Global Recession and Eurozone Debt Crisis: Impact on Exports of China and India

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ABSTRACT

We study the impact of recent crisis episodes viz. the global recession of 2008-09 and the Eurozone debt crisis of 2010-12[2] on the Emerging Market Economies (EMEs) of China and India. Macroeconomic indicators suggest that both China and India were impacted by the crises. We focus on the trade channel of transmission of the crises i.e. on exports from China and India to the U.S. and Euro Area respectively. This study finds that the exports from China and India to both the destinations were affected as a result of the crisis episodes with major exporting sectors of the two economies displaying negative rates of growth. Further, Markov-switching autoregressive models are utilized to examine the regimes in the growth rate of total value of exports to the U.S. and Eurozone. We find presence of slowdown and pickup regimes in the export growth rates. Furthermore, Markov-switching regression results suggest that the economic activity levels in the U.S. and the Eurozone significantly and positively affect the exports to these destinations from China and India across high as well as low export growth rate regimes. As a result, a dampening of the economic activity in the U.S. and Eurozone in the wake of the crises led to a reduction in the rate of growth of exports from China and India due to a fall in the demand for exports.

KEYWORDS: Global Recession, Eurozone Debt crisis, China, India, Exports, Trade Channel

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[2] According to National Bureau of Economic Research (NBER, 2014) and Economic Cycle Research Institute (ECRI, 2014a) data till December, 2014, the global recession in the U.S. occurred from December, 2007 to June, 2009. This encompasses the global financial crisis which extended from September, 2008 till June, 2009 (Federal Reserve Bank of St. Louis). According to the ECRI (2014b), France, Germany, Italy and Spain, which are part of the Eurozone, were experiencing slowdown from February, 2011 to November, 2012, August, 2010 to December, 2012, July, 2010 to December, 2012, and April, 2010 to November, 2012 respectively. Hence, we define the Eurozone crisis period from April, 2010 to December, 2012.

1. INTRODUCTION

According to Reinhart and Rogoff (2009), financial crises are essentially triggered by a collapse of investor confidence, especially in the case of highly leveraged financial markets. Economists believed that the introduction of more innovative financial instruments aimed at increasing the depth of the markets along with flexible monetary policy could contain the risk of occurrence of financial crises since these could tackle the underlying business cycle downturns. However, the 'subprime financial crisis' that started in the United States of America (U.S.) in 2007 could not be tamed and led to a recession in the largest economy of the world. Further, it snowballed into a global financial crisis which led to cascading of financial markets around the world in 2008 and triggered a 'Second Great Contraction' in many economies of the world. The global recession was extraordinary due to its massive coverage, extreme severity, long duration and huge repercussion effects.

From Figure 1A, we observe that the gross government debt of the U.S. was in the range of 60-70% of GDP till 2007. However, in a bid to revive the economy post the crisis, the U.S. government resorted to fiscal expansion which worsened the exchequer as the gross government debt soared to more than 100% in 2012-13. Current account balance (Figure 1B) of the U.S. has been deteriorating till 2006. However, due a dampening of the demand for exports in the face of a recession in the U.S. economy, the current account balance steadily improved since 2007 and now stands at less than 3% of GDP. Unemployment rate (Figure 1C) peaked in the aftermath of the crisis to about 9.6% in 2010 but stands at about 7% in 2013. Figure 1D depicts the growth rate of GDP in the U.S. and shows that the growth rate was negative during 2008-10 and according to the latest data stands at about 2% in 2013. U.S. being the largest economy of the world, the impact of the global recession of 2008-09 crisis was widespread with several countries of the world tumbling into a recession. This subsequently strained governments around the world since they had to overstretch in an attempt to tackle the real effects of the crisis on their economies by undertaking fiscal expansion.

The Eurozone (EZ) or Euro Area (EA) is a major subset of the European Union (EU) and consists of 17 countries, namely Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. In 1992, the Maastricht Treaty had established budgetary and monetary criteria such as size of the budget deficit, government debt, inflation rates, long term interest rates and exchange rates for potential EU member countries to enter the European Economic and

Monetary Union (EMU) and adoption of a single currency, the Euro. In 1999, eleven EU nations adopted the common currency Euro, and formed an EMU, the Euro Area. Thus, the monetary policy of the Euro Area came to be governed by the European Central Bank (ECB). Several EU member nations joined thereafter, and by 2011 the number of Euro Area member countries rose to 17. There was a general growth momentum in the EZ till 2007 coupled with a rise in the twin deficits viz. fiscal deficit and current account deficit. However, in the aftermath of the global recession in 2008-09, sovereign debt levels of Euro Area nations started to mount.

In May of 2010, Greece, one of the members of the EZ, announced that it was facing public finance problems. The public debt issues of Ireland, Portugal and Spain were also unmasked subsequently and a sovereign debt crisis in the EZ economies was inevitable. As a result of these revelations, financial markets around the world plummeted. Consequently, the situation exacerbated into a major Eurozone debt crisis with pan-European and global ramifications especially from the perspective of international trade and financial markets. A major fallout of the EZ debt crisis has been its dampening effect on international capital flows.

Clearly, higher growth in the Eurozone was achieved at the cost of high fiscal deficits (Figure 2A). The global recession necessitated injection of liquidity via a fiscal stimulus, which led to a worsening of the fiscal deficit and public debt situation in the economies. Due to higher growth, there was a rise in the demand for imports which resulted in large current account deficits for most of the Euro Area economies (Figure 2B). Further, the EZ countries were plagued by high unemployment as a consequence of the recession triggered by the global recession (Figure 2C). Since 2007, a severe downturn with negative rates of growth was experienced by most of the EA countries (Figure 2D).

In this paper, we follow the Balance of Payments (BoP) Approach and delve into the trade channel of transmission of the crises, i.e. via exports from the EMEs to the U.S. and EZ respectively, in assessing the impact of the global recession and Eurozone sovereign debt crisis on the EMEs of China and India. Banerji and Dua (2010) examine the synchronization of recessions in major developed and emerging economies during the global recession and find that both China and India did not experience a recession but a milder slowdown. According to IMF (World Economic Outlook), the two countries together held 16% share in total world output (GDP based on PPP) in 2007 which is likely to rise to 25% by 2019. Dua and Tuteja (2014) examine the impact of the Eurozone crisis on China and India. In this paper, we extend

the earlier analysis and focus on the trade channel of transmission of the crises from the U.S. during the global recession and from EA during the Eurozone Sovereign Debt crisis to the Chinese and Indian economies.

With this objective in view, we first discuss the channels of transmission of crises from developed economies to EMEs via the BoP Approach (Blanchard *et al.*, 2010). We then study the macroeconomic fundamentals with emphasis on the BoP aggregates of China and India and assess the impact of the crises on the economies. Additionally, we examine the sectoral pattern of exports from China and India to the destinations of U.S. and Eurozone. Thereafter, we study the regimes in growth rates of total value of exports to the U.S. and EZ from China and India using Markov-switching Autoregression (AR) analysis. Subsequently, we extend our Markov-switching model by incorporating the economic activity level of U.S. and EA as regressors and undertake an econometric analysis to ascertain the impact of global recession and Eurozone crisis on growth of exports from China and India by employing Markov-switching regressions.

The rest of the chapter is organized as follows: section 2 focuses on the channels of crisis transmission proposed by Blanchard *et al.* (2010). In section 3, we provide the sources of data. Thereafter, we present the macroeconomic indicators for China and India in section 4 with a view to assessing their position post the two crises. In section 5, we study the sectoral distribution of exports from China and India to the U.S. and EZ respectively. Subsequently, in section 6, which is divided into three sub-sections, we undertake an econometric analysis to link the impact of the crises on China and India explained in section 2 to the state of growth of exports to the crisis hit economies. The methodology, and empirical model for the Markov-switching AR models of export growth rates are discussed in the first sub-section. In sub-section 6.2, we employ Markov-switching models to discern the state of growth rates in exports to the U.S. and Euro Area from the two economies of China and India. Finally, sub-section 6.3 presents the results of the Markov-switching regression analysis for export growth rates which includes the economic activity levels of U.S. and EZ as regressors. The last section spells out the conclusions.

2. TRANSMISSION OF THE CRISES

In this section, we outline the channels of transmission of the crisis episodes from the developed economies to EMEs like China and India.

Blanchard *et al.* (2010) propose the channels of transmission of the financial crisis in the U.S. to EMEs. The theoretical model focusses on the initial impact (or short-run effects) of the crisis on a small open economy with imperfect capital mobility and foreign currency debt. The transmission of global shocks to the domestic EME would occur via the Balance of Payments (BoP) accounts. An equilibrium in the BoP necessitates that a current account deficit must be financed either by a capital account surplus or a change in the foreign exchange reserves. The impact on the EME is likely to result from trade shocks (on the current account), financial shocks (on the capital account), deterioration of the terms of trade (which affects both the current and the capital account) or a depletion of the foreign exchange reserves. We discuss each of these likely scenarios.

On the current account, there is likely to be a fall in the demand of the EME country's exports due to a fall in the developed countries' output[3] (or a fall in the trading partner country's income). Further, the larger the dependence of the EME on trade, indicated by a higher exports/ GDP ratio, the larger the magnitude of such an impact and destabilization in the domestic economy. Trade shocks may alternatively result in a fall in the goods prices in place of a decrease in the exports. The impact can then be measured via a terms of trade decline and will result in an analogous reduction in the domestic economy's output.

On the capital account, due to a dampening of the global investment sentiment there is a sharp fall in the capital inflows to the EME. Further, a significant rise in uncertainty and risk leads to higher home bias for foreign investors causing a rise in the capital outflows from the EME which on the net leads to a negative capital account. This is notwithstanding the higher debt repayment and servicing obligations in terms of local currency for the EMEs resulting from a depreciation of the exchange rate (assuming it to be floating which is not entirely true in the case of China).

Furthermore, this is coupled with a fall in the terms of trade of the EME which in the absence of the Marshall-Lerner condition being satisfied (which is especially violated for the economies in the short-run) causes the current account deficit to worsen due to higher payment for inelastic imports like crude oil. Faced with such a scenario, the EME has the following

[3] We are assuming that developed countries such as U.S. and Eurozone are significant trading partners for the EMEs. This is indeed the case as we find from an analysis of the data for the major trading partners of the EMEs.

recourse available to it, either payment for the current account deficit via a capital account surplus or a decline in its foreign exchange reserves.

Therefore, the negative demand shocks are transmitted to the domestic EME via trade shocks emanating from the lower demand for domestic goods and financial shocks arising out of the lower demand for domestic assets. As a result, the Central Bank of an EME is left with no other alternative except a deterioration of its foreign exchange reserves leaving it with a lower import cover.

3. DATA

To analyse the impact of the global recession in the U.S. and Eurozone debt crisis on China and India, data has been collected from various sources viz. Eurostat, Federal Reserve Bank of St. Louis, U.S. International Trade Commission and the World Bank. We study the growth rates of exports from China and India to the U.S. and EA calculated as year-on-year changes in the value of total exports to the destinations. The data for total value of exports to the U.S. is collected from United States International Trade Commission over the period January, 1994 to December, 2013. Similar data for total value of exports to the Euro Area is procured from Eurostat and utilized from January, 2000 to December, 2013. Data for IIP of U.S. and Eurozone is sourced from Federal Reserve Bank of St. Louis and Eurostat respectively. Table 1 presents the summary statistics of the Chinese and Indian growth rates of exports to U.S. and EZ respectively. The average growth rate of exports from China to the U.S. is higher than the rate of growth of Indian exports to the U.S. A similar trend is observed in the case of the EZ economies with the Chinese exports to Eurozone growing at a higher rate than the Indian exports to Eurozone.

4. MACROECONOMIC INDICATORS

This section discusses crucial macroeconomic fundamentals for China and India and specifically focusses on key BoP aggregates for the two countries.

Figure 3A presents the GDP growth rate of China and India from 2007 till 2012. In 2007, the GDP growth rate of China was 14% and that of India was 9.8%. The growth process in both the countries slowed down during 2008-09 as a consequence of the global recession. The growth momentum picked up in 2010, however, as the Eurozone crisis unravelled in 2010, growth slowed down again in 2011-13. Year-on-year growth in gross fixed capital formation

(GFCF) is depicted in Figure 3B. The growth in GFCF has remained resilient for China but was severely affected for India in 2008-09 as well as 2012-13. Figure 3C shows the market capitalization of listed companies as a percentage of GDP for the two EMEs. The pre-crisis market capitalization levels for both the economies were well-over 100% (in 2007) but eroded severely in the aftermath of the global recession in 2008 and despite a turnaround in 2009-10, fell again in 2011. In 2012, the market capitalization of Chinese companies was 44% while that of Indian companies was 69%. Figure 3D presents the gross domestic savings rate which has been stable for China at about 51-52% across 2007 to 2013 but fell sharply for India from 34% in 2007 to 26% in 2013. Overall, an analysis of the above indicators shows that both the EMEs underwent a slowdown as a consequence of the global pressures mounted by the crises in the developed economies of U.S. and EZ.

We now focus on the BoP aggregates which according to Blanchard *et al.* (2010) would have been affected due to the crisis episodes. In 2007, the share of exports in China's GDP was 38% (Figure 3E) while the same for India was 20%. China's dependence on exports has reduced overtime and exports held 24% share of in its GDP in 2012. On the contrary, exports as a percentage of GDP for India rose to 24% by 2012. Figure 3F depicts the region of destination for China's exports. In 2005, of the total Chinese exports, U.S. held 21% share, E.U. held 19% share and developing economies held 42% share. By 2012, China diversified its exports away from developed economies and towards developing economies, so that the share of U.S. reduced to 17%, share of E.U. fell to 16% and the share of developing economies increased to 51%. Figure 3G shows a similar trend for Indian exports where U.S. held 17% share, E.U. held 23% share and developing economies held 53% share in 2005. However, by 2012 an altogether different picture emerged with U.S.' share reducing to 13%, that of E.U. falling to 17% and developing economies' share rising to 63% of India's total exports. From Figure 3H, it is clear that while China has maintained an overall current account surplus, the same has been falling over the period 2007-12 and stood at 2.3% of GDP in 2012. India, on the other hand, has a worsening current account deficit which was close to 5% of GDP in 2012.

From Figure 3I, we see that external debt stocks as a percentage of Gross National Income (GNI) have risen from 17% in 2007 to 21% in 2012 for India. The same has been declining for China with 11% in 2007 which fell to 9% in 2012. Figure 3J depicts the net FDI inflows to China and India and we observe the same to be resilient despite the crisis episodes. The net

portfolio equity inflows (Figure 3K), however, fell sharply (and were, in fact, negative for India) for the two EMEs in 2008 as well as 2011.

Figure 3L shows the total reserves in months of imports for China and India. It is important to note that the same have deteriorated between 2009-12 for China as well as India. However, while the Indian import cover is as low as six months, the same for China stands at 19 months.

Figure 3M depicts the nominal exchange rate for China and India vis-à-vis the U.S. Dollar. We notice that the Indian exchange rate (i.e. Rupee) depreciated sharply from Rs. 41/$ to Rs. 59/$ during the period 2007 to 2013. The Chinese Yuan Renminbi (i.e. CN¥) has been appreciating[4] during the period and it appreciated from CN¥ 7.6/$ in 2007 to CN¥ 6.2/$ in 2013. Figure 3N shows the corresponding real effective exchange rates for the two countries. The REER for India depreciated from 100 to 90 between the years 2007 to 2013. On the other hand, the REER for China appreciated from 89 in 2007 to 116 in 2013.

To sum up, we find that both China and India were affected by the crises. For both the economies, current account balance worsened, the volatile portfolio equity inflows fell and the total reserves of the central banks were depleted. In addition, in the Indian case, the exchange rate depreciated vis-à-vis the U.S. Dollar and the terms of trade deteriorated. Moreover, the Indian external debt obligations are rising overtime. China has been relatively more dependent on exports but the share of U.S. and E.U. in exports of China and India has been shrinking. Overall, these factors marred the growth prospects for China and India.

5. EXPORTS FROM CHINA AND INDIA TO THE U.S. AND EUROZONE

In this section, we analyse the pattern of exports from China and India to the U.S. and EZ respectively. Further, we present the sectoral composition[5] of Chinese and Indian exports to both the destinations.

