The Impact of Remittances and Foreign Aid on Savings/Investment in Sub-Saharan Africa

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Definition of variables

gdppc: GDP per capita, 2000 $ constant

remit: Migrant remittances, % GDP

inv: Investment/Gross fixed capital formation (% of GDP)

gs: Gross savings, % GDP

depint: Deposit interest rate

lendint: Lending interest rate

open: Openness as a ratio of imports and exports on GDP, %

inflat: Inflation rate measured by the change in Consumer Price Index

aid: Foreign aid (Official Development Assistance), % of GDP

Summary statistics for savings model

```
sm<-read.csv("E:/dataproject/replication-project/data/sm.csv",
             fileEncoding="UTF-8-BOM",check.names=FALSE,
             header=TRUE,as.is=TRUE,sep=",",na.strings = "")
dim(sm)
```

```
## [1] 930   8
```

```
names(sm)
```

```
## [1] "country" "year"    "gs"      "gdppc"   "remit"   "aid"     "depint"
## [8] "inflat"
```

```
mode(sm)
```

```
## [1] "list"
```

```
class(sm)
```

```
## [1] "data.frame"
```

```
head(sm)
```

```
##   country year        gs    gdppc    remit      aid depint inflat
```

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```
## 1   Benin 1980  4.172431 305.3488 5.479605 6.278590 6.1875  9.596
## 2   Benin 1981 -3.251559 326.8632 4.802502 6.292210 6.2500  0.795
## 3   Benin 1982 13.221546 325.1686 2.914546 6.286586 7.7500  4.059
## 4   Benin 1983  8.192516 302.5671 4.002875 7.753699 7.5000 -6.067
## 5   Benin 1984  7.516613 317.6625 4.001959 7.138005 7.2500 10.265
## 6   Benin 1985  2.634223 332.3023 3.852703 8.980477 7.2500  1.151
```

```
basicStats(sm[,3:8])
```

```
##                     gs        gdppc       remit          aid      depint
## nobs          930.000000 9.300000e+02  930.000000   930.000000  930.000000
## NAs           109.000000 2.100000e+01  196.000000    36.000000   88.000000
## Minimum       -19.140641 1.013382e+02    0.000434    -0.251879    0.000000
## Maximum        87.095976 7.578829e+03  106.478873    94.442098  103.208333
## 1. Quartile     7.209985 2.200187e+02    0.159187     4.132772    5.000000
## 3. Quartile    21.853663 8.117141e+02    3.321616    15.954124   11.031875
## Mean           16.166778 9.338054e+02    4.491910    12.417453    9.381899
## Median         13.980150 3.672847e+02    0.717373     9.640246    7.500000
## Sum         13272.924807 8.488291e+05 3297.062072 11101.203032 7899.558940
## SE Mean         0.470475 4.446103e+01    0.483077     0.396074    0.260461
## LCL Mean       15.243301 8.465470e+02    3.543531    11.640108    8.870668
## UCL Mean       17.090255 1.021064e+03    5.440289    13.194798    9.893130
## Variance      181.725505 1.796896e+06  171.288596   140.245977   57.121437
## Stdev          13.480560 1.340483e+03   13.087727    11.842549    7.557873
## Skewness        1.363968 2.501723e+00    5.305884     2.076496    4.071184
## Kurtosis        3.279745 6.185112e+00   30.600215     6.257574   32.770005
##                   inflat
## nobs          930.000000
## NAs            23.000000
## Minimum       -17.640424
## Maximum       431.699821
## 1. Quartile     3.225077
## 3. Quartile    16.487752
## Mean           15.740516
## Median          8.376000
## Sum         14276.647644
## SE Mean         0.958871
## LCL Mean       13.858648
## UCL Mean       17.622383
## Variance      833.926787
## Stdev          28.877791
## Skewness        6.158510
## Kurtosis       61.949692
```

```
table1<-basicStats(sm[,3:8])
table11<-as.matrix(table1)
table111<-t(table11)
```

```
options(xtable.comment = FALSE)
print.xtable(xtable(table111[,c(7,8,3,4,14)]),size="small")
```

	Mean	Median	Minimum	Maximum	Stdev
gs	16.17	13.98	-19.14	87.10	13.48
gdppc	933.81	367.28	101.34	7578.83	1340.48
remit	4.49	0.72	0.00	106.48	13.09
aid	12.42	9.64	-0.25	94.44	11.84
depint	9.38	7.50	0.00	103.21	7.56
inflat	15.74	8.38	-17.64	431.70	28.88

Summary statistics for investment model

