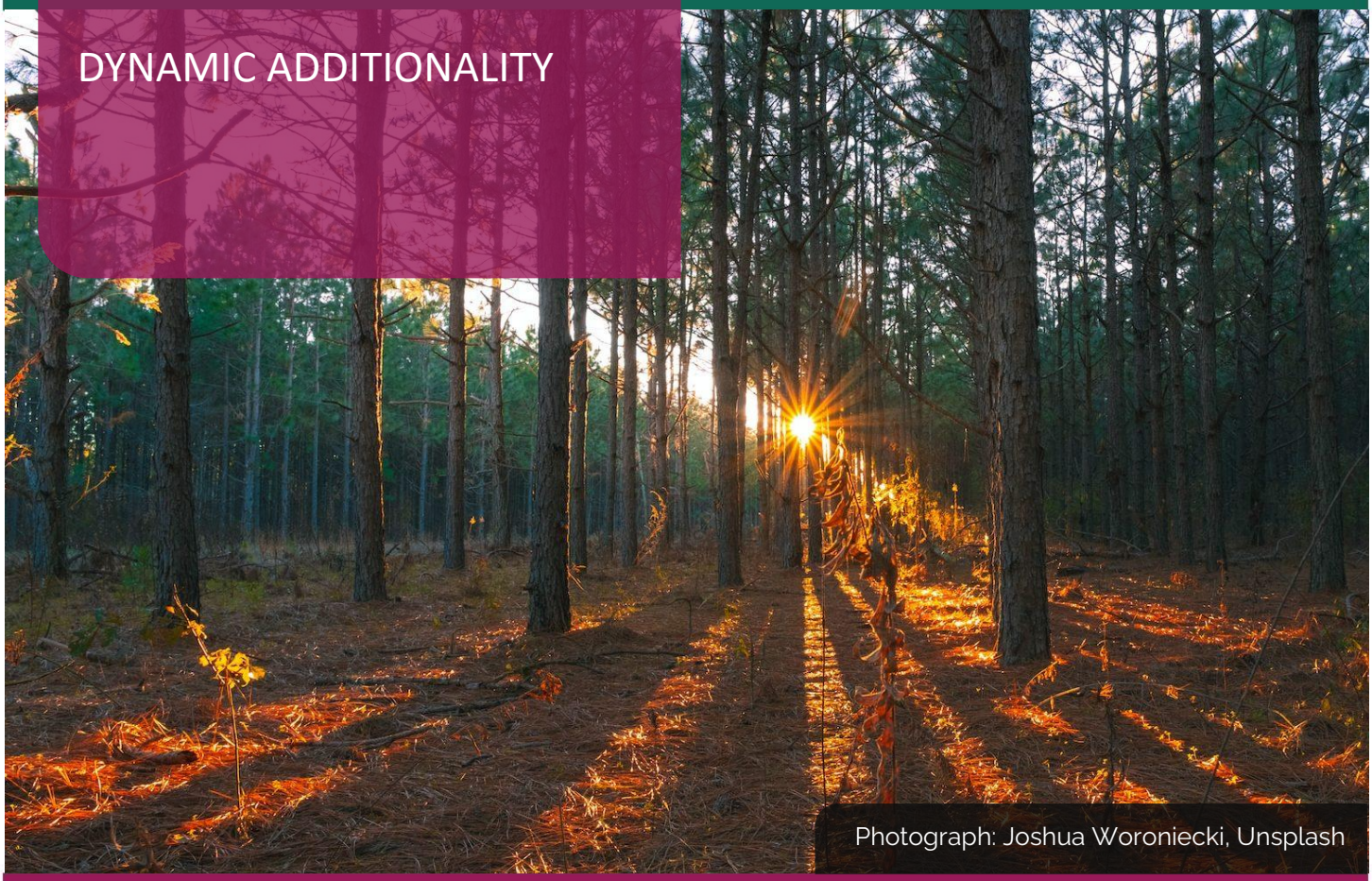
Dragon Capital Chair

REPORT

DYNAMIC ADDITIONALITY



Photograph: Joshua Woroniecki, Unsplash

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Dynamic Additionality

Research and policy question

We examine how forest conservation and restoration can be targeted to deliver *additional* climate benefits: outcomes that exceed business-as-usual (BAU) forest dynamics. We address persistent concerns that conservation policies and carbon markets overestimate baseline deforestation risk, thereby undermining environmental integrity. We offer substantial methodological advances in the *ex-ante* forecasting of additionality, and apply those advances to better understand what interventions, placed where, generate the greatest additional net gains across South America

Methodological approach

We develop a spatially explicit forecasting framework which uses Random Survival Forests to predict forest dynamics from high-resolution remote-sensing data. The RSFs predict annual probabilities of deforestation and regrowth at 30-metre resolution across South America over a 30-year horizon. These predictions are combined into pathway trees that capture the full distribution of future forest trajectories. We translate forest outcomes into carbon stock trajectories, calculate discounted present values, and compare BAU outcomes with counterfactual scenarios of perfect forest protection and reforestation to estimate potential additionality, net of opportunity costs.

