

# ON THE IMPACT OF DEMOGRAPHIC CHANGE ON ECONOMIC GROWTH AND POVERTY

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EE 462 Development Macroeconomics

Reference: Cruz, M., Ahmed, S.A. (2018). On the impact of demographic change on economic growth and poverty. *World Development*, 105, 95-106.

# Summary

- Objective:

To analyze the effects of demographic change on economic growth and poverty

- Empirical Estimation:

Estimate the impact of age structure of population (changes in share of working age and dependency ratios) on per capita GDP growth and poverty rate.

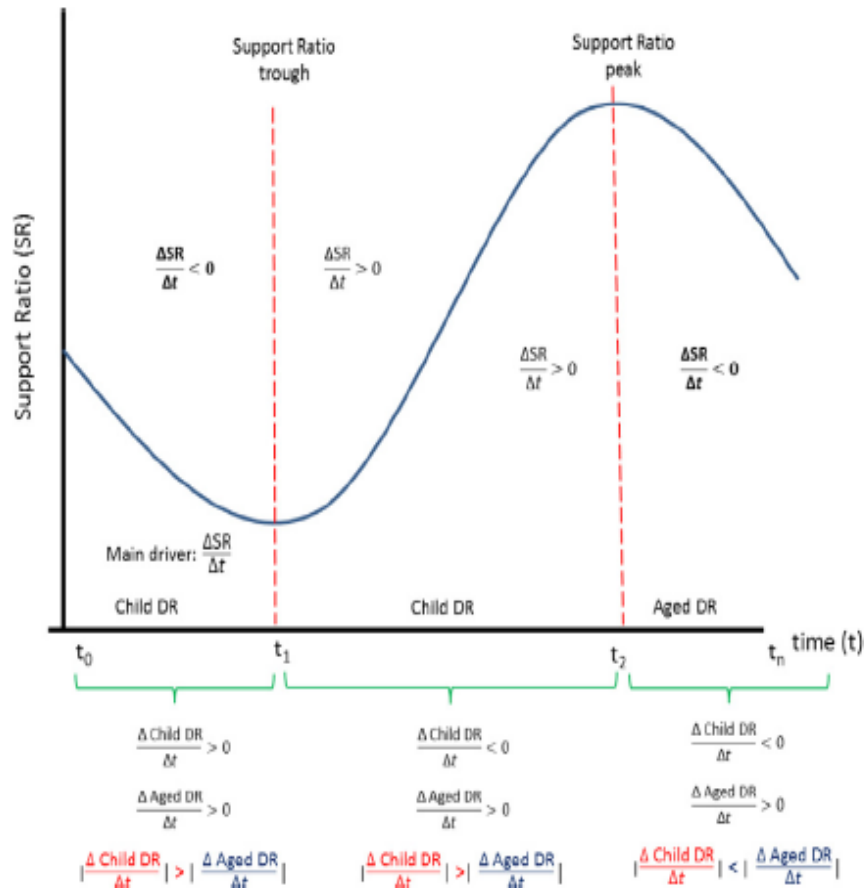
- Findings:

- An increase of 1% point of working-age pop share is associated with an increase of 1.6% points in GDP per capita growth.
- A reduction of 1% point of CDR is associated with a reduction of  $\sim 0.34\%$  in the poverty rate.

