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India's specialisation in IT exports: Offshoring can't defy gravity

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India's specialisation in IT exports

Offshoring can't defy gravity

Indian exports are geared towards IT services. Around 16% of India's total exports are IT services and IT-based business services (average 2000-2003). This level of export specialisation is unrivalled by any comparable country and it is an indicator of a strong comparative advantage. This is surprising because exports of IT services are typically the premise of rich and technology-savvy countries. An educated workforce – which is abundant in rich countries but scarce in poor countries such as India – is the key resource.

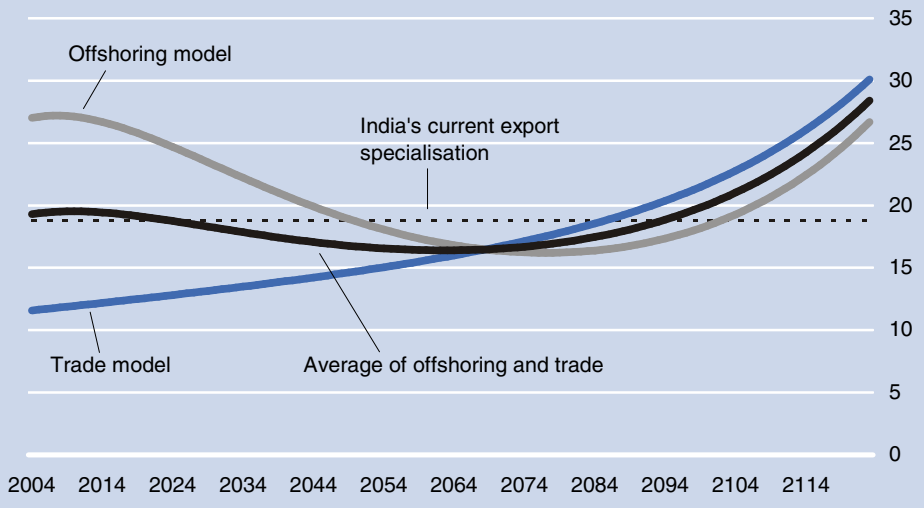
India owes its IT specialisation in part to its reliance on offshoring but also to a shift away from high-tech manufacturing exports. Offshoring offers a route for poor countries to expand their share of skill-intensive exports. This boosts India's export specialisation beyond the level that is predicted by its stage of development. However, the IT boom has also crowded out exports of other high-tech products, such as manufacturing.

Offshoring is a temporary phenomenon. As countries climb up the development ladder the very foundation of the offshoring model – namely low wages – erodes. The specialisation in skill-intensive exports may actually decline in the course of development until – at some point – it picks up again.

India's specialisation may be close to its peak: In one projection (see chart), India's export specialisation in skill-intensive products will be greatest by the year 2010 and regain this level only when GDP per capita will have reached USD 20,000 (c. 2100).

Thomas Meyer (thomas-d.meyer@db.com)

India's export specialisation may be close to its peak
Extrapolation of India's export specialisation in IT and high-tech, %



Source: Author's calculation

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India's specialisation in IT exports

Offshoring can't defy gravity

By Thomas Meyer*

1. Introduction

The success of India's IT industry is iconic. It is the perfect illustration of India's accelerating growth rates and has been a constant source of pride and confidence to the Indians. Indian programmers, software developers, IT consultants and providers of other business services are held in high acclaim worldwide.

According to estimates by the Indian National Association of Software and Service Companies (NASSCOM), a business association, the Indian IT sector – including IT services, IT-based business services and IT-related R&D – generated revenues of around $29.5bn in 2006. It employs around 1.3m people and grew at a rate of over 30% p.a. over the last few years (NASSCOM, 2007). As a consequence, the IT industry contributed around 0.5 to 1 pp to economic growth in India.

Exports are the primary sales channel for Indian IT services. Exports generated around 79% of software and services revenues in 2006 (NASSCOM, 2007). These exports are chiefly generated through IT offshoring, a business model where western companies relocate part of their IT services and the related IT-based business services (henceforth lumped together as IT services unless stated otherwise) to low-wage countries.

The degree of export specialisation is a commonly used indicator of a revealed comparative advantage (Balassa, 1965). By this account, India is one of the strongest contenders: Around 16% of all Indian exports are IT services. Only Israel and Cyprus have a stronger IT-services specialisation. The United States' export share is just 6%.

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What is unusual about this picture is that IT services are typically skill-intensive work: IT offshoring typically covers tasks in programming, software development, data processing, or customer services which draw on qualified personnel (see for instance Rajan, 2006). Most IT services need employees with an advanced education, fluency in English and probably a college degree. However, skilled workers are abundant in the US but scarce in India. In view of the resource endowment, one would expect the country's export specialisation being just the other way round.

The emergence of India as an offshore hub has sparked substantial excitement in the scholarly literature as well as in the political arena – in particular during the 2004 presidential elections in the US. The perceived loss of qualified IT jobs to offshore destinations has caused many to believe that the educated middle class in industrialised countries stands to lose from trade this time. Protectionist rhetoric has gained new traction. And IT may only be the beginning. Alan Blinder, for instance, reckons that between 22% and 29% of all US-American jobs are "offshoreable" in principle – i.e. they can be performed from a distance (Blinder, 2007). If offshore countries were to excel also in the production of a broad array of skill-intensive goods and services at the presently low wages, the very foundations of today's rich economies may be threatened and wages of the educated middle class may erode.

This paper looks at the economic fundamentals that may explain India's export specialisation. To this end, it examines cross-country evidence for a sample of 91 countries. It employs a simple empirical model which relates the extent of export specialisation in IT services and other high-technology products to a list of fundamental characteristics, such as the level of economic development and the supply of skilled workers. Despite its parsimonious setting, this model explains between 25% and 45% of the variation in the sample. A number of observations can be taken from this exercise:

1. The level of development is a driving force behind the export specialisation in IT services and other skill-intensive work such as high-tech manufacturing. Skill-intensive exports are basically the premise of rich countries which have the necessary resources.

