

**Determining Comparative Advantage in Services Outsourcing: The
Human Capital Edge
(Preliminary draft)**

**Shailey Dash
Fellow, Economics
Institute of Integrated Learning and Management
3, Lodhi Institutional Area
New Delhi -110003
India
Tel. No. : 9350837459
Email: shaileydash@gmail.com
Shalley.dash@iilm.edu**

Abstract

International outsourcing of services has come to occupy an increasingly important part of international trade. Analytically services outsourcing is the export of services by a country to the outsourcing nation. Given this, the pattern of trade in these services would be decided in line with country specific comparative advantage equations. Since services are typically intensive in skilled labour and educated manpower, what matters for a country's comparative advantage in services is its resource base in terms of skilled and educated manpower. This is a cross country study which uses the intuitive logic of the Hecksher Ohlin model to determine comparative advantage for a sample of developed countries such as the US, that essentially constitute outsourcers, and developing nations such as India and China that carryout outsourcing . Different definitions of human capital are compared to identify comparative advantage. A key conclusions is that for services outsourcing, the definition of human capital needs to be restricted to secondary and particularly tertiary students rather than literacy. This is further validated by the significance of size of tertiary students in cross country equations estimating business service exports. Secondly, what matters for comparative advantage is the absolute size of the human capital base rather than in percentage terms.

Key words: Services Outsourcing, Comparative Advantage, Hecksher Ohlin, Cross Country Study

JEL codes: F11, F16, F14

I. INTRODUCTION

The advent of the internet and the revolution in telecommunications technology revolution has lead to a paradigm shift in the way in which business is carried out the world over and has lead to the increasing importance of services outsourcing in world trade. A key feature of services outsourcing is that it leverages on international differences in wages and as a result many developing economies, most notably India, have become leaders in this segment. Internationally services outsourcing is a huge and growing market and many other nations both developing and developed are eager to get a share of this pie. One of the key features of the services being outsourced is their labour intensive nature; hence future prospects in this industry critically hinge on international differences in labour costs. This paper is an empirical study that analyzes the cross country configuration of human capital for India and its major competitor nations in the area of services outsourcing. To identify causal factors cross country regressions with business services as the dependent variable are estimated. A key hypothesis of this paper is that there is a positive relationship between the human capital base of a country and services exports.

Services outsourcing can be regarded as imports of services by a developed country for example the US.¹ International outsourcing of services can be analyzed most simply and intuitively by the Hecksher Ohlin (HO) model of factor abundance, where a country has a comparative advantage in the production of products that use its abundant factor more intensively. Innovations in technology, the advent of the internet and dramatic reductions in the costs of telecommunications have combined to make many hitherto nontraded services such as telephonic after sales service into tradables. Also since most outsourced services are highly skilled labour intensive what matters for a country's comparative advantage in services is its resource base in terms of skilled and educated manpower or human capital.

At the macro level most of the work on human capital has focused on the relationship between human capital and growth. However the link between human capital accumulation and growth though intuitively appealing has not been satisfactorily validated through cross-country studies. The link between human capital base and services outsourcing, however has not been explored much and theoretically there appears to be no clear link between models relating human capital and growth to services outsourcing. It is the objective of this paper to explore empirically the relationship between services outsourcing and human capital. The approach owes a little to the standard growth and human capital literature, particularly the cross country

¹ It is not necessary that services outsourcing occurs only as a flow from developed to developing nations. In fact there is a sizable flow of services imports by developing from developed countries such as the US.

empirical approach . On the other hand the relationship between services outsourcing and human capital is based more on comparative advantage and factor proportions.

One of the key finding of this paper is that the human capital edge of a country is determined by the absolute numbers of skilled labour rather than proportions. Though both India and China perform poorly in terms of proportion of population educated to the tertiary level, the sheer weight of numbers is such that these nations are second only to the US in terms of size of skilled labour force. Secondly many nations, such as Ireland and even some of the Eastern Bloc nations, which appear to represent competition to India in the area of services outsourcing really have too small a human capital base to represent any significant threat in the medium term. Results of the cross country pattern of business service exports suggests that the size of the tertiary educated labour force is an important variable determining services exports. Interestingly the equations also show that services exports are associated with high levels of service imports, i.e., possibly there is strong intra industry trade in the services industry. This result is very much in line with results of other studies (For example see Amiti and Wei(2004)).

