REPLICATION EXERCISE

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TABLE II

ESTIMATION OF THE AUGMENTED SOLOW MODEL

Dependent variable: log GDP per working-age person in 1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	6.84	7.79	8.64
	(1.18)	(1.19)	(2.21)
ln(I/GDP)	0.69	0.7	0.28
	(0.13)	(0.15)	(0.39)
ln(n + g + σ)	-1.75	-1.5	-1.08
	(0.42)	(0.4)	(0.76)
ln(SCHOOL)	0.65	0.73	0.77
	(0.07)	(0.1)	(0.29)
$\overline{R}^2$	0.78	0.77	0.24
s.e.e	0.51	0.45	0.33
Restricted Regression:			
CONSTANT	7.85	7.97	8.71
	(0.14)	(0.15)	(0.47)
ln(I/GDP) - ln(n + g + σ)	0.74	0.71	0.28
	(0.12)	(0.14)	(0.33)
ln(SCHOOL) - ln(n + g + σ)	0.66	0.73	0.77
	(0.07)	(0.09)	(0.28)
$\overline{R}^2$	0.78	0.77	0.28
s.e.e	0.51	0.45	0.32

Note. Standard errors in parentheses. The investment and population growth rates are averages for the period 1960-1985. (g + σ) is assumed to be 0.05. SCHOOL is the average percentage of the working-age population in secondary school for the period of 1960-1985.

TABLE III

TESTS FOR UNCONDITIONAL CONVERGENCE

Dependent variable: log difference GDP per working-age person in 1960-1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	-0.267	0.587	3.69
	(0.38)	(0.433)	(0.68)
ln(Y60)	0.0943	-0.00424	-0.341
	(0.0496)	(0.05484)	(0.079)
$\overline{R}^2$	0.03	-0.01	0.46
s.e.e	0.44	0.41	0.18

Note. Standard errors are in parentheses. Y60 is GDP per working-age person in 1960.

TABLE IV

TESTS FOR CONDITIONAL CONVERGENCE

Dependent variable: log difference GDP per working-age person in 1960-1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	1.92	2.25	2.14
	(0.83)	(0.85)	(1.18)
ln(Y60)	-0.141	-0.228	-0.35
	(0.052)	(0.057)	(0.066)
ln(I/GDP)	0.647	0.646	0.39
	(0.087)	(0.104)	(0.176)
ln(n + g + σ)	-0.302	-0.457	-0.766
	(0.304)	(0.307)	(0.345)
$\overline{R}^2$	0.38	0.35	0.62
s.e.e	0.35	0.33	0.15

Note. Standard errors are in parentheses. Y60 is GDP per working-age person in 1960. The investment and population growth rates for this period 1960-1985 (g + σ) is assumed to be 0.05.

TABLE V

TESTS FOR CONDITIONAL CONVERGENCE

Dependent variable: log difference GDP per working-age person in 1960-1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	3.02	3.71	2.76
	(0.83)	(0.91)	(1.2)
ln(Y60)	-0.288	-0.367	-0.398
	(0.062)	(0.067)	(0.070)
ln(I/GDP)	0.524	0.538	0.332
	(0.087)	(0.102)	(0.173)
ln(n + g + σ)	-0.506	-0.545	-0.863
	(0.289)	(0.288)	(0.338)
ln(SCHOOL)	0.231	0.27	0.228
	(0.059)	(0.080)	(0.145)
$\overline{R}^2$	0.46	0.43	0.65
s.e.e	0.33	0.3	0.15

