An Econometric Model for Manufacturing Production Volatility: Evidence from South Korea, lessons for Egypt

Introduction

Economic growth and development could be achieved through industrialization. The importance of industrialization to long-term economic development manifests in its potential for high level of productivity and real income growth, additionally, its crucial role in transforming many low-income countries to middle-income countries. 1 - industrializing economies where the manufacturing industries has been adopted as a strategic sector for accomplishing economic boost in many East Asian countries. Identically, the process of shifting from labor-intensive products to capital intensive products and then from Heavy and Chemical Industries (HCI) to technology-based electronic industries led to 2 - Japan, Singapore, South Korea and Taiwan. Those are well known as the largest economies in the world. However, after Asian financial crisis in 1997, most Asian countries were negatively affected by a series of global economic risks such as the global economic slowdown in 2001, the Iraq conflict and the outbreak of the severe acute respiratory syndrome epidemic in 2003. In addition, the recession prevailed most of the world countries by the US subprime financial crisis in 2007. Moreover, the unexpected devastating earthquake and tsunami occurred in Japan on March of 2011 together with the Arab Spring. Thus, with all those threats, the global financial stability could not be restored and the economic production was negatively affected by external demand reduction, particularly in Asian region. Hence, in this point, a question arises *"Can East Asian manufacturing production survive?"*

The answer of this question has been provided via the global competitive index report which has been conducted by the Deloitte Touche 0 Global Manufacturing Industry group and the U.S. Council on Competitiveness in 2013. The report casted that China is ranked the most competitive manufacturing nation in the world today, also South Korea and Japan are ranked the top 10 competitive manufacturing developed economy nations, while Taiwan and Singapore are ranked the top 10 competitive manufacturing emerging economy nations. The high quality of production and competitive cost structure are the key competitive advantages for these East Asian countries. Those advantages are achieved through the successful industrial policies and the availability of highly educated and skilled labor force which led these countries became the leaders in manufacturing of advanced technologies in the world today.

On the other side, the European sovereign debt crisis threatening the European Union result in the prolonged recession in European industrialized economies that has caused an overall deceleration and surfaced structural problems related to production and trade of developing and emerging industrial economies like many African countries for instance. Hence, with the same context, a gradually reduction in the amount of investment and capital flow directed from European countries to African countries could no longer feed the substantial growth of the manufacturing industry in African emerging economies. With this regard, an intensive debate in the recent literature has been arisen on the financial development and its impact on the industrial production stability. Many scholars recently have argued that the volatility of industrial production reduces in countries that are characterized as financially

independent (Larrain 2004, Huang et al., 2013, Han 2011). In the other word, the more financially developed countries, the lower volatility of industrial production. Evidence from the experience of developed countries showed that well-functioning banking systems and better-developed stock markets independently spur industrial growth by providing different growth-enhancing financial services to the industrial sector (McCaig and Stengos, 2005). However, Beck, Lundberg, and Majnoni (2004) found no robust relationship between financial development and volatility of production with consideration of the type of macro shocks that affects an economy and the stage of development that an economy witnesses. Apparently, therefore, more attention should be placed to investigate the substantial evidence that industrial production is less volatile in developed countries than in developing countries with concentration on macroeconomic aggregates, both financial and fiscal instruments, as well as other endogenous and exogenous factors.

Consequently, this research aims to contribute to the existing literature by exploring empirically the impact of macroeconomic policies on the volatility phenomenon of manufacturing production using a comparative study between South Korea, as a case study of developed countries and it represents one of Asian tigers, and Egypt, as a case study of emerging economies. The purpose of applying this comparative analysis is drawing lessons from the Korean experience to identify the effective industrial policies to promote manufacturing growth in Egypt as well as to learn how to protect the manufacturing production from any global economic risks may occur. In addition, the research will test the hypothesis of financial development led production stability in which industrial production is less volatile in developed countries than in developing countries with concentration on macroeconomic aggregates as well as other endogenous and exogenous factors. The research focuses on the manufacturing industries through the period when globally the economic development plans directed towards the industrialization, since 1970s until the availability of data. Therefore, certain econometric models will be applied in order to analysis the time series data. First, the volatility of manufacturing industries will be measured using industrial volatility index and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and (EGARCH) time series models. Second, panel data sets of 24 different categories of manufacturing industries will be employed for each country; both South Korea and Egypt, in order to test the hypothesis of financial development led production stability. While the third model is the Vector Error Correction VEC and the Granger Causality (GC) test which will be used to estimate the causality between macroeconomic factors and the volatility of manufacturing industries. The study will employ Eviews package version 7.0 in order to analyze the time series data.

