



# **Criss-crossing Globalization: The Phenomenon of Uphill Skill Flows**

**Aaditya Mattoo  
The World Bank**

**Arvind Subramanian  
Peterson Institute for International Economics**

DRAFT

## Criss-Crossing Globalization: The Phenomenon of Uphill Skill Flows

Aaditya Mattoo (World Bank)

and

Arvind Subramanian  
(Peterson Institute for International Economics, Center for Global Development and  
Johns Hopkins University)

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## Introduction

The phenomenon of uphill flows of capital has been subject to great scrutiny in recent years (Bernanke, 2006; Caballero et. al. 2008, and Prasad et. al. 2007 among others). Much of this literature has focused on financial flows (alternatively foreign savings). Indeed in Caballero et. al., (2008), the authors attempt to explain why developing countries export savings while simultaneously importing foreign direct investment (FDI). The assumption has been that the only gravity-defying flow is finance.

But a number of recent high-profile developments raise the possibility of uphill flows in other dimensions. These flows run counter to predictions of standard trade models in which developing countries primarily export unskilled products and are recipients of foreign direct investment (FDI). The recent developments include the take-over of the U.K.'s Jaguar by a prominent Indian enterprise (TATA), the luxury car maker; China's move into the computer industry; Brazil's success in exporting commercial aircraft market to industrial countries; and the growing exports of skilled services from Israel and India to OECD markets.

These developments have in common the flows of skill, embodied in goods, services, or capital (in the form of entrepreneurial and managerial skills associated with FDI), from poorer to richer countries. This paper is a first stab at documenting and understanding this unusual, and possibly significant, phenomenon.

This phenomenon, of course, has not gone unnoticed. A number of papers have recently emphasized the growing sophistication of the export and production base of developing countries. For example, Schott (2007) has shown that China's export profile is becoming increasingly similar to that of many OECD countries (see also Hummels and Klenow, 2005; and Schott, 2005). A related literature has focused on the direction of these export flows but in a more normative context. For example, Samuelson (2004) and Krugman (2008) have examined the consequences of increasing US imports of manufactured goods produced in developing countries that compete with domestic US production. There has also been some discussion, in the popular press, of inward flows of FDI from developing countries (for example, the Dubai Port episode), but primarily related to security issues. These are perspectives, on uphill flows, even paranoid ones, from the top of the hill.

Furthermore, the vast literature on the *effects* of global integration, through goods and FDI, has focused primarily on flows to developing countries. For example, Coe et. al, (1997) highlighted the impact of technology diffusion through imports of capital goods on the growth of developing countries and Lumenga-Neso et al. (2004) the impact of direct and indirect imports from industrial countries. There is also a large literature documenting the effects of inward FDI (Borensztein et. al. 1998; Haskell et. al, 2002).

Recently, Hausmann, Hwang, and Rodrik (2007) have looked at the effects of the sophistication of a country's export profile on its own growth (see also Burgess and

Venables, 2004). In a similar vein Feenstra and Kee (2008) examine whether diversity of export production can have productivity-enhancing effects. However, the effects of outward flows of FDI and skilled exports and of the destination of these flows have received less attention.

Why should the destination of trade and FDI flows matter? Javorcik (2006) has shown that selling to foreign-owned firms located in a country has positive upstream productivity effects because of the possibility of induced technological and managerial improvements. In principle, these benefits can also arise from sales to foreign firms located abroad. Moreover, exports of goods to high income destinations is frequently associated with being part of global production chains that confer important benefits (Hoekman and Javorcik, 2007.)

This paper attempts two things. First, we will present some new data on developing country exports of services, goods, and FDI, assessing the extent to which these are going to richer countries. Second, we will undertake a preliminary exploration of the consequences of these uphill flows of embodied skills in term of the impact on growth of the source country. Here, we will follow closely the work of Hausmann et. al. (2007).

## **Data**

Our trade data comes from the WITS database of the United Nations. We collected data at the 5-digit level (largely because finer data say at the 6-digit level really become available only in the late 1980s and we were interested in checking whether the phenomenon of uphill flows was a feature of historical data). For computational reasons, we collected data for every 5-year interval and restricted the sample to countries that together accounted of about 90 percent of world trade.<sup>1</sup>

Our focus in this paper is on the direction of flows of embodied skills. In three different areas—FDI, goods, and services—for which we present some broad data, we need to explain how we define or illustrate the flow of skills.

In the case of goods, we draw upon Hausmann et al. (2007) for characterizing skill-intensive products. They calculate a measure called PRODY, which is a weighted sum of the per capita GDP of countries exporting a given product, and thus represents the income level associated with each of these goods. In this paper, we define—admittedly arbitrarily—skilled products that are either above the median level or in the top 25<sup>th</sup> percentile of PRODY for all products defined at the 5-digit level of aggregation for the year 1990.

Our FDI data comes from Thomson Financial SDC Platinum database and is described in detail in the appendix.

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<sup>1</sup> In subsequent work, we plan to increase the sample to cover most countries.

## Stylized Facts on Uphillness

We first present some basic facts about the flows of embodied skills.

### *Foreign Direct Investment*

In chart 1A, we plot what we call the average income level of world exports and imports of FDI. In the case of exports of FDI, the average income level is just the export-share weighted income (per capita PPP GDP in constant dollars for a fixed base year<sup>2</sup>) of the countries from which the FDI (or goods) is originating.

In the case of FDI, we find that the average income level declined from about \$29,000 in 2001 to \$26,000 (a decline of about 10%). A different way of depicting this is simply the fact that the share of exports of FDI originating from non-OECD countries increased from about 7 percent to nearly 15% during the 2000s (Chart 1B). It is worth noting that these numbers are not driven by any one country such as China or Brazil or India.

While these charts show how developing countries are becoming increasing exporters of FDI, they do not give an indication of the direction of these flows. Chart 1C isolates the direction of flow of these skills. For each country, FDI outflows to countries richer than itself as a share of the sending countries total FDI is the magnitude of uphill flows. These are added for all non-OECD countries. This share increased from a trough of 35 percent in 2003 to nearly 50 percent in 2007.<sup>3</sup> We plot the share of uphill FDI flows as a share of GDP for a few selected emerging market countries, and we find that indeed these uphill flows are increasing broadly for a number of them (Chart 1D), with the pattern most pronounced for the BRICs.

### *Exports of goods*

We repeat this exercise for exports of sophisticated goods, and find a similar pattern. The average income level of world exports of sophisticated products declined by a similar percent (about 10%) but over a slightly longer period (Chart 2A). Unlike in the case of FDI, China is a big contributor to this decline in the income of the source country for world exports of sophisticated products. Excluding China reduces the decline by nearly 5 percent (Chart 2B).

In Chart 2C, we calculate the uphill flows of sophisticated products from non-OECD countries. For each country, exports of sophisticated exports to countries richer than itself as a share of its total sophisticated exports is the magnitude of uphill flows. These are added for all non-OECD countries. This share was about 1% in 1980 (0.2 percent for highly sophisticated products (HSPs))<sup>4</sup> and increased to 10 percent in 2006 (3 percent for

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<sup>2</sup> The base year was 1995 for FDI and 1990 for trade in goods.

<sup>3</sup> The level of uphill flows are likely to be biased upwards because mergers and acquisitions form a smaller share of inward FDI in developing countries but it is less clear that the change in these flows will suffer from similar biases.

<sup>4</sup> There are two definitions of sophisticated products. The first covers exports that lie above the median value of PRODY (defined in the text) calculated for 1990. The second covers exports that lie in the top 25<sup>th</sup> percentile of PRODY values. For each definition, we compute the weighted average of per capita GDP of

HSPs). The individual country charts show that uphill flows were very pronounced for China, Malaysia, and Mexico but much less so for India and Brazil (Chart 2D).

### *Services*

In services, we focus on exports of services other than transport and travel, i.e. the category “other commercial” (in the US “other private”) services, which cover most skill-intensive business services. Again we find a decline, albeit slow, in the average income level of services exporters (Chart 3A). This trend suggests that developing countries are becoming increasingly important exporters of skilled services.

Unfortunately, bilateral data on services trade is available only the OECD countries, so it is not possible to construct measures of uphill flows analogous to those for goods and FDI.<sup>5</sup> However, bilateral data available for the United States shows that for some developing countries (e.g. India and Malaysia) services exports as a share of GDP are flowing uphill (Chart 3B)

### *Country heterogeneity*

Although the phenomenon of uphill flows appears to characterize several developing countries, there is heterogeneity across them. It is not the case, for example, that countries that see uphill flows of sophisticated exports also see uphill flows of FDI. For example, in Chart 4A, we plot for 22 important emerging market countries for which we have data their uphill FDI flows against uphill sophisticated. There seems to be little correlation between the two. Indeed, there appear to be four distinct categories: countries such as Ireland and Israel do well on both counts; Brazil and India have significant uphill flows of FDI but relatively small uphill exports of sophisticated goods; China and some East Asian (Taiwan and Thailand) and east European (Hungary) countries, on the other hand, are exactly the opposite of Brazil and India, with large uphill export flows but limited FDI flows. Finally, there is a group of countries like Argentina, Pakistan, Mauritius and Turkey that score low on both counts.

