Decomposition of Growth Quality in the Islamic Republic of Iran during the Period 1971-2013

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Abstract

Growth quality index (QGI) is affected by two sets of structural and social composite indicators. Structural indicator contributes to achieve the main target of sound, sustainable, and competitive output growth. By the way, the sound output growth should enhance social public services and living standard. Although QGIs are computed based on different scenarios, the trend of the QGIs and coefficient of variation of the QGIs indicate the robustness of the results. The Correlation among QGI and social sub-components highlights a positive relationship between QGI and school enrollment, per capita income and public spending on education and health. The result of cointegration model indicates that higher government size and devaluation of local currency have evidently exacerbated QGI. Meanwhile, openness and inflation underscore the positive long-run impact over QGI. Furthermore, vector error correction equation outlines that about 84 percent of a short-term shock to the cointegrating vector will be absorbed in the first period. In this context, the impulse response of the QGI to the exchange rate and government size shocks are diminishingly and negatively permanent while the response of the QGI to the shocks of openness is significantly and positively permanent.

JEL Classification Numbers: O40, O55, I10, I20, I32

Keywords: Quality of growth, Structural indicators, Social indicators

1. Introduction

Growth quality which is evidently influenced by the social and structural components can be gradually improved by the sound policy arrangement and macroeconomic stability. Structural components are able to enhance the growth quality through different channels including diversification of output, convergence to the global economy, strengthening of growth as well as growth stability and solidarity. In this context, social indicators should also be improved while the output is getting better. Life expectancy, income inequality and public spending on education and health, which are positively recognized as the growth externalities, should experimentally be enhanced to achieve the main target of the sound growth quality. Living standard, infant mortality and school enrollment are the other social indicators which are

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expected to influence at the same time. External sustainability along with price stability is also crucial to the success of the social targets. Anyway, the growth should be basically accompanied by a better social spillover and solid structural fundamentals.

Long-run sustainable growth is basically expected to enhance targeted public services and social indicators (Todaro, 1994). In this regard, although Thomas et al. (2000) highlighted the increasing importance of improving governance, managing risks, sustaining natural resources and investing over public service as crucial steps to build up growth quality, there are also a group of academic and comprehensive literature over the requirements of sustainable growth based on the solid fundamentals (Dollar et al., 2013). In this study, the quality of growth is historically considered based on two groups of social and fundamental sub-components. Meanwhile, the impact of macroeconomic performance indicators over the growth quality index is technically examined for 4 decades.

The remainder of the paper is structured as follows. The next section introduces an overview over the literature. The technical approaches and macro indicators which are applied to calculate the growth quality are discussed in the third section. The data reference and period of study are explained in the fourth section. .Finally, analysis, results and concluding remarks are given in the last two sections.

2. Literature Review

Sustainable noninflationary growth is the main goal in the macroeconomic environment which is affected by the fundamental indicators including output stability, solidarity, diversification, strengthening as well as competitiveness. Social indicators which are presumably expected to be influenced by the output growth should also be driven by the sound income distribution, life expectancy, job opportunities as well as higher ratio of public health and education expenditures to GDP (Gable, 2012; Schultz, 1999). In this regard, two sets of the structural and social indicators contributed to explain the quality of growth. Meanwhile, demand decomposition, sectorial TFP, engine of growth should also be broad-based to enhance the growth quality resiliency against cyclical temporary shocks (Papageorgiou and Spatafora, 2012). Thus, different aspects of growth quality are materialized into a composite indicator which is noted as Quality Growth Index (QGI). An inclusive QGI should necessarily be based on reliable, structural achievements and social oriented goals. Although sustainable and competitive noninflationary growth has a crucial role in the improvement of the social development, it doesn't necessarily lead to the poverty reduction and income equality. Studies have historically indicated that prudent macroeconomic policy, efficient institutional capacity and targeted social spending along with growth stability can contribute to the reduction of unemployment, inequality and poverty (Dollar et al., 2013; Stern et al., 2014). Ultimately, sound output growth and QGI should gradually be associated with the better social welfare and living standard as it was evidently observed in Sub-Saharan Africa (Martinez and Mlachila, 2013).

Although two sets of social and structural indicators technically contribute to compute QGI, there is also a periodical interrelationship between the social and structural composite indicators given the fact that the QGI is a multidimensional phenomenon (Bils and peter,

2000). Moreover, macroeconomic condition influences QGI through the price and financial stability, government size, competitiveness as well as governance (Mlachila et al., 2014).

3. Approach and Indicators

The quality of growth index is technically calculated by the weighted geometric mean of the two sets of social and structural composite indicators. In this context, both social and structural composite indicators are also computed by the arithmetical average of their subcomponents. Given that every single subcomponents is measured by different scales, so they should be statistically harmonized to be comparable. Technical approaches which are applied to unify the scale of subcomponents comprised normalization, principal component and Min-Max. The QGI is experimentally influenced by the macroeconomic state variables which are statistically applied via Vector Auto Regression (VAR) model.

