

Worldbank Agriculture Analysis

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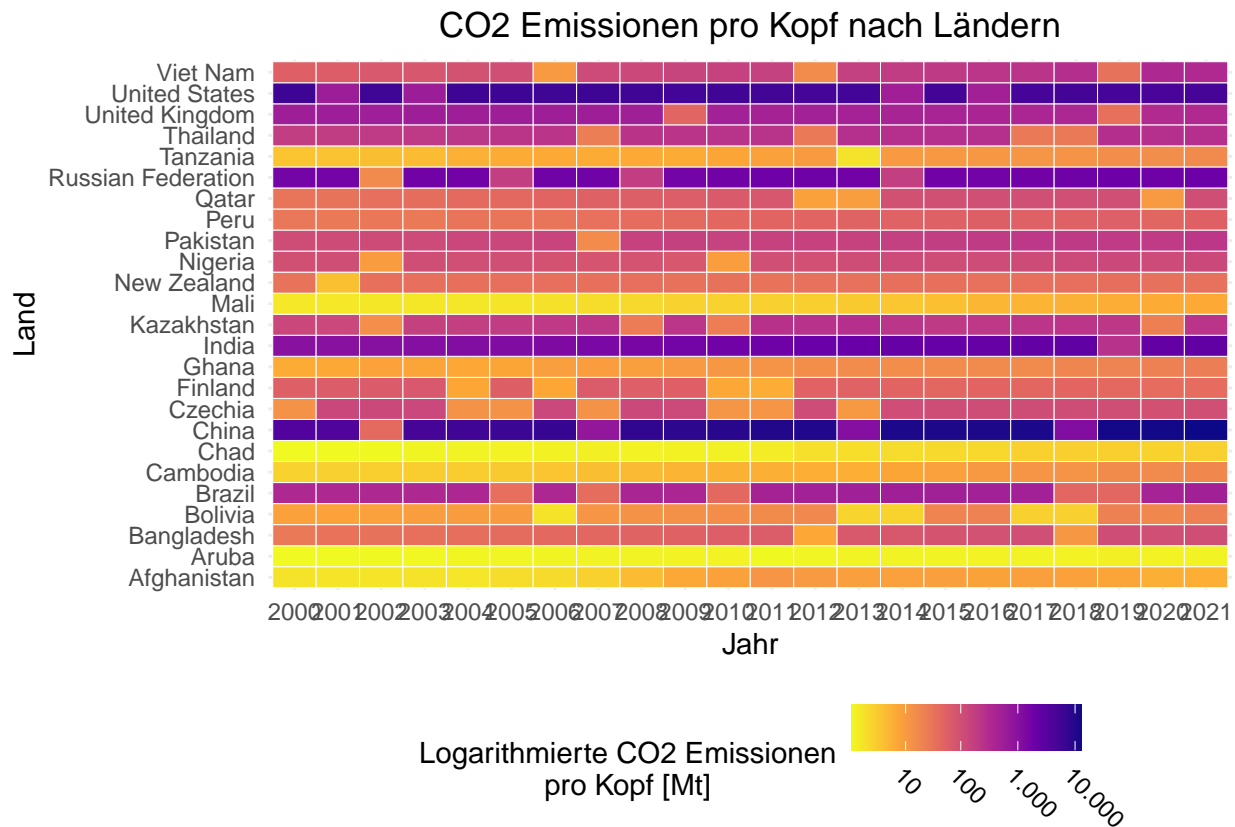
Introduction

This analysis explores relationships between indicators across countries such as percentage of agricultural land, CO2 emissions per capita, and size of surface area using World Bank data. It is divided into two main parts:

1. Is there a relationship between the percentage of agricultural land and CO2 emissions per capita across countries?
2. Does the size of the surface area of the country play a role?.

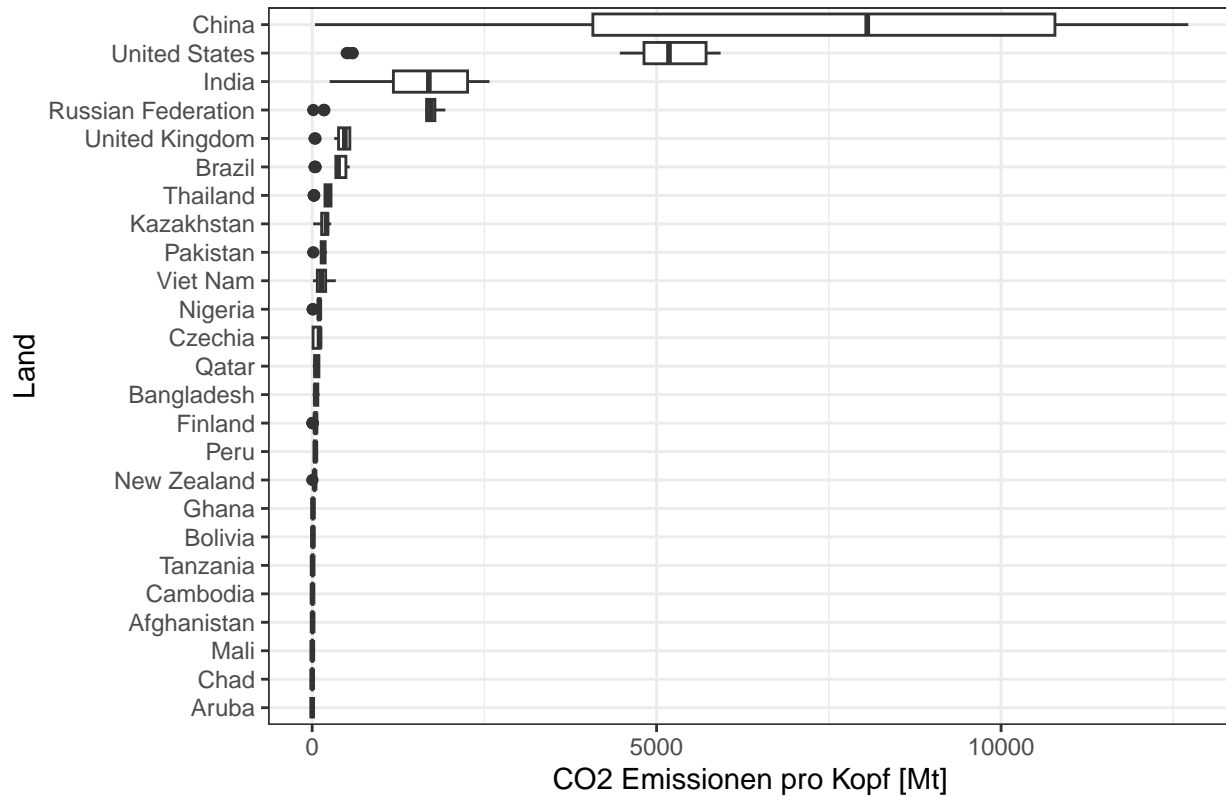
1. Percentage of agricultural land and CO2 emissions per capita

We analyze whether the percentage of agricultural land relates to the CO2 emissions per capita. To get an overview over the interested data and be able to to evaluate future insights correctly, we start by looking at the two indicators separately. Starting with the distribution of the CO2 emissions, we get the following information.



