

Oil price movements and globalisation: is there a connection?

Robert Looney

Abstract

There has been considerable speculation over the years concerning the cost of large oil price movements (“shocks”) to consuming countries. For the advanced industrial countries, the conventional wisdom appears to be that, because these economies are becoming more service-oriented, less energy is needed per unit of gross domestic product (GDP) and hence a lessening of the economic costs associated with increased oil prices. On the other hand, because many newly industrialised or catching-up countries are entering a phase of energy-intensive industrialisation, the same oil shocks are placing an increasing burden on these economies. One can easily argue, however, that industrialisation is only one facet of economic change taking place in the world economy. Conceivably, the rapid pace of increased globalisation may significantly modify these patterns. To test this proposition, an operational definition of globalisation is developed and shown to be positively associated with the strength of oil price shocks. The main finding of the study is that increased globalisation appears to be strengthening the impact of oil price shocks in the advanced industrial countries, but to a much lesser extent in the newly industrialising countries.

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OVER THE YEARS, one of the more illusive questions posed to economists is the extent to which globalisation is taking place and the implications these developments may have for the manner in which external shocks affect domestic economies. With regard to oil price shocks, it is often argued that, with increased globalisation, the advanced industrial countries are less susceptible to such shocks. That is, a given percentage increase in the price of oil today would result in less economic loss over time, due to the fact that, with globalisation, the structures of these economies are becoming more information-based and less energy-intensive. Similarly, newly industrialising countries, that are beginning their phase of energy-intensive, heavy industrialisation, might be expected to be more subject to economic losses associated with the increased price of energy.

The purpose of this paper is to examine these propositions by first developing an operational definition of globalisation. Trends in globalisation over the period 1985–96 are then identified for a sample of advanced and newly industrialising countries. Finally, using vector autocorrelation models of these economies, the impact of oil price shocks is examined, to assess whether there is any association between increased globalisation and the severity of oil price shocks.

In short, has globalisation over time strengthened or weakened the oil link? What elements of globalisation have been most important in this regard? Are these trends likely to continue into the foreseeable future?

1. The process of globalisation

The current debates over the relative merits of globalisation provide some insight into the manner in which market price modifications, brought about by the process of globalisation, might affect the manner in which oil price shocks impact on national economies in different parts of the world. In a recent article, Nobel Prize winner Amartya Sen (2001), of Cambridge University, provides some basic answers to several of the key elements of this debate that have relevance to the problem at hand.

1. Globalisation is not new, nor is it just Westernisation: over thousands of years, globalisation has progressed through travel, trade, migration, the spread of cultural influences and the dissemination of knowledge and understanding (including science and technology).
2. Globalisation is not in itself a folly — it has enriched the world scientifically and culturally and benefited many people economically, as well. In this regard, modern technologies, as well as economic inter-relations, have been influential.
3. The use of the market economy can produce different outcomes. Specifically, the market economy can generate many different results, depending on how physical resources are distributed, how human

Table 1
Initial categorization of countries according to
globalisation and growth mechanism

Endogenous growth	Catching-up	Primary producer	Malthusian	Isolated economies
Australia	Bangladesh	Algeria	Afghanistan	Armenia
Austria	Bulgaria	Angola	Benin	Azerbaijan
Belgium	China	Bolivia	Botswana	Belarus
Canada	Dominican Rep.	Cameroon	Burkina Faso	Kazakhstan
Denmark	Hungary	Chile	Cambodia	Kyrgyzstan
Finland	Indonesia	Congo	Central African Republic	Moldova
France	Jamaica	Costa Rica	Chad	Turkmenistan
Germany	Malaysia	Côte d'Ivoire	Congo, DR	Uzbekistan
Hong Kong	Mauritius	Ecuador		
Ireland	Mexico	Gambia	Eritrea	
Israel	Mongolia	Ghana	Ethiopia	
Italy	Nicaragua	Guinea Bissau	Gabon	
Japan	Oman	Honduras	Guatemala	
Korea	Philippines	Kenya	Haiti	
Netherlands	Poland	Kuwait	Iraq	
New Zealand	Portugal	Mauritania	Jordan	
Norway	Romania	Mozambique	Laos	
Singapore	Spain	Nigeria	Lesotho	
Sweden	Sri Lanka	Papua New Guinea	Liberia	
Switzerland	Thailand	Saudi Arabia	Mali	
Taiwan	Tunisia	Sierra Leone	Namibia	
United Kingdom	Turkey		Nepal	
USA	Vietnam	Syria	Niger	
	Tanzania	Pakistan		
	Togo	Paraguay		
	Trinidad	Rwanda		
	Uganda	Somalia		
	UAE	Sudan		
	Venezuela	Tajikistan		
	Yemen	Zambia		
	Zimbabwe			

Source: Sachs, Jeffrey D. (2000), "Globalization and patterns of economic development", Weltwirtschaftliches Archiv, Vol. 136, No. 4, p. 583.

resources are developed, what rules prevail and so on in all these spheres, and the state and the society have roles, within a country and in the world.

4. The world has changed since the Bretton Woods Agreement — the current economic, financial and political architecture of the world (including the World Bank, the International Monetary Fund and other institutions) was largely set up in the 1940s, following the Bretton Woods Conference in 1944. The implication is that the current system does not have institutions that are responsive to many of the changed economic circumstances, and, as such, many parts of the world are not well served by the current system.

Sen is suggesting that various parts of the world have evolved somewhat differently over the last few decades and, as a result, possess economic environments that respond quite differently to various types of external shock. The main problem in assessing the economic consequences of oil price shocks is, therefore, one of deriving an operational classification of these environments.

1.1 Country classification scheme

In this regard, Jeffrey Sachs (2000) provides a good starting point for grouping countries in terms of their interaction with the global economy. Although Sachs's paper was written to provide a framework for examining the consequences of globalisation for the growth potential of various parts of the world, it develops an initial country classification scheme, which seems appropriate for an assessment of the manner in which market links, such as oil market price movements, produce a differential impact on domestic economies. As a first approximation to the world's different economic environments, Sachs develops five main groups (**table 1**).

1.1.1 Endogenous growth

These countries are experiencing the process of self-sustaining increases in income generated mainly by technological innovation. Innovation raises national income, which, in turn, stimulates further innovation in a positive feedback process (Lucas, 1988; Romer, 1986, 1990).