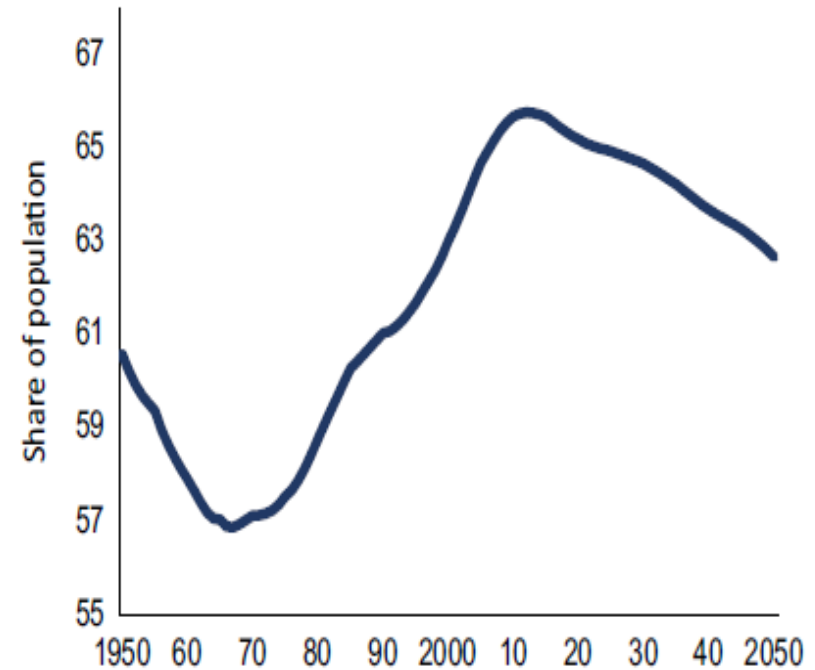
Q: How demographic change impacts growth and poverty?

