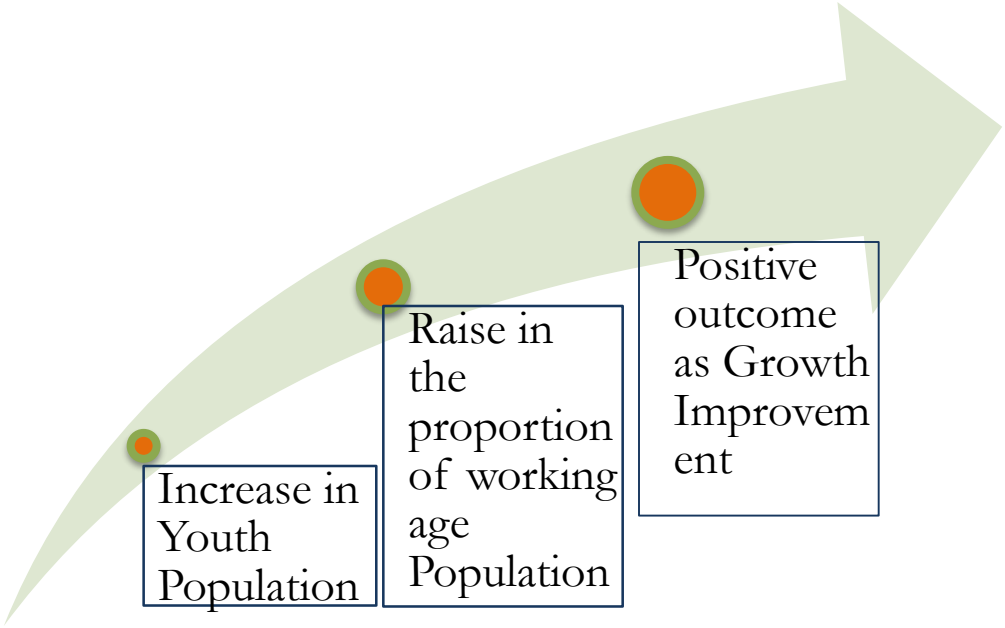
The Long Run Relationship between Youth Population and Economic Growth: Evidences from Time Series Data of Bangladesh

Sayema Haque Bidisha
S.M. Abdullah

Background

- The composition of population and its rule in growth and development prospects
- Contribution to labor market, in particular, the proportional size as well as the trend of youth population is of vital importance.
- From Global point of view: the world now hosts ever largest young people: aged between 10 to 24 and in many countries of the world, the proportion of youth to the population is also showing a rising trend (UNFPA, 2014)



Background Contd.

- Context of Bangladesh (LFS, 2013): Within the age group of 15 to 29 years, there was around 43.4 million people.
- Youth population consisted of around 28 percent of total population of the country.
- This rise in youth population has been reflected in the trend of youth labor force

Year	Youth Labor Force (15 – 29 Years), Source: LFS, 2013
2002 - 03	19 Million
2013	23.4 Million

- This increased youth labor force if coupled with essential education and skill then it could turn into a vital factor for Bangladesh economy.
- Against this backdrop, this paper utilized time series data of Bangladesh and attempted to understand the long run effect of proportional increase in youth population of the growth of gross domestic product of the country.

Review of Existing Literatures

Paper	Data and Area/Countrty	Methodology and Estimation	Findings
Thuku et al. (2013)	Time Series Data, Kenya	VAR Model	Positive relationship between population growth and economic growth
Roudi (2011)	Middle East and North Africa	Descriptive and Graphical Analysis	Proper balance between social safety net programs and market mechanisms to utilize youth population
Iqbal (2015)	Time Series (1974 – 2011), Pakistan	ARDL Bound Testing and Cointegration Approach	Positive and significant impact of working age population on economic growth
Nakibullah (1998)	Time Series (1959 – 90), Bangladesh	VAR Model and Granger Causality	For Bangladesh Per Capita Real GDP Granger cause population growth but reverse causality was not found to be valid. Population growth thus can be treated as endogenous.
Ali et al. (2015)	Time Series (1981 – 2014), Bangladesh	Simple Growth Model, OLS	Negative impact of Population Growth on Economic Development
Ashford (2007)	Sub – Saharan Africa	Comparative Analysis and Projections	Emphasized on Schooling, Prevention of Early Marriage, Family Planning Programs to reap the benefits of increased youth population

Data and Methodology

- Purpose: Estimating the long run impact of proportional increase in youth population on the Growth of GDP
- Data Duration: Time Series – 1972 to 2014, (WDI, World Bank)
- A simple growth model with human capital as well as physical capital being the key factors of growth has been estimated.

