

Impact of Demographic Transition on the Trade Balance of Pakistan: An Econometric Analysis

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Abstract

This study investigated whether a stable long run relationship exists between demographic transition and trade deficit in Pakistan over the period 1981 to 2012. Trade balance is defined as the difference between exports and imports of goods and services. To achieve this objective, Augmented Dickey Fuller unit root test is applied in order to determine the integrated order of the selected variables. Engel Granger cointegration technique is employed to estimate the long run equilibrium relationship as all the variables have same integration order. Different diagnostics such as Ramsey RESET test and stability tests such as CUSUM and CUSUMSQ are applied to test the model specification and stability of estimated model. The estimation and stability tests results suggest that there exists stable long run relationship between trade deficit and its determinants in Pakistan. Population growth, Term of Trade are the main determinants of money demand behavior in Pakistan. This results of the study are useful for public policy as well as fiscal policy. Pakistan economy thus demands for pro public policies in the economy to have political, social and economic stability in the country.

1. Introduction

Demographic transition refers to the situation when a country experiences modernization progress from pre-modern regime of high fertility and mortality rates to post-modern one in which both fertility and mortality rates are low³. This phenomenon changes the age composition in which the proportion of children falls and a sharp increase in the proportion of adult working age population (15-64) is experienced (Dudley Kirk, 2012). This phenomenon changes the age composition in which the proportion of children falls and a sharp increase in the proportion of adult working age population (15-64) is experienced. Rapid population growth of 2 percent per annum on average in last decade, highest in the region, has made it difficult to achieve UN Millennium Development Goals. The total population of Pakistan has reached 184.35 million in 2013. Now Pakistan has become the sixth populous country in the world and it is being expected that it will be a fifth most populous country of the world in 2050 (Economic survey of Pakistan 2012-13). The population of Pakistan is multiplying but the change in age composition has provided it a window of opportunity, Demographic Dividend or Demographic Bonus, to take the advantage of it for economic development. In Pakistan almost two third of population is of working age and one third consists of youth. The median age of population in Pakistan is 22 years, so Pakistan is a young country. Pakistan has this opportunity period from 1990 to 2045 but 23 years have been wasted as this dividend cannot be availed without efficient public policies, markets and institutional reforms. The fundamental economic factors which are very important for the future prediction of world trade and economic growth are demography, investment, advancement in technology, trade cost and institutional reforms. The developments in these factors play the main role in reshaping the pattern of international trade (World Trade Report, 2013).