For this group of countries, globalisation should be a major spur to innovation by increasing the extent of the market. It may also concentrate innovative activity, if it creates a more integrated global labour market for scientists and engineers, who are then likely to aggregate in the highly innovative core economies. Most proxies of innovative activity (patents, research and development expenditure and numbers of scientific publications) suggest a huge spurt in such activities in the 1990s. The rapid growth of labour productivity in the United States of America, since the early 1990s, also supports the notion of a surge in innovation, in line with the increasing globalisation of the world economy.

On the other hand, it is not obvious that globalisation is reducing or increasing this group's vulnerability to oil price shocks. The standard answer is that information-based

economies use less oil per unit of GDP and, therefore, are becoming less dependent on imported energy. For example, in the case of the USA (Stelzer, 2000) during the 1970s, oil products accounted for almost nine per cent of GDP. Today the figure is about three per cent. More efficient car engines are one explanation. Another is the steady shift of the US economy to knowledge-driven activities.

Presumably, also the endogenous growth countries' flexibility and abilities to shift to alternative sources of energy in the short run aid in minimising the economic impact produced by oil price shocks. However, a good case could be made that increased globalisation has created a greatly expanded set of macroeconomic linkages between these and many non-endogenous group countries which may be becoming more vulnerable to oil price shocks, as they speed up industrialisation. An oil shock induced recession in these countries could feed back to the endogenous countries, seriously affecting their economies through declining export sales. Ultimately then, the net impact of oil price movements on the endogenous countries can only be assessed through empirical testing.

1.1.2 Catching-up growth

This group of countries relates to the process whereby an economy, with a lower level of technology and income (the "follower"), narrows the income gap with the higher technology and richer countries (the "leader") through a process of technological diffusion and capital flows from leader to follower.

While all countries enjoy some benefit of technological growth in the leading country, the rate at which technology diffuses from leader to follower differs sharply around the world. A region that is geographically isolated, for example, is much less likely to benefit from technological diffusion.

Two kinds of country appear to be winners in the race to absorb technologies from abroad. Countries with successful export-promotion policies, such as Korea and Taiwan, have earned the foreign exchange necessary to import technologies from abroad. Also, countries that have been able to attract large flows of foreign direct investment have similarly been able to upgrade technologies, with particular success.

There is little doubt that successful catching-up growth involves a positive feedback process between technological diffusion and human capital accumulation. Initially, human capital is low in the laggard economy and technologies are rudimentary. The country may achieve some modest inflow of technology by attracting labour-intensive, export-oriented foreign direct investment, for example, labour-intensive assembly operations in export-processing zones. These simple assembly operations generate income, some modest skills and the resources to invest in improved education. The combination of rising skill levels and growing educational attainment leads to an upgrading of the foreign investment facilities.

As with the endogenous countries, it is impossible to say *a priori* much about the manner in which increased globalisation is affecting the net effects on these countries produced by an oil shock. On the one hand, increased globalisation has accelerated the long-term growth path of these countries (**table 2**), suggesting that they may be operating at close to full potential and thus are more vulnerable to oil price increases.

Table 2
Characteristics of countries, according to growth/globalization categories

	Endogenous growth countries	Catching-up growth countries	Primary commodity producers	Malthusian countries	Isolated economies
Number of countries	23	23	32	31	8
Population total for group, <i>millions</i>	844	2,063	465	466	74
GNP per capita <i>US \$ basis</i>	20,400	5,599	3,694	1,782	2,372
Annual growth of GNP per capita, 1990–99	2.1	2.7	0	–0.3	na
Population in temperate ecozones, %	76	28	9	4	14
Population within 100 km of the sea, %	69	59	44	19	0

Source: Sachs, Jeffrey D., "Globalization and patterns of economic development", Weltwirtschaftliches Archiv, Vol 136, No. 4, 2000, p. 584.

On the other hand, with increased diversification, these economies may be able to shift to alternative sources of energy, thus avoiding the full brunt of the external shocks. Finally, as in the case of the endogenous growth countries, oil price shocks may impact indirectly through slowing down the growth of major external markets. Again, the matter must ultimately be resolved through empirical testing and simulation.

1.1.3 Resource-based growth

This is the process whereby an economy experiences cycles of per capita income, mainly as a result of resource booms and busts. In fact, it has often been noted in recent years that natural resource-rich economies have fared particularly badly (table 2), especially in comparison with many of the resource-scarce economies. Even oil booms may have an adverse effect on oil-producing countries (Looney, 1990) through the Dutch disease mechanisms — an overvalued exchange rate, increased domestic inflation and a shift to non-trade activities. However, given the Dutch disease effect is a longer-term phenomenon, it is probably safe to conclude that, at least in the case of oil producers, the short-run effect of an oil price increase would be positive. Given their rigidity and lack of diversification, non-oil-producing countries would most likely have

declines in their incomes during periods of oil price shocks, especially with globalisation increasing their dependence on foreign markets.

1.1.4 Malthusian decline

Malthusian decline is a process of falling per capita income caused by population pressures outstripping the carrying capacity of the local economy, in circumstances in which the country is neither innovating nor successfully adopting technologies from abroad. These countries seem to be experiencing a long-term decline in living standards, that transcends the effects of terms-of-trade shocks of cyclical phenomena. Sub-Saharan Africa is the most disturbing case of an impoverished region suffering outright declines in living standards. Somewhat less dramatically, the Andean region seems also to be stuck with stagnant or even falling living standards. Given the economic structure of this group of countries, it is probably safe to assume that any trends in globalisation would increase their vulnerability to oil price shocks.

1.1.5 Economic isolation

Economic isolation is a phenomenon of economic stagnation that results from an economy's physical or policy-induced isolation from world markets. The main problem with the landlocked countries is that international trade is sharply hindered by the geographical isolation of these countries. In terms of increased globalisation, foreign investors, in particular, do not view these impoverished nations as effective platforms for export-oriented foreign direct investment. Thus these countries are typically unable to attract the kind of assembly operations in garments, electronics, footwear and other sectors, which have been important stepping stones to economic development in more favourably located economies. Foreign investors come, if at all, only to exploit primary commodities with a high value per unit weight — such as oil and gas, diamonds and other metals — since such commodities can be profitably exploited, even when transport costs are high. Without the diversification and flexibility needed to modify oil price shocks, one must conclude that these countries, unless hydrocarbon producers themselves, are very vulnerable to developments in the international oil market.

