

# Influence of forest stand structure on productivity in comparison to the effect of species identity.

## A study based on global forest inventory data

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# Background

Mixed forests more productive<sup>1,2</sup>

Structured forests more<sup>3</sup>/less<sup>4</sup> productive

global forest inventory data

Diversity vs. Structure  
-> productivity?

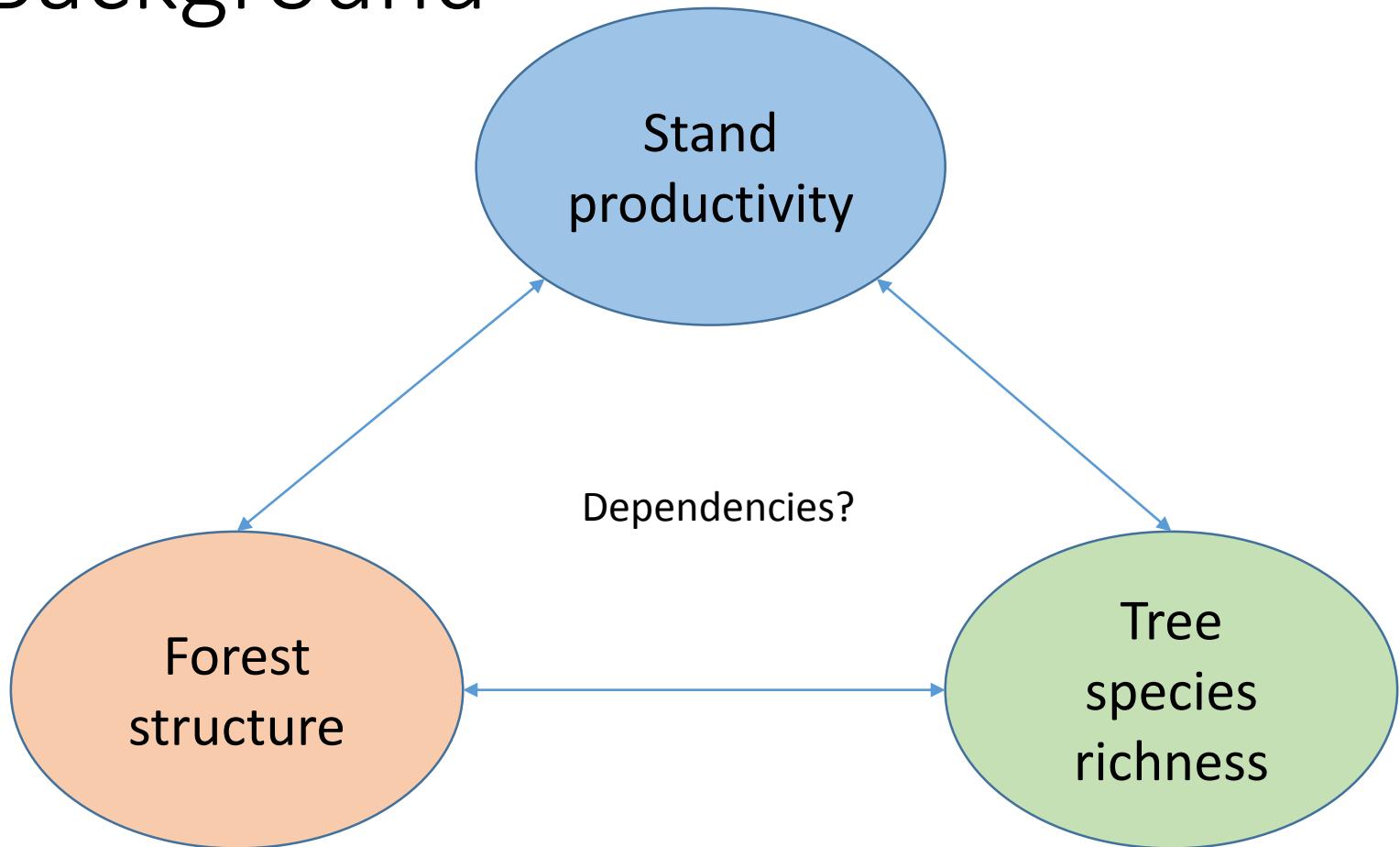
<sup>1</sup>Pretzsch, H., del Río, M., Ammer, C., Avdagic, A., Barbeito, I., Bielak, K. et al, 2015. Growth and yield of mixed versus pure stands of Scots pine (*Pinus sylvestris* L.) and European beech (*Fagus sylvatica* L.) analysed along a productivity gradient through Europe. *Eur J Forest Res* 134, pp. 927–947.