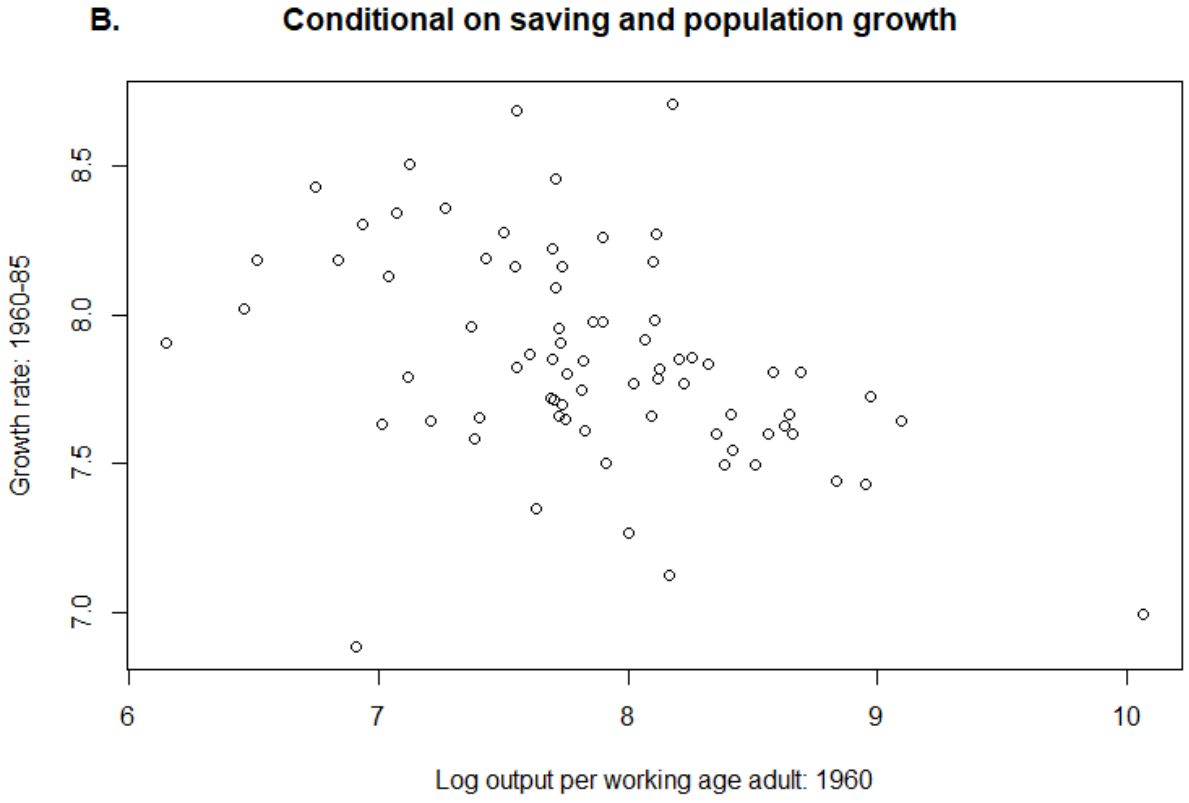
Note. Standard errors are in parentheses. Y60 is GDP per working-age person in 1960. The investment and population growth rates for this period 1960-1985 (g + σ) is assumed to be 0.05. SCHOOL is the average percentage of the working-age population in secondary school for the period 1960-1985.

COMMENTS ON SIMILARITY OF BETA COEFFICIENTS

For all the samples the beta coefficients are either exact or very similar. For the ones that aren't exact, the coefficient is always less than .1 in similarity and usually just a few hundredth decimal places from the coefficient on the paper. The reasoning for this is probably due to the coding software used by the person who wrote the paper and the way R does its float arithmetic and the way it rounds. Even so, most of the data is exact or within just 1 or 2 hundredth of a decimal from one another.

FIGURE I


A.
Unconditional
Growth rate: 1960-85
-0.5
0.0
0.5
1.0
1.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
Log output per working age adult: 1960


B.
Conditional on saving and population growth
Growth rate: 1960-85
7.0
7.5
8.0
8.5
6
7
8
9
10
Log output per working age adult: 1960