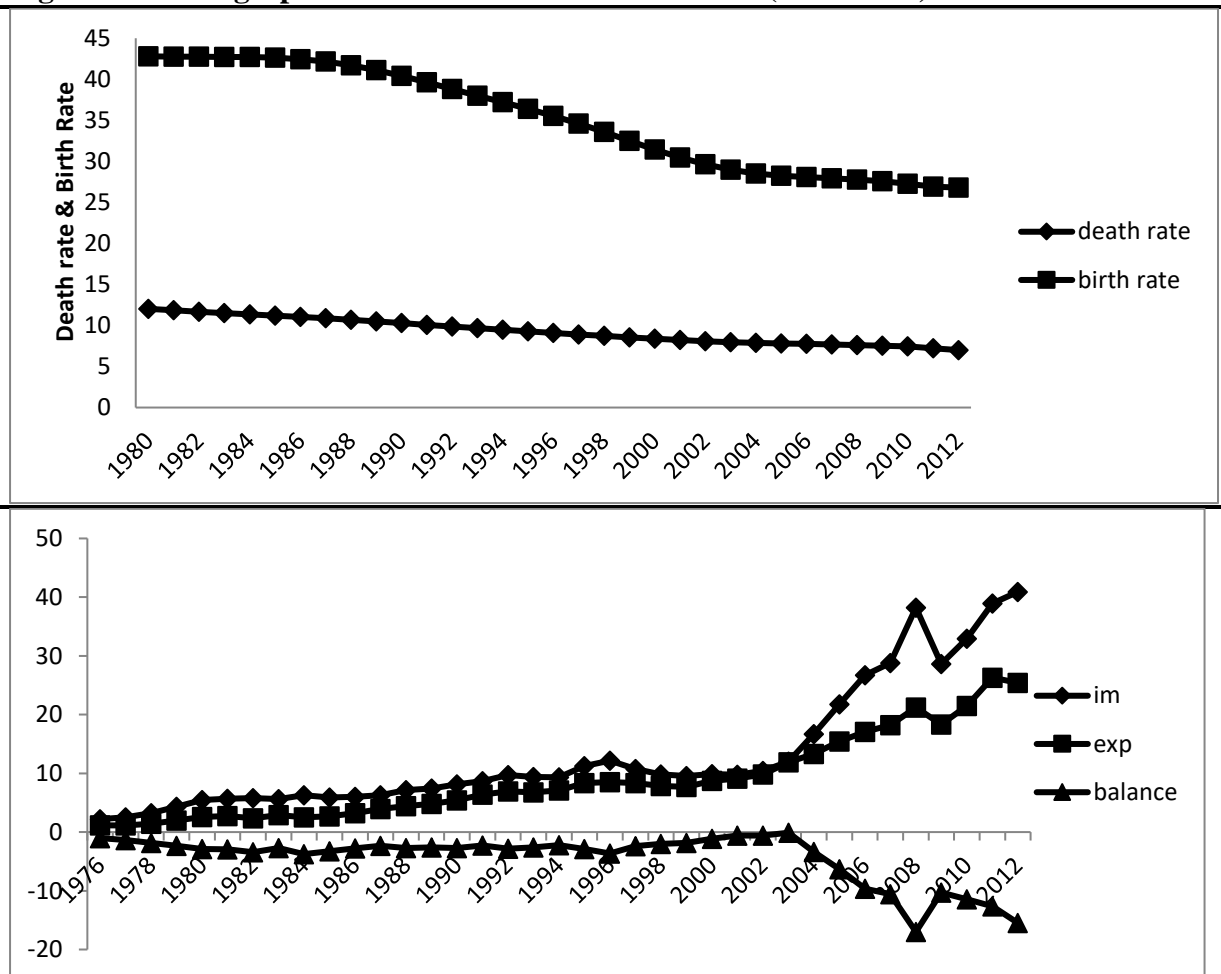
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³ The number of births a woman can have during her child bearing years (i.e. a woman of age 15-49 years) or fecundity in a given society is called TFR while MR or CDR is defined as the total number of death per 1000 persons in a year (PDS, 2007).

Demographic transitions affect international trade through following two channels, (a) Competitiveness and (b) Import demands and Increase in the working age population and labor force which results the increase in labor force participation rate. The higher proportion of working age in the population affects trade by the higher earning which in turn demand more imports. The higher working can provide cheaper labor force to enhance competitiveness and exports. The more the working age population, the more will be the production and exports. There is a positive link between demographic transition and international trade. Importing countries with higher working age proportion will earn more income which increase imports. The capital flows towards the economies which have relatively higher proportion of working age population because of competitiveness (Bloom, Canning & Fink, 2008; Reher, 2008; Yao, 2010; Lee et al., 2008; and Choudhary, and Elhorst 2010).

Figure- 1: Demographic Transition and Trade Balance (% of GDP) in Pakistan



Source: WDI, World Bank (2013)

Trade balance is surplus when a country exports more than its imports and is deficit when the country imports more than its exports. Trade deficit not only stops economic growth but also affect asset position. Exports in Pakistan have some problems which are necessary to solve them to make them productive for the economy and to earn foreign reserves for the development. In the modern competitive world, no one can deny the importance of the fact of the “cost leadership strategy” for the successful exports promotion. Unless we lower the cost of production, every strategy to boost the exports is useless. Pakistani exports are not competitive to maintain their place in international market, for example Pakistan has to face

hard competition in the exports of cotton related products from India and Bangladesh. They are better in quality and competitive in price. Pakistan is experiencing demographic transition from the last 23 years and it will be continued till 2045 (Economic Survey 2011-12). Pakistan is facing consistent trade deficit in last several decades approaching to US \$ 15 bn in 2013. Among several factors affecting exports, imports and trade balance of Pakistan demographic transition is prominent factor generally neglected in the empirically literature on the issue for Pakistan. This study intends to fill the gap in literature by investigating the impact of demographic transition by using time series data from 1981 to 2012.