Notwithstanding the above, it might be possible that success in exporting sophisticated goods will be associated with the greater likelihood of investing in manufacturing. But this also does not turn out to be the case (The best examples are India and Brazil, which are not big uphill exporters of goods but score well on FDI in manufacturing.).

Finally, it is also worth noting that some countries such as Malaysia and Mauritius which are reasonably big exporters of FDI are not big uphill exporters of FDI.

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the exporting countries, with the weights being the share of each country in the total exports of sophisticated products.

<sup>5</sup> It is, in principle, possible to combine OECD data and IMF balance of payments statistics to obtain an estimate of the share of skilled services exports of developing countries directed to OECD countries. However, significant inconsistencies in the data between these two sources prevent meaningful comparisons.

### *“Preston Curves”*

How recent is this phenomenon of uphill flows? We cannot carry out meaningful historical comparisons for FDI because data do not allow us to go too far back but we can attempt to answer this question for exports of sophisticated goods.

To do this, we plot “Preston curves” that relate uphill flows to the level of per capita GDP of a country for three points in time (1986, 1996 and 2005) that are sufficiently apart to allow changes to express themselves. These are shown in Charts 5A and 5B. The noteworthy point that emerges is that the relationship shifts markedly upward in the most recent period for which we have data.<sup>6</sup> The shift implies that over time, uphill flows are becoming more common across the income spectrum. We also find that the fit of the relationship between uphill flows and income tightens over time, suggesting that higher income countries are likely to see more uphill flows.

### **Consequences of Uphillness**

One obvious question is do uphill flows matter, for say economic growth? Hausmann et. al. (2007) have argued that the structure of exports matters for growth. In particular they show that countries that produce more sophisticated goods (defined as those produced by richer countries) are more likely to grow faster. Can similar consequences be claimed for the destination of sophisticated exports?

To pursue this question, we adopt the basic cross-national regression methodology deployed by Hausmann et. al. (2007). Our results for the pure cross-section are in Tables 1A and 1B while the panel regressions are contained in Tables 2A and 2B. .

We first replicate the HHR cross-section results in column 1 using our revised measure of the sophistication of a country’s export basket (our measure of EXPY is different because we do it at a higher level of aggregation and for a different sample). The results are similar to those in HHR. In column 2, we introduce our measure of the average income level of the destination of a country’s sophisticated exports (with sophistication defined as above median level of PRODY). The coefficient on this variable is significant. In column 3, we check that the result is robust to outliers (Ireland being the significant one). In column 4, we use the alternative measure of sophistication (top 25 percentile of products) and our variable remains significant. In column 5, we perform a pseudo-validation check. We also include a measure of uphill flows of unsophisticated products. This variable is not significant while our uphill measure is, albeit at the 10 percent confidence level.

Of course, there are a number of issues with our estimation method: some of our RHS variables are prone to endogeneity bias (despite our using the initial rather than

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<sup>6</sup> This is true when we estimate the relationship: (i) without keeping the sample common across time periods; (ii) after controlling for area, population and remoteness of a country from the world’s center of gravity; and (iii) using alternative measures of uphill-ness of flows. Also, when we estimated the Preston relationships in a formal panel context, we found that the coefficient on the 2005 dummy to be positive and statistically significant. .

contemporaneous values),<sup>7</sup> we may be omitting other variables, and our variables could be mis-measured. Our results should therefore be interpreted at this stage as being conditional associations rather than as being fully identified.

One particular issue with the HHR approach and our adaptations of them is that they are not scaled. For example, the EXPY measure of HHR captures the sophistication of an economy's export basket without taking account of how important (relative to the size of an economy) are the export of these products. There is both virtue and downside in their measure being scale-free—the virtue is the econometric advantage that there is less endogeneity bias; the downside is that the economic intuition is less clear. Our uphill measure too is scale free, capturing the importance of uphill flows in the export basket but not their economy-wide importance.

To address this, we re-define the measures of the composition of the export basket and the uphillness of flows. We create a measure of the share of exports of sophisticated products in GDP, and the share of exports of sophisticated products flowing uphill as a share of GDP (recognizing that this may well add another layer of endogeneity bias<sup>8</sup>). We introduce these in the cross-country regressions instead of their scale-free counterparts that we used earlier (we can either add the total share of sophisticated exports to GDP and the uphill share of that as two variables or simply the uphill and downhill shares of sophisticated exports. We do the latter). We find that the coefficient on the share of uphill products to GDP is significant (column 1, Table 1B) and remains so after excluding Ireland (column 2). In column 3, we also control for the share of total unsophisticated exports in GDP and find that this variable is not significant and does not affect our uphill flow measure.

Given the limitations of the above analysis, we turn to panel estimations in Tables 2A and 2B. In Table 2A, we use the scale-free measures and in Table 2B, we use the measures scaled by GDP. Instead of going through all the columns, we highlight the key findings. When we use the scale-free measures, we find that both the composition of exports and uphillness of the flows of these exports are significant except when we add country fixed effects (column 5). However, when we use the more intuitively plausible scaled measures, we find that the variable capturing uphill flows is statistically significant (columns 2 and 3) even after adding country and time effects. One additional finding is that in the panel, we can find reasonable instruments for our uphill flows and the resulting IV estimations yield significant coefficients for this coefficient (column 9 in Table 2A).

## **Discussion and Limitations of our Analysis**

This paper is a first attempt at documenting a possibly new phenomenon, which we call uphill flows. We presented a set of stylized facts relating to uphill flows of goods,

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<sup>7</sup> We tried IV estimations of our basic OLS results. While are and population serve as good instruments for the EXPY measure, they do not have any traction as instruments for our uphill measure. In future work, we plan to use distance of countries from OECD markets as a possible instrument.

<sup>8</sup> Here uphill-ness is measured in terms of exports of goods to countries richer than the exporting country.

services and FDI, and some preliminary estimates of the consequences of some of these flows. What we have not done is examine the determinants of these flows.

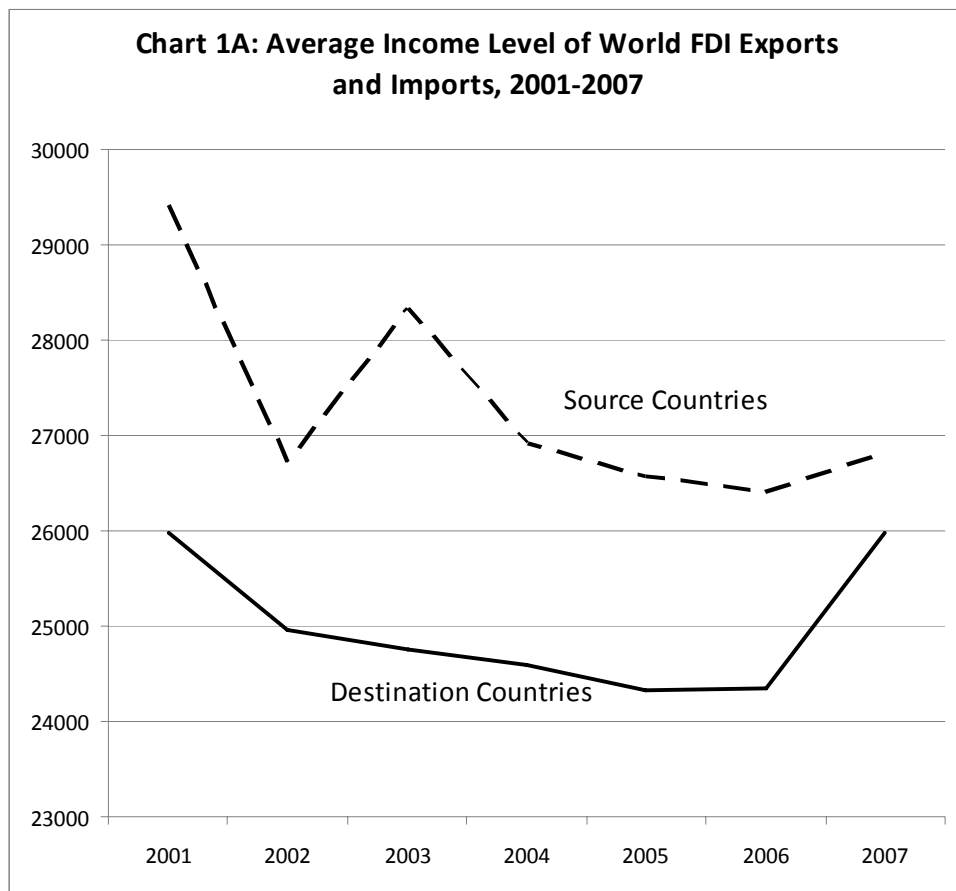
These flows raise some interesting theoretical questions. First, and most obviously, they seem to defy the prediction of the pure Heckscher-Ohlin model of trade driven by relative factor endowments. Second, while such flows can be seen in the light of intra-industry trade models with economies of scale they typically have been predicted between countries at similar levels of development (Helpman and Krugman, 1985). But, in both cases, the inconsistency may be more apparent than real if we were to think of countries like China and India not as single units but as heterogeneous economic units (or regions) with widely differing relative factor endowments (Subramanian, 2007). If there are pockets within developing countries that are sufficiently endowed with skill or are sufficiently developed, then predictions of both models may help explain the observed patterns which lead to what one might call criss-crossing globalization. A third possibility is that the relevant heterogeneity is at the level of firms (Melitz, 2003 and Melitz et al., 2004). In this view, some firms even in developing countries—especially the larger ones—can be more productive than the less productive firms in industrial countries, permitting them to export or even invest abroad.