Variable	Description
GDPG	Growth of Real GDP
GDPSPSE	GDP share of public spending on education
SGER	Secondary gross enrolment rate
GDPSGFCF	GDP share of gross fixed capital formation
GDPSTRADE	GDP share of trade
RYP	Proportion of youths in total population

Data and Methodology Contd.

- ***Identification of Integration Order of the Variables:*** In particular, the following test regression has been estimated for each of the variables for testing the stationarity following Augmented Dickey Fuller (ADF) test procedure :

$$\Delta y_t = \alpha y_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta y_{t-i} + x_t' \delta + u_t$$

$$H_0: \alpha = 0 \text{ implies } \rho = 1, y_t \text{ is Non Stationary}$$

$$H_1: \alpha < 0 \; implies \; |\rho| < 1$$

- ***Selection of Lag Length:*** Selection of suitable lag length is important because introducing too many lags is argued to waste degrees of freedom, while too few lags might lead to the problem of misspecfication and is likely to cause autocorrelation in the residuals. Here, the appropriate lag length was selected using a multivariate version of BIC and AIC.

$$BIC(p) = \ln\left(\det\left(\widehat{\Sigma}\right)\right) + \frac{k(kp+1)\ln(T)}{T}$$

Data and Methodology Contd.

- ***Johansen Cointegration Test (Johansen, 1988):*** Widely used for the presence of multiple cointegrating vectors and for the speed of adjustment parameter. It relies on the relationship between rank of a matrix and its characteristic roots. Consider the following generalization:

$$y_t = A_0 + A_1 y_{t-1} + \varepsilon_t$$

- It can be expressed in difference form as follows:

$$\Delta y_t = A_0 + \pi y_{t-1} + \varepsilon_t$$

- By allowing for higher order auto regressive process the above model can be written as:

$$\Delta y_t = A_0 + \pi y_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta y_{t-i} + \varepsilon_t$$

- In the above process we will be focusing on the estimate of autoregressive coefficient and its corresponding characteristics roots. For performing the test following two test statistics is used:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1})$$

Summary Statistics of the Key Variables

Table 1: Summary Statistics of Key Variables

Year	GDPG		RYP		Correlation (P – Value)
	Mean	Std. Deviation	Mean	Std. Deviation	
1972 – 80	1.764	7.070	23.388	0.437	-0.477(0.193)
1981 – 90	4.021	1.549	26.984	1.453	-0.292(0.411)
1991 – 2000	4.680	0.624	29.024	0.139	0.443(0.198)
2001 – 10	5.578	0.994	29.472	0.129	0.708*(0.021)
2011 – 14	6.265	0.264	28.977	0.169	0.840(0.160)
1972 - 2014	4.273	3.538	27.469	2.423	0.336*(0.027)

Note: * indicates 5 percent level of significance

- During early years average GDPG was low with a high standard deviation. The correlation among GDPG and RYP found to be negative and insignificant when sub samples has been considered.
- Average GDPG was increasing along with its consistency and the correlation coefficient turned out to become positive during 1990s.
- When the overall sample has been considered the correlation among these two variables has been found to be positive and significant.
- Thus, our descriptive statistics therefore provides evidence of plausible positive impact of proportional increase in youth population in economic growth for Bangladesh- the impact of change in RYP on GDPG could be considered as a long run phenomena for Bangladesh.