2. Literature Review

Age composition is very important for the economic performance of the country because different individuals have different economic behavior at different stages of life. The country with more proportion of children in the total population spends more of their resources to their care (food, health, education etc.) which will depress the economic performance of the economy and ultimately the economic growth. Similarly, the higher old dependency ratio puts same impact on the economy as the higher child dependency ratio. With more proportion of working age in the total population, a country can experience demographic dividend through increase in labor supply, savings and human capital by making efficient use of public policies and with flexible labor market. The recent literature also shows that demography is also the fundamental economic factor with other factors to reshape the position of external sector through competitiveness, import demand, and savings channels.

Choudhary, and Elhorst, (2010) estimated the impact of demographic transition on economic growth in Pakistan, India and China. The study concluded that trade balance influenced economic growth in 46 % in China, 39 % in India and 25 % in Pakistan. Lee et al. (2008) found a negative relationship between dependency ratio and current account balance. When the old dependency ratio increases, there is decline in labor supply which leads to increase the cost of labor. Because of scarce labor, the return on capital falls that leads fall in investment. The capital flows towards the economies which have relatively higher proportion of working age population. Jaffri (2012) by applying Autoregressive Distributive Lag (ARDL) approach of the co integration for the period of 1984-2010 found the impact of population growth on the current account of Pakistan and concluded that there is negative and significant relationship in the population growth and current account balance in the long run in Pakistan. Gries and Grundmann (2011) found asymmetric effect of trade on the fertility rate of developed and developing countries and their positive or negative relationship depends on the export structure. When they regress fertility on the export of manufacturing and primary sector, a negative impact of high skilled sector on fertility while no impact or positive impact of trade on fertility rate was found for developing economies. Yao (2010) estimated the effect of demographic transition on the export led growth for China for the period 1978 to 2008. China made some structural reforms. Double transition of ten to fifteen years (demographic transition and structural changes) is the basis of export led growth of China. The double transition is also the reason of imbalances in the economy in the shape of low wage rate, decreasing share of consumption in GDP and the gain from trade in the shape of capital return and government taxes. Imbalances will be worsened due to aging in 2040. Narciso (2010) found a negative relationship between demographic factor that is old age dependency ratio and capital inflows that is FDI and FPI. This demographic change would generate differential in the expected rate of return and the expectations about future would change the investment decisions in favor of the country that have relatively young population. This phenomenon can lead to higher capital movement from developed countries to developing countries. Cook (2005) found that population aging does not have appreciable or noticeable effect on the current account balance. Claude (2010) found the effect of aging on capital

inflows by employing life cycle theory and overlapping generation model. He concluded that the aging will lead to decrease in aggregate savings as well as decline in the domestic demand and this process leads to run current account surplus. Afzal (2009) used the data on population growth and economic development of Pakistan from 1981 to 2005 to find the relationship between them. The study used multivariate analyses and found that there is highly significant and negative coefficient of population growth effect on economic development in Pakistan. The above literature shows that demographic transition has important macroeconomic implications for the economy. The earlier literature mostly showed positive as well as negative impact of demographic transition on the external sector on the economy.

3. Research Methodology

There are many factors which determine the exports performance and imports and they are demand side and supply side factors. The used model has both demand and supply factors. The model which is being followed is an augmentation of Paulino and Thirlwall (2004) and Lopez (2004);

$$TB_t = B_0 + B_1RER_t + B_2YF_t + B_3YD_{t-1} + B_4TOT_t + B_5PG_t + B_6D_t + \varepsilon_T \dots \dots \dots (1)$$

Where RER is real exchange rate; YF is foreign income; YD is domestic income; TOT is terms of trade; PG is population growth to capture demographic transition; D is dummy variable to capture the effects of global financial crisis of 2008 and ε_t is the error term. The discussion on the determinants of trade balance in Pakistan is here in the following sections.