2. Offshoring offers a route for poor countries to expand their share of skill-intensive exports beyond the level traditionally predicted by their stage of development. The necessary ingredients are a (relatively) well qualified workforce at low wages and the ability to communicate effectively with international clients – preferably in English.
3. India owes its export specialisation in IT services in part to its reliance on offshoring but also to a shift away from high-tech manufacturing exports – which are lower than expected.
4. Offshoring is a somewhat temporary phenomenon. As countries climb up the development ladder the very foundation of the offshoring model – namely low wages – erodes. The specialisation in skill-intensive exports may actually decline in the course of development until – at some point – it picks up again.
5. India's specialisation may be close to its peak: By one projection, India's export specialisation in skill-intensive products will be greatest by the year 2010 and regain this level only when GDP per capita will have reached $20,000 (c. 2100).

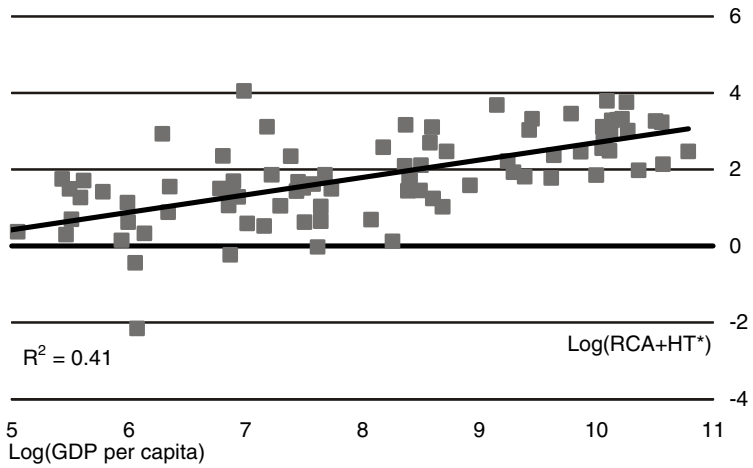
As it appears, offshoring cannot defy the shackles of economic fundamentals. Whilst there is legitimate concern in some industrialised countries that offshoring might cost jobs and prosperity, there is little evidence that poor countries could take over production of skill-intensive products on a large scale. Doing so would require a similar level of development. But then they would not be poor, low-wage countries anymore.

2. Offshoring: A new form of trade?

The fragmentation of production processes across borders is not an entirely new phenomenon. But advances in information and communication technology have accelerated this trend and enabled inroads into the services sector, which was mostly exempt from fragmentation in the past. The rise of the Indian IT offshoring industry over the last two decades is a vivid illustration.

Fig 1 | Skill-intensity rises with income

Income [Log(GDP per capita)] vs high-skill specialisation [Log(RCA+HT*)]



RCA: Exports of computer & information services and other business services in % of total exports
HT: Exports of high-technology manufacturing products, % of total exports

Sources: Author's calculation, based on IMF, World Bank, 2007

Whether offshoring has different implications than traditional trade is debated in the literature. Some authors discuss offshoring firmly based on the traditional trade literature (e.g. Bhagwati, 2004; Mankiw and Swagel; 2005, Meyer, 2007). Others see unique features that may or may not have different results from what traditional trade theory would say (see for instance Jones and Kierzkowski, 2000, Baldwin and Robert-Nicoud, 2007). Grossman and Rossi-Hansberg (2006b), for example, present a model of trade in tasks in which all domestic factors of production may gain from trade – as opposed to the classical Stolper-Samuelson result – because trade in tasks may effectively boost the productivity of the factor whose tasks become easier to move offshore.

By and large, the export specialisation in skill-intensive goods and services follows the resource endowment and thus confirms the general notion of traditional trade models à la Heckscher-Ohlin. As illustrated in figure 1, around 40% of the variation in the specialisation in skill-intensive exports can be explained by variations in GDP per capita. Rich countries have the necessary resources: an educated workforce, capable infrastructure, good institutions, and a high level of technology, in particular. Yet, the Indian experience and the empirical analyses of sections 3 and 4 suggest that there is also room for poorer countries to engage in skill-intensive exports.

A simple way to distinguish offshoring from traditional trade is to look at the technology used in production. Western firms which relocate certain tasks of their

production chain to low-wage countries may continue to use their own, more advanced technology in the offshore country. By paying the local wage (and local overheads) but using the advanced technology of their home country, relocating firms can pocket the difference between the workers' marginal product and labour costs. Offshoring typically entails additional transaction and communication costs, if only because a remote production facility has to be managed from a distance, and these costs have to be deducted from this difference. Obviously, offshoring only pays when lower wages outweigh the additional transaction and communication costs (see Baldwin and Robert-Nicoud, 2007).

This form of technology transfer may explain why some poor countries excel in high-skilled exports although their resource endowment suggests otherwise. Offshore facilities offer attractive employment opportunities for educated people and typically produce skill-intensive intermediate goods or service tasks to parent firms in rich countries.