# Demographic transition and dividends

a) Demographic transition and dividends

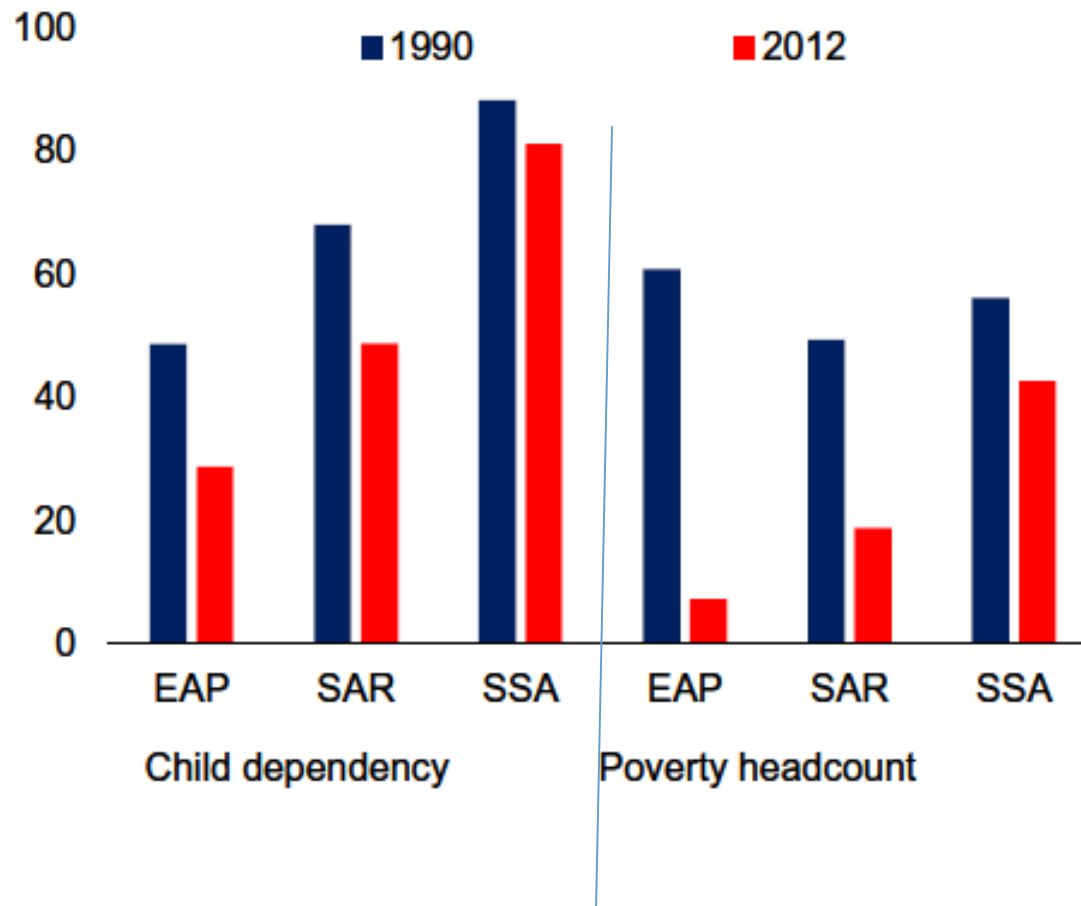


b) Share in global population, aged 15–64, percent



Q: How does the support ratio (SR) change over time?

# Dependency Ratio



Q: What's the relationship between child dependency and poverty headcount?

# Empirical Strategy

- An accounting identity

$$\frac{Y}{N} = \frac{Y}{L} \frac{WAP}{N} \frac{L}{WAP}$$

- Take log and find growth rates:

- $g_y = g_z + g_w + g_l$

$$g_y = a + bf(X) + g_w + e$$

$$g_y = a + bf(X) + g_{CDR} + g_{ADR} + e$$

Q: What are the dependent and independent variables?

# Endogeneity Issues

Q: What are the endogeneity issues?

- Unobservable factors (omitted variable)
- Reverse causality

# Data and Trend

Q: What are the data sources used in the analysis?

- Demographic data
- GDP
- Others?

# Descriptive Statistics

**Table 2**  
Average share of the working age population by World Bank region and income group classification.

Region/Income groups	1950	1960	1970	1980	1990	2000	2010
EAP	55.8	53.8	52.5	54.7	57.4	59.4	63.1
ECA	61.3	59.3	58.0	61.6	62.9	64.5	68.4
LAC	54.1	51.4	50.5	53.6	56.8	59.7	63.7
MENA	56.0	53.1	51.3	51.3	53.1	58.7	63.7
SAS	55.7	56.1	54.2	54.5	54.4	57.2	61.7
SSA	55.5	54.2	52.7	51.7	51.5	52.8	54.4
Low income	55.6	54.8	53.3	52.5	51.7	52.4	53.8
Lower-middle income	56.2	54.3	52.6	53.4	54.6	56.8	60.5
Upper-middle income	56.6	54.3	53.2	56.0	58.7	62.0	65.9
High income: OECD	64.5	62.6	62.9	64.3	66.4	67.2	67.4
High income: non- OECD	59.7	56.9	57.9	61.7	64.0	66.1	70.1
Total	58.2	56.2	55.5	57.1	58.7	60.6	63.5

Source: UN (2015).

Note: HIC refers to high-income countries; EAP refers to low and middle-income East Asia and the Pacific; ECA refers to low and middle-income Europe and Central Asia; LAC refers to low and middle-income Latin America and the Caribbean; MNA refers to low and middle-income Middle East and North Africa; SAR refers to low and middle-income South Asia; and SSA refers to low and middle-income Sub-Saharan Africa.

**Q: Which region has the highest (or lowest) share of working age pop'n?  
How does the share of working age pop'n change over time?**