```
im<-read.csv("E:/dataproject/replication-project/data/im.csv",
                  fileEncoding="UTF-8-BOM",check.names=FALSE,header=TRUE,
                  as.is=TRUE,sep=",",na.strings = "")
dim(im)
```

```
## [1] 850   9
```

```
names(im)
```

```
## [1] "country" "year"    "inv"     "gdppc"   "remit"   "aid"     "lendint"
## [8] "open"    "gs"
```

```
mode(im)
```

```
## [1] "list"
```

```
class(im)
```

```
## [1] "data.frame"
```

```
head(im)
```

```
##   country year       inv    gdppc    remit      aid lendint     open        gs
## 1   Benin 1980        NA 305.3488 5.479605 6.278590    14.5 53.13862  4.172431
## 2   Benin 1981        NA 326.8632 4.802502 6.292210    14.5 59.88937 -3.251559
## 3   Benin 1982 27.052328 325.1686 2.914546 6.286586    16.0 57.85734 13.221546
## 4   Benin 1983 16.626738 302.5671 4.002875 7.753699    14.5 45.34201  8.192516
## 5   Benin 1984 12.475506 317.6625 4.001959 7.138005    14.5 50.51130  7.516613
## 6   Benin 1985  8.748403 332.3023 3.852703 8.980477    14.5 60.30122  2.634223
```

```
basicStats(im[,3:9])
```

```
##                     inv        gdppc       remit          aid      lendint
## nobs          850.000000 8.500000e+02  850.000000   850.000000   850.000000
## NAs            51.000000 4.100000e+01  175.000000    52.000000   189.000000
## Minimum         1.930579 1.013382e+02    0.000434    -0.251879     6.000000
## Maximum        74.820573 7.578829e+03  106.478873    94.442098   278.916667
## 1. Quartile    14.794531 2.354767e+02    0.164714     4.369705    13.500000
## 3. Quartile    24.221304 9.289910e+02    3.580935    17.041056    21.370833
## Mean           20.724377 9.847622e+02    4.785224    13.023658    19.299349
```

```
## Median          18.927478 4.110713e+02    0.726746     9.972731    16.398241
## Sum          16558.776971 7.966726e+05 3230.026268 10392.879208 12756.869696
## SE Mean          0.351895 4.818172e+01    0.523636     0.430489     0.532311
## LCL Mean        20.033628 8.901861e+02    3.757071    12.178631    18.254123
## UCL Mean        21.415125 1.079338e+03    5.813377    13.868685    20.344575
## Variance        98.940014 1.878076e+06  185.081135   147.886253   187.297318
## Stdev            9.946860 1.370429e+03   13.604453    12.160849    13.685661
## Skewness         1.761323 2.390298e+00    5.074113     2.030646    11.090952
## Kurtosis         5.181350 5.591981e+00   27.853505     5.809843   195.840946
##                      open           gs
## nobs           850.000000   850.000000
## NAs             37.000000   114.000000
## Minimum          6.320343   -19.140641
## Maximum        209.874333    73.659003
## 1. Quartile     45.810583     8.460065
## 3. Quartile     92.163723    21.691662
## Mean            71.543197    16.282121
## Median          60.970663    14.833301
## Sum          58164.619498 11983.640935
## SE Mean          1.285304     0.436351
## LCL Mean        69.020287    15.425478
## UCL Mean        74.066107    17.138763
## Variance      1343.081035   140.135891
## Stdev           36.648070    11.837901
## Skewness         1.047762     1.044218
## Kurtosis         0.792432     2.541203
```

```
table2<-basicStats(im[,3:9])
table22<-as.matrix(table2)
table222<-t(table22)
```

```
options(xtable.comment = FALSE)
print.xtable(xtable(table222[,c(7,8,3,4,14)]),size="small")
```

	Mean	Median	Minimum	Maximum	Stdev
inv	20.72	18.93	1.93	74.82	9.95
gdppc	984.76	411.07	101.34	7578.83	1370.43
remit	4.79	0.73	0.00	106.48	13.60
aid	13.02	9.97	-0.25	94.44	12.16
lendint	19.30	16.40	6.00	278.92	13.69
open	71.54	60.97	6.32	209.87	36.65
gs	16.28	14.83	-19.14	73.66	11.84

Plot based on data for SSA 1980-2008