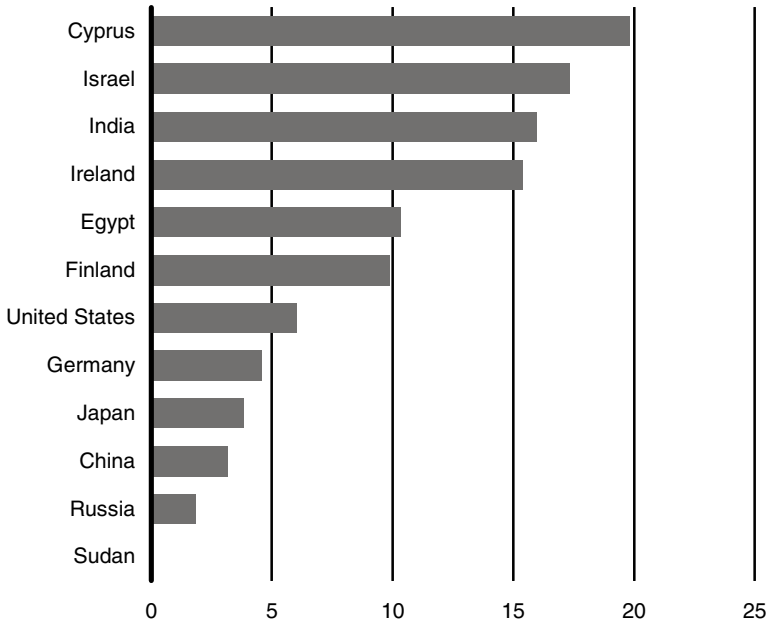
Baldwin and Robert-Nicoud (2007) call this "shadow migration" because offshoring has the same effect as if workers from poor countries were to work in rich countries' facilities at their home countries' wages. But that may be an exaggeration. Firms can only transfer firm-specific technology such as machines, work routines or management techniques but not broader, country-specific amenities such as good institutions or social capital. This limits the extent to which skill-intensive production can spread in poor countries. In fact, the differences in country-specific technology are an important reason for the wage differences and thus necessary to make the offshoring model possible in the first place.

3. How special is India's IT specialisation?

India's prominence as an offshore production hub for IT services is well visible: On average between 2000 and 2003, around 16% of India's total exports were *computer and information services* and *other business services*. Both balance-of-payments positions are being used frequently in the literature to describe the business of offshoring (see for instance Amiti and Wei, 2004). Yet, both positions are only imperfect proxies. *Computer and information services* cover tasks such as data

processing, hardware consultancy, software implementation but also news-related services. With the exception of the latter, most of these components appear to be a fair representation of IT services. *Other business services* is a residual category which covers those business services that are not allocated to other categories. While many IT-based business services that are commonly considered to be part of offshoring are included here, such as call-centre operations and other back-office tasks, there are also potentially many services outside the realms of IT-based offshoring included here. Hence, a high figure for *other business services* may overstate the actual amount of IT-based business processes. Still, both balance-of-payments positions include valuable information on the respective industry and should therefore be included in the analysis.

Fig 2 | India reveals a comparative advantage for IT
Share of exports of computer and information services and other business services in a country's total exports, average 2000-2005 (or latest) [%]



Sources: Author's calculation based on IMF, 2007

At 16%, India's exports of IT services account for a very high share of India's total exports. Only Cyprus and Israel command a higher share. Ireland is only just behind India's level. Yet, none of the big industrial and technologically savvy countries such as the US, Germany or Japan have an export share that is nearly as high. China's export share is only 3.2%. The bottom of this list is occupied by poor African states such as Sudan and Kenya.

Table 1 | Top-5: IT and IT-based business services exports
2005 or latest

	Exports of computer and information services and other business services, USD m	Of which are computer and information services, %
Cyprus	1,719	12.5
Israel	10,056	45.0
India	13,967	81.4
Ireland	31,728	58.8
Egypt	1,574	1.6

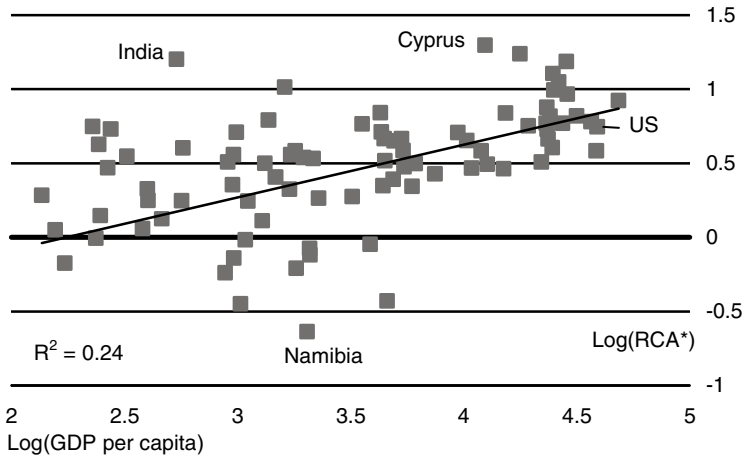
Source: Author's calculation based on IMF, 2007

At first glance, India's specialisation appears strong but not exceptional. After all, other countries have a similar or even higher export share. But the other countries with a pronounced export specialisation in IT services – say, those with an export share above 10% – differ in some aspects from India. Israel and Ireland are small high-income economies with a highly educated workforce. Hence, the resource endowment is much better suited for the production of more sophisticated services. Ireland in particular is a well known global offshore (some call it nearshore) centre and many firms have relocated part of their IT and business processes there. Cyprus and Egypt, on the other hand, have a lower level of GDP per capita than either Israel or Ireland and the level of tertiary education is also worse. However, their specialisation is largely based on exports of *other business services* while *computer and information services* are only a small fraction of IT services exports (see table 1). As noted above, it is quite likely that *other business services* capture more than just IT-based services. Hence, the export shares of Cyprus and Egypt may be inflated by non-IT services.

Standard trade theory suggests that in particular rich countries with a highly educated workforce should have a comparative advantage in IT services. This impression is supported by looking at the export share of IT services in relation to GDP per capita. The export share of IT services is estimated by the share of *computer and information services* and *other business services* in a country's total exports (average 2000 to 2005, or latest). The variable is named RCA. Figure 3 illustrates the positive relation between wealth and specialisation in IT services.