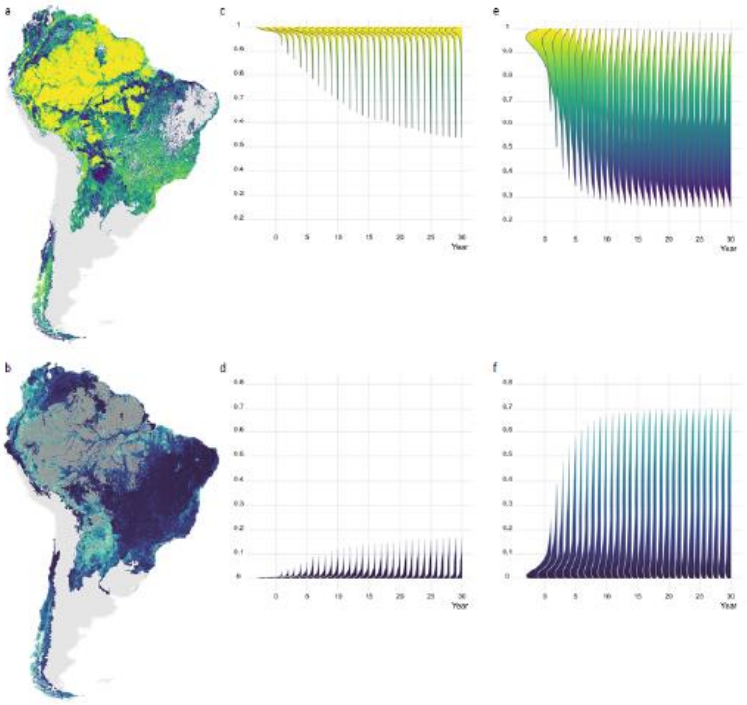

Fig. 2 Random Survival Forest predictions

(a-b) Predicted 30-year probabilities of (a) forest survival and (b) forest regrowth. (c-f) Distributions of predicted (c) survival probability of primary forest, (d) regrowth probability of primary non-forest areas, (e) survival probability of secondary forest, and (f) regrowth probability of secondary non-forest areas through time.

Findings

We project substantial forest and carbon losses under BAU, concentrated along agricultural frontiers. Relative to this baseline, we find large but spatially heterogeneous potential additional gains. Avoided deforestation delivers the greatest aggregate benefits, particularly along forest edges with high deforestation risk and carbon density, while reforestation yields high additionality in selected locations despite slower carbon accumulation. Net of opportunity costs, we estimate potential additional benefits of USD 763 billion from forest protection and USD 526 billion from reforestation. Early avoided emissions generally generate higher present values than delayed sequestration.

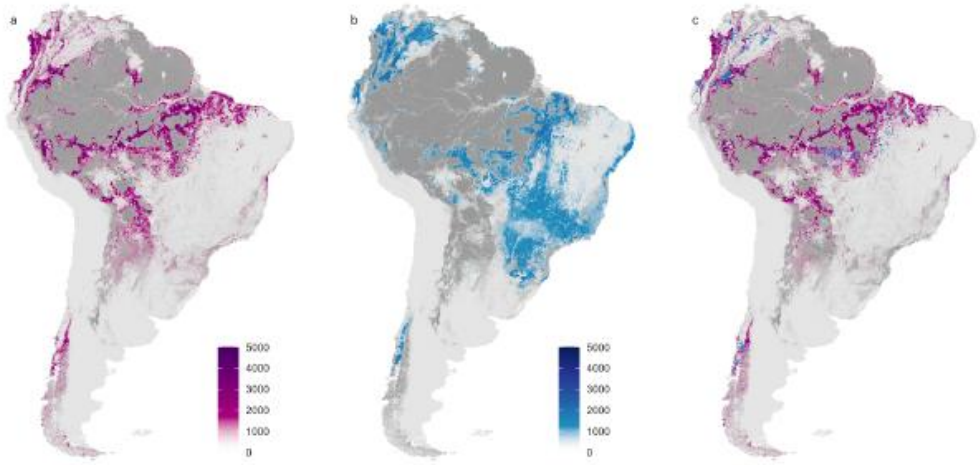

Fig. 4 Potential additional value of interventions over 30 years relative to the 2021 baseline

(a) Potential additional value from protecting standing forest (USD ha^{-1}). (b) Potential additional value from reforesting previously deforested areas (USD ha^{-1}). (c) The map indicates the intervention with the highest value, net of opportunity cost of land use (USD ha^{-1}).

Policy implications

Our results show that additionality is highly location specific. Conservation policies and carbon offset schemes should therefore prioritise areas facing genuine deforestation risk, or low baseline regrowth likelihoods, rather than low-risk or likely to regrow forests. Our framework provides transparent, ex-ante guidance for allocating public and private finance, improving cost-effectiveness, and restoring credibility in forest-based climate mitigation.

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Economic Policy Decision Making for Biodiversity

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