Policy may also play a role in explaining uphill flows. One factor may have been international patterns of protection, in particular rich country barriers against imports of less skill intensive products and developing country barriers against imports of more skill intensive products. Thus, the larger developing countries may have been inhibited from exploiting their natural comparative advantage, i.e. exporting less-skill intensive products to richer countries and more skill-intensive products to poorer countries. Another factor is the evolving structure of factor endowments: recent research shows that some of the larger developing countries are investing proportionately more in technical education than both poorer and richer countries.

We have not examined in any detail the channels through which uphill exports of sophisticated goods and services affect overall economic performance. One possibility is that our measure of destination may actually capture a finer degree of product differentiation, in horizontal or vertical terms. For example, Schott (2005) established that even when developing exports fall within the same product categories as rich country exports, they tend to have lower unit values and may be located lower on quality ladders. In other words, what we identify as uphill flows may just be an alternative or complementary measure for product quality/sophistication. Our findings could then be seen as adding to the evidence on such quality mattering for economic performance.

Another possibility is that final exports of sophisticated goods by a country may reflect merely its comparative advantage in the final “assembly” stage rather than a deeper sophistication in its production processes. For example, a significant proportion of China’s uphill exports of sophisticated goods contain imports of sophisticated components from rich countries. On the one hand, this could indicate that we are mismeasuring sophistication. On the other hand, our measure could capture the extent of a country’s participation in modern global production chains which confer benefits in

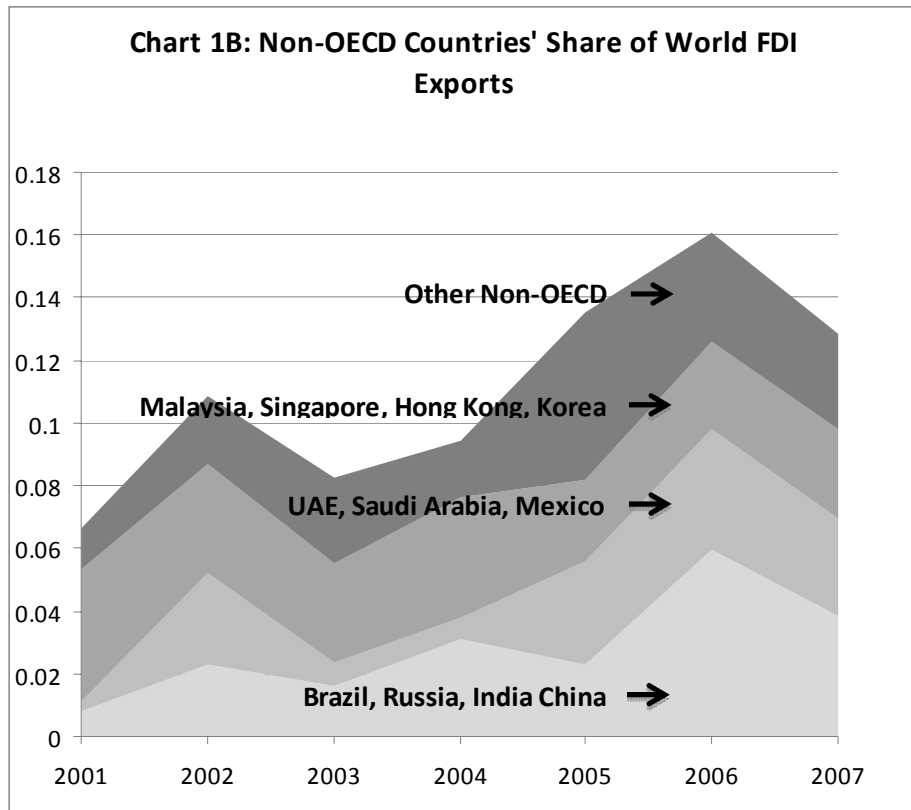
terms of knowledge of markets, just-in-time capability, improved production technology etc. Thus, what we capture—imperfect though it undoubtedly is—may provide clues about an additional channel through which the impact of global integration is felt.



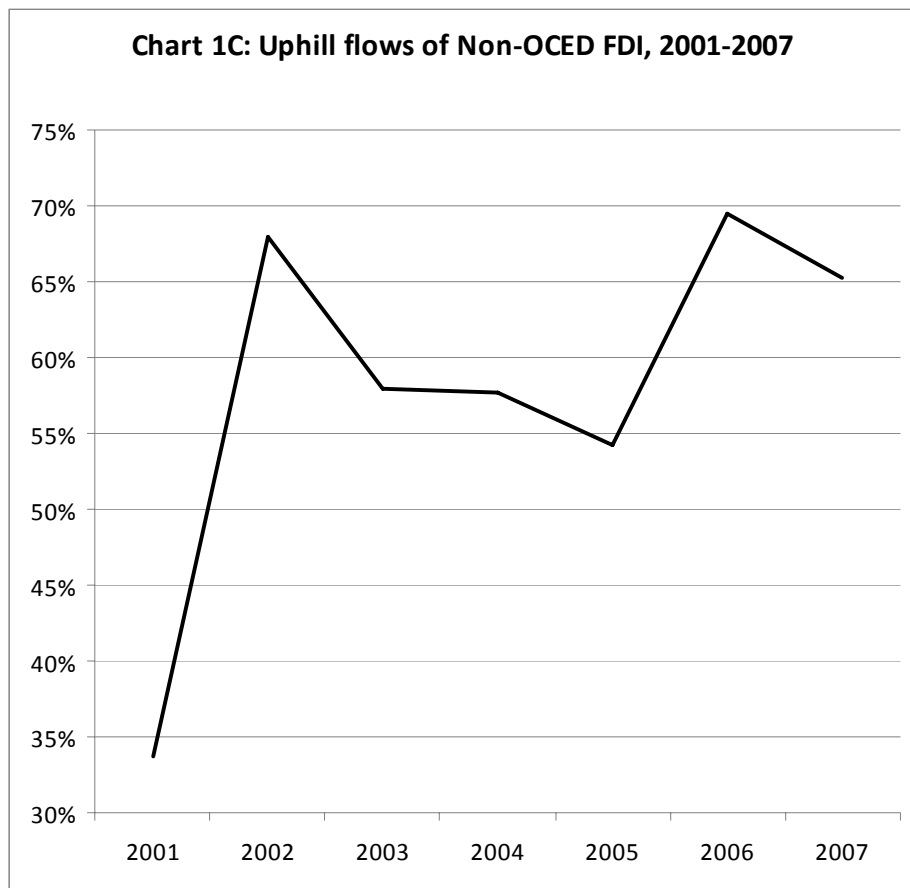
Source: Thomson Financial SDC Platinum Database.

The dotted line plots the weighted average income of the FDI-sending countries, where the weight of each country is its share in total FDI outflows. The other line does the same for FDI imports. FDI data correspond to mergers and acquisitions and are explained in greater detail in the appendix.

