# GLOBAL SHOCK TRANSMISSION TO EMERGING MARKETS

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The process of global integration has intensified the competition in world markets during the 1990s. In the new environment, many developing countries are increasingly relying upon greater trade integration for upgrading their international competitiveness and promoting their dynamic comparative advantage. In view of growing global integration, this paper attempts to analyze whether Indian, Hungarian and Polish economies have become more internationalized as a result of economic reforms embraced by each of these countries in early 1990s and hence vulnerable to global economic cycles: the integration hypothesis. The paper applies variance decompositions derived from vector auto regression to assess the degree of economic integration of the three economies with U.S. economy. The study concludes that, in the pre-liberalization period U.S. economy did not influence the Indian, Hungarian and Polish economies. Shocks from U.S. had no impact on their aggregates. In the post liberalization period, however, the results are mixed. Hungarian aggregates show very low degree of integration with US followed by Poland, and India. Although, all the three countries have shown varying degrees of integration in the post-liberalization period, none of the economies are found to be overly vulnerable to international shocks. It can be argued that despite opening of economy and transition towards integration with the global economy, the degree of integration across countries still remains significantly low.

## I. INTRODUCTION

In the globalized world of 1990s, emerging countries' markets and transition economies have assumed a major role in the international trade. Since the 1990s, many emerging and transition countries have embraced a regional approach to trade and investment liberalization alongside their bilateral and multilateral efforts. The liberalization or globalization journey is not a new one. Over the past five centuries, technological change has progressively reduced the barriers to international integration. Increased international trade, coupled with significant advances in communications technology, has forced greater economic interaction between countries. Countries have slowly moved toward economic integration, which has eroded traditional political concepts such as the nation-state and sovereignty.

International economic interdependence has significantly improved standards of living for most nations and promises further sizable benefits. Profound technological, social, and cultural changes have bound the world's nations closer together by reducing effective economic distances among them. Technology has, in effect, shrunk the planet. Consumers and producers are increasingly aware of potentially profitable international exchanges and of economic opportunities abroad. Foreign goods, foreign vacations, and foreign financial investments that were once exotic are now virtually commonplace. For instance, European countries have benefited greatly as a result of EU formation and Mexico, Canada and U.S.A from NAFTA agreement.

Economic integration across borders offers both positive and negative effects because of linkages of the economies with the external world. Changes in economic conditions in a given country are rapidly felt in other countries. Countries are linked by their exports and imports and by international investment. The conventional view is that the world economy is more integrated or internationalized today than it was a century ago. In this context it is often claimed that the economic integration between the countries have become stronger. This study investigates whether this is indeed the case. Compared with a decade ago, is there a more rapid or greater transmission of economic shock from one country to another? Against this background, a mix of emerging and transition economy countries: India, Hungary and Poland are used as the focus of this research, specifically because each of these countries has adopted an economic liberalization program in the early 1990s. Accordingly, the paper analyzes the economic integration of India, Hungary and Poland with the U.S. economy as a result of the trade liberalization policy adopted by

them in the early 1990s. It attempts to answer the question, are these economies more integrated with U.S. economy today than they were prior to economic reforms?

The structure of the paper is as follows. Section II sets out the theoretical framework of international transmission of economic shocks. Section III briefly describes the liberalization process and policy changes of India, Hungary and Poland. Section IV describes the conceptual framework, model, methodology and the variables; Section V discusses the empirical results while section VI concludes the paper.

## II. INTERNATIONAL TRANSMISSION OF SHOCKS

Overwhelming evidence links openness and economic growth. A considerable amount of work on the influence of foreign variables on the domestic economies has been undertaken. In recent years, many developing and transition economy countries like India, Hungary and Poland have made efforts to liberalize their trade and investment regimes. To a great extent these reform efforts have been consistent with the policy prescriptions that emerge from economic first principles: trade barriers should be low, more or less uniform across sectors, transparent, and not discretionary and should operate through the price mechanism (World Bank Report, 1998). Opening of economy however creates strong linkages that could result in transmission of economic changes from the dominating partner to the dependent economy.