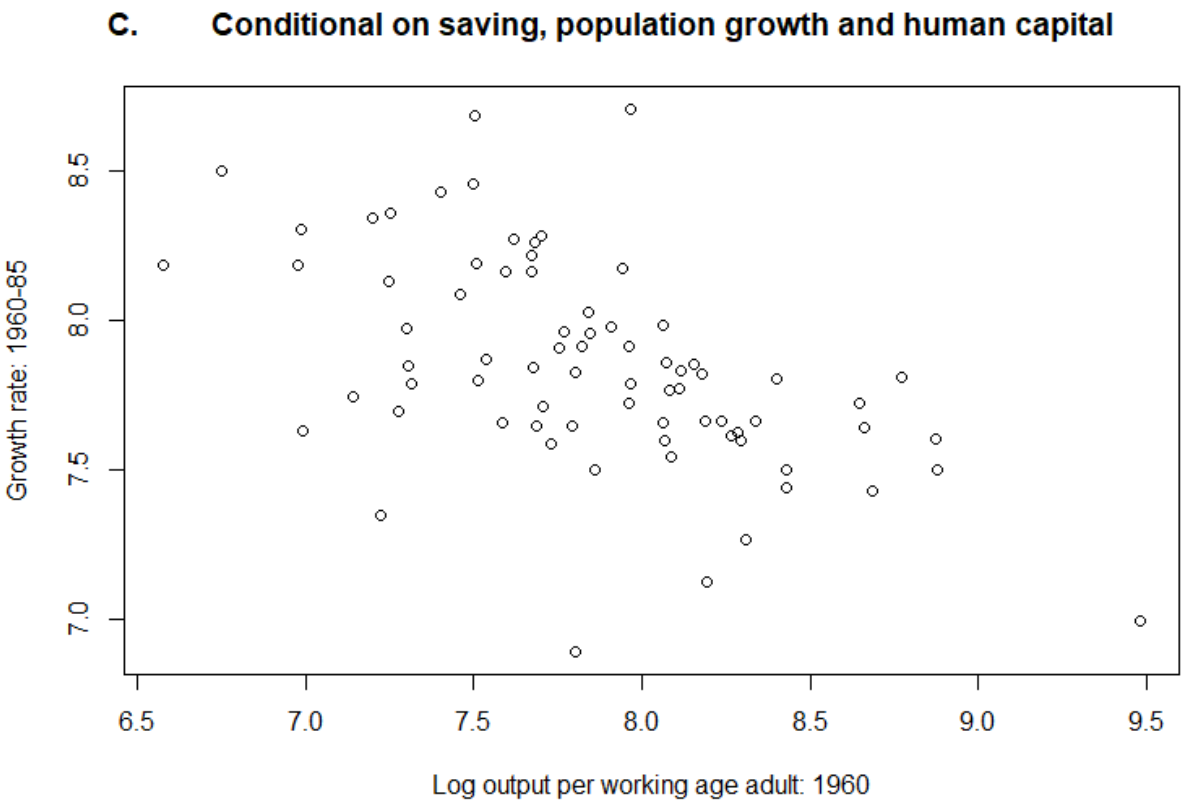

C. Conditional on saving, population growth and human capital
Growth rate: 1960-85
7.0
7.5
8.0
8.5
6.5
7.0
7.5
8.0
8.5
9.0
9.5
Log output per working age adult: 1960

