Impact of Population Growth on Economic Growth

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Introduction

Introduction

- Major independent variable is population growth.
- A relationship between population growth and economic growth exists because a higher population means more workforce, therefore more productive potential.
- Data source for the study is world bank, unit of analysis is Developing countries and the study is both quantitative and qualitative.
- Increase in population growth leads to greater workforce in the future

Literature review
Historical Background

- Population growth is a crucial factor for policy makers and economists to understand its impacts on economies.
- Population is linked with economic development and growth, making it significant for economic performance.
- Low population economies need to promote higher growth rates for increased productivity, while high population economies face challenges due to scarce resources and social problems.
- The global population increased by 0.94% from 2020 to 2021, and Pakistan's population rose by 1.9%, impacting not only GDP but also living standards, employment, poverty, and income distribution.

Empirical literature

- One study found that the effect of population growth on economic growth has been more adverse since 1980 (Headey & Hodge, 2009).
- Another study using Sher Ali's model found a positive relationship between population growth and economic development in India (Phani et al., 2019).
- A study using time series data from 1970 to 2010 in India found strong evidence for a positive association between per capita GDP and population increase (Sahoo, 2015).
- A study of 30 countries found a positive relationship between population growth and per capita income (Sibe et al., 2016).

Model

Equation

$$GDP_{it} = \beta_0 + \beta_1(popg_{it}) + \beta_2\,(unemp)_{it} + \beta_3\,(FDI_{it}) + \beta_4\,(LBR_{it}) + \beta_5\,(save_{it}) + \beta_6\,(DPR_{it}) + \beta_7\,(trade_{it}) + \mu_{it}$$

Null Hypothesis

$H0$ = No significant link between changes in population and GDP.

$$H0: \beta_1 = 0$$

Alternate Hypothesis

$H1$ = Population increase and economic growth are closely correlated.

$$H1: \beta_1 \neq 0$$

Quantification Table

Variable	Description	Measurement	Data Source
GDP	Economic Growth	GDP growth in %	World Bank
Pop g	Population growth	Annual growth in %	World Bank
Unemp	Rate of unemployment as a % of total labor force	Annual growth in(%)	World Bank
FDI	Foreign direct investment	Net inflows	World Bank

LBR	Labor force	Total Labor force in billions	World Bank
SAVE	Gross Savings	As % of GDP	World Bank
DPR	Age Dependency ratio	As a % of working population	World Bank
Trade	Exports	Exports of goods and services in US $ (trillions)	World Bank

Descriptive statistics

Table 1a: Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
GDP	overall	3.768892	4.260081	-21.3999	34.5	N = 1166
	between		1.906953	0.5018305	8.035746	n = 53
	within		3.818032	-19.20446	30.23315	T = 22
POPG	overall	1.481529	1.839882	-4.170336	19.36043	N = 1166
	between		1.269249	-1.044296	6.717194	n = 53
	within		1.342837	-7.884197	14.58052	T = 22
UNEMP	overall	6.103631	3.851968	0.1	29.77	N = 1166
	between		3.282075	0.4655455	15.80423	n = 53
	within		2.063932	-1.470596	21.50954	T = 22
FDI	overall	4.614711	9.839884	-57.53231	138.215	N = 1166
	between		5.124618	0.8268431	21.53189	n = 53
	within		8.428226	-74.44949	121.2978	T = 22
LBR	overall	2.71E+07	6.57E+07	169060	4.89E+08	N = 1166
	between		6.61E+07	191309.2	4.53E+08	n = 53
	within		4523431	-3.23E+07	6.28E+07	T = 22
SAVE	overall	26.63881	14.49172	-29.91538	75.54961	N = 1166
	between		13.50433	-3.055962	65.53728	n = 53
	within		5.561503	-5.414148	55.53004	T = 22
ADR	overall	54.71172	15.38479	16.17202	94.40981	N = 1166
	between		14.85488	20.71047	90.78586	n = 53
	within		4.472371	40.84456	75.55677	T = 22
TRADE	overall	91.54198	63.56512	16.35219	437.3267	N = 1166

	between		62.13609	26.68344	363.1185	n = 53
	within		15.78691	24.13982	171.3009	T = 22

Table 1c: Summary statistics (Developing countries)