5.1 Exports to U.S.

Figure 4 Panel A shows the trend in annualized month-on-month exports from China and India to the U.S. The rate of growth of Chinese as well as Indian exports to the U.S. was negative from October, 2008 to December, 2009. Table 2 Panel A shows the sectoral

[4] The Chinese Yuan has been undervalued and the appreciation of Yuan can be seen as a correction in the currency rates.
[5] Standard International Trade Classification at 1 digit level i.e. 1 digit SITC-wise composition

composition of exports from China to the U.S. and, similarly, the sectoral share in exports to the U.S. have been depicted in Panel B for India. From Panel A, we notice that the major exporting sectors for China are machinery and transport equipment, and manufactured goods. Further, it can be observed that the growth rates in all the major exporting sectors retarded in 2008 (excepting beverages which had slowed down in 2008 itself) and display negative rates of growth in 2009. While the sectors bounced back in 2010 with higher growth, the subsequent years were again marred by slower growth across the sectors. From Panel B, we find that India chiefly exports chemicals, manufactured goods, machinery and transport equipment, and mineral fuels, lubricants to the U.S. The share of machinery and transport equipment is the highest among the exporting sub-categories. All the segments display negative growth rates in 2008-09 (apart from crude materials and others which display negative growth rates in 2008). Further, analogous to the Chinese case, while the growth momentum seems to be picking up in 2010, we discover that the Indian exporting sectors slowed down again in 2011-13.

5.2 Exports to Eurozone

Figure 4 Panel B depicts the annualized monthly growth rate of exports from China and India to the Eurozone. The rate of growth of exports to the EA from China and India was negative during 2009 and it has been falling drastically since August, 2010. Table 3 shows the sectoral composition of exports to the Euro Area in Panel A for China and in Panel B for India. The slowdown is spread across all the major industries exporting to the Euro Area. From Panel A, we note that the major exporting sectors for China are manufactured goods followed by machinery and transport equipment. Moreover, all the Chinese exporting sectors display negative growth rates in 2012-13. Some of the sectors such as animal and vegetable oils, fats and waxes do not display negative growth rates during 2011-13 but that is possibly due to the lower base effect resulting from a loss of growth momentum in 2009. In Panel B, we obtain similar trends for India with the major exporting sector to the EZ being manufactured goods. We find that most of the exporting segments display negative growth rates in 2009 (apart from beverages which display negative growth rates from 2011-13). Moreover, while the sectoral exports' growth seems to be bouncing back in 2010-11, growth in the exporting industries decelerated in 2012-13 especially in the major exporting sector.

Therefore, we conclude that Chinese and Indian exports to U.S. and Euro Area have been severely hit as a consequence of the global recession and the Eurozone debt crisis. The magnitude of Chinese exports to U.S. and Euro Area is higher and China is relatively more

dependent on exports and, therefore, it is likely to have been more affected as a result of the crisis episodes.

6. ECONOMETRIC ANALYSIS OF EXPORT GROWTH RATES

In the preceding section, we studied the trends in exports from China and India to the U.S. and EA respectively. In this section, we undertake an econometric analysis to discern the regimes in the growth rates of Chinese and Indian exports to the developed economies-U.S. and Euro Area. This entails delineating cycles in growth rates of exports from China and India to the U.S. and E.Z. using a Markov-switching AR approach proposed by Hamilton (1989, 1990) in the context of the business cycle literature. Further, we show that the exports would be affected by the state of economic activity in the destination country. As a result, we analyse the impact of the crisis episodes and a consequent lowering down of the economic activity levels in the U.S. and E.Z. on the growth rates of exports from China and India. This is estimated using a Markov-switching regression (Quandt, 1958; Goldfeld and Quandt, 1973a; b) with Index of Industrial Production (IIP) of the destination nation which proxies the economic activity level as the regressor.

6.1 Methodology and Empirical Model

The methodology, and empirical model for the Markov-switching analysis of growth rates of exports employed in the paper are discussed in this sub- section. In the first step, we test for non stationarity or the presence of a unit root in the time series. Towards this end, we conduct the Lee and Strazicich (2003) unit root test which allows for structural breaks in the null hypothesis of a unit root.

In view of the export growth rates (Dua and Banerji, 2001, 2007) being subject to regimes, the 2-regime univariate empirical model for these can be expressed as follows

$$x_{US}^{CHI}{}_{t} = g_{S_t}(x_{US}^{CHI}{}_{t-j})$$

$$x_{US}^{IND}{}_{t} = h_{S_t}\left(x_{US}^{IND}{}_{t-j}\right)$$

$$x_{EZ}^{CHI}{}_{t} = m_{S_t}\left(x_{EZ}^{CHI}{}_{t-j}\right)$$

$$x_{EZ}^{IND}{}_{t} = n_{S_t}(x_{EZ}^{IND}{}_{t-j})$$

where $x_{US}^{CHI}, x_{US}^{IND}, x_{EZ}^{CHI}, x_{EZ}^{IND}$ are the growth rates of exports from China and India to U.S. and Eurozone respectively, $S_t = 1, 2$ denotes the states of the world[6] representing time periods of upturns and downturns in the growth rate of exports from China and India to the U.S. and Eurozone respectively.

We model the behaviour of a univariate time series (i.e. growth rates of exports x_t) using the general Markov Switching Intercept Heteroscedasticity (MSIAH) specification which could be described by a 2-state first-order Markov-switching autoregression (MS-AR) model (proposed by Hamilton, 1989; 1990),

$$x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_{S_t j} x_{t-j} + \sigma_{S_t} \varepsilon_t$$

where $\mu_{S_t} = \mu_1, \mu_2$ is the regime-dependent intercept in states 1 and 2 respectively; $\phi_{S_t} = \phi_{1j}, \phi_{2j}$ is the vector of regime-dependent autoregressive coefficients[7] in states 1 and 2 respectively and $\sigma_{S_t}^2 = \sigma_1^2, \sigma_2^2$ is the regime-dependent variance in states 1 and 2 respectively. The model can be utilized to elicit cycles intrinsic to the export growth rates inferred from the probabilities derived from the above model. The other variants of the process are MSI, and MSIA which indicate the absence of regime-switching in autoregressive (A) parameters and heteroscedasticity (H) respectively, and MSM (Hamilton, 1990) which includes regime-dependent means along with MSMH[8] which contains regime-dependent means and variances. Further, $S_t = 1,2$ is the random variable governing the switching process in the model which is the realization of a two-state Markov chain process.

A discrete-time Markov chain process is a stochastic process $S_t, t = 0,1, \ldots$ which can take a finite number of values and is governed by the 'Markov assumption' which states that the probability of transition at each point of time would depend only on the current state and

[6] We do not have prior information regarding the time periods of the two regimes and therefore, impose a first-order Markov chain process on the latent variable generating the regimes.

[7] The optimal number of regimes which are assumed to be two in the above specification and lags *j* will be selected on the basis of Krolzig (1997).

[8] The alternative specifications for the Markov-switching AR model are as follows

MSIAH: $x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_{S_t j} x_{t-j} + \sigma_{S_t} \varepsilon_t$

MSIA: $x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_{S_t j} x_{t-j} + \sigma \varepsilon_t$

MSIH: $x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_j x_{t-j} + \sigma_{S_t} \varepsilon_t$

MSI: $x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_j x_{t-j} + \sigma \varepsilon_t$

MSMH: $x_t - \mu_{S_t} = \sum_{j=1}^{k} \phi_j (x_{t-j} - \mu_{S_{t-j}}) + \sigma_{S_t} \varepsilon_t$

MSM: $x_t - \mu_{S_t} = \sum_{j=1}^{k} \phi_j (x_{t-j} - \mu_{S_{t-j}}) + \sigma \varepsilon_t$

nothing else. p_{ij} denotes the transition probability from state *i* to state *j* i.e. the probability of being in state *j* in the next period, given that the present period state is *i*. Then, the probability that $S_{t+1} = j$ or the conditional distribution of a future state $S_{t+1}|S_0, S_1, \dots, S_{t-1}, S_t$ is dependent only on the current state and is independent of the realization of all past states

$$P\{S_t = j|S_{t-1} = i, S_{t-2} = k, \dots, x_{t-1}, x_{t-2}, \dots\} = P\{S_t = j|S_{t-1} = i\} = p_{ij}$$

If there are 2 states then the transition probability matrix will be

$$P = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix}$$

The Markov switching model allows for a regime-shift, which is the outcome of an unobserved Markov chain process, in the parameters of Autoregression (AR). The estimation is conducted using Maximum Likelihood Estimation (MLE) or Expectation-Maximization (EM algorithm, Dempster *et al.*, 1977).

6.2 Results of MS-AR Models

In this sub-section, we estimate Markov-switching models to identify the regimes in growth rates of Chinese and Indian exports to the U.S. and Euro Area.

To gauge the state of growth in exports from China and India, we consider year-on-year changes (which eliminate seasonality) in the total value of exports from the two countries to the U.S. and Eurozone respectively. Thereafter, we utilize Markov switching AR models to elicit the slowdown and pick up phases in the export growth rates and assess the periods when there has been a dip in the trade activity of the two EMEs. The time period for analysis of export growth rates is from January, 1997 to December, 2013 for exports to the U.S. and from January, 2001 to December, 2013 for exports to the Eurozone.

Prior to the construction of the Markov-switching models, we need to test for stationarity of the time series. The export growth rates considered for the analysis are plagued by several structural breaks and therefore, the standard unit root tests would not be valid (Perron, 1989). Hence, we utilize the Lee-Strazicich (2003) unit root test which allows for structural breaks in the null hypothesis of a unit root and conclude that the growth rates of exports are stationary (Table 4). Subsequently, we utilize the Box-Jenkins methodology for lag selection and

determine the appropriate Markov-switching model[9] for each of the variables. The Markov-switching models are estimated using the Expectation-Maximization (EM) algorithm (Dempster *et al.*, 1977).

Table 5 reports the estimation results of the two-state Markov-switching models for the export growth rates. The smoothed probabilities of the slowdown regime for the Chinese and Indian export growth rates for the U.S. and Eurozone are given in Figures 5A-5D respectively.

We first discuss the growth rates for Chinese and Indian exports to the U.S. The mean rates of export growth for China and India are lower in the first regime and therefore, this regime corresponds to the low growth state or the slowdown or downturn phase. The transition probabilities which represent persistence of the regimes i.e. $p_{11}$and p_{22} for Chinese export growth rates are 0.9638 (slowdown-regime) and 0.9751 (pickup-regime), and for the Indian export growth rates are 0.8912 (slowdown-regime) and 0.9841 (pickup-regime) respectively. This indicates that the pickup-regimes in exports tend to be longer and more persistent than the slowdown-regime for both China and India. Our results show that Chinese exports to the U.S. were experiencing a slowdown in December of 2013. On the other hand, Indian exports to the U.S. were in the pickup phase during the same time period. The average duration of a pickup phase in Chinese exports to the U.S. is 40 months while that for the Indian exports to the U.S. is about 62 months.

From Figures 5A and 5B for the Chinese and Indian slowdowns in exports to the U.S., it is evident that the Markov-switching models have captured two episodes of slowdown in exports. These are the slowdown in exports in response to the U.S. recession of 2001[10] and the global recession of 2008-09. Interestingly, the slowdown regime for the Chinese exports to the U.S. has persisted even after the recent global recession seems to have died down.

We now discuss the case of the Eurozone export growth rates for China and India. As before, the mean rates of export growth for China as well as India are lower and negative in the first regime and therefore, this regime corresponds to the slowdown state. The transition probabilities $p_{11}$and p_{22} are 0.9740 (slowdown-regime) and 0.9641 (pickup-regime) for

[9] The autocorrelation function (ACF) and partial autocorrelation function (PACF) of the series are plotted. The plausible ARMA (autoregressive moving average) models are selected, estimated and examined. We then go on to formulate the corresponding parsimonious Markov Switching model based on Krolzig (1997).
[10] According to ECRI (2014a), the U.S. economy experienced a recession from March, 2001 to November, 2001.

Chinese export growth rates and 0.9729 (slowdown-regime) and 0.9658 (pickup-regime) for Indian export growth rates. This indicates that the slowdown-regime in rate of growth of exports is longer than the pickup-regime for the two EMEs. The average duration of a slowdown phase in Chinese exports to the Eurozone is 38 months while that for the Indian exports is 37 months. Further, it is noteworthy that both the slowdown and pickup states are persistent for the Eurozone export growth rate cycles of China and India. Our results show that both Chinese and Indian exports to the Euro Area were undergoing a slowdown phase in December, 2013.

Figures 5C and 5D present the smoothed probabilities for slowdowns in the Chinese and Indian exports to the Eurozone. The Markov-switching model captures the following episodes of slowdown in exports-the downturn in exports resulting from a recession in the European economies from 2001 to 2003[11], the global recession of 2008-09 and the Eurozone debt crisis 2010-11 onwards. Clearly, the slowdown regime for the Eurozone export growth rates for both the economies has continued even after the recent global recession ended owing to the ongoing crisis in the Eurozone economies. As a result, both the economies have still not been able to return to the high export growth regime.

Therefore, the Markov Switching analysis of export growth rates reveals two states for China and India which correspond to the behaviour of the exports during slowdowns and pickups. The slowdown episodes include the global recession for exports to the U.S. and the Eurozone crisis for exports to the Euro Area.

6.3 Results of Markov-switching Regressions

In this sub-section, we test for the impact of the recent crisis episodes in the U.S. and Eurozone on the export growth rates of China and India. We extend our base empirical model presented in sub-section 6.1 by incorporating the growth rates of economic activity, z_t, in the U.S. and Eurozone as follows

$$x_{US}^{CHI}{}_t = g'_{S_t}(x_{US}^{CHI}{}_{t-j}, z_t^{US})$$

[11] Several European economies including members of the Eurozone underwent a recession during 2001-03. According to ECRI (2014a), the recession period for Austria was January, 2001 to December, 2001, for France was from August, 2002 to May, 2003, for Germany was from January, 2001 to May, 2003, and for Switzerland was from March, 2001 to March, 2003.

$$x_{US}^{IND}{}_t = h'_{S_t}\left(x_{US}^{IND}{}_{t-j}, z_t^{US}\right)$$

$$x_{EZ}^{CHI}{}_t = m'_{S_t}\left(x_{EZ}^{CHI}{}_{t-j}, z_t^{EZ}\right)$$

$$x_{EZ}^{IND}{}_t = n'_{S_t}(x_{EZ}^{IND}{}_{t-,}, z_t^{EZ})$$

where x_{US}^{CHI}, x_{US}^{IND}, x_{EZ}^{CHI}, x_{EZ}^{IND} and S_t are as defined above. z_t^{US} and , z_t^{EZ} denotes the growth rate of economic activity levels in the U.S. and Eurozone respectively.

In the same vein, we extend our earlier MS-AR models for the growth rates of exports to perform the following univariate Markov-switching regression specification[12] (Quandt, 1958; Goldfeld and Quandt, 1973a; 1973b)

$$x_t = \mu_{S_t} + \sum_{j=1}^{k} \phi_{S_t j} x_{t-j} + \delta_{S_t} z_t + \sigma_{S_t} \varepsilon_t$$

where μ_{S_t} and ϕ_{S_t} are as defined above, and δ_{S_t} are the regime-switching coefficients for the variables representing the economic activity level of U.S. and Eurozone respectively[13]. To proxy for the economic activity level in the U.S. and Eurozone, we include the growth rates of the Index of Industrial Production (IIP) of each of the economies i.e. z_t^{US} and z_t^{EZ}. This model can be utilized to test for causality from variable z_t to variable x_t. As before, the Expectation-Maximization (EM) algorithm (Dempster *et al.*, 1977) is employed to estimate the Markov-switching regression models. A positive and significant coefficient δ indicates a significant rise in the average growth rate of the total value of exports from China (or India) in response to a rising growth rate of IIP in the U.S. (or Eurozone). The intuition can be inferred from a standard macroeconomic framework where a higher output of the foreign economy which is a destination for domestic exports leads to a rise in the exports from the domestic economy to the foreign economy. In other words, a dampening of the economic activity or growth rate of IIP in response to a crisis, as was the case for the U.S. economy during the global recession and the Eurozone economy during the Eurozone debt crisis, would lead to a fall in the growth

[12] The switching between two regimes that the *t*th observation of variable *x* is generated by one of the following two regression equations
$x_t = \mu_1 + \sum_{j=1}^{k} \phi_{1j} x_{t-j} + \delta_1 z_t + \sigma_1 \varepsilon_t$ or $x_t = \mu_2 + \sum_{j=1}^{k} \phi_{2j} x_{t-j} + \delta_2 z_t + \sigma_2 \varepsilon_t$.
[13]Studies like Riedel (1988), Aristotelous (2001) and Marquez and Schindler (2007) which estimate the export function also account for the impact of the export destination's economic activity level.

rate of exports from China and India to these destinations (due to a lowering of the demand for Chinese and Indian exports by U.S. and Eurozone residents).