FIGURE I

APPENDIX

R CODE:

```
# Author: Mahfuz Kamal

# Date: 11/19/19

# Notes:

install.packages("readr")

library(readr)

# import files

Intermediate = read.csv("C:\\Users\\mahfu\\OneDrive\\Desktop\\R\\Replication Exercise\\Intermediate.csv")

NonOil = read.csv("C:\\Users\\mahfu\\OneDrive\\Desktop\\R\\Replication Exercise\\Nonoil.csv")

OECD = read.csv("C:\\Users\\mahfu\\OneDrive\\Desktop\\R\\Replication Exercise\\OECD.csv")

# Table 2

  # Making Models

Table2_OECD = lm(log(OECD$GDP85)~log(OECD$IONY)+log(OECD$POPGRO+.05)+log(OECD$SCHOOL))

Table2_Intermediate =
lm(log(Intermediate$GDP85)~log(Intermediate$IONY)+log(Intermediate$POPGRO+.05)+log(Intermediate$SCHOOL))

Table2_Nonoil = lm(log(NonOil$GDP85)~log(NonOil$IONY)+log(NonOil$POPGRO+.05)+log(NonOil$SCHOOL))

  # Getting the data

summary(Table2_OECD)

summary(Table2_Intermediate)

summary(Table2_Nonoil)

# Table 2 Restricted

  # Making Variables

x1 = log(OECD$IONY) - x3

x2 = log(OECD$SCHOOL) - x3

x3 = log(OECD$POPGRO + .05)

y1 = log(OECD$GDP85)

a1 = log(Intermediate$IONY) - a3

a2 = log(Intermediate$SCHOOL) - a3

a3 = log(Intermediate$POPGRO + .05)

y2 = log(Intermediate$GDP85)

b1 = log(NonOil$IONY) - b3

b2 = log(NonOil$SCHOOL) - b3

b3 = log(NonOil$POPGRO + .05)
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```
y3 = log(NonOil$GDP85)

  # Making Models

RTable2_OECD = lm(y1~x1+x2)

RTable2_Intermediate = lm(y2~a1+a2)

RTable2_Nonoil = lm(y3~b1+b2)

  # Getting the data

summary(RTable2_OECD)

summary(RTable2_Intermediate)

summary(RTable2_Nonoil)

# Table 3

  # Making Models

Table3_OECD = lm(log(OECD$GDP85)-log(OECD$GDP60)~log(OECD$GDP60))

Table3_Intermediate = lm(log(Intermediate$GDP85)-log(Intermediate$GDP60)~log(Intermediate$GDP60))

Table3_Nonoil = lm(log(NonOil$GDP85)-log(NonOil$GDP60)~log(NonOil$GDP60))

  # Getting the data

summary(Table3_OECD)

summary(Table3_Intermediate)

summary(Table3_Nonoil)

# Table 4

  # Making Models

Table4_OECD = lm(log(OECD$GDP85)-
log(OECD$GDP60)~log(OECD$GDP60)+log(OECD$IONY)+log(OECD$POPGRO+.05))

Table4_Intermediate = lm(log(Intermediate$GDP85)-
log(Intermediate$GDP60)~log(Intermediate$GDP60)+log(Intermediate$IONY)+log(Intermediate$POPGRO+.05))

Table4_Nonoil = lm(log(NonOil$GDP85)-
log(NonOil$GDP60)~log(NonOil$GDP60)+log(NonOil$IONY)+log(NonOil$POPGRO+.05))

  # Getting the data

summary(Table4_OECD)

summary(Table4_Intermediate)

summary(Table4_Nonoil)

# Table 5

  # Making Models

Table5_OECD = lm(log(OECD$GDP85)-
log(OECD$GDP60)~log(OECD$GDP60)+log(OECD$IONY)+log(OECD$POPGRO+.05)+log(OECD$SCHOOL))
```

```
Table5_Intermediate = lm(log(Intermediate$GDP85)-
log(Intermediate$GDP60)~log(Intermediate$GDP60)+log(Intermediate$IONY)+log(Intermediate$POPGRO+.05)+log(Intermediate$SCHOOL))

Table5_Nonoil = lm(log(NonOil$GDP85)-
log(NonOil$GDP60)~log(NonOil$GDP60)+log(NonOil$IONY)+log(NonOil$POPGRO+.05)+log(NonOil$SCHOOL))

  # Getting the data

summary(Table5_OECD)

summary(Table5_Intermediate)

summary(Table5_Nonoil)

# Making the figures

  # Figure A

m = log(Intermediate$GDP85)-log(Intermediate$GDP60)

z = log(Intermediate$GDP60)

plot(z,m, xlab = "Log output per working age adult: 1960", ylab = "Growth rate: 1960-85", main = "A.
Unconditional                                    ")

  # Figure B

fitted.model1 = lm(log(Intermediate$GDP60)~log(Intermediate$IONY)+log(Intermediate$POPGRO + .05))

residuals1 = fitted.model1$residuals

fitted.model2 = lm(m~log(Intermediate$IONY)+log(Intermediate$POPGRO + .05))

residuals2 = fitted.model2$residuals

n = mean(log(Intermediate$GDP60)) + residuals1

o = mean(z) + residuals2

plot(n,o, xlab = "Log output per working age adult: 1960", ylab = "Growth rate: 1960-85", main = "B.          Conditional on
saving and population growth                    ")

  # Figure C

fitted.model3 = lm(log(Intermediate$GDP60)~log(Intermediate$IONY)+log(Intermediate$POPGRO +
.05)+log(Intermediate$SCHOOL))

residuals3 = fitted.model3$residuals

fitted.model4 = lm(m~log(Intermediate$IONY)+log(Intermediate$POPGRO + .05)+log(Intermediate$SCHOOL))

residuals4 = fitted.model4$residuals

p = mean(log(Intermediate$GDP60)) + residuals3

q = mean(z) + residuals4

plot(p,q, xlab = "Log output per working age adult: 1960", ylab = "Growth rate: 1960-85", main = "C.      Conditional on
saving, population growth and human capital      ")
```