<sup>2</sup>Liang, J., Crowther, T.W., Picard, N., Wiser, S., Zhou, M., Alberti, G. et al, 2016. Positive biodiversity-productivity relationship predominant in global forests. *Science* 354, aaf8957.

<sup>3</sup>Bohn, F.J., Huth, A., 2017. The importance of forest structure to biodiversity-productivity relationships. *The Royal Society*.

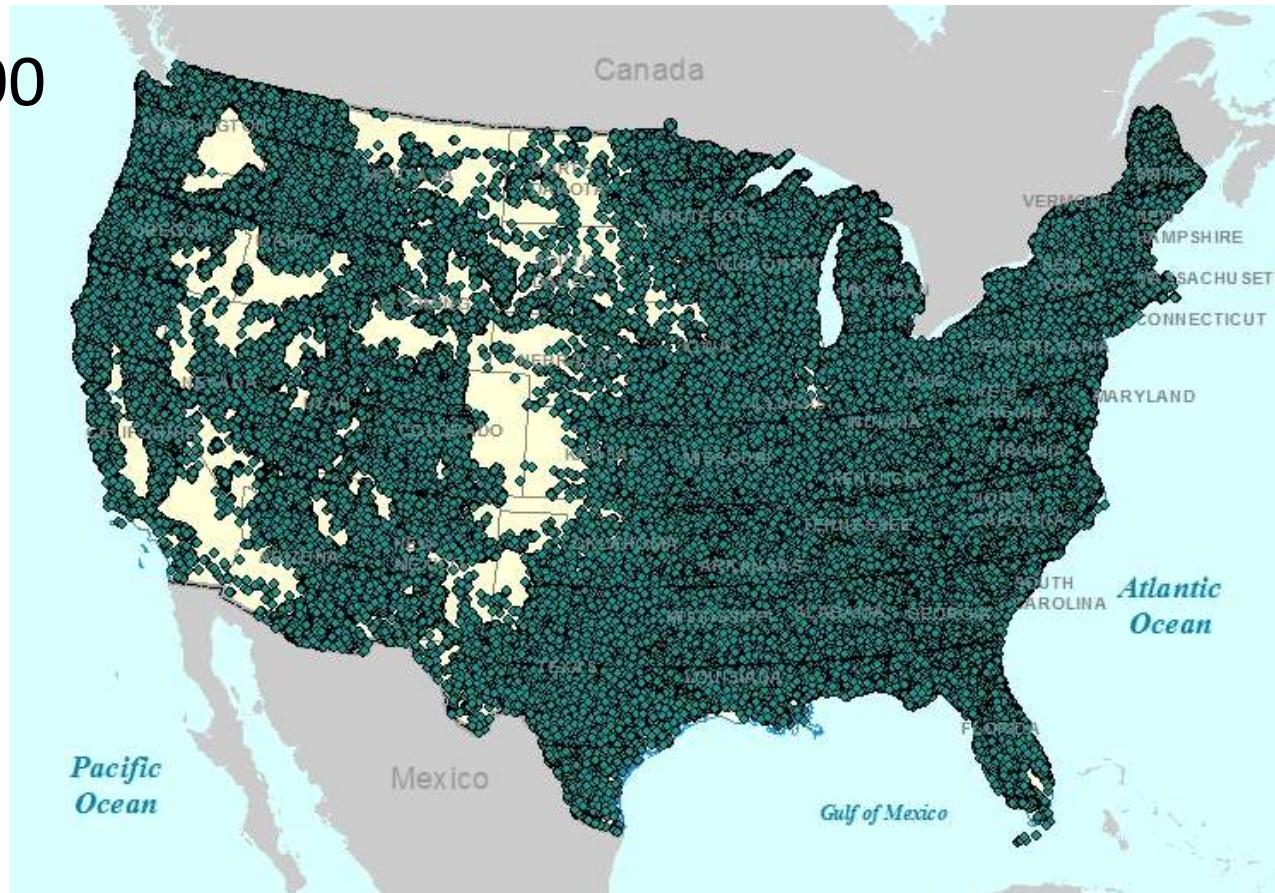
<sup>4</sup>Luu, T.C., Binkley, D., Stape, J.L., 2013. Neighborhood uniformity increases growth of individual Eucalyptus trees. *Forest Ecology and Management* 289, pp. 90–97.