Figures 6A and 6B depict the growth rates of IIP in the U.S. and Eurozone economies along with the crisis episodes for the period under study. We observe that the fall in rate of growth of IIP in U.S. or Eurozone is synonymous with the crisis episodes for both the economies. Therefore, we utilize the growth rate of IIP as a regressor in the Markov-switching models of export growth rates as it can capture the crises in the U.S. and Eurozone economies respectively.

Results of the Markov-switching regressions are presented in Table 6. We begin by analysing the Chinese export growth rates for U.S. using Markov-switching regression. The first state depicts lower growth rates and, therefore, corresponds to the slowdown phase. We find that $\delta_1 \; and \; \delta_2$ are positive and significant at 1% level of significance. Therefore, the Chinese export growth rates for U.S. are positively impacted by the economic activity level in the U.S. Further, $\delta_1 < \delta_2$ which implies that the increase in economic activity level of the U.S. in the pickup phases affects the exports more than it would in the slowdown phase. However, since $\delta_1 > 0$ it indicates that as the economic activity level in the U.S. measured by IIP growth rates falls, as was the case during the global recession, it leads to a fall in the rate of growth of Chinese exports to the U.S. Next, we study the Indian export growth rates for U.S. by employing Markov-switching regression. As in the previous case, both $\delta_1, \delta_2 > 0$, which indicates that a fall in the economic activity level in the U.S. would lead to a fall in the rate of growth of Indian exports to the U.S. We conclude that Chinese and Indian growth rates for U.S. exports were significantly reduced during the global recession episode.

We now discuss the case of growth rate of Chinese exports to the Eurozone using Markov-switching regression. As before, the first state depicts lower growth rates and therefore corresponds to the slowdown phase. The coefficients for the growth rate of Eurozone's IIP i.e. $\delta_1 \; and \; \delta_2$ are positive and significant at 1% level of significance. Therefore, the growth rates for Chinese exports to the Eurozone are positively impacted by the growth in IIP of the Eurozone. Further, both $\delta_1, \delta_2 > 0$ which means that a rise (fall) in the economic activity level of the Eurozone in the leads to a rise (fall) in the rate of growth of Chinese exports to the Eurozone. Similarly, we analyze the rate of growth of Indian exports to the Eurozone using Markov-switching regression. The results are analogous with both $\delta_1, \delta_2 > 0$, which indicates that a rise (fall) in the economic activity level of the Eurozone proxied by growth rate of

Eurozone's IIP would lead to a rise (fall) in the growth rate of Indian exports to the Eurozone. Therefore, a dampening of economic activity levels in the Eurozone as a consequence of the Eurozone Sovereign debt crisis led to a fall in the rates of growth of Chinese and Indian exports to the destination.

Henceforth, we conclude that the global recession significantly affected the Chinese and Indian exports to the U.S. This was followed by a crisis in the Eurozone which led to a fall in the growth rates of exports of China and India to the Eurozone.

7. CONCLUSIONS

In this paper, we study the impact of recent crisis episodes viz. global recession of 2008-09 and Eurozone debt crisis of 2010-12 on the EMEs of China and India. We succinctly describe the channels of crisis transmission to EMEs propounded by Blanchard *et al.* (2010) in the context of the financial crisis in the U.S. Based on the BoP Approach, the analysis suggests that the crisis would lead to dampening of the demand for EME exports resulting in a deterioration of the current account balance along with a reduction in capital-inflows and accentuation of capital outflows from the EME which would cause a worsening of its capital account balance. These coupled with a fall in the terms of trade and a depreciation of the nominal exchange rate would result in a decline in the foreign exchange reserves of the EME.

Subsequently, we examine the macroeconomic fundamentals of China and India and find that growth in the economies has slowed down in the aftermath of the crisis episodes in the West. While China has been relatively more dependent on exports (due to a higher share of exports in GDP), the share of developed economies of U.S. and E.U. in exports of China and India has been shrinking over the period 2007-13. Furthermore, we observe that the current account balance has indeed worsened, along with a reduction in the volatile portfolio equity inflows and diminishing of the total reserves for both China and India. Additionally, the Indian Rupee depreciated vis-à-vis the Dollar and the terms of trade for India deteriorated. Moreover, the Indian external debt obligations have been rising over the period 2007-13. The analysis of macroeconomic indicators of the two EMEs reveals that the impact of the crises is in line with that suggested by Blanchard *et al.* (2010).

Thereafter, we focus on the trade channel of crisis transmission and examine the sectoral composition of Chinese and Indian exports to the U.S. and Eurozone respectively. On the basis of the detailed-SITC category-wise analysis of exports to the U.S. and Euro Area, we find that

the growth rates for almost all the major exporting sectors of China and India have been negative in 2009 for the U.S. exports, and 2009 and 2012 for the exports to Eurozone.

We then undertake an econometric analysis to assess the impact of the crisis episodes on Chinese and Indian export growth. Our Markov-switching AR analysis reveals two phases in the export growth rates of China and India which correspond to the behaviour of the exports during slowdowns and pickups. These slowdown episodes include the periods indicating dampening of exports to the U.S. due to the global recession and fall of exports to the Euro Area in response to the Eurozone crisis. We then extend our analysis and perform Markov-switching regressions with the IIP of the destination nation as proxy for the economic activity level as the regressor. We show that the exports growth rates are affected by the state of economic activity in the destination country. As a result, we conclude that the global recession which led to a fall in the economic activity level of U.S. significantly affected the Chinese and Indian exports to the U.S. Similarly, a crisis in the Eurozone which reduced economic activity level in the economy resulted in a reduction in the growth rates of exports of China and India to the destination.

To conclude, the findings from an investigation of the export growth rates and sectoral composition of exports from China and India to the U.S. and Eurozone individually, and Markov-switching AR and regression analyses of the same corroborate the conclusion that Chinese and Indian exports were adversely affected as a result of the recent crises that transpired in the advanced economies of U.S. and Eurozone. Further, in view of a significant share of exports in GDP for both the economies, the slowdown in exports may have been one of the chief causes of a slowdown in the overall growth for China and India.

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TABLES AND FIGURES

TABLES

Table 1: Descriptive Statistics

	x_{US}^{CHI}	x_{US}^{IND}	x_{EZ}^{CHI}	x_{EZ}^{IND}
Mean	14.25***	12.88***	12.11***	9.67***
Std. Dev	13.17	15.79	16.49	15.82
Skewness	-0.11	0.13	0.09	0.06
Kurtosis	0.59***	1.12*	-0.68*	0.19
Minimum	-22.42	-26.63	-23.53	-29.56
Maximum	57.50	67.81	54.18	59.84

Note: x_{US}^{CHI} denotes the rate of growth of exports from China to U.S., x_{US}^{IND} denotes the rate of growth of exports from India to U.S., x_{EZ}^{CHI} denotes the rate of growth of exports from China to Eurozone and x_{EZ}^{IND} denotes the rate of growth of exports from India to Eurozone. *, ** and *** denote 10%, 5% and 1% levels of significance respectively.

Table 2: Distribution of Exports to U.S. by Major Sectors

Panel A: China

Distribution of Exports to U.S. by Major sectors								
China	**Share of total exports[a]**	**Rate of growth (%)[b]**						
Sector		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Food and live animals	1%	18%	13%	-14%	18%	14%	5%	-2%
Beverages and tobacco	0%	32%	-20%	4%	5%	-6%	59%	-7%
Crude materials, inedible, except fuels	0%	6%	10%	-33%	25%	24%	10%	-3%
Mineral fuels, lubricants and related materials	0%	-43%	202%	-85%	60%	-29%	-14%	22%
Animal and vegetable oils, fats and waxes	0%	42%	53%	-9%	-5%	16%	12%	7%
Chemicals and related products, n.e.s.	3%	16%	46%	-21%	26%	28%	2%	4%
Manufactured goods classified chiefly by material	11%	10%	8%	-28%	19%	11%	8%	5%
Machinery and transport equipment	51%	11%	4%	-8%	29%	12%	8%	4%
Miscellaneous manufactured articles	32%	12%	1%	-12%	19%	2%	4%	3%
Commodities and transactions not classified elsewhere in the SITC	1%	14%	5%	-10%	5%	7%	7%	4%

Note: a in 2013, b year-on-year in each category; Source: U.S. International Trade Commission

Panel B: India

Distribution of Exports to U.S. by Major sectors								
India	**Share of total exports[a]**	**Rate of growth (%)[b]**						
Sector		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Food and live animals	0%	7%	6%	-11%	29%	14%	133%	-29%
Beverages and tobacco	0%	28%	50%	-4%	-17%	11%	51%	-17%
Crude materials, inedible, except fuels	5%	21%	-14%	21%	47%	437%	22%	-44%
Mineral fuels, lubricants and related materials	9%	120%	-39%	-23%	428%	-25%	11%	102%
Animal and vegetable oils, fats and waxes	0%	24%	74%	-44%	72%	34%	-19%	2%
Chemicals and related products, n.e.s.	19%	-2%	-12%	-10%	12%	3%	21%	4%
Manufactured goods classified chiefly by material	33%	8%	14%	-28%	43%	18%	-1%	15%
Machinery and transport equipment	10%	53%	17%	-23%	33%	17%	10%	-11%
Miscellaneous manufactured articles	16%	-3%	44%	-7%	36%	32%	-2%	6%
Commodities and transactions not classified elsewhere in the SITC	1%	-19%	-22%	15%	7%	27%	35%	-6%

Note: a in 2013, b year-on-year in each category; Source: U.S. International Trade Commission

Table 3: Distribution of Exports to Eurozone by Major sectors
Panel A: China

Distribution of Exports to Eurozone by Major sectors							
China	**Share of total exports[a]**	**Rate of growth (%)[b]**					
Sector		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Food, drinks and tobacco	1%	22%	4%	-7%	20%	11%	-4%	0%
Food and live animals	1%	22%	4%	-7%	19%	11%	-4%	0%
Beverages and tobacco	0%	11%	21%	22%	23%	14%	-3%	-9%
Raw materials	0%	8%	5%	-36%	43%	19%	-10%	-10%
Crude materials, inedible, except fuels	0%	9%	7%	-37%	44%	19%	-10%	-11%
Mineral fuels, lubricants and related materials	0%	-3%	74%	-71%	0%	0%	-37%	19%
Petroleum, petroleum products and related materials	0%	-10%	116%	-22%	19%	7%	-17%	-12%
Animal and vegetable oils, fats and waxes	0%	0%	-63%	-15%	-4%	55%	21%	20%
Manufactured goods	40%	19%	7%	-14%	33%	4%	-2%	-5%
Chemicals and related products, n.e.s.	2%	22%	25%	-14%	40%	17%	-3%	1%
Other manufactured goods	17%	25%	6%	-15%	21%	7%	-4%	-4%
Manufactured goods classified chiefly by material	5%	43%	1%	-35%	34%	15%	-7%	-3%
Machinery and transport equipment	21%	13%	7%	-13%	43%	-1%	0%	-6%
Miscellaneous manufactured articles	12%	18%	9%	-5%	16%	4%	-3%	-4%
Commodities and transactions not classified elsewhere in the SITC	0%	165%	-33%	-31%	60%	22%	-15%	-3%

Note: a in 2013, b year-on-year in each category; Source: Eurostat

Panel B: India

Distribution of Exports to Eurozone by Major sectors								
China	**Share of total exports[a]**	**Rate of growth (%)[b]**						
Sector		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Food, drinks and tobacco	3%	12%	14%	-13%	13%	29%	6%	1%
Food and live animals	3%	12%	14%	-15%	10%	33%	7%	2%
Beverages and tobacco	0%	22%	28%	-36%	44%	-11%	-11%	-4%
Raw materials	1%	8%	14%	-29%	44%	25%	2%	-12%
Crude materials, inedible, except fuels	1%	7%	0%	-20%	31%	20%	11%	-15%
Mineral fuels, lubricants and related materials	6%	29%	97%	-5%	121%	13%	-1%	-4%
Petroleum, petroleum products and related materials	6%	29%	94%	-4%	122%	12%	0%	-4%
Animal and vegetable oils, fats and waxes	0%	12%	88%	-57%	111%	40%	-23%	-2%
Manufactured goods	30%	16%	8%	-15%	22%	21%	-11%	0%
Chemicals and related products, n.e.s.	6%	23%	14%	-12%	34%	28%	2%	5%
Other manufactured goods	18%	11%	1%	-20%	20%	22%	-13%	1%
Manufactured goods classified chiefly by material	10%	20%	0%	-34%	32%	33%	-15%	1%
Machinery and transport equipment	6%	34%	33%	-1%	22%	14%	-14%	-11%
Miscellaneous manufactured articles	8%	2%	3%	0%	9%	10%	-10%	1%
Commodities and transactions not classified elsewhere in the SITC	0%	-13%	65%	-11%	19%	284%	-23%	-64%

Note: a in 2013, b year-on-year in each category; Source: Eurostat

Table 4: Unit Root Test Results: Lee-Strazicich Unit Root Test for Structural Change

Variable	Trend Break Model	Crash Model	Inference
x_{US}^{CHI}	-6.21**	-4.67***	I (0)
x_{US}^{IND}	-6.41**	-5.03***	I (0)
x_{EZ}^{CHI}	-5.31*	-4.84***	I (0)
x_{EZ}^{IND}	-5.19	-4.11**	I (0)
z_t^{US}	-6.85***	-5.29***	I (0)
z_t^{EZ}	-5.50*	-4.34**	I (0)
Critical Values			
Crash Model	1%	5%	10%
LM_τ	-4.545	-3.842	-3.504
Trend Break Model		λ_2	
λ_1	0.4	0.6	0.8
0.2	-6.16, -5.59, -5.27	-6.41, -5.74, -5.32	-6.33, -5.71, -5.33
0.4	-	-6.45, -5.67, -5.31	-6.42, -5.65, -5.32
0.6	-	-	-6.32, -5.73, -5.32

Note: x_{US}^{CHI} denotes the rate of growth of exports from China to U.S., x_{US}^{IND} denotes the rate of growth of exports from India to U.S., x_{EZ}^{CHI} denotes the rate of growth of exports from China to Eurozone, x_{EZ}^{IND} denotes the rate of growth of exports from India to Eurozone, z_t^{US} denotes the rate of growth of Index of Industrial Production for U.S. and z_t^{EZ} denotes the rate of growth of Index of Industrial Production for Eurozone. Critical values are at the 1%, 5% and 10% levels, respectively. $\lambda_j$denotes the location of breaks.

Table 5: Parameter Estimates for Univariate Two-state Markov-switching AR Models

	x_{US}^{CHI}	x_{US}^{IND}	x_{EZ}^{CHI}	x_{EZ}^{IND}
Model	MSI	MSI	MSIH	MSI
Lags	1	1	4	1
μ_1	1.18	-5.43	-1.33	-1.39
μ_2	12.31***	7.08***	9.70***	10.75***
ϕ_1	0.42***	0.57***	0.36***	0.47***
ϕ_2	-	-	0.11	-
ϕ_3	-	-	0.30***	-
ϕ_4	-	-	-0.16*	-
σ_1	69.39***	110.54***	41.82***	97.31***
σ_2	-	-	79.40***	-
LogL	-722.13	-763.93	-536.47	-585.69
P_{11}	0.9638	0.8912	0.9740	0.9729
P_{22}	0.9751	0.9841	0.9641	0.9658
Duration 1	27.62	9.19	38.46	36.9
Duration 2	40.32	62.70	27.86	29.21

Note: *, ** and *** denote 10%, 5% and 1% levels of significance respectively.