3.1 Fundamental Indicators of the QGI

To compute a fundamental, i.e. structural, composite indicator which positively influences GI, the average of the five state variables is calculated to explain the output growth stance. These five state variables include stability, strength, diversification, competitiveness, and solidarity of growth which are respectively measured by the inverse coefficient of variation, per capita income, Herfindahl-Hirschman Index (HHI) of the sectorial value added[3], ratio of net external demand to GDP, and the ratio of machinery investment to GDP. The QGI is also affected by the social composite indicator which is experimentally computed through the arithmetic average of life expectancy, income inequality and the share of public health and education spending in GDP which are the key vehicles to improve the living standards and to reduce the poverty.

Descriptively speaking, growth stability is statistically computed by the ratio of mean to the standard deviation of GDP growth (inverse coefficient of variation for the output growth). The higher ratio indicates more stability in the growth period which may improve the panic and social indicators. Strengthening of the output growth is usually highlighted by the GDP per capita which should be calculated based on the purchasing power parity approach for the economies with high volatility of nominal exchange rate. Anyway, growth strengthening is an important course to reduce poverty in the medium and long term while enhancing the QGI. Growth diversification is also an indicator to explain the sound QGI which is technically computed by the HHI method. Higher amount of the HHI outlines centralization (concentration) of the value added in specific sectors. In this context, engine of growth should be experimentally diversified to enhance the growth quality resiliency against contingent cyclical shocks while maintaining the long-run growth stability. Open economies are influenced by the spillover from the global trade and international financial transactions. Hence, these companies are benefited from lower external demand distortions rather than the domestic one. Export-led growth economies have evidently achieved more stable growth

[3]- Another experimental proxy is the HHI of sectoral export basket; given the fact that export diversification is strongly correlated with output diversification (Papageorgiou & Spatafora, 2012).

which is underscored by the ratio of net external demand to the output as an indicator to explain outward orientation of growth. Meanwhile, external orientation of growth should usually enhance productivity owing to the competitive business environment, global knowledge transformation, easy access to the world financial resources as well as modern competitive technology (Diao et al., 2006). Ultimately, growth solidarity which is mathematically measured by the ratio of machinery investment to GDP is the key indicator to explain QGI and potential production capacity.

3.2 Social Indicators of the QGI

Sound output growth is basically expected to influence social welfare indicators and living standard in different income groups. Hence, there are a set of social indicators which weightedly contributed to build QGI including the life expectancy, Gini Coefficient, school enrollment, infant mortality as well as the ratio of public health and education expenditure to GDP. They have obviously outlined the share of human capital and living standard in the sustainable economic growth. In other words, sound social indicators are the key factors to achieve the target of better QGI. Education and health expenditure contribute to enhance living standard through improving life expectancy, reducing infant mortality and ameliorating human capital.

3.3 How to Compute QGI

There are three main methodologies to calculate QGI including principal components, normalization and Min-Max method which totally contribute to construct one index.

3.3.1 Principal Component Analysis

Principal component analysis is a statistical approach that uses an orthogonal transformation to convert a group of variables, which are possibly correlated, into a set of values. The new set of values should statistically be linearly uncorrelated variables which are called principal components. The number of principal components is at most equal to the number of original variables. The first principal component has the largest possible variance, and the next components in turn have the highest possible variance under the constraint which are orthogonal to (i.e., uncorrelated with) the preceding components. The principal components are orthogonal because they are the eigenvectors of the covariance matrix, which is symmetric. Given the fact that the social and structural variables which are applied to construct QGI are in different units (scales) and that PCA is sensitive to the relative scaling of the original variables, the PCA is not used in the study. The transformation process of different series may also cause missing information which leads to an overshadowed economic elaboration[4]. Thus, the alternative approaches should be technically reconsidered to compute efficient, inclusive and composite indicators for specifying the QGI.

3.3.2 Normalization and MIN-MAX Approaches

[4]- The PCA doesn’t consider any sort of distribution for the given variables.

The variables which are statistically used to compute social and structural composite indicators are obviously measured in different metrics, so they should be standardized by the Z-score (1). Z-score is calculated by the ratio of the subtraction of every single variable from its mean to standard deviation. The Z statistic is a centered and reduced normal distribution with zero mean and unit standard deviation in case the variable is normally distributed. Given the fact that all the variables have been statistically converted to the same metrics by the normalization, they can be applied arithmetically or geometrically to compute single composite indicator. To adjust the impact of outlier variables on the Z-score distribution, the outlier variables can be selectively smoothed or the alternative methodology, Min-Max approach, can be replaced because of the big number of the outliers. Min-Max approach converts the eight structural and social variables in a comparable indicator from 0 to 1 while the deviations also smooth significantly (2). Thus, structural and social composite indicators are calculated by the geometrical average of converted explanatory variables.

$$z = \frac{(x-\mu)}{\delta} \qquad (1)$$

$$D = \frac{(x-x_{min})}{(x_{max}-x_{min})} \qquad (2)$$

Although social variables are experimentally influenced by the structural variables, both can contemporaneously contribute to compute weighted composite indicator for QGI via geometric average approach (3). The relative importance of social and structural composite indicators in the QGI is technically defined based on the different scenarios to examine QGI robustness. By the way, the causality and endogeneity between structural and social indicators should also be tested to characterize the impact of the structural development on the social stance.