```
ssa<-read.csv("E:/dataproject/replication-project/data/ssa.csv",
              fileEncoding="UTF-8-BOM",check.names=FALSE,header=TRUE,
```

```
              as.is=TRUE,sep=",",na.strings="")
dim(ssa)
```

```
## [1] 29  5
```

```
names(ssa)
```

```
## [1] "year"              "ForeignAid"       "Remittances"      "ForeignAidShare"
## [5] "RemittancesShare"
```

```
mode(ssa)
```

```
## [1] "list"
```

```
class(ssa)
```

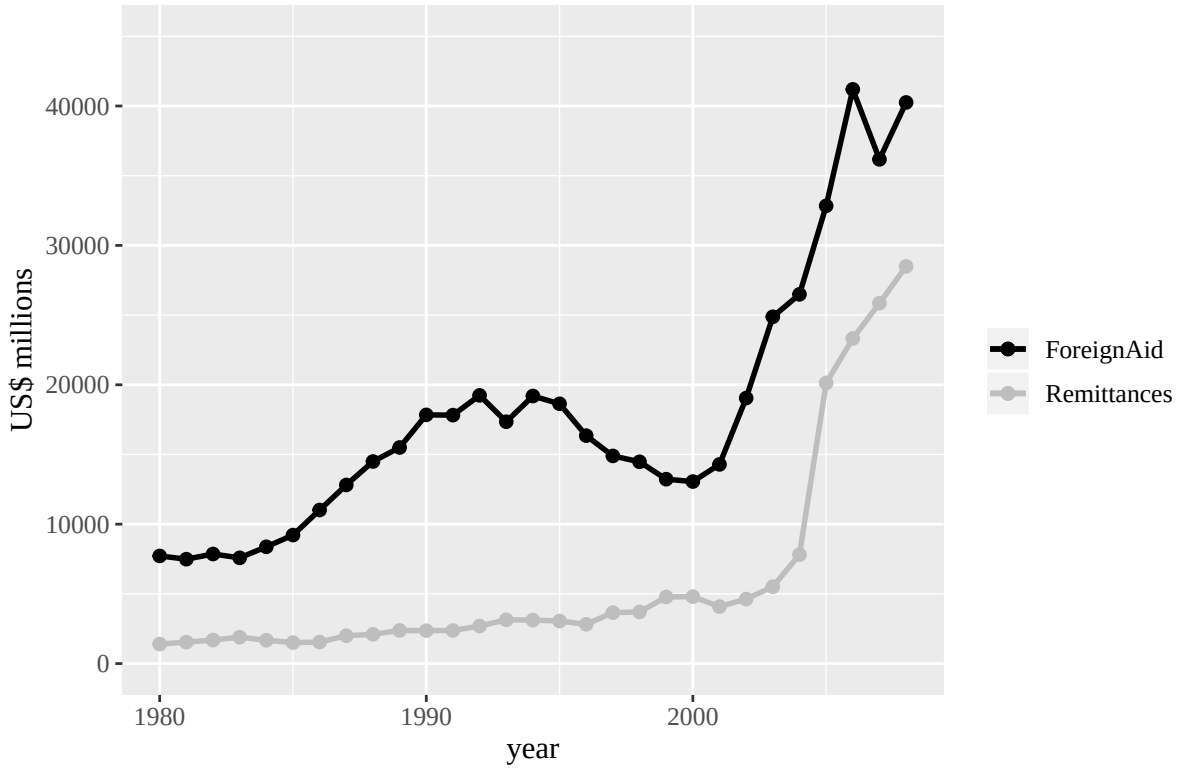
```
## [1] "data.frame"
```