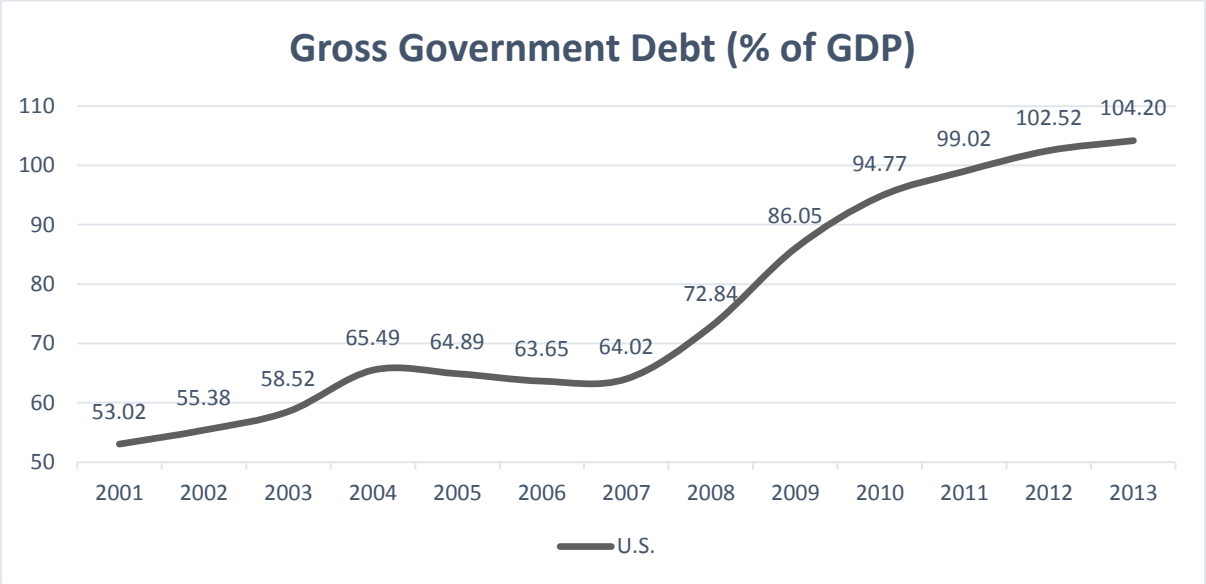
Table 6: Parameter Estimates for Univariate Two-state Markov-switching Regression Models

	x_{US}^{CHI}	x_{US}^{IND}	x_{EZ}^{CHI}	x_{EZ}^{IND}a
Lags	1	1	4	1
μ_1	4.26****	4.28****	1.48	1.04
μ_2	21.31****	14.60	11.03****	7.23**
ϕ_{11}	0.47****	0.46****	0.52****	0.39***
ϕ_{12}	-0.13	-0.59****	-0.61****	0.41***
ϕ_{21}	-	-	0.10	-
ϕ_{22}	-	-	0.13****	-
ϕ_{31}	-	-	0.29****	-
ϕ_{32}	-	-	0.46****	-
ϕ_{41}	-	-	-0.12*	-
ϕ_{42}	-	-	0.37****	-
γ_1	-	-	-	11.69**
γ_2	-	-	-	-1.45
δ_1	0.90****	1.01****	0.39***	0.72****
δ_2	4.74****	9.08****	4.81****	1.44***
σ_1	59.68****	91.27****	60.52****	92.58***
σ_2	-	-	1.43****	-
Log L	-713.97	-757.24	-514.21	-577.58
AIC	1445.95	1532.48	1060.42	1177.16
BIC	1475.81	1562.34	1108.80	1210.64
HQ	1458.03	1544.56	1080.07	1190.76

Note: a indicates that the regression equation includes dummy for crisis periods viz. from 09/2008-02/2009, 04/2010-07/2010, 11/2010-12/2010 and 05/2011-11/2011 with coefficients γ_i respectively. *,**,***,**** indicate significance at 20%, 10%, 5% and 1% respectively.

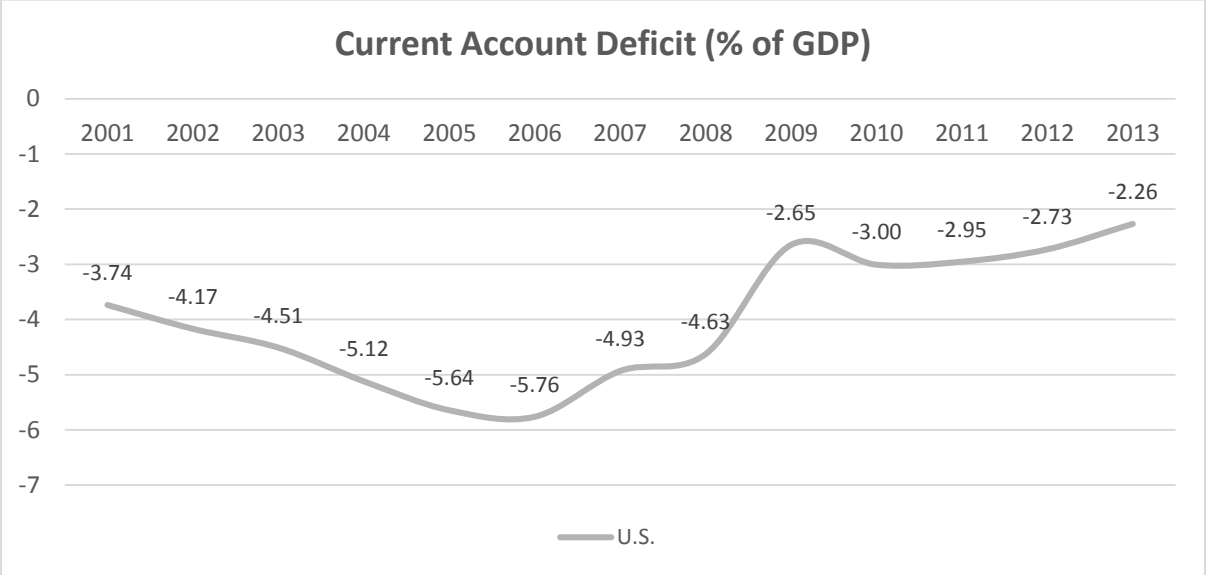
FIGURES

Figure 1A: Gross Government Debt (% of GDP) in the U.S.



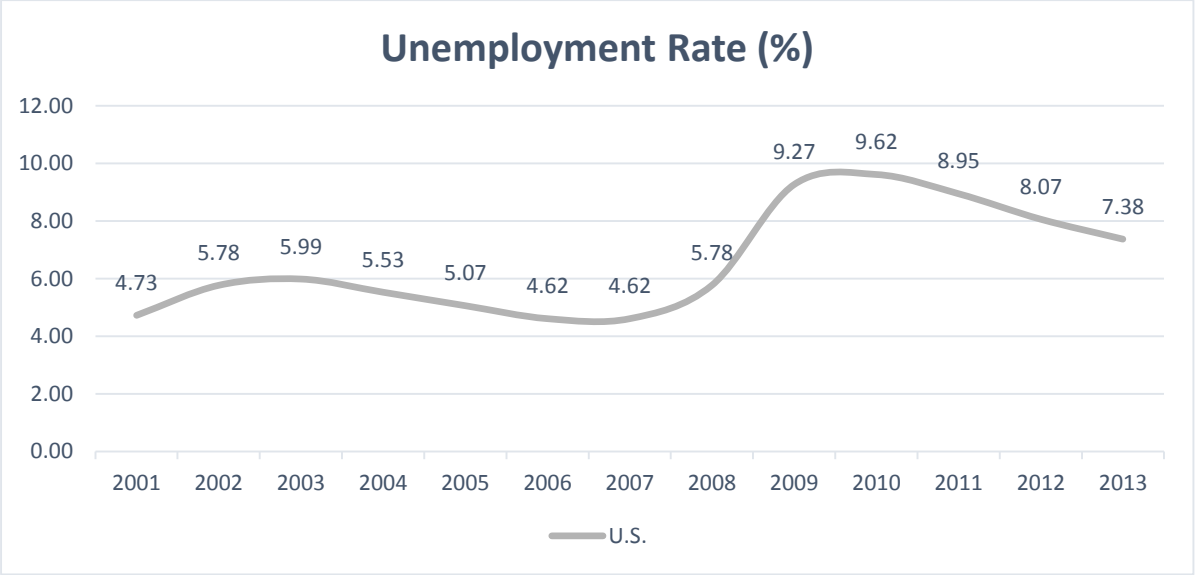
Source: Federal Reserve Bank of St. Louis

Figure 1B: Current Account Deficit (% of GDP) in the U.S.



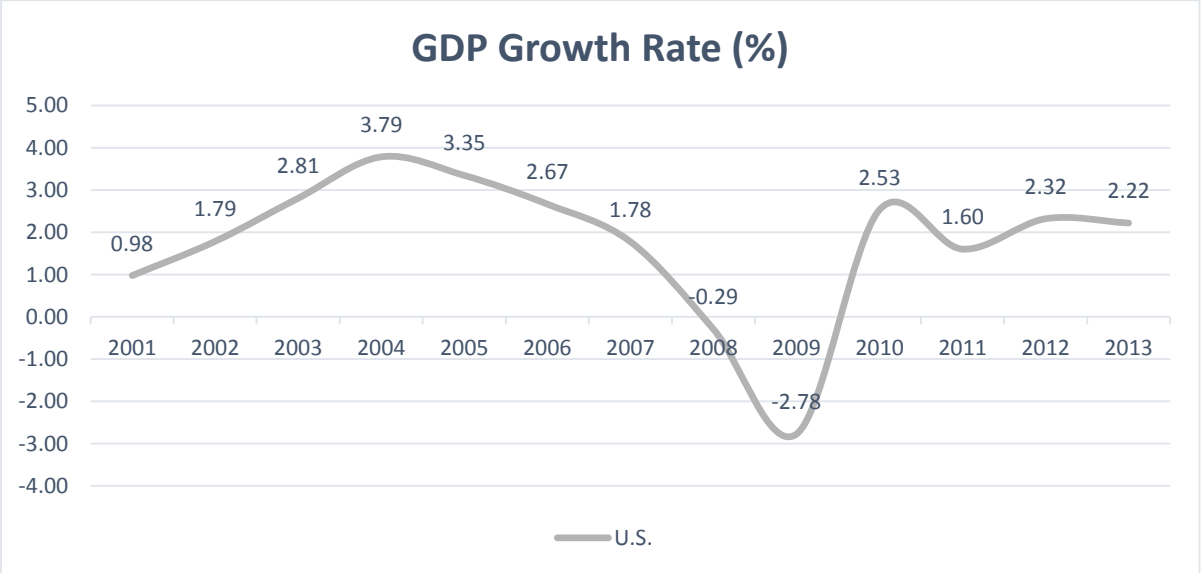
Source: Federal Reserve Bank of St. Louis

Figure 2C: Unemployment Rate (%) in the U.S.



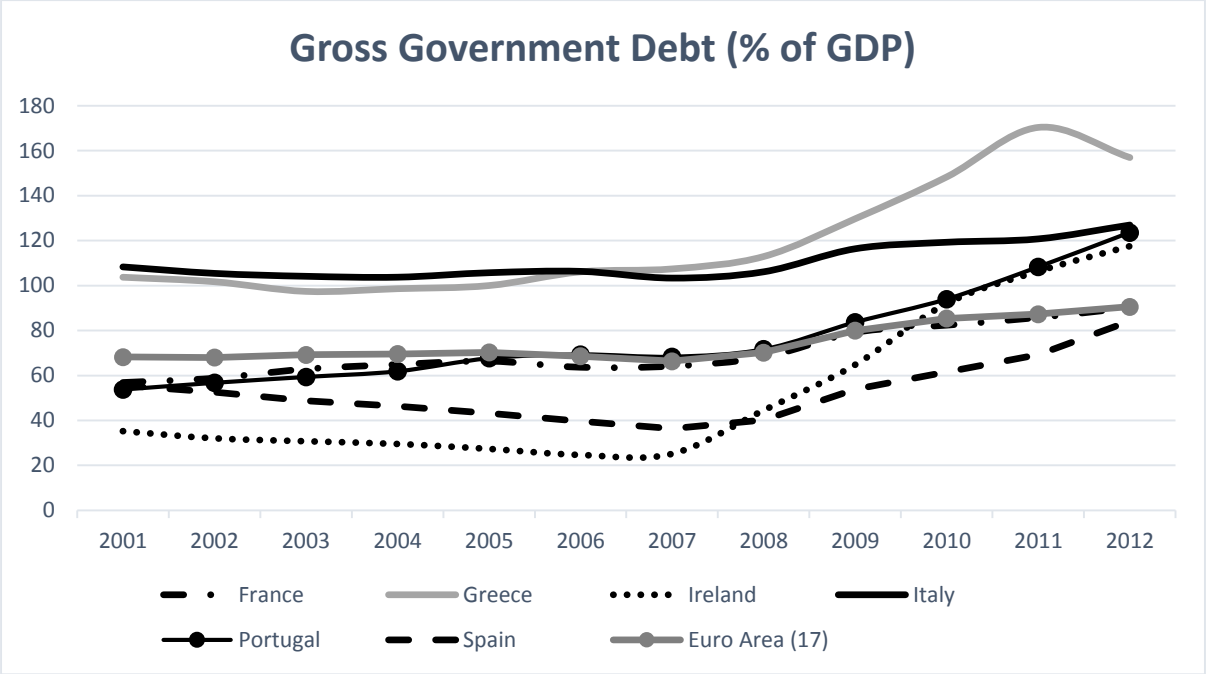
Source: Federal Reserve Bank of St. Louis

Figure 2D: GDP Growth Rate (%) in the U.S.



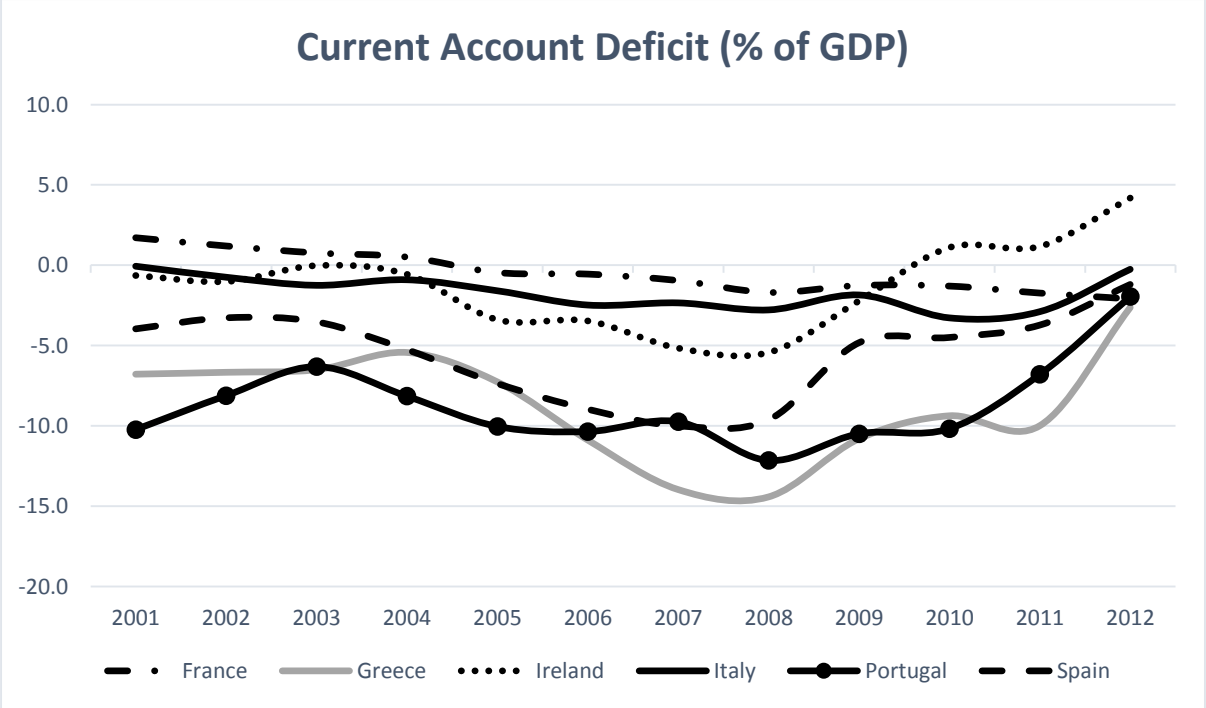
Source: Federal Reserve Bank of St. Louis