Demographic transitions and Trade Balance: The economic rationale is straightforward for the “scale effect”, that is the exporter country with higher population higher working-age ratios lead to more labor supply, and thus higher output, so it exports more; for the importer country, higher working-age ratio simply higher income so it imports more. Thus there is negative effect of population growth on trade balance (Galor and Mountford, 2008).

Terms of trade and Trade Balance: The term of trade is expressed as the ratio of price index of export to the price index of imports and it is multiplied by 100 to express in percentage form (Salvatore). There is a significant impact of change in terms of trade on the economies of the developed countries because their exports have major share of commodities product in exports Fatima (2010).

Domestic Income and Trade Balance: The economic growth or the expansion in the economy increases demand for domestic and foreign products. Therefore, there is need to invest more to meet the rising demand but the investment in developing economies always depend on imports of intermediate and capital goods so this phenomenon worsen the trade balance Falak (2008). Since the relatively higher elasticity of income in developing countries is not a surprise. This would raise the demand for consumer goods as well as capital goods that leads to trade deficit in these countries (Sulaiman, 2010).

World income and Trade Balance:

Zada, Mhammad, and Bahadar (2010) estimated the determinants of exports of Pakistan. The demand side factors like world GDP, real exchange rate and world price are the main determinants of exports of Pakistan. Demand side factors are more important than supply side factors in the case of Pakistan and this is because of higher price and world income elasticity of exports demand.

4. Results and Discussions

This section comprises of two parts as first integration orders are decided on the basis of panel unit roots analysis and then the estimates are determined in the impact analysis.

Unit Root Tests

The results and findings of unit root tests (DFGLS) on the selected variables are given.⁴ This section also presents results and the findings the OLS approach to Cointegration, long run estimates of the selected variables, short run estimates in the form of error correction model and other short run diagnostic tests for autocorrelation, heteroskedasticity and model misspecification. Most of the macroeconomic time series are trended (non-stationary) at levels which mean these series have changing mean and variance while these series become stationary at 1st difference. Therefore in order to check the stationary status of the variables entering the model, all the variables are examined for determining their order of integration. Lag order is selected on the basis of Akaike Information Criteria (AIC) for all variables.

Table-1: Results of Unit Root(DFGLS Unit Root Test)

Variables	At Level		At First Difference		Decision
	With intercept	With intercept and Trend	With intercept	With intercept and Trend	
PG	-1.421038(3)	-3.03(1)	-3.088(2)**	-3.29(2)*	I(1)
TOT	-1.159777(0)	-2.19(0)	-5.69(0)***	-5.62(0)***	(1)
FY	2.193723(0)	-0.52(0)	-4.233(0)***	-5.02(0)***	I(1)
GDP	5.752634(0)	-2.19(0)	-2.798(0)**	-4.76(0)***	I(1)
TB	-2.084680(0)	-1.69(0)	-6.86(0)***	-2.98(0)*	I(1)

All the 1st difference variables seem to reject the null hypothesis of unit root at 1% level of significance as reported in above table. Therefore it is concluded that all the variables are of integrated order 1 i-e I(1) at 1% level of significance. All the variables are I(1) which fulfills first requirement of applying Engle Granger co integration technique.

Long Run Estimates

Table-2 : Long Run Coefficients using the Cointegration Approach DV: TB

Regressors	Coefficient Estimates	Standard Error	T-Ratios	Probability
C	-1.909575	6.491724	-0.294155	0.7709
PG	7.650888	2.081875	3.674999	0.0010
TOT	-0.112704	0.033469	-3.367378	0.0023
FY	-6.57E-08	1.84E-07	-0.356370	0.7243

⁴ Eviews 6 software is used to accomplish the task.