1.1.6 Summary

The previous sections have outlined a very general starting point for examining how trends in trends in globalisation may affect the manner in which oil price increases impact upon economies. Clearly, the great diversity of economic environments makes generalisation in this area very hazardous. On the other hand, several distinctive national economic environments can be identified. As a very first approximation, it is reasonable to expect that most, or all, countries in a particular group would be affected in a roughly similar manner by external oil shocks.

Building on this framework, the next section provides an operational method for quantifying these country groupings and, when necessary, reclassifying countries to better reflect a common underlying set of global economic forces. More importantly,

the analysis will assess the manner in which globalisation has altered the structure of these countries over time, with regard to making them more or less vulnerable to oil price shocks.

1.2. Quantification of globalisation

One of the main hindrances, to a meaningful assessment of the manner in which increased globalisation affects the manner in which oil price shocks impact on national economies, is that the term “globalisation” remains vague, meaning different things to different people and groups. There seems to be a consensus that globalisation — whether economic, political, cultural or environmental — is defined by increasing levels of interdependence over vast distances. A study by A.T. Kearney (2001) notes, however, that few people have undertaken the task of actually trying to measure those levels of interdependence. For instance, how do we determine the extent to which a country has become embedded within the global economy? How do we demonstrate that globalisation is racing ahead, rather than just limping along? Clearly the lack of a clear, precise definition underlies much of the current arguments and debates over the extent of globalisation and the manner that this phenomenon is changing the structure of national economies. As the Kearney study notes: “Without the means to quantify the extent of globalisation, any meaningful evolution of its effects will remain elusive” (A.T. Kearney 2001, p. 56).

1.2.1 Previous attempts at quantification

The Kearney approach is to reverse-engineer globalisation and break it down into its most component parts. On a country-by country basis, Kearney quantifies the levels of personal contact across national borders by combining data on international travel, international phone calls and cross-border remittances and other transfers. The Kearney index charts the World Wide Web by assessing, not only its growing numbers of users, but also the number of internet hosts and secure servers through which they communicate, find information and conduct business transactions.

The Kearney globalisation index also measures economic integration, tracks the movements of goods and services by examining the changing share of international trade in each country’s economy, and measures the permeability of national borders through the convergence of domestic and international prices. The index also tracks the movements of money by tabulating inward and outward direct foreign investment and portfolio capital flows, as well as income payments and receipts.

As the Kearney study notes, much of the conventional wisdom, cherished by both champions and critics of globalisation, collapses under the weight of hard data, ranging from the pace and scale of global integration and the characteristics of the digital divide to the impact of globalisation on income inequality, democratisation and corruption. Rosenau (1996) has also outlined the many of the benefits in, and conceptual problems of, devising a meaningful operational definition of globalisation.

While the Kearney index is a step in the right direction, it still suffers from many of the problems associated with index construction. Here the problems are fundamentally as follows.

- (1) What measures do you want to include in the index?
- (2) Are these measures comparable across countries? Specifically, is there a universal standard on what each measure comprises, and is the data of equal quality across countries?
- (3) What system of weights will be used to combine the various measures into a final summary index? Clearly, each possible (arbitrary) weighting system will provide a somewhat different picture as to the extent of globalisation in any particular country. The Kearney study does not treat these issues, but they need to be addressed before the index can provide any new meaningful insights into the globalisation process. Lockwood (2001) outlines a number of other problems associated with Kearney index.

1.2.2 A new approach to quantification

One way to get around this problem is to compile an extensive data set of the most widely used economic statistics and measures of world trade, capital flows, economic integration and the like. Clearly, many of these measures will overlap and thus be redundant. Using factor analysis, however, the main dimensions of global diversity can be identified.

More specifically, the basic assumption of factor analysis is that a limited number of underlying dimensions (factors) can be used to explain complex phenomena. The resulting data reduction produces a limited number of independent (uncorrelated) composite measures. In the current example, measures, such as value added per unit of capital, value added per labourer, value added per firm and so on, could provide a composite index of productivity or relative efficiency in factor usage. One advantage of indexes formed in this manner is that it avoids the problem of selecting one measure of efficiency, say value added per worker, over just as logical alternatives.

Formally, as an initial step in exploratory data analysis, factor analysis has three objectives: to study the correlations of a large number of variables, by clustering the variables into factors, such that variables within each factor are highly correlated; to interpret each factor, according to the variables belonging to it; and to summarise many variables by a few factors.

The usual factor analysis model expresses each variable as a function of the factors common to several variables and a factor unique to the variable:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + U_j \quad (1)$$

where:

- z_j = the j th standardised variable
- m = the number of factors common to all the variables
- U_j = the factor unique to variable z_j
- a_{ji} = factor loadings

The number of factors, m , should be small and the contribution of the unique factors should also be small. The individual factor loadings, a_{ji} , for each variable should be either very large or very small, so each variable is associated with a minimal number of factors.

To the extent that this factor analysis model is appropriate for the problem at hand, the objectives noted above can be achieved. Variables with high loadings on a factor tend to be highly correlated with each other, and variables that do not have the same loading patterns tend to be less highly correlated. Each factor is interpreted according to the magnitudes of the loadings associated with it.

Perhaps more importantly for the problem at hand, the original variables can be replaced by the factors with little loss of information. Each case (firm) receives a score for each factor; these factor scores can be computed as:

$$F_i = b_{i1}z_1 + b_{i2}z_2 + \dots + b_{ip}z_p \quad (2)$$

where b_{ij} are the factor score coefficients. Factor scores are, in turn, used in the discriminant analysis that follows. In general, these factor scores have less error and are, therefore, more reliable measures than the original variables. The scores express the degree to which each case possesses the quality or property that the factor describes. The factor scores have a mean of zero and a standard deviation of one.