# Background



# Inventory plots US

~ 576'000  
plots



# Inventory plots Germany

~ 50'000 plots



# Methods

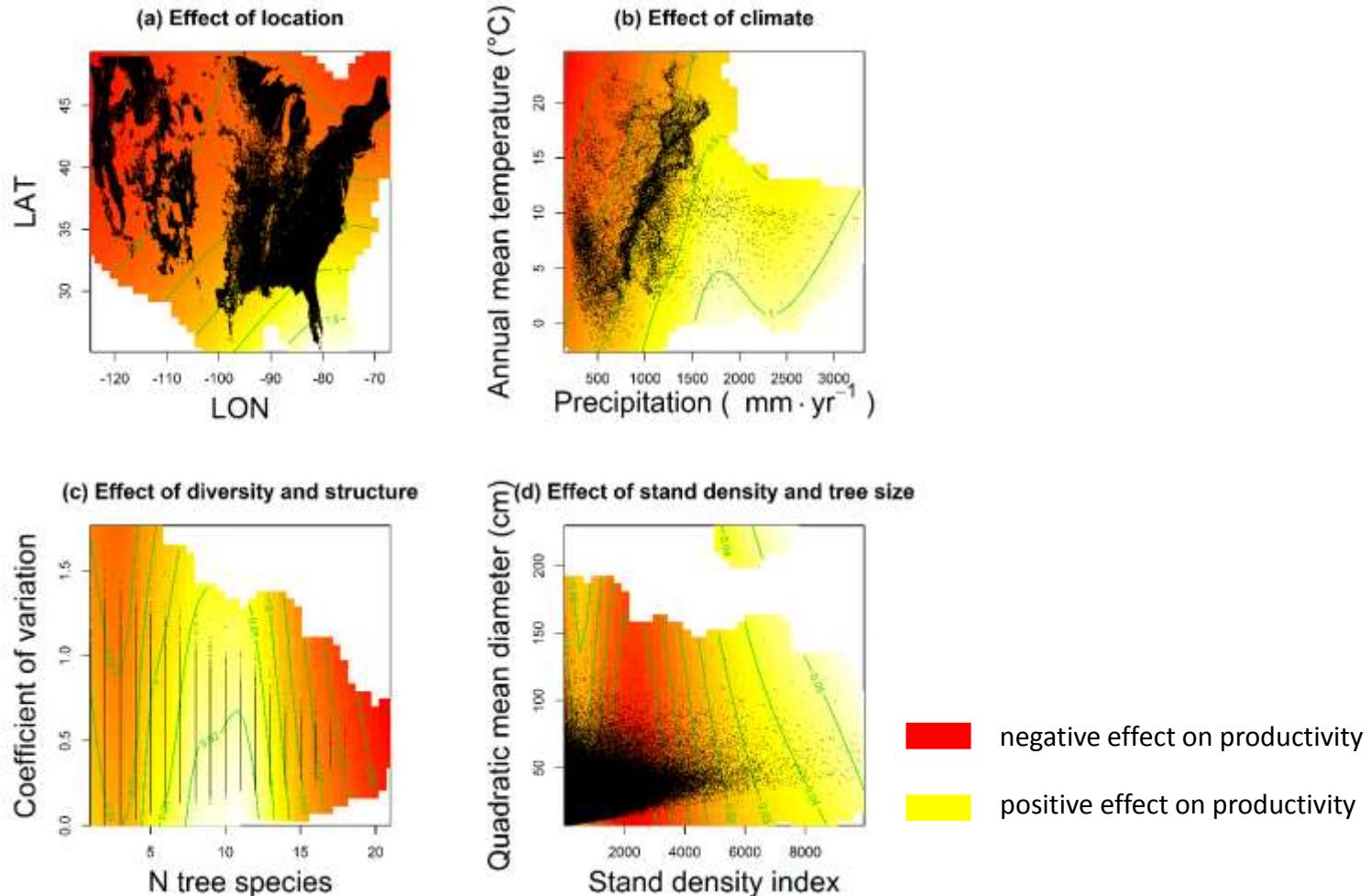
- Generalized additive models
- Interaction terms