**Chart 1B**

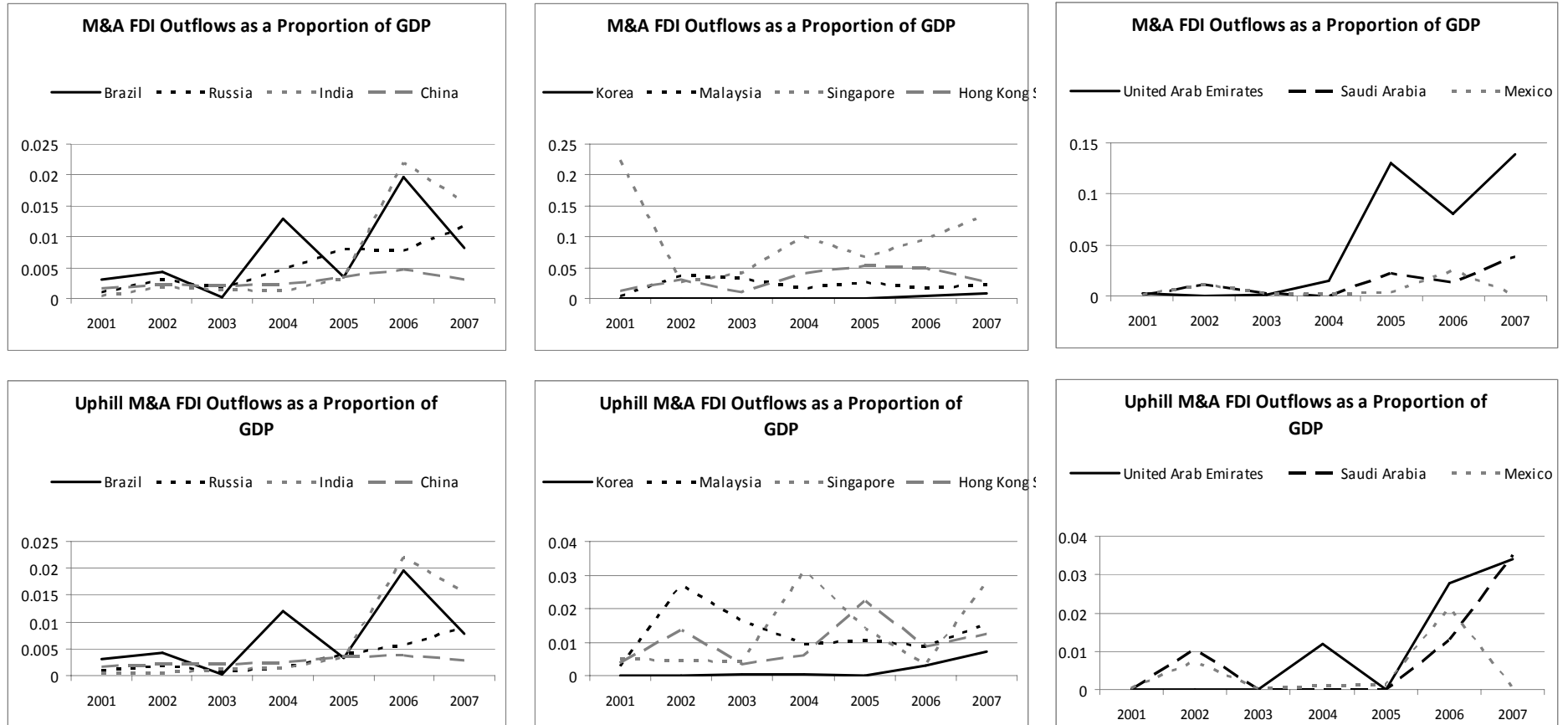


Main “other non-OECD” countries are South Africa and Israel.



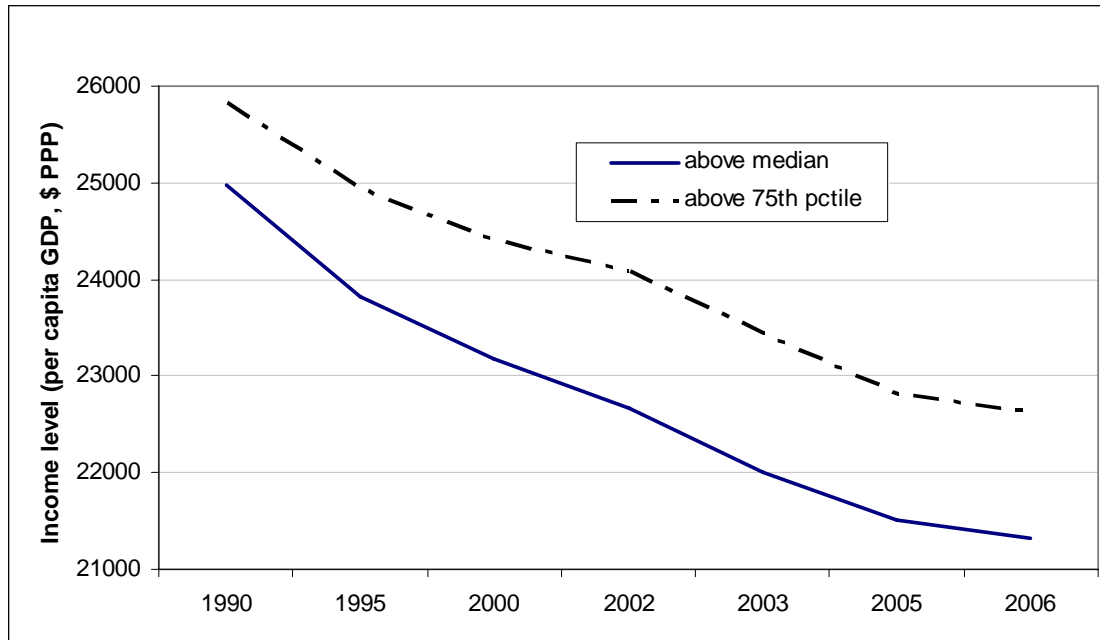
For each country, FDI outflows to countries richer than itself as a share of the sending countries total FDI is the magnitude of uphill flows. These are added for all non-OECD countries.

**Chart 1D: FDI Outflows and Uphill FDI Outflows, 2001-2006, Selected Countries**



For each country, uphill FDI outflows are flows to countries richer than the sending country and are expressed as a share of its GDP.

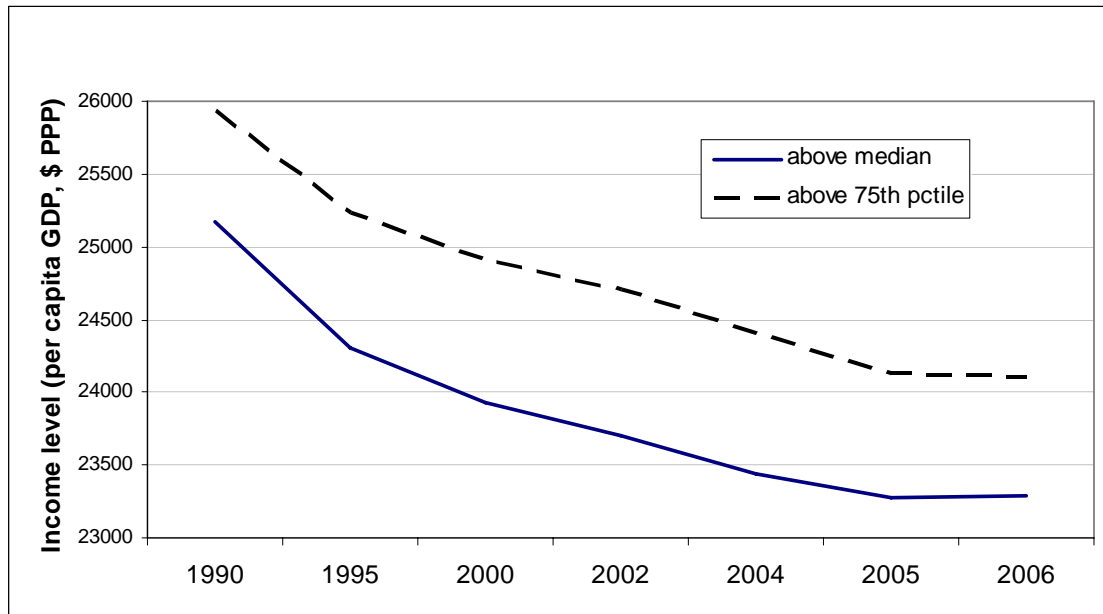
**Chart 2A: Average income level of world exports of sophisticated products, 1990-2006**



Source: UN COMTRADE.