Vast majority of empirical research on the transmission of economic shocks from one country to another has looked at how U.S. variables have influenced the domestic economies of non-U.S. countries. Burdekin [1989] and Lastrapes and Koray [1990] investigate the transmission of U.S. disturbances to individual European economies. Further, Canova and Dellas [1993] specifically investigate whether one can identify international trade-based cycles for a sample of 10 industrialized countries in the 1960-86 period. They find some evidence for transmission of trade disturbances in the pre-1973 period but much weaker evidence during the post-1973 period. Common shocks (e.g., oil shocks) or financial (capital account) links appear to play a significantly larger role during the latter period. Ben-David (1993) shows that open economies converge and that the trade agreements of the European Union have resulted in the convergence of its members. Ben-David's work shows that the economies that converge are those that are integrated in the world economy through trade. Baldwin and Seghezza (1996) document positive growth effects of the European Union for the medium term.

The theoretical research summarized above suggests that international interdependence is often said to be strong and to have increased. International trade is taken to be an indicator of interdependence, and its high and rapidly growing values, but for some interruptions, is accepted as evidence of the increasing interdependence of nations. The increase in the share of world exports in world GDP is largely the result of dramatic reductions in transport costs, as well as the decline in such trade barriers as tariffs and import quotas and the opening of new markets like China, India and Mexico[1].

Against this backdrop, India, Hungary, and Poland portray good examples to analyze the degree of economic integration, most specifically because of economic reforms program adopted by these countries in the early 1990s.

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[1] Between 1820 and 1992, world population increased 5-fold, income per head 8-fold, world income 40-fold, and world trade 540-fold (Maddison, 1995). The share of world exports in world GDP rose from 6 percent in 1950 to 16 percent in 1992. For industrial countries, the proportion of exports in GDP increased from 12 percent in 1973 to 17 percent in 1992. For 16 major industrial countries, it rose from 18.2 percent in 1900 to 21.2 percent in 1913 (Nayyar, 1995).

### III. THREE CASES: INDIA, HUNGARY, AND POLAND

India's liberalization strategy is two pronged -- internal and external. The primary interest for us is in external liberalization. Generally, any move toward a more open economy is considered efficiency enhancing because it exposes the economy to greater competitiveness. Table 1 summarizes a few of the salient features of pre- and post-liberalization periods for India[2].

### TABLE 1 maybe a couple of facts about other two countries in the table.

#### Salient Features of Pre- and Post-Liberalization Periods for India

| Period | Pre-Liberalization |
|---|---|
| Constraints | • High import tariffs and quantitative restrictions on imports<br>• Pre-1991 trade and exchange rate regime granted a generally high level of protection and also made-to-measure protection for manufacturing industries favored by the import-substitution strategy.<br>• Core sectors of the economy state owned<br>• Restrictions on FDI included limiting entry only into specified priority areas<br>• All negotiations to be routed through state institutions<br>• Policy of outright hostility toward foreign investment |
| **Period** | **Post Liberalization** |
| Reasons for reforms | • Unsustainable macroeconomic imbalances in the Indian economy, particularly with regard to escalating fiscal deficits<br>• Indian economy was left lagging in terms of economic growth and development relative to its East Asian neighbors such as China and Korea<br>• Balance of payment crises as foreign exchange reserves plummeted to U.S.\$1 billion in late June 1991, barely sufficient to cover a fortnight worth of imports<br>• India entered into IMF structural adjustment program |
| Policy Changes | • Outward looking and open-door trade policy<br>• Market determined exchange rate<br>• Partial lifting of import restrictions and greater access to imports<br>• Streamlining of tariff structure and abolition of quantitative restrictions on most imports<br>• Attracting private capital through FDI |

External circumstances created conditions necessary for the main phase of liberalization policy, which began in July 1991. This phase began with 19% currency devaluation. The interest rate was increased significantly to curb the flight of short-term capital. Quantitative restrictions were also significantly reduced for all tradable goods. Instead of import licensing based on 26 separate lists, in 1994 there was only a single list. Of the 55 goods restricted to importing only by state agencies, most have now been taken off this list. The number of items that were subject to controls was reduced from 439 to 210 over this period. Besides these, many changes have been made in industrial regulations, foreign investment, and banking. Efforts were made to reduce the central government fiscal deficit, in part by mobilizing financing from IMF, the World Bank and other sources.