Fig 3| Rich countries export IT services

Income [Log(GDP per capita)] vs IT specialisation [Log(RCA*)]



*RCA: Exports of computer & information services and other business services in % of total exports

Sources: Author's calculation, based on IMF, World Bank, 2007

In order to obtain a slightly more systematic impression, we estimated a simple empirical model. The dependent variable is RCA. Our line-up of explaining variables consists of (i) GDP per capita (GDP), (ii) the share of students in tertiary education (EDUC), (iii) a dummy variable if a country has English as an official language (ENGL), and (iv) the number of internet users per 1,000 people (INTER).[1] All of them have a supposedly positive impact on the production of IT services. Most IT and IT-based business services need a qualified workforce. The Indian IT business association NASSCOM, for instance, boasts the quality of its knowledge professionals as one of the key advantages. By the same token, the main users of offshoring are located in Anglo-Saxon countries (Meyer, 2006). Therefore, low-wage countries with an English speaking populace should have an edge because communication is easier and some services – e.g. call centres – could not be possibly relocated otherwise. The degree of internet penetration captures additionally the affinity towards technology.

Low-cost offshore destinations combine high-skill workers with low wages. So the combination between high education and low GDP per capita may hold additional explanatory power. For a relocating company, the degree of education at a certain

[1] Data on exports of computer and information services and other business services are from the IMF's Balance of Payment Statistics. High-technology manufacturing exports, GDP per capita (in 2000 USD), the share of students in tertiary education (% of the respective age cohort), number of internet users per 1,000 people are from the World Development Indicators (WDI) database. The dummy for English as an official language is from CEPII.

wage rate in the target country is arguably more important than the level of education per se. Since GDP per capita correlates strongly with wages, a high value of EDUC in relation to GDP should indicate the prevalence of an educated but affordable workforce which in turn should boost offshoring. However, the variable EDUC per GDP has proven to be statistically insignificant. One reason for this result may be that many countries with a socialist tradition – e.g. those formerly belonging to the Soviet bloc – boast high tertiary education but are often quite poor at the same time. Moldova, for instance has a GDP per capita of around $400 (figures for 2004 in prices of 2000) but nearly 32% of the people in the respective age cohort are enrolled in tertiary education. India's GDP per capita is $540 but only 11.5% are enrolled in tertiary education. Yet, no country of the former Soviet bloc has developed a particular export specialisation in IT services. True, many Eastern European countries have jumped on the offshoring train but their export structure remains less focused (see Meyer, 2006). As it appears, it takes more than skilled workers at affordable prices to leverage the potential of offshoring. One additional necessary condition may be the ability to communicate in English. Shifting certain tasks of the production chain to low-wage countries is only efficient if the cost differential is not foiled by excessively high transaction costs (see, for instance Baldwin and Robert-Nicoud, 2007). Speaking a different language than the sponsor would certainly boost transaction costs. Hence, we combine the variable EDUC per GDP with a dummy for English as official language – i.e. we put the following interaction term into the equation: $\frac{EDUC}{GDP} ENGL$. This interaction term produces a positive value only for countries where English is an official language. Otherwise it is zero. Hence, a high value for this interaction term indicates that English is spoken, and that tertiary education is widespread in relation to GDP. A combination of high education and moderate wages should attract international sponsors. The corresponding models are given by:

$$\text{Trade(a)}: RCA = c + \beta_1 GDP + \beta_2 EDUC + \beta_3 ENGL + \beta_4 INTER + u$$

$$\text{Offshoring(a)}: RCA = c + \beta_1 GDP + \beta_2 EDUC + \beta_4 INTER + \beta_5 \frac{EDUC}{GDP} ENGL + u$$

For the sake of this analysis, the full model without the interaction term will be referred to as the "trade" model because it follows the more standard trade theory.

"Offshoring" denotes the model with the interaction term because it explicitly allows for poor countries to make inroads into skill-intensive exports via, well, offshoring.

The results of this exercise are described in table 2. As it appears, all variables correlate individually with RCA positively and significantly. Yet, in the full "trade(a)" model, only GDP per capita retains explanatory power. That is not too surprising because of multicollinearity. Countries tend to improve education and internet penetration as they get richer.

Table 2 | Dependent variable: RCA – share of exports of computer and information services and other business services in a country's total exports, average 2000-2005 (or latest) [%]
Method: OLS

	Ia	IIa	IIIa	IVa	Trade(a)	Offshoring(a)
c	2.94	3.136	3.95	2.820	2.675	2.568
GDP	0.00161***				0.00015***	0.00015***
	(3.17E-05)				(5.29E-05)	(5.23E-05)
EDUC		0.0377***			0.00125	
		(0.0152)			(0.0201)	
ENGL			1.954**		1.051	
			(0.932)		(0.937)	
INTER				0.00657***	0.00045	0.000991
				(0.0016)	(0.003)	(0.0025)
$\frac{EDUC}{GDP}$ ENGL						145.62*
						(0.0025)
R^2	23.2%	6.6%	4.7%	16.9%	24.6%	25.7%
N	90	90	91	89	87	87

Standard errors are in parentheses. Asterisks denote statistical significance at ***1%; **5% and *10% levels.
Data sources: CEPII, IMF, WDI

The interaction term in the offshoring model turns out to be statistically significant together with GDP. This suggests that rich countries are in principle better suited to specialise in exports of IT services but that there is also room for low-wage offshore destinations. GDP has a twofold effect on export specialisation. Firstly, it indicates the level of economic development. Since IT services are skill-intensive products, richer countries are typically better suited to export them – as evidenced by the positive correlation between RCA and GDP. However, a low GDP per capita does translate into low wages. This attracts international clients seeking a low-cost destination, given that educated workers are available (even if not as abundant as in

rich countries) and communication works well. Under these conditions, even poor countries can develop an export specialisation in IT services as shown by the positive

Table 3 | India's actual share of IT exports exceeds fitted values

	***actual* export share (%)**	**actual/fitted** Trade(a)	**actual/fitted** Offshoring(a)
India	15.95	3.9	2.8
China	3.16	1.0	1.1
UK	11.16	1.3	1.5
Ireland	15.40	1.8	2.1
Israel	17.35	2.4	2.8

IT: Computer and information services plus other business services

Source: Author's calculation

correlation between RCA and the interaction term. While many other potential influences have been ignored here, even these parsimonious models explain about a quarter of the variation in RCA.