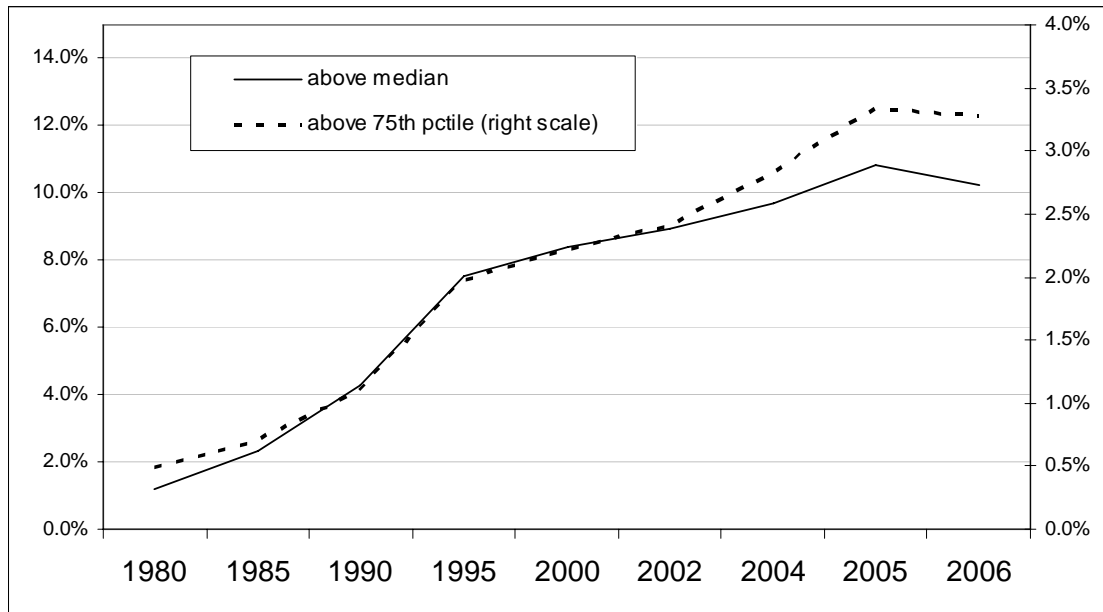
There are two definitions of sophisticated products. The first covers exports that lie above the median value of PRODY (defined in the text) calculated for 1990. The second covers exports that lie in the top 25<sup>th</sup> percentile of PRODY values. For each definition, we compute the weighted average of per capita GDP of the exporting countries, with the weights being the share of each country in the total exports of sophisticated products.

**Chart 2B: Average income level of world exports of sophisticated products, 1990-2006 (excluding China)**



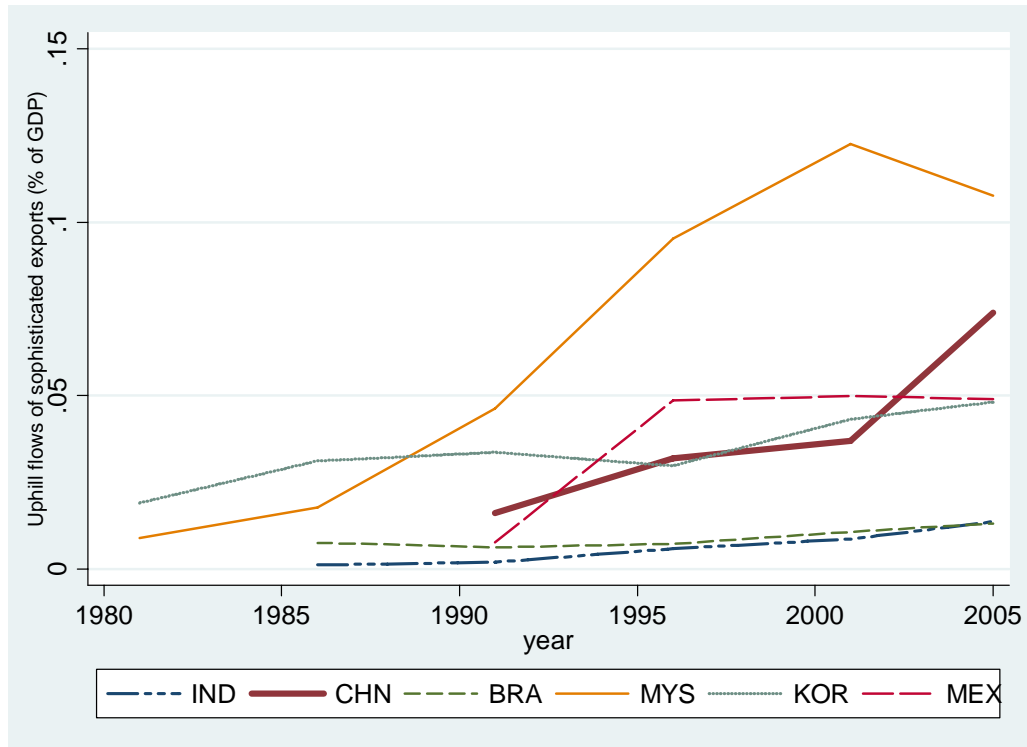
See note to Chart 2A above.

**Chart 2C: Uphill flows of sophisticated exports from non-OECD Countries, 1990-2006**



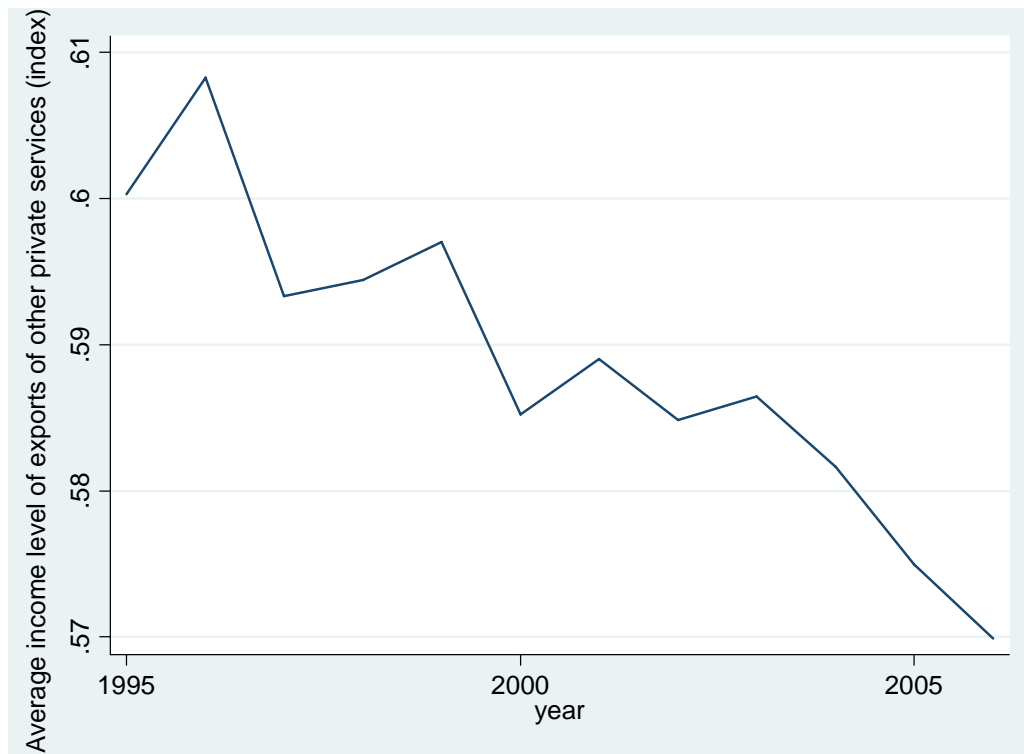
For each country, the measure of uphill flows is exports of sophisticated goods to countries richer than itself as a share of its total sophisticated exports. These are added for all non-OECD countries.

**Chart 2D: Uphill flows of sophisticated exports as a share of source country GDP, 1980-2005**



The measure of uphill flows is the value of exports of sophisticated products as a share of a country's GDP (all measured in current dollars).

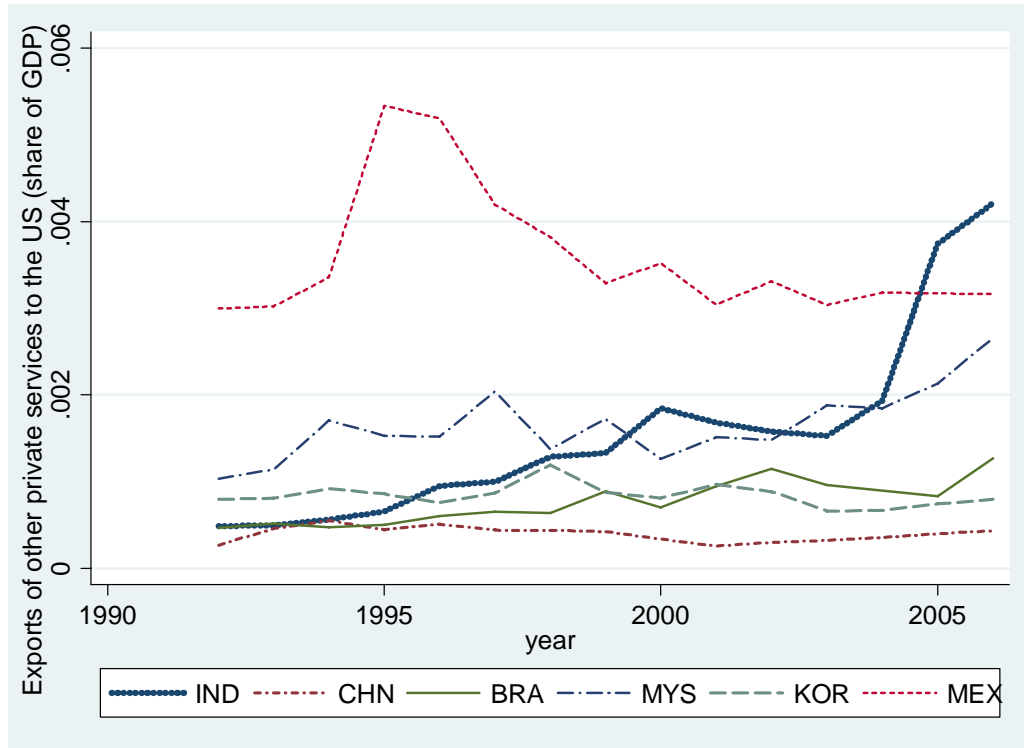
**Chart 3A: Average income level of world exports of other private services, 1995-2006**



Source: IMF Balance of Payments Statistics.