Figure 2A: Gross Government Debt (% of GDP) in the Eurozone Economies



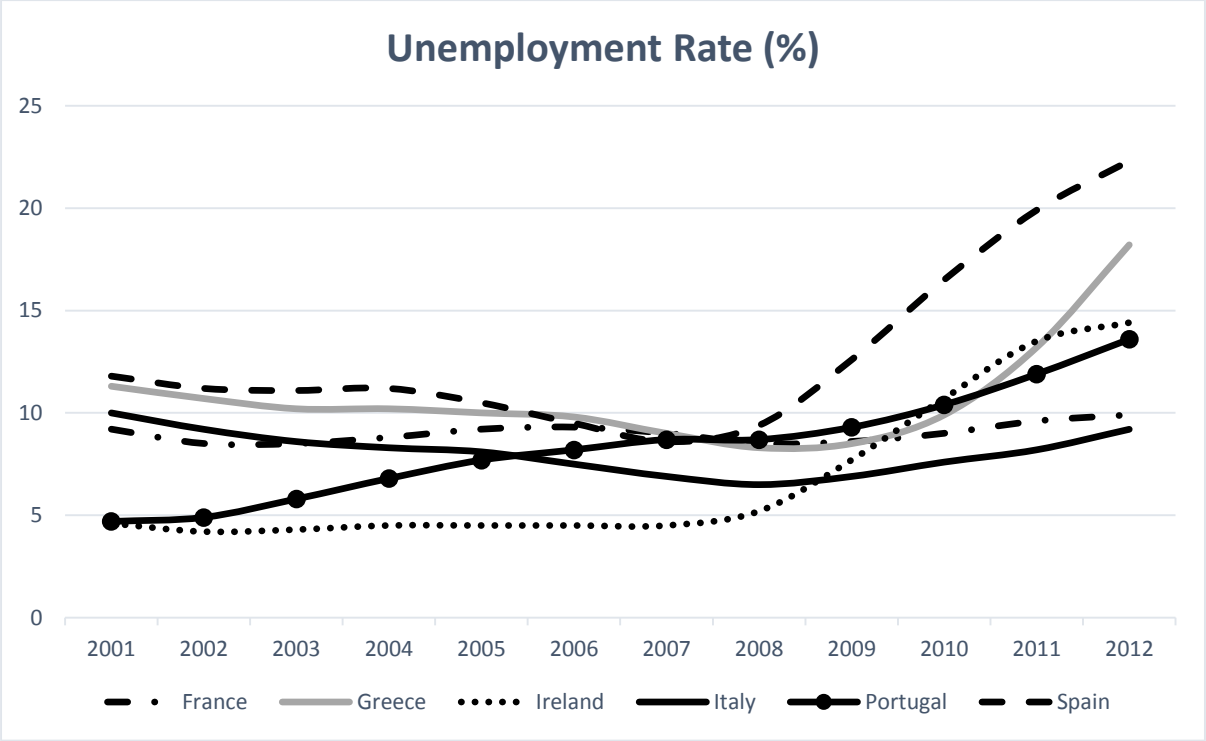
Source: Eurostat

Figure 2B: Current Account Deficit (% of GDP) in the Eurozone Economies



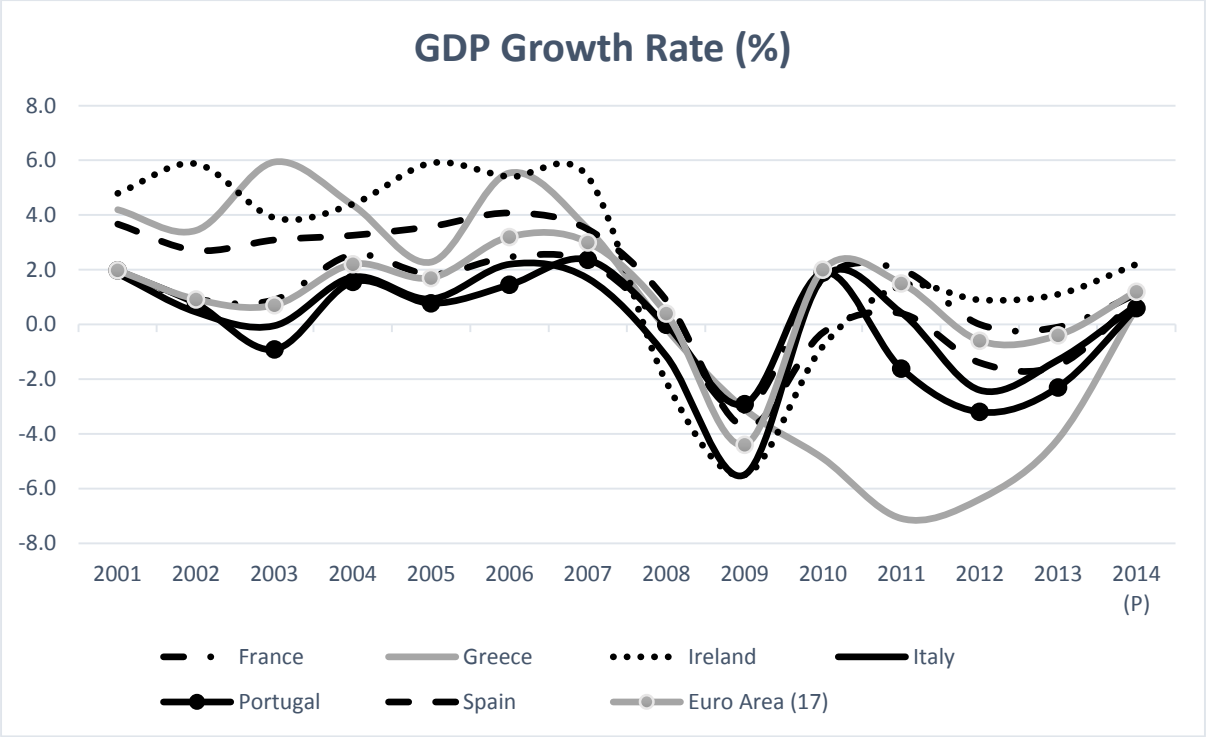
Source: OECD Database

Figure 2C: Unemployment Rate (%) in the Eurozone Economies



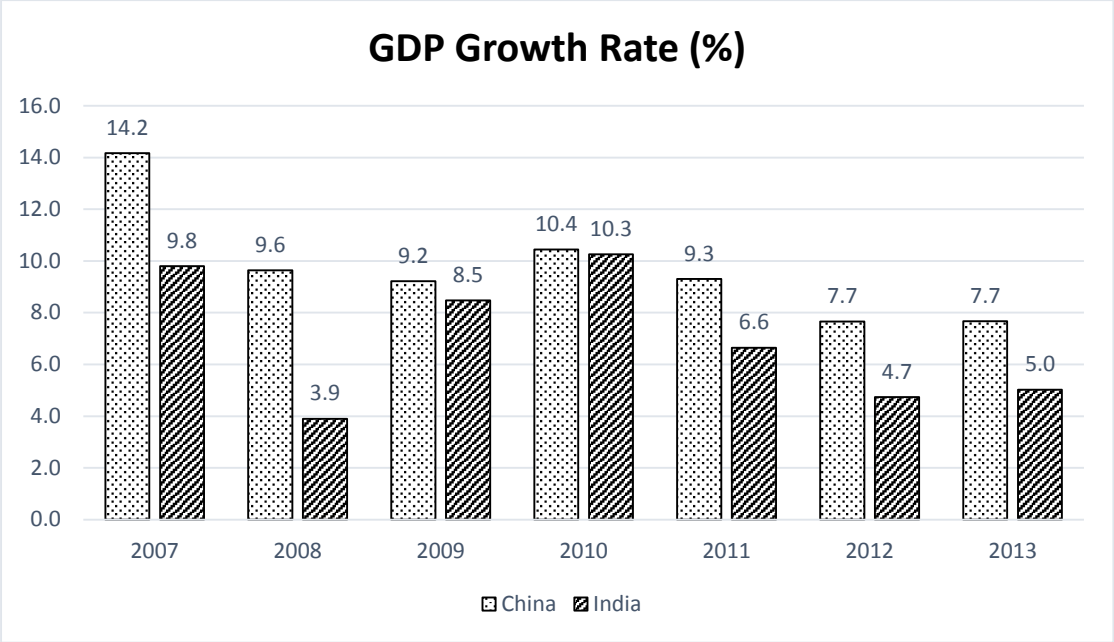
Source: Eurostat

Figure 2D: GDP Growth Rate (%) in the Eurozone Economies



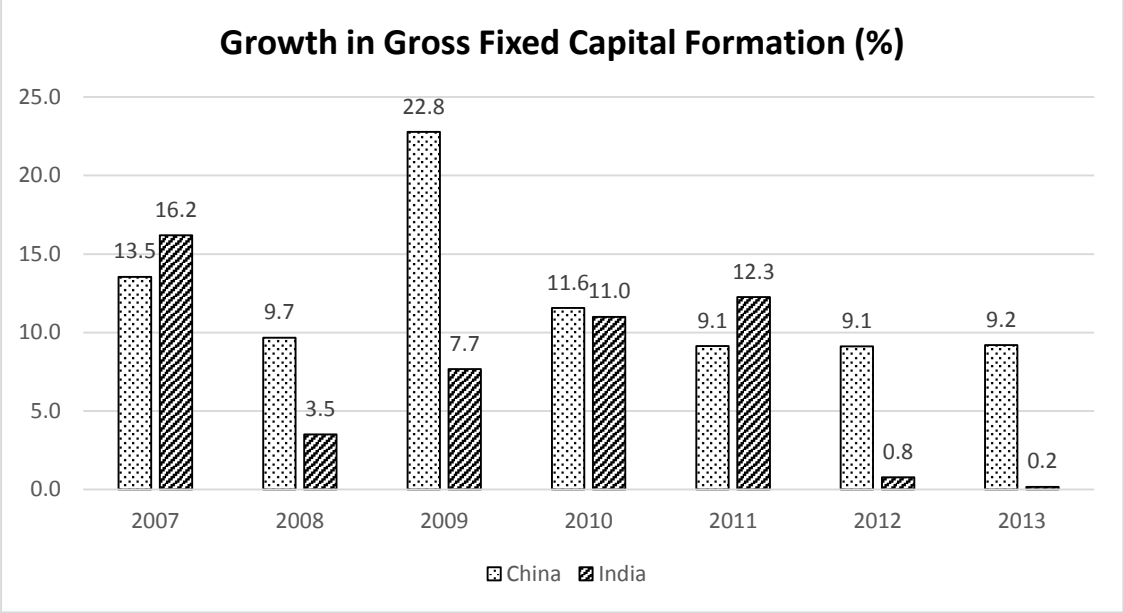
Source: Eurostat

Figure 3A: GDP Growth Rate (%)



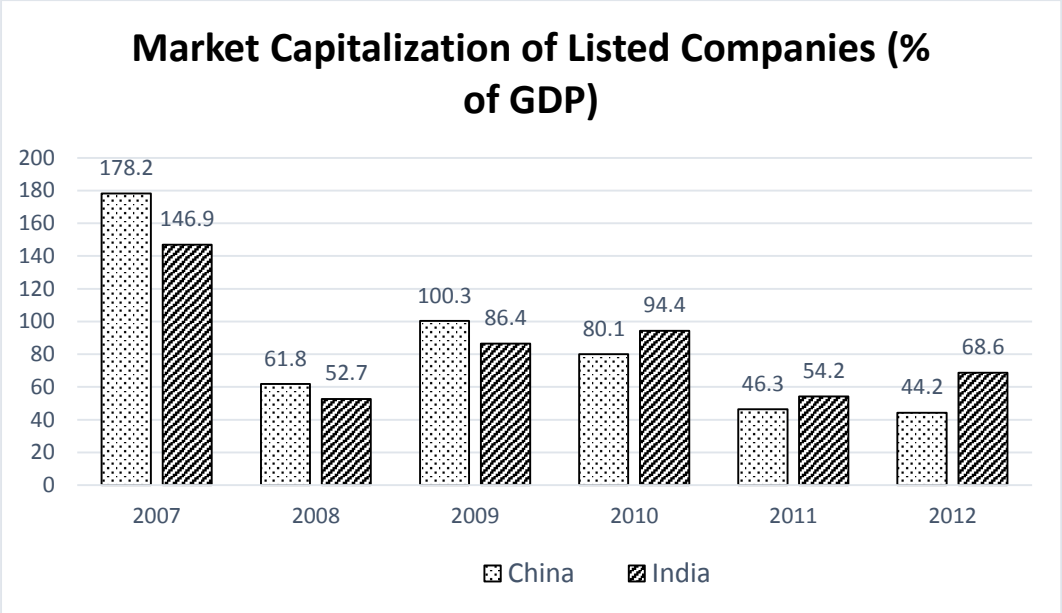
Source: World Development Indicators, 2014

Figure 3B: Growth in Gross Fixed Capital Formation (Annual, in %)



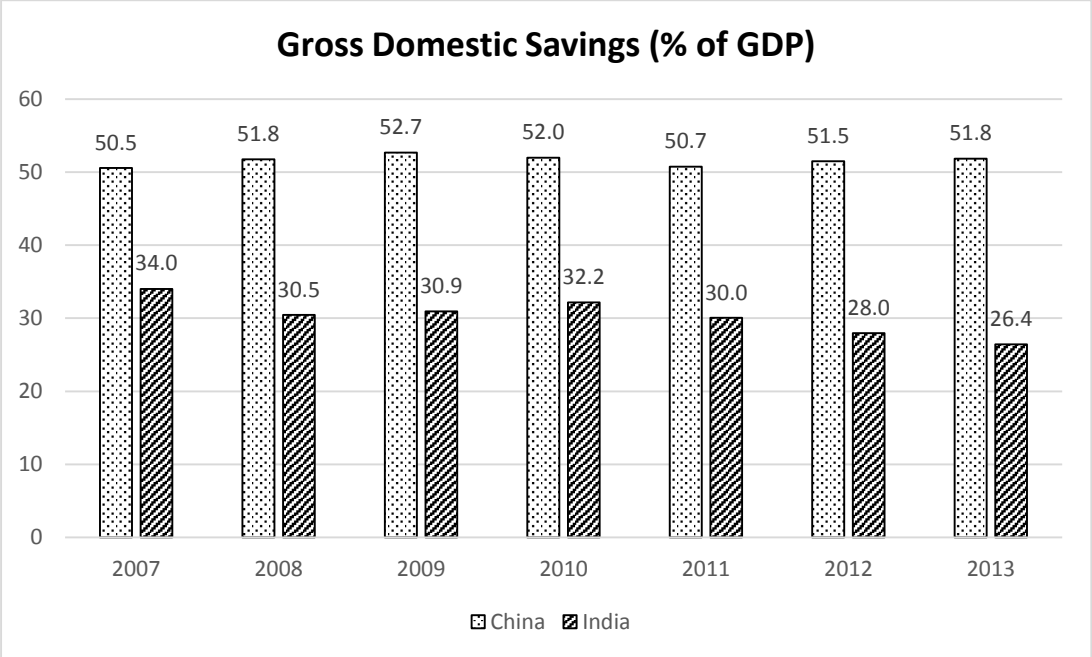
Source: World Development Indicators, 2014

Figure 3C: Market Capitalization of Listed Companies (% of GDP)



Source: World Development Indicators, 2014

Figure 3D: Gross Domestic Savings (% of GDP)