GDP	3.16E-05	4.84E-05	0.651947	0.5199
DUM2008	3.859758	1.971235	1.958040	0.0606
R ²	0.773798	Akaike info criterion	4.088572	
Adjusted R ²	0.731908	Schwarz info. criterion	4.360664	
F-Statistics	5.77E-08	Hannan-Quinn criterion.	1.255038	
Stationarity of Residual	With Intercept	ADF= -4.30(4)	Prob.= 0.002	
	With intercept and Trend	ADF= -4.337(4)	Prob.= 0.009	

These results show that variables are cointegrated and have long term relationship and error correction equation confirms this long term relationship. To measure the effect demographic transition on trade balances population growth rate is used. The earlier literature shows positive as well as negative impact of higher working age population on trade balance. Pakistan is in third stage of demographic transition where population growth rate is decreasing and the working age population is increasing 2 percent per annum (Economic Survey of Pakistan- 2013). The coefficient of population growth is positive and statistically significant indicating the strong positive effect on the trade deficit in Pakistan which is opposite to the literature. The positive sign indicates the actual position of Pakistan that is the incompetent population, low level of human capital, agricultural exports having low value, imports of petroleum products, machinery, fertilizers and also the unsuccessful public policies. The population growth is significant at 1% level of significance. The P-value of ADF unit root test applied on the residual confirmed the long run relationship.

Error Correction Model

The estimates of error correction (ECM) representation associated with the above long run relationship based on OLS model is reported in the following table 4.8. As the estimated lagged error correction term is negative and highly significant thus supporting the long run relationship among the variables of the model. The estimated value of the equilibrium correction coefficient is -0.585106 which is significant at 1% level of significance and implies a reasonable speed of adjustment to the equilibrium level. The estimated value of the equilibrium correction coefficient indicates that -58.51% . It shows that in one year 58.5% deviation of actual series TDGDP from its long term path is removed.

Regressors	Coefficient Estimates	Standard Error	T-Ratios	T-Probability
C	-0.537869	0.433988	-1.239365	0.2272
ECM(-1)	-0.585106	0.192512	-3.039323	0.0057
DTOT	-0.072619	0.031226	-2.325595	0.0288
DPG	4.508150	3.369049	1.338108	0.1934

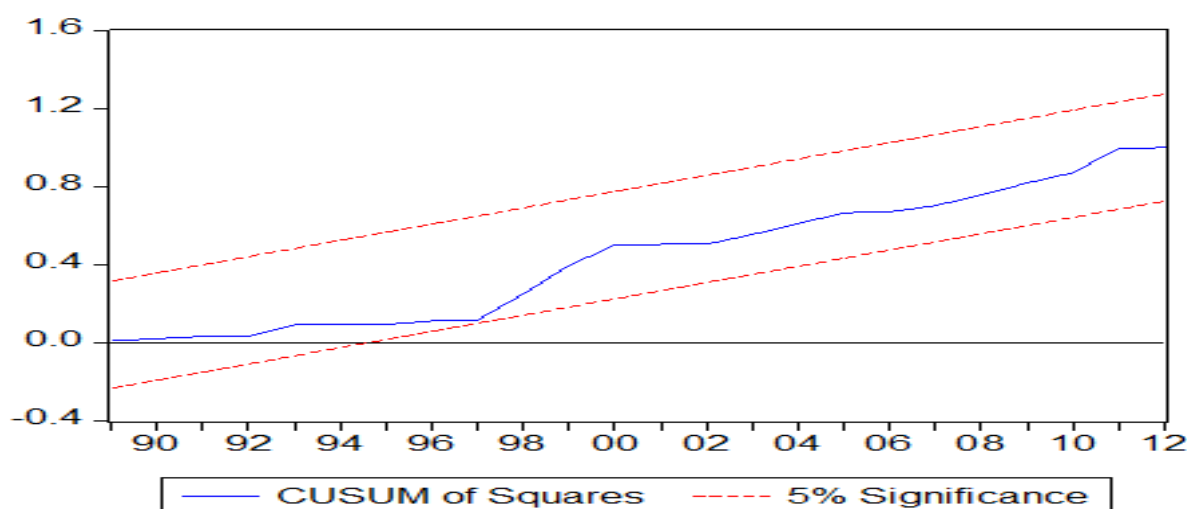
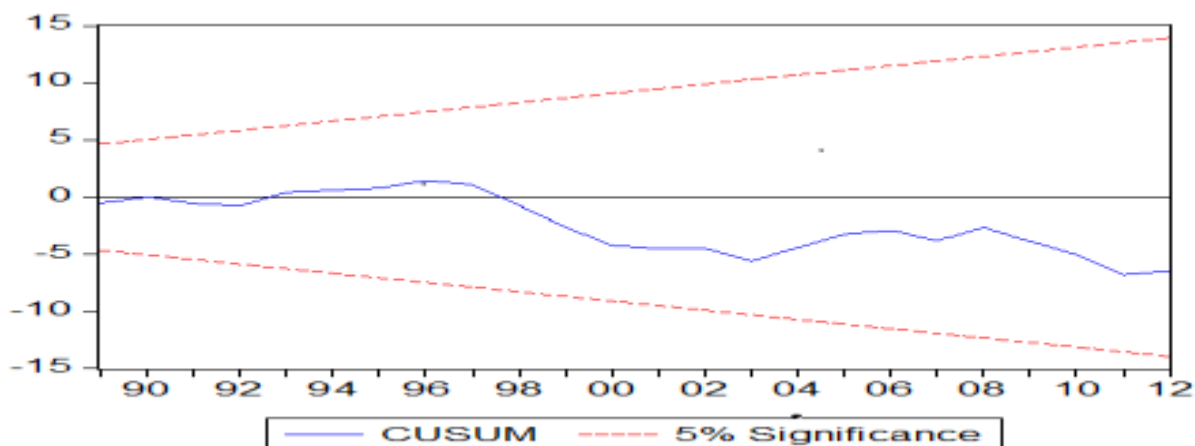
DWGDP	2.93E-07	1.36E-07	2.155470	0.0414
DTDGDP(-2)	0.496897	0.164850	3.014236	0.0060
R-squared	0.514125	F-statistic	0.002575	