0.246 8.782 50.328 672.243 232.015 12717.655

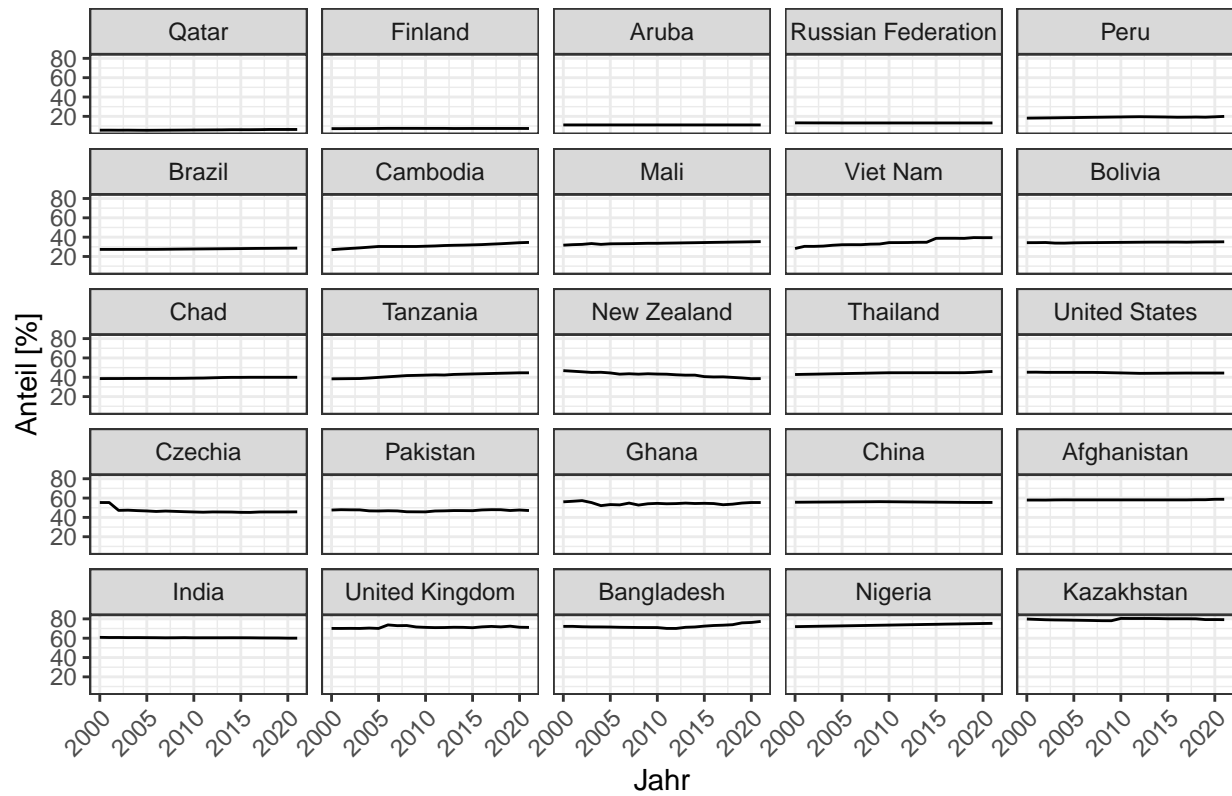
Streuungszerlegung der CO2 Emissionen pro Kopf bezüglich Länder



Streuung zwischen den Ländern: 2787843

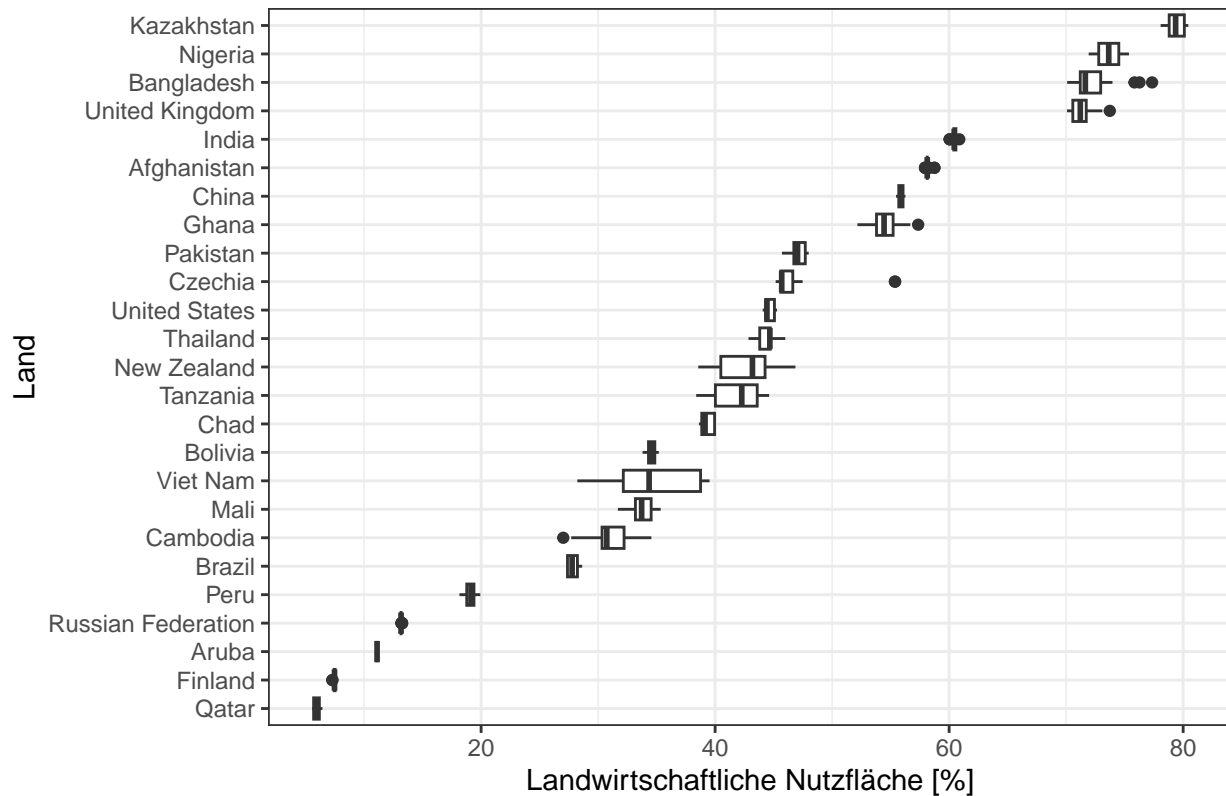
The CO2 emissions have high variance within the countries. Simultaneously, there are enormous differences in absolute amounts between the countries. Therefore, the greatest challenge may lie in comparing the different countries' values and trends although the data is provided on a per capita basis. Furthermore, the distribution of the percentage of agricultural land delivers the following information.