$$QGI = \sqrt[j]{STI^{\alpha}.SOI^{\beta}} \quad j = \alpha + \beta \qquad (3)$$

j=2 if α=β=1 ; j=4 if α=3, β=1 ; j=8 if α=5, β=3 (4)

The QGI is evidently affected by the different macroeconomic state variables including foreign exchange rate as a nominal anchor which reflects inflation expectation and financial stability condition; headline inflation as a key variable which influences the financial flows between real and financial sectors (Tobin, 1969); openness as an indicator which outlines the macroeconomic competitiveness and integrity with the global economy; government size as an indicator to monitor macroeconomic efficiency and private sector-led growth; finally, contract intensive money as an indicator of well-governance which highlights the security of the property rights to proceed the private sector contracts. The relationship between QGI and the state variables is statistically estimated by VAR approach. The impulse response and variance decomposition are also examined to highlight the impact of the explanatory variables on the QGI deviations.

4. Data

The data of this study consists of the annual data from 1971 to 2013. As for the data, time Series data of the Iranian Central Bank and World Development Indicators Database were used. To characterize out the impact of short-term fluctuations of explanatory variables on the relationship between social and structural indicators, the data is basically categorized into five different periods.

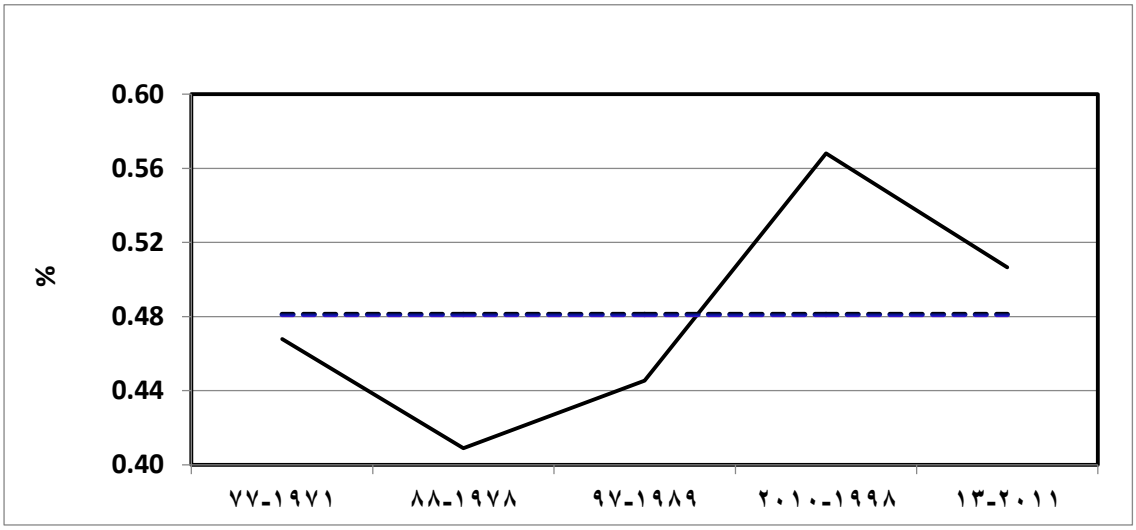


Chart 1. Composite indicators of growth quality in five different periods

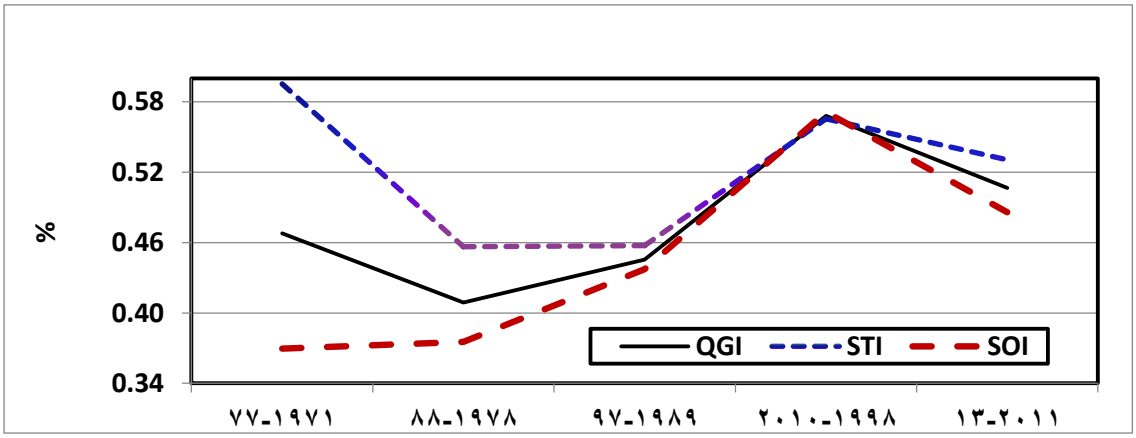


Chart 2. Social and structural composite indicator of growth quality in five different periods