```
head(ssa)
```

```
##   year ForeignAid Remittances ForeignAidShare RemittancesShare
## 1 1980    7721.58     1397.70            2.84              0.62
## 2 1981    7488.76     1535.20            1.97              0.46
## 3 1982    7860.07     1686.02            2.25              0.56
## 4 1983    7584.87     1891.60            2.50              0.72
## 5 1984    8376.56     1673.44            3.15              0.73
## 6 1985    9217.59     1502.91            3.64              0.70
```

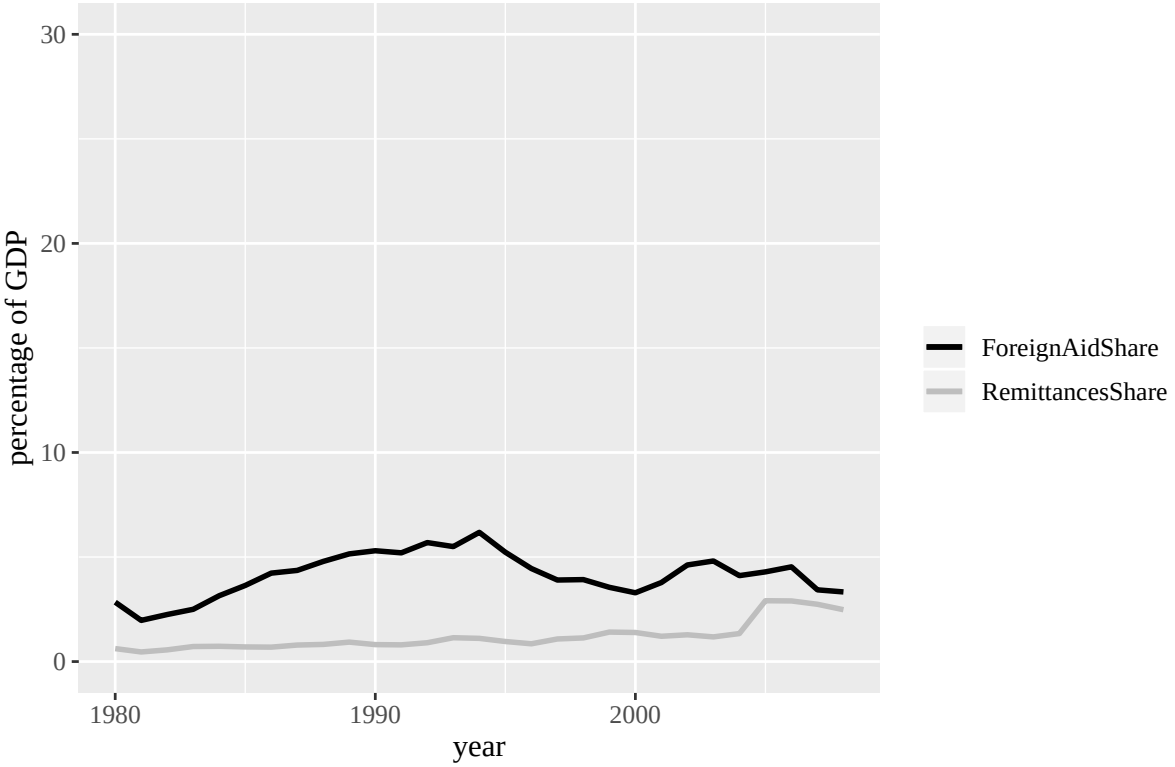
```
ssa1<-data.frame(year=ssa$year,ForeignAid=ssa$ForeignAid,Remittances=ssa$Remittances)
ggplot()+
  geom_line(data = ssa1,aes(x = year,y = ForeignAid,colour =
                              "ForeignAid"),size=1)+
  geom_point(data = ssa1,aes(x = year,y = ForeignAid,colour =
                               "ForeignAid"),size=2)+
  ylim(0,45000)+
  geom_line(data = ssa1,aes(x = year,y = Remittances,colour =
                              "Remittances"),size=1) +
  geom_point(data = ssa1,aes(x = year,y = Remittances,colour =
                               "Remittances"),size=2)+
  scale_colour_manual("",values = c("ForeignAid" = "black",
                                    "Remittances" = "gray"))+
  xlab("year")+ylab("US$ millions")+
  theme(text=element_text(size=12, family="Times"))+
  ggtitle("Figure 1: Remittances and foreign aid in SSA, 1980-2008")
```

Figure 1: Remittances and foreign aid in SSA, 1980–2008




