A New Zealand view of the Good Country Index

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Contents

Chapter 1

Introduction

In response to a tweet from helenclarknz I thought I would take a closer look, from a New Zealand perspective, at the Good Country Index:

https://goodcountry.org/index/results

Which has a description of the original data here

https://goodcountry.org/index/source-data

As the Good Country Index is licenced as Creative Commmons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) the products of this analysis should be considered similar. The code for generating my analysis I am releasing under an MIT licence, so you are welcome to use and adapt it with attribution. The data forming the index was downloaded from the site on the 23rd of October 2017

I am also drawing on World Bank GDP per capita data

https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

and World Bank GDP (current US$)

https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

which is open licenced, via the direct csv download link from the above pages

Wikipedia's list of oldest Universities by County

https://en.wikipedia.org/wiki/List_of_oldest_universities_in_continuous_operation

which is licenced with Creative Commons Attribution-ShareAlike 3.0

Finally, I am drawing directly on one of the sources the Good Country Index is based on, The World Bank: Distance to Frontier Score: Doing Business Indicators,

http://www.doingbusiness.org/data/distance-to-frontier

via the downloadable excel file of data

http://www.doingbusiness.org/data/~/media/WBG/DoingBusiness/Documents/Miscellaneous/DB17-Distance-to-Frontier-xlsx

(note: directly downloading the file gives a different format than clicking the button on the webpage, for this I have used the former)

Data gathering code

```
library(readxl)
library(jsonlite)
library(dplyr)
library(tidyr)
library(countrycode)
library(rvest)
library(feather)

GCI_country_info <- function(x, gciver){
  gooddf <- data.frame(id = x$countries$id,
                       name = x$countries$name,
                       isoCode = x$countries$isoCode,
                       stringsAsFactors = FALSE)
  gooddf$version <- gciver
  return(gooddf)
}

v1.1_json <- fromJSON("https://goodcountry.org/indexData.json?version=1.1")
v1.0_json <- fromJSON("https://goodcountry.org/indexData.json?version=1.0")
gci1.1 <- GCI_country_info(v1.1_json, 1.1)
gci1.0 <- GCI_country_info(v1.0_json, 1.0)

indicate_desc <- function(x, y, inlist){
  section <- c("4","12","13","14","15","16","17")
  group <- c("Science & Technology", "Culture", "International Peace & Security",
             "World Order", "Planet & Climate", "Prosperity & Equality", "Health & Wellbeing")
  chap <- group[section == x]
    title = inlist[["indicators"]][["children"]][[y]][["title"]]
    title <- title[!is.na(title)]
    code = inlist[["indicators"]][["children"]][[y]][["code"]]
    code <- code[!is.na(code)]
    description = inlist[["indicators"]][["children"]][[y]][["description"]]
    description <- description[!is.na(description)]
    reference = inlist[["indicators"]][["children"]][[y]][["reference"]]
    reference <- reference[!is.na(reference)]
    treatment = inlist[["indicators"]][["children"]][[y]][["treatment"]]
    treatment <- treatment[!is.na(treatment)]
 z <- data.frame(section=chap, title, code, description, reference,
                 treatment, stringsAsFactors = FALSE)
  return(z)
}

arrangement = "
group,indicator
4,5
4,6
4,7
4,8
4,9
12,10
12,11
12,18
12,19
```

```
12,20
13,21
13,22
13,23
13,24
13,25
14,26
14,27
14,28
14,29
14,30
15,31
15,32
15,33
15,34
15,35
16,36
16,37
16,38
16,39
16,40
17,41
17,42
17,43
17,44
17,45"

json_locations <- read.csv(text=arrangement, colClasses="character")

gci1.1_indicators_meta <- bind_rows(apply(json_locations,1,
                          function(x){indicate_desc(x=x[1], y= x[2],
                                                    inlist=v1.1_json)}))
gci1.0_indicators_meta <- bind_rows(apply(json_locations,1,
                          function(x){indicate_desc(x=x[1], y= x[2],
                                                    inlist=v1.0_json)}))

gci_indicator_info <- function(x,y, inlist){
    z <- data.frame(ranks =
  as.numeric(v1.1_json[["countries"]][["indicators"]][[x]][["children"]][[y]][["rank"]]),
                    stringsAsFactors = FALSE)
    codes <- v1.1_json[["countries"]][["indicators"]][[x]][["children"]][[y]][["code"]]
    codes <- codes[min(which(!is.na(codes)))]
    names(z) <- codes
    return(z)
}

gci1.1_indicators <- bind_cols(apply(json_locations,1,
                          function(x){gci_indicator_info(x=x[1], y= x[2],
                                                    inlist=v1.1_json)}))

gci1.0_indicators <- bind_cols(apply(json_locations,1,
                          function(x){gci_indicator_info(x=x[1], y= x[2],
                                                    inlist=v1.0_json)}))
```

```
rm(v1.0_json, v1.1_json, json_locations)

# upon inspection Côte d'Ivoire is present twice, the second time as a phantom entry,
# so I am removing the second entry(number 42) which has no associated data
gci1.0 <- gci1.0[-42,]
gci1.1 <- gci1.1[-42,]
gci1.0_indicators <- gci1.0_indicators[-42,]
gci1.1_indicators <- gci1.1_indicators[-42,]

## rather than calculate out the aggregate scores (given tiebreaking etc) I have just
## copied the aggregates from the website
goodc <- readLines("raw_data/goodcountryindex.txt")
gci1.1_aggregate <- data.frame(Country.Name = goodc[1:163 * 9 - 6],
                 a_Overall = goodc[1:163 * 9 - 7],
                 b_ScienceTechnology = goodc[1:163 * 9 - 5],
                 c_Culture = goodc[1:163 * 9 - 4],
                 d_InternationalPeaceSecurity = goodc[1:163 * 9 - 3],
                 e_WorldOrder = goodc[1:163 * 9 - 2],
                 f_PlanetClimate = goodc[1:163 * 9 - 1],
                 g_ProsperityEquality = goodc[1:163 * 9],
                 h_HealthWellbeing = goodc[1:163 * 9 + 1],
                 stringsAsFactors = FALSE)

# combine the aggregate and the individual scores
# this implicitely clears out entries without data for the 1.1 aggregate merge
gci1.0 <- cbind(gci1.0, gci1.0_indicators)
gci1.1 <- cbind(gci1.1, gci1.1_indicators)

gci1.1 <- merge(gci1.1_aggregate, gci1.1, by.x="Country.Name", by.y="name")
# make aggregates numerics
gci1.1$a_Overall <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                     "",gci1.1$a_Overall))
gci1.1$b_ScienceTechnology <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                               "",gci1.1$b_ScienceTechnology))
gci1.1$c_Culture <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                     "",gci1.1$c_Culture))
gci1.1$d_InternationalPeaceSecurity <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*","",gci1.1$d
gci1.1$e_WorldOrder <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                        "",gci1.1$e_WorldOrder))
gci1.1$f_PlanetClimate <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                           "",gci1.1$f_PlanetClimate))
gci1.1$g_ProsperityEquality <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                                "",gci1.1$g_ProsperityEquality))
gci1.1$h_HealthWellbeing <-  as.numeric(gsub("[ abcdefghijklmnopqrstuvwxyzz]+.*",
                                             "",gci1.1$h_HealthWellbeing))

rm(gci1.0_indicators, gci1.1_aggregate, gci1.1_indicators)
# world bank GDP per capita in 2011
GDPcap <- read.csv("raw_data/API_NY_GDP_PCAP/API_NY.GDP.PCAP.CD_DS2_en_csv_v2.csv",
                   skip=4, stringsAsFactors = FALSE)
GDPcap11 <- GDPcap[,c("Country.Name", "Country.Code", "X2011")]
rm(GDPcap)
```

```
# world bank GDP  in 2011
GDP <- read.csv("raw_data/API_NY_GDP_MKTP/API_NY.GDP.MKTP.CD_DS2_en_csv_v2.csv",
                    skip=4, stringsAsFactors = FALSE)
GDP11 <- GDP[,c("Country.Name", "Country.Code", "X2011")]
rm(GDP)

# wikipedia page
wp <- "https://en.wikipedia.org/wiki/List_of_oldest_universities_in_continuous_operation"
html = read_html(wp)
tbls <- html_table(html_nodes(html, "table"), fill=TRUE)
u1 <- data.frame(yr=tbls[[1]][["Year"]], whr=tbls[[1]][[4]], stringsAsFactors = FALSE)
u2 <- data.frame(yr=tbls[[2]][["Year"]], whr=tbls[[2]][[1]], stringsAsFactors = FALSE)
u3 <- data.frame(yr=tbls[[3]][["Year"]], whr=tbls[[3]][[1]], stringsAsFactors = FALSE)
u4 <- data.frame(yr=tbls[[4]][["Year"]], whr=tbls[[4]][[1]], stringsAsFactors = FALSE)
u5 <- data.frame(yr=tbls[[5]][["Year"]], whr=tbls[[5]][[1]], stringsAsFactors = FALSE)
u6 <- data.frame(yr=tbls[[6]][["Year"]], whr=tbls[[6]][[1]], stringsAsFactors = FALSE)
u7 <- data.frame(yr=tbls[[7]][["Year"]], whr=tbls[[7]][[1]], stringsAsFactors = FALSE)
u1$whr <- gsub(".*, ", "", u1$whr)
u1$yr[10] <- "1293"
u1 <- u1 %>% separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr)
u2 <- u2 %>% separate(col=whr, into=c("whr","nr"), sep="\n\\(", fill="right") %>%
  separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr, -nr)
u3 <- u3 %>% separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr)
u4 <- u4 %>%
  separate(col=whr, into=c("whr","nr"), sep="\n\\(", fill="right", extra="merge") %>%
  separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr, -nr)
u5a <- data.frame(whr=c("Anguilla",
                        "Antigua and Barbuda",
                        "Bahamas",
                        "Barbados",
                        "Belize",
                        "British Virgin Islands",
                        "Cayman Islands",
                        "Dominica",
                        "Grenada",
                        "Jamaica",
                        "Montserrat",
                        "St. Kitts and Nevis",
                        "St. Lucia",
                        "St. Vincent and the Grenadines",
                        "Trinidad and Tobago",
                        "Turks and Caicos"), stringsAsFactors = FALSE)
u5a$yr <- "1948"
u5 <- u5[-25,]
u6 <- u6 %>%
  separate(col=whr, into=c("whr","nr"), sep="\n\\(", fill="right", extra="merge") %>%
  separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr, -nr)
u7a <- data.frame(whr=c("Cook Islands",
                          "Fiji",
                          "Kiribati",
                          "Marshall Islands",
                          "Nauru",
                          "Niue",
```

```
                            "Samoa",
                            "Solomon Islands",
                            "Tokelau",
                            "Tonga",
                            "Tuvalu",
                            "Vanuatu"), stringsAsFactors = FALSE)
u7a$yr <- "1968"
u7 <- u7[-11,]
u7 <- u7 %>%
  separate(col=whr, into=c("whr","nr"), sep="\n\\(", fill="right", extra="merge") %>%
  separate(col=yr, into=c("yr","mr"), sep=4) %>% select(-mr, -nr)
unis <- bind_rows(u1,u2,u3,u4,u5,u5a,u6,u7,u7a)
rm(u1,u2,u3,u4,u5,u5a,u6,u7,u7a,html,tbls)
unis <- unis %>% mutate(yr = as.numeric(yr)) %>% filter(!is.na(yr)) %>%
  group_by(whr) %>% summarise(yr = min(yr))

# wikipedia's country names not standard, so I am adding the ISO codes
unis$isocode <- countrycode(unis$whr, origin="country.name", destination="iso3c")

# Doing business spreadsheet
# the wp1 wp2 paste0 is just to fit code with margins
wp1 <- "http://www.doingbusiness.org/data/~/media/WBG/DoingBusiness/Documents/"
wp2 <- "Miscellaneous/DB17-Distance-to-Frontier-historical-dataset.xlsx"
download.file(paste0(wp1, wp2), destfile="raw_data/DTF.xlsx")
dtf <- read_excel("raw_data/DTF.xlsx", sheet="DBO5-17 for Excel") %>%
  select("cod", "economy", "region", "incomegroup", "dbyear","DTFtradedef_db1415",
         "tradingexportdocsdtf", "tradingexporttimedtf", "tradingimportdocsdtf",
         "tradingimporttimedtf", "tradingexportcost_defdtf", "tradingimportcost_defdtf",
         "tradeXcostborderdtf", "tradeMcostborderdtf", "tradeXtimeborderdtf",
         "tradeMtimeborderdtf", "tradeMcostdocsdtf", "tradeMtimedocsdtf",
         "tradeXcostdocsdtf", "tradeXtimedocsdtf") %>%
  mutate(dbyear = as.numeric(dbyear))

#GCI1.1 and GCI1.0 are both missing a few ISO codes
gci1.1$isoCode[is.na(gci1.1$isoCode)] <-
  countrycode(gci1.1$Country.Name[is.na(gci1.1$isoCode)], origin="country.name",
              destination="iso3c")
gci1.0$isoCode[is.na(gci1.0$isoCode)] <-
  countrycode(gci1.0$name[is.na(gci1.0$isoCode)], origin="country.name",
              destination="iso3c")

## now save everything in feather format for the other chapters
write_feather(dtf, "processed_data/dtf.feather")
write_feather(gci1.0, "processed_data/gci10.feather")
write_feather(gci1.0_indicators_meta, "processed_data/gci10meta.feather")
write_feather(gci1.1, "processed_data/gci11.feather")
write_feather(gci1.1_indicators_meta, "processed_data/gci11meta.feather")
write_feather(GDP11, "processed_data/gdp11.feather")
write_feather(GDPcap11, "processed_data/gdpcap11.feather")
write_feather(unis, "processed_data/unis.feather")
```

Chapter 2

Overall - Total Score

Neighbouring Countries:

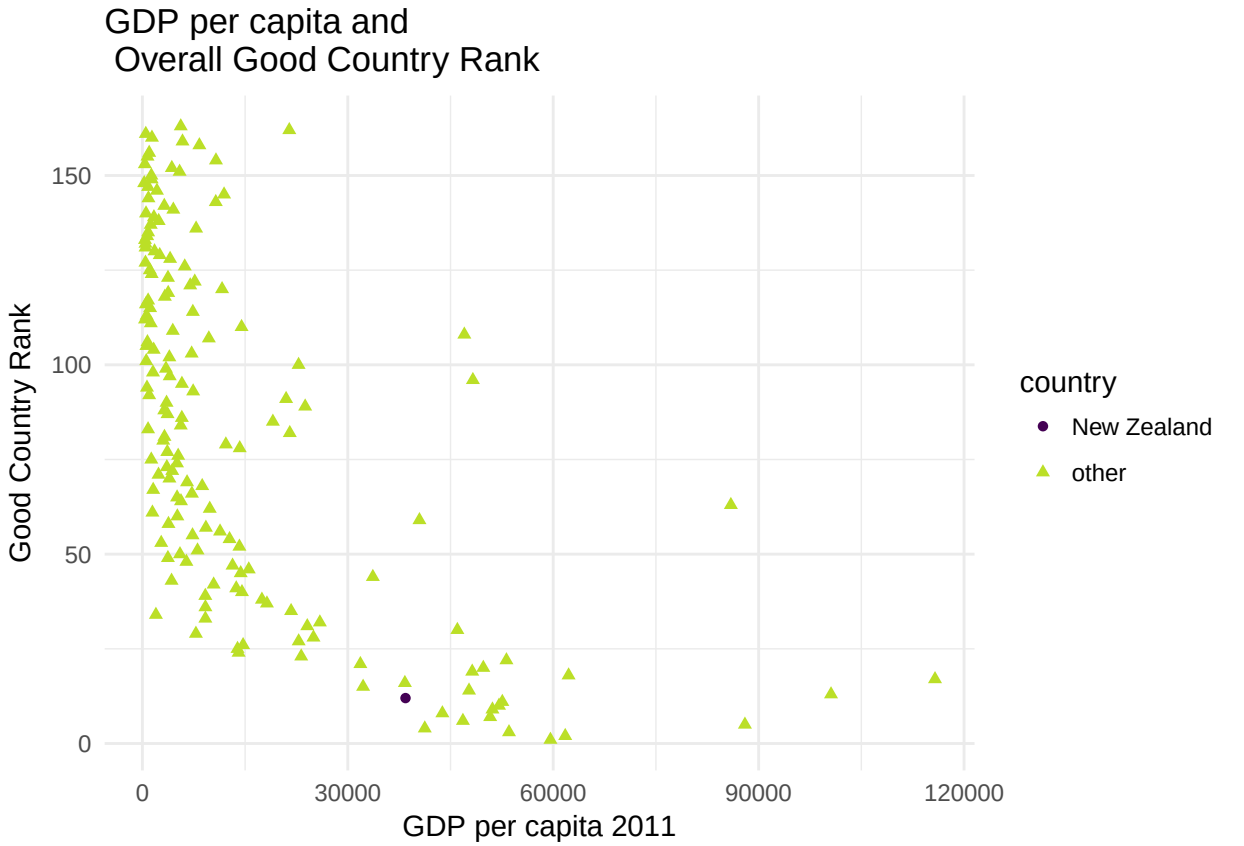
(worse), Luxembourg, Italy, Cyprus, Belgium, Norway, New Zealand, Ireland, Canada, Austria, France, Finland, (better)

We can call New Zealand a "pretty good" country within the Good Country Index- Better than Italy or Norway and worse than Canada or the France, if we pick some countries that we normally think in terms of. Let's understand the detail, though.

The Good Country Index uses eight ranked criteria (each made from a bundle of indicators), that are averaged together to produce the overall ranking. However, in reading the source details I noticed that the individual sources were "in relation to the size of the economy". As the individual parts are in relation to the economy, that means that, when aggregated, the individual sources each contribute a small amount and the economy (common throughout) plays a greater roll as the aggregation takes place. If five of the individual scores of a section are in relation to the size of the economy, then in calculating the section aggregate the size of the economy is used five times more often than any one of the individual factors.

To explore this idea I am using GDP per capita on the grounds that if related to the size of the economy is minimising biases relating to country size and wealth, it may be introducing biases related to the welath of inhabitants.

Graphing the relationship between the Good Country rank and the GDP per capita, the graph looks like:



My Interpretation and Opinions:

The lack of entries in the lower right of the graph indicated that countries with a GDP per person of less than 30000 PPP dollars cannot be in the top 20 countries. Overall, given the wealth of inhabitants, New Zealand seems to be near to as highest ranked as it can be, without engaging in extraordinary actions. For example Moldova has a rank much lower (better) than many all other countries in its wealth band largely due to its peacekeeping efforts.

The group of countries in ranks 75 to 110 with higher GDP per capita are dominated by Middle Eastern Oil producing countries, and should perhaps be read as being displaced left from similar countries without the same resource extraction. If this group is excluded, then the graph forms a very strong overall pattern of maximum rank being linked to wealth.

This is not to say that wealth is the primary cause- only that wealth of inhabitants is a strong indicator, as there may be factors linked to wealth contributing to the outcome.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "a_Overall"
var_prettynom <- "Overall"
var_sides <- 5
```

```
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

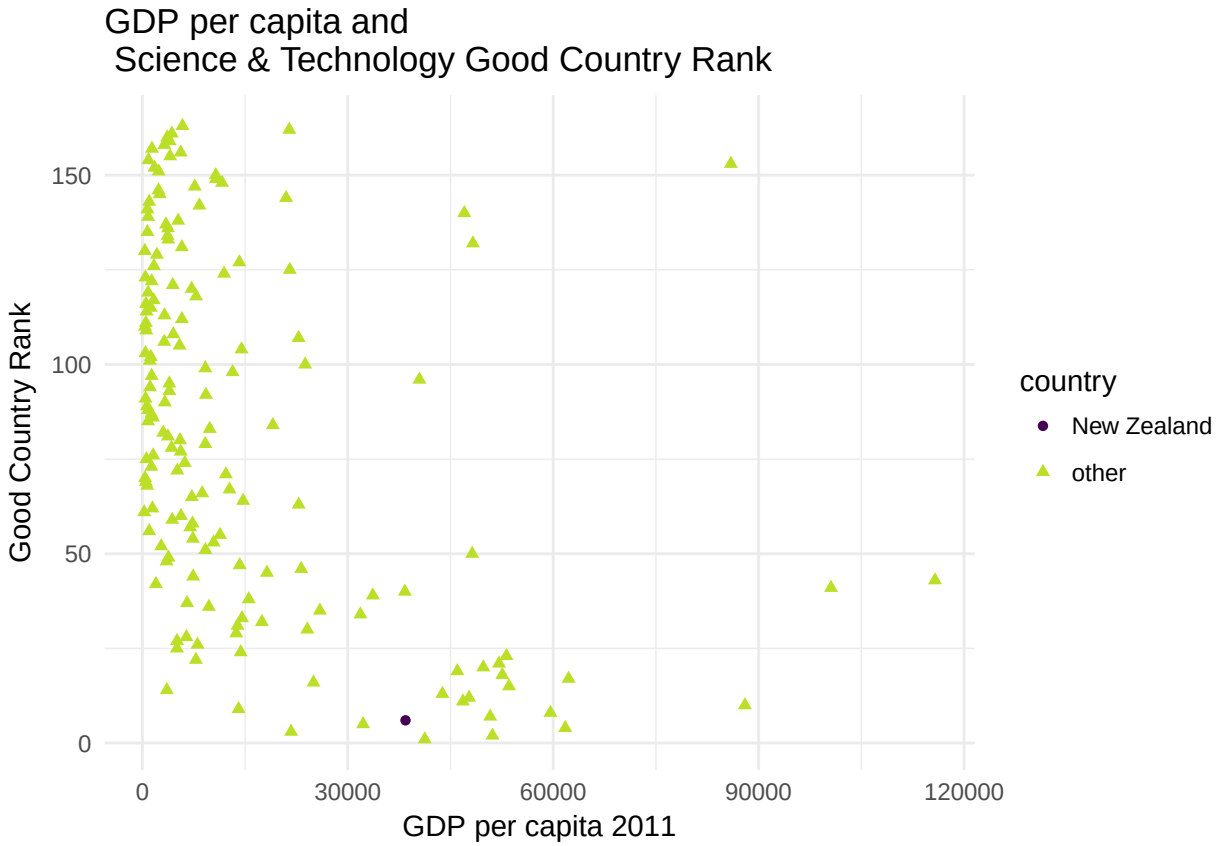
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 3

Science & Technology - Aggregate Score

Neighbouring Countries:

(worse), Germany, Switzerland, Hungary, Sweden, Finland, New Zealand, Cyprus, Denmark, Czech Republic, Austria, United Kingdom, (better)



My Interpretation and Opinions:

This graph is highly consistent with the role of wealth in the overall ranking- Economy is playing a less clear role (as measures by the spread of the data) as it has been used less often, but there is still a distinct

relationship where no country of low wealth is at the upper end of the the Science and Technology index.

In rankings, New Zealand is in a generally good place, better than Germany or Sweden and worse than Denmark or the United Kingdom. Even if we consider the GCI in relation to GDP per capita, we are still doing very well for countries in our wealth range.

As a comment on the sources that make up the measure, I think it might be interesting to consider if number of science graduates as a proportion of the population is a more current measure of a country's contribution to science than some of the measures in this index.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "b_ScienceTechnology"
var_prettynom <- "Science & Technology"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

3.1 International Students Science & Technology

From Good Country Source Descriptions:

Description: Number of foreign students studying in the country (according to UNESCO) relative to the size of the economy.

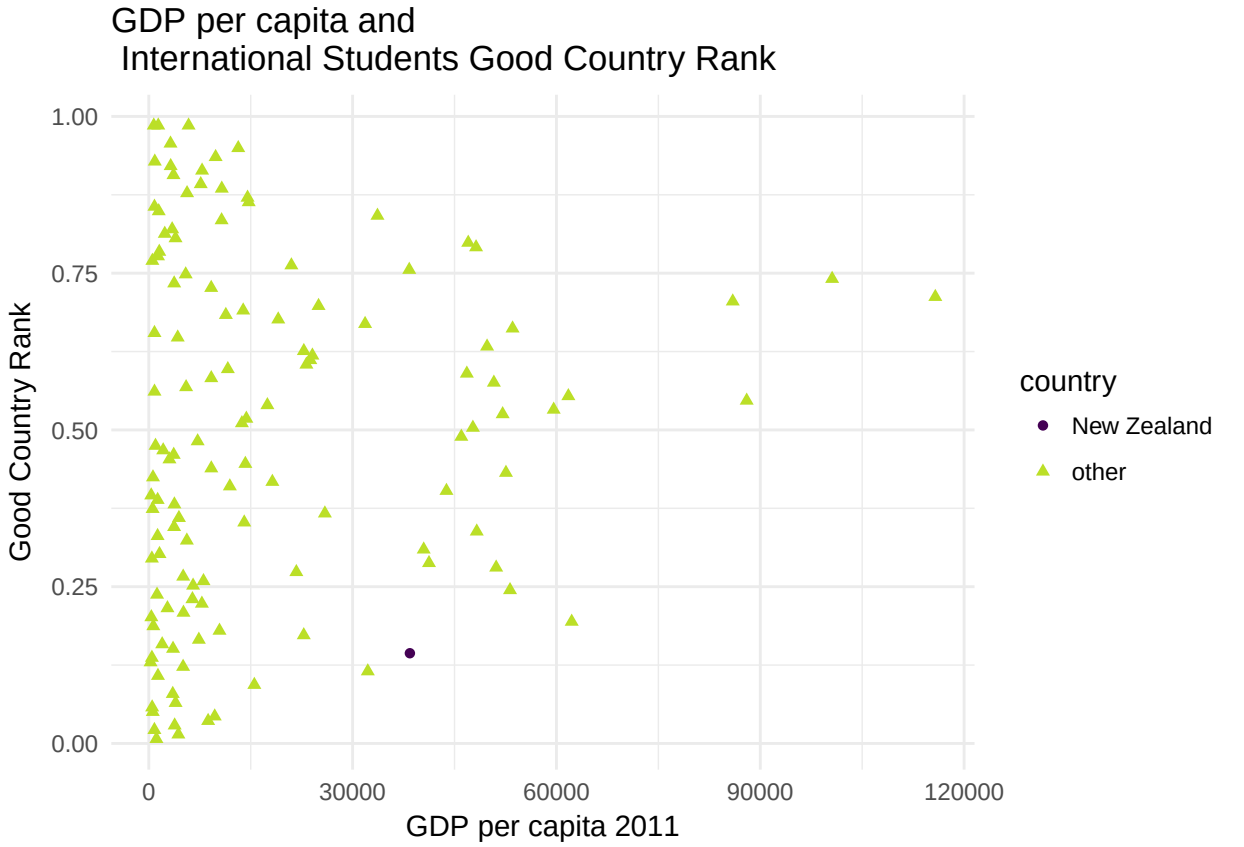
Source: Data adapted from UNESCO Institute for Statistics (UIS), http://data.uis.unesco.org/ (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years,

missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Malaysia, Bahrain, Saint Lucia, Moldova, Ukraine, New Zealand, Guinea, Burundi, Bosnia and Herzegovina, Cyprus, Yemen, (better)



My Interpretation and Opinions:

Considering country wealth with number of international students, there does seem to be a relationship. The range of the international student measure narrows as the wealth of the country increases. We can say New Zealand has a nearly maximal rank in receiving International Students given the wealth of the inhabitants, so whatever the associated factors, as we are nearly at maximum it would seem to be hard to increase compared to being a worse rank. Without considering wealth, the kind of countries we are grouped with (better than Malaysia and Ukraine, worse than Burundi and Yemen) are not countries we normal fall into a group with. To me this suggests that the index measure is bringing out factors not normally considered.