# Methods

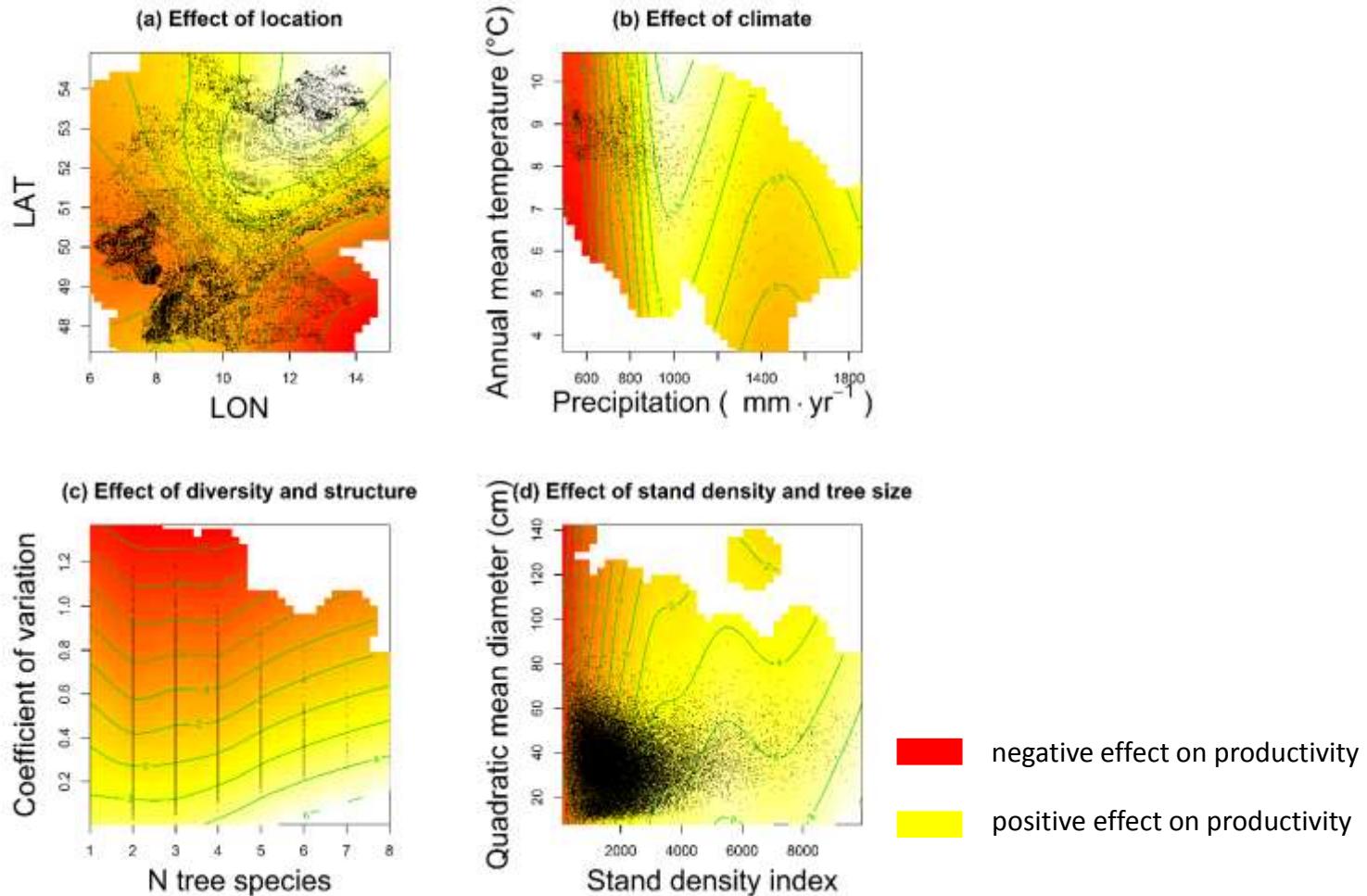
- Generalized additive model
- Interaction terms
- $P_i = a + f_1(LON_i, LAT_i) + f_2(\text{Temperature}_i, \text{Precipitation}_i)$   