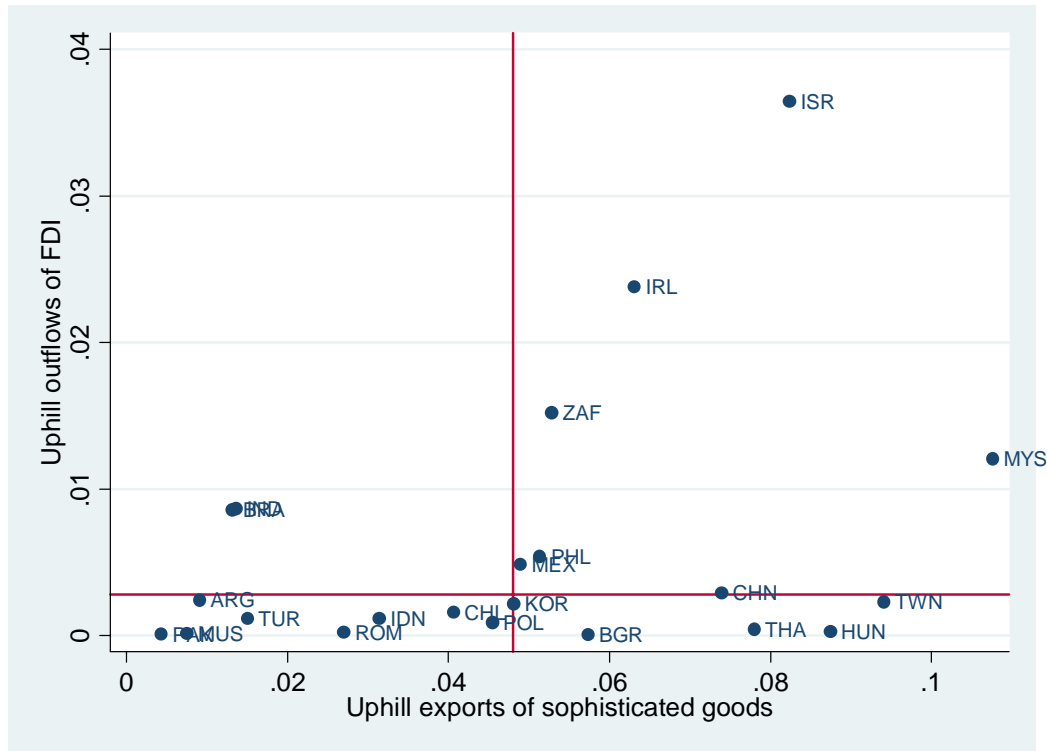
Other private services exports are services other than transport and travel and cover most skill-intensive business services. We compute the weighted average of per capita GDP of the exporting countries, with the weights being the share of each country in the total exports of other private services.

**Chart 3B: Exports to the U.S. of other private services as a share of source country GDP, 1990-2006**



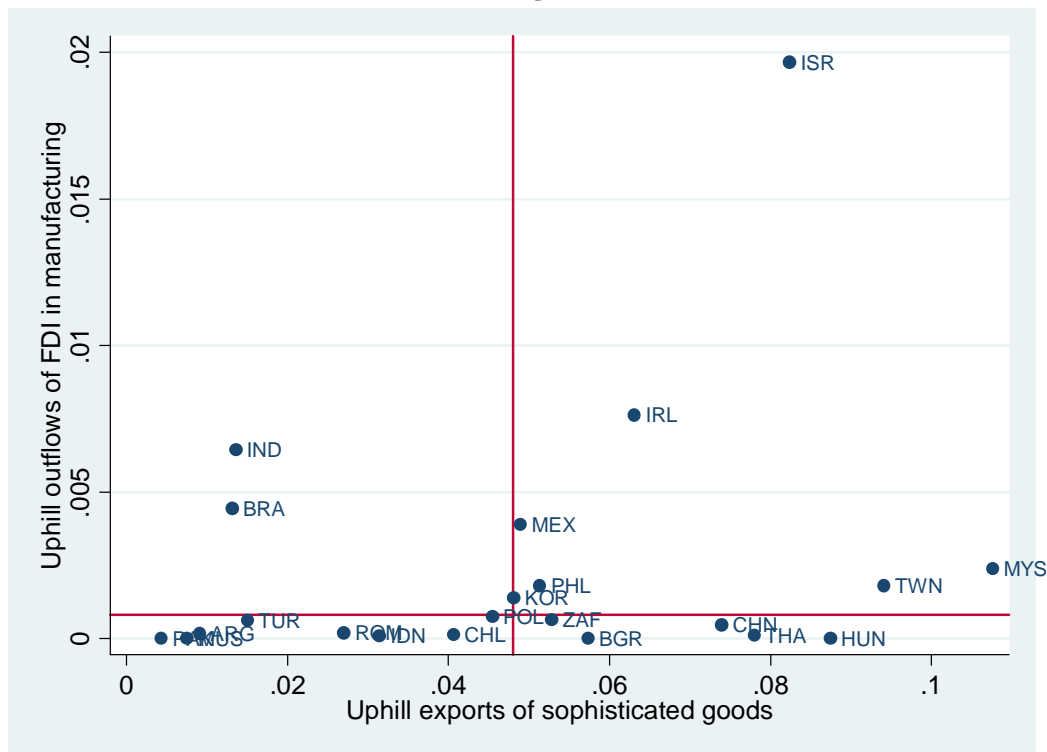
Source: U.S. Bureau of Economic Analysis.  
See Note to Chart 3A above.

**Chart 4A: Uphill Flows of FDI and Exports of Sophisticated Goods (Averages for 2002-2007)**



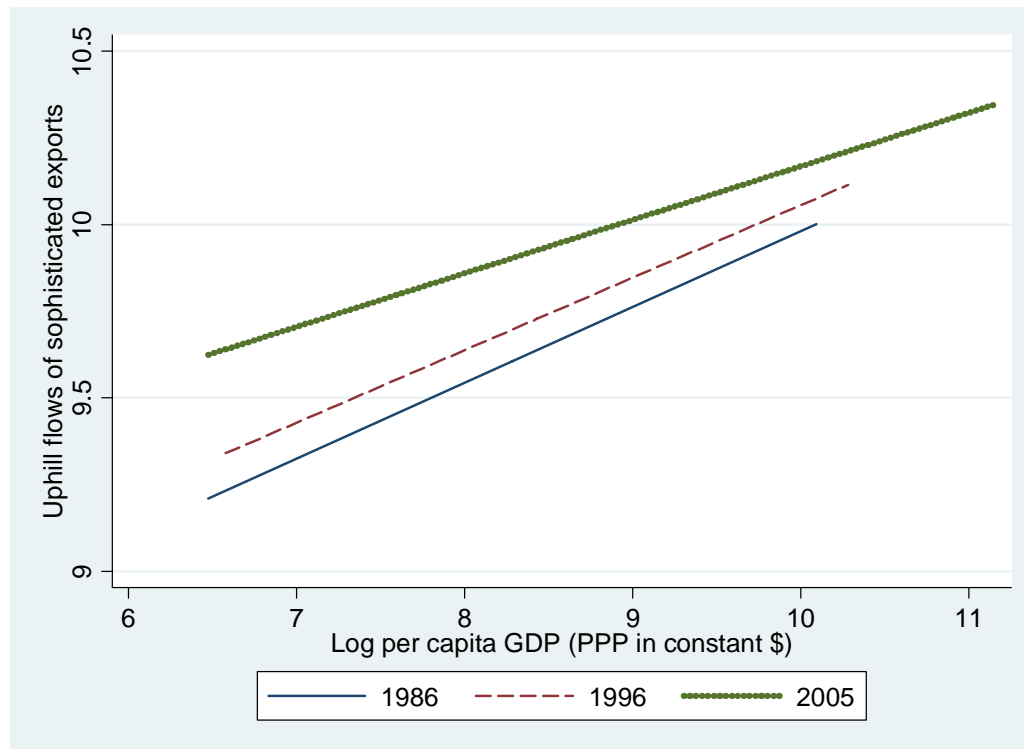
Source: UN COMTRADE and Thomson Financial SDC Platinum Database.  
 Uphill outflows of FDI and exports of sophisticated goods are all expressed as a share of a country's GDP.