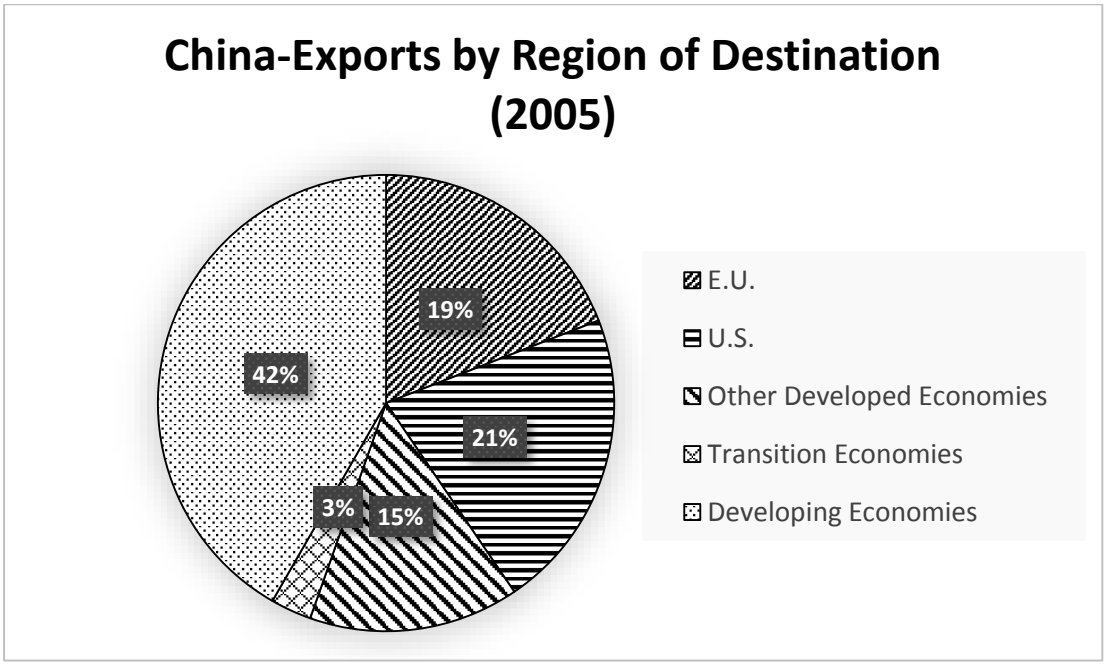
Source: World Development Indicators, 2014

Figure 3E: Share of Exports in GDP (%)

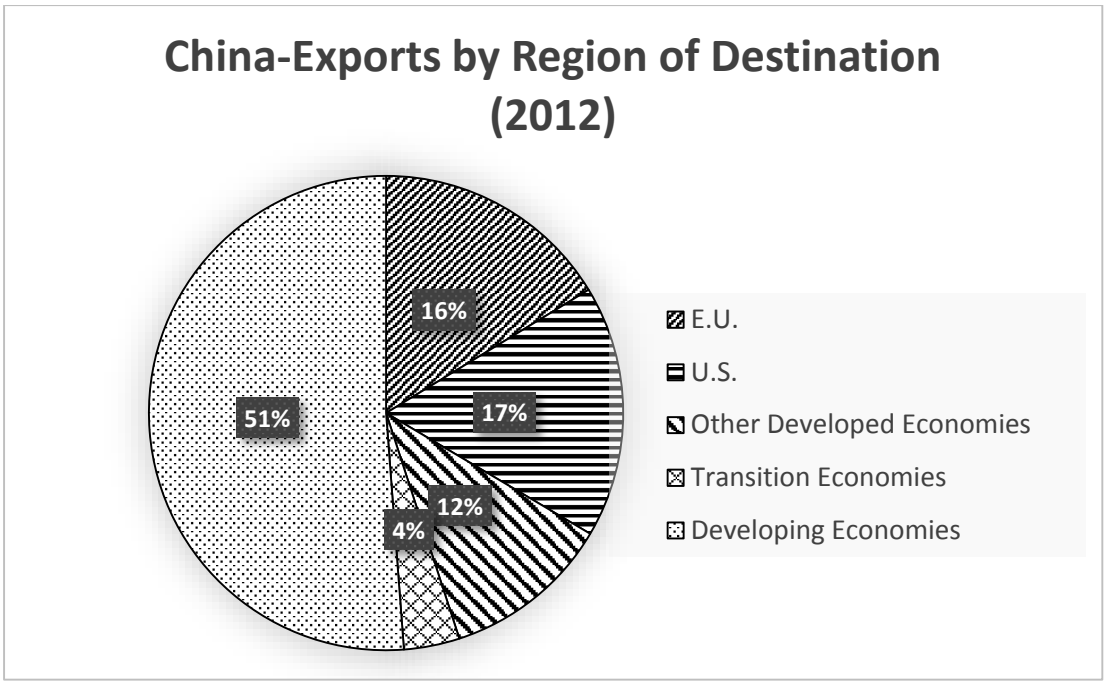
Source: World Development Indicators, 2014

Figure 3F: Regional Distribution of Chinese Exports by Destination in 2005 and 2012

i) 2005



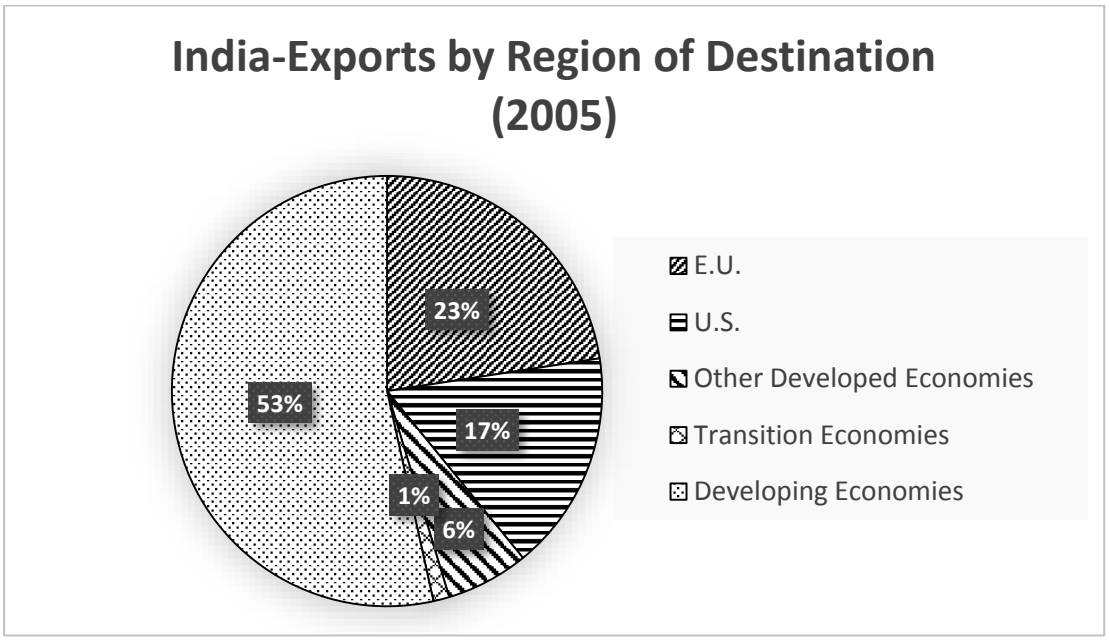
ii) 2012



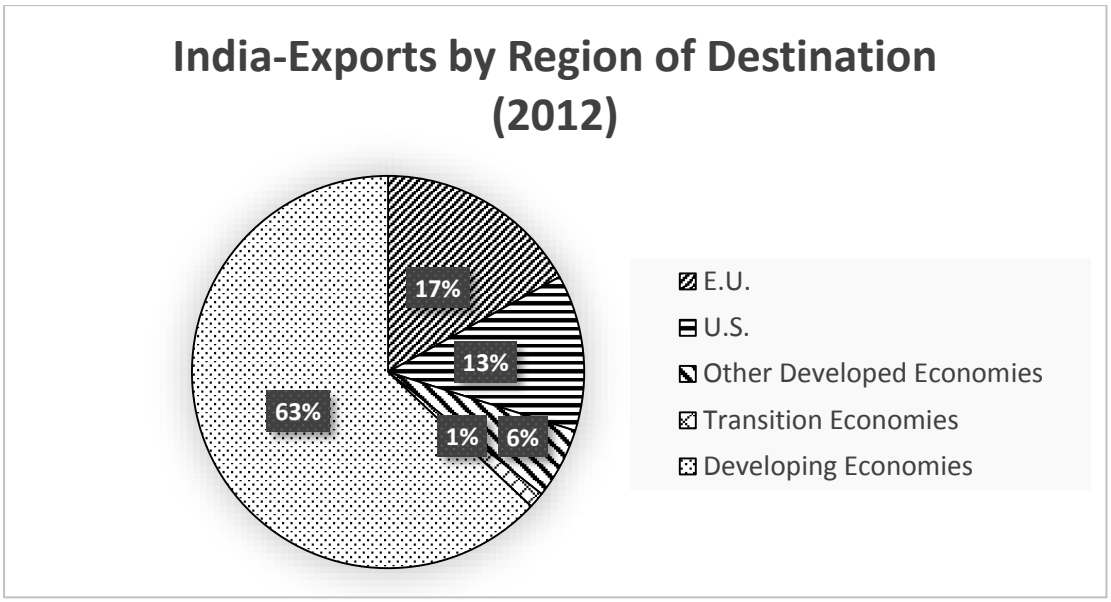
Source: Handbook of Statistics, UNTAD, 2013

Figure 3G: Regional Distribution of Indian Exports by Destination in 2005 and 2012

i) 2005

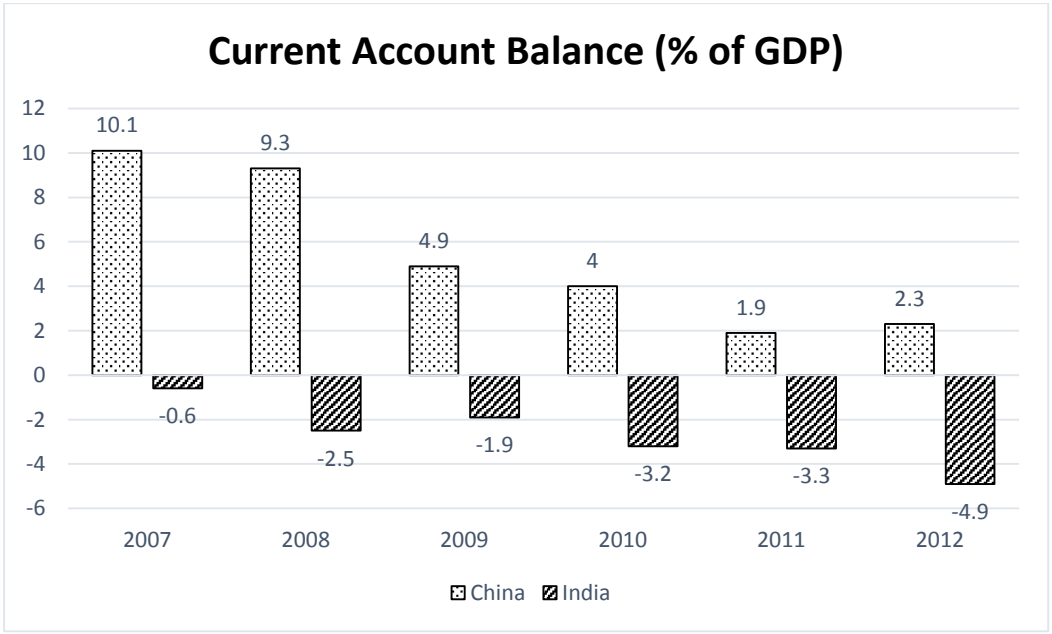


ii) 2012



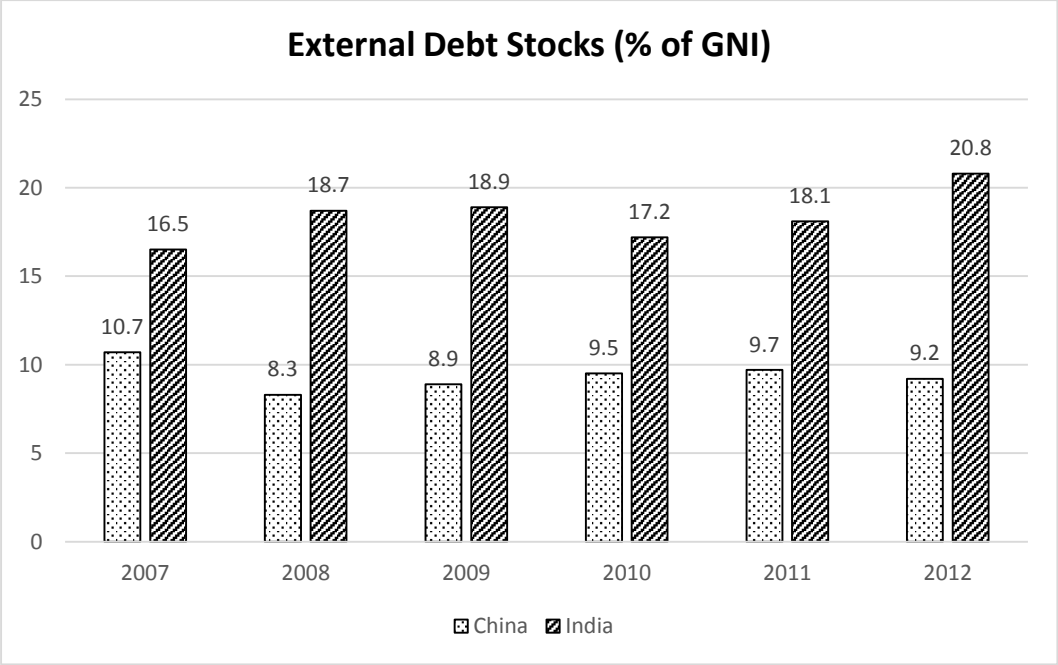
Source: Handbook of Statistics, UNTAD, 2013

Figure 3H: Current Account Balance (% of GDP)



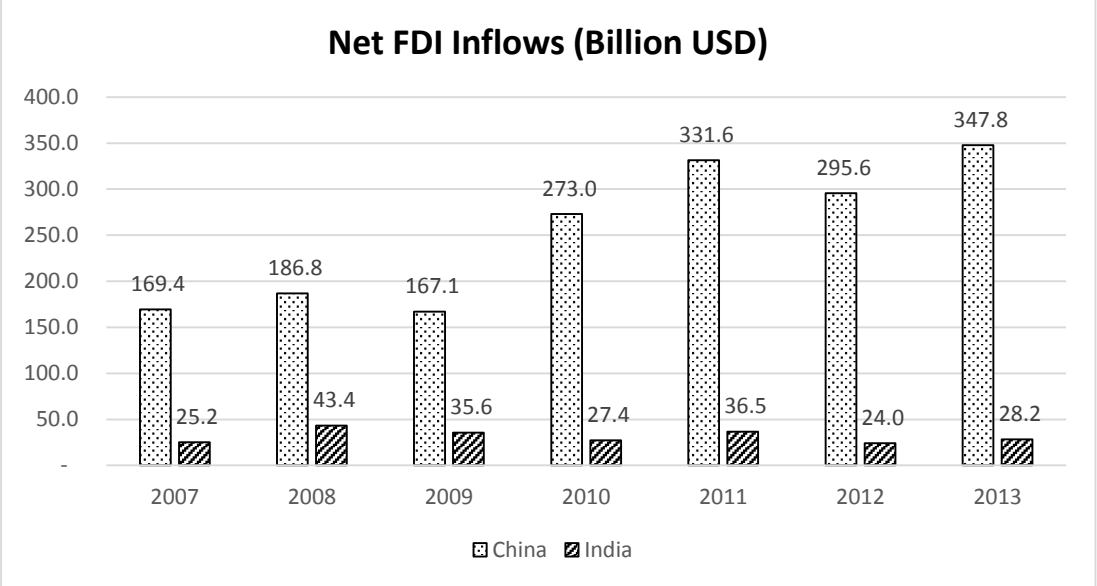
Source: World Development Indicators, 2014

Figure 3I: External Debt Stocks



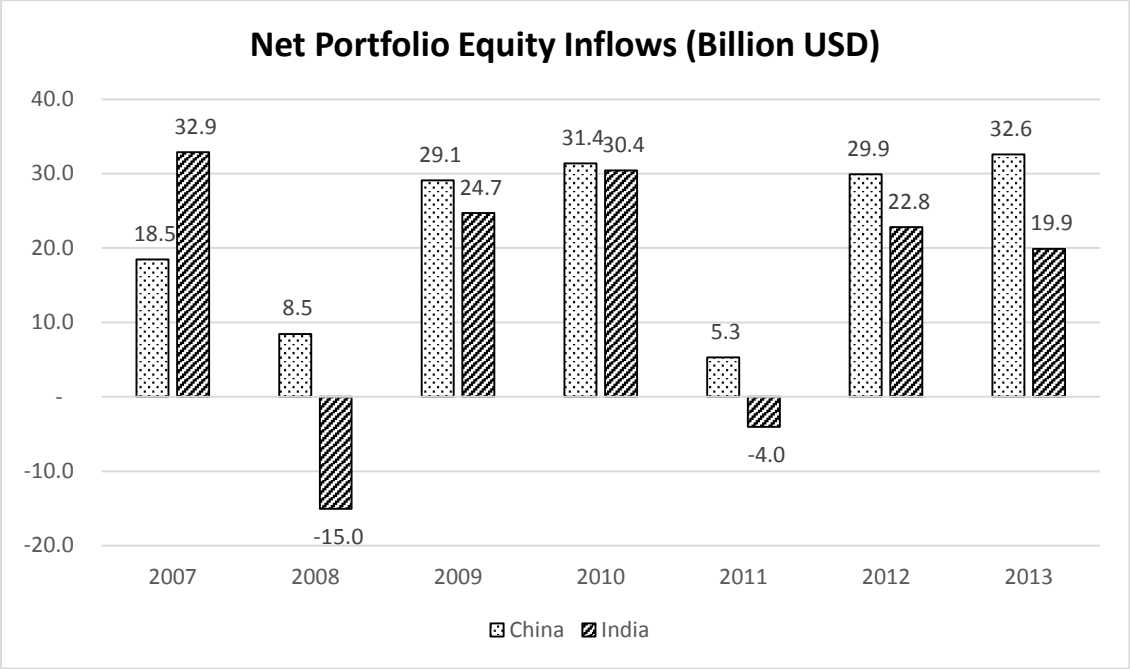
Source: World Development Indicators, 2014