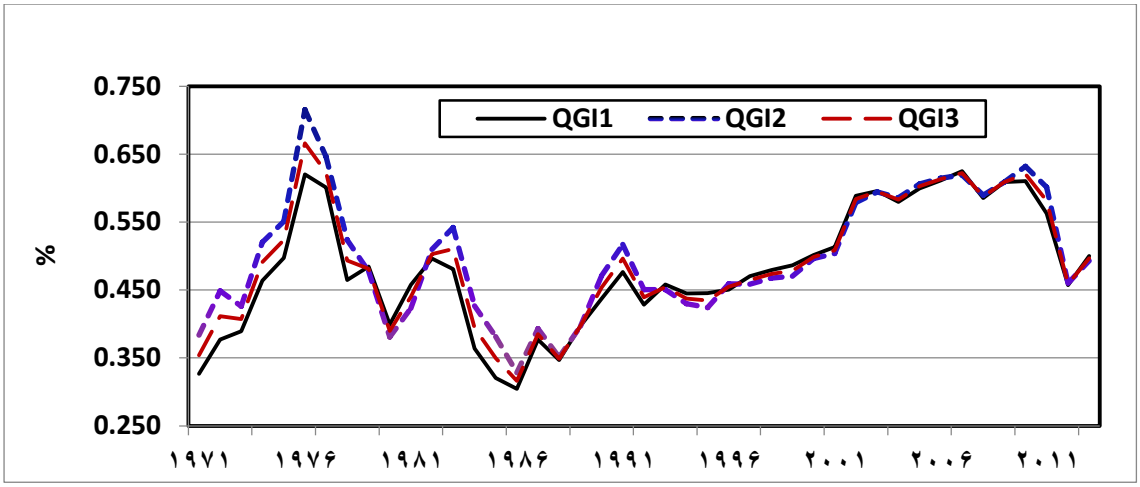


Chart 3. Composite indicator of growth quality in five different periods with different weights

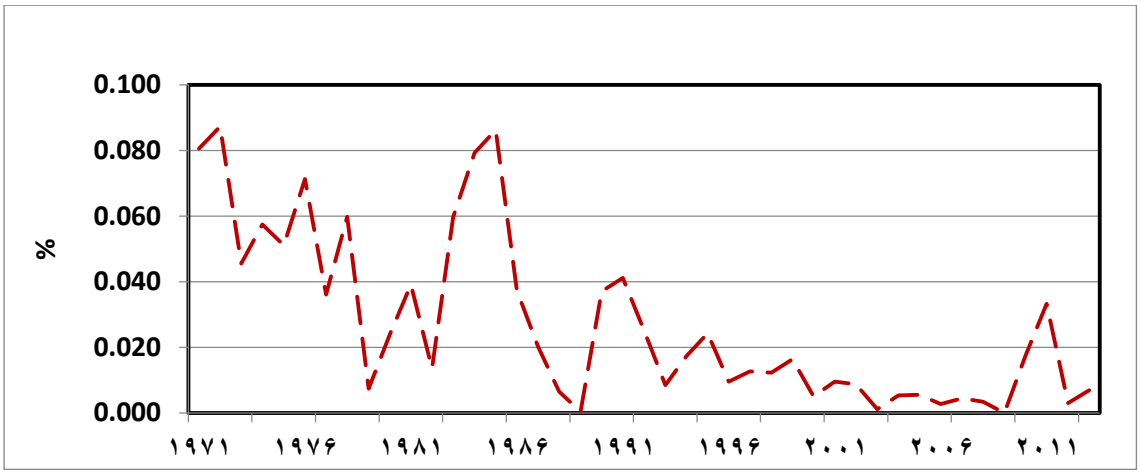


Chart 4. Coefficient of Variation of the composite indicators of growth quality

5. Results

5.1 The QGI quality

QGI fluctuated smoothly over the past four decades and as it was statically scored the least and the most amount of QGI was 0.31 and 0.63 in 1986 and 2007 respectively. By the way, QGI has gradually improved and has passed the average of the whole period in the recent period although it significantly declined during the Iran-Iraq war from 1980 to 1988 (chart 1). The deviation of the QGI is obviously originated from the fluctuations of social and structural composite indicators in different five periods whereas the fluctuation gap between the two composite indicators has been continuously narrowed in the recent periods (Chart 2). In this context, the average amount of the coefficient of variation for social and structural indicators is respectively small, about 0.24 and 0.19 units, which underline low fluctuations of the both

indicators. Meanwhile, the share of social and structural indicators to explain QGI deviations were so close, about 48 and 52 percent, which along with the small amount of coefficient of variation underscore the reasons behind the low fluctuation of QGI.

To examine the robustness of the QGI, different weights were applied to calculate the geometric average of both social and structural indicators including (0.5, 0.5), (0.25, 0.75) and (0.375, 0.625) which highlights the strong growth and robustness (Chart 3). The trend of the coefficient of variation for different amount of the QGI has been evidently narrowed which reiterates the robustness of the QGI (Chart 4). It also indicates a stable and smooth trend of the explanatory variables which contribute to compute the social and structural indicators, especially over the past 20 years.

5.2 Living standard and QGI

Living standard is experimentally expected to be influenced by the QGI although social indicators affect a sound QGI too. The correlation between QGI and social development implies a positive and light correlation between QGI, per capita income, school enrolment and public health and education spending while the correlation coefficient of income inequality reflects insignificant and negative correlation. In other words, the QGI improvement has not historically led to a better income distribution (Gini coefficient) in Iran, mainly because of the high and permanent inflation and its positive wealth effect on the high-income groups (table 1).