The layout of this paper is as follows: Section II briefly provides an intuitive analysis of analysis of outsourcing within the Hecksher Ohlin model. Section III examines the relationship between human capital and services outsourcing including theoretical and empirical issues in the definition and measurement of human capital. Section IV examines various indicators of human capital for the countries being considered to determine sources of comparative advantage. Section V sets up cross country regression

equations to identify causal factors determining services outsourcing. Section VI wraps up with some conclusions and policy implications

II. APPLICATION OF THE SIMPLE HO MODEL TO SERVICES OUTSOURCING

. The Hecksher Ohlin (HO) model of international trade, though simplistic, provides an organic analysis of trade flows between nations, particularly the direction of flow. Crucial to determining the direction of trade flows, i.e., which country exports what products, is the definition of factor abundance. The classic version of the HO model with highly restrictive assumptions, posited a two factor world, usually capital and labour. Typically the West or North, as it's sometimes known, comprises countries that are essentially capital abundant. The South or, the developing world, comprises countries that are capital deficient and labour abundant. Trade patterns would consist of the flow of goods intensive in capital being exported from the West in return for goods intensive in labour.

The Hecksher Ohlin model stresses on physical capital as being the major source of productivity, particularly in the West. The US, for example, was earlier characterized as a country rich in physical capital. However US imports were found to be more intensive in capital than exports – a phenomenon termed the Leontief Paradox .² One of the explanations for the Leontief Paradox was that the empirical analysis had ignored human

² For details see Leontief, Wassily, “ Domestic Production and Foreign Trade: The American Capital Position Reexamined, “ *Proceedings of the American philosophical Society* 97, September 1953

capital. The US is now characterized as being rich in both physical and human capital; hence it would be expected to have a comparative advantage in goods that embody scientific knowhow and physical capital. These would include high-end services, advanced computer software, defence equipment. India, on the other hand, has been characterized as a capital scarce, labour abundant economy. The HO model predicts that the US would export high end services and import cheap labour intensive manufactured goods from India such as textiles. This pattern of trade appears to be broadly consistent with the trade between developed and developing nations.

Since many outsourced services are labour intensive and generally do not require large scale of production or investment in infrastructure, etc. low cost is achieved primarily through use of low cost skilled labour. Therefore comparative advantage is clearly determined by the availability of skilled labour. This is a major reason why emerging nations such as India, China, and the Philippines are leaders in services outsourcing and among them India has, so far, been leading the pack.

India's edge in outsourcing of services has been attributed to many factors including the widespread use of English, Indian aptitude for computers and most importantly the availability of highly educated skilled labour at wages which are a quarter of those in the US. However, though outsourcing in India appears well established, it cannot be assumed that outsourcing will continue to increase at an exponential rate. This is because many other developing nations offering similar low cost advantages to India, are gearing up to attract such flows. Given this, future flows may be diverted to other emerging

nations such as China, Philippines, Mexico and Malaysia. Further since services outsourcing is a lucrative and fast growing market and represents a huge economic opportunity, many developed nations including Ireland, Russia, and South Africa are also very much in the fray. Rapidly rising salaries of skilled labour in the BPO and ITES sectors in India could mean that India may lose out to developing nations, given that low salaries represents one of the most important factors determining flows of outsourcing to India. The English language advantage gives India an edge, but many of the non English speaking nations such as China, and many of the new Eastern Bloc countries have embarked on aggressive English language programmes.