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[2] For details on India's economic reform processes please refer to the following books; India's Economic Reforms 1991-2001 by Vijay Joshi May 1999, South Asia Books; ISBN: 0195643615, Economy and Business in India Under Reforms, by S.L. Rao, October 1996, South Asia Books; ISBN: 8122004237, The State, Development Planning and Liberalization in India (Soas Studies on South Asia) by T. J. Byres, February 1998, Oxford Univ Pr; ISBN: 0195639731, Economic Liberalization, Industrial Structure and Growth in India by Ashok S. Guha, August 1990, Oxford Univ Pr; ISBN: 0195622898

In the late eighties Hungary broke away from dependency on Soviet Union by reforming the economy from Soviet/Communist to a market economy. This required a restructuring and reform of economic options towards liberalization and integration to the global economic system, flexible exchange rate, reduction of trade tariff and liberalization of capital flows leading to increasing economic integration of Hungary with the rest of world.

Although Hungary enjoyed one of the most liberal and economically advanced economies of the former Eastern bloc, both agriculture and industry began to suffer from a lack of investment in the 1970s, and Hungary's net foreign debt rose significantly--from $1 billion in 1973 to $15 billion in 1990--due largely to consumer subsidies and unprofitable state enterprises. Reduced exports to the former Soviet bloc and shrinking industrial output contributed to a sharp decline in GDP. The external debt burden, one of the highest in Europe, reached 250% of annual export earnings, while the budget and current account deficits approached 10% of GDP. In the face of economic stagnation, Hungary opted to try further liberalization by passing a joint venture law, enstating an income tax, and joining the International Monetary Fund (IMF) and the World Bank. By 1988, Hungary had developed a two-tier banking system and had enacted significant corporate legislation, which paved the way for the ambitious market-oriented reforms of the post-communist years. Beginning early 1990 Hungary began market reforms with price and trade liberalization measures, a revamped tax system, and a nascent market-based banking system.

The overriding goal of Hungarian economic policy, however, has been to prepare the country for accession to the European Union at the earliest possible date. Although many challenges remain, the prospects of EU membership in the next decade are excellent.

In 1990, the Poland began a comprehensive reform program to replace the centralized command economy with a market-oriented system. The economic reforms introduced in 1990 removed price controls, eliminated most subsidies to industry, opened markets to international competition, and imposed strict budgetary and monetary discipline. Poland was the first former centrally planned economy in central Europe to end its recession and return to growth in the early 1990s.

Since 1992, the Polish economy has enjoyed an accelerated recovery, although growth has recently slowed. The private sector now accounts for over two-thirds of GDP. The gross domestic product (GDP) grew 4.0% in 2000, but was expected to increase only by about 1.0% in both 2001 and 2002. Slowing growth has boosted unemployment, which stood at 17.4% at the end of 2001. Tight monetary policy and slow growth have helped temper inflation, which was down to 5.5% in 2001. Likewise, Poland's current account deficit, which grew rapidly in the late 1990's, fell to 4.0% of GDP in 2001. The budget deficit remains a source of concern: the slowing economy drove up the deficit to an estimated 5% of GDP in 2001.

Throughout the 1990s the United States and other Western countries supported the growth of a free enterprise economy by reducing Poland's foreign debt burden, providing economic aid, and lowering trade barriers. Poland graduated from USAID assistance in 2000. Poland is recently joined the European Union. As a result of Poland's growth and investment-friendly climate, the country has received over $50 billion in direct foreign investment since 1990.

In early 2002, Poland launched a new set of economic reforms, designed in many ways to complete the process launched in 1990. The package acknowledges the need to improve Poland's investment climate, particularly the conditions for small and medium-sized enterprises, and better prepare the economy to compete as an EU member. The country also aims to improve its public finances to prepare for eventual adoption of the euro.