Operationally, the computations of factors and factor scores for each country were obtained through a principal components procedure. The data used in the analysis was taken from the annual World Bank World Development Indicators (2001) and include:

1. Domestic absorption (per cent of GDP)
2. Domestic credit provided by banking sector (per cent of GDP)
3. Expenditure, total (per cent of GDP)
4. Trade (per cent of GDP)
5. Trade (per cent of goods GDP)
6. Imports of goods and services (per cent of GDP)
7. Financing from abroad (per cent of GDP)
8. Foreign direct investment, net inflows (per cent of GDP)
9. Exports of goods and services (per cent of GDP)
10. Domestic financing, total (per cent of GDP)
11. Gross private capital flows (per cent of GDP, PPP)
12. Telephone mainlines (per 1,000 people)
13. Gross foreign direct investment (per cent of GDP, PPP)
14. GDP growth (annual per cent)
15. Import growth (annual per cent)
16. Exports of goods and services (annual per cent growth)
17. Sub-Saharan dummy
18. Small country dummy
19. Oil dummy
20. Revised country classification

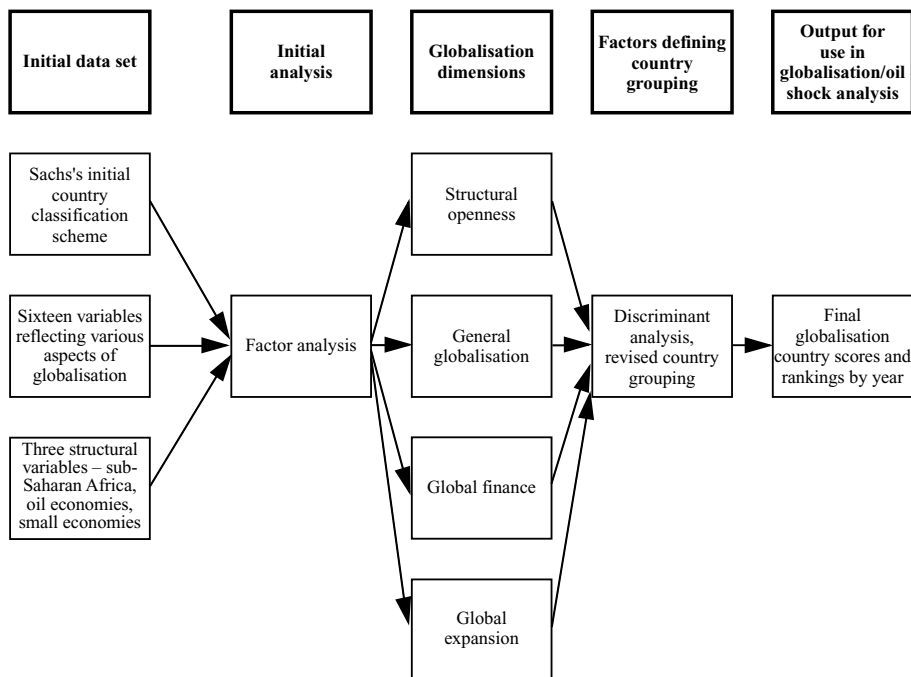
1.2.3 *Quantified dimensions of globalisation*

While the exact composition of factors varied slightly from year to year over the analysis period (1985–97), the 20 variables generally produced five main trends or dimensions (factors).

1. Structural openness, depicting the share of national economic integration into the world economy. Operationally, this comprises the share of imports and exports as a percentage of GDP. The variables comprising this factor do not change much over time and the dimension is usually the first factor to be extracted from the data set.
2. General globalisation, for lack of a better term. This dimension incorporates those variables that load on Sachs's country grouping dimension (table 1). Sachs's list of countries was also expanded to include several additional countries, such as Brazil. The number of variables loading on this grouping dimension increase considerably over time, with the factor incorporating an increasingly diverse set of global indices. From this, we can conclude that the process of globalisation affects each of the different country groupings in unique ways and that globalisation is an ongoing process, in this regard.
3. Finance, comprising both domestic and foreign components, such as foreign direct investment and financing from abroad.
4. Growth/trade expansion, comprising both external and internal measures of economic expansion. The main variables comprising this factor are import and export growth and overall GDP growth. Usually (but not always), GDP growth is highly correlated with the measures of trade expansion.
5. Global structure, comprising several structural variables to take into account several unique country characteristics identified in the literature. The literature (Bloom and Sachs, 1998) suggests that the sub-African countries may have a unique set of factors that sets them apart from other developing countries. To take this potential factor into account, a variable (SUBAF) was created, with zeros for the non-African countries and one for the African nations.

Another body of literature contends (Looney, 1991) that small countries, due to a much narrower resource base and smaller domestic market, are at a disadvantage *vis-à-vis* their larger counterparts. To take this effect into account, another variable was created with a value of one assigned to the smaller nations (usually those with a population less than five million) and a zero for the larger countries.

Figure 1
Globalisation and country economic environments



Finally, another body of literature (Looney, 1992) stresses the unique structure of the oil economies. This factor is taken into account, with a final variable, oil, which assigns a value of one to the oil economies and a zero to non-oil nations.

1.2.4 Revised factor scores and country groupings

Because Sachs's classification was intended to examine the growth potential of a large group of countries, there is a good chance his country groupings do not correspond precisely with an ideal grouping intended to define unique economic environments for our purposes i.e. the identification of differential impacts stemming from oil price shocks. Also, Sachs's definition appears to be static. There is little evidence of movement between groups or a precise indication of under what circumstances movement might take place. In the case of economic environments, we would expect more shifting between groups, as countries evolve and economic policies are altered.

To overcome these limitations, we proceeded (**figure 1**) with the following procedure.

First, for each individual year examined, a factor analysis was undertaken using the 20 variables noted above. In the case of 1995, 54 countries had complete data observations for this period and were retained in the analysis. The 20 variable data set comprised five main dimensions or factors (based on the constraint of an eigen value of one or greater).

Sachs's country classification term was included in the second factor, along with gross private capital flows, export share of GDP, gross foreign direct investment, etc. That is, these variables varied significantly by country grouping. The country factor scores on each dimension are based on a scale, with a mean of zero. Positive numbers indicate above-normal attainment of a particular factor or global dimension, while negative values indicate that the country/group is below average in the attainment of that dimension. For example, in 1995, the trade patterns of the USA account for a considerably smaller share of GDP than the sample norm. The USA is even well below the norm of the endogenous growth countries (group 1). It is considerably above the sample average for its attainment of general globalisation (dimension two), but again considerably below the norm for endogenous growth countries. It is slightly above the norm for global financial flows, and even above the norm for endogenous growth countries. Finally, the USA had above-average growth during this period, again somewhat above that of the group 1 countries. In general, the global structure dimension is an amalgamation of variables that do not load on one of the main globalisation dimensions, so its significance is hard to interpret. It is included here to simply show the complete results of the analysis.