Variable		Mean	Std. Dev.	Min	Max	Observations
GDP	overall	4.635283	4.551865	-21.3999	34.5	N = 660
	between		1.707319	0.501831	8.035746	n = 30
	within		4.230535	-18.3381	31.09954	T = 22
POPG	overall	1.48598	1.114511	-2.87987	9.97197	N = 660
	between		0.90107	-1.0443	2.913143	n = 30
	within		0.675337	-2.64173	10.2101	T = 22
UNEMP	overall	6.205848	3.93988	0.14	29.77	N = 660
	between		3.36814	0.718864	14.36409	n = 30
	within		2.13068	0.038439	21.61176	T = 22
FDI	overall	4.422562	10.43983	-57.5323	138.215	N = 660
	between		5.35283	0.826843	21.53189	n = 30
	within		9.013901	-74.6416	121.1057	T = 22
LBR	overall	3.48E+07	8.19E+07	188839	4.89E+08	N = 660
	between		8.31E+07	251266.9	4.53E+08	n = 30
	within		5846666	-2.46E+07	7.05E+07	T = 22
SAVE	overall	22.99641	14.85855	-29.9154	64.09542	N = 660
	between		13.65944	-3.05596	48.5634	n = 30
	within		6.335757	-4.46029	51.88764	T = 22
ADR	overall	61.07533	15.42011	37.51824	94.40981	N = 660
	between		14.92363	43.73848	90.78586	n = 30
	within		4.707664	47.20817	79.05934	T = 22
TRADE	overall	86.12601	60.81003	16.35219	388.1204	N = 660
	between		59.17296	29.8837	312.3801	n = 30
	within		17.54992	18.72385	165.885	T = 22

Correlation Matirx

Table 2a: Correlation Matrix

	GDP	POPG	UNEMP	FDI	LBR	SAVE	ADR	TRADE
GDP	1							
POPG	0.2495	1						
UNEMP	-0.1533	-0.3067	1					
FDI	0.1096	-0.042	0.0091	1				
LBR	0.0595	-0.0436	-0.032	-0.0984	1			
SAVE	0.1548	0.2369	-0.1937	0.1578	-0.0316	1		
ADR	0.0414	-0.0283	-0.0114	-0.1441	0.0552	-0.5609	1	
TRADE	0.0545	-0.0073	-0.1242	0.4021	-0.2421	0.4496	-0.4087	1

T-Test

Table 3 a: T-test of Mean-comparison at 95 percent Confidence Level:

Developed and DevelopingCountries Data

Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	**t value**	p value
POPG by Ddeveloped~1	660	506	1.486	1.476	0.011	0.109	0.1	0.925
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	**t value**	p value
UNEMP by Ddevelope~1	660	506	6.206	5.971	0.236	0.228	1.05	0.301
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-

	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
FDI by Ddeveloped:~1	660	506	4.423	4.865	-0.443	0.582	-0.75	0.447
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
LBR by Ddeveloped:~1	660	506	34810244	17101396	17708848	3848906	4.6	0
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
SAVE by Ddeveloped~1	660	506	22.997	31.39	-8.393	0.821	-10.25	0
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
ADR by Ddeveloped:~1	660	506	61.075	46.412	14.664	0.801	18.3	0
-	-	-	-	-	-	-	-	-
Two-sample t test with equal variances	-	-	-	-	-	-	-	-
	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
TRADE by Ddevelope~1	660	506	86.126	98.606	-12.481	3.74	-3.35	0.001