Landwirtschaftliche Nutzfläche nach Ländern



##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	5.564	29.805	43.411	42.040	56.129	80.439

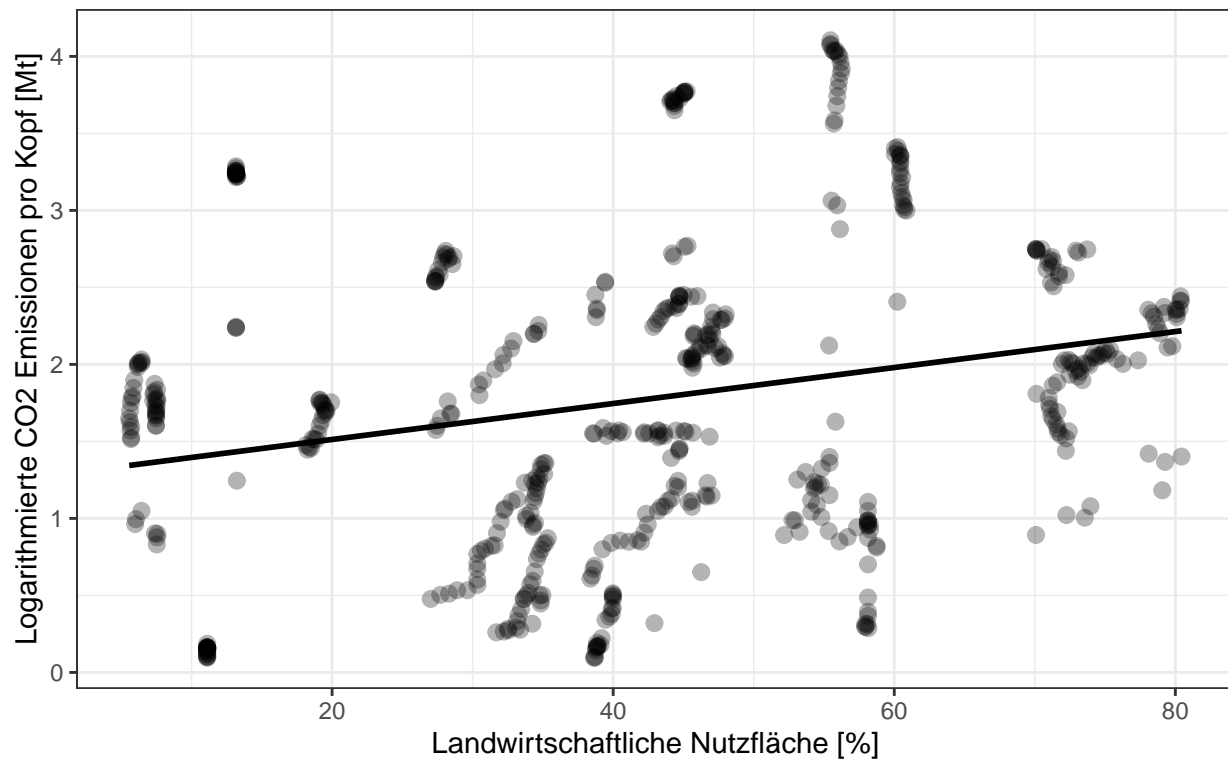
Streuungszerlegung der landwirtschaftlichen Nutzfläche bezüglich Lär



Streuung zwischen den Ländern: 437.7944

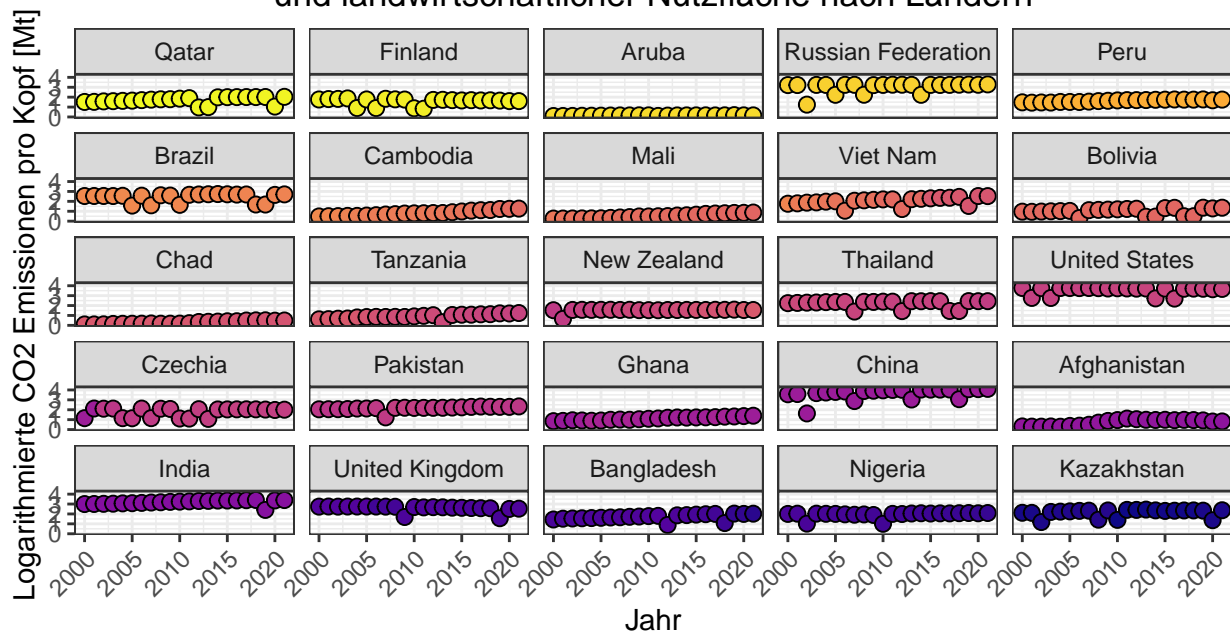
In contrast to the CO2 emissions, the percentages of agricultural land have rather low variance within the countries. However, there are recognizable deviations between the countries, spanning from only five to up to eighty percent. As we operate on a capped percentage scale though, comparisons should be possible quite well. Moving on, we want to bring those two variables back together. For this purpose, analyzing the distribution of the collected data while disregarding the country-specific origin gives us this cloud of data points. Note, that the CO2 emissions are displayed logarithmic to counter the expansive value disparity in the data.

Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche

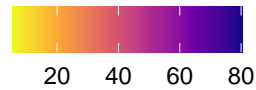


We can recognize a slightly positive linear trend between the variables. However, the development over time and the country-specification of observations are completely ignored. In order to take those factors back into consideration, we first distinguish among the countries by facetting our visualization for an in depth comparison of the indicators for each country over time.

Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche nach Ländern

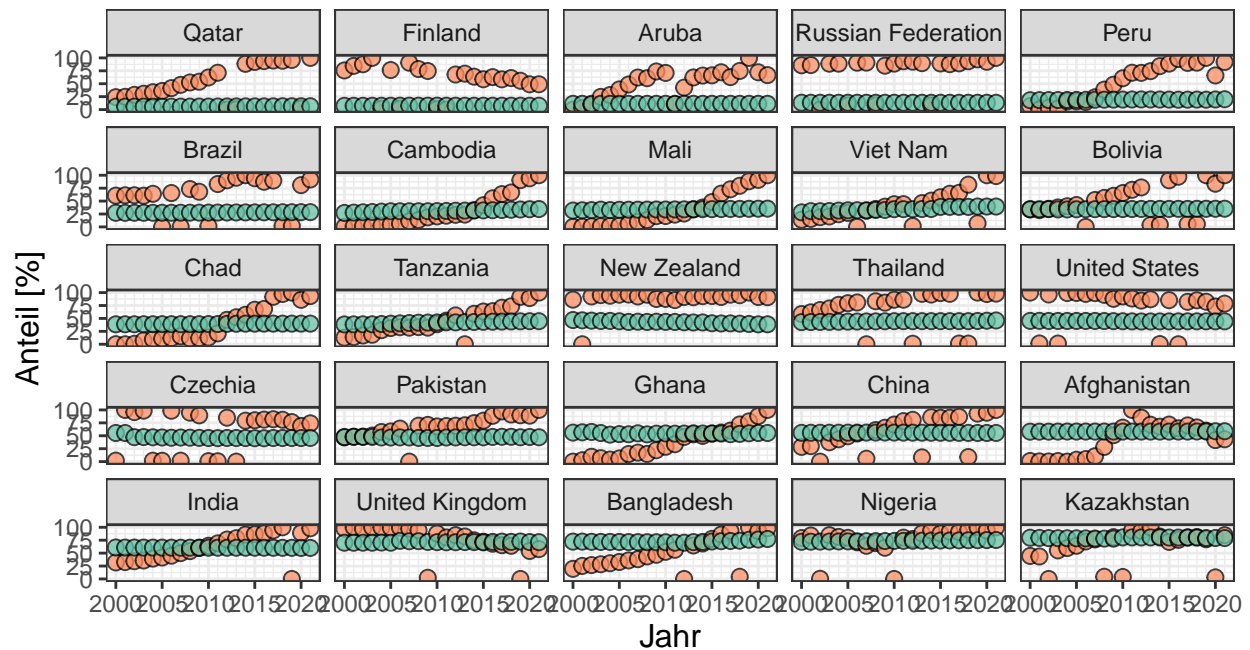


Landwirtschaftliche Nutzfläche [%]



The in ascending percentage of agricultural land sorted facets show no obvious connection between the two indicators, as the CO2 emissions are developing quite arbitrarily regardless of the associated percentage of agricultural land. To dig even further, we now adjust the data by normalizing the CO2 emissions within each country, letting us investigate relative changes on the same scale as the agricultural land.

Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche nach Ländern



Landwirtschaftliche Nutzfläche [%] ● (Min, Max)–normalisierte CO2 Emissionen pro Kopf

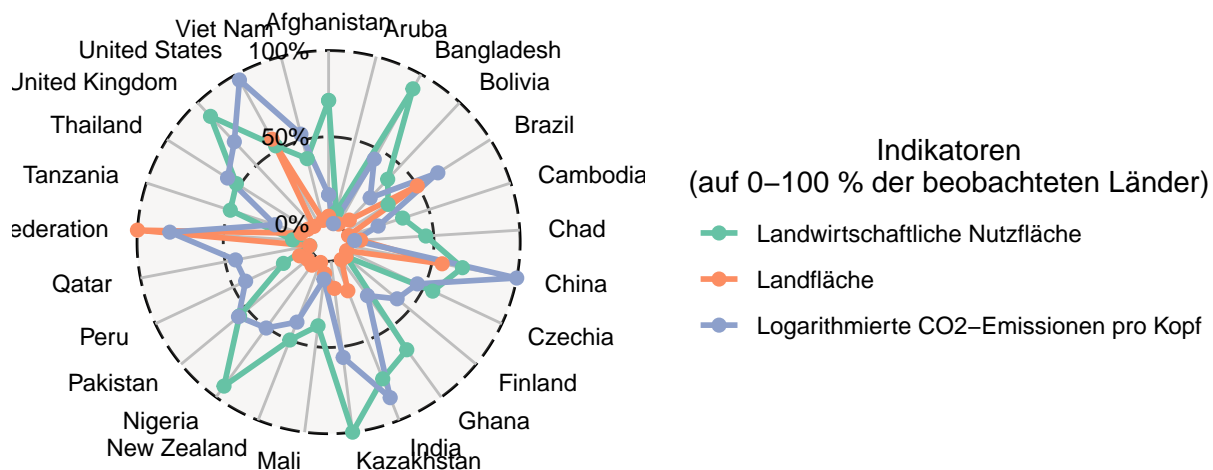
As we can see, there seems to be no direct relationship between the countries' percentage of agricultural land and their CO2 emissions per capita.

2. Influence of surface area on previous relationship

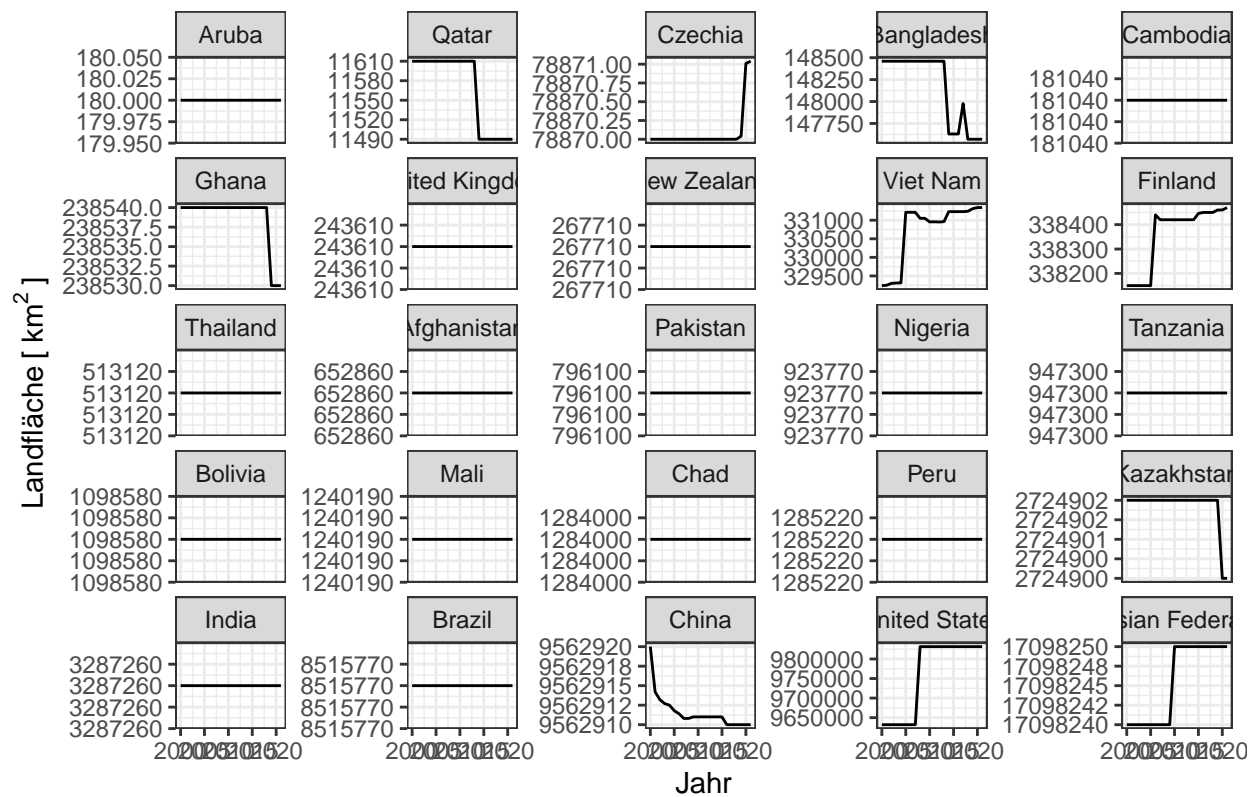
However, one further aspect that might change that non-relationship is the introduction of another variable to take into account, namely the countries' surface areas.