Secondly, using the country factor scores from this step, a discriminant analysis was undertaken to assign a new set of country groupings. Which of the five main dimensions of globalisation noted above were critical in assigning countries to one of the five groups? For example, in 1995, two dimensions, (a) general globalisation and (b) trade expansion, were statistically significant in separating the sample countries into five main groupings. Of the original country classifications, 71.7 per cent remained in their initial groups, with the remainder assigned to new groups. For example, Korea had only a 8.3 per cent chance of being a group 1 (endogenous growth) country, but a 90.3 per cent chance of correctly falling into group 2 (catching-up).

The third step entailed redefining the country classification variable, from the results of the second step above. Here, the factor analysis was re-run to generate a new set of factor scores, more reflective of each country's position in the total sample and in its assigned group.

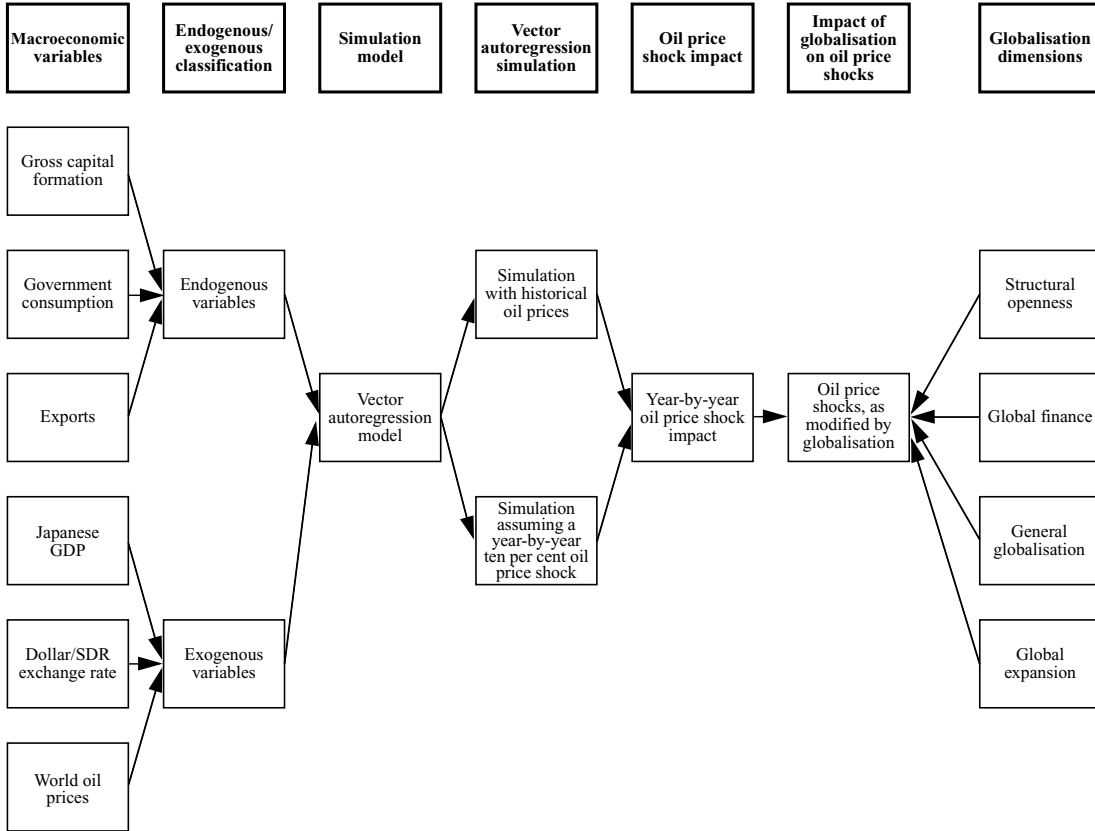
And finally, using these scores, a new discriminate analysis found that general globalisation (factor 2) and global expansion (factor 3) were statistically significant in assigning countries to the five-group model. On this basis, the probability of correct placement in one of the five groups was 92.6 per cent, with all of the group 1 countries correctly placed. This last step provides the country groupings and factor scores used in the oil price impact analysis. As noted above, the analysis was undertaken for 1977, 1980, 1983 and each year for the period 1985–97.

1.2.5 Globalisation and the strength of oil shocks

The revised factor scores or globalisation dimensions for each country are a key element in assessing the manner in which oil price shocks have been modified over time by changes in the world economy. Using the USA as an example, the link between oil price shocks and globalisation is outlined in **figure 2**.

As a starting point, a macroeconomic model was constructed for each of the 19 countries examined. In the case of the US economy, the model consisted of three

Figure 2
USA: globalisation impact on oil price shocks



endogenous macroeconomic variables, gross capital formation, government consumption and exports (all at constant dollar prices), and three exogenous variables: Japanese constant price GDP, the dollar/special drawing right (SDR) exchange rate and world oil prices. A first set of simulations for each year (1985–97) were made, using the historical values for oil prices. A second set of simulations were made, assuming a ten per cent increase in the price of oil for each base year. The net impact on GDP was then calculated, by subtracting the simulations incorporating oil price shocks from the historical series. Oil shock impacts were calculated for the shock year and two subsequent years. Finally, the resulting oil shocks were regressed on the various globalisation dimensions, to assess the role that changes in global dimensions for each country might have had in modifying the manner in which oil prices altered that country's GDP.

2. Economic impact of oil price shocks

Using the framework developed above for the changing strength of oil price shocks, a sample of 19 countries was undertaken.

2.1 USA

2.1.1 *Patterns of globalisation*

The USA is far and away the world's leading economic power. Its GDP totalled US \$9.3 trillion in 1999; assuming international purchasing power parity, this was three times the size of Japan's output, 4.8 times the size of Germany's and almost seven times the size of the United Kingdom's. Although the volume of its exports and imports exceeds that of any other country, the value of the USA's external sector, as a percentage of its GDP, is comparatively low. Exports of goods and services accounted for less than 11 per cent of GDP in 1999, considerably less than the European Union's 25–29 per cent in recent years.