Things that would potential improve New Zealand's rank in this area are increasing the number of international students (which the data suggests would be difficult) or decreasing the country's GDP (which would have negative consequences), so this is not a measure I would strive to change too much.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
```

```
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "st11"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

3.2 Journal exports Science & Technology

From Good Country Source Descriptions:

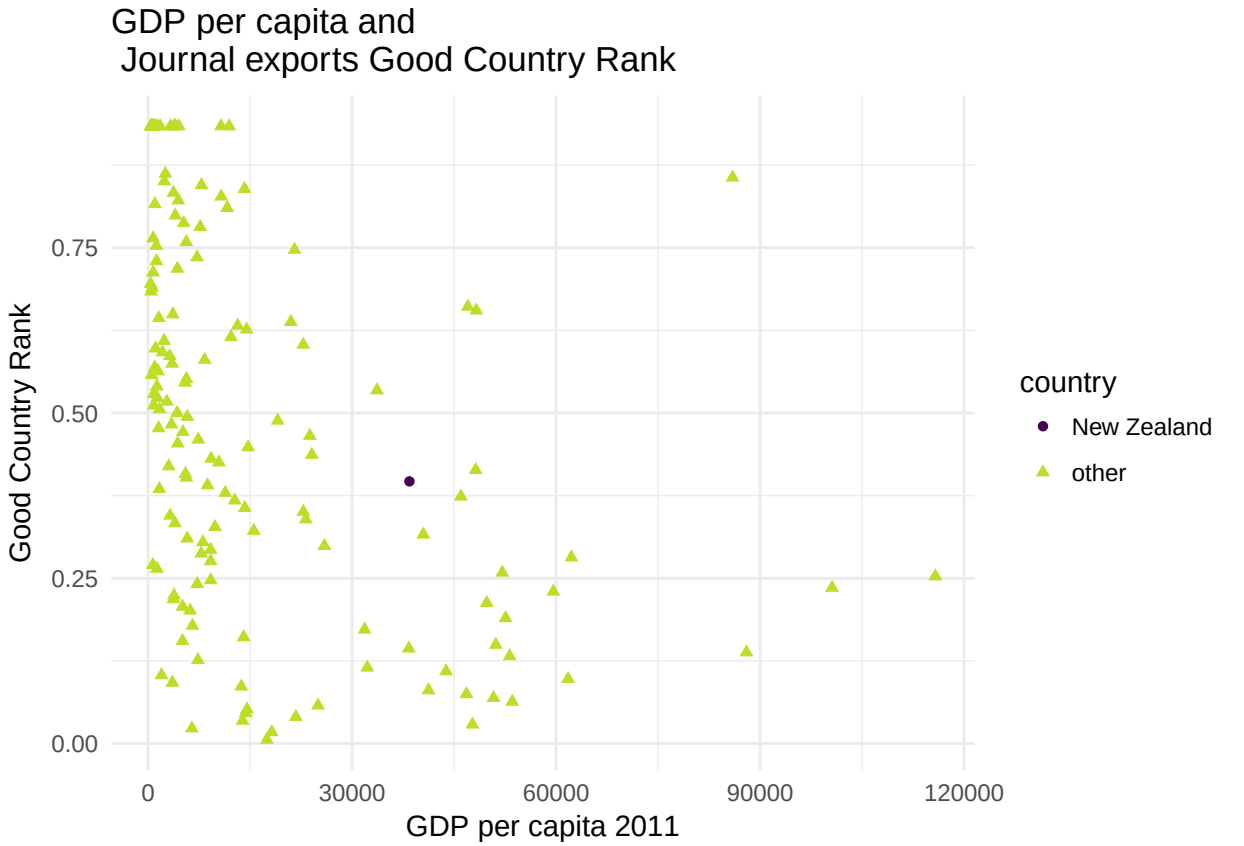
Description: Exports of periodicals, scientific journals and newspapers (according to ITC) relative to the size of the economy.

Source: Data adapted from Trade Map, International Trade Centre, www.intracen.org/marketanalysis (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Malaysia, Morocco, Japan, Thailand, Namibia, New Zealand, Lebanon, Zambia, Turkey, Iceland, Argentina, (better)



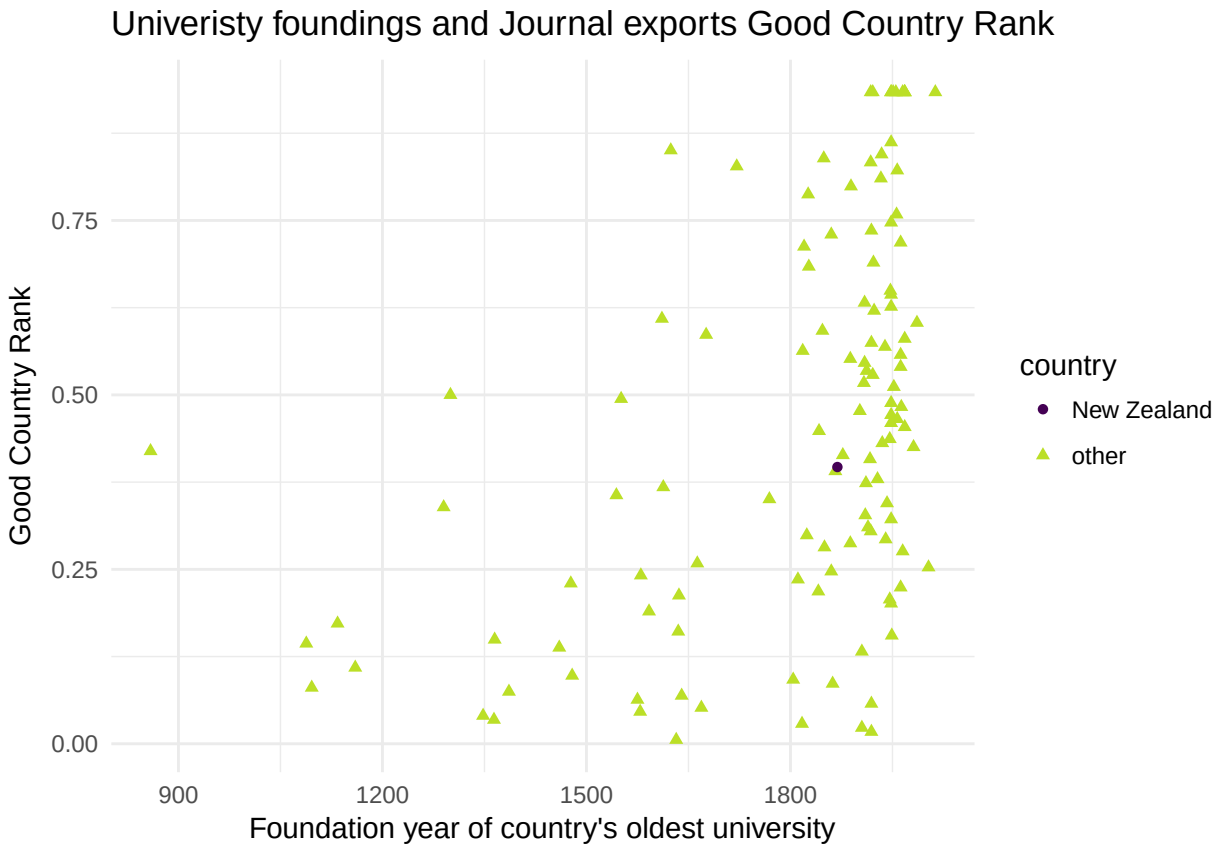
My Interpretation and Opinions:

For Journal Exports, the relation to wealth of inhabitants is that wealthy countries do not have poor journals exports index numbers, while it is still possible for poor countries to have a high journal exports number. This index is reinforcing the upper right emptiness of the overall pattern.

New Zealand's place is within a group we may not normally consider- better than Malaysia and Japan and worse than Lebanon and Turkey, and would seem that NEw Zealand could improve its place dramtically as it is so low in regards to the wealth of the inhabitants. This made me wonder if there was another significant factor that was causing the adjustment by size of the country's GDP to be overly strong as the initial measure is related to things not connected to GDP.

Since journal exports ties to journal production, and journal production ties to the cummulative size of academia (since it is harder to establish a new journal if a journal on the subject already exists) I decided to test the GCI index for this measure against a convienient measure of cummulative academic history.

On the principle of "some information that is easy to get that seems related", I compared the GCI journal exports rank to the age of the oldest Univeristy in that Country, sourced from Wikipedia, as a quick comparison.



There does seem to division between countries with pre- and post- 1800 universities. Very few "old" countries are outside of best 25% of the index, while "young" university countries are centred on a "worse" point in the distribution. This suggest that cummulative advantages of history (which can't easily be changed) is playing a role here, and while New Zealand can improve, it will be harder to do so than just the GCI index alone might cause one to think.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "st12"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
```

```
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

```
unis <- read_feather("processed_data/unis.feather")
gci <- gci11[,c("isoCode",var_code)]
names(gci) <- c("isocode","gci_rank")
axtitle <- paste("Univeristy foundings and", trimws(var_prettynom), "Good Country Rank")
gci %>%
  inner_join(unis, by="isocode") %>%
  filter(!is.na(yr) & gci_rank != 0) %>%
  mutate(country = ifelse(isocode == var_cciso, var_highlight, "other")) %>%
  ggplot(aes(x=yr, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("Foundation year o
  ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
  ggtitle(axtitle)
```

3.3 International publications Science & Technology

From Good Country Source Descriptions:

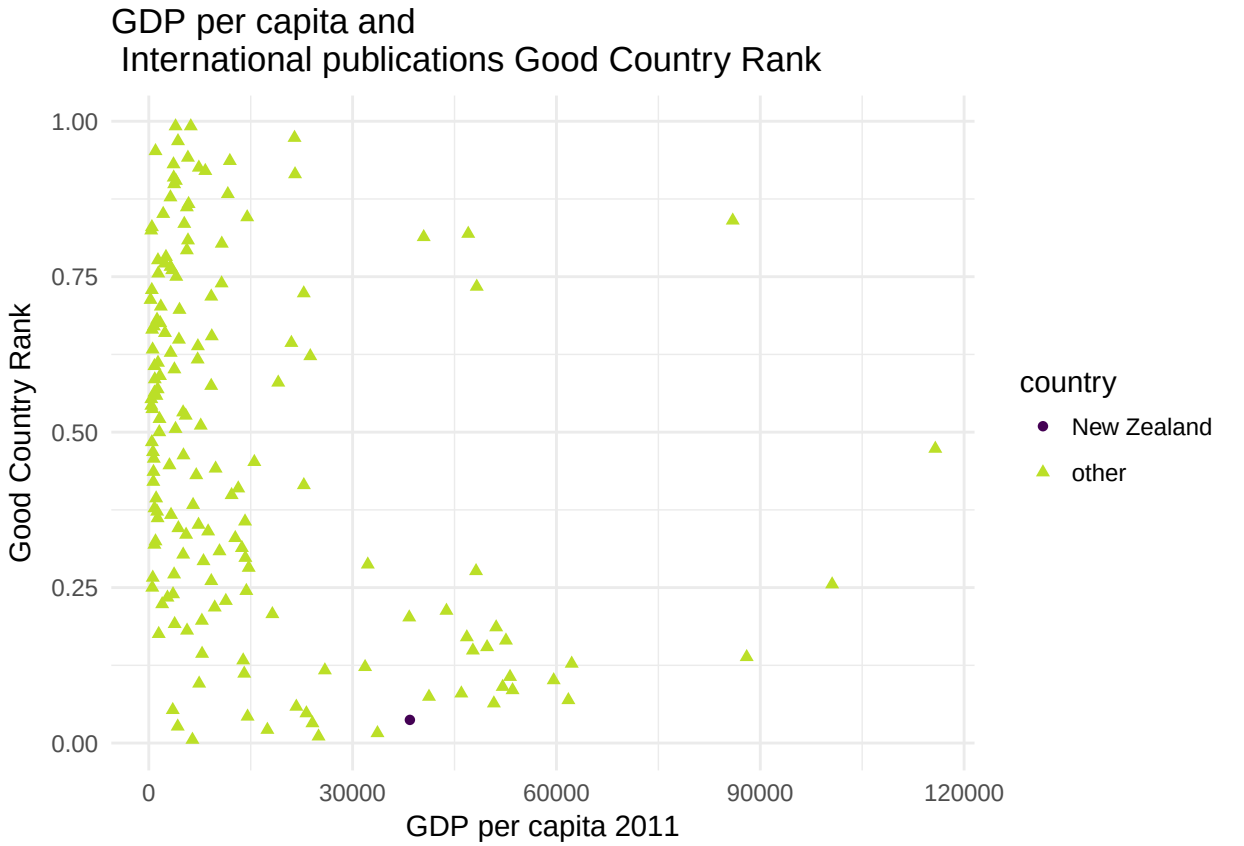
Description: Number of articles published in international journals (according to World Bank) relative to the size of the economy.

Source: Data adapted from The World Bank: Scientific and technical journal articles: National Science Foundation, Science and Engineering Indicators (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Finland, Czech Republic, Armenia, Portugal, Croatia, New Zealand, Republic of Korea, Tunisia, Estonia, Israel, Slovenia, (better)



My Interpretation and Opinions:

Number of international publications has a sharply converging range relating to wealth of inhabitants and New Zealand is very well ranked for a country of its GDP.

Similar countries are (worse) Finland and Portugal, and (better) South Korea and Slovenia.

There is not really much scope for New Zealand to improve here.

What I think would be an interesting comparison, that I have not explored, is any relationships based on language families between Journal Exports and International Publications. I am wondering if New Zealand's native English speaking population makes it easier to publish articles internationally in both U.S. and U.K. publications.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "st13"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

3.4 Nobel prizes Science & Technology

From Good Country Source Descriptions:

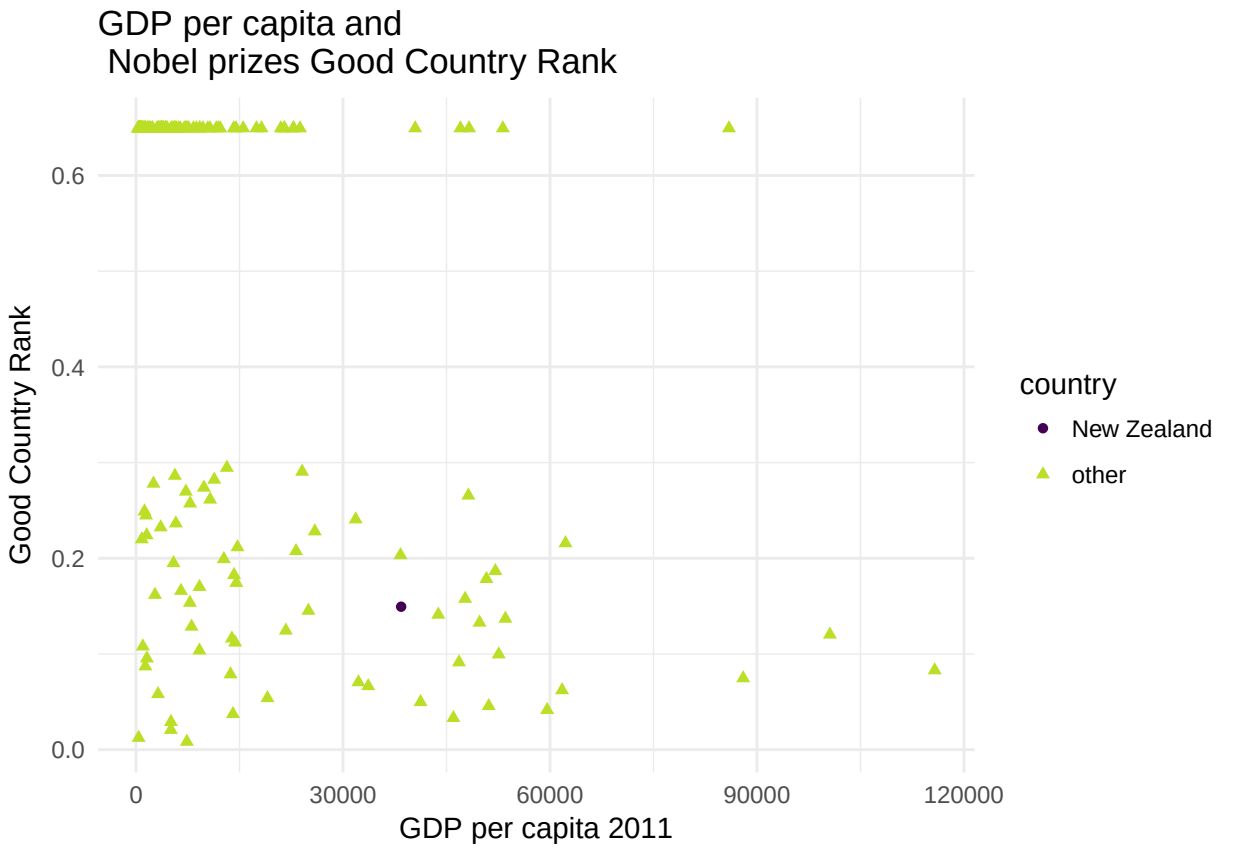
Description: Accumulated Nobel prizes (up to 2011) assigned to countries based on laureates' country of birth as well as country (countries) of institutional affiliation at the time of the award, relative to the size of the economy.

Source: Data compiled from http://www.nobelprize.org/nobel_prizes/lists/all/ (and divided by GDP according to World Bank data).

Treatment: Accumulated Nobel prizes (up to 2011) are assigned to countries based on laureates' country of birth as well as country (countries) of institutional affiliation at the time of the award. Values are divided by GDP and ranked.

Neighbouring Countries:

(worse), Romania, Belarus, Egypt, Belgium, Bulgaria, New Zealand, Slovenia, France, Netherlands, United States of America, South Africa, (better)



My Interpretation and Opinions:

Either you are a country that has won one or more nobel prizes over time, or you are not (and the ties amoung the not winners are resolved by their ranks in other measures).

As New Zealand has won prizes, it falls into a group better than Romania or Belgium and worse than France or the United States.

Based on the graph, there is a weak (binary) relationship to wealth of the inhabitants (as wealthy countries are less likely not to have won a nobel prize), but little relationship within those countries that have one at least one prize.

While the graph suggests that New Zealand could improve its ranking, keep in mind that it is cummulative Nobel Prizes to the Index year (in this case 2011), and it is very difficult to make ourselves a European country in the early years of the twentieth century. So, a bit like the Journal Exports there is a historical weight to this measure. As getting a Nobel Prize is a very infrequent event for most countries, it would be easier to raise our rank by making the economy worse and lowering the country's GDP, as this doesn't change the Nobel Prizes won to date. I am not advocating this strategy. In truth, I am just suggesting this is not a measure that actions of NEw Zealand can change much.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "st14"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

3.5 Patents Science & Technology

From Good Country Source Descriptions:

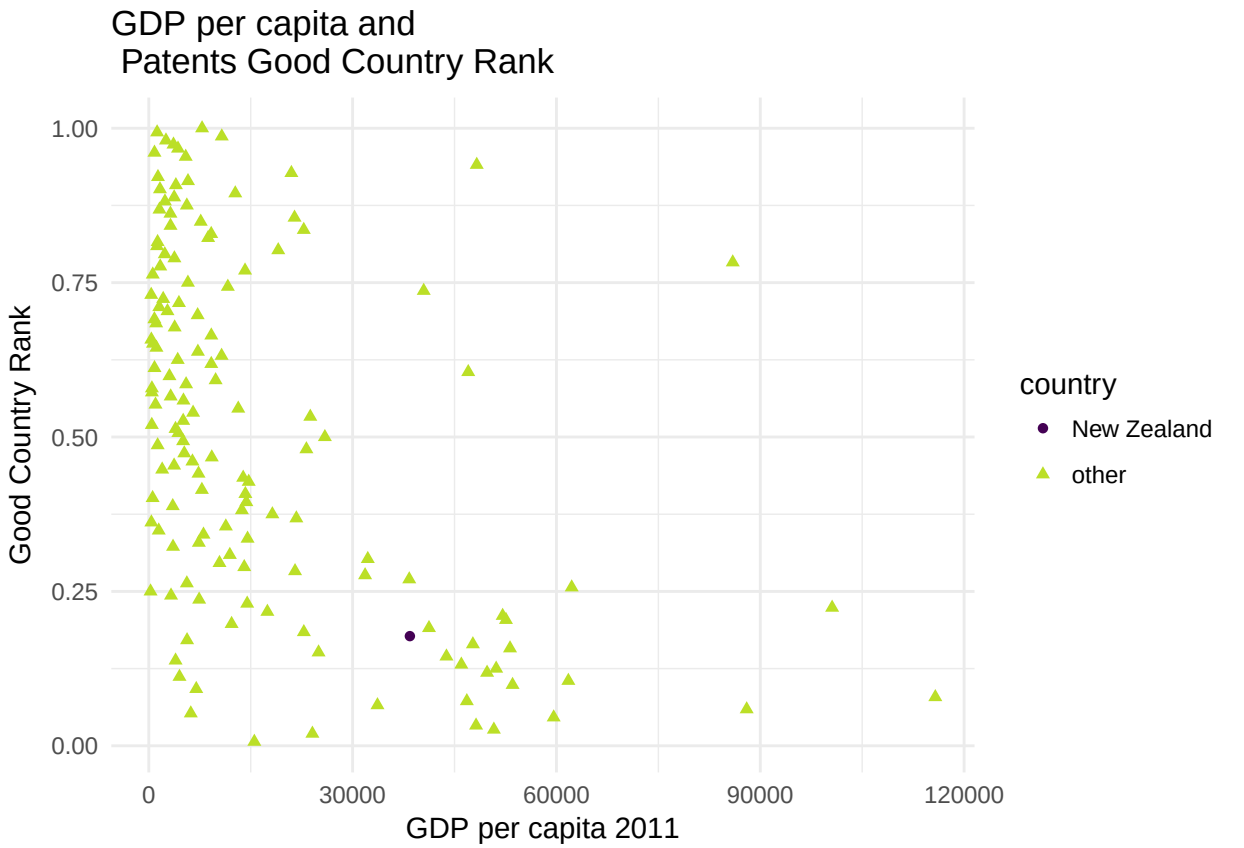
Description: Number of International Patent Cooperation Treaty applications (according to WIPO) relative to the size of the economy.

Source: Data adapted from WIPO Statistics Database, http://ipstatsdb.wipo.org (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Canada, Ireland, Seychelles, United Kingdom, Malta, New Zealand, China, Belgium, Singapore, Slovenia, France, (better)



My Interpretation and Opinions:

New Zealand ranks poorly in number of patents for a country of its wealth, though better than Canada and the United Kingdom (and worse than China and France).

This matches discussion within New Zealand about structural issues around lack of private industry research and development. I would suggest that of all the Science and Technology indicators, this is the one New Zealand has the most genuine room to improve in.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "st15"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
```

```
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

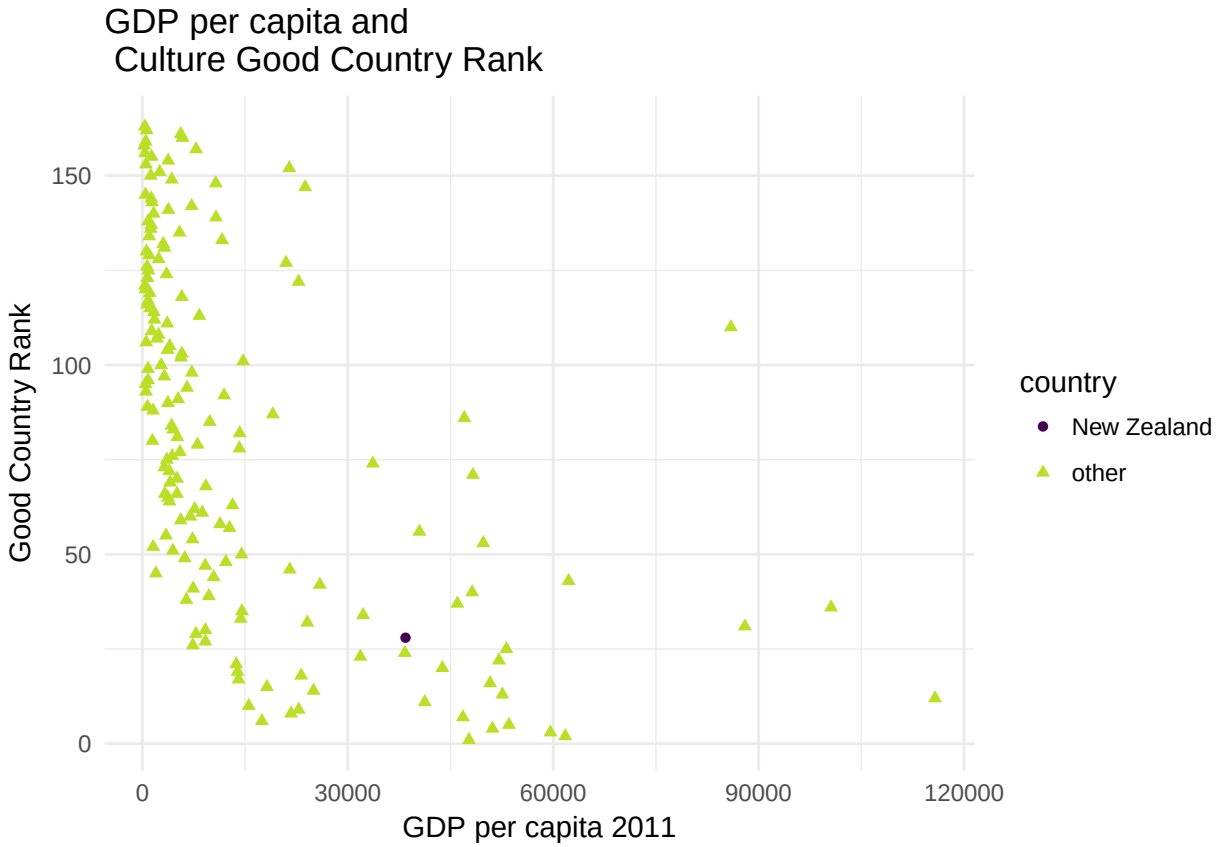
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 4

Culture - Aggregate Score

Neighbouring Countries:

(worse), Lithuania, Republic of Korea, Switzerland, Mauritius, Bulgaria, New Zealand, Romania, Saint Lucia, Singapore, Italy, Spain, (better)



My Interpretation and Opinions:

The same pattern of rank being associated with wealth of inhabitants that was observed with the Science aggregate category can be seen in the Culture category. Most of my thoughts about the overall distribution match my comments for Science, including wondering if number of Arts graduates per population would provide a useful current proxy measure of contributions to world culture.