## IV. EMPIRICAL METHODOLOGY

To determine the degree of shock transmission it is important to identify the degree of economic integration as a result of liberalization of economic structure of a country. The current study investigates the degree to which India, Hungary and Poland are integrated with the U.S economy as a result of the liberalization reforms. The integration hypothesis is investigated over two different time periods. The first time period represents the pre-liberalization period and, the second time period represents the post-liberalization period.

The main objective of the paper is to determine the degree of economic integration of these countries with U.S. in the post-liberalization period but more specifically to see whether economic and business cycles of U.S have transmitted and impacted Indian, Hungarian, and Polish economies as a result of their reforms.

Early claims of the increased integration hypothesis were based on two separate pieces of time series information: trends in the statistic of openness in economies and changes in the behavior of real exchange rates (Wheeler and Pozo, 1997). The current study focuses only on the behavior of the openness in economies and analyzes its usefulness in assessing integration. The current study employs vector auto regression (VAR) technique to investigate the transmission of cycles across countries.

## MEASURE OF OPENNESS

One measure of openness of an economy is the ratio of export/import to the total GDP. This ratio reflects the contribution of external sector to the overall GDP of the country. Indexes of openness for selected years reported by IMF are presented in Table 2 for India, Hungary, and Poland respectively. The figures in the three columns of the table purport to measure the degree to which Indian, Hungarian, and Polish economic production is vulnerable to foreign influences.

**Table 2**

**Indexes of openness 1950-2000**

(Ratios in percent)

|  | India | Hungary | Poland |
|---|---|---|---|
| YEAR | (EX+IM)/GDP | (EX+IM)/GDP | (EX+IM)/GDP |
| **1950** | 11.4 | 65.0 | 54.5 |
| **1955** | 12.2 | 72.7 | 33.4 |
| **1960** | 10.7 | 82.2 | 30.1 |
| **1965** | 8.2 | 86.6 | 31.9 |
| **1970** | 7.2 | 76.6 | 22.1 |
| **1975** | 11.4 | 80.8 | 40.9 |
| **1980** | 13.5 | 67.8 | 34.8 |
| **1985** | 11.8 | 64.8 | 39.2 |
| **1990** | 12.8 | 59.7 | 42.8 |
| **1995** | 17.9 | 88.1 | 46.5 |
| **2000** | 20.2 | 129.3 | 51.2 |

Source and Notes: Exports (EXP) and imports (IMP) refer to merchandise services and goods and (EX+IM)/GDP represent ratio of total trade. The figures were obtained from *International Financial Statistics Yearbook, IMF* various issues.

It can be observed from Table 2 and figure 1 that India, in the decade of nineties has demonstrated a considerably higher degree of openness as compared to the previous decade. The observed increase in the degree of openness in post-liberalization period creates expectation of more vulnerability to foreign shocks. It can be argued that the sudden surge of openness is the result of economic reforms, which opened the Indian markets for trade and commerce with the rest of the world. However the trend is not steady due to many reasons, which have been discussed in detail by various authors. These findings call into question the assertion that India has until the recent past, been a closed economy feeling little pressure from foreign shocks.

Figure 1: Openness Index for India, Hungary and Poland
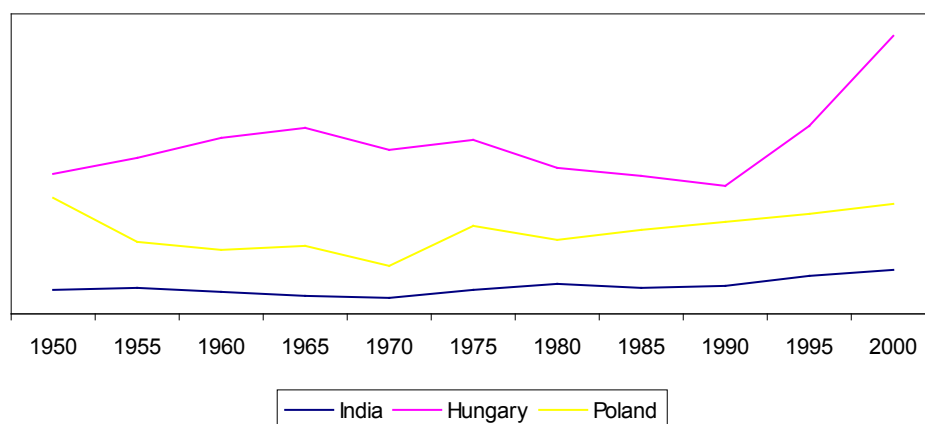