Indikatordaten im Zeitraum 2000 bis 2021

Mittlere Indikatordaten pro Land pro Indikator



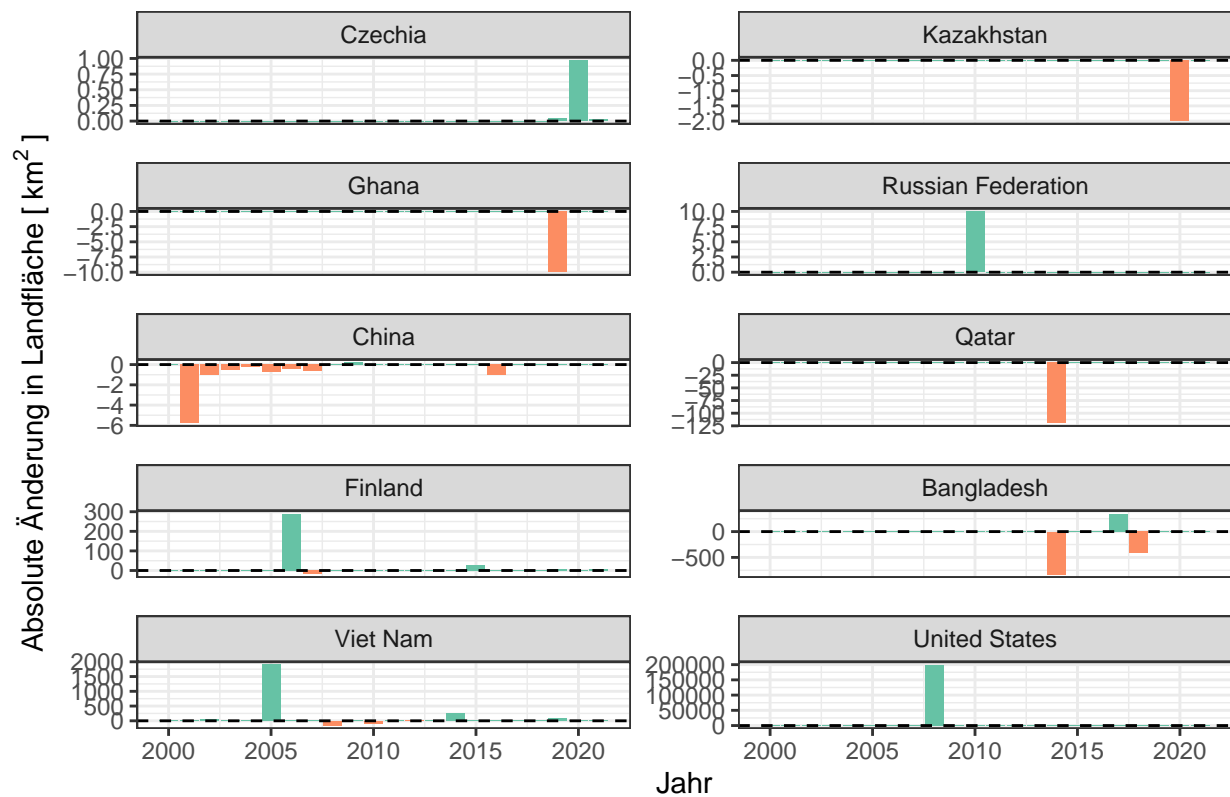
Landfläche nach Ländern



As we can see, there are several countries with no changes in surface area throughout the interested timespan at all. Therefore, before heading forward, we first want to zoom in on those with changes a little closer.

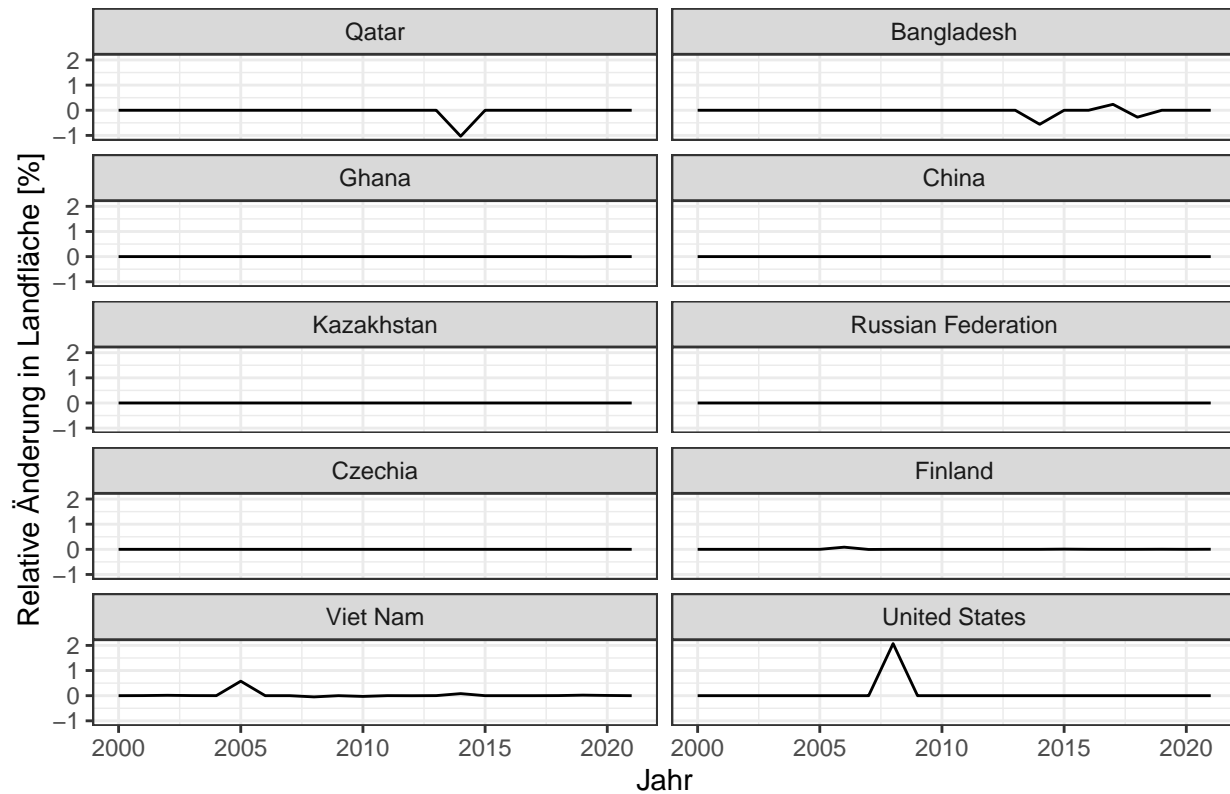
Anzahl der Länder ohne Veränderungen: 10