New Zealand's ranking, better than Korea and Bulgaria while worse than Romania and Italy seems in the right general area as my self image of my country. The more specific rank in relation to the wealth of inhabitants seems lower than my self image though.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "c_Culture"
var_prettynom <- "Culture"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

4.1 Creative goods exports Culture

From Good Country Source Descriptions:

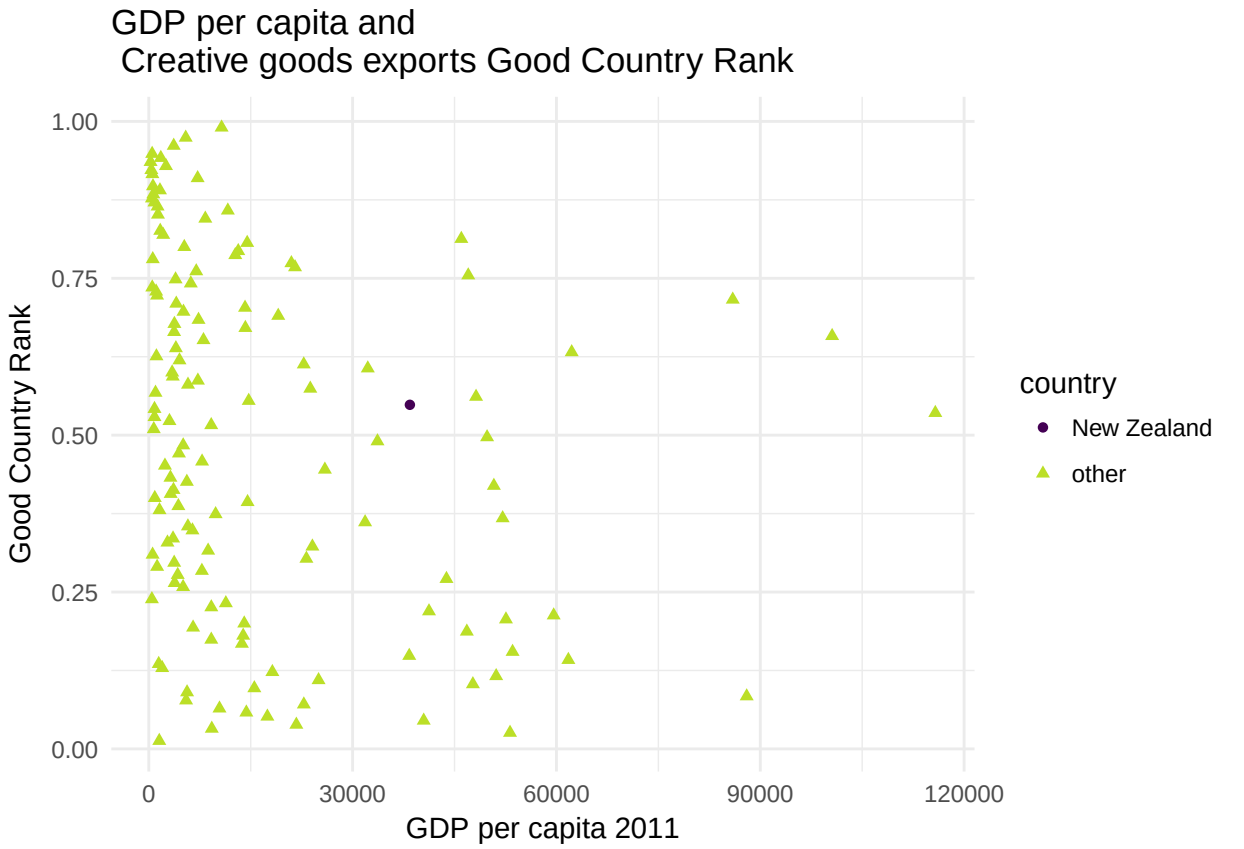
Description: Exports of creative goods (UNCTAD's Creative Economy Report categorisation) relative to the size of the economy.

Source: Data adapted from UNCTADstat, UNCTAD's Creative Economy Report (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Peru, Saudi Arabia, Kenya, Japan, Chile, New Zealand, Zimbabwe, Luxembourg, Bangladesh, Morocco, Costa Rica, (better)



My Interpretation and Opinions:

Creative Goods Exports is very weakly related to wealth, as the best 25% and worst 25% of countries by GCI rank have very different distributions of wealth. New Zealand is towards the worse end in relation to wealth (and this is a measure we are in the lower half of in raw scores). New Zealand is better than Japan or Chile and worse than Luxembourg or Bangladesh.

I couldn't quickly track down raw country numbers to explore in more detail, but my concern with export figures is that for New Zealand it might be reflecting "Tyrany of Distance" effects of the difficulty of exporting things from New Zealand to the rest of the world. If this is the case (and I do not know either way at the moment) then it is a physical feature of our location and harder for us as a nation to do anything about it.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "cu21"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
```

```
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

4.2 Creative services exports Culture

From Good Country Source Descriptions:

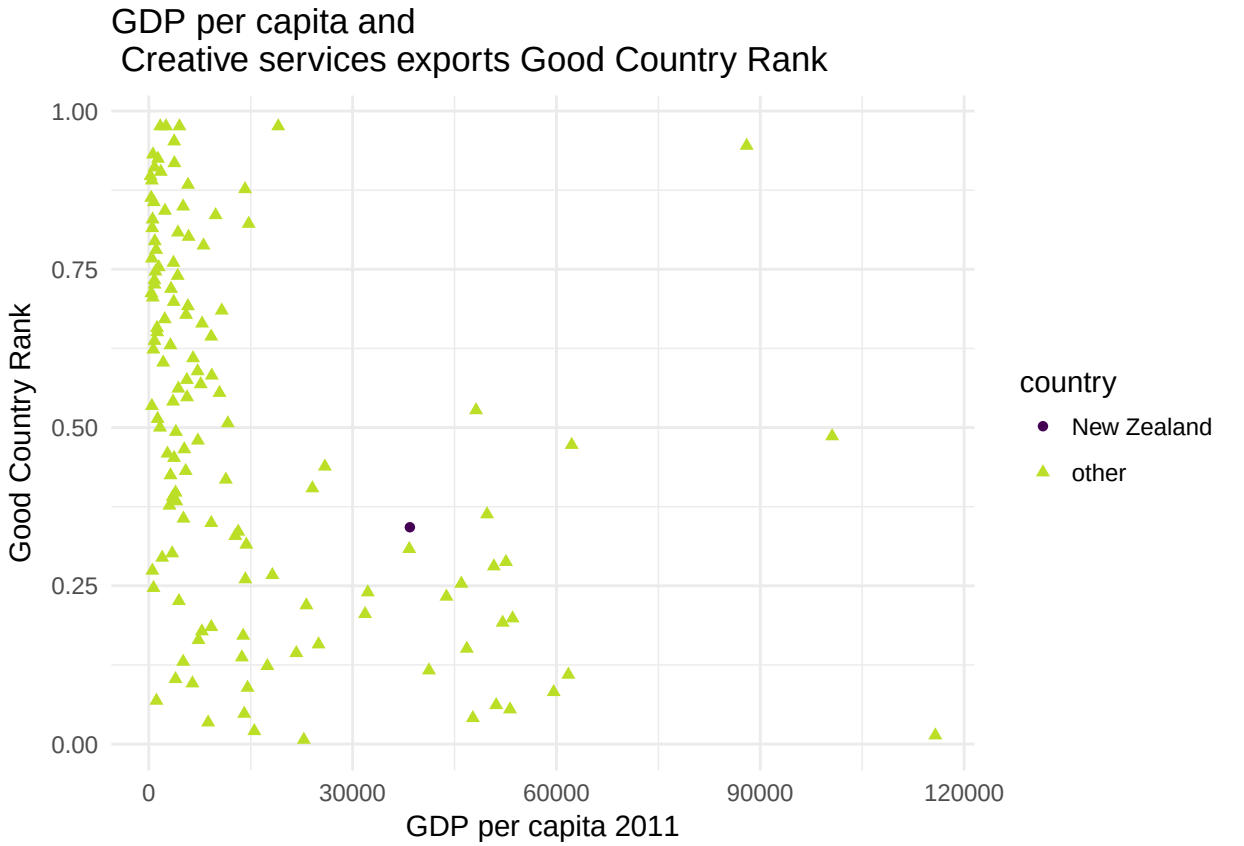
Description: Exports of creative services (UNCTAD's Creative Economy Report categorisation) relative to the size of the economy.

Source: Data adapted from UNCTADstat, UNCTAD's Creative Economy Report (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Tonga, Morocco, United States of America, Jamaica, Mauritius, New Zealand, Brazil, Argentina, Lithuania, Italy, Guyana, (better)



My Interpretation and Opinions:

Creative Services Exports is more clearly related to wealth than Creative Goods Exports, with richer countries being almost all in the best 30% of exporters. While New Zealand is doing better overall than Goods, in the top half, we are still generating a poor rank relative to other countries in our wealth band. New Zealand is better than Tonga or the United States and worse than Brazil or Italy

Again, as with Services, I couldn't quickly track down raw country numbers to explore in more detail, so have a similar concern that export volumes may be linked to an unchangable relative physical distances. So I can't really judge how useful it is for the country to try and improve this.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "cu22"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

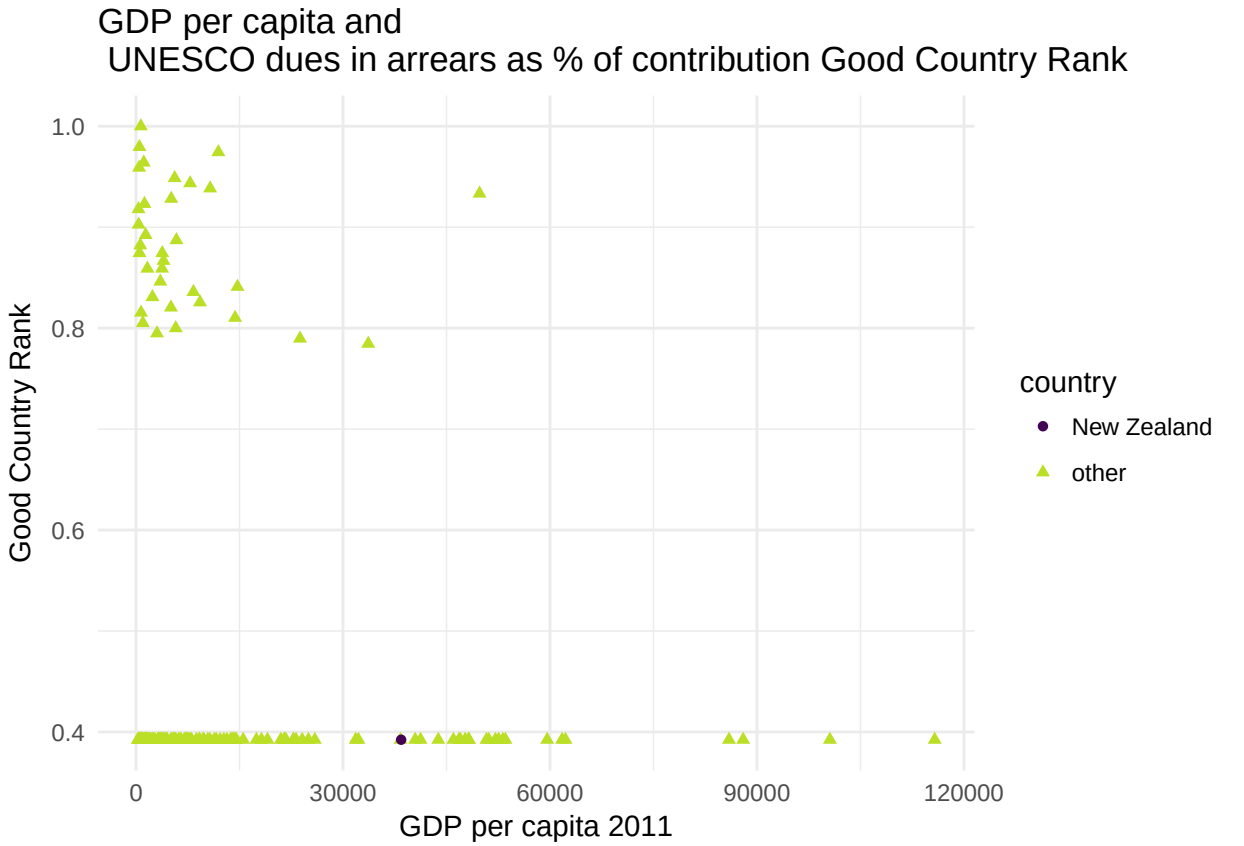
4.3 UNESCO dues in arrears as % of contribution Culture

From Good Country Source Descriptions:

Description: UNESCO dues in arrears as percentage of contribution (negative indicator).

Source: Data compiled from UNESCO, UNESDOC, http://unesdoc.unesco.org/images/0021/002108/210825e.pdf.

Treatment: Dues is arrears are divided by the annual contribution agreed and ranked.



My Interpretation and Opinions:

Either your country is up to date with dues to UNESCO, or it is not. And it is most only poor countries that are not. In New Zealand's case this means that we are part of the vast tie for first that is then broken by the other indicators.

About the only lesson for New Zealand in this is that if we fell into arrears then our GCI rank would plummet as we would be below needing a tie break. So keep paying the dues we have committed to.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "cu23"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
```