In the case of Hungary and Poland however, the trend is quite different. In the late eighties the Hungary economy experienced some openness compared to preceding years, which can be attributed to strong pro-democratic political movements during this time. These movements lead to regime change followed by economic reforms in the beginning of 1990. In the 1990s polish economy suffered economy slowdown due to various reasons[4]. These reasons can be attributed to the dip in the degree of openness after 1991 until the economic ascended to recovery in 1997. The Polish economy has shown steady degree of openness in the post-liberalization period.

## VARIABLES AND MEASURES

Measure of openness purports to measure the degree to which Indian, Hungarian, and Polish economic production is vulnerable to foreign influences. It provides the degree of openness of economic production of each country but fails to capture the transmission of shocks from one country to another. Therefore to test the integration hypothesis more elegantly, we developed a methodology that draws upon existing studies relating to the transmission of economic shocks from one country to another. While adapting this framework to the present context, the following variables were identified.

The domestic variables (India, Hungary and Poland) in this study are the Industrial Production (IND IP, HUN IP, and POL IP), Price Level (IND P, HUN P, AND POL P), and Money stock (IND M, HUN M, and POL M). The international variables are the U.S. Industrial production (U.S. IP); price Level (U.S. P), and Money stock (U.S. M). Brief descriptions of the data series can be found in the Appendix.

## DATA ANALYSIS

Three different countries- India, Hungary, and Poland are selected as the focus of this paper's inquiry to determine whether their economies are more integrated with the U.S. economy in the post-liberalization period as compared to the pre-liberalization period. For the purpose of this study we treat U.S. as the rest of the world. Empirical analysis was conducted using variance decompositions (VDCs) derived from vector auto regression (VAR) models. [5,6] In each VAR, all endogenous variables enter with a common lag. VDCs

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[4]The reasons for economy slowdown are discussed in brief in Section III of this paper.

[5], [6] Vector auto regression (VARs) was introduced into empirical economics by Sims (1980), who demonstrated that VARs provide a flexible and tractable framework for analyzing economic time series. Vector autoregression is developed to answer questions concerning the dynamic relationship between the microeconomic time series. Variance decomposition decomposes variation in an endogenous variable into the component shocks to the endogenous variables in the VAR. The variance decomposition gives information about the relative importance of each random innovation to the variables in the VAR. The t-period ahead forecast error from a VAR is $\varepsilon_{t+s} + \Psi_1 \varepsilon_{t+s-1} + \Psi_2 \varepsilon_{t+s-2} + \ldots + \Psi_{s-1} \varepsilon_{t+1}$

are ideally suited for analyzing the impact of shocks from international variables on Indian, Hungarian, and Polish variables. VDCs show the portion of the forecast error variance for each variable that is attributable to its own innovations and to innovations from the other variables in the system (Wheeler and Pozo, 1997)[7]. Both direct and indirect effects are captured by VDCs.

VDCs in the current study determine the amount of forecast variance in each Indian, Hungarian, and Polish variable explained by innovations to international variables. One set of VDCs is constructed for each estimation period. Comparisons are then made across the two estimation periods (India: pre- liberalization: 1976-1990, post-liberalization: 1991-2002, Hungary. pre- liberalization: 1976-1989, post-liberalization: 1990-2002, and Poland: pre- liberalization: 1976-1989, post-liberalization: 1990-2002). For example, if innovations to U.S IP explains more of the forecast error variance in IND IP or HUN IP or POL IP in the second estimation period than in the first estimation period, the hypothesis that the these countries have become more integrated after the liberalization is supported.