Short Run Diagnostic Tests

Both Breusch-Godfrey Serial Correlation LM and ARCH LM tests are meant for to check the presence of serial correlation. Breusch-Godfrey Serial Correlation LM examined the presence of serial correlation in the error terms of the regression model while ARCH LM test investigate the presence of serial correlation in the variance of error terms. The results of these tests indicated the absence of serial correlation in the model. White Test is also a Langrage Multiplier (LM) test and it is more general test to examine the presence of Heteroskedasticity in the regression model. The results of the test showed that the p- value is very high than the level of significance (usually $\alpha=0.05$), therefore the null of presence of Heteroskedasticity is rejected in the present case. Ramsey's RESET test for functional form confirms that there is no specification problem in the short run model and therefore it is concluded that the model is well specified.

Tests	F-statistic	P-Value	Decision
Breusch-Godfrey Serial Correlation LM Test	0.433235	0.653822	No Serial Correlation
ARCH LM Test:	2.393876	0.111887	
White Heteroskedasticity Test	0.905909	0.596555	No Heteroskedasticity
Ramsay RESET Test	0.705406	0.504741	No Mis-specification

In this study CUSUM and CUSUMSQ tests by Brown et, al. (1975) are employed in order to test the stability of the present model. The test concludes with parameter instability if the graph of cumulative sum goes outside the area between the two critical lines. Figure (1) shows the graph of CUSUM and CUSUMSQ statistic with relevant standard errors. It is clear from the figure that the estimated error correction model found to be stable in terms of CUSUM as the graph lies within the critical boundaries.



5. Conclusion and Recommendations

This study has attempted to empirically determine whether there exists a long-run relationship between demographic transition and trade gap or deficit trade balance in Pakistan over the period 1981 to 2012. To achieve the objectives of the study, Engel Granger Approach to Cointegration is employed to estimate the cointegration relationships between the trade deficit and its determinants. In order to find the integrated order of the time series variables efficient unit root tests such as DFGLS unit root test is employed. All the variables are found to be integrated of order one at 1% level of significance. The demographic transition is proxied by population growth Rate and the estimated coefficient carries positive sign as which is not unexpected. The population growth rate is significant at 1% level of significance. Its estimated coefficient is equal to 4.508150. The error correction regression associated with the long run relationship based on the OLS approach shows that the estimated lagged equilibrium correction term is negative and highly significant. Therefore this result clearly supports the Cointegration among the selected variables. The estimated coefficient of this feedback parameter is -0.5851 which suggests that when TD exceeds its long run relationship with TOT, PG, WGDP, GDP, adjustment towards long run equilibrium takes place by about 58.51% in the first year after disequilibrium. In summary the estimation and stability test results show that there exists stable long run trade deficit function of demographic transition in Pakistan. Term of trade and population growth are the main determinants of trade gap in Pakistan economy thus indication of long term pro public policies in the form of increasing female labour force participation rate, entrepreneurial skill enhancement program, vocational training, financial empowerment and social awareness to accept women as playing their role in the economic activity.