# Results

**Table 3**  
Growth of the working-age share of the population can increase real GDP per capita.

Variables	Fist-difference			Panel fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
Δ share of WAP	1.61 <sup>***</sup> (0.53)	1.88 <sup>***</sup> (0.44)	1.61 <sup>***</sup> (0.47)	1.36 <sup>***</sup> (0.51)	1.67 <sup>***</sup> (0.39)	1.79 <sup>***</sup> (0.47)	2.44 <sup>**</sup> (0.99)	2.00 <sup>***</sup> (0.66)	1.57 <sup>**</sup> (0.69)
Initial GDP-pc		-0.50 <sup>***</sup> (0.18)	-0.96 <sup>***</sup> (0.29)		-2.21 <sup>***</sup> (0.51)	-3.07 <sup>***</sup> (0.51)		-0.06 (0.45)	-0.72 (0.65)
Schooling (years)		0.71 <sup>***</sup> (0.25)	0.53 <sup>*</sup> (0.30)		-0.16 (0.54)	-0.05 (0.57)		0.91 <sup>**</sup> (0.38)	0.32 (0.67)
% of trade on GDP			0.01 <sup>*</sup> (0.00)			0.02 <sup>***</sup> (0.01)			0.02 <sup>**</sup> (0.01)
Observations	1,796	1,427	1,063	1,796	1,427	1,244	1,796	1,427	1,063
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
<i>Fixed Effects</i>									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. <sup>\*\*\*</sup>p < .01, <sup>\*\*</sup>p < .05, <sup>\*</sup>p < .1. Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked Latitude), Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

**Q: What's the impact of working-age share of pop'n on real GDP per capita?**

**Table 4**  
Impacts of dependency ratio on real GDP per capita.

Variables	Fist-Difference			Panel Fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
CHD dep	-0.55*** (0.17)	-0.61*** (0.12)	-0.59*** (0.16)	-0.44** (0.17)	-0.50*** (0.12)	-0.49*** (0.15)	-0.90** (0.39)	-0.78*** (0.16)	-0.50** (0.25)
AGED dep	1.21** (0.61)	0.54 (0.70)	0.58 (0.68)	0.78 (0.64)	0.11 (0.76)	-0.50 (0.70)	1.82 (1.36)	0.04 (1.16)	0.78 (1.16)
Initial GDP-pc		-0.46** (0.18)	-0.89*** (0.28)		-2.18*** (0.52)	-3.03*** (0.52)		-0.30 (0.42)	-0.80 (0.61)
Schooling (years)		0.67*** (0.24)	0.36 (0.28)		-0.18 (0.54)	-0.02 (0.58)		1.02** (0.46)	0.21 (0.90)
% of trade on GDP			0.01** (0.00)			0.02*** (0.01)			0.02* (0.01)
Observations	1,796	1,427	1,063	1,796	1,427	1,244	1,796	1,427	1,063
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
<i>Fixed effects</i>									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. \*\*\*p < .01, \*\*p < .05, \*p < .1. Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked, Latitude), Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

**Q: What are the impacts of dependency ratios on real GDP per capita?**

**Table 5**  
Heterogeneous effects.

Variables	Fist-difference			Panel fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
CHD dep	-0.56*** (0.21)	-0.60*** (0.14)	-0.55*** (0.17)	-0.50** (0.20)	-0.56*** (0.14)	-0.56*** (0.18)	-0.76* (0.44)	-0.72*** (0.20)	-0.53** (0.25)
CHD dep *SAS	-0.04 (0.49)	-0.07 (0.49)	-0.79 (0.57)	0.16 (0.45)	-0.06 (0.46)	0.13 (0.59)	0.10 (0.56)	0.31 (0.56)	-1.98 (2.08)
CHD dep *SSA	0.06 (0.33)	-0.05 (0.32)	-0.00 (0.43)	0.29 (0.37)	0.23 (0.39)	0.22 (0.45)	0.17 (0.47)	0.30 (0.46)	0.67 (0.66)
AGED dep	1.05 (0.66)	0.13 (0.73)	0.77 (0.74)	0.45 (0.67)	-0.71 (0.71)	-1.09 (0.69)	2.73* (1.49)	-0.34 (1.11)	-0.07 (1.27)
AGED dep *SAS	2.70** (1.16)	3.46*** (0.96)	2.15* (1.22)	4.16*** (1.06)	5.33*** (0.96)	7.62*** (0.98)	3.33 (3.26)	4.47 (4.99)	3.49 (10.22)
AGED dep *SSA	-0.15 (2.46)	1.97 (3.20)	0.51 (3.76)	0.71 (2.19)	4.35* (2.46)	3.53 (2.85)	-3.28 (3.20)	2.02 (3.61)	1.97 (6.98)
Initial GDP-pc		-0.48** (0.19)	-0.94*** (0.29)		-2.28*** (0.53)	-3.14*** (0.52)		-0.44 (0.44)	-1.20* (0.63)
Schooling (years)		0.70*** (0.25)	0.45 (0.30)		-0.19 (0.55)	-0.01 (0.58)		0.98*** (0.38)	-0.17 (1.00)
% of trade on GDP			0.01** (0.00)			0.02*** (0.01)			0.02** (0.01)
Observations	1,796	1,427	1,063	1,796	1,427	1,244	1,796	1,427	1,063
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
Fixed Effects									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. \*\*\*p < .01, \*\*p < .05, \*p < .1. Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked, Latitude), Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