Table 1.Correlation coefficients among QGI and social sub-components

	Per capita income	Gini coefficient	School enrollment	Health and education spending
QGI	0.76	-0.13	0.83	0.45

5.3 Specification model for the QGI

Macroeconomic stance affects the QGI via some main macroeconomic variables which are statistically examined by the VAR approach. The explanatory variables are respectively defined as inflation, nominal exchange rate, openness, ratio of government expenditure to GDP, and contract intensive money. Although quality of bureaucracy and corruption control indicators should be theoretically applied as two supplementary and explanatory variables to contain rent-seeking activities and to enhance growth quality, lack of adequate time series data cause to replace contract-intensive money as an alternative variable for the sound governance in the basic model. Anyway, the relationship between explanatory variables and QGI is statistically estimated by the VAR approach in order to explain the lagged-impacts of the variables on the QGI and to address endogeneity challenge. In other words, the QGI is

linearly estimated based on its own lagged values and current and past amount of the other explanatory variables while the estimated equations have uncorrelated error terms.

The VAR approach prepares an exclusive, comprehensive, reliable and multi objectives toolkit for data processing through description, forecasting, deduction, and policy analysis. In this context, several steps have technically been taken to examine the model. First, the unit root test to outline the order of integration for every single variable; second, the cointegration and Granger causality tests to highlight the number of cointegrated vectors and the ability of the whole variables to explain the QGI changes; third, the optimum lags and correlogram of error term to determine the number of optimum lags by the Wald test as well as the serial correlation of the error term in the estimated vector; finally, impulse response and variance decomposition to track the impact of a shock over QGI in a specific period and to characterize the effect of every single variable on the QGI deviations respectively.

5.4 Results

The unit root test underscores that the logarithm of all variables is non-stationary at level which becomes stationary after first difference (Table 2).

Table 2. Critical value of the unit root test

	LQGI	LCPI	LGOVS	LEXR	LCIM	LOPEN
I(0)	-2.41	-2.07	-2.26	-2.13	-2.35	-2.19
I(1)	-6.08	-3.24	-6.64	-3.93	-7.99	-4.91

T-statistic critical value 90%: -3.198

The cointegration test indicates a single linear cointegrated vector with one optimum lag. Granger causality test also confirms the joint effectiveness of the most explanatory variables on the QGI. The causality effect of the contract-intensive money on QGI and the impact of the joint variables over the contract- intensive money are rejected statistically while the sign of the coefficient and its statistic in the cointegration model were respectively meaningless and insignificant. The output of cointegrating equation is estimated as follows:

$$LQGI = -0.55 - 0.12 * LEXR + 0.12 * LCPI + 0.26 * LOPEN - 0.17 * LGOVS \qquad (5)$$

(2.39) (2.72) (4.62) (1.88)

As it was experimentally expected, devaluation of local currency as a nominal anchor which highlights the financial stability had a negative and long-run impact on the QGI. Government size has reversely influenced the total factor productivity and QGI. In this regard, openness as an indicator which monitors competitiveness and convergence to the global economy has positively enhanced growth stability in the long-term through the stability of demand.

Inflation was unexpectedly and positively correlated with the QGI mainly because of the inflationary environment in Iran's economy where the average inflation and its coefficient of variation were about 18.7 and 0.5 over the past four decades .Thus, output growth was historically accompanied with the long-run inflation. Anyhow, high inflation (above the long-run mean) affected the output growth and consequently distorted QGI.

$$D(LQGI) = -0.007 - 0.11 * D\big(LEXR(-1)\big) + 0.17 * D\big(LCPI(-1)\big) - 0.22 * D\big(LOPEN(-1)\big) + 0.29 * D\big(LGOVS(-1)\big) - 0.84 * ECM \quad (6)$$

Vector error correction model indicates that about 84 percent of a short-term shock to the cointegrating equation will be statically absorbed within the first period. Meanwhile, the impulse response of the QGI to the exchange rate and the government size shocks are diminishingly and negatively permanent while the response of the QGI to the shock of openness is significantly and positively permanent. In this regard, inflation has insignificant impact over QGI during this period. Variance decomposition of the QGI underscores the share of every single variable on the QGI's distortions, as openness by 45%, QGI by 23%, government size by 18% and nominal exchange rate by 11% have respectively influenced the QGI deviations after 10 periods.

6. Conclusion

Quality of growth is affected by two sets of structural and social composite indicators. Structural indicator is arithmetically computed based on the growth features including stability, diversification, strengthening, competitiveness, solidarity which contribute to achieve the target of sound, sustainable and competitive output growth. By the way, the sound output growth should also enhance social public services and living standard through reducing infant mortality, increasing school enrolment, growing public health and education spending, improving life expectancy and income equality. Both social and structural composite indicators are calculated by the average of the structural growth features and social stance sub-components. Moreover, the QGI is computed via the weighted geometric mean of the social and structural indicators. Although the QGIs are weightedly computed based on different scenarios, the trend of the QGI and the coefficient of variation of the QGI indicate the robustness of results. Deviation of the QGI is influenced by the social and structural composite indicators (about 48 and 52 percent respectively).