Landfläche in Ländern mit Veränderungen zwischen 2000 und 2021

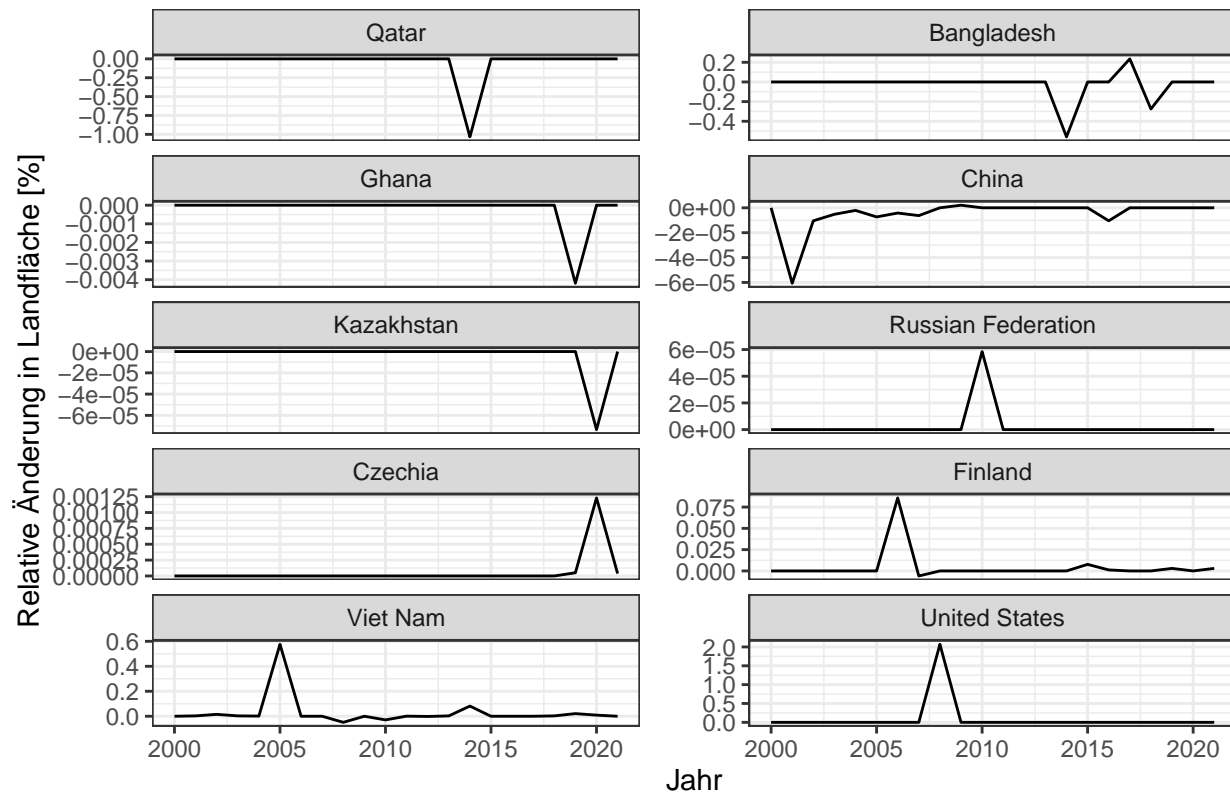


For the vast majority of the countries, the changes can be classified as under 1000 square kilometers over the whole timespan. Similar insights can be derived when looking at the relative changes.

Landfläche in Ländern mit Veränderungen zwischen 2000 und 2021



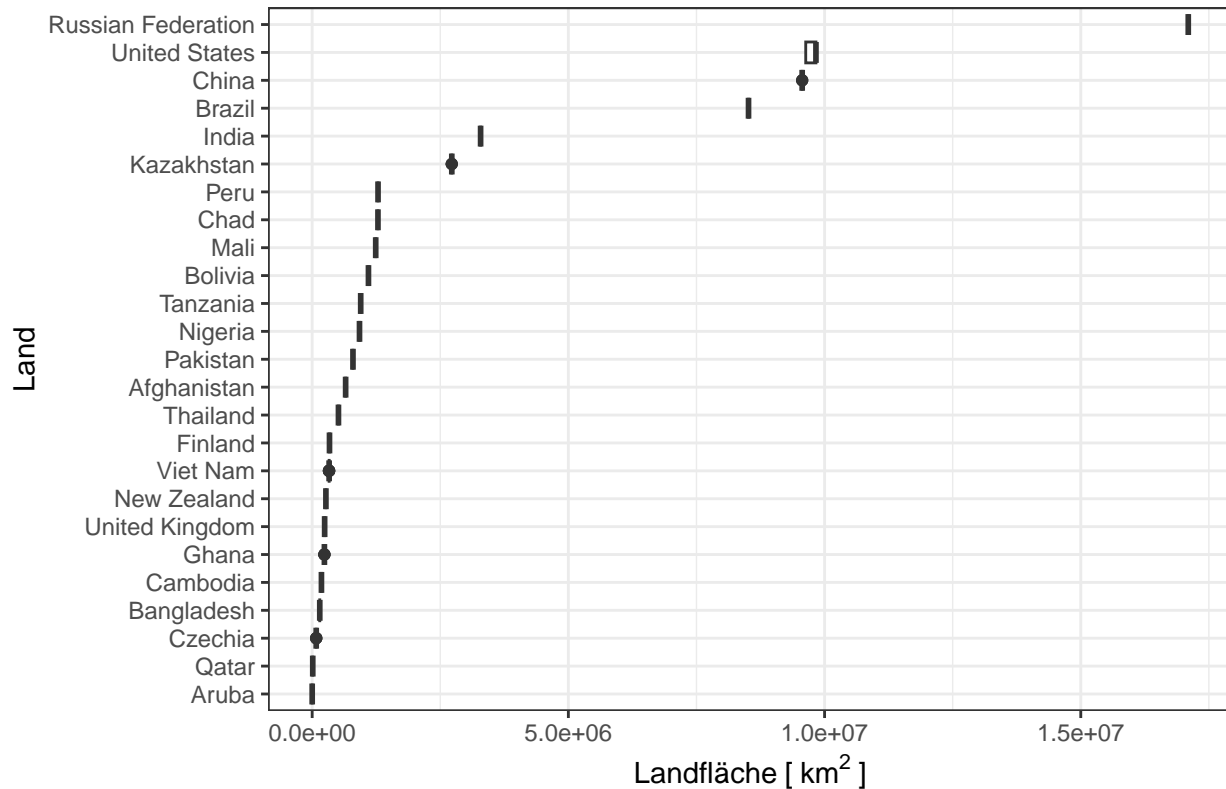
Landfläche in Ländern mit Veränderungen zwischen 2000 und 2021



For each country, even those with changes throughout the timespan, there are at most minimal changes of

two percent in surface area. To finally confirm those claims we take a look at the scatter decomposition.