```
gci %>%
  inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
  filter(!is.na(X2011) & gci_rank != 0) %>%
  mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
  ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
  ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
  ggtitle(axtitle)
```

4.4 Freedom of movement Culture

From Good Country Source Descriptions:

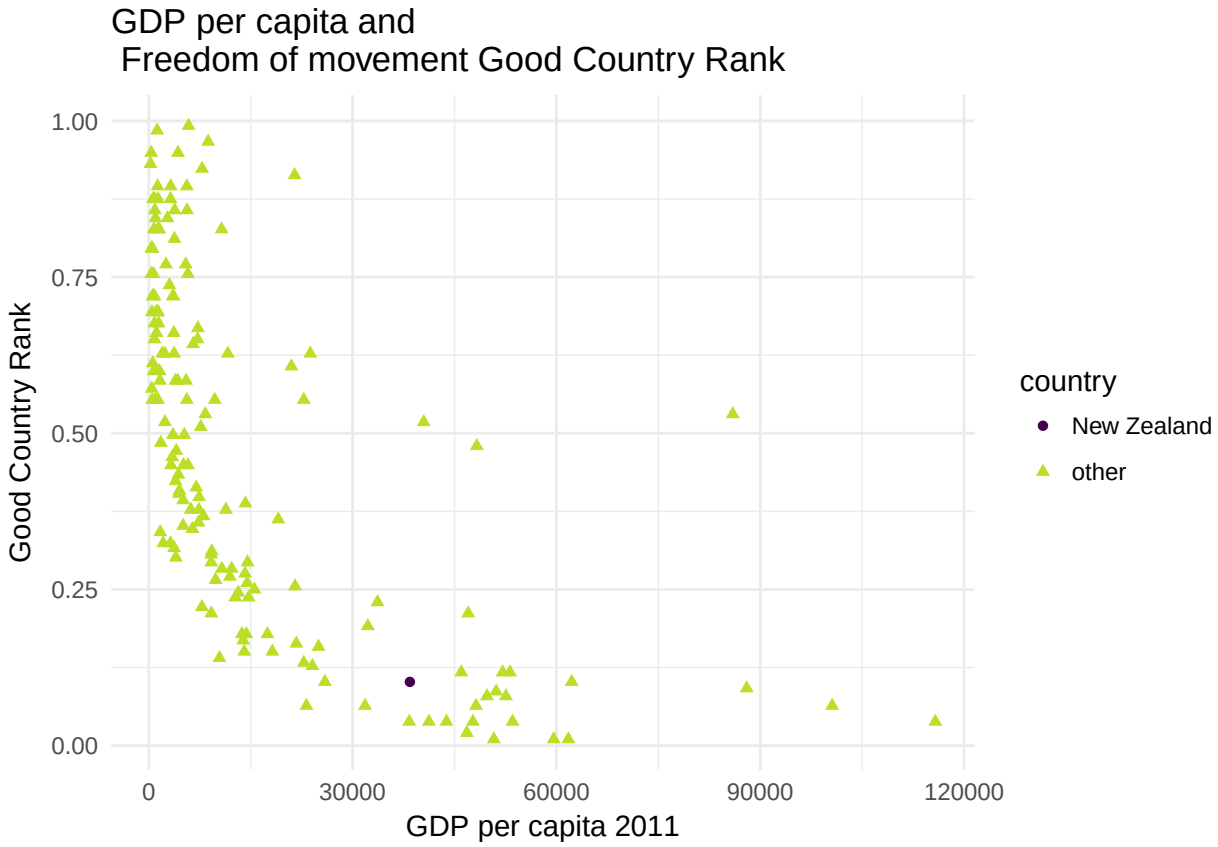
Description: Number of countries and territories that citizens can enter without a visa (according to Henley & Partners).

Source: Data sourced from The 2011 Henley & Partners Visa Restriction Index.

Treatment: Data sourced in its original form, with permission. Scores were ranked.

Neighbouring Countries:

(worse), Canada, Iceland, Singapore, Australia, Greece, New Zealand, Switzerland, Austria, Ireland, United States of America, Japan, (better)



My Interpretation and Opinions:

Freedom of Movement has an extremely link to GDP per Capita, being more or less the same distribution as the over GCI graph.

New Zealands rank seems to fall into a category of very good for a non-EU country, where it gets more complicated due to freedom due to the ocuntry and freedom due to the country belonging to the larger EU group.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "cu24"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

4.5 Press freedom Culture

From Good Country Source Descriptions:

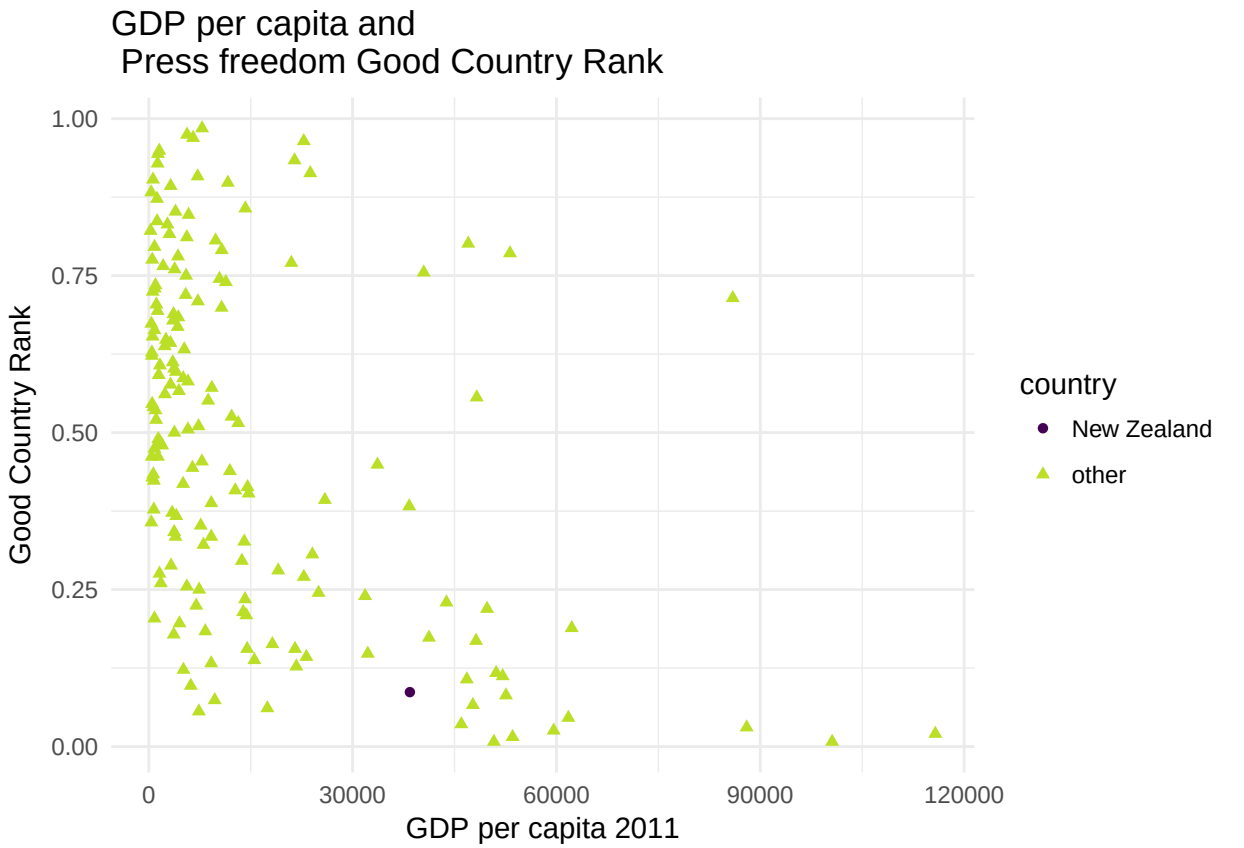
Description: Freedom of the press (based on mean score for Reporters without Borders and Freedom House index as a negative indicator).

Source: Data compiled from http://en.rsf.org/press-freedom-index-2013,1054.html and http://www.freedomhouse.org/reports

Treatment: Two index scores averaged and ranked.

Neighbouring Countries:

(worse), Jamaica, Austria, Canada, Germany, Saint Vincent and the Grenadines, New Zealand, Ireland, Palau, Belgium, Estonia, Saint Lucia, (better)



My Interpretation and Opinions:

Press Freedom also seems to have an association with GDP per capita, as contries with well off inhabitants are concentrated in the top 30% of GCI ranks.

New Zealand seems to have a very good rank for its GDP per capita (overall better than Canada and Germany, worse than Ireland and Belgium), so there would not seem to be much opportunity to improve in this area.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "cu25"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
```

```
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

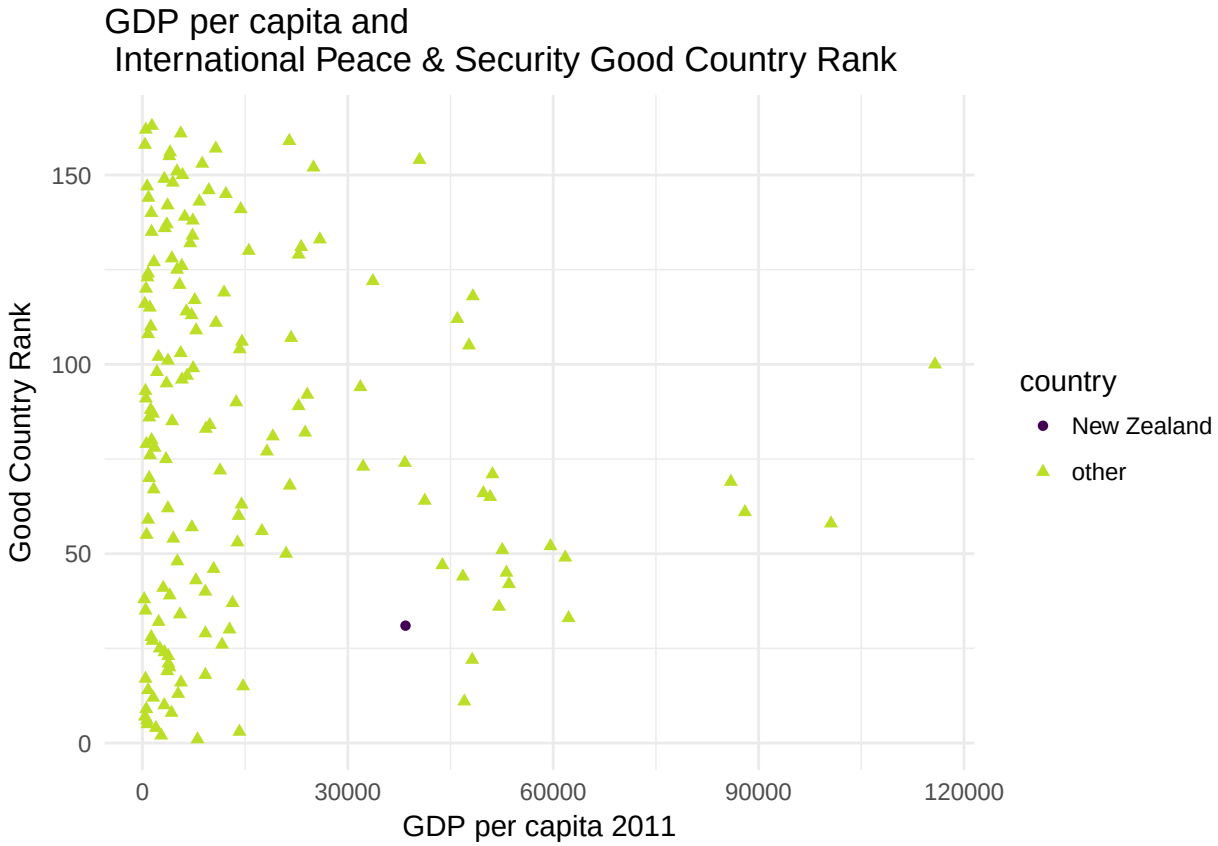
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 5

International Peace & Security - Aggregate Score

Neighbouring Countries:

(worse), Canada, Guinea, Thailand, Australia, Bolivia, New Zealand, Argentina, Romania, Cameroon, India, Kazakhstan, (better)



My Interpretation and Opinions:

The aggregated International Peace & Security score shows a general reduction in GCI rank range with increasing GDP per capita.

For the overall rank, New Zealand is in a high 20s to low 30s group, better than countries such as Canada and Australia while worse than countries such as Romania and India. Compared to contries of similar wealth, New Zealand is among the best countries.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "d_InternationalPeaceSecurity"
var_prettynom <- "International Peace & Security"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

5.1 Peacekeeping troops International Peace & Security

From Good Country Source Descriptions:

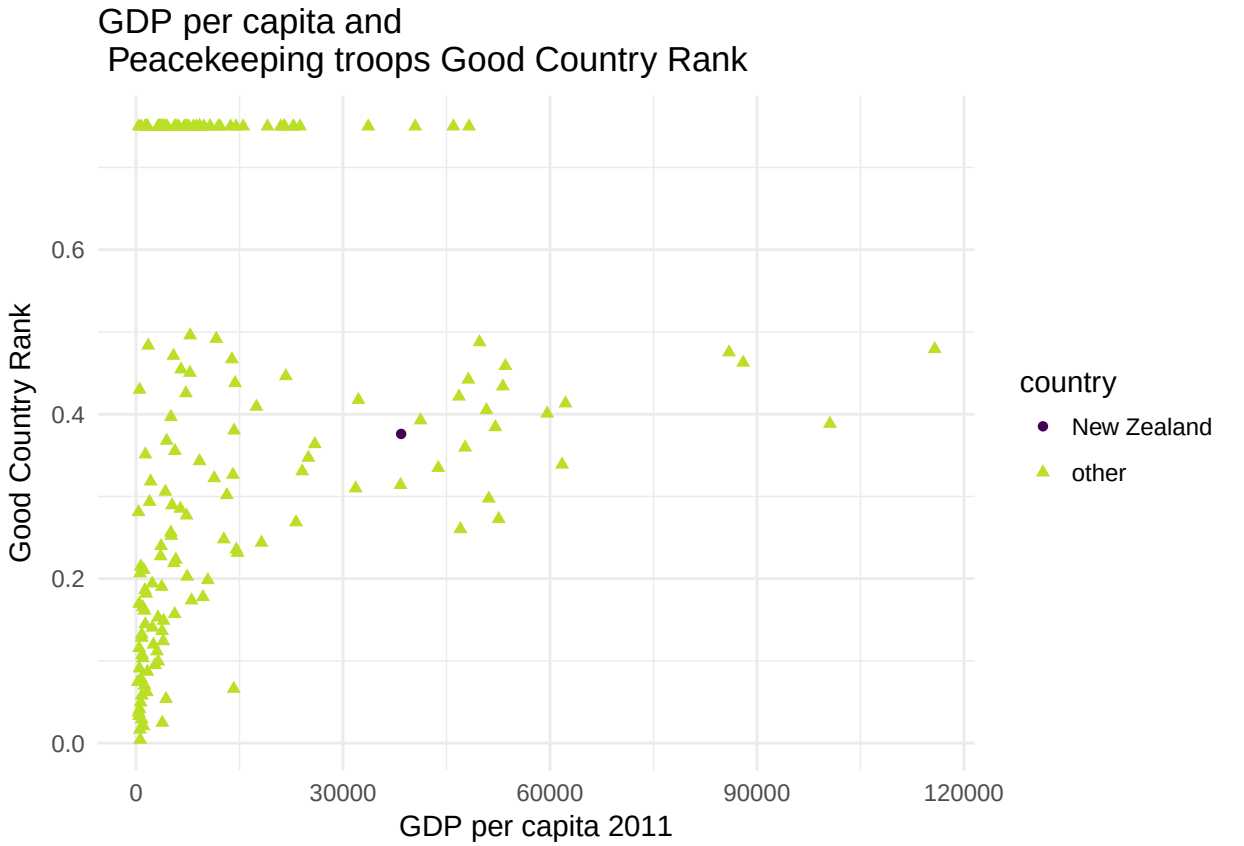
Description: Number of peacekeeping troops sent overseas for UN missions, relative to the size of the economy.

Source: Data adapted from United Nations, Peacekeeping Statistics, http://www.un.org/en/peacekeeping/resources/statistics/contributors_archive.shtml (and divided by GDP according to World Bank data).

Treatment: Countries not listed were assumed not to have contributed (i.e. missing value = 0). Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Republic of Macedonia / FYROM, United Kingdom, Norway, Canada, Russian Federation, New Zealand, Albania, Greece, Belgium, China, Lesotho, (better)



My Interpretation and Opinions:

The measure of number of peacekeepers (in relation to size of economy) is highly sensitive to GDP per capita. Among countries that supply peace keepers, the number supplied decreases as GDP per capita increases.

New Zealand is in the better half of countries overall, the worse half of countries supplying peacekeepers, and the better half of what might be expected given the wealth of its inhabitants. The GCI range New Zealand is in places us a little better than Canada and Norway, and a bit worse than Belgium and China.

There would seem to be some room for improving New Zealands peacekeeping relative to other countries, but that needs to be caveated by economic confounders clearly in play.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "ps31"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

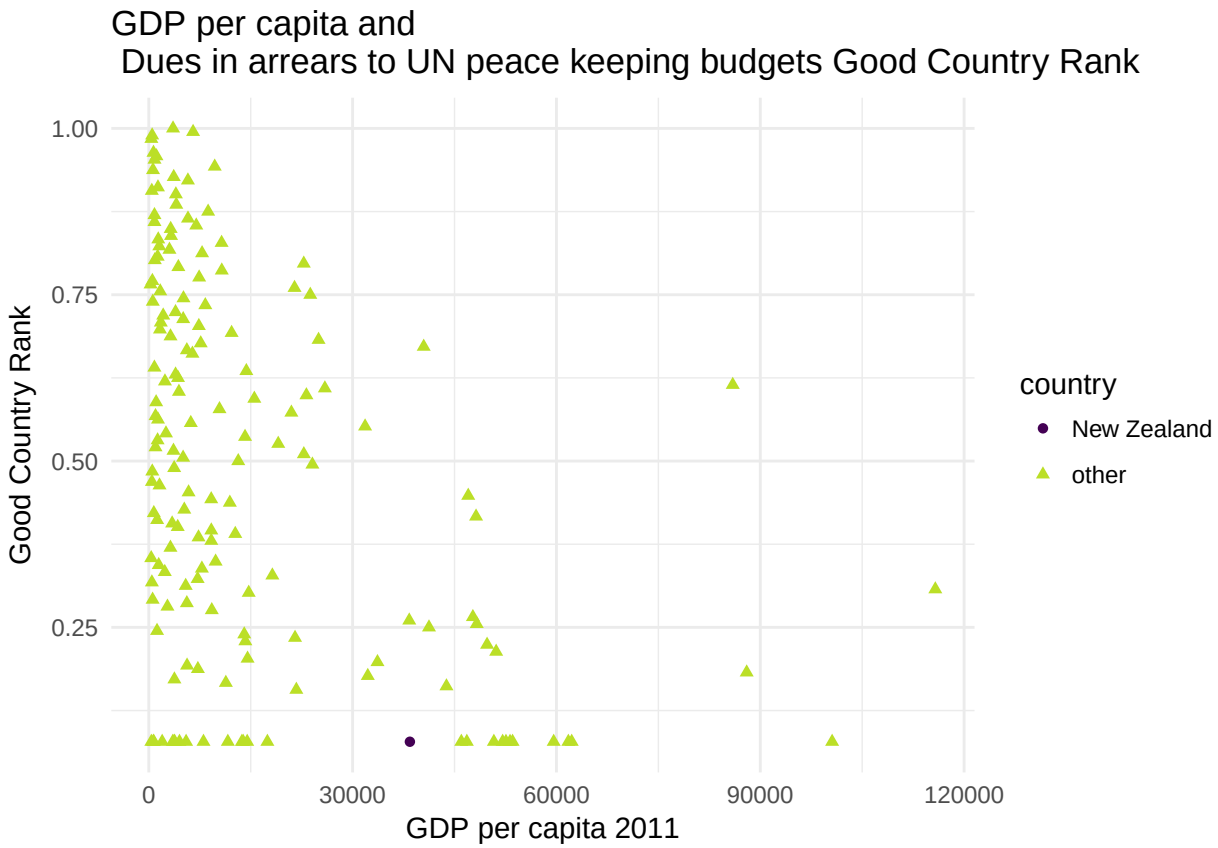
5.2 Dues in arrears to UN peace keeping budgets International Peace & Security

From Good Country Source Descriptions:

Description: Dues in arrears to financial contribution to UN peacekeeping missions as percentage of contribution (negative indicator).

Source: Data compiled from United Nations, Committee on Contributions, Status reports, http://www.un.org/en/ga/contributions/status.shtml.

Treatment: Dues in arrears are divided by the annual contribution agreed and ranked.



My Interpretation and Opinions:

Be in arrears for UN peacekeeping budgets does not seem to relate to GDP per capita.

As New Zealand is tied among countries that are up to date, and the tie is broken with other indicators, the main thing for New Zealand is that getting into arrears would lead to a fall of many places as we would be out of the tied area.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "ps32"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
```

```
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

5.3 International violent conflict International Peace & Security

From Good Country Source Descriptions:

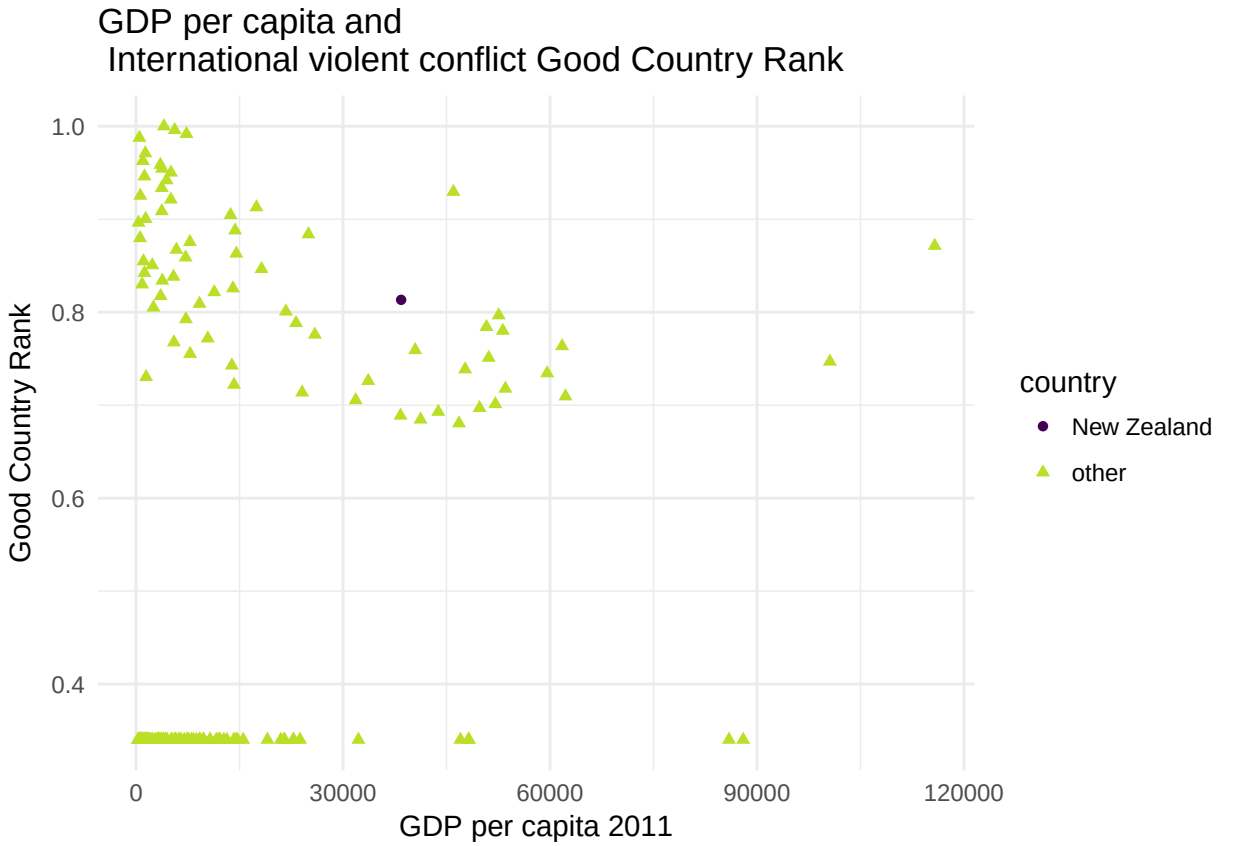
Description: Attributed number of casualties of international organised violence (number of casualties per conflict divided by the number of countries involved according to UCDP/PRIO) relative to the size of the economy (negative indicator).

Source: Data compiled from UCDP/PRIO Armed Conflict Dataset V4, http://www.pcr.uu.se/research/ucdp/datasets/ucdp_prio_armed_conflict_dataset/. Gleditsch, Nils Petter; Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg & Håvard Strand (2002) Armed Conflict 1946–2001: A New Dataset. Journal of Peace Research 39(5): 615–637. Themnér, Lotta & Peter Wallensteen (2013) Armed Conflict, 1946-2012 Journal of Peace Research 50(4) (and divided by GDP according to World Bank data).

Treatment: Number of casualties per conflict divided by the number of countries involved. The number of 2011 causalities per conflict in which a country is involved is totalled (and divided by GDP and ranked).

Neighbouring Countries:

(worse), Jordan, Cambodia, Hungary, Turkey, Ukraine, New Zealand, Romania, Nigeria, Czech Republic, Ireland, Colombia, (better)



My Interpretation and Opinions:

Violent conflict (relative to size of economy) shows a clear pattern that among countries that have engaged in violent conflict, countries of poorer people have a worse rank. Due to the normalisation by size of economy, the Nez Zealand finds itself in is not a group we would normally think of ourselves as equivalent to.

In particular, New Zealands ranking in the worst 20% of countries causing casualties may strongly conflict with New Zealander's self perceptions, so I think it is worth stressing how this measure is calculated. The number of casualties in a country is divided among countries with forces present in that country (then that number is divided by the GDP of the country). So New Zealand's rank is the result of having troops in Afghanistan in 2011, and then among those with troops present a ranking on the size of our economy. This measure is a measure of presence in a war zone (reflecting the number of casualties), not the actions of a country's troops within that war zone.

The only way for New Zealand to improve our rank here is stop being part of alliances, even if we are only sending troops to do reconstruction work.

Note: the original source data has shifted to http://ucdp.uu.se/#

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "ps33"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

5.4 Arms exports International Peace & Security

From Good Country Source Descriptions:

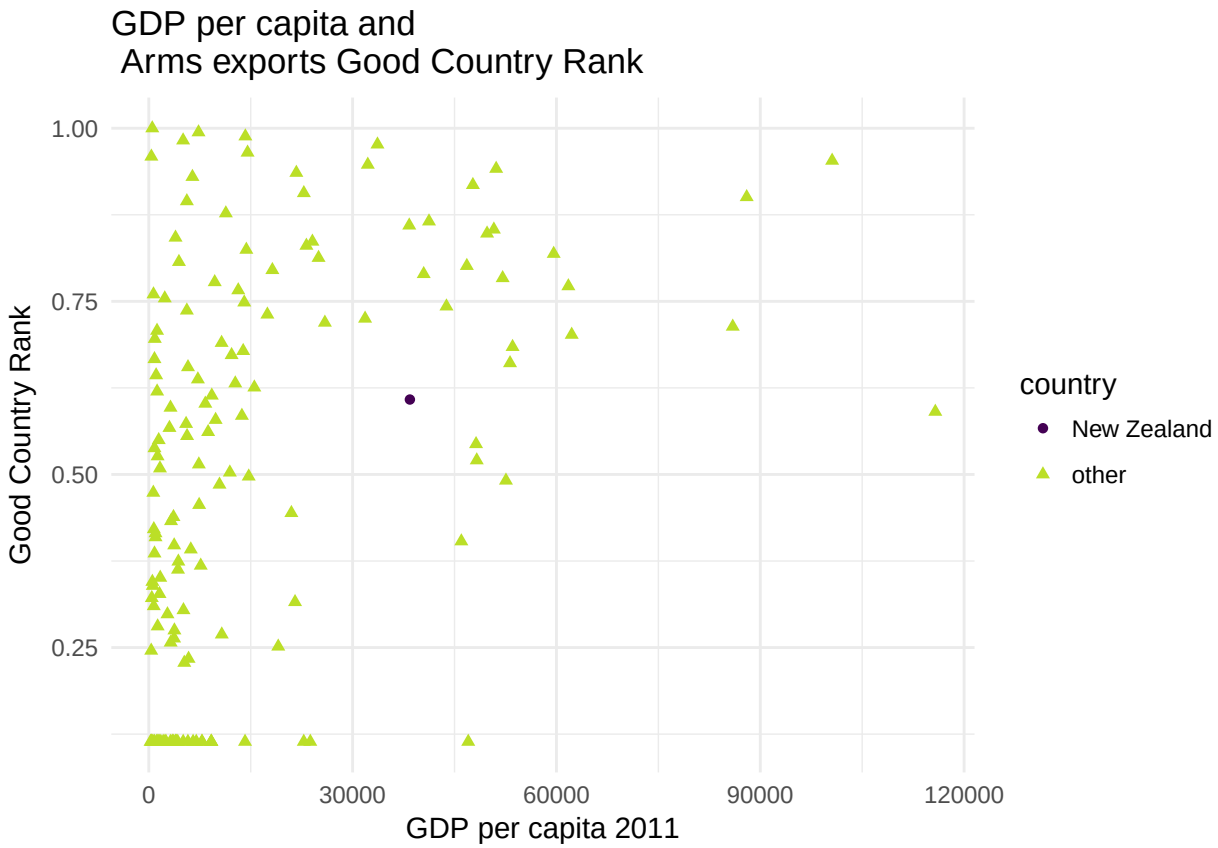
Description: Exports of weapons and ammunition (according to ITC) relative to the size of the economy (negative indicator).

Source: Data adapted from Trade Map, International Trade Centre, www.intracen.org/marketanalysis (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Colombia, Argentina, Barbados, Pakistan, Panama, New Zealand, Suriname, Congo, Luxembourg, Latvia, Mexico, (better)



My Interpretation and Opinions:

For Arms (Arms and ammunition; parts and accessories thereof) exports by the size of the economy, there is a clear relationship with GDP per capita. The higher the GDP per capita, the more arms and compents sales your county makes, producing a limit on maximal rank the reverse of most other indicators.

For its GDP per capita, New Zealand is contributing a relatively low level of arms and components to the world. Checking the orginal data, the exported 4.4 million USD in arms and components in 2011 more than half is made up of sales to the Australia and Canada. I also checked imports, out of interest, and New Zealand imported 5.3 million USD of Arms and ammunition; parts and accessories thereof, so I am wondering how much of the 4.4 million was just passing through.