Estimation Results: Stationarity Check

Table A1: ADF Test for Checking Stationarity

ADF Test Results, Null Hypothesis: Series Contains a Unit Root									
Variables	**None**			**Constant**			**Constant and Trend**		
	Test Statistic	**P**	**Stationarity**	**Test Statistic**	**P**	**Stationarity**	**Test Statistic**	**P**	**Stationarity**
GDPG	0.458	0.80	Non Stationary	-1.038	0.72	Non Stationary	-12.837*	0.00	Stationary
D(GDPG)	-3.809*	0.00	Stationarity: I(1)	-3.786*	0.00	Stationarity: I(1)	-3.644**	0.03	Stationary
GDPSPSE	-0.59	0.45	Non Stationary	-0.993	0.74	Non Stationary	-0.98	0.93	Non Stationary
D(GDPSPSE)	-5.453*	0.00	Stationarity: I(1)	-5.418*	0.00	Stationarity: I(1)	-5.381*	0.00	Stationarity: I(1)
SGER	1.789	0.98	Non Stationary	0.244	0.97	Non Stationary	-2.972	0.15	Non Stationary
D(SGER)	-2.991*	0.00	Stationarity: I(1)	-3.587*	0.01	Stationarity: I(1)	-3.787**	0.02	Stationarity: I(1)
GDPSGFCF	4.336	1.00	Non Stationary	-1.333	0.60	Non Stationary	-2.378	0.38	Non Stationary
D(GDPSGFCF)	-3.370*	0.00	Stationarity: I(1)	-4.697*	0.00	Stationarity: I(1)	-4.727*	0.00	Stationarity: I(1)
GDPSTRADE	0.941	0.90	Non Stationary	-0.504	0.88	Non Stationary	-2.454	0.34	Non Stationary
D(GDPSTRADE)	-7.186*	0.00	Stationarity: I(1)	-7.544*	0.00	Stationarity: I(1)	-7.636*	0.00	Stationarity: I(1)
RYP	0.767	0.87	Non Stationary	-3.704*	0.00	Stationary	-1.419	0.83	Non Stationary
D(RYP)	-1.720***	0.08	Stationarity: I(1)	-1.995	0.28	Non Stationary	-5.590*	0.00	Stationarity: I(1)

Note: * indicates one percent level of significance, ** indicates five percent level of significance and *** indicates ten percent level of significance.

Lag Selection

Table A2: VAR Lag Structure Selection

Lag	AIC	BIC
Endogenous Variables: GDPG, RYP, GDPSGFCF, GDPSPSE, GDPSTRADE, SGER		
0	24.009	24.265
1	11.239	13.031
2	9.072	12.399*
3	8.670	13.533
4	6.980*	13.379

Note: * Indicates Lag Order selected by the respective criterion

Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
Unrestricted Cointegration Rank Test (Trace)				
None*	0.6722	147.419	95.753	0.000
At most 1*	0.6114	102.800	69.818	0.000
At most 2*	0.5445	64.986	47.856	0.000
At most 3*	0.4001	33.525	29.797	0.017
At most 4	0.2640	13.083	15.494	0.111

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values

Hypothesized No. of CE(s)	Eigenvalue	Max - Eigen Statistic	0.05 Critical Value	Prob.**
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
None *	0.6722	44.618	40.077	0.014
At most 1*	0.6114	37.814	33.876	0.016
At most 2*	0.5445	31.460	27.584	0.015
At most 3	0.4001	20.441	21.131	0.062
At most 4	0.2640	12.261	14.264	0.101

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values

Cointegrating Vector: Long run Relationship

Cointegrating Equation: Long Run Coefficients						
GDPG	**RYP**	**GDPSGFCF**	**GDPSPSE**	**GDPSTRADE**	**SGER**	**Constant**
1.000	-0.431**	0.784*	-1.648**	-0.338*	-0.087	6.387
	(0.193)	(0.201)	(0.614)	(0.068)	(0.045)	-

Note: * indicates one percent level of significance, ** indicates five percent level of significance. Standard Errors are in Parenthesis

- The long run coefficient attached with RYP is significant at 5 per cent level implying that there exists a long run equilibrium relationship between RYP and GDPG.
- The long run impact of GDPSTRADE, GDPSPSE is found to be significant with proper sign. Most importantly the impact of GDPSPSE was found to be more than others implying the importance of investment in human capital from govt. perspective.
- Nevertheless, the long run impact of SGER was observed to be insignificant although the sign was proper and that of GDPSGFCF was significant with an opposite sign.