Pie charts

Fig 1 b

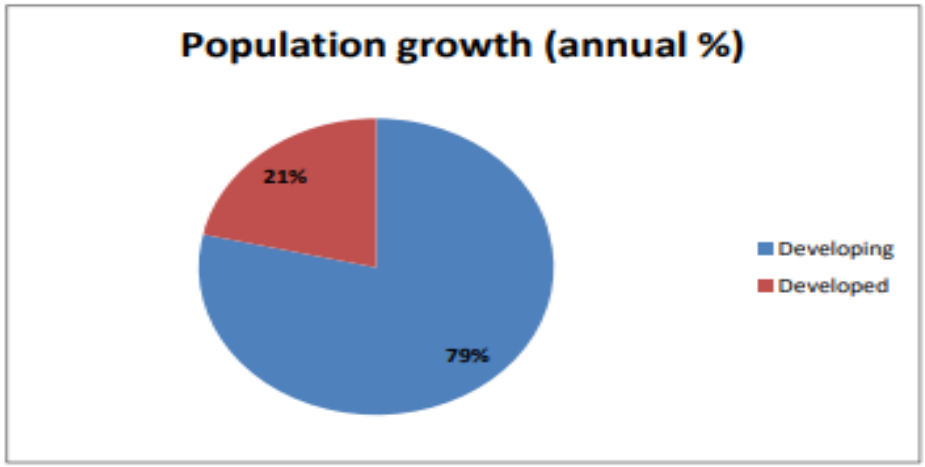
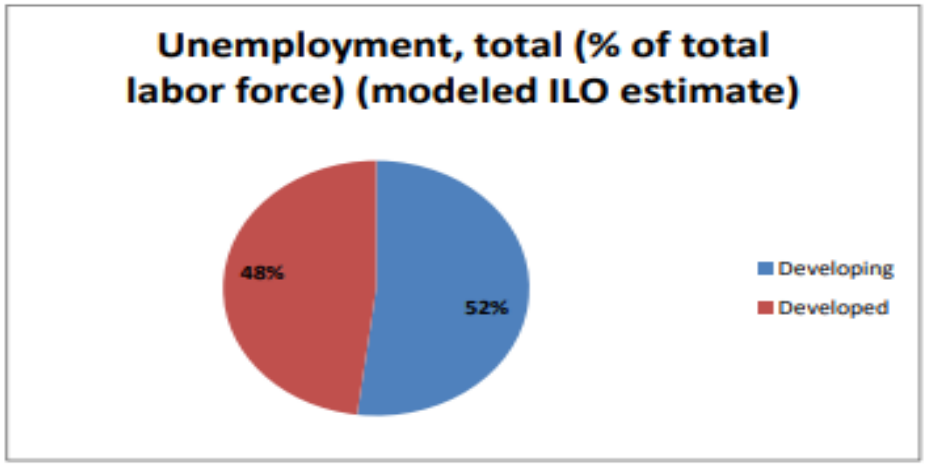


Fig 1 c



Line chart

Fig 2 c

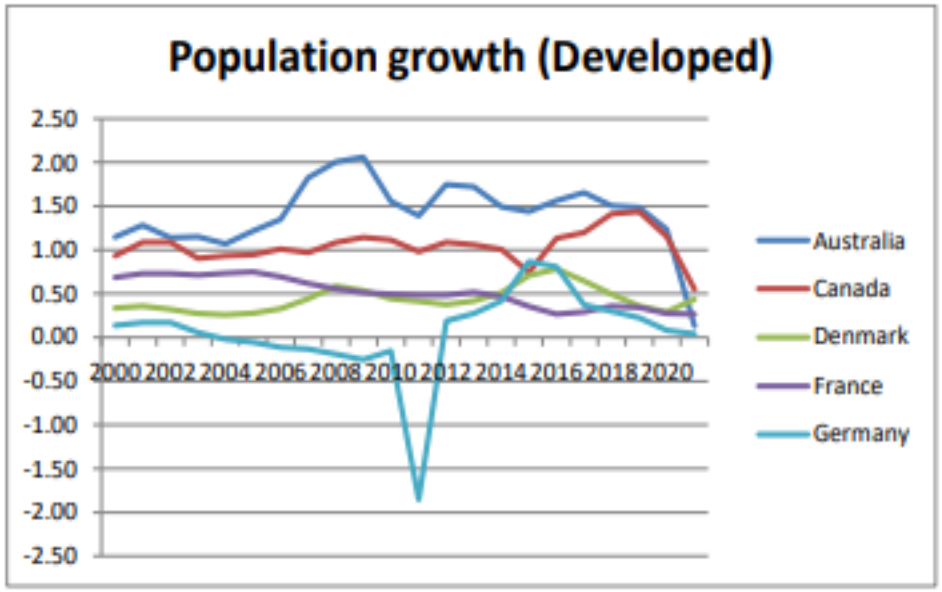
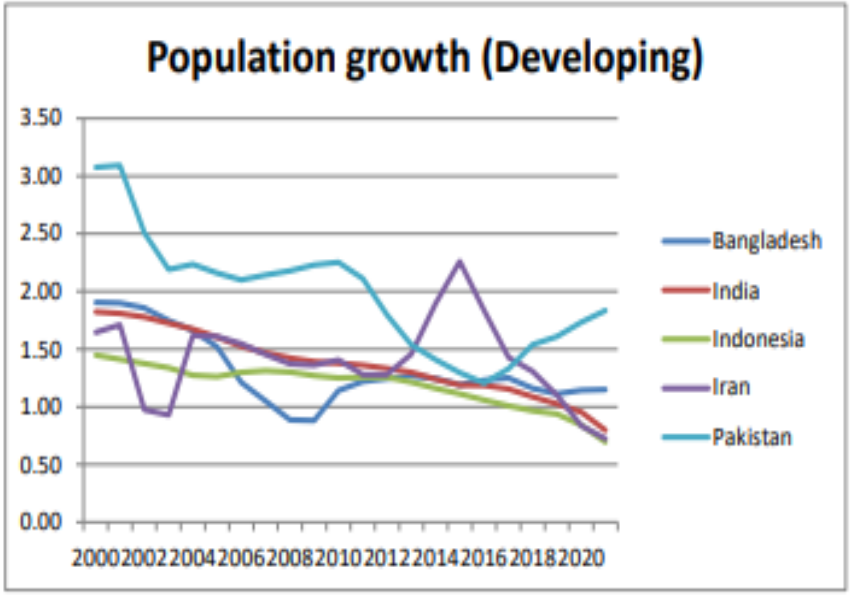