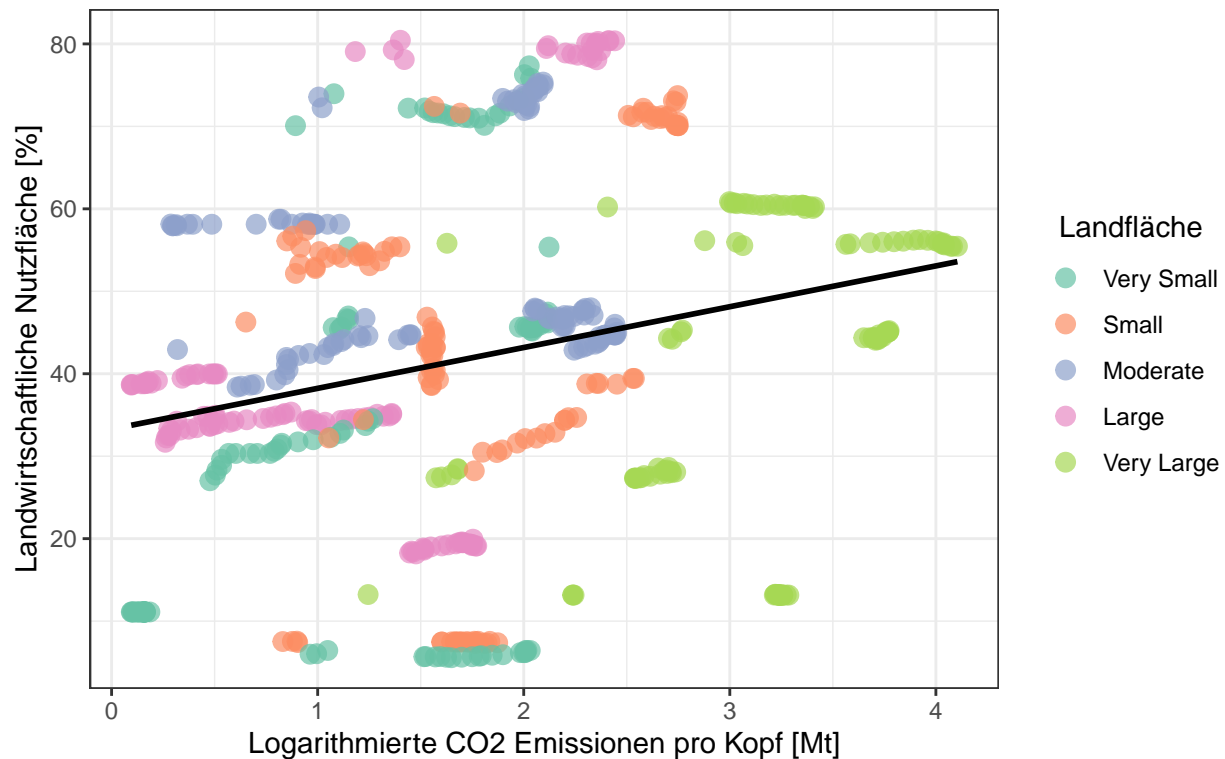
Streuungszerlegung der Landfläche bezüglich Ländern



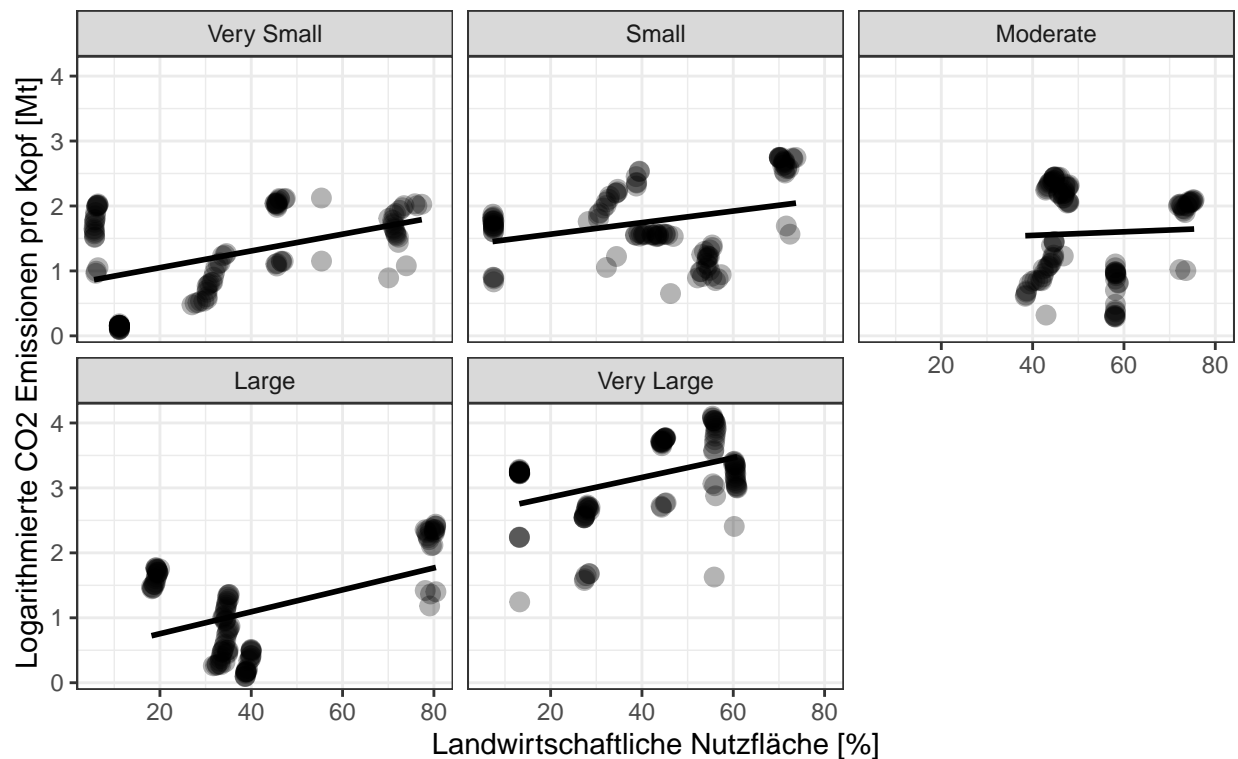
Streuung zwischen den Ländern: 1.783129e+13