If it is pass through, and more arms are coming in than going out, New Zealands rank is an artifact of the data. If it is not pass through there is room for improvement. The degree to which it is pass through is something that could be analysed.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "ps34"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
```

```
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

5.5 Internet security (2014) International Peace & Security

From Good Country Source Descriptions:

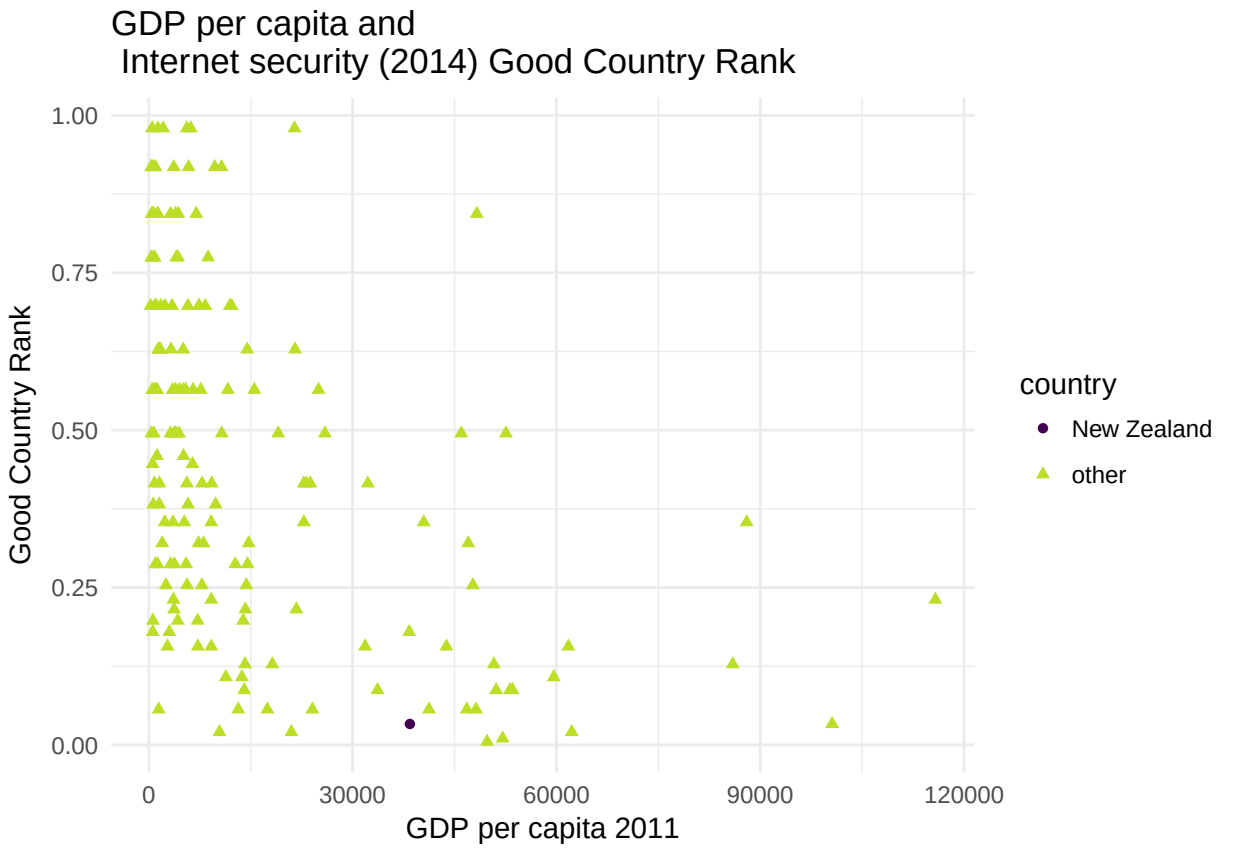
Description: Global Cybersecurity Index score (according to ITU 2014 first edition).

Source: Data sourced from ITU (first edition 2014) http://www.itu.int/en/ITU-D/Cybersecurity/Pages/GCI.aspx.

Treatment: Data sourced in its original form. Values were ranked.

Neighbouring Countries:

(worse), Germany, India, Japan, Republic of Korea, United Kingdom, New Zealand, Norway, Australia, Malaysia, Oman, Canada, (better)



My Interpretation and Opinions:

There is a relationship between GDP per capita and Internet Security, and New Zealand is at the upper end of both raw ranks and the ranks in relation to wealth. So maybe we could improve a little with more effort, but we are well above average to start with so any reversion to the mean would bring us down.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "ps35"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
```

```
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

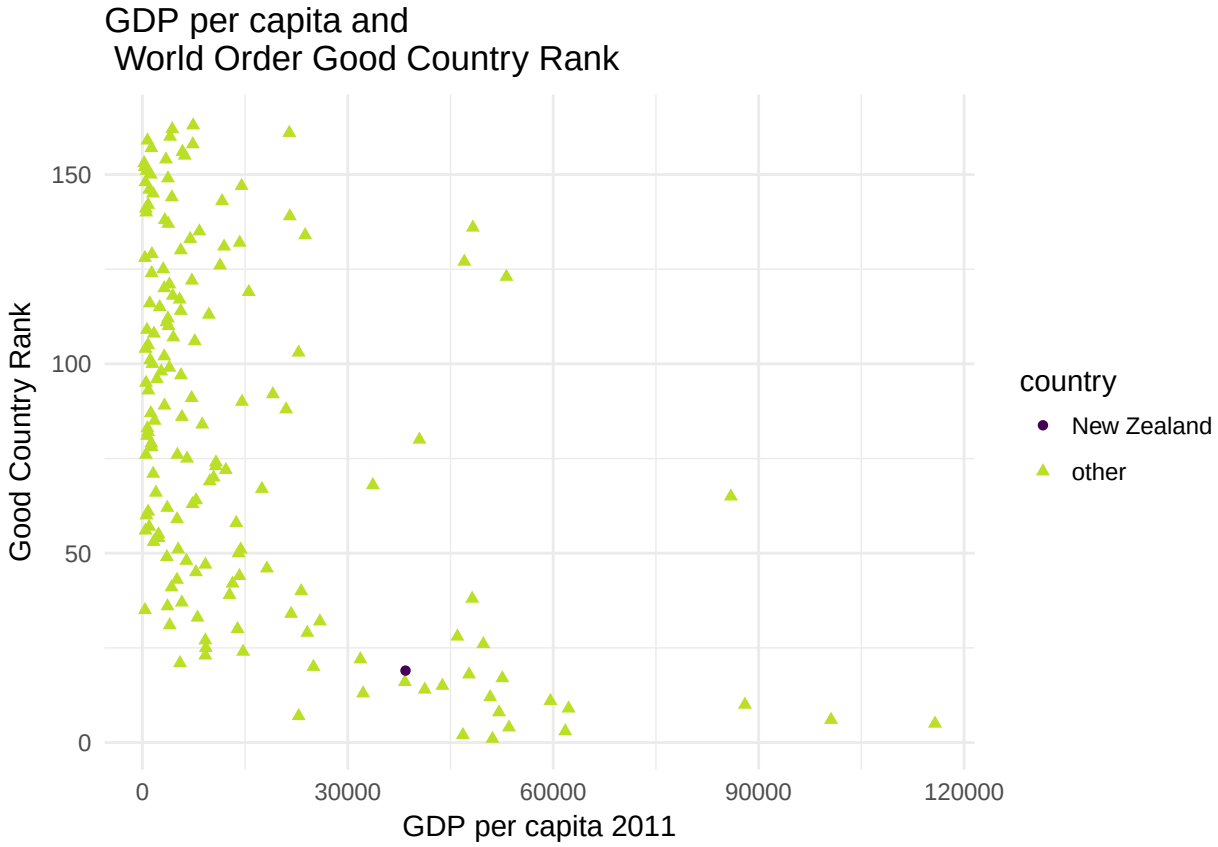
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 6

World Order - Aggregate Score

Neighbouring Countries:

(worse), Chile, Costa Rica, Spain, Thailand, Slovenia, New Zealand, Belgium, Ireland, Italy, France, United Kingdom, (better)



My Interpretation and Opinions:

The World Order aggregate category is sensitive to GDP per capita, as no poor country is among the best ranked countries.

New Zealand's place is a bit under where it could be given the trend of the data, though relatively high overall.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "e_WorldOrder"
var_prettynom <- "World Order"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

6.1 Charity giving World Order

From Good Country Source Descriptions:

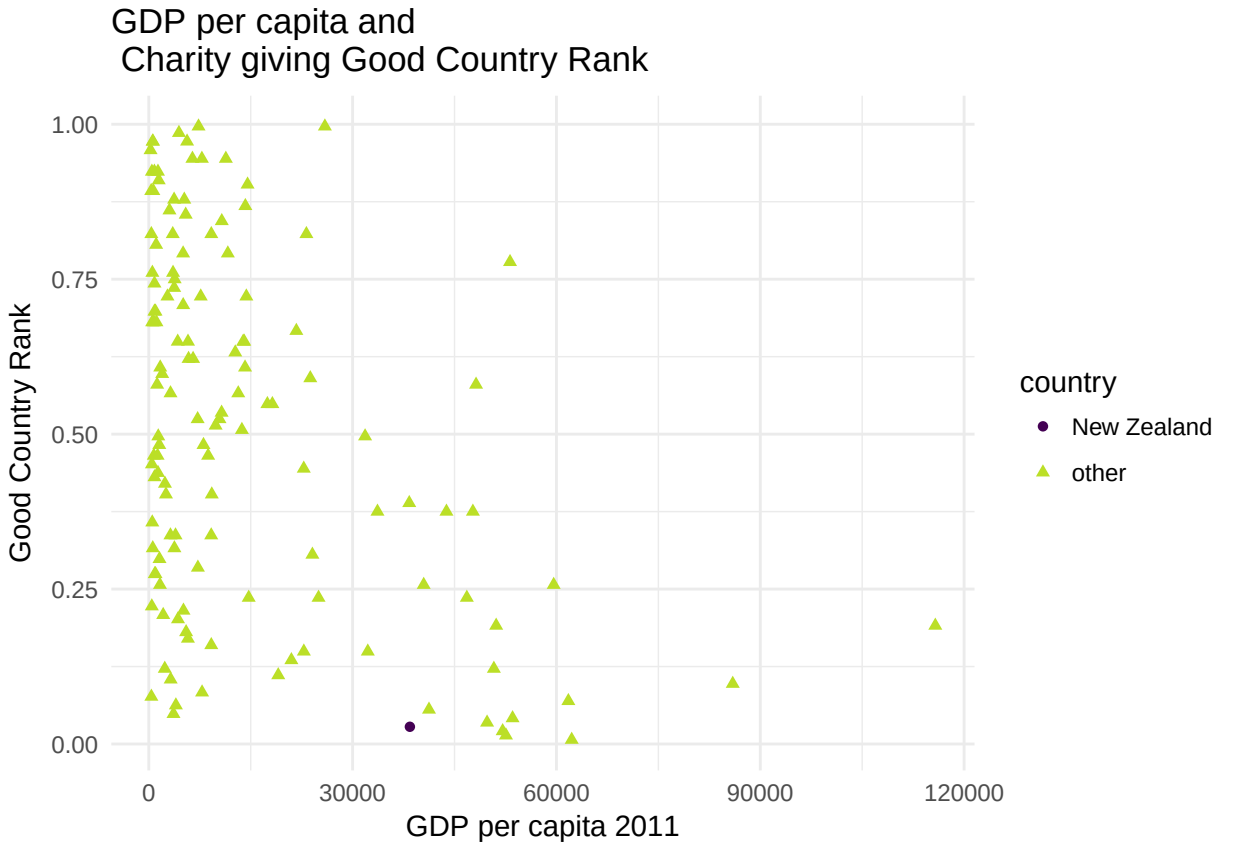
Description: Percentage of population that gives to charity (according to Charities Aid Foundation) as proxy for cosmopolitan attitude.

Source: Data sourced from Charities Aid Foundation (2011) World Giving Index, https://www.cafonline.org/navigation/footer/about-us/publications.aspx.

Treatment: Data sourced in its original form. Values were ranked.

Neighbouring Countries:

(worse), Paraguay, United Kingdom, Indonesia, Netherlands, United States of America, New Zealand, Canada, Ireland, Australia, (better)



My Interpretation and Opinions:

Charity Giving is slightly sensitive to GDP per capita as most tend towards the better ranks in this category, but it is not a distinct a trend as many other indicators.

New Zealand is in 4th place overall behind Australia, Ireland, and Canada. If GDP per Capita is taken into account, then New Zealand is as good as any other country in this respect. There is not much opportunity for improvement in this indicator.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "wo41"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
```

```
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

6.2 Refugees hosted World Order

From Good Country Source Descriptions:

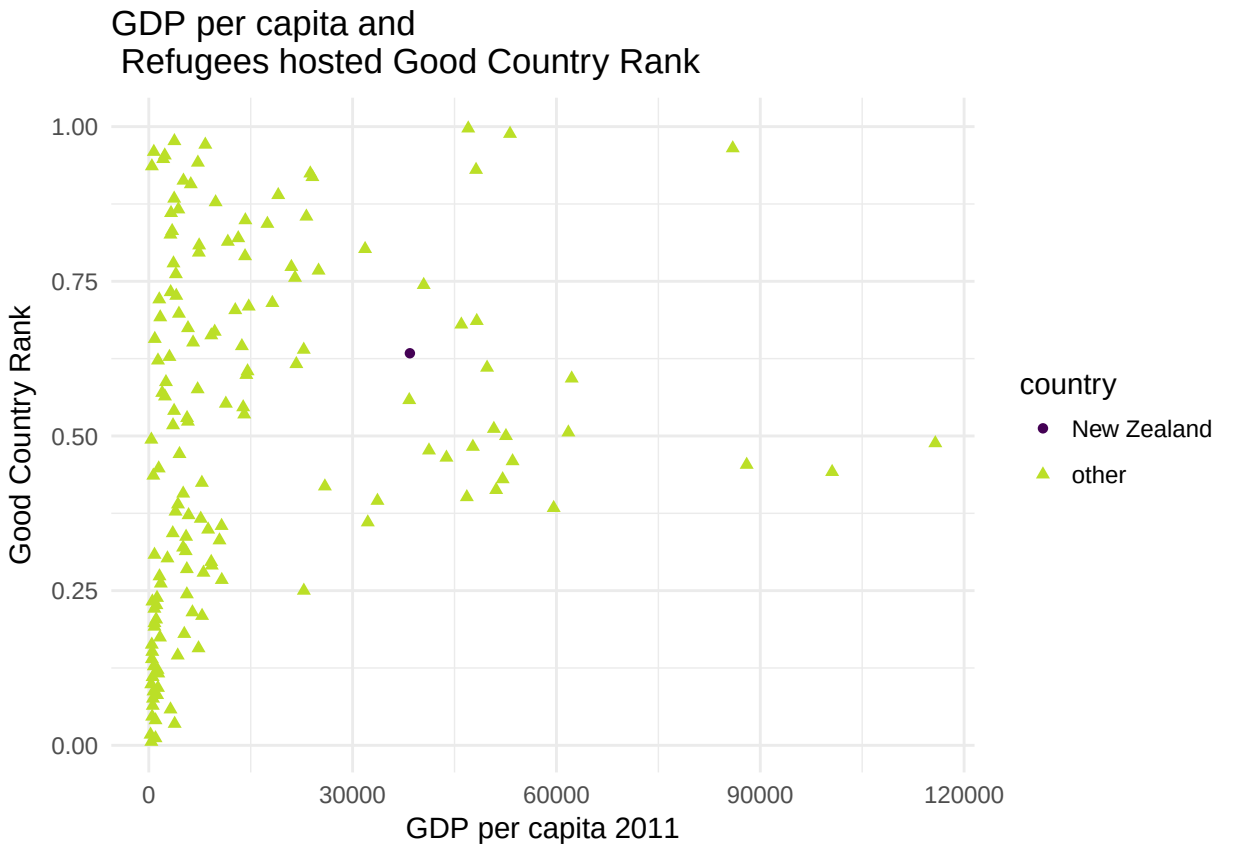
Description: Number of refugees hosted (according to UNHCR) relative to the size of the economy.

Source: Data adapted from UNHCR Population Statistics, http://popstats.unhcr.org/Default.aspx (and divided by GDP according to World Bank data).

Treatment: Values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Romania, Cambodia, Belarus, Latvia, Bahrain, New Zealand, Morocco, Lesotho, Czech Republic, United States of America, Croatia, (better)



My Interpretation and Opinions:

Refugees hosted (relative to the size of the economy) is seinsitive to GDP per capita, as the range of values narrows as wealth increases.

New Zealand is both poor overall and poor in relation to its GDP per capita. If there is a measure that New Zealand both morally should try and improve and could easily improve itself by doing so, it is hosting more refugees.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "wo42"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
```

```
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

6.3 Refugees generated World Order

From Good Country Source Descriptions:

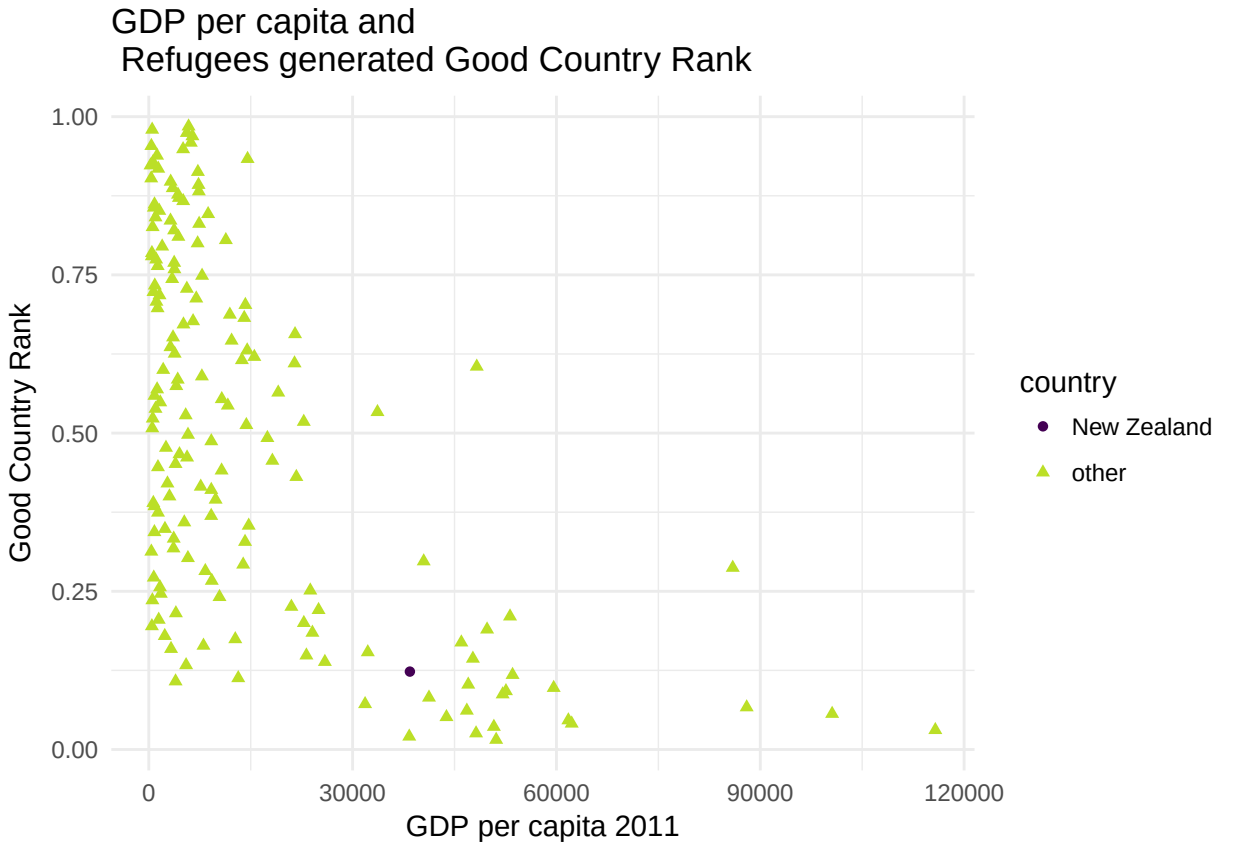
Description: Number of refugees overseas (according to UNHCR) relative to the size of the population (negative indicator).

Source: Data adapted from UNHCR Population Statistics, http://popstats.unhcr.org/Default.aspx (and divided by population size according to World Bank data).

Treatment: Values were divided by population size and ranked.

Neighbouring Countries:

(worse), Cyprus, Portugal, Belgium, Greece, Thailand, New Zealand, Netherlands, Brazil, Samoa, Brunei Darussalam, Sweden, (better)



My Interpretation and Opinions:

Refugees Generated shows a relationship to GDP per capita, with the common pattern of wealthier countries in all the best ranks.

New Zealand is in around the middle of the range for its GDP per capita, which may come as a shock to people not familiar with the raw data.

New Zealanders may be surprised that the country generates refugees, but this is an artifact of the data collection. The origin of the refugee is the port previous to the country they claimed refugee status in, and the large proportion of New Zealand refugees to Australia is caused by people passing through New Zealand then seeking refugee status in Australia.

There is not much New Zealand can do, as a country, to change our ranking here.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "wo43"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
```

```
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

6.4 Birth rate World Order

From Good Country Source Descriptions:

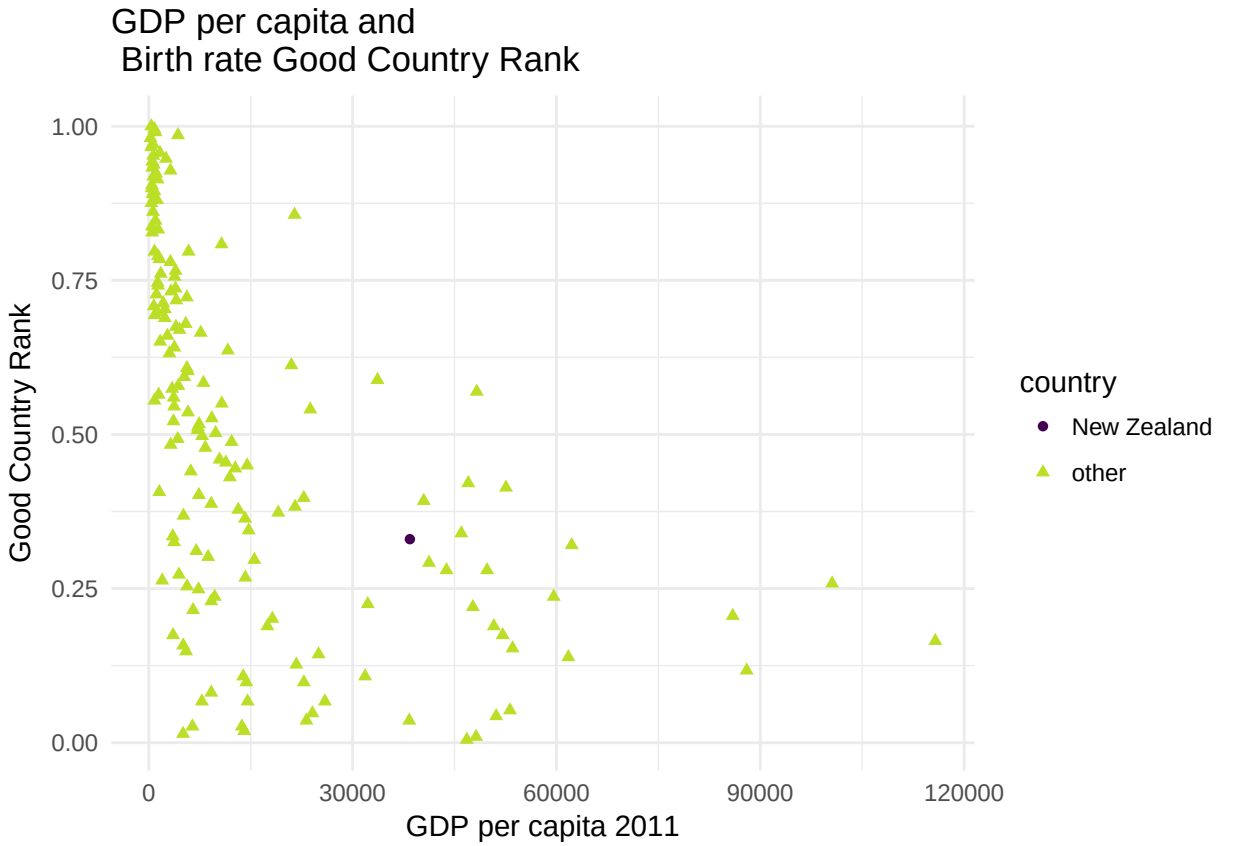
Description: Population birth rate (according to World Bank as negative indicator).

Source: Data adapted from The World Bank: Birth rate (annual %): World development Indicators.

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then ranked.

Neighbouring Countries:

(worse), Jamaica, Uruguay, Chile, Iceland, Armenia, New Zealand, Georgia, Australia, Dominica, Lebanon, Barbados, (better)



My Interpretation and Opinions:

Birth Rate is sensitive to GDP per capita, as wealthy countries have low birth rates.

New Zealand has a poor ranking for its GDP per Capita, though a good rank overall. MY feeling is that this high rate may relate to ethnic diversity within New Zealand culture that is not relected in other medium to high income countries.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "wo44"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
```

```
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

6.5 UN Treaties signed World Order

From Good Country Source Descriptions:

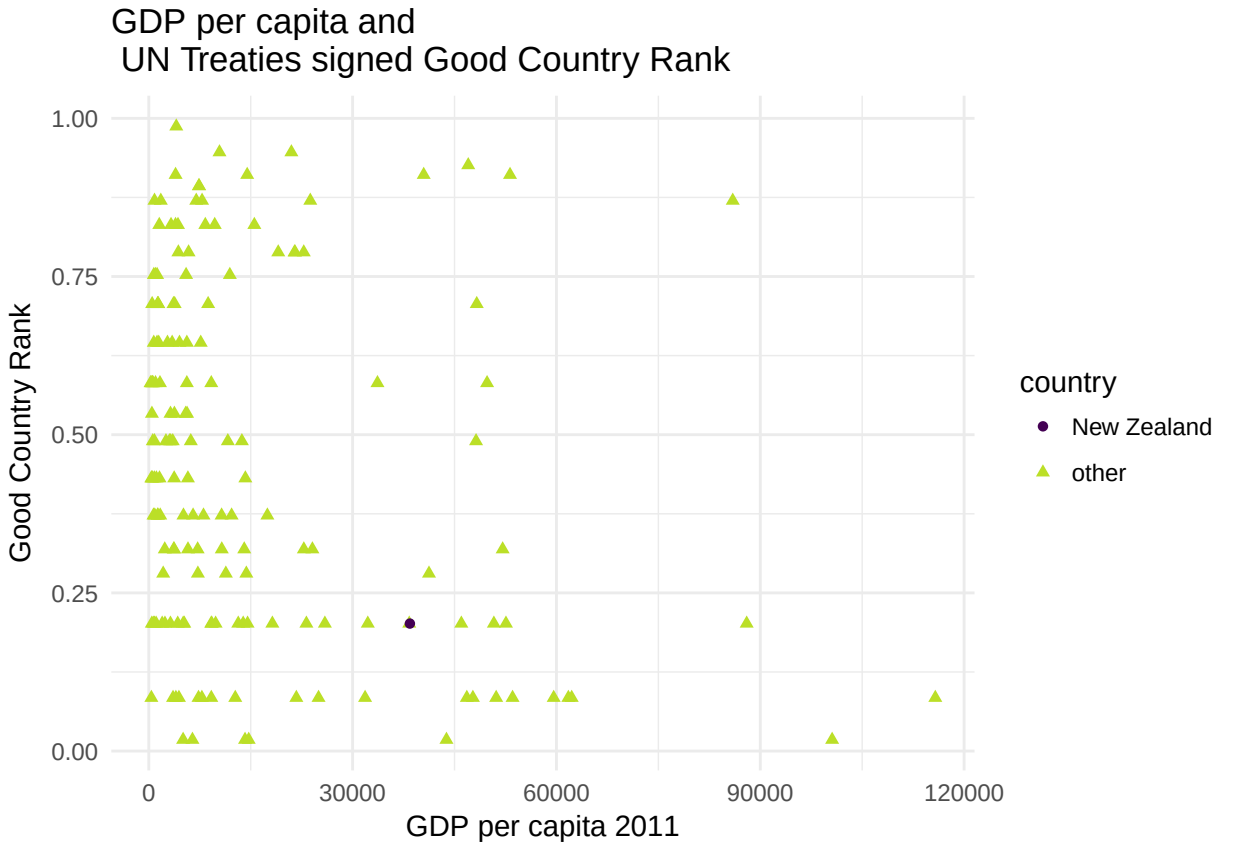
Description: Number of UN treaties signed (up to 2011) as proxy for diplomatic action and peaceful conflict resolution.

Source: Number of UN treaties signed (up to 2011) as proxy for diplomatic action and peaceful conflict resolution.

Treatment: "On May 15, 2000, UN Secretary-General Kofi Annan sent the leaders of the Member States a letter identifying the twenty-five treaties most central to the spirit and goals of the UN Charter (see: http://www.un.org/cyberschoolbus/briefing/law/ilresources.htm). Since 2000, several updates and major new treaties were added, such as: The Optional Protocol to the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment. New York, 18 December 2002. The International Convention for the Protection of All Persons from Enforced Disappearance. New York, 20 December 2006. The Optional Protocol to the Convention on the Safety of United Nations and Associated Personnel. New York, 8 December 2005. The United Nations Convention against Corruption. New York, 31 October 2003. The Amendment to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be deemed to be Excessively Injurious or to have Indiscriminate Effects. Geneva, 21 December 2001. The Amendment to Annex B of the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Nairobi, 17 November 2006. This indicator counts the number of these treaties signed/acceded/succeeded/ratified (using http://treaties.un.org), with a potential high score of 31 (Annan's 25 plus 6 updates/new treaties). Recent treaties (since 2008) were not included as states need time to sign/accede. Counts were ranked."

Neighbouring Countries:

(worse), Ireland, Italy, Mali, Mexico, Moldova, New Zealand, Panama, Poland, Portugal, Republic of Macedonia / FYROM, Senegal, (better)



My Interpretation and Opinions:

UN treaties signed relates weakly to GDP per capita, as no wealthy countries show a large rejection of the UN.

Because this ranking is almost entirely made up of tied blocks, I suspect (without actually checking the data) that the differences between each block are a very small number of signed treaties. This in turn would mean that signing one treaty makes a large difference in rank, as it shifts a country into being tied among the next better block.

New Zealand, tied in the third block, would experience a big leap in GCI rank if it ratified another UN treaty.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "wo45"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

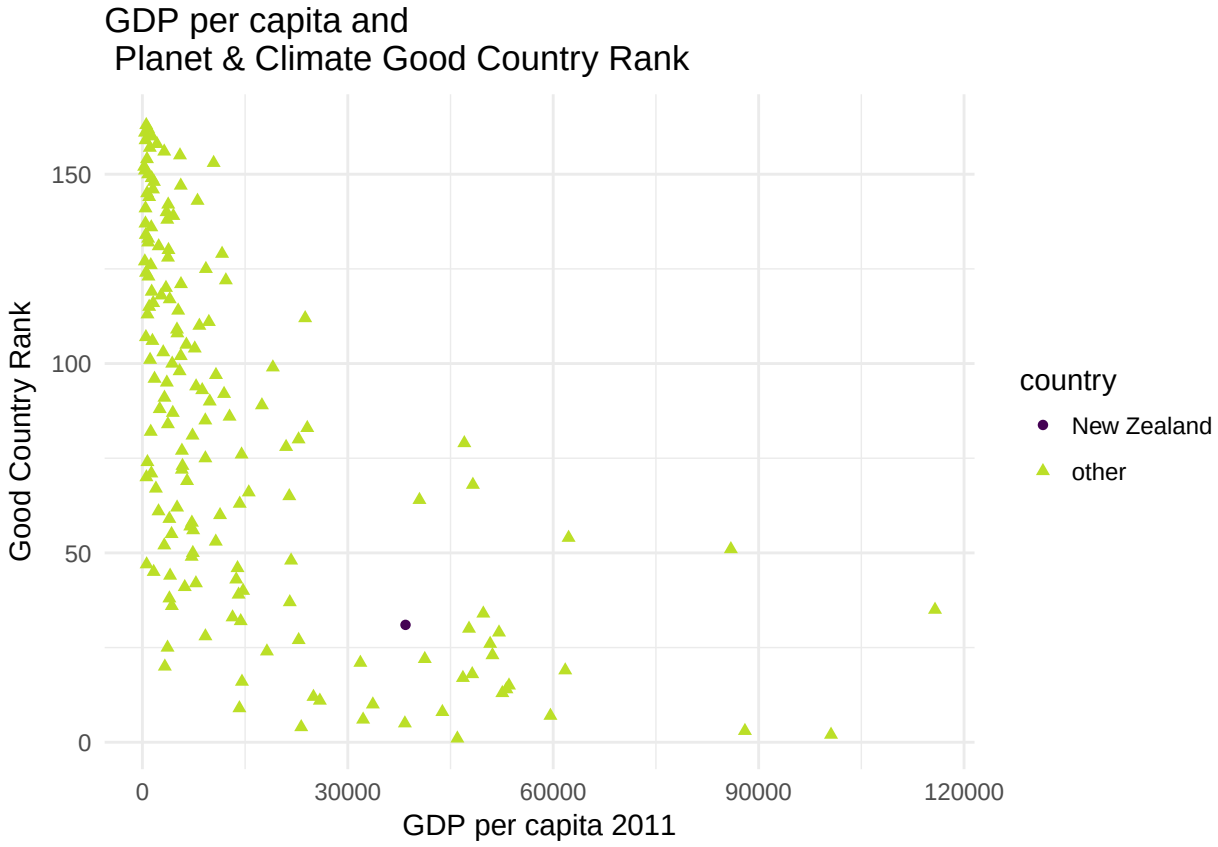
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 7

Planet & Climate - Aggregate Score

Neighbouring Countries:

(worse), Angola, Luxembourg, United States of America, Brazil, Lithuania, New Zealand, Belgium, Canada, Romania, Malta, Finland, (better)



My Interpretation and Opinions:

Planet an Climate, as is common among aggregate categories, is sensitive to GDP per Capita.

New Zealand has a good overall rank, but a poor rank for a country of our wealth.