**Q: What are the impacts of dependency ratios on real GDP per capita in different regions?**

Table 6

Impacts of dependency ratio on product per workers (productivity).

Variables	Fist-difference			Panel fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
CHD dep	-0.18 (0.17)	-0.19 (0.14)	-0.21 (0.17)	-0.10 (0.17)	-0.12 (0.14)	-0.13 (0.17)	-0.61* (0.35)	-0.36** (0.19)	-0.19 (0.23)
AGED dep	1.43** (0.70)	0.87 (0.71)	0.86 (0.70)	0.76 (0.75)	0.18 (0.80)	-0.43 (0.74)	2.22 (1.36)	0.46 (1.15)	1.38 (1.41)
Initial GDP-pc		-0.54*** (0.20)	-0.85*** (0.29)		-2.05*** (0.56)	-2.94*** (0.56)		-0.63 (0.48)	-0.43 (0.67)
Schooling (years)		0.66** (0.26)	0.26 (0.29)		-0.24 (0.57)	-0.17 (0.60)		1.09** (0.45)	0.39 (0.89)
% of trade on GDP			0.01** (0.00)			0.02*** (0.01)			0.02** (0.01)
Observations	1,751	1,425	1,063	1,751	1,425	1,243	1,751	1,425	1,063
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
<i>Fixed effects</i>									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. \*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$ . Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked, Latitude), Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

**Q: What are the impacts of dependency ratios on productivity?**

**Table 7**  
Impact of changes in dependency ratio on poverty rate (\$ 1.9 poverty line).

Variables	Fist-Difference			Panel Fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
CHD dep	0.47** (0.19)	0.23* (0.13)	0.29** (0.12)	0.51** (0.23)	0.25 (0.15)	0.21 (0.14)	0.61*** (0.21)	0.23 (0.15)	0.34** (0.17)
CHD dep *SAS	-0.38 (0.34)	-0.29 (0.34)	-1.21** (0.51)	-0.44 (0.83)	-0.09 (0.79)	-0.62 (0.49)	-0.40 (0.39)	-0.35 (0.35)	-0.95 (1.00)
CHD dep *SSA	-0.36 (0.33)	0.18 (0.42)	0.23 (0.47)	0.25 (0.75)	0.59 (0.72)	0.95 (0.67)	-0.66*** (0.22)	0.44 (0.59)	0.27 (0.81)
AGED dep	0.10 (0.46)	0.24 (0.42)	0.23 (0.43)	0.12 (0.45)	0.18 (0.38)	-0.13 (0.42)	0.06 (0.58)	0.25 (0.69)	0.19 (0.54)
AGED dep *SAS	0.50 (3.61)	-5.38 (5.56)	-0.44 (5.59)	-8.51* (5.02)	-9.38* (5.16)	-13.51* (7.60)	0.32 (3.57)	-5.63 (7.30)	-0.90 (11.44)
AGED dep *SSA	0.48 (2.37)	-2.80 (2.67)	-3.64 (3.34)	-5.72 (8.28)	-6.28 (8.01)	-9.46 (7.22)	0.74 (7.29)	-5.77 (4.87)	-6.75 (8.32)
Initial GDP-pc		2.46* (1.29)	3.05** (1.46)		1.25 (2.22)	1.44 (2.14)		0.96 (1.88)	2.21 (3.76)
Schooling (years)		0.56 (2.08)	0.67 (2.16)			0.25 (3.96)		4.97 (4.22)	3.10 (6.16)
% of trade on GDP			-0.02 (0.02)			-0.03 (0.02)			-0.02 (0.03)
Observations	350	302	291	350	341	299	350	302	291
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
<i>Fixed effects</i>									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. \*\*\* p < .01, \*\* p < .05, \* p < .1. Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked, Latitude), Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