*VAR MODEL REPRESENTATION*

$$Y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \beta x_t + \epsilon_t$$

Where $Y_t$ is a k vector of endogenous variables, $x_t$ is a d vector of exogenous variables, $A_1, \ldots, A_p$ and $\beta$ are matrices of coefficients to be estimated, and $\epsilon_t$ is a vector of innovations.

Given the focus of this paper, integration of the Indian and two transition economies (Hungary Poland), the relative placements of foreign variables (U.S.) and domestic (India, Hungary, and Poland) variables in the ordering is critical. Since the study investigates influence of foreign variables on India, Hungary, and Poland, we choose the place domestic variables above the international variables. (e.g., POL IP, POL P, POLM, US IP, US P, US M)[8]. Hence the domestic variables (India, Hungary, and Poland) are allowed to contemporaneously influence the U.S variables, but U.S. variables are not allowed to contemporaneously influence domestic variables. Given the current study's concern with the impact of U.S. on Indian, Hungarian, and Polish variables, the placement in the ordering of for e.g., one Hungary variable relative to another Hungary variable and one U.S. variable relative to another U.S. variable is a matter of indifference.

We test separately for each country, the influence of U.S. variables during each of the two estimation periods - pre and post liberalization period. Quarterly data are used in both of the estimation periods.

## V. FINDINGS OF THE RESEARCH

The main results of this paper are contained in the VDCs. Tables 3, 4 and 5 reports the VDCs for India, Hungary, and Poland for the first and second estimation periods. The estimates of percentages of forecast error variance in each India, Hungary and Poland variables attributable to the U.S variables are reported. The significant variables are denoted by an asterisk (*). The significance information is taken from vector auto-regression p-values. Variables with p-values less than 0.05 are considered significant.

Table 3 reports the Proportion of forecast error variance in Indian variables explained by variations in U.S variables in the two estimation periods. An analysis of Table 3 results indicates that, in the 1976-91 period, shocks to foreign variables do not explain a significant portion of the forecast error variance in the IND M. Shocks to US IP and US M do explain a significant portions of forecast error variance in IND IP (lagged by

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[7] Sims (1982) and Wheeler and Puzo (1997) mention that the strength of Granger casual relationships may be measured with VDCs. If, for example, innovations to US IP explain a significant portion or the forecast error variance in INP IP or HUN IP or POL IP, a strong granger causal relationship from U.S. IP to INP IP or HUN IP or POL IP is said to exist.

[8] This choice of ordering biases the results against finding impacts of US (treated as rest of the world) on the domestic variables (IND, HUN, POL)

three and two period respectively). Shocks to US P do explain significant portions of forecast error variance in IND P and IND M (lagged by three and two period respectively). This leads to the conclusion that U.S. had little, if any, impact on India during the pre-liberalization period. This is consistent with our argument that the India functioned as a closed economy over this first estimation period. For the period 1991-2000, results indicate that shocks to U.S. variables do have a significant impact on the Indian variables. That is, shocks to U.S. variables do explain a significant portion of the forecast error variance in Indian variables in the second estimation period. As shown in table 3, shocks to US IP and US M explain a significant portion of the forecast error variance in IND M. Furthermore shocks to US IP and US M explain a significant portion of forecast error variance in both IND P and IND IP. Overall, the transmission of shocks from US variables to India variables has not increased in the post-liberalization period.