```
library(feather)
library(dplyr)
```

```
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "f_PlanetClimate"
var_prettynom <- "Planet & Climate"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

7.1 Ecological footprint Planet & Climate

From Good Country Source Descriptions:

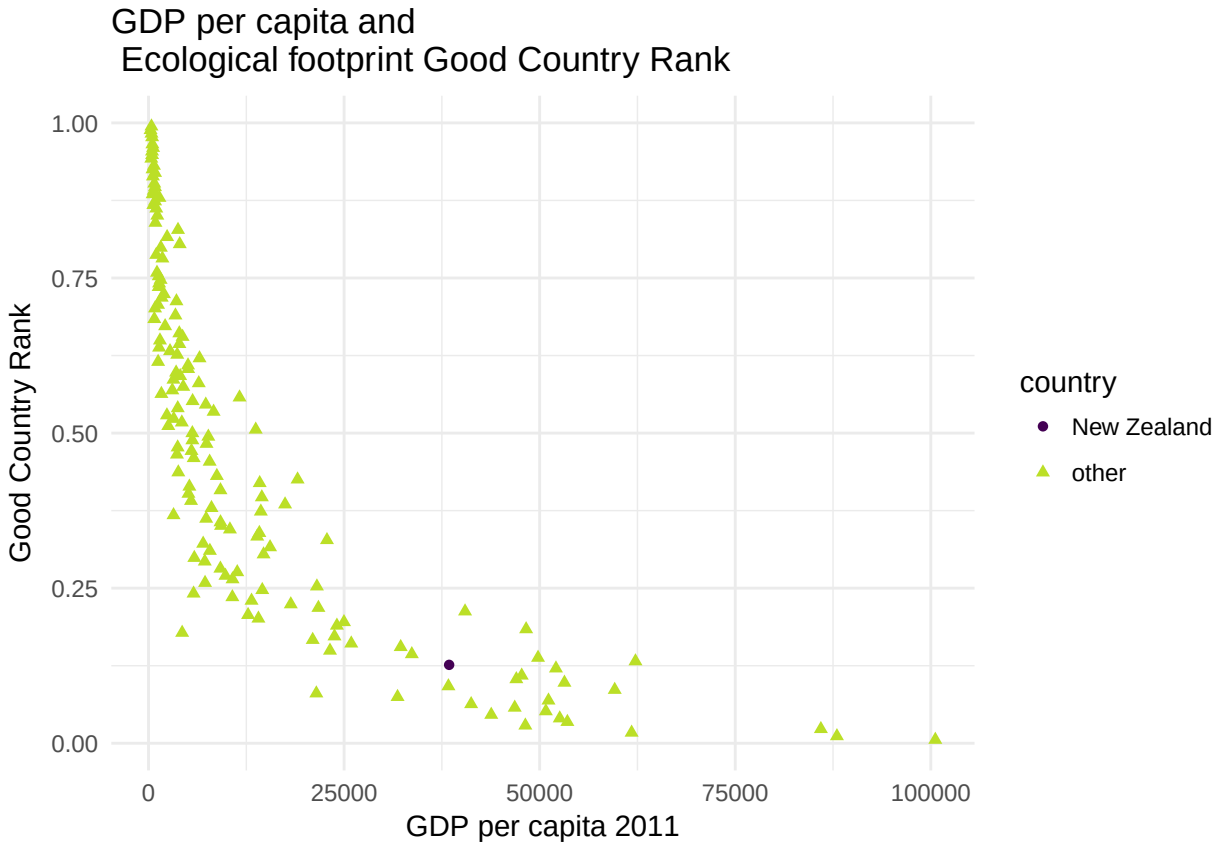
Description: National Footprint Accounts, Ecological footprint (according to Global Footprint Network) relative to the size of the economy (negative indicator).

Source: Data adapted from Global Footprint Network, 2015. National Footprint Accounts, 2014 Edition (2011 data). Available online at http://www.footprintnetwork.org.

Treatment: Total national footprint values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Cyprus, Portugal, Israel, United States of America, Australia, New Zealand, Canada, Belgium, Brunei Darussalam, Singapore, Italy, (better)



My Interpretation and Opinions:

Ecological Footprint (relative to GDP of country) is highly sensitive to GDP per capita, with this measure forming a pattern very similar to the overall index.

In this case I suspect that the Ecological footprint does not scale directly to the country's GDP so the normalisation is introducing a wealth dependency in the data.

New Zealand scores well overall (being a medium to high wealth country) however it does poorly in relation to other countries near it in wealth.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pc51"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

7.2 Reforestation since 1992 Planet & Climate

From Good Country Source Descriptions:

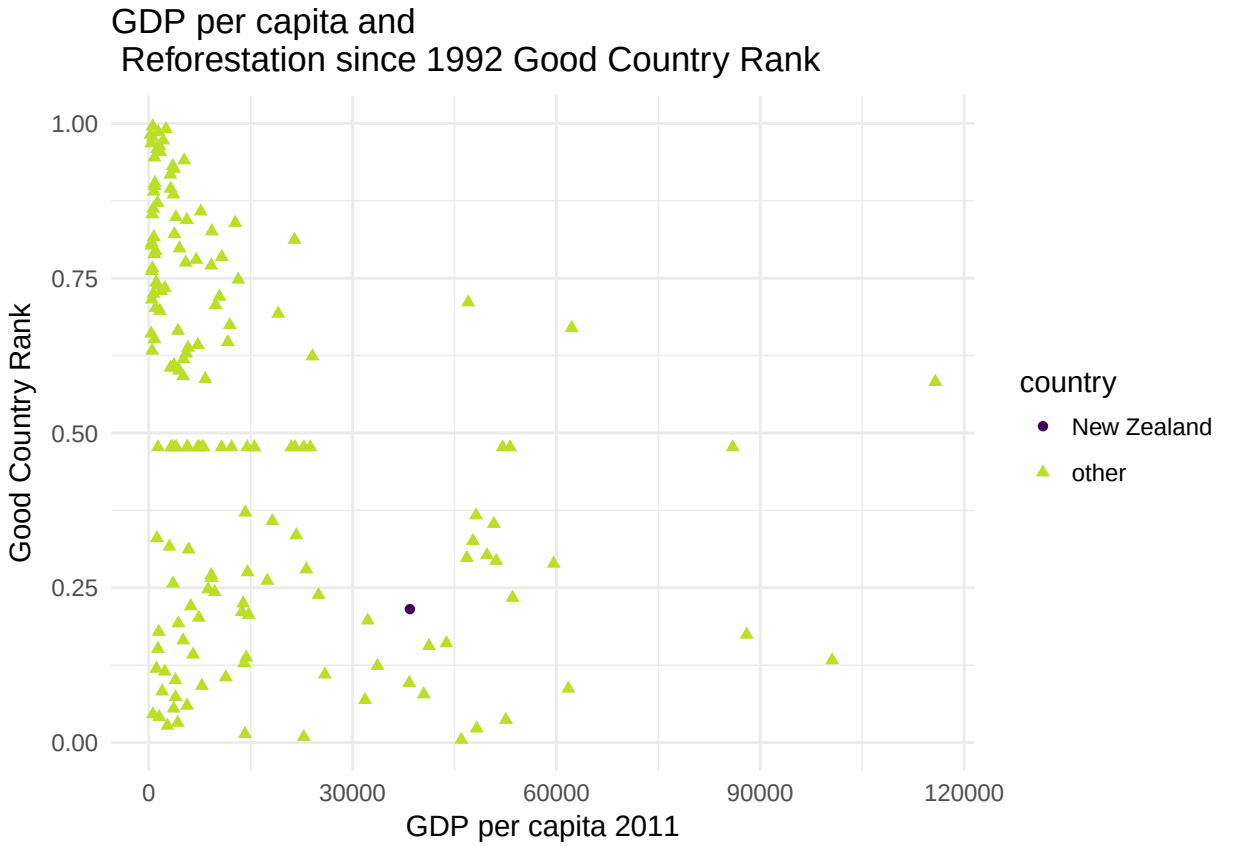
Description: Re-/De-forestation since 1992 (according to UNEP Environmental Data Explorer).

Source: Data adapted from UNEP (2015): The UNEP Environmental Data Explorer, as compiled from Food and Agriculture Organization of the United Nations (FAO) - FAOStat . United Nations Environment Programme. http://ede.grid.unep.ch (and divided by GDP according to World Bank data).

Treatment: The forest area in 2011 was compared to 1992 and % growth or decline values were ranked.

Neighbouring Countries:

(worse), Palau, Slovenia, Netherlands, Poland, Saint Vincent and the Grenadines, New Zealand, Latvia, Chile, Saint Lucia, Cyprus, Fiji, (better)



My Interpretation and Opinions:

The deforestation measure consists of well ranked countries that have reforested since 1992, countries whose forest levels have not changed, and countries that have deforested. It is mildly linked to GDP per capita as wealthy countries have almost all reforested.

New Zealand is a mid-range reforestation country. Given policies of the newly elected government, New Zealand should experience a dramatic improvement in its rating when it comes time to use 2020 data (in around 2026)

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pc52"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
```

```
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

7.3 Hazardous pesticides exports Planet & Climate

From Good Country Source Descriptions:

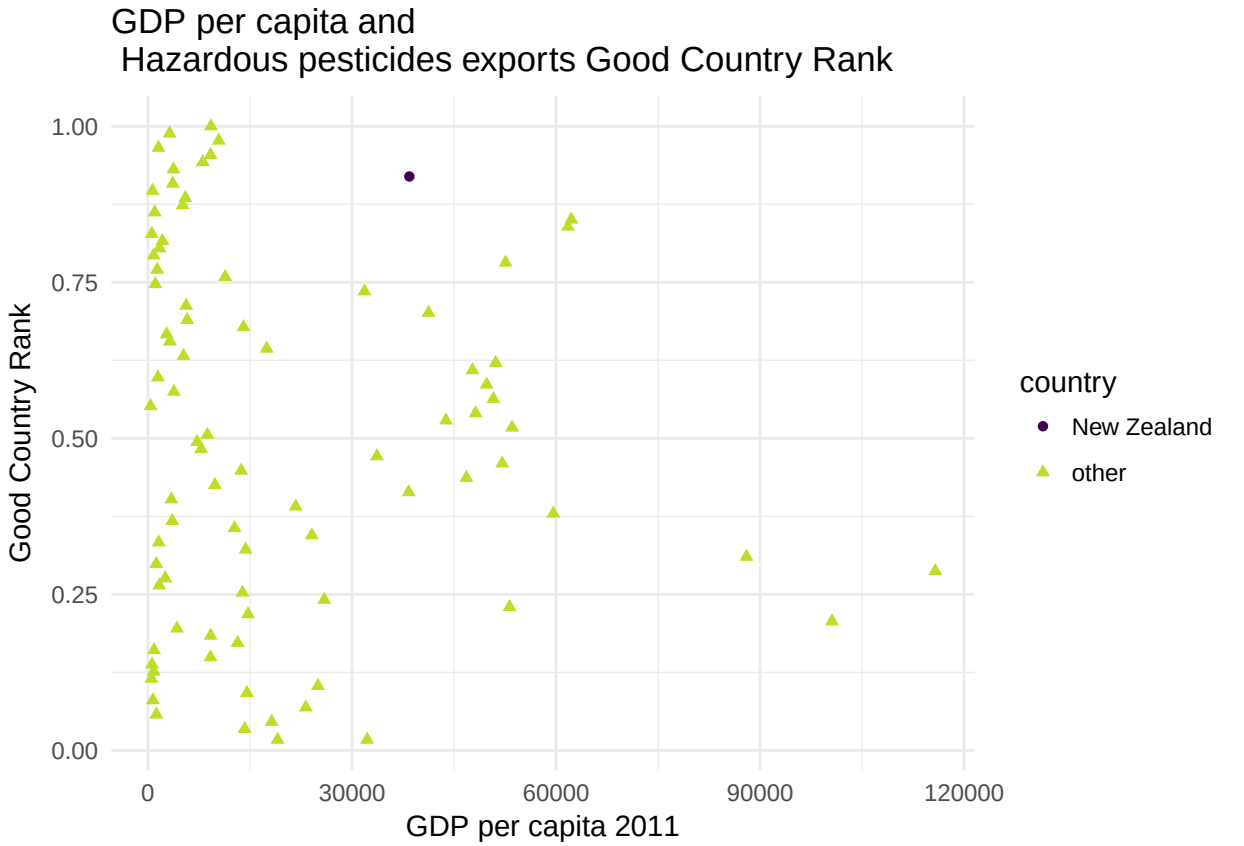
Description: Hazardous pesticides exports (according to UNEP Environmental Data Explorer) relative to the size of the economy (negative indicator).

Source: Data adapted from UNEP (2015): The UNEP Environmental Data Explorer, as compiled from Food and Agriculture Organization of the United Nations (FAO) - FAOStat . United Nations Environment Programme. http://ede.grid.unep.ch (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Malaysia, Viet Nam, Costa Rica, South Africa, El Salvador, New Zealand, Indonesia, Burkina Faso, Thailand, Jamaica, Kenya, (better)



My Interpretation and Opinions:

Hazardous Pesticide exports is sinsitive to GDP per capita, as the range of GCI ranks narrows as wealth increases.

New Zealand is the worst ranked wealthy country, and among the worst in the world. But living in an agricultural country with a fragile native environment and strong border controls stopping invasive species, most New Zealanders are going to question the idea producing presticides is immoral.

While there is clearerly vast room for improving in this category, most New Zealander's would feel it is more ethical to gaurd the local environment. So my opinion is while we could improve here in GCI rankings, the sacrifice of species required would not reflect the spirit of the GCI.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pc53"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

7.4 CO2 emissions Planet & Climate

From Good Country Source Descriptions:

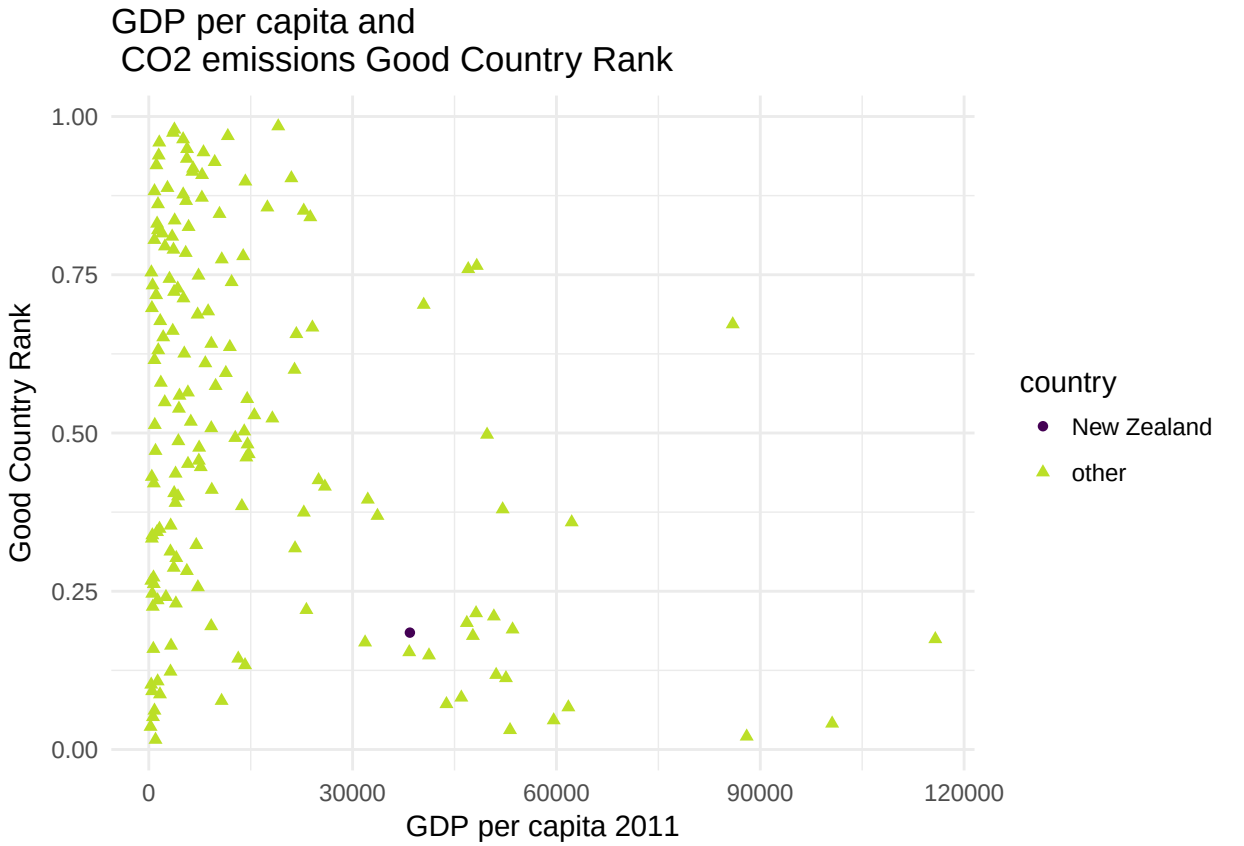
Description: CO2 emissions (according to World Bank) relative to the size of the economy (negative indicator).

Source: Data adapted from The World Bank: CO2 emissions (kt): Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States. World Development Indicators (and divided by GDP according to World Bank data).

Treatment: Values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Japan, Finland, Germany, Costa Rica, Netherlands, New Zealand, Belgium, Luxembourg, Spain, Vanuatu, Burkina Faso, (better)



My Interpretation and Opinions:

CO2 emissions relative (relative to size of economy) forms a very complicated relationship via what I suspect is a relationship between energy sources and wealth of country.

While New Zealand has a moderately good rank, it also has a very good rank for countries in its wealth range. This suggests there is not a lot of improvement New Zealand can easily do.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pc54"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
```

```
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

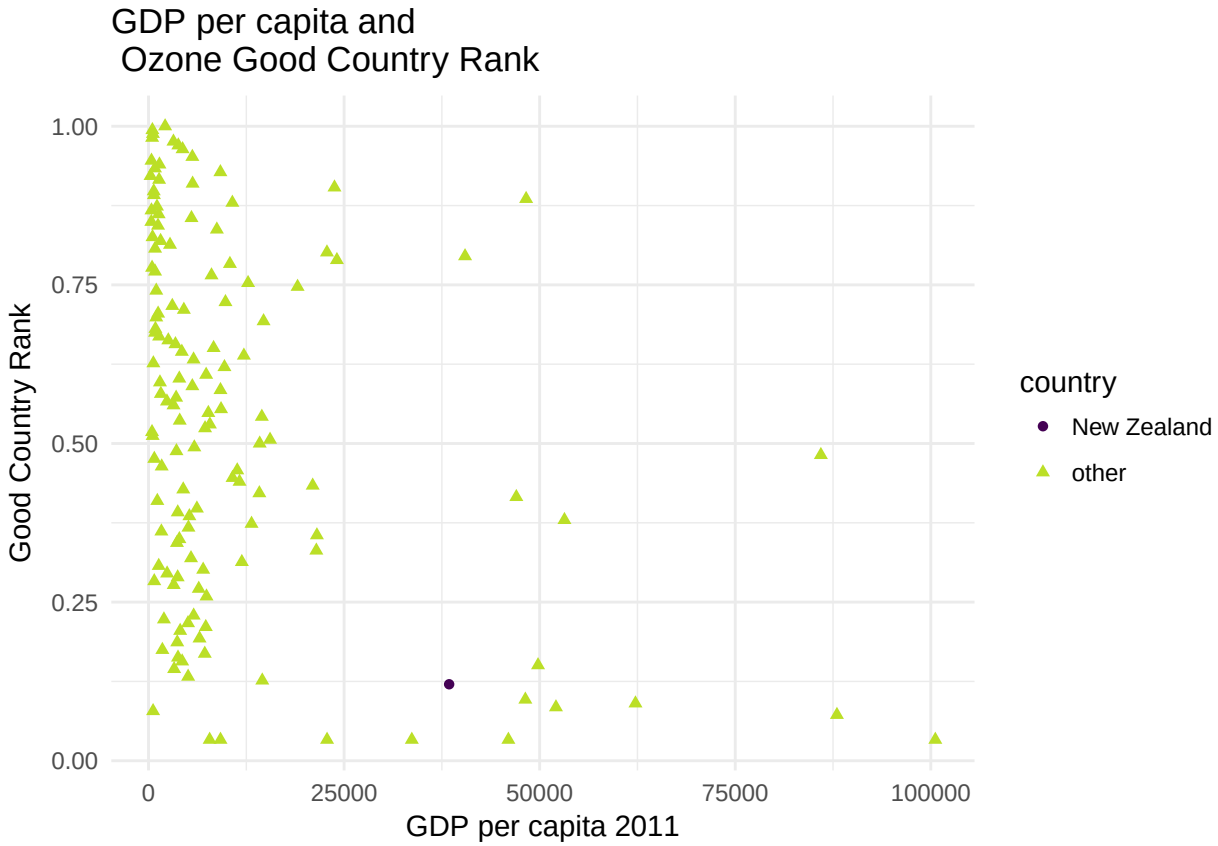
7.5 Ozone Planet & Climate

From Good Country Source Descriptions:

Description: Consumption of ozone-depleting substances - all (according to UNEP Environmental Data Explorer) relative to the size of the economy (negative indicator).

Source: Data adapted from UNEP (2015): The UNEP Environmental Data Explorer, as compiled from United Nations Envrionment Programme . United Nations Environment Programme. http://ede.grid.unep.ch (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.



My Interpretation and Opinions:

The relationship between consumption of ozone depleting substances (relative to the size of the economy) is sensitive to GDP per captia, as welathy countries dominate the best ranks.