The Correlation between QGI and social sub-components highlights a positive relationship between QGI and school enrollment, per capita income and public spending on education and health while the correlation of income equality is negative.

The QGI is experimentally influenced by the macroeconomic variables including inflation, nominal exchange arte, openness, contract intensive money as well as government size which are examined by the VAR method. The result of cointegration model indicates that higher government size and devaluation of local currency have evidently exacerbated QGI, mainly because of their negative impact on the total factor productivity, inflation expectation and cost-push inflation which consequently contract QGI. In this regard, the coefficient and

statistic of contract-incentive money were statistically meaningless and insignificant. Moreover, openness and inflation underscored the positive long-run impact over QGI due to the historical inflationary environment of the Iran's economy and the impact of the external trade over competitiveness and sustainable output put growth.

Vector error correction model outlines that about 84 percent of a short-term shock to the co-integrating vector will be absorbed in the first period. Meanwhile, the impulse response of the QGI to the exchange rate and government size shocks are diminishingly and negatively permanent while the response of the QGI to the shock of openness is significantly and positively permanent. In this regard, inflation has insignificant impact over QGI during the period.

References

Alonso-Carrera, J.(2010). Growth, Sectoral Composition, and the Evolution of Income Levels. *Journal of Economic Dynamics & Control*.34, No.12, pp. 2440-2460.

Berg, A., J. Ostry, and J. Zettelmeyer.(2008). What Makes Growth Sustained?. IMF Working Paper 08/59 (Washington: International Monetary Fund).

Bils, M., and K. Peter.(2000). Does Schooling Cause Growth?. *American Economic Review*. vol. 90, pp. 1160–1183.

Burnside, C., and D. Dollar. (2000). Aid, Policies, and Growth. *American Economic Review*. Vol. 90, No. 4, pp. 847–68.

Diao, X., J. Rattsø, and H. E. Stokke.(2006). Learning by Exporting and Structural Change: A Ramsey Growth Model of Thailand. *Journal of Policy Modeling*. Vol. 28, pp. 293–306.

Dollar, D., and Kraay, A.(2002). Growth is Good for the Poor. *Journal of Economic Growth*.Vol. 7, No. 3, pp. 195–225.

Duttagupta, R., and M. Mlachila. (2008).What is Really Good for Long-Term Growth? Lessons from a Binary Classification Tree (BCT) Approach. IMF Working Paper 08/263 (Washington: International Monetary Fund).

Guillaumont Jeanneney, S. and R. Kpodar.(2006). Financial Development, Financial Instability and Poverty. CERDI Working Paper #E.2006.7. 32

Hausmann, R., L. Pritchett, and D. Rodrik.(2005). Growth Accelerations. *Journal of Economic Growth*. 10, No. 4, pp. 303–29.

Loayza, N., and C.E. Raddatz.(2010). The Composition of Growth Matters for Poverty Alleviation. *Journal of Development Economics*. 93, No. 1, pp. 137–51.

Martinez, M., and M. Mlachila.(2013). The Quality of the Recent High-Growth Episode in Sub-Saharan Africa. IMF Working Paper 13/53 (Washington: International Monetary Fund).

Mlachila, M., R. Tapsoba, and S.J.A Tapsoba.(2014). A Quality of Growth Index for Developing Countries: A Proposal. IMF Working Paper 14/172 (Washington: international Monetary Fund).

Papageorgiou, C., and N. Spatafora.(2012). Economic Diversification in LICs: Stylized Facts and Macroeconomic Implications. IMF Staff Discussion Note No. SDN/12/13 (Washington: International Monetary Fund).

Schultz, P.(1999). Health and Schooling Investments in Africa. *Journal of Economic Perspectives*.Vol. 13, No. 3, pp. 67–88.

Stern, S., A. Wares, S. Orzell, and P. O'Sullivan.(2014). Social progress Index 2014 Methodological Report. The Social Progress Imperative.

Turnovsky, S. J., and P. Chattopadhyday.(2003). Volatility and Growth in Developing Economies: Some Numerical Results and Empirical Evidence. *Journal of International Economics.* 59, no. 2:267–395.

Appendix 1

Vector Error Correction Estimates
Date: 11/02/14 Time: 16:18
Sample (adjusted): 1352 1392
Included observations: 41 after adjustments
Standard errors in ( ) & t-statistics in [ ]