As noted earlier, our approach focuses largely on the period 1985–97, the period when many observers feel the process of globalisation began to significantly affect the world's leading economies. The rationale here is to provide a framework for examining a large sample of countries, so that their various unique patterns of globalisation could be identified and examined as possible contributing factors to the differing manner in which oil price shocks affect national economies.

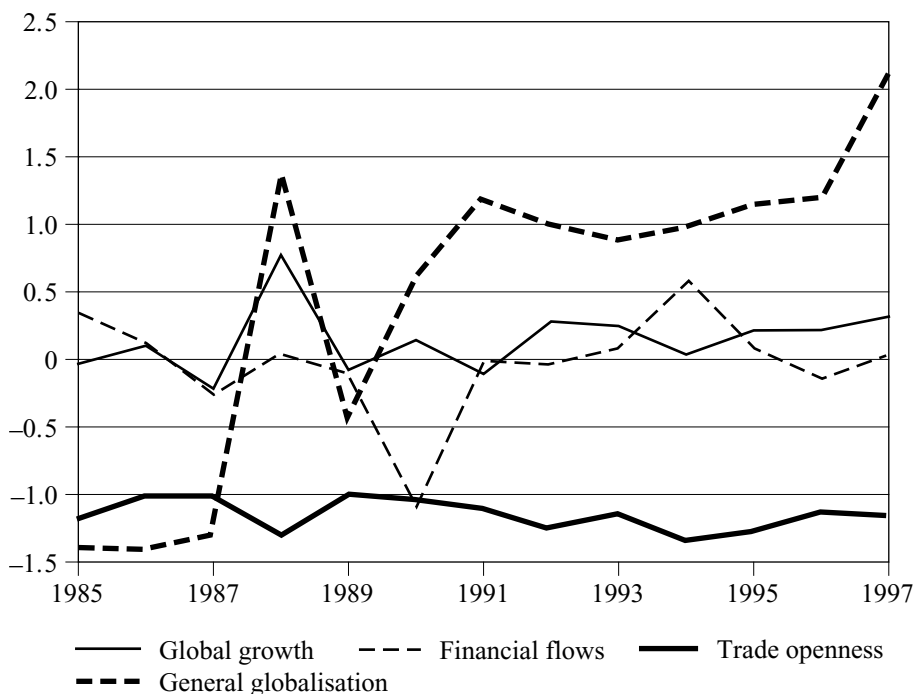
With these goals in mind, the factor/discriminant analysis of US globalisation found some significant differences between the US economy and the norm for group 1 countries. **Table 3** reports the factor scores on the globalisation dimensions for the USA, group 1 and group 2 countries. Factor scores are, in effect, an index formed from the weighted average of the most important elements entering into a dimension. They have a mean of zero, with positive numbers indicating an above-average attainment of the country/group on that dimension. Negative scores are indicative of below-average attainment of that dimension. On this basis:

- (1) the US structural openness dimension scores considerably below the group average, suggesting that trade plays less of a role in the US economy than for other advanced industrial nations;

Table 3
Dimensions of globalisation: factor scores, 1988–96

		Structural openness	General globalisation	Financial globalisation	Global growth
1988	USA	-1.305	1.367	0.023	0.773
	Group 1	-0.190	1.166	-0.081	0.116
	Group 2	0.112	-0.290	-0.080	0.690
1989	USA	-1.109	1.238	-0.104	-0.078
	Group 1	0.004	1.669	-0.119	-0.103
	Group 2	-0.056	-0.292	-0.102	0.148
1990	USA	-1.031	0.615	-1.114	0.143
	Group 1	-0.024	1.387	-0.722	-0.109
	Group 2	-0.027	-0.481	-0.600	0.037
1991	USA	-1.116	1.185	-0.003	-0.108
	Group 1	-0.066	1.423	-0.200	-0.208
	Group 2	0.069	0.161	0.116	0.132
1992	USA	-1.229	1.007	-0.041	0.280
	Group 1	-0.142	1.504	-0.067	-0.269
	Group 2	0.257	0.043	-0.182	0.306
1993	USA	-1.159	0.876	0.054	0.247
	Group 1	-0.180	1.399	0.407	-0.182
	Group 2	0.381	0.102	-0.285	0.074
1994	USA	-1.342	0.968	0.590	0.036
	Group 1	-0.156	1.541	0.244	-0.223
	Group 2	0.325	0.110	-0.071	0.146
1995	USA	-1.278	1.134	0.074	0.214
	Group 1	-0.294	1.618	-0.023	-0.208
	Group 2	0.096	-0.117	-0.294	0.706
1996	USA	-1.115	1.213	-0.160	0.217
	Group 1	-0.326	1.724	-0.239	-0.106
	Group 2	0.159	-0.034	-0.341	0.140
1997	USA	-1.146	2.124	0.024	0.316
	Group 1	-0.694	2.538	0.079	-0.159
	Group 2	0.461	0.028	-0.558	0.100
Average	USA	-1.183	1.173	-0.066	0.204
	Group 1	-0.207	1.597	-0.072	-0.145
	Group 2	0.178	-0.077	-0.240	0.248

Figure 3
Patterns of globalisation: USA
Factor scores: globalisation dimensions



- (2) the general globalisation dimension is also somewhat below the group norm; while
- (3) financial globalisation and growth in the world market are above the pattern typically found in other advanced countries.

Recent patterns of US globalisation have been (as in the other group 1 countries) characterised by a rapid increase in the general globalisation dimension (**figure 3**). Contrary to popular belief, the USA has not dramatically increased its relative position to other countries, with regard to the other dimensions of globalisation: global openness, financial flows or expansion in the global economy. This finding is consistent with that of Dunn (2001). While Dunn's main conclusion is that the US economy is far from being completely globalised, our findings suggest that, at least with regard to the general globalisation dimension, significant movement has been made in that direction.

Table 4
Summary oil shock impact analysis: USA

	Globalisation dimensions			
	General globalization	Structural openness	Financial globalization	Global growth
Cumulative				
Impact year	+	ins	ins	ins
Impact year + 1	+	ins	ins	ins
Impact year + 2	+	ins	ins	ins
Cumulative per cent GDP				
Impact year	+	ins	ins	ins
Impact year + 1	+	ins	ins	ins
Impact year + 2	+	ins	ins	ins
Yearly				
Impact year	+	ins	ins	ins
Impact year + 1	+	ins	ins	ins
Impact year + 2	+	ins	ins	ins

Notes: Group 1 country.