- +  $f_3(N.SP_i, CVd_i) + f_4(SDI_i, Dq_i) + \varepsilon_i$   


# Results – USA



# Results – Germany



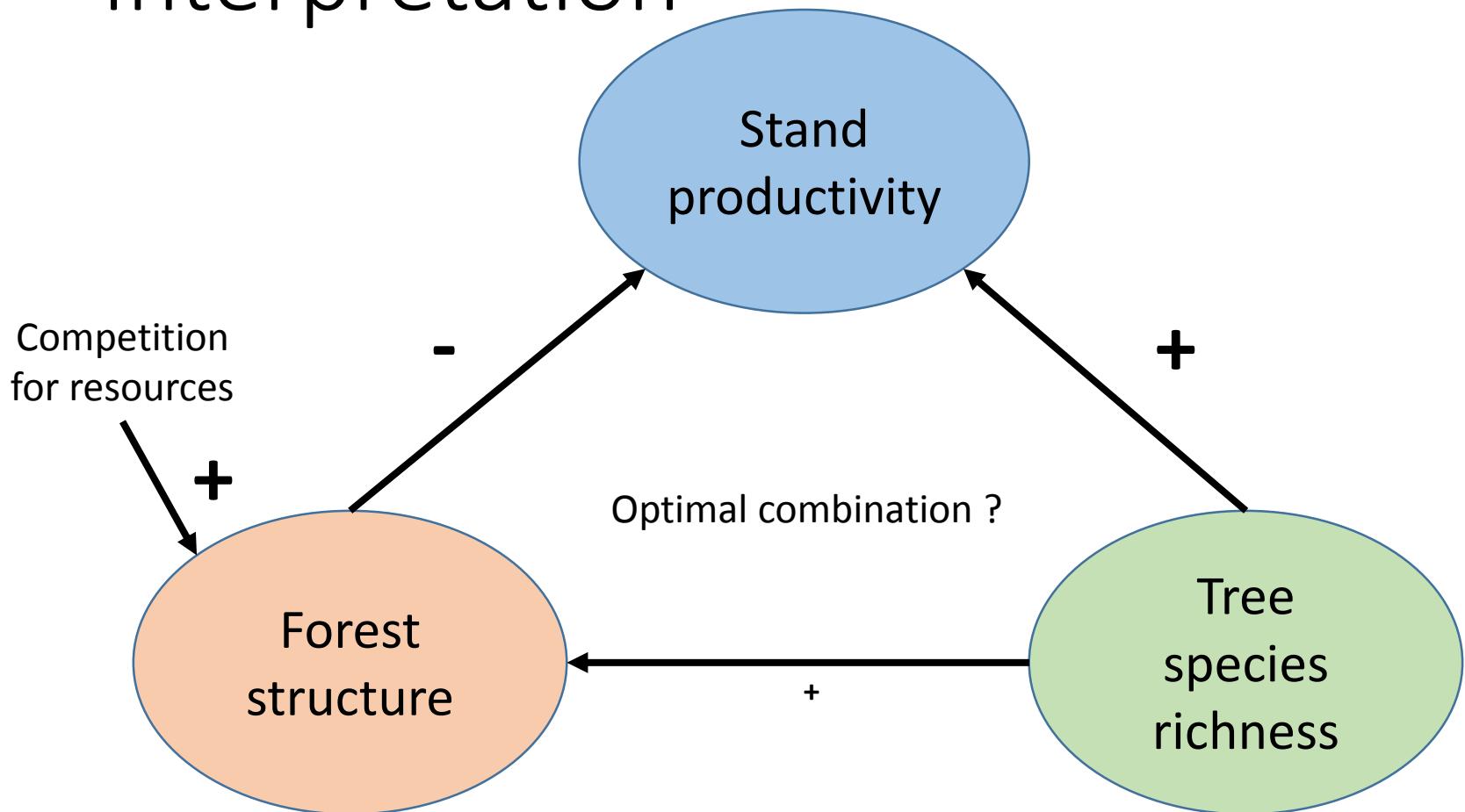
# Results - Summary

Effect	Productivity	
	USA	GER
Dry and warm climate	-	-
Tree Species richness	+	(+)
Tree size heterogeneity	(-)	-
Stand density	0	+

# Results - Summary

Effect	Structural heterogeneity	
	USA	GER
Temperature	0	+
Precipitation	-	0
Stand density	+	+
Tree species richness	+	(+)

# Interpretation



# Conclusion

-> mixing, not too much structuring

-> productivity ↑

# Outlook

- Other forest ecosystem functions?
  - More joint analyses (structure vs. mixing)
  - Study area
- > optimal combination of structure and mixing?



# Thank you!