**TABLE 3**

| India: Pre and Post liberalization period | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variance Decompositions 1976-1990 and 1991-2002 (Quarterly Data) | | | | | | | |
| Explained by variations in | | | | | | | |
| | | 1976 -1991 | | | 1991 -2002 | | |
| Relative Variation in | Horizon (years) | US IP | US P | US M | US IP | US P | US M |
| IND IP | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.677164 | 3.714308 | **1.365498*** | 5.493 | 0.085638 | 1.241779 |
| | 12 | **0.612423*** | 5.067768 | 2.104732 | 4.586099 | 0.34468 | **2.2181*** |
| IND P | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.002846 | **4.10805*** | 1.6263 | **6.668963*** | 0.190641 | 8.861671 |
| | 12 | 8.96275 | **12.69606*** | 4.780208 | 18.74636 | 0.406465 | 12.15602 |
| IND M | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.903054 | **2.863661*** | 0.001561 | **3.824213*** | 2.839316 | **0.036577*** |
| | 12 | 5.00824 | 5.173361 | 0.029873 | 8.82236 | 4.548147 | 5.058025 |

Note: The entry in each cell represents the percentage of the forecast error variance in the variable i accounted for by innovations to variable j. * indicates the significance at 5% level

Table 4 reports the forecast error variance in Hungary variables explained by variations in U.S variables in the two estimation periods. Table 4 results indicate that, in both of the estimation periods shocks to foreign variables did explain a small portion of the forecast error variance in Hungary variables. In the first estimation period shocks to US M do explain a significant portion of forecast error variance in HUN P, and HUN M respectively (lagged by three and two period respectively). In the post-liberalization period, results indicate that shocks to US IP, US P, and US M do have significant impact on the HUN P lagged by two periods. Shocks to US P and US M also explain small significant portion of the forecast error variance in HUN IP and HUN M (lagged by three and two periods respectively). The effect of US variables on Hungarian variables though slightly increased in the post-liberalization period, the results indicate the degree of integration would still be considered as low. Two explanations can be attributed to these results. One is that the Hungarian economy functioned as closed economy during the first estimation period, and the second is that, majority of its trade partners are from European countries and not U.S[9].

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[9] Hence if this study is to be conducted with UK or Germany as international variables, different results can be expected.

**TABLE 4**

| Hungary: Pre and Post liberalization period | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variance Decompositions 1976-1989 and 1990-2002 (Quarterly Data) | | | | | | | |
| Explained by variations in | | | | | | | |
| | | 1976-1989 | | | 1990-2002 | | |
| Relative Variation in | Horizon (Years) | US IP | US P | US M | US IP | US P | US M |
| HUN IP | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.71 | 1.16 | 0.49 | 0.08 | 2.82 | 3.32 |
| | 12 | 0.52 | 0.93 | 4.00 | 4.22 | 6.79 | **4.28*** |
| HUN P | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 4.44 | 11.39 | 0.11 | **26.06*** | **3.19*** | **2.43*** |
| | 12 | 14.37 | 8.55 | **2.37*** | 25.54 | 3.02 | 2.52 |
| HUN M | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 12.88 | 5.25 | **9.12*** | 0.17 | 0.12 | 3.86 |
| | 12 | 9.05 | 3.10 | 4.75 | 1.44 | **0.20*** | 8.67 |

Note: The entry in each cell represents the percentage of the forecast error variance in the variable i accounted for by innovations to variable j. * indicates the significance at 5% level

Table 5 reports the forecast error variance in Polish variables explained by variations in U.S variables in the two estimation periods. Table 5 results indicate that, shocks to foreign variables do not explain a significant portion of the forecast error variance in the POL IP; POL P; and POL M in the first estimation period. In the post-liberalization period, results indicate that shocks to US IP do have significant impact on the POL P and POL M. Further more shocks to US P and US M do explain a significant portion of the forecast error variance in the POL IP and POL M (lagged by three periods). One of the reasons for increasing degree of integration with US economy in the post-liberalization period could be that throughout the 1990s the United States supported the growth of a free enterprise economy in Poland by reducing Poland's foreign debt burden, providing economic aid, and lowering trade barriers.