US data used in the analysis.

+ indicates a factor increasing the strength of oil price increases in affecting GDP.

ins = statistically insignificant at the 95 per cent level.

2.1.2 Globalisation and oil price shocks

The USA — a group 1 country — has, as we will see, the normal pattern of a positive sign (**table 4**) associated with increased levels of general globalisation i.e. over time, and everything else being equal, oil price shocks have been stronger because of globalisation. Perhaps as a result of the general globalisation dimension, there has been a significant increase in the amount of GDP loss associated with oil price shocks (**figures 4 and 5**).

2.2 Other countries

A similar analysis was undertaken for 18 additional countries, whose selection was dictated largely by the available data. Here, the analysis found a clear linkage between the globalisation defined country groups and the manner in which oil shocks affect their economies (**table 5**). Over time, and contrary to popular opinion, group 1 countries have become more vulnerable to oil price shocks, in the sense that a ten per cent increase in the price of oil today would cause a greater reduction in income i.e. the oil shock driven loss in income as a per cent of GDP has increased gradually over time, in line with the process of globalisation. For these countries, general globalisation and

Figure 4
Yearly oil shock impact: USA
10% oil shock % impact on US GDP

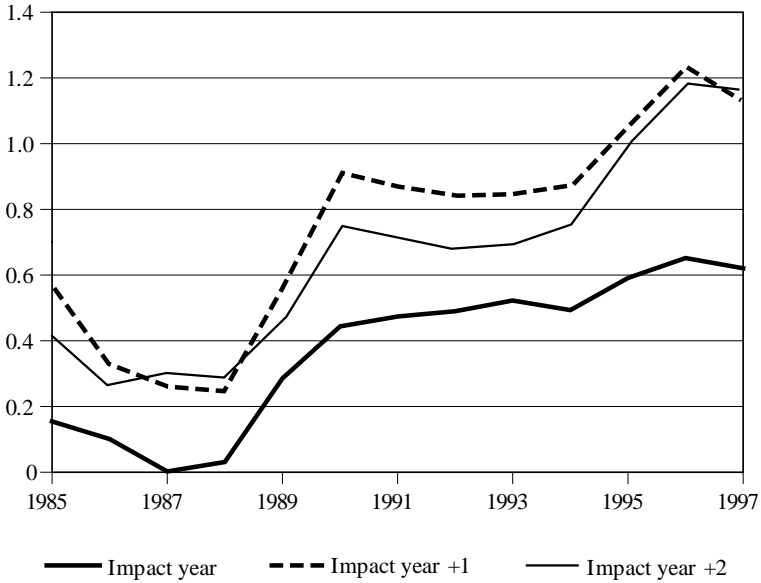


Figure 5
Cumulative oil shock impact: USA
10% oil shock % impact on US GDP

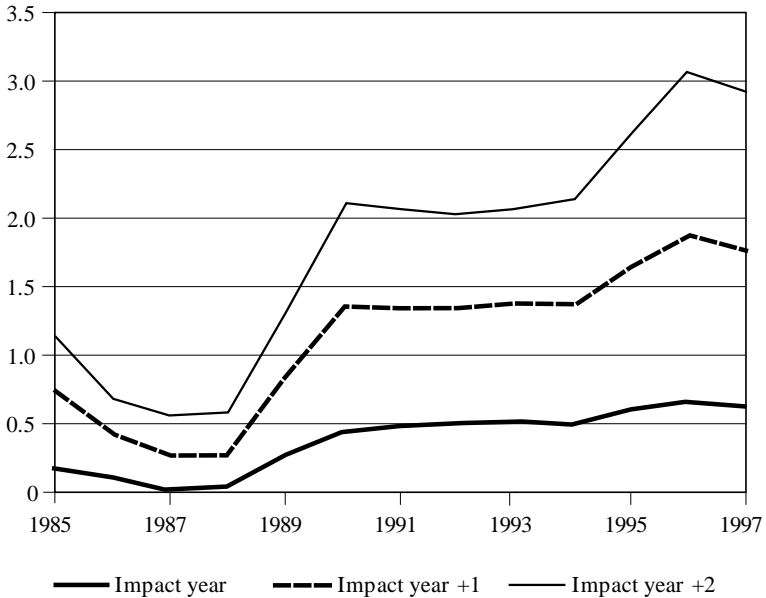


Table 5
Summary oil shock impact analysis

Globalisation dimension impact

	General globalisation	Structural openness	Financial globalisation	Global growth
Group 1 countries				
USA	+			
Australia	+	+	+	
Austria	+	+	-	
Canada	+			+
Finland	+	+	+	-
France	+			
Germany	+	+		+
Italy	+			
Netherlands	+	+	?	+
Sweden	+	+	-	-
UK	+			
Japan	+		-	
Spain	+	+	-	-
Group 2 countries				
Korea	-	+	+	-
Philippines	-	-	+	
Portugal	-			-
South Africa	-		+	+
Oil countries				
Mexico (Group 2)	-	-		
Norway (Group 1)	-	-	+	-