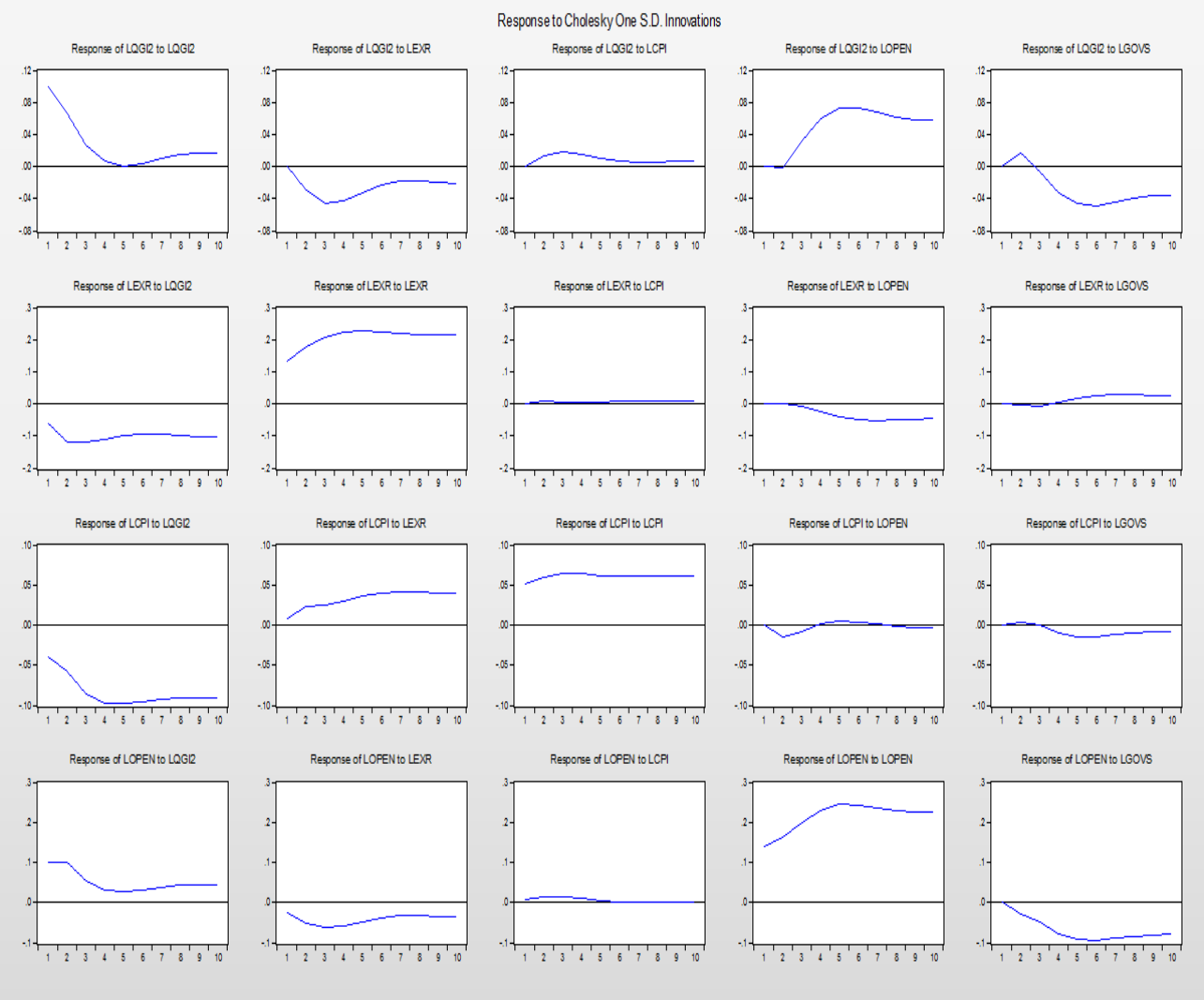
Cointegrating Eq:	CointEq1
LQGI2(-1)	1.000000
LEXR(-1)	0.120948 (0.05060) [2.39005]
LCPI(-1)	-0.121209 (0.04445) [-2.72689]
LOPEN(-1)	-0.263659 (0.05703) [-4.62352]
LGOVS(-1)	0.170023 (0.09051) [1.87856]
C	0.547917

Error Correction:	D(LQGI2)	D(LEXR)	D(LCPI)	D(LOPEN)	D(LGOVS)
CointEq1	-0.839579 (0.19121) [-4.39093]	0.113970 (0.28148) [0.40489]	-0.272153 (0.12747) [-2.13512]	-0.880581 (0.33461) [-2.63165]	-0.296353 (0.22281) [-1.33006]
D(LQGI2(-1))	0.475160 (0.19133) [2.48352]	-0.401139 (0.28166) [-1.42421]	0.316255 (0.12754) [2.47959]	0.629423 (0.33482) [1.87990]	0.075988 (0.22295) [0.34083]
D(LEXR(-1))	-0.115049 (0.11674) [-0.98554]	0.322786 (0.17185) [1.87827]	0.116345 (0.07782) [1.49505]	-0.073454 (0.20429) [-0.35956]	-0.236161 (0.13603) [-1.73608]
D(LCPI(-1))	0.172520 (0.23540) [0.73289]	0.140022 (0.34654) [0.40406]	0.132585 (0.15692) [0.84490]	-0.087588 (0.41194) [-0.21262]	0.141022 (0.27430) [0.51411]
D(LOPEN(-1))	-0.215273 (0.12512) [-1.72048]	0.018145 (0.18420) [0.09850]	-0.171886 (0.08341) [-2.06069]	-0.088429 (0.21897) [-0.40385]	0.042284 (0.14581) [0.29000]
D(LGOVS(-1))	0.292670 (0.13741) [2.12992]	-0.049808 (0.20228) [-0.24623]	0.070072 (0.09160) [0.76497]	-0.095556 (0.24046) [-0.39738]	-0.117908 (0.16012) [-0.73637]
C	-0.007439 (0.04002) [-0.18590]	0.081322 (0.05891) [1.38046]	0.133883 (0.02668) [5.01887]	0.016897 (0.07003) [0.24130]	-0.012030 (0.04663) [-0.25799]