Fig 2 d



Regression Results

VARIABLES	(1) GDP	(2) GDP	(3) GDP
POPG	0.500***	0.413***	0.500***
	(0.0808)	(0.0723)	(0.178)
UNEMP	-0.109**	-0.139***	-0.109
	(0.0537)	(0.0483)	(0.0847)
FDI	0.0550***	0.0431***	0.0550
	(0.0128)	(0.0113)	(0.0386)
LBR	-3.34e-09	6.18e-08**	-3.34e-09
	(2.56e-08)	(2.42e-08)	(2.48e-08)
SAVE	0.140***	0.119***	0.140***
	(0.0209)	(0.0183)	(0.0422)
ADR	0.0790***	0.0462*	0.0790**
	(0.0262)	(0.0252)	(0.0385)
TRADE	0.0170**	0.0137**	0.0170*
	(0.00730)	(0.00671)	(0.0101)
2001.Time		-1.412**	
		(0.619)	
2002.Time		-1.262**	
		(0.621)	
2003.Time		-0.581	
		(0.622)	
2004.Time		0.638	
		(0.626)	
2005.Time		-0.323	
		(0.632)	

2006.Time	0.211
	(0.642)
2007.Time	0.290
	(0.649)
2008.Time	-2.635***
	(0.656)
2009.Time	-4.653***
	(0.645)
2010.Time	-0.0992
	(0.648)
2011.Time	-0.921
	(0.656)
2012.Time	-1.777***
	(0.656)
2013.Time	-1.875***
	(0.656)
2014.Time	-1.305**
	(0.654)
2015.Time	-1.406**
	(0.653)
2016.Time	-1.539**
	(0.653)
2017.Time	-1.601**
	(0.657)
2018.Time	-1.806***
	(0.663)
2019.Time	-2.798***
	(0.664)
2020.Time	-8.197***
	(0.651)
2021.Time	-0.0378

		(0.658)	
Constant	-6.082***	-3.323*	-6.082*
	(1.927)	(1.828)	(3.063)
Observations	1,166	1,166	1,166
R-squared	0.123	0.352	0.123
Number of Countries	53	53	53

Regression Developing Countries

Table 6: Developing Countries Regression

VARIABLES	(1) GDP	(2) GDP	(3) GDP
POPG	0.608**	0.477**	0.608**
	(0.247)	(0.228)	(0.243)
UNEMP	-0.121	-0.137*	-0.121
	(0.0810)	(0.0771)	(0.124)
FDI	0.0481***	0.0595***	0.0481
	(0.0179)	(0.0165)	(0.0549)
LBR	1.47e-08	6.59e-08**	1.47e-08
	(3.09e-08)	(3.00e-08)	(2.67e-08)
SAVE	0.128***	0.119***	0.128**
	(0.0272)	(0.0251)	(0.0529)
ADR	0.0850**	0.0126	0.0850
	(0.0392)	(0.0428)	(0.0595)
TRADE	0.0245**	0.0175*	0.0245**
	(0.00984)	(0.00945)	(0.0112)
2001.Time		-0.307	
		(0.965)	
2002.Time		-0.176	
		(0.971)	
2003.Time		0.220	
		(0.977)	
2004.Time		0.700	
		(0.991)	
2005.Time		0.423	
		(1.006)	
2006.Time		0.585	
		(1.025)	
2007.Time		1.569	
		(1.038)	
2008.Time		-2.391**	
		(1.052)	
2009.Time		-3.320***	
		(1.036)	
2010.Time		0.425	
		(1.046)	
2011.Time		-0.605	
		(1.060)	
2012.Time		-1.088	
		(1.065)	
2013.Time		-1.384	
		(1.069)	
2014.Time		-0.625	
		(1.070)	
2015.Time		-1.220	
		(1.072)	
2016.Time		-1.251	
		(1.071)	
2017.Time		-0.999	
		(1.077)	
2018.Time		-1.491	
		(1.086)	
2019.Time		-2.517**	
		(1.095)	
2020.Time		-8.136***	
		(1.072)	
2021.Time		-0.448	
		(1.085)	
Constant	-6.502**	-1.794	-6.502
	(3.057)	(3.303)	(4.887)
Observations	661	661	661
R-squared	0.103	0.290	0.103
Number of Countries	31	31	31