In conclusion, we recognize that the changes in surface area are negligible over time. Therefore, we drop our focus on the development over time considering this variable when moving on. More interesting might be shifting the perspective towards whether the absolute amount of surface area has any influence on the relationship between agricultural land and CO2 emissions for our subset of countries. For this exploration, we want to distinguish our countries into the following groups:

Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche

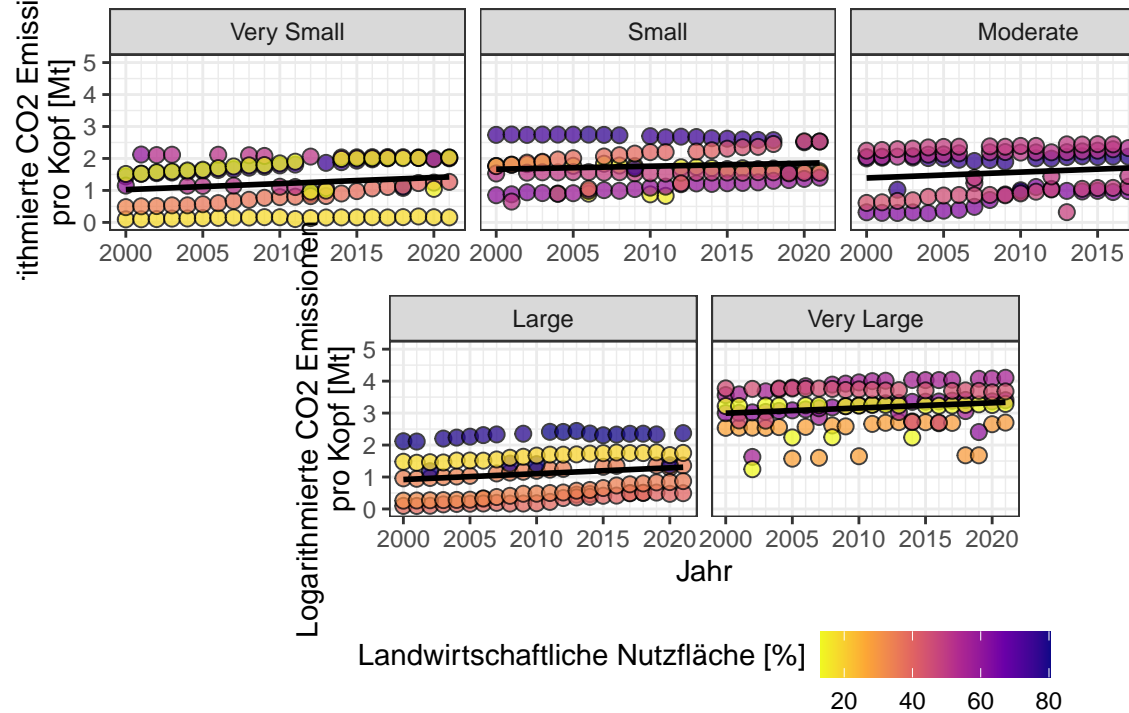


usammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche für Ländergruppen bezüglich deren Landfläche



We see there is no direct influence obvious through the grouping of the data. Let's dig deeper by looking at the

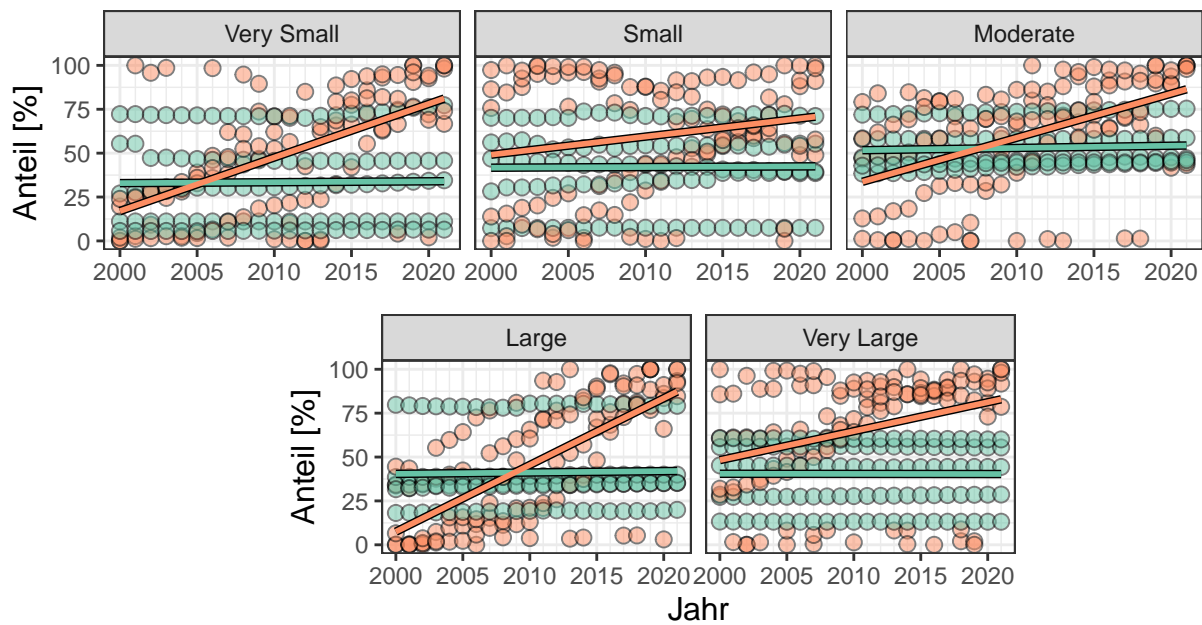
Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlich für Ländergruppen bezüglich deren Landfläche



time-specific distribution.

The biggest anomalies regarding the CO2 emissions with the percentage of agricultural land in mind seem to be the moderate and very large surface area countries. Here on one hand, we can detect comparably high percentages in agricultural land for the moderate area countries, but those do not transfer themselves to any obvious differences in the CO2 emissions compared to the other groups. On the other hand, the very large countries stand out by having the supposedly expectable highest CO2 emissions among all groups. Marginal differences appear between the development over time, as the very large area countries are constant over the two decade timespan, while the other groups have slightly increasing trends. If we finally pivot back to our normalized comparison we did earlier, we can do the same now with our grouped data according to the surface area categories.

Zusammenhang zwischen CO2 Emissionen pro Kopf und landwirtschaftlicher Nutzfläche für Ländergruppen bezüglich deren Landfläche



● Landwirtschaftliche Nutzfläche [%] ● (Min, Max)-normalisierte CO2 Emissionen

We cannot identify any obvious connection between the CO2 emissions per capita and the percentage of agricultural land even with the interested countries categorized by surface area.