New Zealand's rank is good overall but poor in relation to countries near it in wealth, suggesting there is definitely room for improvement in this category.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pc55"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
```

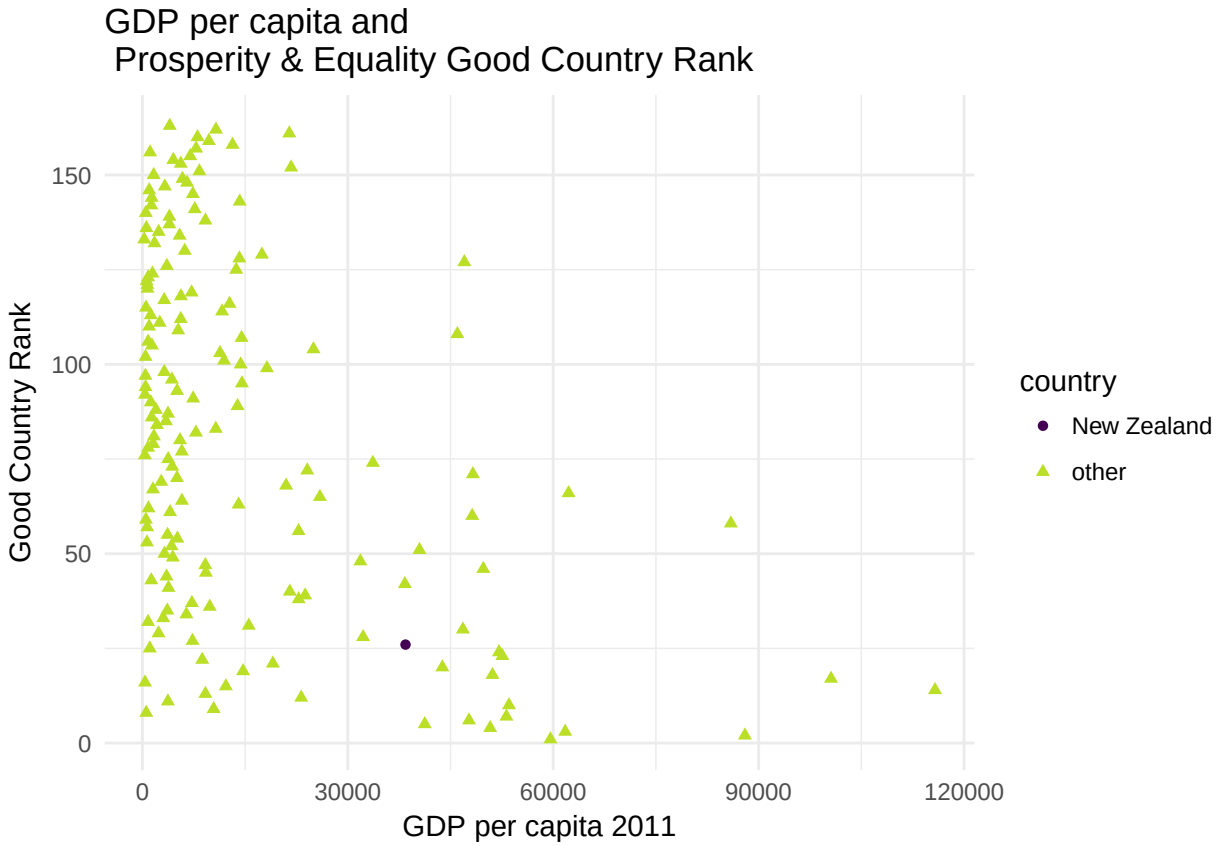
```
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 8

Prosperity & Equality - Aggregate Score

Neighbouring Countries:

(worse), Barbados, Germany, Philippines, Cyprus, Montenegro, New Zealand, Senegal, Canada, Ireland, Lebanon, Trinidad and Tobago, (better)



My Interpretation and Opinions:

The Prosperity and Equality aggregate is mildly related to GDP per capita, as wealthier countries are concentrated in the best half of ranks. Given the category, I was expecting the relationship to be stronger.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "g_ProsperityEquality"
var_prettynom <- "Prosperity & Equality"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

8.1 Open trading Prosperity & Equality

From Good Country Source Descriptions:

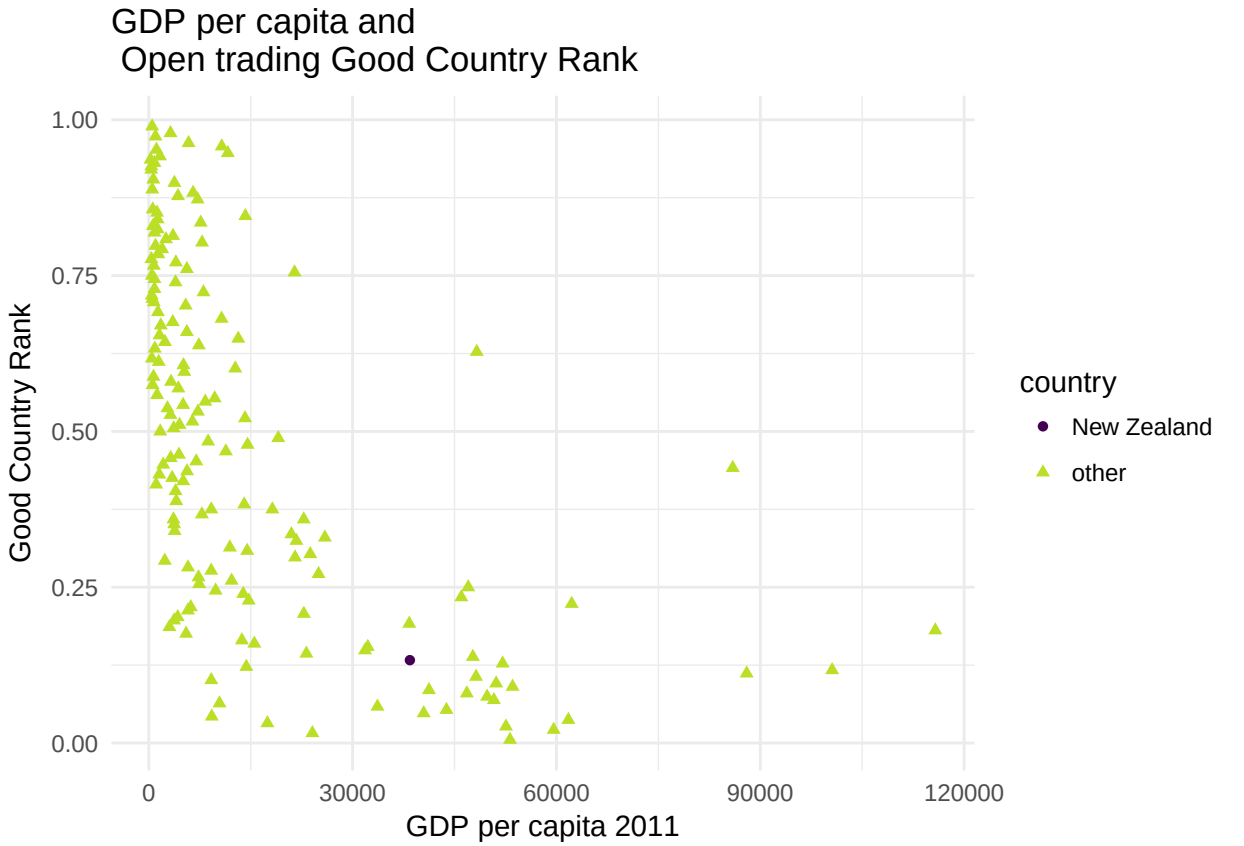
Description: Trading across borders (open trading performance compared to best practice; i.e. IFC distance to frontier)

Source: Data adapted from The World Bank: Distance to Frontier Score: Doing Business Indicators, http://www.doingbusiness.org/data/distance-to-frontier.

Treatment: Data sourced in its original form. Scores were ranked.

Neighbouring Countries:

(worse), Barbados, Cyprus, Spain, Portugal, Belgium, New Zealand, Canada, Lithuania, Norway, Switzerland, Japan, (better)



My Interpretation and Opinions:

The Open trading category is sensitive to GDP per capita, showing a curve similar to many other measures.

New Zealand is reasonable overall and in the mid range of countries near it in wealth.

Which just seems wrong.

Any New Zealander aware of national measurements knows that everyone who rates the openness of the economy has rated New Zealand in the best three countries for every year in the past few decades. Indeed, the overall summary figure of the original source rates New Zealand in the top three for every year.

The cause of the measure is that the specific attribute being used is the "Trading Across Borders" score, which is a measure made up of the paperwork, time, and cost, of shipping goods by sea. As New Zealand is at the fringes of the world's shipping networks shipping is expensive and cargo is aggregated to ship (making it slower to get on a ship) compared to locations more central to the world's transort networks.

With two of the three subcomponents of the measure being based on geographic location, there is nothing New Zealand can do to improve its rank in this area.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pe61"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

8.2 UN volunteers abroad Prosperity & Equality

From Good Country Source Descriptions:

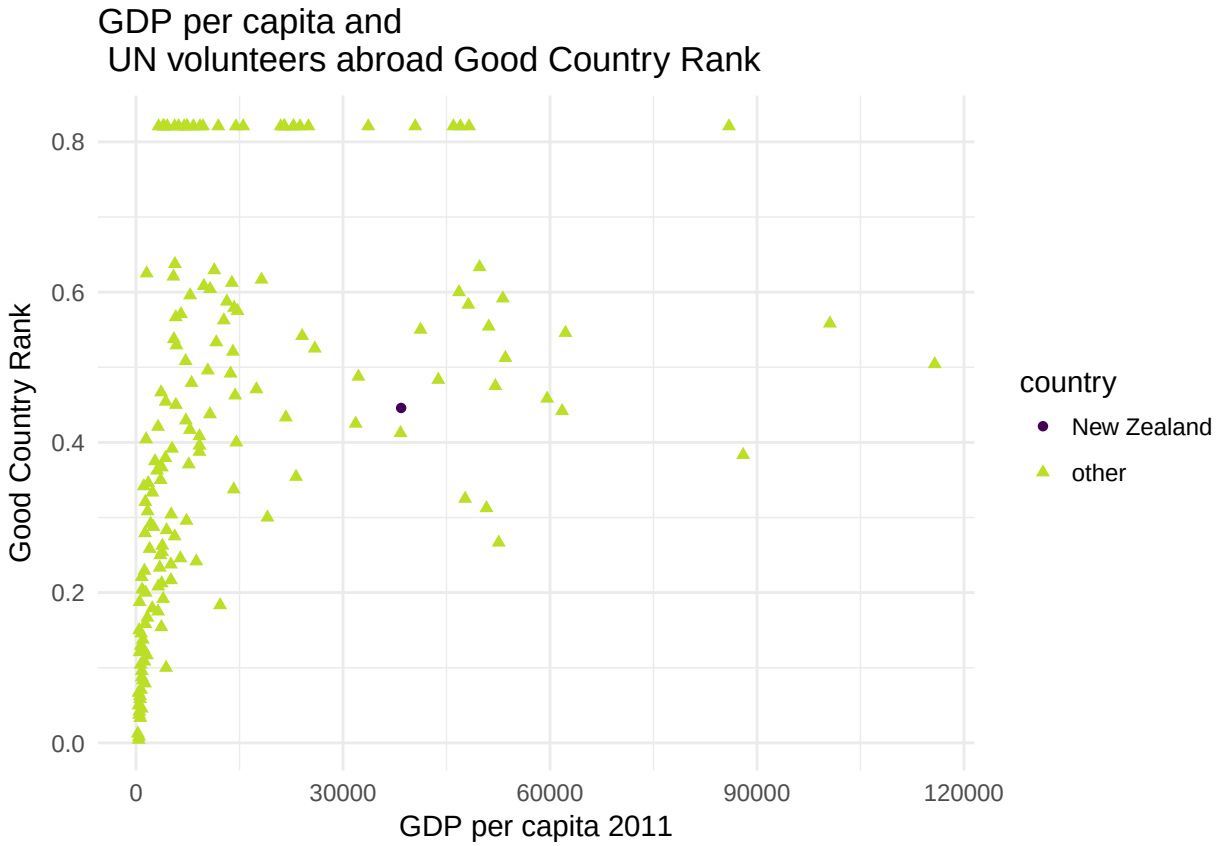
Description: Number of aid workers and volunteers sent overseas (according to UNV) relative to the size of the economy.

Source: Data adapted from UNV (2011), Annual report, http://www.unv.org/en/news-resources/resources/annual-report-2011.html (and divided by GDP according to World Bank data).

Treatment: Countries not listed were assumed not to have contributed (i.e. missing value = 0). Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Indonesia, Lithuania, Sweden, Angola, Peru, New Zealand, Denmark, Gabon, Czech Republic, Colombia, Spain, (better)



My Interpretation and Opinions:

The number of aid workers and volunteers (relative to the size of the economy) is senstive to GDP per capita, but in the most unusual way seen among these indicators.

The distirbution narrows then widens again as the wealth of the economy increases. I speculate that this relates to another factor, such as management vs worker structures in aid projects relative to the wealth of participants.

New Zealand has a poor overall rank, but a good rank for its wealth, suggesting it would be difficult to improve the rank due to confounding factors.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pe62"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

8.3 Fairtrade market size Prosperity & Equality

From Good Country Source Descriptions:

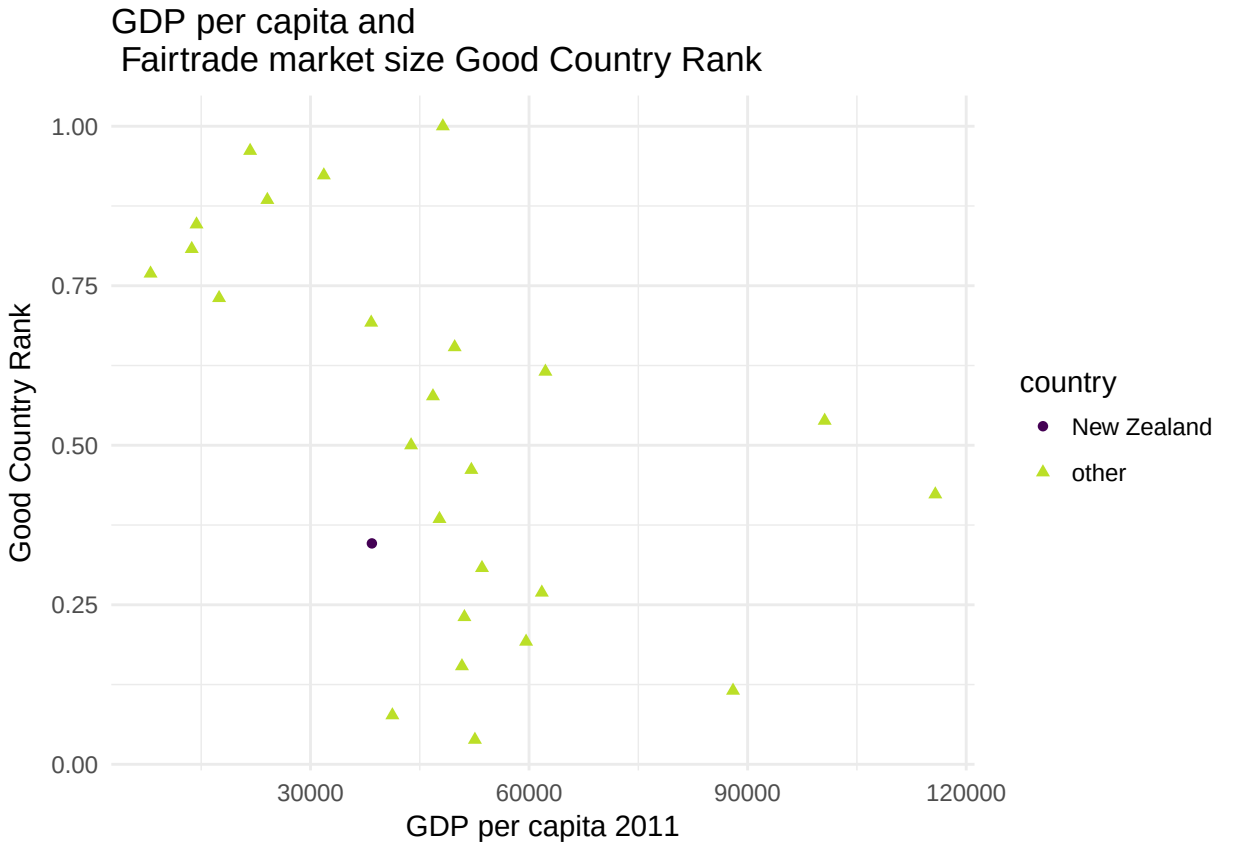
Description: Fairtrade market size (according to Fairtrade International) relative to the size of the economy.

Source: Data adapted from Fairtrade International, Annual Review 2011-12, http://www.fairtrade.net/annual-reports.html (and divided by GDP according to World Bank data).

Treatment: Values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Norway, France, Canada, Luxembourg, Belgium, New Zealand, Netherlands, Denmark, Austria, Sweden, Finland, (better)



My Interpretation and Opinions:

The Fairtrade market size indicator is sensitive to GDP per capita in both an obvious and non-obvious way.

Mid range to wealthy countries dominate the best rankings, marking a clear division with lower wealth countries.

Less obviously, but just as important, only a small number of countries have a fair trade sector reported, and the presence of countries in the data is heavily weighted to wealthier countries. This creates a non response bias, giving the scores a very different rank to what they would have if there was a more complete data set.

New Zealand is in the top 10, but this is not a particularly good achievement in relation to the limited set of data present. The easiest way of improving New Zealand's rank in this area would be to include more countries.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pe63"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
```

```
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

8.4 FDI outflows Prosperity & Equality

From Good Country Source Descriptions:

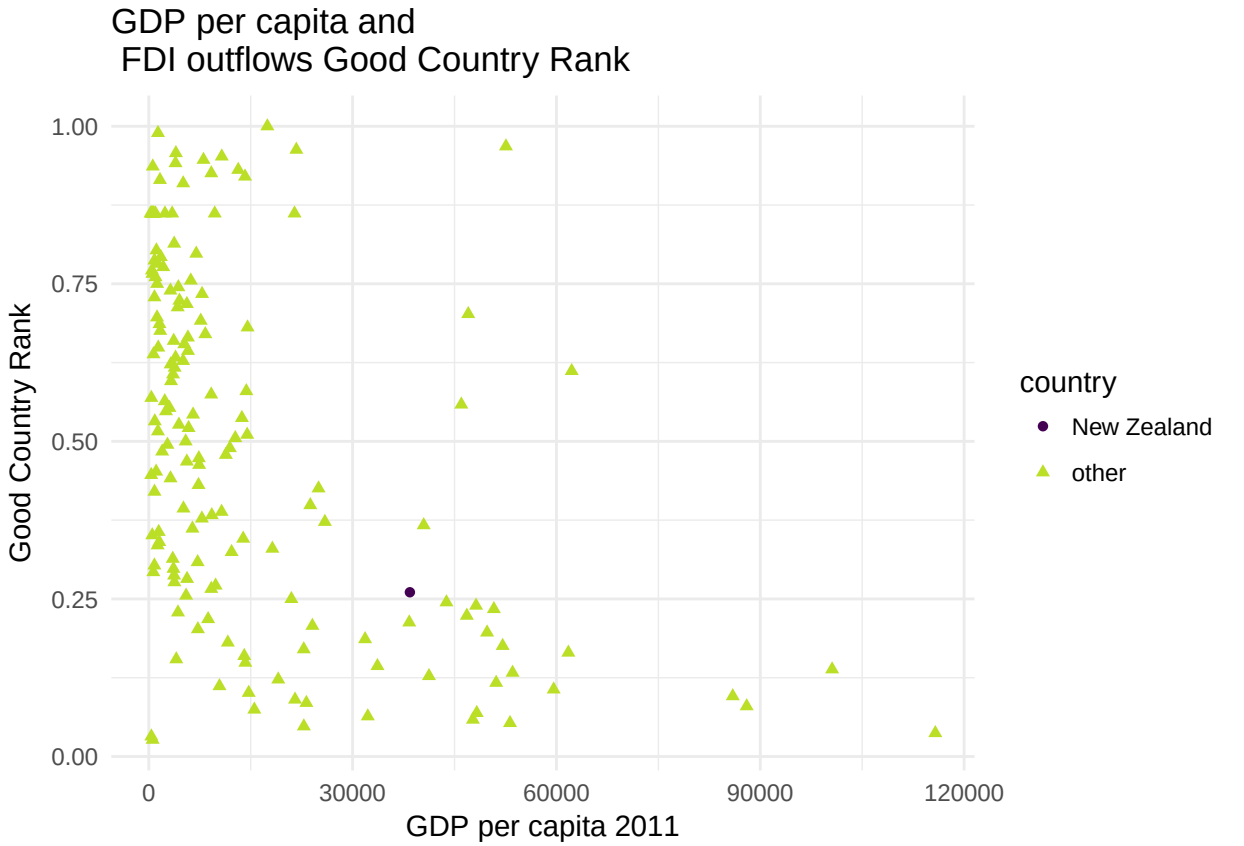
Description: FDI outflow (according to UNCTAD) relative to the size of the economy.

Source: Data adapted from UNCTADstat.

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then ranked.

Neighbouring Countries:

(worse), Georgia, China, Mongolia, Mexico, Mauritius, New Zealand, Thailand, Oman, France, Japan, Finland, (better)



My Interpretation and Opinions:

FDI outflow is the investment of people in the economy in other economies. Relative to the the size of the economy this measure is sensitive to GDP per capita, as wealthy countries dominate in investing in other economies.

New Zealand had a good rank overall (being a mid-high GDP per capita country), but a low rank for the wealth of the people. While this suggests room for improvement, I think it might be interesting to see if this is being influenced by "tyrany of distance" effects seen in other trade measures that NEw Zealand cannot do anything about.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pe64"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

8.5 Development assistance Prosperity & Equality

From Good Country Source Descriptions:

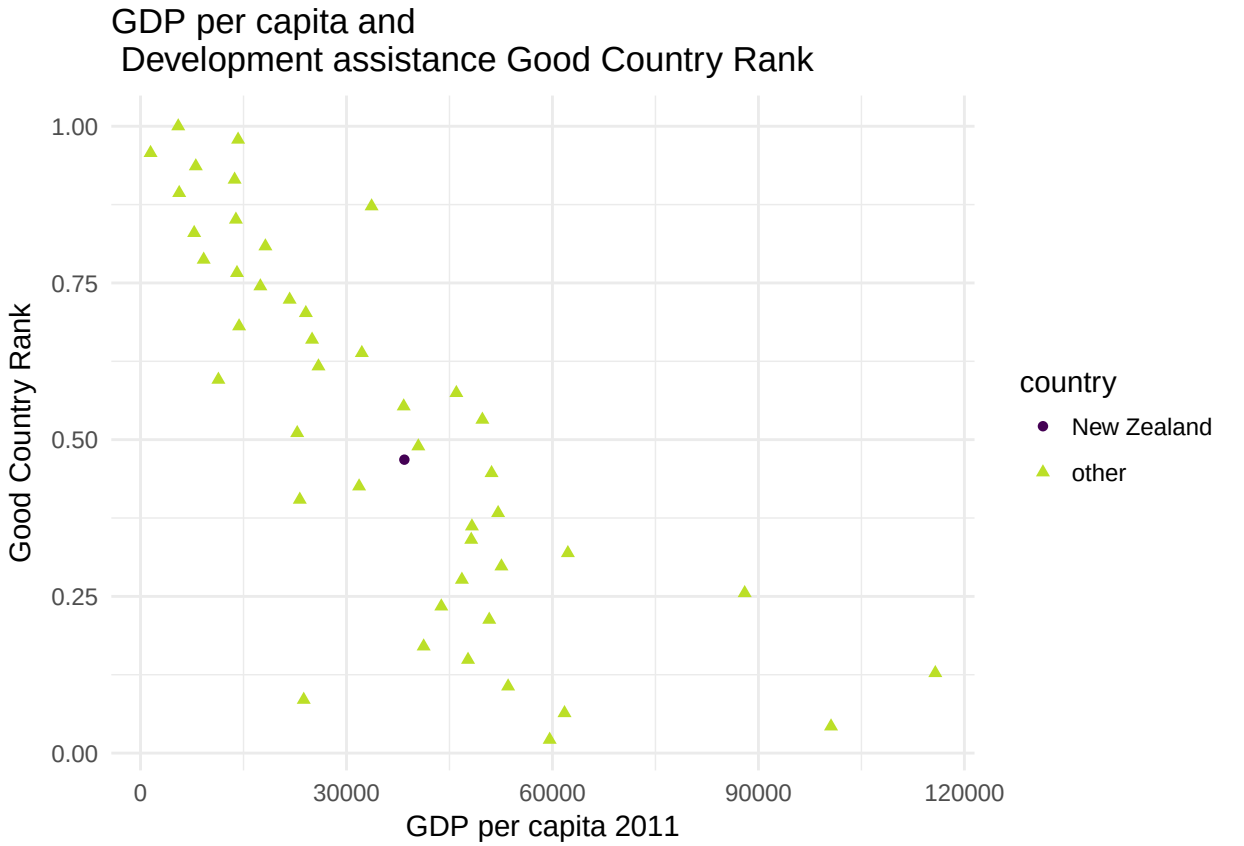
Description: Development cooperation contributions (aid according to Development Initiatives) relative to the size of the economy.

Source: Data adapted from Development Initiatives, 'Investments to End Poverty', 2013 http://devinit.org/report/investments-to-end-poverty/ (and divided by GDP according to World Bank data).

Treatment: Values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Iceland, Italy, United States of America, Malta, United Arab Emirates, New Zealand, Austria, Spain, Portugal, Canada, Kuwait, (better)



My Interpretation and Opinions:

Development assistance (relative to the size of economy) is senstive to GDP per capita in an extremly linear way. However, this measure also suffers from a very limited data set with potential selection bias in relation to wealth.