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regression Developed Countries

Table 6: Developing Countries Regression

VARIABLES	(1) GDP	(2) GDP	(3) GDP
POPG	0.608**	0.477**	0.608**
	(0.247)	(0.228)	(0.243)
UNEMP	-0.121	-0.137*	-0.121
	(0.0810)	(0.0771)	(0.124)
FDI	0.0481***	0.0595***	0.0481
	(0.0179)	(0.0165)	(0.0549)
LBR	1.47e-08	6.59e-08**	1.47e-08
	(3.09e-08)	(3.00e-08)	(2.67e-08)
SAVE	0.128***	0.119***	0.128**
	(0.0272)	(0.0251)	(0.0529)
ADR	0.0850**	0.0126	0.0850
	(0.0392)	(0.0428)	(0.0595)
TRADE	0.0245**	0.0175*	0.0245**
	(0.00984)	(0.00945)	(0.0112)
2001.Time		-0.307	
		(0.965)	
2002.Time		-0.176	
		(0.971)	
2003.Time		0.220	
		(0.977)	
2004.Time		0.700	
		(0.991)	
2005.Time		0.423	
		(1.006)	
2006.Time		0.585	
		(1.025)	
2007.Time		1.569	
		(1.038)	
2008.Time		-2.391**	
		(1.052)	
2009.Time		-3.320***	
		(1.036)	
2010.Time		0.425	
		(1.046)	
2011.Time		-0.605	
		(1.060)	
2012.Time		-1.088	
		(1.065)	
2013.Time		-1.384	
		(1.069)	
2014.Time		-0.625	
		(1.070)	
2015.Time		-1.220	
		(1.072)	
2016.Time		-1.251	
		(1.071)	
2017.Time		-0.999	
		(1.077)	
2018.Time		-1.491	
		(1.086)	
2019.Time		-2.517**	
		(1.095)	
2020.Time		-8.136***	
		(1.072)	
2021.Time		-0.448	
		(1.085)	
Constant	-6.502**	-1.794	-6.502
	(3.057)	(3.303)	(4.887)
Observations	661	661	661
R-squared	0.103	0.290	0.103
Number of Countries	31	31	31

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Relevance and Contribution

- Rising population throughout the world specially in developing countries.
- Test Malthusian theory and Solo Growth model.
- Will help the government in decision making.
- In developing countries higher population is not matched by the availability of jobs, leading towards unemployment.
- Higher opportunity cost for governments to support the rising population

Policy and Recommendations

- Investment in human capital can increase productivity and build a more competitive and productive economy in developing nations.
- Encouragement of entrepreneurship by lowering entry-level bureaucratic hurdles and offering tax advantages can promote economic growth by generating new companies and jobs.
- Developing nations should promote foreign investment by fostering an advantageous business environment, lowering barriers to foreign ownership, and offering incentives to investors to bring in money and technology.
- Developing nations should invest in infrastructure such as roads, bridges, and power plants to promote trade, transportation, and communication, and reduce business expenses to encourage economic growth.
- Policies and implications specific to Pakistan include export promotion, agriculture investment, infrastructure improvement for energy, and education improvement to raise productivity and improve the capabilities of the workforce.

Conclusion

- Population growth has a significant impact on economic growth in both developing and developed countries.
- The relationship between population growth and economic growth is complex and influenced by various factors such as human capital development, technological advancements, natural resources availability, and government policies.
- Positive effects of population growth on economic growth are more evident in developing countries than developed ones.
- Appropriate measures must be put in place to ensure that population increase translates into increased productivity rather than expanding unemployment rates.
- Policymakers should develop tailored solutions based on each country's unique circumstances to achieve sustainable development goals.

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