**Chart 4B: Uphill Flows of FDI in Manufacturing and Exports of Sophisticated Goods (Averages for 2002-2007)**



Uphill outflows of FDI in manufacturing and exports of sophisticated goods are all expressed as a share of a country's GDP.

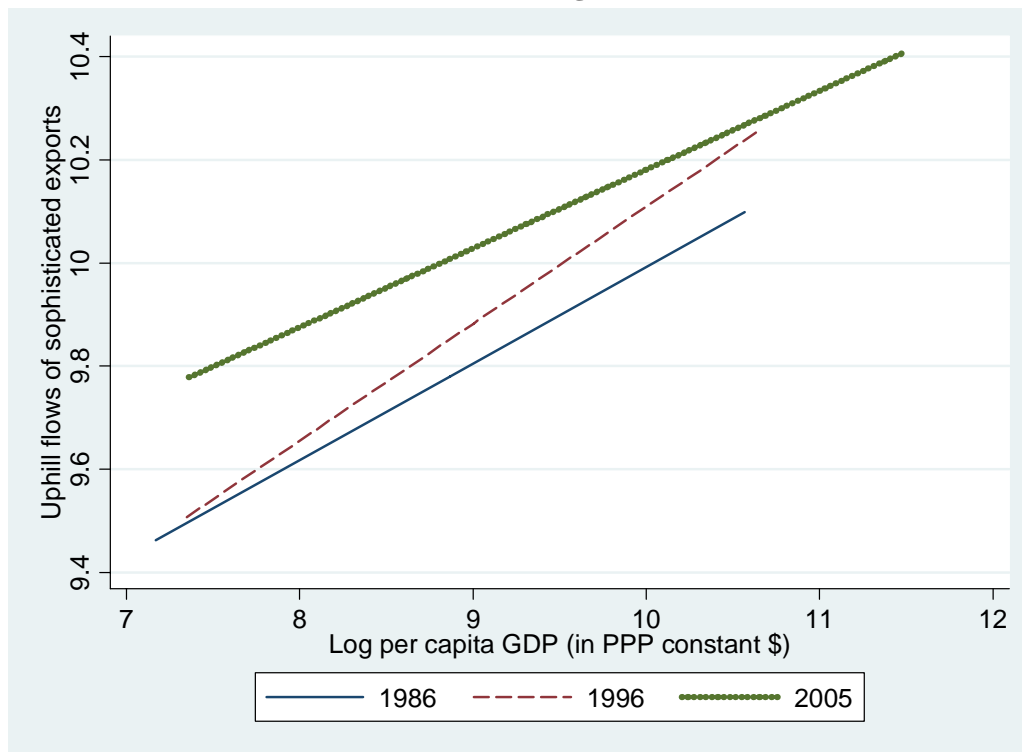
**Chart 5A: Uphill Flows of Sophisticated Exports and Per Capita GDP, 1986, 1996, and 2005**



Source: UN COMTRADE

Uphill flows are measured as the average income level of all the destination countries which receive a country's sophisticated exports (defined here as above-median PRODY exports), where the weights are each destination country's share in total exports of the sending country. The sample is kept constant for all three periods.

**Chart 5B: Uphill Flows of Sophisticated Exports and Per Capita GDP, 1986, 1996, and 2005 (Controlling for other factors)**



This chart is the same as Chart 5A above, except that it includes for each year for which the relationship is plotted, controls for area, population and remoteness (all in log terms).

$$remote_j = \frac{1}{\sum_k \frac{GDP_k}{D_{jk}}} \quad j \neq k, \text{ where } D \text{ is}$$

Remoteness (due to Freund and xx) is measured as distance and there are k foreign countries.

**Table 1A: Growth and Uphill Flows of Sophisticated Exports  
(Cross-Sectional Regressions; Scale-free measure of sophisticated exports)**

Variable	(1)	(2)	(3)	(4)	(5)
	Dependent variable is Annual average growth 1994-2003				
Initial per capita GDP (log)	-0.005 (0.006)	-0.006 (0.006)	-0.005 (0.006)	-0.005 (0.006)	-0.006 (0.006)
Export sophistication	0.023* (0.012)	0.022* (0.011)	0.020* (0.011)	0.021* (0.012)	0.016 (0.012)
Years of primary schooling	0.004 (0.013)	0.003 (0.012)	0.003 (0.013)	0.002 (0.013)	0.001 (0.013)
Capital stock	-0.005 (0.006)	-0.005 (0.006)	-0.005 (0.006)	-0.005 (0.006)	-0.005 (0.006)
Institutional quality (Rule of law)	0.009*** (0.003)	0.008*** (0.003)	0.007** (0.003)	0.007** (0.003)	0.009*** (0.003)
Uphill export flows of sophisticated_50 products (export-weighted)		0.009** (0.004)	0.009** (0.004)		0.007* (0.004)
Uphill export flows of sophisticated_75 products (export-weighted)				0.008* (0.005)	
Downhill export flows of sophisticated_50 products (export-weighted)					0.011 (0.009)
Constant	-0.106 (0.073)	-0.178** (0.086)	-0.162* (0.087)	-0.162* (0.090)	-0.221** (0.098)
Observations	62	62	61	61	61
Adjusted R-squared	0.169	0.211	0.210	0.194	0.221
F-test	4.13	3.79	5.05	4.93	4.99

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 1B: Growth and Uphill Flows of Sophisticated Exports  
(Cross-Sectional Regressions; Sophisticated exports scaled by GDP)**

Variable	(1)	(2)	(3)	(4)
	Dependent variable is Annual average growth 1994-2003			
Initial per capita GDP (log)	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.006)	-0.001 (0.006)
Downhill export flows of sophisticated_50 products (as share of GDP)	-0.099** (0.047)	-0.084* (0.043)	-0.106* (0.058)	
Uphill export flows of sophisticated_50 products (as share of GDP)	0.263*** (0.080)	0.159** (0.065)	0.136* (0.068)	
Years of primary schooling	-0.001 (0.017)	0.002 (0.016)	0.002 (0.017)	0.005 (0.017)
Capital stock	-0.003 (0.006)	-0.003 (0.006)	-0.003 (0.006)	-0.002 (0.006)
Institutional quality (Rule of law)	0.010*** (0.003)	0.009*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
Non-sophisticated exports of sophisticated_50 products (as share of GDP)			0.021 (0.026)	
Downhill export flows of sophisticated_75 products (as share of GDP)				-0.374*** (0.082)
Uphill export flows of sophisticated_75 products (as share of GDP)				0.119 (0.105)
Non-sophisticated exports of sophisticated_75 products (as share of GDP)				0.030* (0.016)
Constant	0.050* (0.029)	0.046 (0.030)	0.040 (0.032)	0.034 (0.031)
Observations	61	60	60	60
Adjusted R-squared	0.314	0.153	0.144	0.149
F-test	6.17	6.27	6.18	7.63

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 2A: Growth and Uphill Flows of Sophisticated Exports  
(Panel Regressions; Scale-free measure of sophisticated exports)**

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	Fixed effects	Random Effects	IV	IV
Per capita GDP (log)	-0.003 (0.003)	-0.006** (0.003)	-0.005* (0.003)	-0.006** (0.003)	-0.055*** (0.010)	-0.007** (0.003)	-0.013** (0.005)	-0.012** (0.005)
Export sophistication	0.010* (0.005)	0.009* (0.005)	0.010* (0.005)	0.009* (0.005)	0.005 (0.006)	0.005 (0.005)	0.035** (0.017)	0.007 (0.006)
Years of primary schooling	0.009* (0.005)	0.010** (0.004)	0.009** (0.004)	0.010** (0.004)	0.010 (0.018)	0.019*** (0.006)	0.003 (0.005)	0.012** (0.006)
Uphill export flows of sophisticated_50 products (export-weighted)		0.013*** (0.004)		0.011*** (0.004)	-0.004 (0.011)	0.010** (0.005)	0.011*** (0.004)	0.039** (0.016)
Uphill export flows of sophisticated_75 products (export-weighted)			0.010*** (0.004)					
Downhill export flows of sophisticated_50 products (export-weighted)				0.006 (0.007)				
Remoteness (log)						0.002 (0.004)		
Land area (log)						-0.005*** (0.001)		
Population (log)						0.007*** (0.002)		
Constant	-0.057 (0.039)	-0.147*** (0.048)	-0.133*** (0.045)	-0.196*** (0.073)	0.495*** (0.154)	-0.125** (0.062)	-0.319*** (0.113)	-0.349*** (0.120)
Observations	267	267	266	267	267	256	256	256
Adjusted R-squared	0.063	0.103	0.087	0.104	0.230		-0.019	-0.117
F-test	3.19	4.08	4.24	3.75	6.78		3.17	3.06
Number of countries					65	62		
R-squared						0.10		

