the ultimate land-use classes.
- Identify the date of change with a high degree of accuracy and relatively little bias.
- The amount of developed land in the Pearl River Delta tripled between 1988 and 1996.

Satellite estimates of agricultural land and rates of conversion are different from official reports

Figures Embargoed Until Publication

Seto, K. C., Kaufmann, R. K., and Woodcock, C.E., Agricultural land conversion in Southern China, *Nature* (in press).

Changes in land use are driven by changes in the domestic economy and foreign direct investment



Arrows indicate the direction of the relation between variables

Green arrows significant at $p < 0.10$; Red arrows significant at $p < 0.05$

Conclusions

- Annual time series of remotely sensed images can be used to assess land-use and land-use change.
- Time series of remotely sensed images can be integrated with time series of socioeconomic data to estimate statistically meaningful models of land-use and land-use change.
- Models and satellite imagery can be used to investigate the effects of government policies and international economic conditions on land-use and land-use change.

Publications

- Seto, K. C., Kaufmann, R. K., and Woodcock, C.E. Agricultural land conversion in Southern China, *Nature* (in press).
- Song, C., Woodcock, C. E., Seto, K. C., Pax-Lenney, M., and Macomber, S. Classification and change detection using Landsat TM data: When and how to correct the atmospheric effects? *Remote Sensing of Environment* (in press).
- Seto, K. C., Woodcock, C.E., Song, C., Huang, X., Lu, J., and Kaufmann, R. K. Monitoring land-use change in the Pearl River Delta using Landsat TM, *International Journal of Remote Sensing* (in review).
- Kaufmann, R.K. and Seto, K. C. Using Logit models to classify land use from satellite imagery, *Remote Sensing of Environment* (in review).
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Publications (cont'd)

- Seto, K. C. and Kaufmann, R.K. Modeling the drivers of land-use change: integrating remote sensing with time series socioeconomic data, (in preparation).
- Seto, K. C. and Kaufmann, R.K. Forecasting land-use change in the Pearl River Delta: the effect of economic uncertainty, (in preparation).
- Seto, K.C., Woodcock, C.E., Dye, D. G., and Kaufmann, R. K. Comparing carbon fluxes from land cover conversion and increased energy use in Southern China, (in preparation).
- Hinchliffe, T., Dye, D. G., and Woodcock, C. E. Modeling changes in terrestrial net primary production associated with recent land cover conversion in the Pearl River Delta, Guangdong Province, China, (manuscript available).