**TABLE 5**

| Poland: Pre and Post liberalization period | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variance Decompositions 1976-1989 and 1990-2002 (Quarterly Data) | | | | | | | |
| Explained by variations in | | | | | | | |
| | | 1976-1989 | | | 1990-2002 | | |
| Relative Variation in | Horizon (Years) | US IP | US P | US M | US IP | US P | US M |
| POL IP | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.05 | 0.19 | 0.04 | 0.26 | 2.86 | 2.63 |
| | 12 | 0.10 | 0.04 | 0.01 | 0.54 | **3.44*** | 24.10 |
| POL P | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.07 | 0.20 | 0.002 | **3.79*** | 1.31 | 9.44 |
| | 12 | 0.07 | 0.39 | 0.03 | 3.05 | 1.84 | 17.43 |
| POL M | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 0.08 | 0.18 | 0.002 | **0.02*** | 1.13 | 4.60 |
| | 12 | 0.09 | 0.55 | 0.05 | **7.12*** | 14.10 | **2.55*** |

Note: The entry in each cell represents the percentage of the forecast error variance in the variable i accounted for by innovations to variable j. * indicates the significance at 5% level

A comparison of results of the three countries leads us to conclude that during the pre-liberalization period none of the three countries were vulnerable to foreign shocks excepting few minor influences as reported in above tables. However for the post liberalization period the results are somewhat different. India for instance seems to have higher degree of integration with U.S. economy than Poland or Hungary. Poland and Hungary, though influenced by U.S. economy after the liberalization of economic and trade policies, is not overly vulnerable to international shocks. The total amount of forecast error variance in all the domestic variables explained by U.S. variables in the second period is much greater than the first estimation period.

## VI. CONCLUSION

This paper has attempted to answer the question; does liberalization causes the economic integration across countries? To test our integration hypothesis we choose three countries: India, Hungary, and Poland as focus of this enquiry. The study concludes that, in the pre-liberalization period U.S. economy did not influence the Indian, Hungarian and Polish economies. Shocks from U.S. had no impact on their aggregates. This is consistent with the openness indexes that suggest these economies were not internationalized in pre-liberalization period. In the post liberalization period, however, the results are mixed. Hungarian aggregates show very low degree of integration with US followed by Poland, and India. In later periods industrial production, price level and monetary variables are influenced by the shocks to US variables. In sum, foreign events appear to affect the Indian, Hungarian and Polish economies in varying degree though in small and sometimes significant manner during in post-liberalization period.

Comparing the three countries under study, Hungary is least vulnerable to shocks from US, while the degree of Poland's vulnerability is somewhat higher than Hungary. This result was surprising, as Hungary's strategic position in Europe and its relative lack of natural resources have dictated a traditional reliance on foreign trade. On the other hand Poland's results was somewhat expected as throughout the 1990s the United States supported the growth of a free enterprise economy by reducing Poland's foreign debt burden, providing economic aid, and lowering trade barriers. India of the three has shown higher degree of integration to foreign shocks. The somewhat higher degree of integration in the post-liberalization can be ascribed to the recent increase in the modern sector trade such as information technology services. In this context the modern sectors may be more susceptible to the economic shocks from U.S. Further, it also suggests that India has followed a mixture of closed and open economic liberalization policy. By this mixed approach India can cushion against the adverse effects of such shocks by further strengthening the country's economic fundamentals as also by continuing to "follow a calibrated approach towards liberalization". Although, all the three countries have shown varying degree of integration in the later period, none of the economies are overly vulnerable to transmission of international shocks.

## APPENDIX

### Description of Data Series

IND IP, HUN IP, POL IP, US IP represent industrial production of India, Hungary, Poland and United States. Numerous other studies have operationalized this variable for similar kind of studies. Quarterly data from 1976 to 2000 were obtained from International Financial and Statistics (International Monetary Fund, line. 66..c).

IND P, HUN P, POL P, US P represent price levels of India, Hungary, Poland and United States. Quarterly data from 1976 to 2000 were obtained from International Financial and Statistics (International Monetary Fund, line. 63).

IND M, HUN M, POL M, US M represent money stock of India, Hungary, Poland and United States. Quarterly data from 1976 to 2000 were obtained from International Financial and Statistics (International Monetary Fund, line. 34).

Annual Exports, Imports and GDP data from 1950-2000 for the measure of openness were obtained International Financial and Statistics (International Monetary Fund, line.70, 71 and 99 respectively).

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