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 2B: Growth and Uphill Flows of Sophisticated Exports  
(Panel Regressions; Sophisticated exports scaled by GDP)**

Variable	(1) Random effects	(2) Fixed effects	(3) Fixed effects	(4) Fixed effects	(5) Fixed effects
Per capita GDP (log)	-0.007*** (0.003)	-0.063*** (0.012)	-0.063*** (0.012)	-0.060*** (0.012)	-0.042*** (0.008)
Uphill export flows of sophisticated_50 products (as share of GDP)	0.229*** (0.055)	0.231*** (0.085)	0.226** (0.090)		
Downhill export flows of sophisticated_50 products (as share of GDP)	-0.024 (0.031)	0.056 (0.049)	0.063 (0.052)		
Years of primary schooling	0.019*** (0.007)	0.021 (0.019)	0.021 (0.019)	0.022 (0.020)	0.052*** (0.018)
Non-sophisticated exports of sophisticated_50 products (as share of GDP)			0.012 (0.035)		
Uphill export flows of sophisticated_75 products (as share of GDP)				0.264 (0.197)	0.489** (0.205)
Downhill export flows of sophisticated_75 products (as share of GDP)				0.059 (0.127)	0.081 (0.151)
Non-sophisticated exports of sophisticated_75 products (as share of GDP)				0.037 (0.034)	0.034 (0.036)
Constant	0.050*** (0.019)	0.547*** (0.099)	0.547*** (0.099)	0.522*** (0.096)	0.316*** (0.060)
Observations	258	258	258	258	258
Number of rcode	64	64	64	64	64
R-squared	0.13				
Adjusted R-squared		0.288	0.285	0.271	0.171
F-test		5.92	5.19	4.82	5.59

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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## Appendix: Foreign Direct Investment Data<sup>9</sup>

To what extent do we see uphill flows of foreign direct investment (FDI) in the available data, and how have these flows changed in recent years? To pursue this question, we examined merger and acquisition (M&A) FDI data from Thomson Financial's SDC database from January 1995 to December 2007, using this data on M&A FDI as a proxy for FDI more broadly.

### Data Source

Use of M&A data for these purposes rather than broader measures of FDI is dictated by the lack of an adequate data source that includes both of the two components of FDI – greenfield investment in new assets, and the acquisition of existing assets through M&A activity. UNCTAD's World Investment Report (WIR) database includes coverage of both total FDI and M&A inflows and outflows for each country, but the *published* dataset does not break these *flows* down on a bilateral basis – data on countries of origin are not available for inflows, while data on destination countries are not provided for outflows. While some UNCTAD-based datasets used by other researchers have endeavored to create this bilateral breakdown, these datasets generally examine FDI stocks rather than flows, and have reliable data across a broad range of countries only for a few years, generally between 2003 and 2005.

By contrast, reasonably comprehensive and highly granular coverage is available for M&A FDI in the form of commercial financial databases. Such databases report information at the individual transaction level, enabling analysis on three principal axes: source countries of flows, destination countries of flows, and industry sectors of flows. For this analysis, the SDC Platinum database was chosen for its comprehensive dataset, including hundreds of thousands of cross-border M&A transactions from 1985 up until the present date.

### Timeframe

In seeking to examine uphill flows of FDI, the years of greatest interest are evidently the most recent ones. While the major East Asian countries have had a significant presence as exporters of FDI for some time, only since the turn of the millennium have the four BRIC countries joined them in this regard, and only since 2002 have net FDI outflows for these four countries combined amounted to more than 2% of total world FDI flows. Major oil-exporting countries like Saudi Arabia, Mexico and the United Arab Emirates (UAE) have joined these ranks even more recently. The overall period chosen analysis for this study was thus that covering the years from 2001 to 2007 inclusive.

### Data Coverage

For the purpose of this analysis, only completed transactions where transaction value was disclosed and recorded, and where the stake acquired in the target company met or exceeded 10 percent were included. Accurate recording of transaction values is clearly

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<sup>9</sup> This appendix has been prepared by Janak Mayer.

essential to any calculation of flows, while stakes below 10% are considered too small to be classified as FDI under most definitions. Including only disclosed-value transactions eliminates a little over half the transactions recorded in the database, since many transactions are for unlisted companies, or for other reasons do not face strict disclosure requirements. The dataset resulting from these selection criteria includes some 37,963 deals, totaling \$8.4 trillion in value.

Comparison of the data set resulting from this selection with M&A data and total FDI data provided in aggregate form in UNCTAD's World Investment Report (WIR) demonstrates that the overall transaction coverage provided by the SDC Platinum database over this time period is strong. Only between 2000 and 2002 is the total value of M&A transactions reported in the SDC database below that reported in the WIR; in these years coverage remains above 80%, while in all the remaining years the SDC dataset captures a bigger total transaction volume than that reported by WIR.

Two weaknesses with regard to data coverage, however, must be acknowledged. Firstly, while the overall volume of transactions captured by the SDC-based dataset is higher than that reported by UNCTAD, for certain years and certain categories, the coverage is lower. Thus, while compared with UNCTAD, SDC data report higher M&A FDI inflows into OECD countries (see below for notes on country groupings) for all years except 2000-02, OECD outflow volumes reported are routinely lower than those reported by UNCTAD.

Secondly, comparing UNCTAD M&A data to UNCTAD total FDI data reveals some weaknesses with the methodology of using M&A FDI as a proxy for FDI more broadly. While for OECD countries M&A FDI represents on average 89% of total OECD FDI inflows over the chosen timeframe, and (curiously) more than 100% of FDI outflows, for the major emerging countries examined these proportions are far lower. UNCTAD M&A figures represent 23% of FDI inflows into, and 41% of outflows from these countries, suggesting that greenfield FDI accounts for the majority of FDI flows in both directions for these countries. It thus may be possible that the M&A dataset used under-represents south-south FDI in comparison to south-north, since transactions in the former category are more likely to occur in the form of greenfield FDI rather than as M&A.

## **Country Groupings and Data Overview**

OECD membership was the principal determinant used to distinguish between developed and emerging countries. Although Mexico and Korea are now both OECD members, for the purposes of this analysis both were included in the emerging countries grouping rather than the OECD grouping. Of the 30 signatory states to the OECD treaty, 28 were thus included as OECD countries in our study. Of the remaining 184 countries included in the SDC M&A dataset, 168 were included in the category "Non-OECD", while the remaining 16 were considered to be offshore financial centers (OFCs), and placed in a separate category. Of these offshore financial centers, Bermuda is by far the most significant, representing the destination of around 1% of M&A FDI outflows across the timeframe examined, commencing at a peak of at 3% in 2001 before falling away to become the destination of only 0.33% of outflows, on average, between 2002 and 2007.

Among the 168 Non-OECD countries, 11 were selected for more detailed analysis.

These 11 were:

- Four East Asian emerging markets: Singapore, Hong Kong, Malaysia and South Korea
- The four 'BRIC' countries: Brazil, Russia, India and China
- Three significant oil exporting countries: Saudi Arabia, the United Arab Emirates (UAE) and Mexico

Together, as exporters of M&A FDI, these 11 emerging countries represent 71% of all Non-OECD M&A outflows. Since, within this group of 11, the sub-groupings implied by the 3 bullet points above represent an intuitive and coherent way of distinguishing and comparing between countries with key shared characteristics, these groupings were used to represent data examining the nature of M&A FDI outflows by individual countries. Overall, the data reveal that the Non-OECD share of M&A FDI outflows have been growing dramatically over the course of the last six years, while the composition of Non-OECD outflows has also altered significantly over that time. While in 2001, Non-OECD countries accounted for only 7% of world M&A FDI outflows, by 2006 that had risen to 16%. Where in 2001 the East Asian nations accounted for an astonishing 64% of all Non-OECD outflows, by 2006 they accounted for only 17%. The BRIC nations had grown from 13 to 37% of the Non-OECD total over this time, while the oil exporters increased their share from 4 to 24% (see Chart 1D).