**Q: What are the impacts of dependency ratios poverty rate?**

**Table 8**  
Impact of changes in dependency ratio on poverty gap (\$ 1.9 poverty line).

Variables	Fist-difference			Panel fixed-effects			GMM		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
CHD dep	0.18** (0.08)	0.04 (0.07)	0.07 (0.08)	0.22** (0.11)	0.06 (0.08)	0.07 (0.08)	0.26** (0.13)	0.07 (0.09)	0.12 (0.09)
CHD dep *SAS	0.11 (0.19)	0.03 (0.16)	-0.44** (0.22)	0.11 (0.59)	-0.10 (0.26)	-0.10 (0.24)	0.07 (0.22)	-0.03 (0.25)	-0.29 (0.50)
CHD dep *SSA	-0.26 (0.26)	0.04 (0.34)	0.19 (0.37)	0.23 (0.33)	0.42 (0.29)	0.41 (0.29)	-0.50 (0.33)	0.21 (0.39)	0.01 (0.60)
AGED dep	-0.10 (0.20)	-0.03 (0.18)	-0.05 (0.25)	-0.01 (0.22)	-0.08 (0.20)	-0.13 (0.21)	-0.10 (0.23)	-0.21 (0.27)	-0.22 (0.33)
AGED dep *SAS	2.49 (2.63)	-3.26 (2.81)	-1.10 (2.91)	-2.08 (3.27)	-6.32 (4.12)	-6.49 (4.16)	2.11 (2.68)	-4.06 (4.41)	-0.04 (4.61)
AGED dep *SSA	0.99 (1.91)	-1.79 (1.84)	-2.56 (2.25)	-4.49 (4.51)	-5.83* (3.00)	-5.78* (2.99)	1.13 (2.26)	-3.19 (3.31)	-1.32 (4.62)
Initial GDP-pc		1.34** (0.67)	1.78** (0.80)		2.24* (1.27)	2.29* (1.27)		0.47 (1.02)	0.87 (1.29)
Schooling (years)		0.90 (1.18)	1.68 (1.31)		3.31 (2.15)	3.45 (2.20)		3.29 (2.10)	2.71 (2.37)
% of trade on GDP			-0.01 (0.01)			-0.01 (0.01)			-0.01 (0.02)
Observations	350	302	291	350	302	299	350	302	291
<i>Additional control</i>									
Institutions			Yes			Yes			Yes
Geography			Yes			Yes			Yes
Population size			Yes			Yes			Yes
Health			Yes			Yes			Yes
<i>Fixed effects</i>									
Year (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes				Yes	Yes	Yes
Country				Yes	Yes	Yes			

Source: Authors' estimations.

Note: First-difference Ordinary Least Square (FD); Panel Fixed Effects (FE); Generalized Method of Moments (GMM). Standard errors clustered at the country level are reported in parentheses. \*\*\*p < .01, \*\*p < .05, \*p < .1. Additional control variables include: Institutions (British colony, French colony, Non-colony); Geography (Landlocked, Latitude). Population size (Population size in the initial period 1950, population size in the final period 2010), and Health (Incidence of Malaria in 1994).

Q: What are the impacts of dependency ratios on poverty rate in each region?