Post Estimation Diagnostic Results

Table A3: Testing for residual autocorrelation in VECM

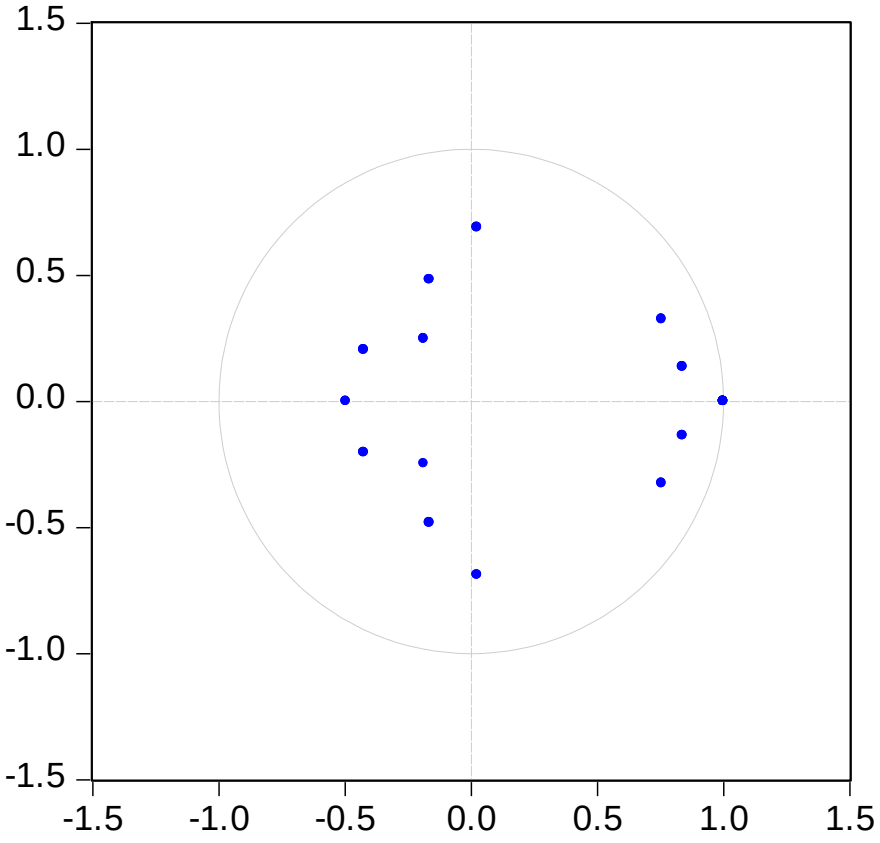
Lag Order (h)	Q – Stat.	Prob.
Null Hypothesis: No Residual Autocorrelation up to lag h		
1	9.294	-
2	39.364	-
3	71.930	0.288
4	99.425	0.553
5	131.491	0.639
6	166.210	0.651
7	190.735	0.825
8	215.769	0.918
9	245.773	0.941
10	271.861	0.971

Table A4: LM test of VECM residuals

Test Statistic (χ^2)	Prob.
Null Hypothesis: No Heteroscedasticity in VECM Residuals	
520.349	0.778

Post Estimation Diagnostic Results

Figure A1: Plot of inverse AR roots in VECM



Conclusion and Recommendations

- In case of Bangladesh, an increase in the proportional share of youth population to total population in the long run tends to have a positive and significant impact on economic growth.
- We should however keep in mind that, for integrating and utilizing the youth population in the growth process of the country requires increased investment in education and skill development program and to carefully plan and strategize in favor of it.
- Given that a significant percentage of youth work force of Bangladesh possesses no education with a very small percentage holds university degree, it is of paramount importance for upgrading the education level of the youth. In terms of technical and vocational training, similar scenario can be found, which requires similar policy focus too.
- Budgetary spending on education should be increased
- Quality assessment is fundamental in education and skill development
- Initiatives for youth development involves a number of ministries. Effective coordination across the relevant personnel is critical in this regard for timely and efficient implementation of government programmes.

Thanks for your Concentration