Figure 3J: Net Foreign Direct Investment Inflows (Billion US Dollars)



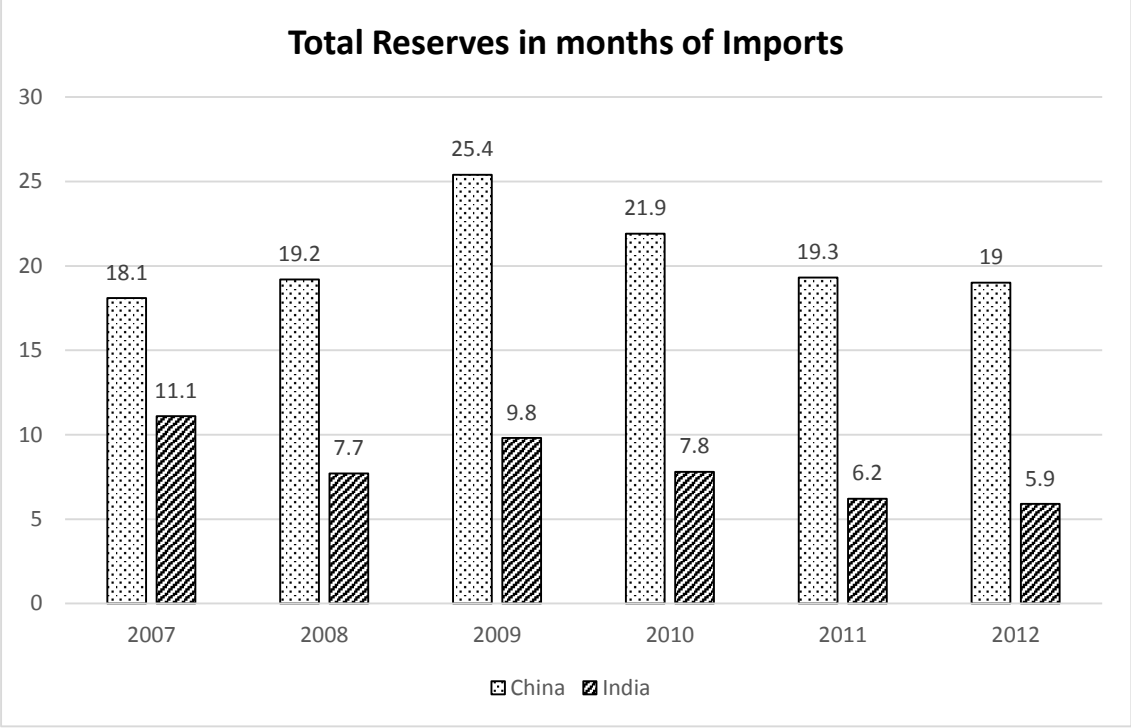
Source: World Development Indicators, 2014

Figure 3K: Net Portfolio Equity Inflows (Billion US Dollars)



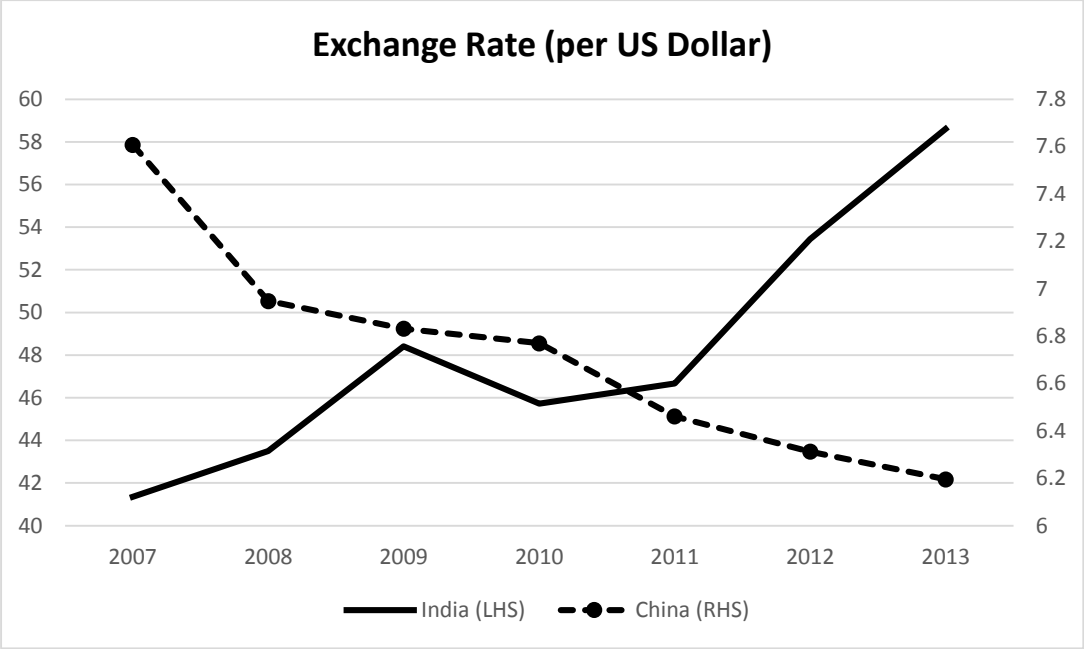
Source: World Development Indicators, 2014

Figure 3L: Total Reserves (in months of Imports)



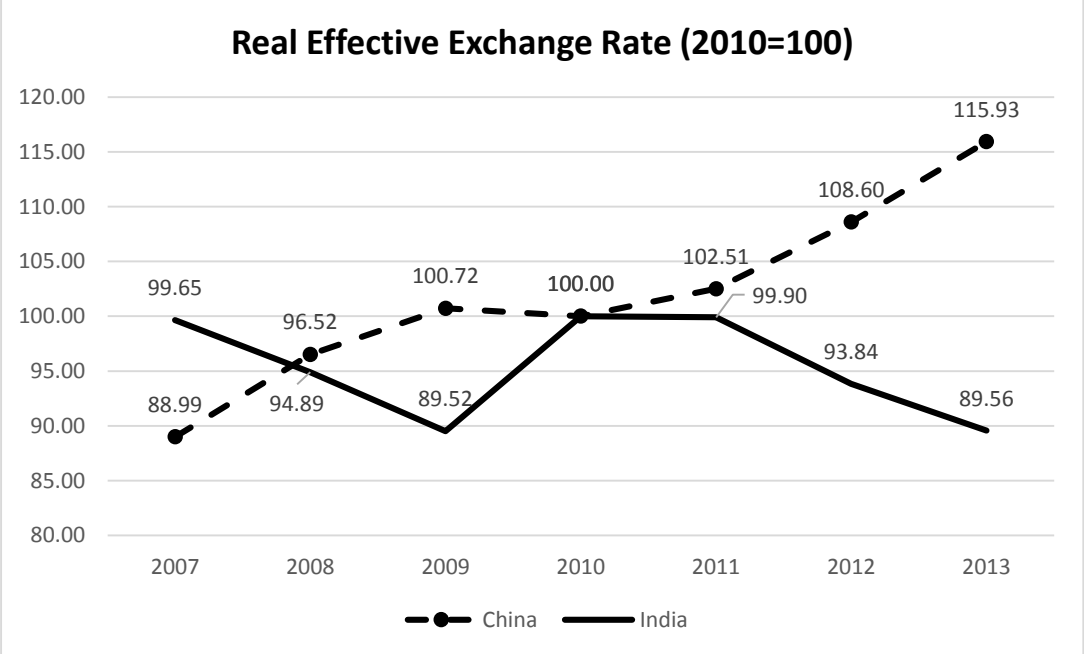
Source: World Development Indicators, 2014

Figure 3M: Exchange Rate (vs. US Dollar)



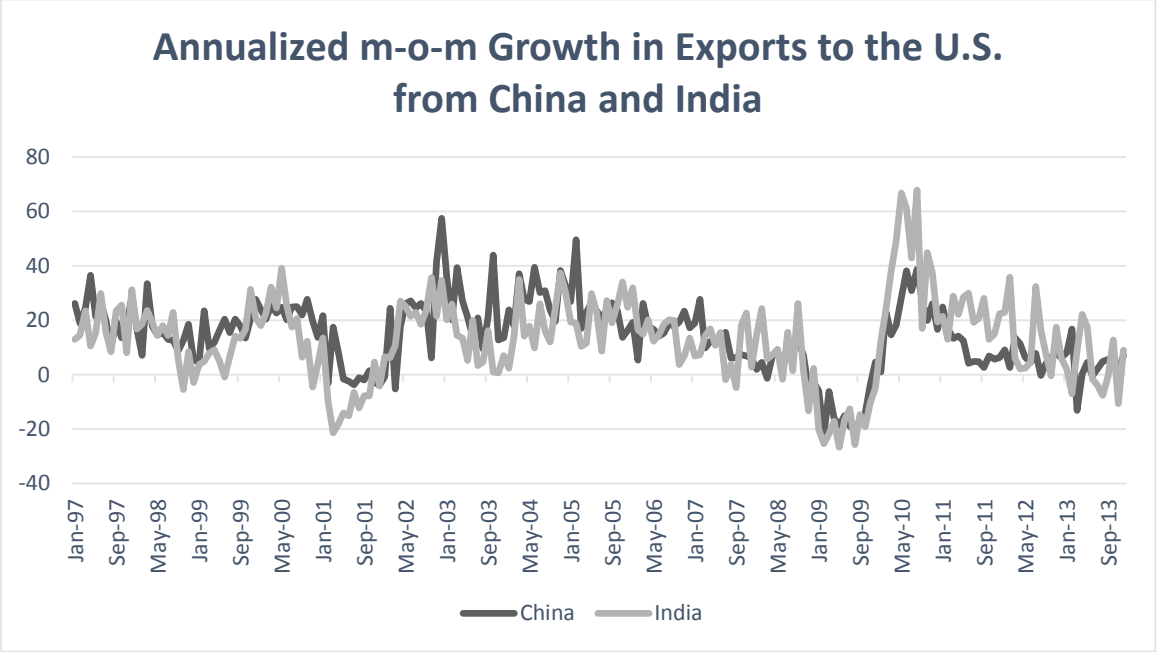
Source: World Development Indicators, 2014

Figure 3N: Broad Real Effective Exchange Rate (2010=100)



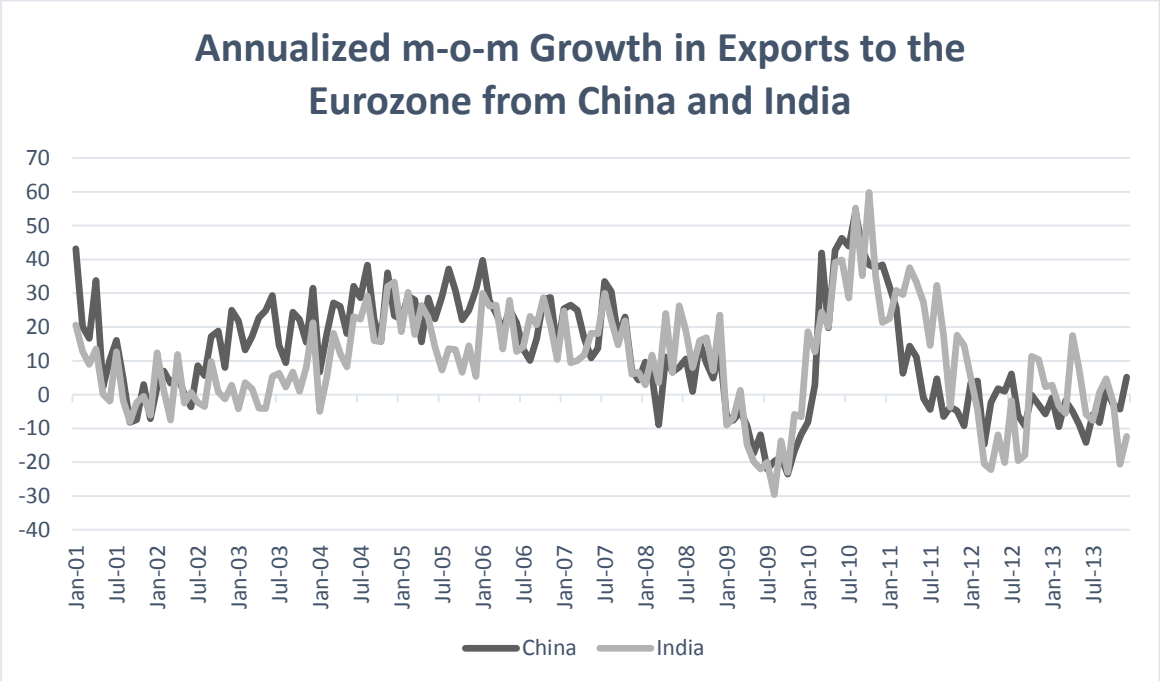
Source: Federal Reserve Bank of St. Louis

Figure 4A: Annualized month-on-month Growth in the Value of Exports to the U.S. from China and India



Source: U.S. International Trade Commission

Figure 4B: Annualized month-on-month Growth in the Value of Exports to the Eurozone from China and India



Source: Eurostat

Figure 5A: Smoothed Probability of Regime 1 (Slowdown) in Growth Rate of Exports from China to U.S.

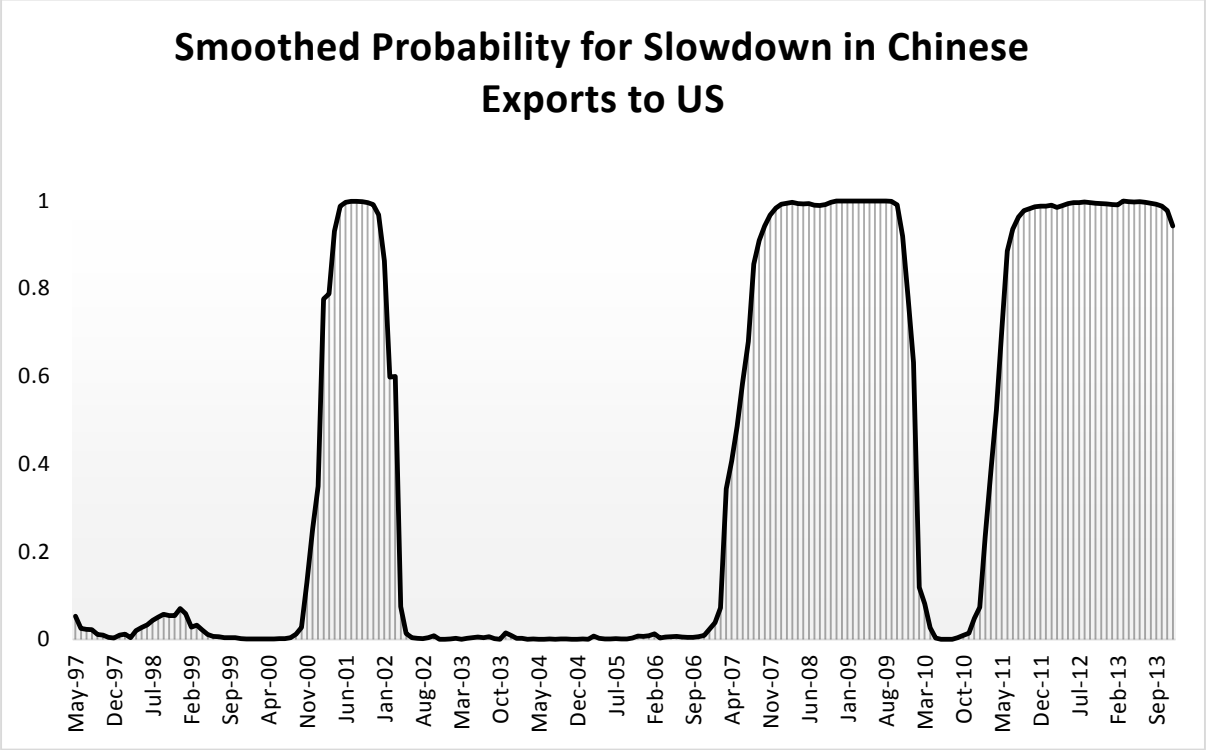


Figure 5B: Smoothed Probability of Regime 1 (Slowdown) in Growth Rate of Exports from India to U.S.