Research Significance

This research aims to explore empirically the macroeconomic policies influencing the volatility of manufacturing production. There is no previous empirical research explored the main macroeconomic policies, both the financial and fiscal policies' instruments, affecting the production volatility of manufacturing industries. Moreover, this research will measure the volatility index for detailed manufacturing dataset which is divided into 24 manufacturing industry categories classified by ISIC 4. As well as the volatility index will be estimated using econometric models, GARCH and EGARCH. Those models will be employed to estimate the volatility dynamic behavior and to predict volatility trends. Furthermore, the VEC model and granger causality test will be applied to measure the causality between the

macroeconomic policies and the volatility index, separately for each category. Additionally, the econometric model will show this causal relation for each category through using cross-section data within the panel dataset model based on GMM.

The research will conduct a comparative study between developed economies, represented in South Korea, and emerging economies, represented in Egypt in order to draw lessons for the emerging economies to identify which policies promote the manufacturing production growth and others cause the instability in that growth.

Research Questions

This research aims to answer the following questions:

1- What are the macroeconomic policies influencing the volatility of manufacturing production?
2- Are manufacturing industries less volatile in developed countries than in developing countries with consideration of the effect of macroeconomic factors as well as other endogenous and exogenous factors?
3- Which lessons can be drawn from Korean experience in promoting manufacturing industries sector for any emerging economy?

Research Methodology

This research proposes a macroeconomic model for the volatility of manufacturing production. The model has been developed from Keynesian-Neoclassical synthesis macro model in order to investigate the impact of macroeconomic policies on the volatility of manufacturing production.

First, the dependent variable, the manufacturing production volatility index, is computed on the base of the International Monetary Fund (IMF) framework. The manufacturing production volatility index is calculated as a standard deviation of monthly changes in manufacturing production over the entire five years involved in each observation. Straightaway, the manufacturing industries index data will be collected for each month over the study time period (proposed to be 1975- 2013, quarterly data) of each manufacturing industry category (24 categories), which are classified according to the International Standard Industrial Classification (ISIC) version 4, in each country separately. Empirically, the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and EGARCH time series models will be applied to estimate the volatility of manufacturing production in order to capture the volatility dynamic behavior as well as to forecast the volatility trends.

Second, the explanatory variables consist of three main sectors: Financial sector, government sector, and trading sector. Each sector is explained through behavioral equations and identities. First, the financial sector which is analyzed through two main aspects: 1-) financial development (measured as the average private credit by deposit money over GDP). 2-) financial gross which represents total capitalization (includes bank credit, credit by other financial institutions, and stock markets). Second, government sector which plays a key role in drawing the fiscal policy. This sector contains one main variable mainly is: government expenditure on Research and Development (R&D). Third and the last sector is the trade sector. This sector plays a pivotal role in the model through its bivariate effect through imports and exports. The sector contains two main variables: tariffs rate, and trade liberalization (measured as the ratio of sum of exports and imports to GDP).

Additionally, the model contains a number of endogenous variables, mainly are: gross capital formation as a proxy of technological level, human capital formation (measured by the average of school enrollment rate for the three educational levels, primary, secondary, and tertiary levels) as a proxy of intellectual capital, as well as interest rate on loans, and economic stability which is expressed by a composite index constructed from two major indicators of price fluctuations (Consumer Price Index and GDP deflator).

Moreover, there are exogenous variables, mainly are: Real Effective Exchange Rate (REER), and Foreign Direct Investment (FDI).

In order to investigate the dynamics relationship between the macroeconomic variables and the volatility of manufacturing production for different industry categories in each country as well as to test the research hypothesis of financial development led production stability, panel data sets will be employed using Generalized Method of Moments (GMM) method. The GMM method will be used in order to avoid biased estimation may be produced from the OLS and the TSLS parameters as well as the correlation with the error term. While the causality between macroeconomic factors and the volatility of manufacturing industries will be estimated using the Vector Error Correction (VEC) model. VEC model assesses the short run and the long-run equilibrium relationship; moreover, VEC model not only examines how much the dependent variable will change in response to the independent variables, but also examines the speed of this change. For more reliable estimation, the Granger Causality (GC) test will be employed to estimate any potential predictability power of one explanatory variable for the other.

The econometric model results will reveal which macroeconomic policies promote the industrial production growth and which others cause its volatility. The result analysis will show the effective industrial policies that have been used by Korean government in promoting the production growth as well as how South Korea, as one of Asian Tigers, could protect the manufacturing production from global economic shocks. 0 0 1 454.27 415.87 Tm 0 1 257.09 429.67 Tm5(o 0 182.78 40)]km 0 139(Asia)327 Tm[e)4(x

Research Results:

I am still working on the results and will be ready soon

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The research will depend on pervious literature (books, Journals, and previous studies) in the same area of research.

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