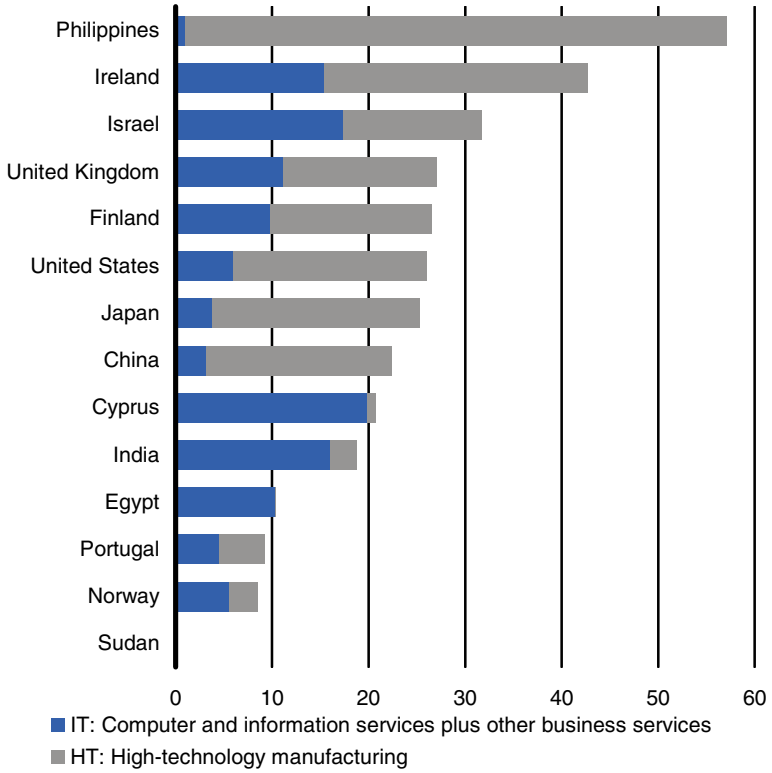
Using the results of the trade(a) and offshoring(a) models, it is possible to estimate the export share of IT services based on the selected fundamentals. A comparison between this predicted export share and the actual export share is an indication of how exceptional India's or any other country's position is in fact. As it turns out, India's average export share over 2000-2003 exceeds the predicted value by a factor 3.9 (trade[a]) respectively factor 2.8 (offshoring[a]).

In the trade(a) model, no other country has a higher multiple. Cyprus and Egypt come close, but for reasons explained above. The export shares of Israel and Ireland – at a level similar to India's – appear more in line with fundamentals. Their multiples are between 1.8 and 2.4 (see table 3). In the offshoring(a) model, India's export share appears less exceptional. India's multiple is on par with that of Israel, and Ireland follows closely. Cyprus and Egypt even have much higher multiples – but again, they are arguably driven by non-IT exports. Yet, bear in mind, that India is the only big country with a high multiple. Small countries are much more likely to be specialised in some sectors – simply because they are too small to achieve an efficient sector scale in many sectors. Therefore, it is to be expected that for any given sector, there are

some small countries that are specialised in it. In our case, they happen to be Israel and Ireland.

4. India has a bias towards IT not high-tech

Fig 4 | India not a high-tech star
Share of IT and HT exports in a country's total exports, average 2000-2005 (or latest) [%]



Sources: Author's calculation based on IMF and WDI, 2007

India's prominent position as an offshore hub for IT and IT-based business services does not translate into a general specialisation in sophisticated products. In fact, India's share of high-technology manufacturing exports is markedly below that of other countries. Only 2.8% of all exports are classified as high-technology. Such exports include products with a high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. A share of 2.8% is not small compared with other countries at a similar level of economic development, but it pales in comparison to the more advanced regions. The US, for instance, commands an export share of around 20%. China's export share of high-technology product exceeds 19%, the Philippine's share even 56%. The latter two countries' shares may be inflated by exports that are still classified as high-technology but have moved down-market in the meantime. Certain electronic components for instance

have become a commodity over the last few years, though they may be counted as high-tech nevertheless.

Table 4 | Dependent variable: RCA+HT – share of exports of computer and information services and other business services plus high-tech exports in a country's total exports, average 2000-2005 (or latest) [%]
Method: OLS

	Ib	IIb	IIIb	IVb	Trade(b)	Offshoring(b)
c	6.387	5.006	8.281	4.776	3.404	3.009
GDP	0.00049***				0.00023	0.00027**
	(9.42E-05)				(0.00014)	(0.00013)
EDUC		0.1498***			0.0401	
		(0.0424)			(0.0571)	
ENGL			10.40***		7.273***	
			(2.646)		(2.581)	
INTER				0.0240***	0.0081	0.0141**
				(0.0044)	(0.0084)	(0.0063)
$\frac{EDUC}{GDP}$ ENGL						1091.93***
						(216.02)
R^2	24.7%	12.9%	15.2%	26.3%	33.7%	44.8%
N	84	86	88	86	83	83

Standard errors are in parentheses. Asterisks denote statistical significance at ***1%; **5% and *10% levels. Data sources: CEPII, IMF, WDI

High-technology manufacturing products may draw on a similar set of resources as IT and IT-based business services, in particular a skilled workforce at affordable wages. Hence, a lower share of high-technology exports may just be the consequence of a higher share of IT services exports because domestic resources may have been allocated towards the latter. Combining both exports thus gives a more complete picture (see figure 4): India loses its exceptional position but it is still a strong contender with regard to sophisticated services and products. However, other countries, in particular if they are rich and technologically savvy, are typically more specialised in such exports which corresponds to standard trade theory.