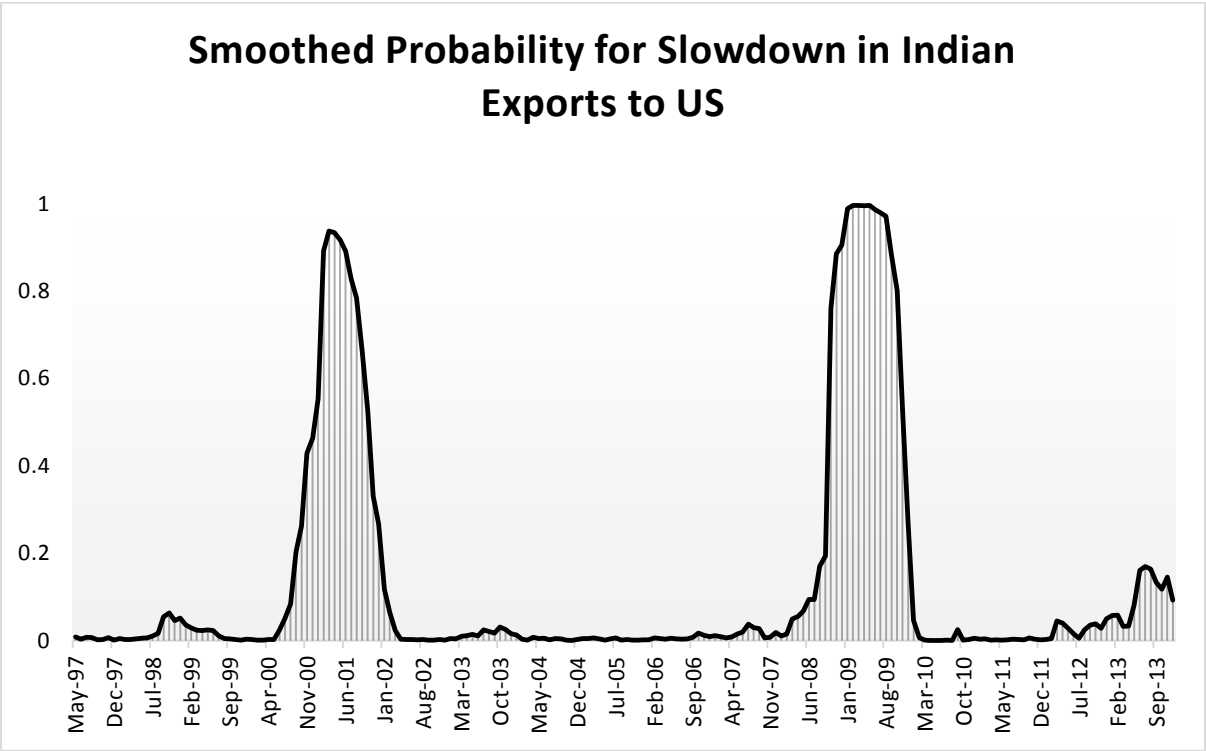


Figure 5C: Smoothed Probability of Regime 1 (Slowdown) in Growth Rate of Exports from China to Eurozone

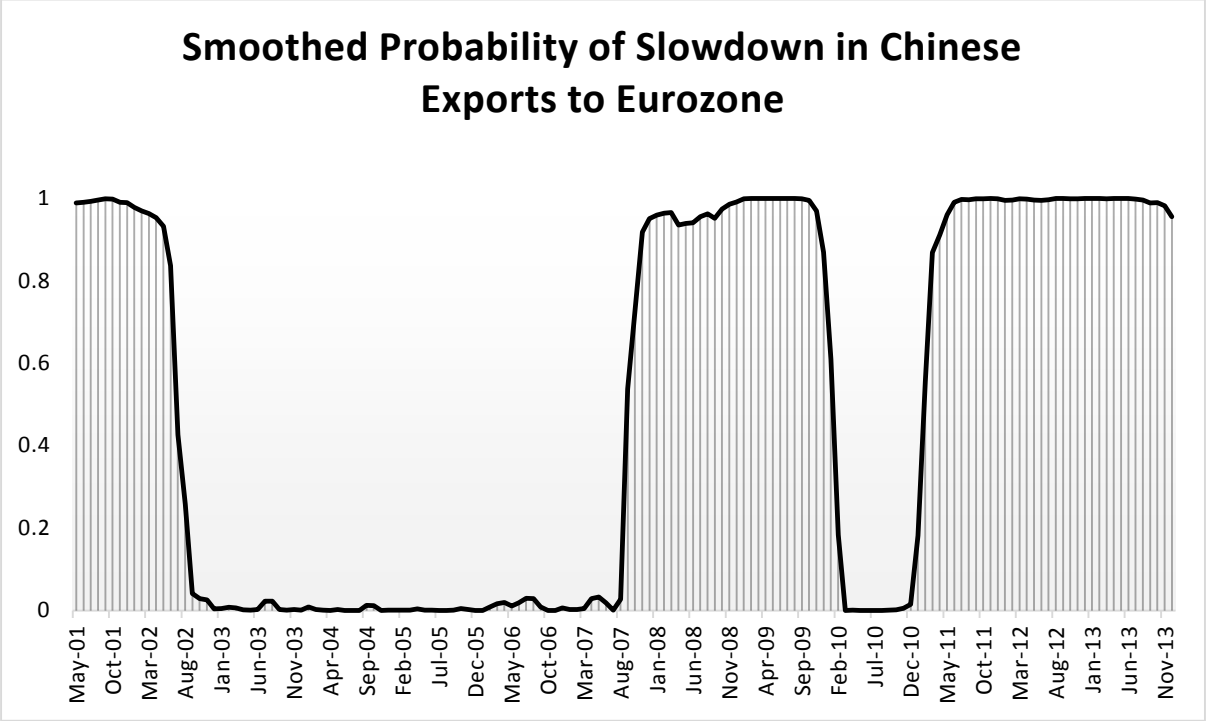


Figure 5D: Smoothed Probability of Regime 1 (Slowdown) in Growth Rate of Exports from India to Eurozone

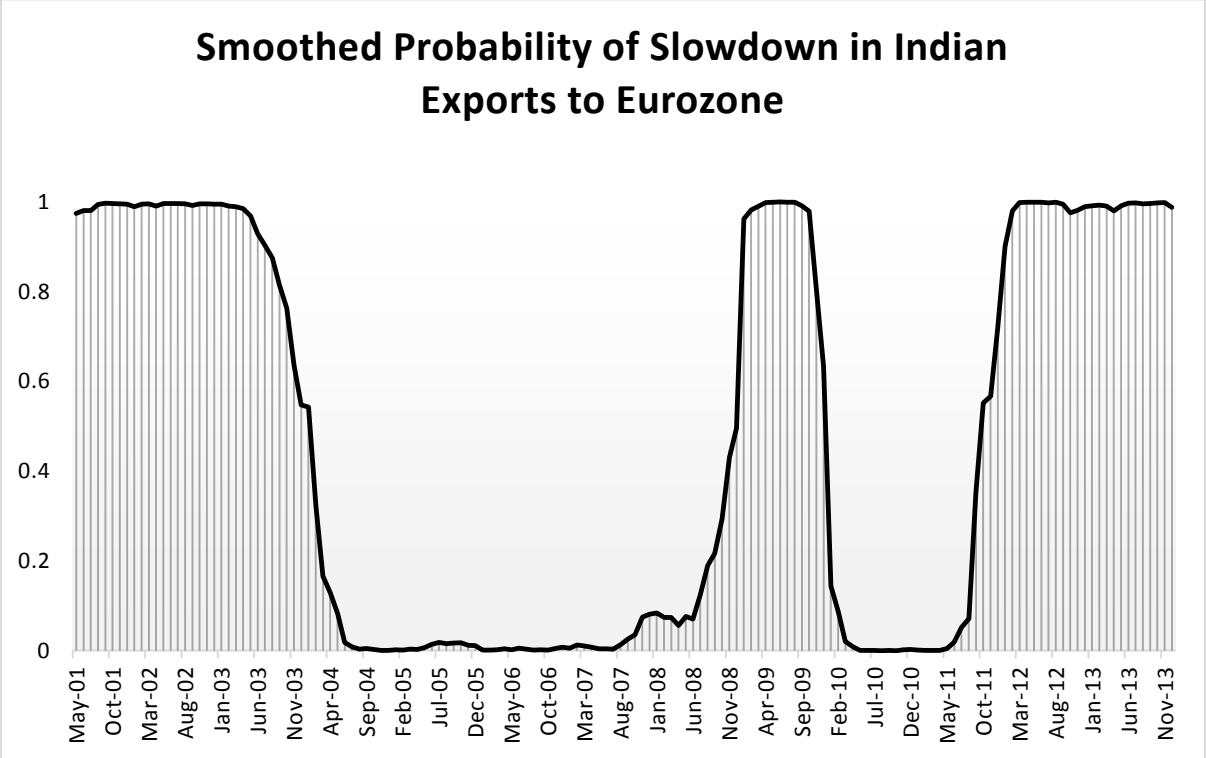
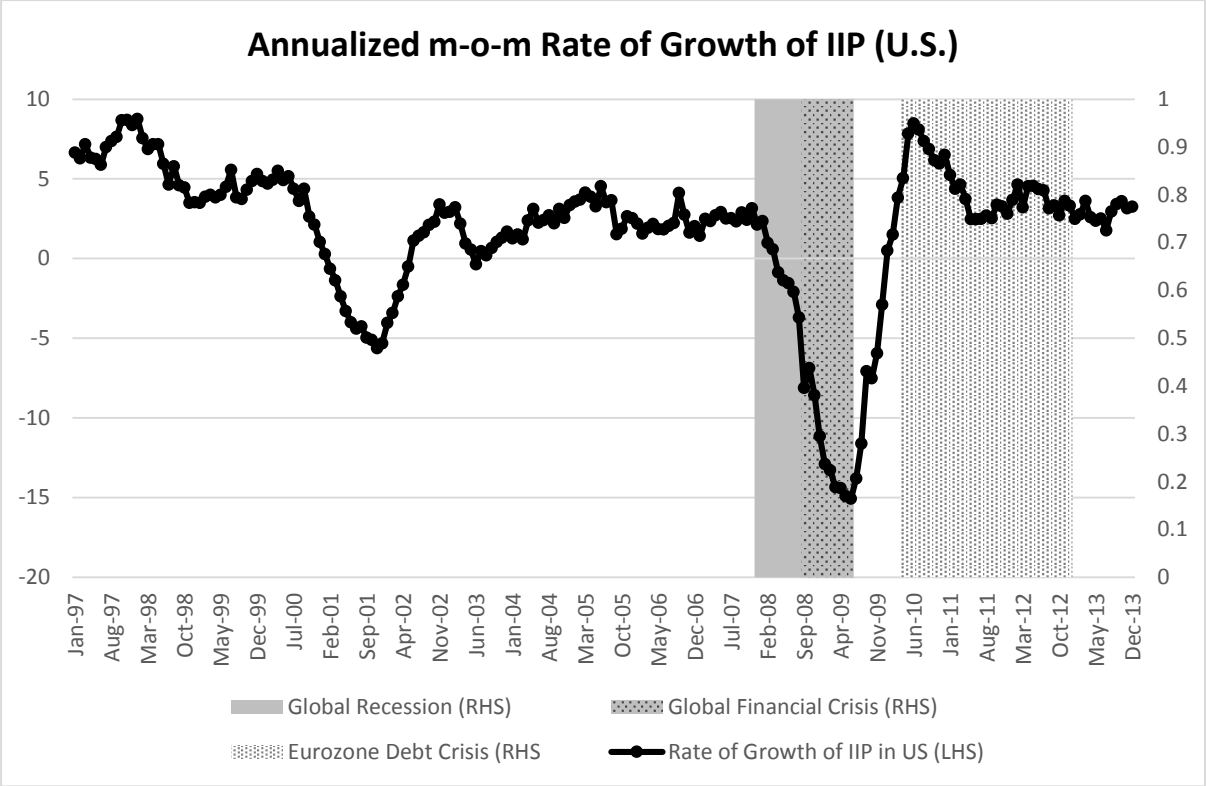
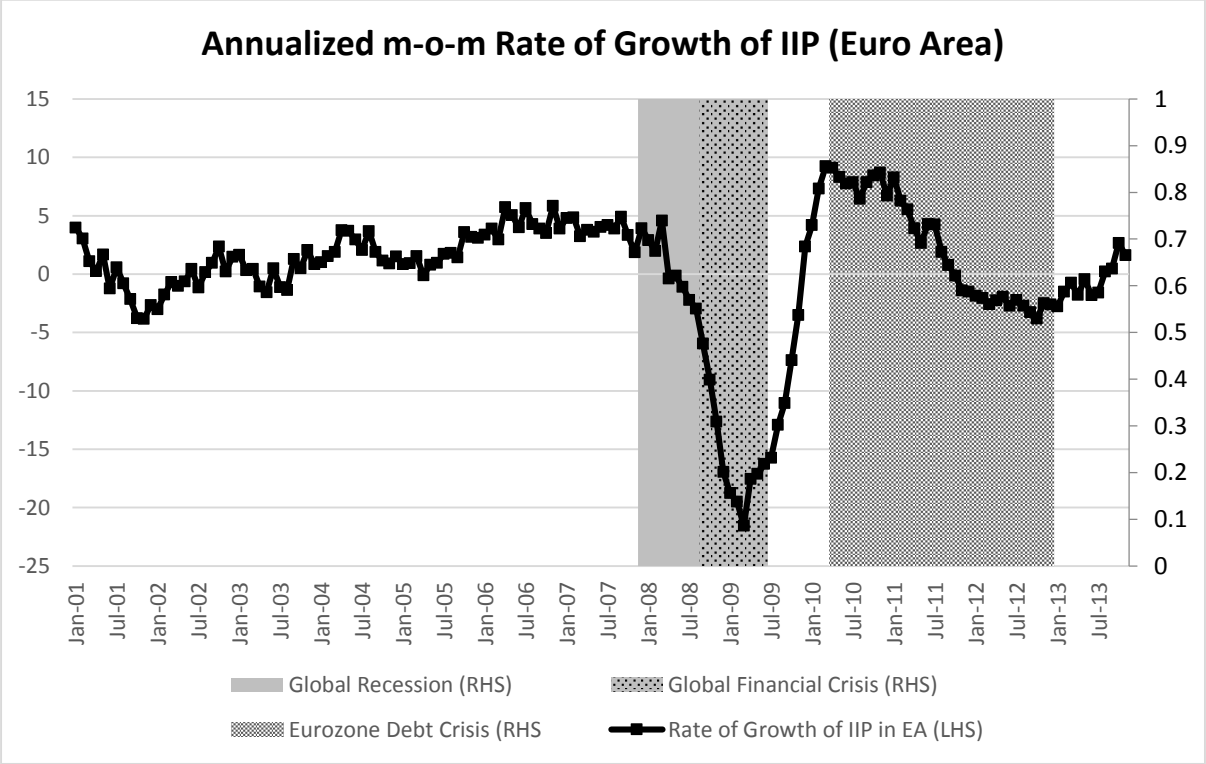


Figure 6A: Annualized month-on-month Rate of Growth of IIP in the U.S.



Source: Federal Reserve Bank of St. Louis

Figure 6B: Annualized month-on-month Rate of Growth of IIP in Euro Area



Source: Eurostat