R-squared	0.443597	0.286823	0.307087	0.223212	0.169017
Adj. R-squared	0.345409	0.160968	0.184808	0.086131	0.022373
Sum sq. resids	0.336248	0.728719	0.149428	1.029755	0.456587
S.E. equation	0.099447	0.146400	0.066294	0.174031	0.115884
F-statistic	4.517805	2.278997	2.511369	1.628327	1.152566
Log likelihood	40.29483	24.43933	56.92100	17.35066	34.02324
Akaike AIC	-1.624138	-0.850699	-2.435171	-0.504910	-1.318207
Schwarz SC	-1.331577	-0.558138	-2.142610	-0.212349	-1.025646
Mean dependent	0.002280	0.149653	0.173302	-0.003100	-0.019852
S.D. dependent	0.122915	0.159827	0.073426	0.182048	0.117202

Determinant resid covariance (dof adj.)	1.21E-10
Determinant resid covariance	4.74E-11
Log likelihood	196.4527
Akaike information criterion	-7.631839
Schwarz criterion	-5.960061

Appendix 2



Appendix 3

Variance Decomposition of LQGI2:

Period	S.E.	LQGI2	LEXR	LCPI	LOPEN	LGOVS
1	0.099447	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.124560	91.65471	5.340087	1.118939	0.007578	1.878682
3	0.140484	75.52174	14.96279	2.709184	5.084355	1.721928
4	0.162622	56.49806	17.99261	2.867273	17.25176	5.390307
5	0.187070	42.69603	16.54079	2.428240	28.10628	10.22865
6	0.208176	34.52005	14.59850	2.045361	35.05372	13.78238
7	0.224617	29.87820	13.23790	1.804567	39.19489	15.88445
8	0.237708	27.09317	12.41657	1.662391	41.78019	17.04768
9	0.249061	25.15011	11.95208	1.579740	43.58703	17.73104
10	0.259745	23.54052	11.68921	1.528507	45.02898	18.21278

Variance Decomposition of LEXR:

Period	S.E.	LQGI2	LEXR	LCPI	LOPEN	LGOVS
1	0.146400	17.84960	82.15040	0.000000	0.000000	0.000000
2	0.259616	26.12578	73.78762	0.066344	0.002438	0.017817
3	0.354396	25.59948	74.24956	0.052387	0.059670	0.038898
4	0.433797	23.46960	76.07814	0.040888	0.373570	0.037809
5	0.501233	21.57060	77.32079	0.040652	0.920854	0.147102
6	0.559722	20.24193	77.88079	0.050793	1.500933	0.325546
7	0.611655	19.44617	78.03895	0.066786	1.958899	0.489194
8	0.658912	19.02356	78.03591	0.082660	2.258694	0.599181
9	0.702857	18.80716	77.99975	0.094902	2.437313	0.660872
10	0.744326	18.67699	77.98054	0.103118	2.545646	0.693703

Variance Decomposition of LCPI:

Period	S.E.	LQGI2	LEXR	LCPI	LOPEN	LGOVS
1	0.066294	36.80972	1.736503	61.45378	0.000000	0.000000
2	0.109656	41.00998	5.258805	51.94473	1.725398	0.061090
3	0.155630	50.71660	5.170065	42.95141	1.129607	0.032318
4	0.196613	56.03175	5.466262	37.50830	0.717757	0.275925
5	0.231623	58.39378	6.305334	34.13952	0.570811	0.590551
6	0.261443	59.34872	7.262926	32.15972	0.471276	0.757362
7	0.287270	59.67087	8.091433	31.04962	0.391208	0.796874
8	0.310380	59.76397	8.695287	30.42634	0.338573	0.775834
9	0.331705	59.81583	9.091429	30.04777	0.305205	0.739761
10	0.351792	59.88998	9.344660	29.77772	0.279609	0.708035

Variance Decomposition of LOPEN:

Period	S.E.	LQGI2	LEXR	LCPI	LOPEN	LGOVS
1	0.174031	31.94946	2.380623	0.239801	65.43012	0.000000
2	0.265427	27.50239	4.671912	0.328144	66.39018	1.107371
3	0.345044	18.77205	6.152631	0.374336	72.11790	2.583080
4	0.427404	12.73320	5.990189	0.307712	76.01100	4.957898
5	0.503800	9.428090	5.205716	0.228906	78.18644	6.950845
6	0.569630	7.670155	4.506357	0.179110	79.45884	8.185539
7	0.625502	6.737356	4.013967	0.148658	80.25491	8.845113
8	0.674064	6.218333	3.692421	0.128010	80.79161	9.169628
9	0.717995	5.878828	3.488041	0.113082	81.18412	9.335930
10	0.759152	5.606638	3.354414	0.101874	81.49285	9.444224

Cholesky Ordering: LQGI2 LEXR LCPI LOPEN LGOVS