We use the same empirical analysis as above but with the sum of the shares of high-technology manufacturing and IT services exports as dependant variable – named RCA+HT. The results of this exercise are given in table 4. As in the previous analysis, each of the explaining variables – i.e. GDP per capita, tertiary education, a

dummy for English as an official language, and internet penetration – correlate positively and significantly with RCA+HT. In all specifications, the R^2 is higher than in the original setting which suggests that the selected fundamentals are better suited to explain the general tendency to produce sophisticated products and services than just IT services. Close to 45% of the variation in RCA+HT can be explained by the offshoring(b) model.

However, the results also produce a rather remarkable result. The dummy variable ENGL turns out to exert a huge influence. A country with English as an official language appears to have a higher share of RCA+HT of between 7.3 (trade[b]) and 10.4 (model IIIb) percentage points – all other things being equal. By the same token, the interaction term $\frac{EDUC}{GDP} ENGL$ in the offshoring(b) model also has a huge coefficient.[2]

In the first set of models, ENGL exerts are smaller influence on RCA, even if one takes into account that RCA has a mean of 4.4% whereas the mean of RCA+HT is 10.4%. The different impact is puzzling because it is the IT-service sector which should benefit most from a common language. English is the lingua franca for IT professionals and most relocating companies are based in English-speaking countries. Yet, the results from this estimation suggest that the prevalence of the English language also boosts exports of other high-technology products.

Table 5 | India's actual share of IT and HT exports within the range of fitted values

	***actual* export share (%)**	**actual/fitted** Trade(b)	**actual/fitted** Offshoring(b)
India	18.8	1.6	0.7
China	22.4	4.6	5.1
UK	27.1	1.1	1.3
Ireland	42.7	2.0	2.6
Israel	31.7	1.5	1.8

IT: Computer and information services plus other business services
HT: High-technology manufacturing

Source: Author's calculation

[2] The sample contains 21 countries with English as an official language which span from the UK to India, Hong Kong, Malta, Namibia or Eritrea. Colonial origin and the introduction of Anglo-Saxon-style institutions may play a role, but the strong position of ENGL remains even if the quality of institutions is controlled – e.g., by including the International Country Risk Guide (ICRG) composite indicator as an additional explaining variable.

India's actual export share of IT services plus high-technology manufacturing products is well within the range of fitted values: the multiples of actual vs fitted values are between 0.7 (offshoring[b]) and 1.6 (trade[b]). Ireland and Israel have higher multiples (see table 5). Also, China's actual export share is between 4.6 and 5.1-times higher than predicted by the models – but again that may be partly due to a excessively generous classification of high-technology.

Table 6 | Better estimates with RCA+HT
Dependent variable is RCA or RCA+HT

	RCA	RCA+HT
India's multiples (actual/fitted)	**2.8 – 3.9**	**0.7 – 1.6**
R^2	25 – 26%	34 – 45%

Source: Author's calculation

Combining the export shares of IT services with high-technology manufacturing nearly doubles the explanatory power of the models and provides estimates for India which are much closer to the actual numbers (see table 6).

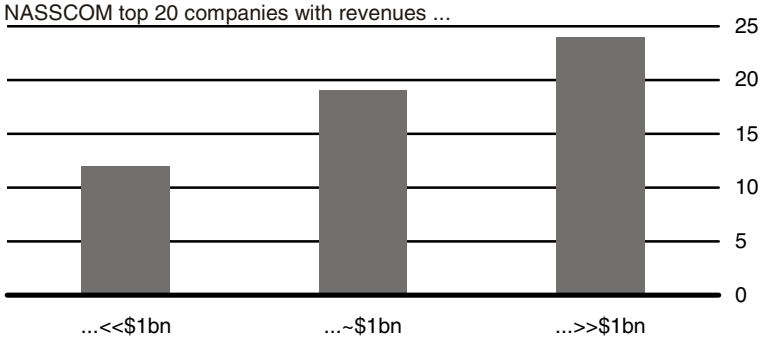
The reasons for the bias towards IT services and away from high-tech manufacturing exports are difficult to unbundle and deep analysis is beyond the scope of this paper. Yet, two factors appear to have contributed: firstly, a discriminating economic policy and, secondly, rising economies of scale. Trade barriers and red tape help to explain the somewhat low overall volume of trade in India.[3] Yet, many activities in the IT sector, in particular those in the offshoring business, are freed from such restrictions. These privileges include for instance the creation of Software Technology Parks (STP), tax breaks for IT firms, and the permission of full ownership of local firms by foreigners (WTO, 2005). The latter is particularly relevant for a certain offshoring model which requires that the provider is fully or mainly owned by the relocating company. This model is often referred to as *captive* offshoring, and is often chosen when critical tasks or sensitive data are being involved. India's former minister for telecommunications, Pramod Mahajon, once quipped that India is a leader in "IT and beauty contests, the two areas that the government has stayed out" (Kapur 2002: 94). As a consequence, the IT sector has benefited from a mixture of benign neglect first and outright government support after the initial success became apparent.

[3] See Neuhaus (2005) for a discussion on the different measures of openness.

The Indian IT offshore sector shows evidence of rising economies of scale. The top-3 Indian providers with revenues in excess of $1bn have grown by around 40% (in terms of revenues) on average in the financial year 2006 compared to around 20% growth in the rest of the top-20. Also, the big ones are more profitable. Profit margins increased from 12% for smaller Indian offshore providers (revenues less than $1bn), to 19% for medium-sized firms (revenues around $1bn) to 24% for the top-3 (see figure 5). This gravitation towards the big players suggests the presence of rising economies of scale.