New Zealand is completely average within the countries that are listed. But because the ranking is sensitive the number of measures, again what would make a lot of difference to New Zealands rank is including more countries.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "pe65"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
```

```
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

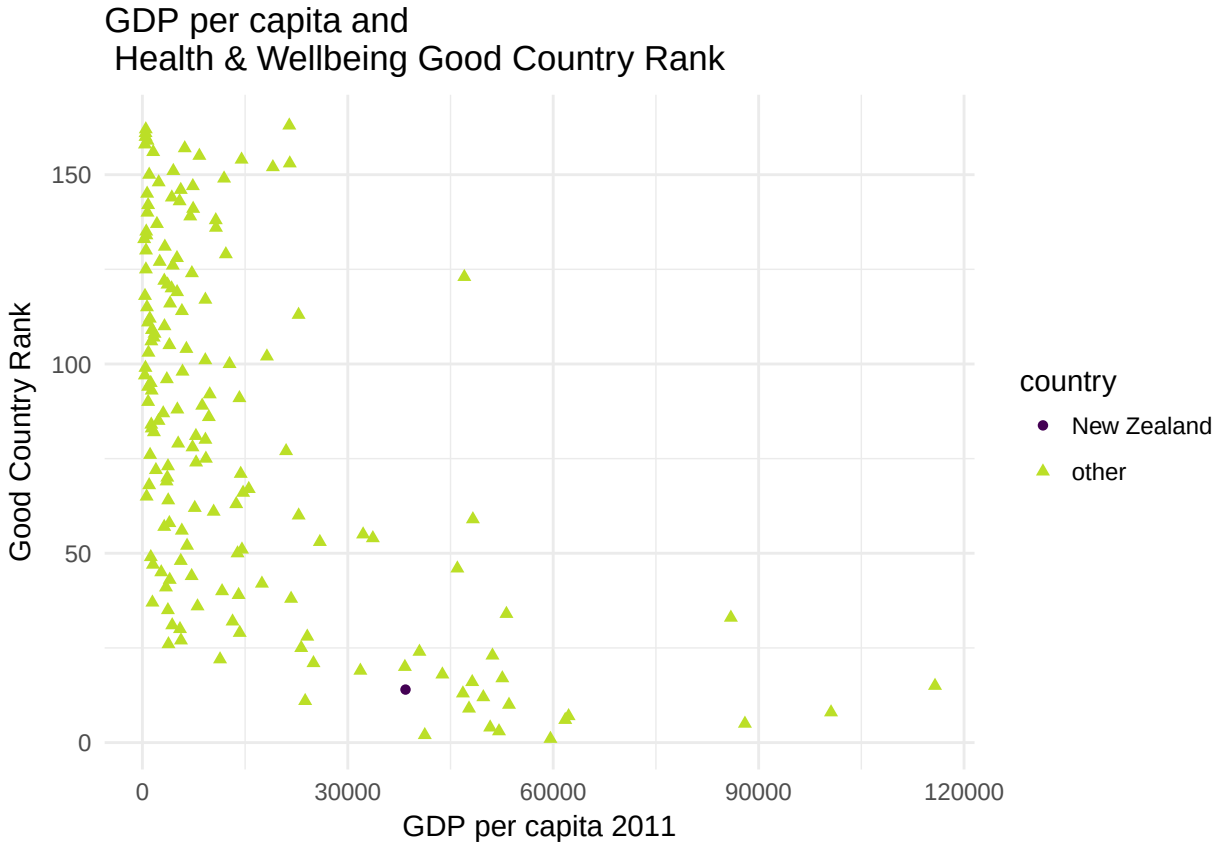
```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 9

Health & Wellbeing - Aggregate Score

Neighbouring Countries:

(worse), Spain, France, Ireland, Japan, Luxembourg, New Zealand, Germany, United States of America, Saudi Arabia, Netherlands, Belgium, (better)



My Interpretation and Opinions:

The Health and Wellbeing aggregate category ranking is related to DP per capita in a similar way to other aggregates.

Much like some of the early aggregates, I personally think number of medical school graduates per capita is a figure worth exploring, as with a general world wide shortage of doctors it might be a use proxy for

contempory contributions to health.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "h_HealthWellbeing"
var_prettynom <- "Health & Wellbeing"
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

9.1 Food aid Health & Wellbeing

From Good Country Source Descriptions:

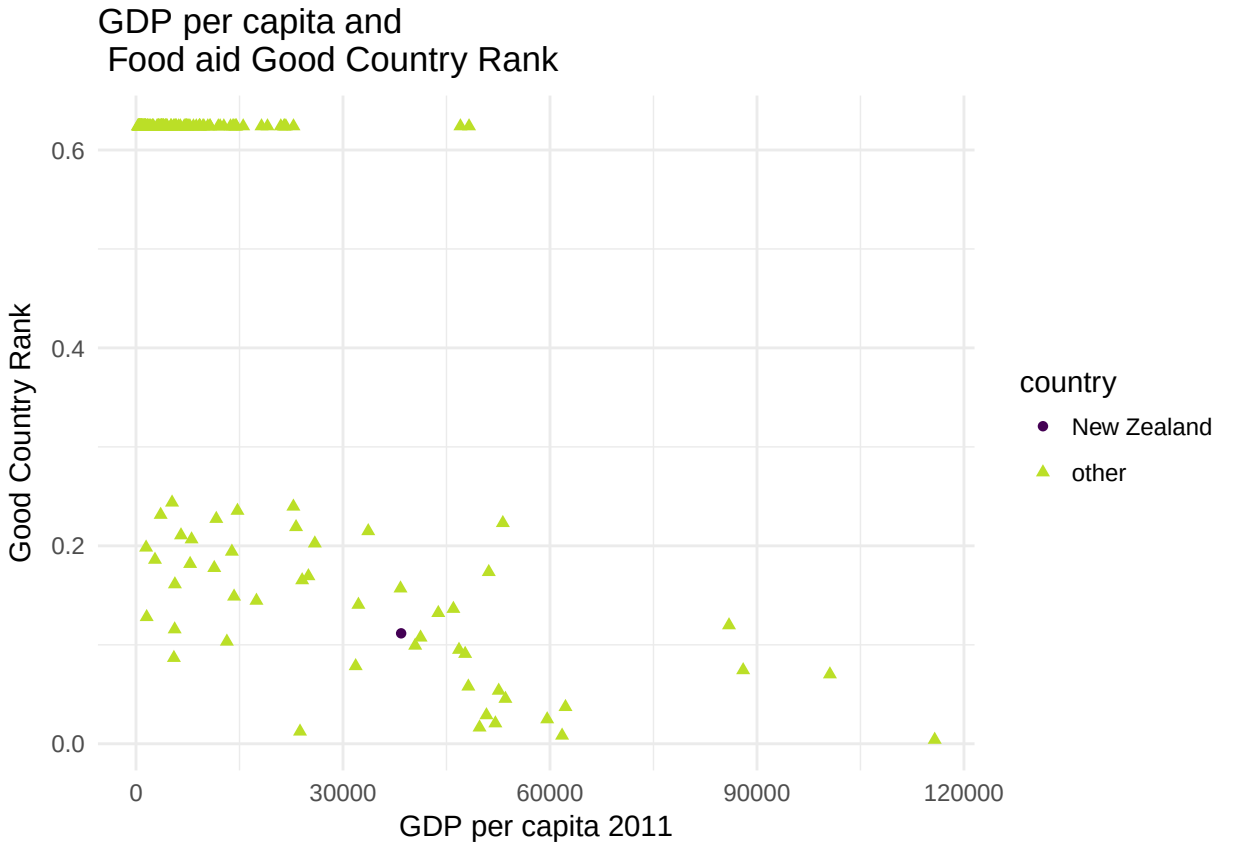
Description: Amount of wheat tonnes equivalent food aid shipments (according to WFP) relative to the size of the economy.

Source: Data adapted from World Food Programme's World Food Information System, http://www.wfp.org/fais/ (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Otherwise, countries not listed were assumed not to have contributed (i.e. missing value = 0). Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Iceland, France, Viet Nam, Qatar, Namibia, New Zealand, United Kingdom, Brazil, United Arab Emirates, Germany, Belgium, (better)



My Interpretation and Opinions:

Wheat equivalent tonnes of food aid shipments (relative to the size of the economy) is related to GDP per capita in a couple of ways. Those who contribute no food aid are dominated by poorer countries, and of countries that countribute food aid, wealthy countries have the highest ranks.

New Zealand is in a good postion overall, and an average postion for its wealth. In theory New Zealand could improve its rank. However as the tyrany of distance has affected other shipping related indicators, this one should be checked for spatial effects.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "hw71"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
```

```
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

9.2 Pharmaceutical exports Health & Wellbeing

From Good Country Source Descriptions:

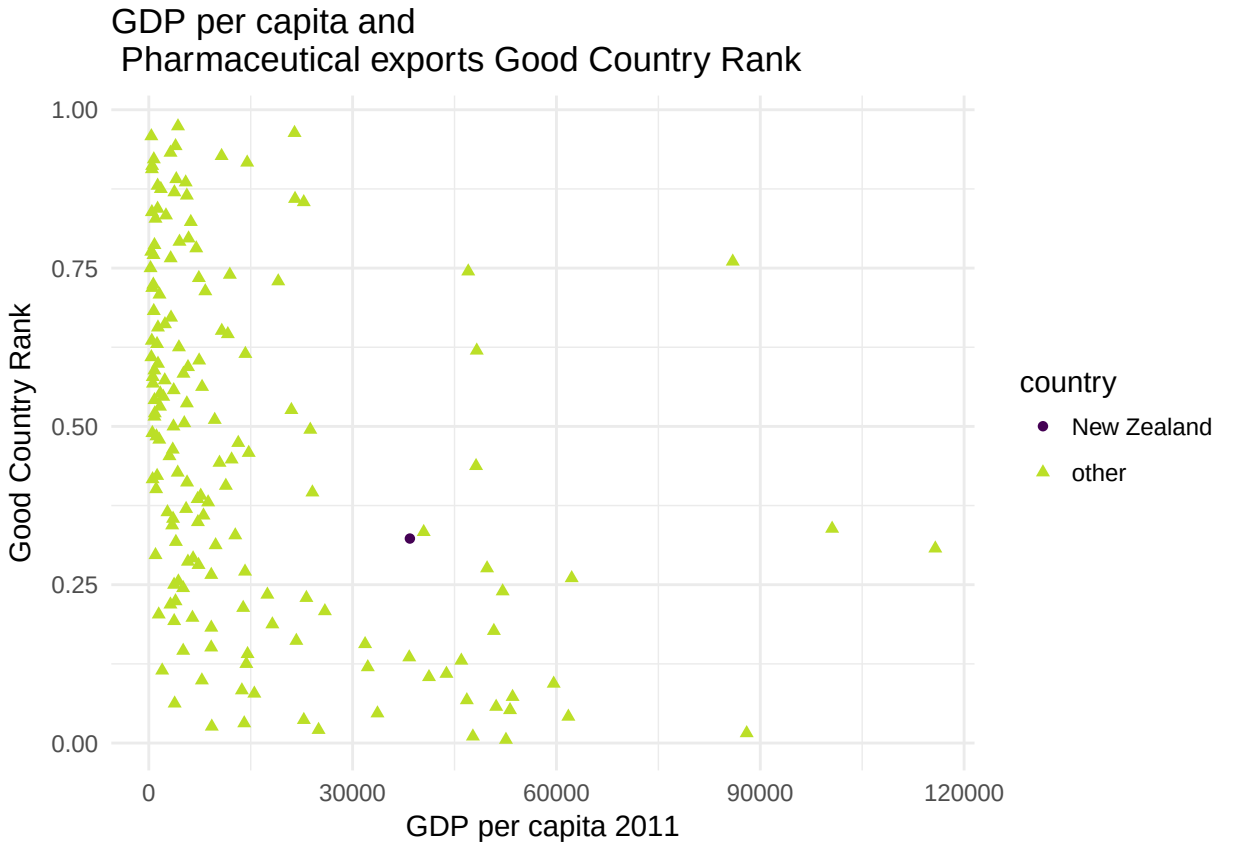
Description: Exports of pharmaceuticals (according to ITC) relative to the size of the economy.

Source: Data adapted from Trade Map, International Trade Centre, www.intracen.org/marketanalysis (and divided by GDP according to World Bank data).

Treatment: In case 2011 data for a particular country was missing, but data was available for other years, missing data was imputed based on time series analysis using SPSS TREND function. Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Colombia, Guyana, Norway, United Arab Emirates, Argentina, New Zealand, Paraguay, Mexico, Luxembourg, Kenya, Belarus, (better)



My Interpretation and Opinions:

Pharmaceutical Exports (relative to the size of the economy) does match weakly to GDP per capita, but as a minima rather than a maxima. In this repsect New Zealand has a moderately good rank, but a very bad rank for its GDP per capita.

This suggests New Zealand could improve its ranking, but pharmaceutical exports are not something suited to delays in shipping. So as with other export related measures, it needs to be checked if the distance exports needs to travel affects the ability to do well with this measure.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "hw72"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
```

```
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

9.3 Voluntary excess donations to the WHO Health & Wellbeing

From Good Country Source Descriptions:

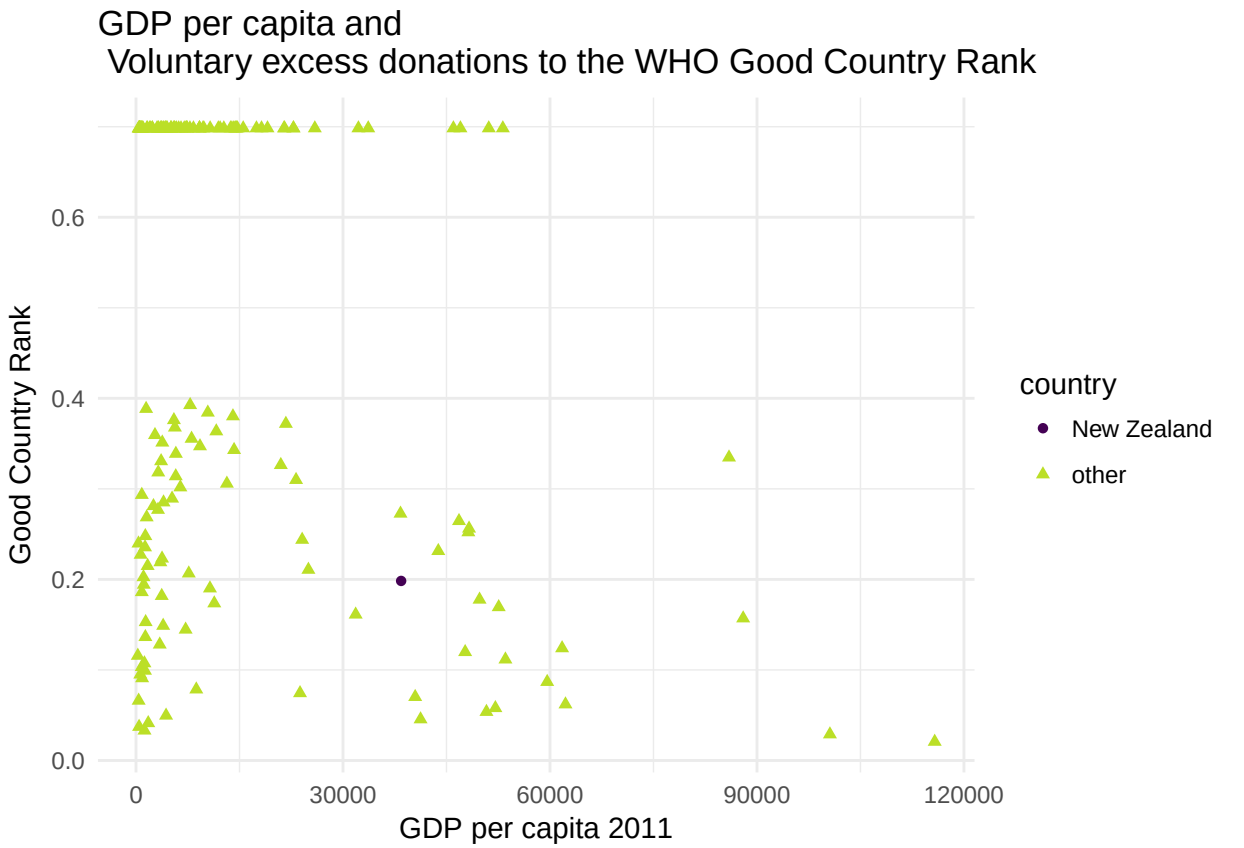
Description: Voluntary excess contributions to World Health Organisation relative to the size of the economy.

Source: Data adapted from World Health Organisation's Institutional Repository for Information Sharing, http://apps.who.int/iris/ (and divided by GDP according to World Bank data).

Treatment: Countries not listed were assumed not to have contributed (i.e. missing value = 0). Values were then divided by GDP and ranked.

Neighbouring Countries:

(worse), Armenia, Nicaragua, Slovenia, Botswana, Senegal, New Zealand, Kyrgyzstan, Gabon, Zimbabwe, Georgia, United States of America, (better)



My Interpretation and Opinions:

With voluntary excess donations to the WHO, either a country makes donations or it doesn't. There is a relationship to GDP per capita, but it is a complex non-linear one. New Zealand has a good overall rank but a poor rank for the wealth of the country. This suggests there is definite scope for improving NEw Zealand's rank, essentally by giving money to the WHO.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "hw73"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
```

```
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

9.4 Humanitarian aid donations Health & Wellbeing

From Good Country Source Descriptions:

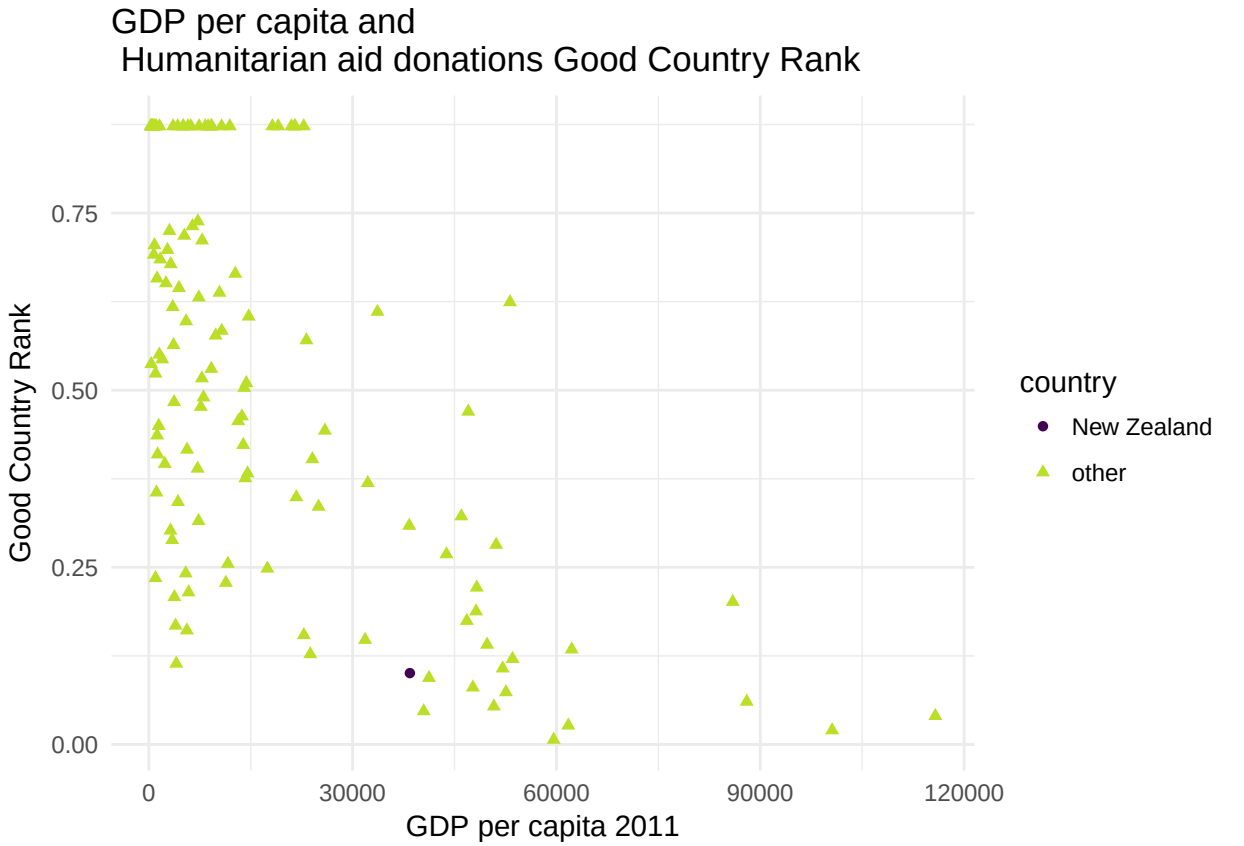
Description: Humanitarian aid contributions (according to UNOCHA) relative to the size of the economy.

Source: Data adapted from UNOCHA, Financial Tracking Service (FTS), http://fts.unocha.org (and divided by GDP according to World Bank data).

Treatment: Values were divided by GDP and ranked.

Neighbouring Countries:

(worse), Australia, Saudi Arabia, Netherlands, Tonga, Canada, New Zealand, United Kingdom, Belgium, Ireland, Switzerland, Finland, (better)



My Interpretation and Opinions:

Humanitarian Aid (relative to the size of the economy) is related to the GDP per capita. As normal wealthy countries are in all the best ranks.

New Zealand has a very good rank overall, and a very good rank for its wealth. So it is liekly difficult to improve much more given the position we are currently at.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "hw74"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
```

```
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9)
    ggtitle(axtitle)
```

9.5 International Health Regulations Compliance Health & Well-being

From Good Country Source Descriptions:

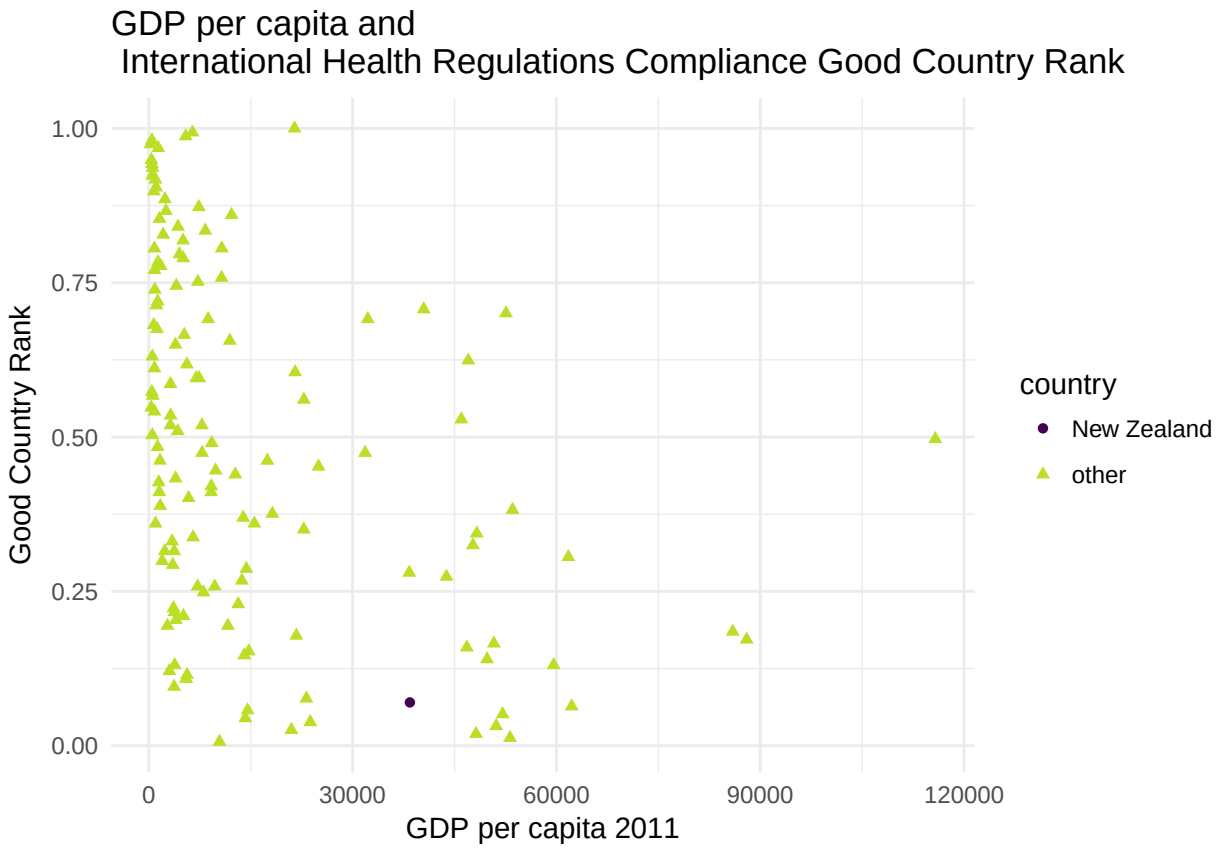
Description: International Health Regulations Compliance (according to WHO).

Source: Data compiled from World Health Organisation's Global Health Observatory data repository, http://apps.who.int/gho/data/node.main.IHR00ALLN?lang=en.

Treatment: Average compliance on all health regulation capacities was calculated and ranked.

Neighbouring Countries:

(worse), Morocco, China, Thailand, Georgia, Portugal, New Zealand, Australia, Croatia, Canada, Russian Federation, Saudi Arabia, (better)



My Interpretation and Opinions:

International Health Regulations Compliance is mildly senstive to GDP per capita. Wealthy countries are not in poorest compliance, and poor countries are not represented in the best ranks.

New Zealand is at a very good rank overall and a very good rank for its wealth. So there is not a lot of easy room for improvement.

```
library(feather)
library(dplyr)
library(tidyr)
library(knitr)
library(ggplot2)
library(viridis)
gci11 <- read_feather("processed_data/gci11.feather")
metagci11 <- read_feather("processed_data/gci11meta.feather")
gdpcap11 <- read_feather("processed_data/gdpcap11.feather")
```

```
var_code <- "hw75"
var_meta <- metagci11[metagci11$code == var_code,]
var_prettynom <- var_meta[,2]
var_sides <- 5
var_cciso <- "NZL"
var_highlight <- "New Zealand"
```

```
nznear <- gci11[,c("Country.Name", "isoCode", var_code)]
names(nznear) <- c("Country", "isoCode", "Rank")
nznear <- nznear %>% filter(Rank != 0) %>% arrange(desc(Rank))
nzloc <- which(nznear$isoCode == var_cciso)
```

```
above <- ifelse(nzloc - var_sides < 1, 1, nzloc - var_sides )
below <- ifelse(nzloc + var_sides > nrow(nznear), nrow(nznear), nzloc + var_sides )
neighbours <- paste(c("(worse)", nznear$Country[above:below], "(better)"),collapse=", ")
```

```
  gci <- gci11[,c("isoCode",var_code)]
  names(gci) <- c("isoCode","gci_rank")
  axtitle <- paste("GDP per capita and\n", trimws(var_prettynom), "Good Country Rank")
  gci %>%
    inner_join(gdpcap11, by=c("isoCode" = "Country.Code")) %>%
    filter(!is.na(X2011) & gci_rank != 0) %>%
    mutate(country = ifelse(isoCode == var_cciso, var_highlight, "other")) %>%
    ggplot(aes(x=X2011, y=gci_rank, colour=country, shape=country)) + geom_point() + xlab("GDP per capi
    ylab("Good Country Rank") + theme_minimal() + scale_color_viridis(discrete=TRUE, begin=0, end=0.9) +
    ggtitle(axtitle)
```

Chapter 10

R information and citations

This analysis used R 3.3.2

R Core Team (2016). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

and the packages:

readxl

To read in excel files

Hadley Wickham and Jennifer Bryan (2017). readxl: Read Excel Files. R package version 1.0.0. https://CRAN.R-project.org/package=readxl

jsonlite

To work with JSON data from the Good Country Index website

Jeroen Ooms (2014). The jsonlite Package: A Practical and Consistent Mapping Between JSON Data and R Objects. arXiv:1403.2805 [stat.CO] URL https://arxiv.org/abs/1403.2805.

dplyr

To manipulate data

Hadley Wickham, Romain Francois, Lionel Henry and Kirill Müller (2017). dplyr: A Grammar of Data Manipulation. R package version 0.7.4. https://CRAN.R-project.org/package=dplyr

tidyr

To improve the arrangement of data

Hadley Wickham (2017). tidyr: Easily Tidy Data with 'spread()' and 'gather()' Functions. R package version 0.6.3. https://CRAN.R-project.org/package=tidyr

countrycode

To check country identification codes:

Vincent Arel-Bundock (2017). countrycode: Convert Country Names and Country Codes. R package version 0.19. https://CRAN.R-project.org/package=countrycode

rvest

To gather data from web pages

Hadley Wickham (2016). rvest: Easily Harvest (Scrape) Web Pages. R package version 0.3.2. https://CRAN.R-project.org/package=rvest

feather

To create intermediate files

Hadley Wickham (2016). feather: R Bindings to the Feather 'API'. R package version 0.3.1. https://CRAN.R-project.org/package=feather

knitr

To create finished reports

Yihui Xie (2017). knitr: A General-Purpose Package for Dynamic Report Generation in R. R package version 1.16.

ggplot2

To make plots of the data

H. Wickham. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York, 2009.

viridis

To automatically produce a nice colour scheme for the plots

Simon Garnier (2016). viridis: Default Color Maps from 'matplotlib'. R package version 0.3.4. https://CRAN.R-project.org/package=viridis

bookdown

To produce the finished website and pdf

Yihui Xie (2017). bookdown: Authoring Books and Technical Documents with R Markdown. Chapman and Hall/CRC. ISBN 978-1138700109