All the above reasons point to the need for a more fundamental analysis of the factors that determine comparative advantage. In the long run, i.e., over a 5-10 year horizon, it is the fundamental forces of demand and supply in the skilled labour market that determines salaries or the price of labour. The price of labour would be determined by the stocks of human capital available. To assess this there is a need to study the endowment of human capital in developing nations. A large base of human capital along with low salaries is clearly what is going to determine the direction of flow services outsourcing. If, for example, developing nations are not necessarily abundant in human capital but are characterized by lower wages, then outsourcing of services, by increasing demand for human capital, may cause wages to increase. This would reduce the cost differential making outsourcing less attractive.

II. RELATIONSHIP BETWEEN HUMAN CAPITAL AND SERVICES OUTSOURCING

A. Theoretical Work on Growth and Human capital

Human capital is defined as the skills, capacities and abilities possessed by an individual which permit him to earn income. A more complete definition is given by the OECD, where human capital is defined to consist of all forms of knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being (Van Leeuwen (2004)). Analytically human skills have been likened to physical capital and can be augmented through investment which can be in the form of education, training or 'on the job' experience or some combination of all three. The key point is that investment in human capital has an economic cost which includes not just the explicit cost of tuition but also the implicit opportunity cost of incomes sacrificed in the process of education. Further aspects such as work experience and on job training, though important aspects of human capital, are difficult to model in within the framework of conventional economic theory as noted in Mincer(1974).

Most of the work on human capital has focused on the relationship between human capital and growth. The role played by human capital resources in determining flows of services outsourcing is a relatively new and under researched area. The study and assessment of human capital resources of a country presents problems both theoretically, and empirically. Early growth theories based on the Solow model gave no specific role given to human capital. The new endogenous growth theories however have accorded

human capital a central role in determining growth. In this group there are two broad approaches to modeling the effects of human capital on growth see Temple (2001) for a survey. The first category focuses on the accumulation of human capital where human capital is viewed as a normal input and the level of output directly depends upon the human capital stock (Lucas (1988). In these models sustained growth is due to the accumulation of human capital over time. The second category focuses on the stock of human capital which either generates innovations Romer (1990) or improves a country's ability to adapt to and invent new technologies Nelson & Phelps (1966). Human capital in these models is essentially is seen as a facilitator of externalities and technology and is a key input in the production of new ideas. Work at the micro level focuses on measuring returns to education to an individual using the Mincer equation which measures the relationship between earnings and the cost of education in terms of the opportunity cost of student time . At the macro level the bulk of theoretical and empirical work has focused on establishing the link between growth and human capital.

B. Empirical Work on Human Capital and Growth

At the empirical level, the new growth theory has spawned a more solidly empirical focus leading to the development of some important data sets which provide a comparable set of statistics on educational attainment for a broad number of countries (Barro and Lee(2000), Barro (1991)). Most of the empirical work on the role of human capital has been conducted within the framework of the new growth theory and has relied on cross-country evidence (see, for example Barro & Lee (2000), Barro (1991) and Benhabib &

Spiegel (1994)). Surprisingly most of the empirical studies have found that the change in schooling variable has an insignificant effect if it is included in GDP growth equations (Krueger & Lindahl (2001)). Results of this kind are often perceived as rather dubious, since all growth regressions share a number of important statistical problems . This may be because the empirical study and assessment of human capital resources of a country is a knotty problem as there are problems in the definition of what exactly constitutes human capital, and, further how to measure it. Human capital is mentioned as consisting of both formal and informal education. However limiting human capital to educational attainments, for example ignores the important role played by work experience.

Empirically the most popular definition of the human capital variable uses the educational stock-approach. This is a name for a whole basket of proxies of human capital and are generally based on formal education measures such as enrollment ratios, literacy rates, etc. This implies that human capital is defined very narrowly as it excludes such things as costs of health, experience etc. Further the literacy definition, though convenient from the perspective of data availability, ignores the effect of ability, education and experience on human capital. Another reason why these measures are imperfect proxies is that they are not based on economic theory and do not take into account discounting of future income earnings. Further they also fail to differentiate between the cost of raising a child and maintenance investment in health from private investment in human capital such as higher education. Two other proxy measures of human capital that have become popular are educational attainment and average years

of schooling. As a reaction to the existing proxies such as adult literacy some studies tried to construct data which represent the highest attained education in the labour force.