Fig 5| Big firm, big profit

Profits for the quarter ending Dec 2006, % of revenues



Source: Apte et al., 2007

Top-tier firms have a couple of advantages in the offshoring business. They can bundle tasks and smooth out peaks in demand. They are also finding it easier to relocate part of their work to other low-wage countries such as China or Vietnam. Besides multinationals, they are often the first choice for talented employees. Since people are the key resource in a skill-intensive business, this gives them an important edge over smaller competitors. Moreover, a big size allows to serve a dispersed client base without losing efficiency on the way – something smaller firms have struggled with (see Apte, 2007). The arguably biggest advantage of size is reputation. While many tasks are scaleable and many smaller firms could leverage efficiency by specialising in certain business fields, the appreciation as an acclaimed and reliable provider is a strong selling point vis-à-vis clients. Typical offshore contracts span over multiple years and switching to a different provider is often costly. Therefore many clients prefer a provider whose sustainability and quality of execution are indisputable.

Table 7 | Serial growth accelerations in India
Average growth in real GDP per capita p.a., %

	China	India	Asia	USA	World
1965 - 1974	3.5	0.8	3.7	2.2	2.7
1974 - 1984	6.6	2.3	5.4	2.0	1.2
1984 - 1994	8.8	3.4	7.1	1.9	1.4
1994 - 2004	8.2	4.4	6.4	2.2	1.7
1965 - 2004	**6.8**	**2.8**	**5.7**	**2.1**	**1.7**
2006 - 2020*	4.4	3.9	n.a.	2.0	n.a.

Sources: Author's calculation, WDI, 2007; *Bergheim (2005)

5. India may be close to its offshoring peak

The level of development appears to have two and for poor countries opposing effects on export specialisation. Firstly, there is a generally positive relation between the share of skill-intensive exports and GDP per capita. Richer countries typically have the necessary resource endowments – an educated workforce, good institutions, capable infrastructure – to boast a comparative advantage in skill-intensive goods and services. However, low GDP per capita translates into low wages. This attracts international clients seeking a low-cost destination, given that educated workers are available (even if not as abundant as in rich countries) and communication works well. Under these conditions, even poor countries can develop a specialisation in skill-intensive exports.

Yet, you can't get rich by staying poor. In the course of development, incomes and eventually wages will rise, putting the offshoring model under pressure. In contrast to the traditional trade model, offshoring may result in a declining export specialisation in skill-intensive products as countries get richer until – at some point – it picks up again.

To illustrate the point, consider the case of India. Table 5 describes the empirical relation between the export specialisation and economic fundamentals. Using these relations, it is possible to extrapolate what may happen as India gets richer.

India is still a poor country – classified as low income by the World Bank. Yet, real growth rates of GDP per capita have been rising constantly. In the mid-60s, the average Indian produced less than $200 compared with more than $500 in 2004 (in prices of 2000). The average per capita growth rate between 1965 and 2004 of 2.8% may be less than the Asian average (5.7%) or China's (6.8%) but it exceeds for instance that of the US (2.1%) as well as global growth (1.7%). Going forward, India's growth rate is projected to stay high in the foreseeable future – at a rate of 3.9% it is only just behind China's 4.4% (see table 7). The extrapolation in this section uses a future growth rate of 3.9% p.a.

How will the share of students enrolled in tertiary education (EDUC) and the internet diffusion (INTER) evolve as India gets richer? Both variables are highly correlated with GDP per capita as shown in table 8.

Table 8 |
Method: OLS

Dependent variable:	**EDUC**	**INTER**
C	-61.32	-748.32
Log GDP	12.06*** (1.134)	124.08*** (8.149)
R^2	57.4%	73.2%
N	86	87

Standard errors are in parentheses. Asterisks denote statistical significance at ***1%; **5% and *10% levels. Data sources: WDI

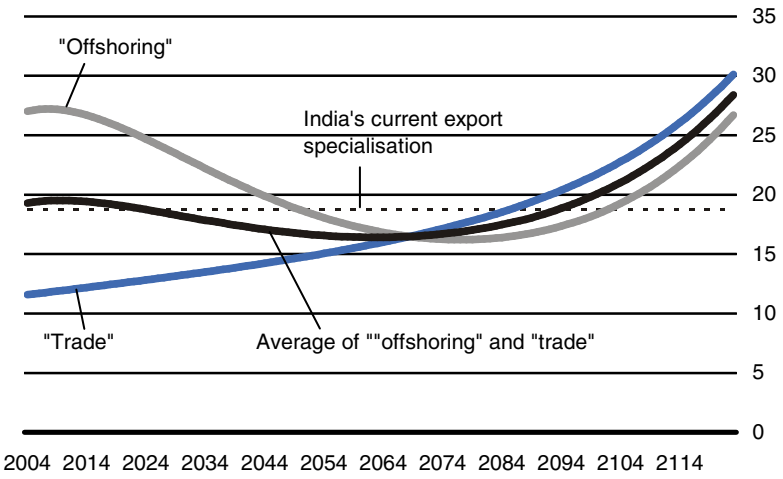
Using the coefficients in table 8 allows projecting the rise in education and internet adoption in the course of development based on cross-country averages. We have adjusted both constants slightly – using -64.33 (instead of -61.32) for education and -747.82 (instead of 748.32) for internet diffusion – in order to get starting values that match India's exactly.