```
ssa2<-data.frame(year=ssa$year,"ForeignAidShare"=ssa$ForeignAidShare,
                 RemittancesShare=ssa$RemittancesShare)
ggplot()+
  geom_line(data = ssa2,aes(x = year,y = ForeignAidShare,colour =
                              "ForeignAidShare"),size=1)+
  ylim(0,30)+
  geom_line(data = ssa2,aes(x = year,y = RemittancesShare,colour =
                              "RemittancesShare"),size=1)+
  scale_colour_manual("",values = c("ForeignAidShare" = "black",
                                    "RemittancesShare" = "gray"))+
  xlab("year")+ylab("percentage of GDP")+
  theme(text=element_text(size=12, family="Times"))+
  ggtitle("Figure 2: Share of remittances compared to foreign aid in SSA,1980-2008")
```

Figure 2: Share of remittances compared to foreign aid in SSA,1980–2008



Obtaining the data

As the authors state, "Our data come from two main sources: the World Development Indicators (WDI) 2006 of the World Bank and David Roodman's Index of Donor Performance data compilation on foreign aid originally published in 2005 and updated in 2009 within the Center for Global Development". So I downloaded the data as they say from the two sources at the beginning. However, I find out that authors do not provide a full description of the data they use.

gdppc is defined as GDP per capita (2000 USD constant). But only GDP per capita (2010 USD constant) can be obtained from the the World Development Indicators (WDI). When I learn how to do empirical analysis, I think it will result in some difference. So I try my best to find data same as those authors use from other databases. Finally I obtained the data of GDP per capita (2000 USD constant) from Africa Development Indicators (ADI), which is also a database of the World Bank. This problem is solved.

As the authors state, "We have an unbalanced panel because of insufficient data on certain periods with two samples of 37 and 34 SSA countries that have sufficient data over the period 1980–2004." Due to their incomplete description of the data they use, actually I am not sure how sufficient it is. So I decided to obtain the data as sufficient as possible. After a long time search, finally I obtain the data mainly from the World Development Indicators (WDI) of the World Bank, Africa Development Indicators (ADI) of the World Bank and World Economic Outlook (WEO) Database of International Monetary Fund (IMF). Foreign Aid (% GDP) and Openness can be got by simple calculation based on data from these Database.

Comparison

There are several differences between summary statistics for my data with those in the article.

First of all, when I evaluate the data I obtained, I find that my observations are more than the authors'. As I mentioned before, I am not sure "how sufficient" do the authors mean because of incomplete description. So I obtain the data as sufficient as possible. The possible reason may be that I refer to more databases and get more sufficient data than authors. Some countries only have one or two variables' data that are not recorded in one database but recorded in another. I completed the data from more databases. So the number of observations will also increase.

Second, as the World Bank declares in their website about Data Compilation Methodology, "Our comprehensive publications World Development Indicators and International Debt Statistics contain data that generally rely on official sources, although some adjustments are made in the balance of payments to account for fiscal/calendar-year differences. Within these publications we attempt to present data that are consistent in definition, timing and methods. Even so, updates and revisions over time may introduce discrepancies from one edition to the next." Updates and revisions over time are very common for most databases. So there may be differences between the data I have collected now and those collected by the authors about ten years ago.

The most obvious difference is about Share of Foreign Aid (% GDP) in *Figure* 2. I calculate based on World Bank Data. There are data of Foreign Aid (2015 USD constant), Foreign Aid (current USD), GDP per capita (2000 USD constant), GDP (2010 USD constant) and GDP (current USD). So I calculate by

$$Foreign\ Aid\ (percentage\ of\ GDP) = [\frac{Foreign\ Aid\ (current\ USD)}{GDP\ (current\ USD)}] * 100$$

I checked it several times and there should be no mistake. However, my results are much different from the authors'. I think the authors may have made a mistake. Fortunately, this is just a description of the overall situation in sub-Saharan Africa, not included in the panel data. The data of Foreign Aid (% GDP) of different countries in different years in the panel are similar. So the mistake does not affect the empirical process.

I also calculated the Openness according to the authors' definition. Openness refers to a ratio of imports and exports on GDP. There are data of Imports of goods and services (% of GDP) and Exports of goods and services (% of GDP) in World Bank. Add them together to get Openness. Our results are similar.

In addition to the difficulty of obtaining sufficient data, the most difficult part is to learn to how to use packages. Besides the learning in class, I have spent much time learning the further usage of the xtable and ggplot2 packages by R's help and Google. In particular, I learned how to draw a line chart with multiple polylines.

References

Methodologies. (n.d.). Retrieved from https://datahelpdesk.worldbank.org/knowledgebase/articles/906531-methodologies.