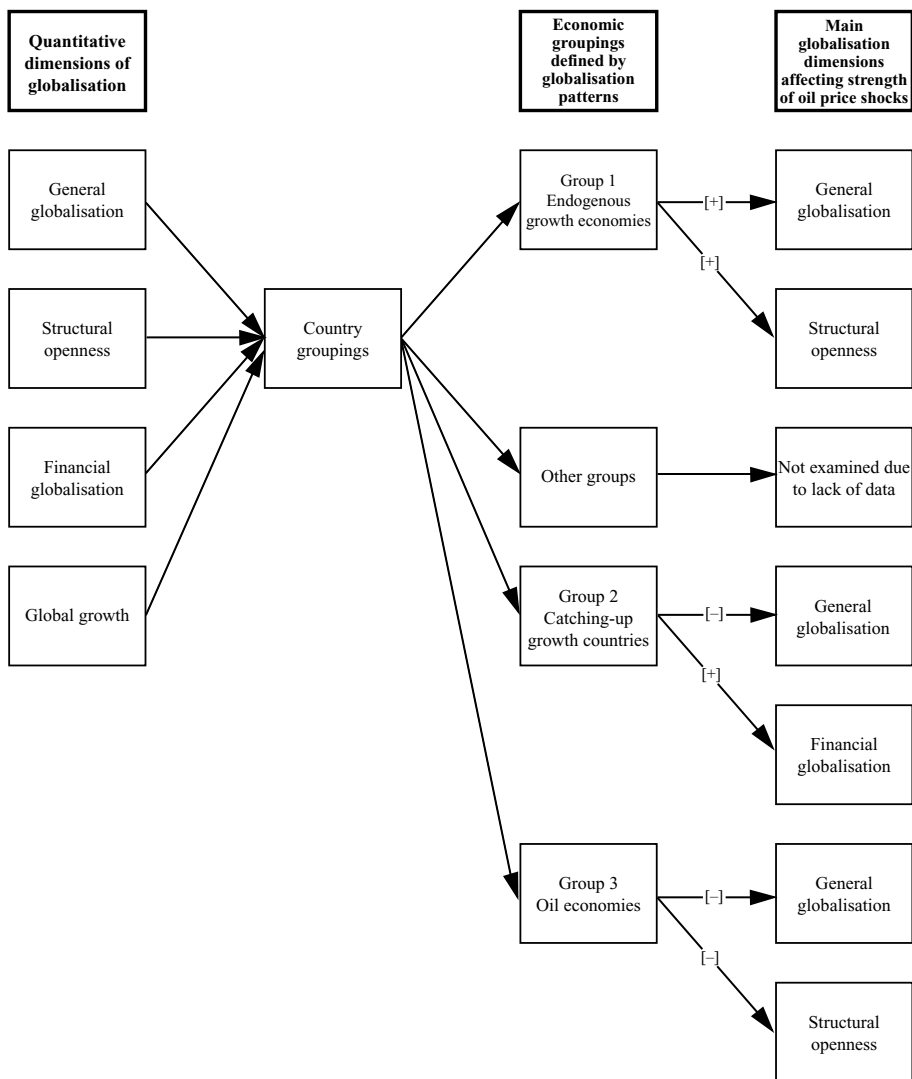
Notes: + indicates a factor increasing the strength of oil price increases in affecting GDP.
- indicates a factor weakening the strength of oil price increases in affecting GDP.

structural openness have been most responsible for the increased severity of oil shocks. Changes in financial globalisation and the global growth dimension of globalisation have not only played a much smaller role in this regard, but have also made some countries less vulnerable and others more vulnerable — no clear patterns emerge from these aspects of globalisation.

The two group 1 exceptions are Spain and Japan, where financial flows have lessened somewhat the severity of oil price shocks. Nonetheless, oil price shocks still inflict considerable economic losses on these countries.

As might be imagined, the two oil economies included in the study, Mexico and Norway, would experience increased income associated with oil price shocks. On the

Figure 6
Summary: patterns of globalisation and oil price shocks



other hand, movements in globalisation have resulted in Norway obtaining smaller and smaller economic gains from oil price shocks, whereas Mexico's gains have stabilised.

A very different globalisation/oil shock pattern characterises the group 2 (catching-up) countries. Over time, increases in the general globalisation dimension has lessened the impact of oil price shocks on these countries. On the other hand, the financial dimension has worked to increase the severity of oil shocks on most of these countries. The net effect is that the Philippines, Portugal and South Africa have, with time, experienced a gradual increase in the severity of oil price shocks. In Korea's case, the forces of globalisation have appeared to neutralise each other. The net effect has been a rather constant loss in income associated with oil price shocks.

Conclusions

Summing up (**figure 6**), these findings, combined with the likely trends in globalisation, suggest that, contrary to the conventional wisdom, there is reason to believe that oil price shocks in the future may produce more rather than less severe impacts on the advanced industrial countries. Interestingly, these effects are less for the newly industrialising or catching-up countries.

References

Bloom, D., and Jeffrey Sachs (1998), "Geography, democracy and economic growth in Africa", *Brookings Papers on Economic Activity*, No. 2, pp. 207–289.

Dunn, Robert M., Jr (2001), "Has the US economy really been globalised?", *Washington Quarterly*, Vol. 24 (No. 1), pp. 53–64.

Kearney, A.T. Inc (2001), "Measuring globalization", *Foreign Policy*, No. 122, pp. 56–65.

Lockwood, Ben (2001), "A note on the robustness of the Kearney/foreign policy globalization index", *GSR, University of Warwick Working Paper*, No. 79.01.

Looney, Robert E. (1992), "Real or illusionary growth in an oil-based economy: government expenditures and private sector investment in Saudi Arabia", *World Development*, Vol. 20, pp. 1,367–1,376.

Looney, Robert E. (1991), "The viability of Arab Gulf industrial development: the relative importance of linkages versus size effects", *Economia Internazionale*, Vol. XLIV, No.2–3, pp. 228–243.

Looney, Robert E. (1990), "Oil revenues and the Dutch disease in Saudi Arabia: differential impacts on sectoral growth", *Canadian Journal of Development Studies*, Vol. XI, No.1, pp. 119–133.

Lucas, Robert (1988), "On the mechanics of economic development", *Journal of Monetary Economics*, Vol. 22, pp. 3–42.

Pesaran, Hashem M., and Bahram Pesaran (1997), *Working With Microfit 4.0: Interactive Econometric Analysis*, Cambridge, Camfit Data.

Romer, Paul (1990), "Endogenous technical change", *Journal of Political Economy*, Vol. 98, pp. s71–s102.

Romer, Paul (1986), "Increasing returns and long run growth", *Journal of Political Economy*, Vol. 94, pp. 1,002–1,037.

Rosenau, James (1996), "The dynamics of globalization: toward an operational formulation", *Security Dialogue*, Vol. 27, No. 3, pp. 247–262.

Sachs, Jeffrey (2000), "Globalization and patterns of economic development", *Weltwirtschaftliches Archiv*, Vol. 136, No. 4.

Sen, Amartya (2001), "If it's fair, it's good: ten truths about globalization", *International Herald Tribune*, 14 July.

Sims, C. (1980), "Large-scale econometric models", *Econometrica*, Vol. 48, No.1, pp. 1–48.

Stelzer, Irwin (2000), "Oil loses power to drive boom off course", London Times, 23 January.

World Bank (2000), World Development Indicators, 2000, Washington, World Bank.