With projections on GDP per capita, education and internet diffusion, it is possible to estimate India's share of skill-intensive exports over time (see figure 6). The traditional "trade" model shows the typical monotonously upward sloping evolution. The "offshoring" model shows a more twisted development. According to the "offshoring" extrapolation, the export specialisation rises at a quite early stage of

development, then declines and then rises again broadly in line with the traditional “trade” model. The “offshoring” model predicts a higher, the traditional “trade” model a lower export specialisation than India actually has. Interestingly, a simple average of both models delivers a prediction (19.3%) that is quite close to the actual share of 18.8%.

As it appears, India may still be in a period of growing specialisation in skill-intensive exports. Growth in education more than compensates rising GDP per capita which makes relocations more attractive. But that may be about to change. The turning point of the pure “offshoring” extrapolation is already 2007, that of the average extrapolation is 2010. Beyond these turning points, the rise in GDP per capita more than outweighs the gains in education and high-skill specialisation declines. This decline continues far into this century with a low point of 16.4% around the year 2060 for the average extrapolation. At that time, India will boast GDP per capita of around $5,100 (in prices of 2000) and close to 39% of the respective age cohort will be enrolled in tertiary education. Going forward, the share of skill-intensive exports will rise again, but it will take until the year 2100 for export specialisation to reach a similar level as in 2010. The average Indian will then produce close to $20,000 and student enrolment will reach 55%.

Fig 6| Dip ahead
Extrapolation of India's export specialisation in IT and high-tech, %



Source: Author's calculation

The exercise in figure 6 illustrates the typical u-shape in the relation between the specialisation in skill-intensive exports and the level of development within the "offshoring" model. It shows that the revealed comparative advantage in the production of skill-intensive products that some poor countries enjoy is a rather temporary phenomenon. This puts the current excitement and alarm over the rise of offshoring into perspective. After all, the basic notion that rich and technologically savvy countries have a comparative advantage in the production of skill-intensive products is unaffected by the "offshoring" model. What is more, the comparative advantage currently enjoyed by offshore destinations such as India should not be extrapolated linearly into the future. Rather a dip and convergence to the traditional "trade" model is more likely.

Note, however, that although the "offshoring" model does not lend support to the idea of an ever growing comparative advantage in skill-intensive products for poor countries it doesn't predict a collapse either. The export specialisation predicted by the "offshoring" model – and therefore necessarily also by the average model – stays well above the traditional "trade" model until far into this century despite its declining relative weight. Moreover, there is little reason to expect a decline in skill-intensive exports in absolute terms. The shift in the relative weights appears relatively minor compared with the overall export growth. All this points to a more balanced view: Offshoring – as described in this analysis – allows some poor countries to develop an export specialisation in skill-intensive products which they would not enjoy otherwise. But neither does offshoring overthrow the traditional economic pecking order nor is it an over-hyped business model that is going to fade away anytime soon.

A word of caution is in order here. The extrapolation in figure 6 serves as an illustration but it is not a forecast. Changes in technology which boost or curb transaction costs, for instance, may reshape the path of the "offshoring" model. The same goes for policy changes. Also, the gains in education and internet diffusion in the course of development are based on contemporary cross-country evidence (see table 8) which may or may not be appropriate for India in the future. However, the fundamental structural relation – the u-shape – is robust to a variety of different specifications.

6. Conclusions

The rise of India's IT industry is obvious. Its success draws on India's supply of well-educated, English-speaking and affordable workers. But these fundamentals explain only part of the story – as illustrated by our simple empirical analysis. India's actual export specialisation in IT services exceeds the fitted values of the empirical "trade" model by a factor 4. No other country has a higher multiple; only Israel and Ireland come close. This paper argues that two factors contribute to this specialisation: Firstly, India makes extensive use of the offshoring model by which western firms relocate part of their production to low-wage countries. Offshore production facilities typically combine local talents at local wages with the advanced technology of the parent company. They often use this combination to produce and export skill-intensive goods and services back home. As a consequence, the skill-intensity of exports may be upwardly biased in the presence of offshoring compared to the intensity suggested by the level of development. However, the actual/fitted multiple declines only to 2.8 if the empirical estimation addresses offshoring more directly. This suggests that the presence of offshoring is not sufficient to explain India's export specialisation in IT services.

A second observation is that the specialisation in IT services comes – at least partly – at the expense of other high-tech manufacturing exports. The actual/fitted multiple declines to values between 0.7 ("offshoring") and 1.6 ("trade") if high-tech manufacturing exports are included because India exports relatively little of them. Moreover, the explanatory power of the estimation rises when high-tech manufacturing exports are being included: the R^2 rises from around 25% to between 34 and 45%. IT services and high-manufacturing exports appear to draw on a similar set of economic fundamentals – a well educated workforce, in particular – and a bias towards one seems to crowd out the other.

Obviously, there is no magic behind India's IT specialisation. This should lend comfort to those who feel threatened by the rise of offshoring and the progress some poor countries have made in exporting skill-intensive products. In the long run, the level of development is the leading driver behind a comparative advantage in the production of skill-intensive products. Offshoring allows a country to export more skill-

intensively at an early stage of development – provided that transaction costs are sufficiently low – but this model draws on low wages in the first place. Yet, wages tend to rise as countries climb up the development ladder. This crowds out the very foundation of the offshoring model and results in a declining export specialisation for intermediate stages of development. The example of India, detailed in section 4, illustrates this u-shaped evolution: India's specialisation in skill-intensive exports may reach a peak between 2007 and 2010 and decline afterwards. It may take until the year 2063 for specialisation to rise again and until the end of this century for the current level to be reached again (see section 5 for assumptions and qualifications). While this should not be seen as a forecast, it serves to illustrate the ups and downs in the evolution of export specialisation.

The success of India's IT industry has additional effects that are not easily measured in economic terms. It is a constant source of pride and confidence to the Indian economy and has contributed to the growing perception of India as an economic powerhouse. This has a great marketing effect for Indian products and companies.

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