Attainment is a stock variable which takes into account formal education in the labour force. From these attainment figures one can estimate the average years of education which is currently much in use as a human capital proxy . Many studies have used these proxies (for e.g Barro(1995), Barro(1997)).

This is an area which presents huge problems due to lack of data and associated measurement problems . Since most empirical measures of human capital require cross country data which is comparable, many of them have used adult literacy ratios and school enrollment ratios as proxies for human capital . These proxies have some clear disadvantages. Firstly, it is clear that the enrollment ratios are flow and not stock variables. They do not even perfectly measure the flow. Moreover, they only measure those in school (i.e., those who do not take part in the labour force yet). The same goes for adult literacy which generally only focuses on primary education, and ignores other forms of human capital. There are also problems of important differences in the nature and quality of schooling across countries, which could undermine the usefulness of international comparisons. Even such things as the length of the school year can show a surprising degree of variation across countries.

Empirically the effect of human capital growth has yet to be validated conclusively. A key issue is whether the human capital variable should be change in education or the level of education and their effect on growth. By and large the change in education

variable has not been found to have empirical significance and has yielded the surprising result that the influence of growth of human capital on GDP growth is not important as in (Nelson & E. Phelps(1966). Further a well known study by Benhabib & Spiegel (1994) finds coefficients for the regression of the growth of human capital on GDP are negative. However problems both in the specification of human capital and in the quality of the underlying data make this difficult to objectively verify .

There appears, as of now, no clear link between these models which relate human capital and growth and services outsourcing. One link that could arise is that services outsourcing, by increasing output and productivity in the services sector of the economy also leads to higher levels of growth. Though it is too early to say so, this appears to be a factor at least in the high growth rates shown by the Indian economy in the last few years, where the growth rate of GDP in 2003-04 was 8.5%, up from an average of 6.8% between 1992-97.

C. Relation between Education and Growth

How does education impact on growth? Education is thought to permanently increase the efficiency of the labor force and facilitates the absorption of superior technologies. This linkage appears to be more important for secondary and tertiary education. Primary schooling acts more in the nature of a prerequisite for secondary schooling and is not found to be significantly associated with growth. There is also some sort of threshold effect or critical mass associated with education and growth, i.e., there has to be a certain 'thickness' in the labour market for skills before dynamic feedback can come into play.

Thus if there are a few good scientists in a developing economy, they are unlikely to have a sizable impact on growth without the assistance of other skilled individuals such as technicians and engineers to cooperate with their work .

Education is also associated with significant non quantifiable social benefits that impact positively on growth via positive externalities arising from an educated and skilled population. These include the ability to participate more intelligently and in a more informed fashion in democratic and political decision making processes. This has the effect that the policy choices made are more rational and there is greater accountability of the government and the political set up to citizens. Other associated positive outcomes include: better public awareness, better social cohesion, better health, environmental awareness etc. Some of these social outcomes represent a return to the individual; others are more in the nature of societal benefits.

D. Education and Comparative Advantage in Services

For purposes of determining the comparative edge in services outsourcing, this study focuses on the simplest possible definitions of human capital. It is the contention of this paper that an analysis of these can also be insightful and provide hypotheses that can be tested more rigorously at a later stage. Comparative advantage based on human capital is not something, which changes or develops over a very short period of time. Unlike physical capital, which can be augmented in a relatively short period of time if there are no financial constraints, human capital can be augmented at a relatively slow pace. This

is because human capital first and foremost implies education of the labour force. If a minimum of secondary education is taken as being necessary for labour to come in the human capital category, then, for a country to add significantly to its human capital base, would take at least 10-12 years. In fact what we term human capital normally comprises labour that has had at least a graduation level education and preferably postgraduate/technical qualifications. Further a very critical component of human capital augmentation occurs during the process of “on the job training” and work experience. This is a factor, which cannot be captured by the macro level statistics, which are typically available for measuring human capital.