References

- Ashok, P., and Corneliu, S. (2004). Relationship between Trade Liberalization, Economic Growth and Trade Balance: An Econometric Investigation.
- Afzal M. (2009). Population Growth and Economic Development in Pakistan. *The Open Demography Journal*, 2, 1-7.
- Bloom D. E, Canning D Fink, (2011). ‘Implications of population aging for economic growth’. PGDA Working Paper No.64.
- Choudhary, T.M., and Elhorst, P.J. (2010). Demographic Transition and Economic Growth in China and Pakistan. *Economic System*, 34(3) 218-236
- Claude, J.C. (2010). "Demographic Transition Patterns and their Impact on the Age Structure". *Population and Development Review* 16 (2), 327–336.
- Cook C. (2005) Population growth and savings rates: Some new cross-country estimates, *International Review of Applied Economics*, 19(3), 301-319.
- Fatima, N. (2010). Analysing the Terms of Trade Effect for Pakistan. *Pakistan Institute of Development Economics, Islamabad PIDE Working Papers 2010: 59*
- Falk, M. (2008). Determinants of the Trade Balance in Industrialized Countries, FIW-Research Reports, No. 013, FIW - Research Centre International Economics, Vienna
- Galor, O., and Mountford, A. (2008). Trading Population for Productivity: Theory and Evidence. *Review of Economic Studies*, 75(4), 1143-1179.
- Gries, T., & Grundmann, R. (2014). Trade and fertility in the developing world: The impact of trade and trade structure. *Journal of Population Economics*, 27(4), 1165-1186
- Jaffri, A.A., Tanveer., Rooma., and Isma. (2012). "Impact of Population Growth on Current Account Balance of Pakistan". *Journal of Managerial Sciences*, 188 (2).
- Kirk, D. (1996). “Demographic Transition Theory”. *Population Studies* 50 (3) 361-387.
- Lee, J., Ostry, J.D., Milesi-Ferretti, G.M., Ricci, L.A., and Prati, A. (2008), "Exchange rate assessments: CGER methodologies", IMF Occasional Paper 261.
- Ministry of Finance, Government of Pakistan. (2013). *Economic survey of Pakistan*. . Islamabad: Economic Advisor's Wing, Ministry of Finance.
- Ministry of Finance, Government of Pakistan. (2012). *Economic survey of Pakistan*. . Islamabad: Economic Advisor's Wing, Ministry of Finance.
- Narciso A. (2010). The Impact of Population Ageing on International Capital Flows.
- Pacheco-López, P., and Thirlwall, A.P. (2005). “Trade Liberalisation, the Balance of Payments and Growth in Latin America”.
- Paulino, and Thirlwal (2004). “Trade Liberalization and Economic Performance in Developing Economies”. *The Economic Journal Volume 114 (493). Global Economic Paper, No 202*
- Reher, D. (2009). The Economic and Social Implications of Demographic Transition. *Prepared for international workshop on “The Long Term Economic Implication of Demographic Transition”*. *Journal of commerce*, 1(1)
- Sulaiman M. (2010) Determinant of Balance of Trade: Case Study of Pakistan. *European Journal of Scientific Research*, Vol. 41 (1) 13-20,
- Yang Yao, Y. (2010). The Double Transition and China’s Export-led Growth. *China Center for Economic Research (CCER) & National School of Development (NSD) Peking University, China*.
- World Bank. (2019). *World trade Report, Fall 2013 - Globalization Backlash*. Washington DC: The World Bank.
- Zada, N., Mhammad, M., and Bahadar, K. (2010). Determinants of Exports of Pakistan A Country-wise Disaggregated Analysis.