The benefits of education at different levels works in different ways for the labour market. Widespread primary education and basic literacy ensures that the labour force is able to participate in the development process. Further it also has the externality effect of raising the general level of health, hygiene, trainability and productivity of the population. It is likely however that such labour would essentially fit into the category of semiskilled labour suitable for manufacturing enterprises at various levels. A second category of labour can be assumed to have finished basic schooling and possibly even some non professional graduate degrees. Such labour would be suitable for low level skilled jobs such as call centres, low level programme writing, etc. The highest caliber of labour would be those who are professionally or technically qualified individuals. These would include individuals such as engineers, doctors, management specialists, researchers. Services outsourcing typically tends to make use of the second and third

category of skilled labour. Such labour has tended to be much cheaper in emerging markets than in developed economies.

Another important point in the estimation of human capital is that what matters for determination of salaries is the stock of educated manpower available at a point of time. However, figures such as school enrollment ratios, etc are more in the nature of flow variables as they actually tell us the numbers likely to be added to the skilled labour force, whereas what is required is some measure of the human capital stock of a country. Literacy on the other hand is a stock variable and tells us the number of people in a country that are able to read. Similarly figures for number of graduates or matriculates is a stock figure whereas enrollments in secondary and tertiary education are flow figures. Unfortunately international data bases such as the UNESCO data do not distinguish between the stock and flow aspect and different statistics for education are presented in stock or flow terms.

For analyzing comparative advantage in services outsourcing, what is more relevant is statistics that provide indications of secondary and tertiary education as, typically, most services require highly skilled labour with at least graduate level education. Many of the categories require postgraduate or technical degrees. Therefore when we talk about a country's human capital, it is these statistics that are most relevant. For purposes of cross country comparison in this paper, standard international data bases such as UN demographic data are used. The main focus of analysis in this paper is to compare the size of human capital for the countries being studied using such proxies such as literacy,

primary, secondary and tertiary education ratios. These are taken as proxies of a country's endowment of skilled labour.

III: CROSS COUNTRY ANALYSIS OF HUMAN CAPITAL

This section presents a brief analysis of various components of country's educated manpower. The analysis is carried out for a sample of both developing and developed economies. In the case of developed nations, two groups are considered: countries such as US, UK, France that essentially represent outsourcers. The second group consists of countries such as Canada, South Africa, Ireland, which though developed, are also positioned as potential competitors for services outflows. Many economies in Eastern Europe are also highly competitive in this area. The main competitors include: Russia, Czech Republic, Hungary and Poland. In the developing nation group, India and its main competitors including China, Philippines, Malaysia, and Mexico are considered.

A. Factor Proportions

The definition of factor abundance has many components to it. From a macroeconomic perspective, what matters is the overall size of the population. This can be taken as a broad indicator of labour abundance for an economy. Table I shows the total population figures for the countries being studied. As would be expected, China and India are by the far most populous nations. Others nations that have high populations, and, hence, manpower, are Philippines, Mexico in the developing group and Russia in the Eastern

Block group. The US also clearly qualifies as being a large economy in terms of labour abundance.

With the exception of Poland, the other two Eastern Block economies being considered (Czeck and Hungary) are quite small. Similarly, though Ireland is considered an important centre for IT, it has a total population size of 4 million. The proportion of people in the age group 15 -65 is 67. 4%; hence the size of the working population, i.e., population above 15 years, is also concomitantly lower at 2.7 million(see Table I below).

Adult literacy is one of the proxies commonly used for measuring the skilled labour force of a country. This measure is obviously not very good as adult literacy represents the first step up the human development ladder. Adult literacy has been associated, in earlier empirical analysis, with overall level of social development rather than necessarily being correlated with growth. Figures for adult literacy as a percentage of the population aged fifteen and above are presented in Table II. Expectedly all the developed countries have universal adult literacy. Interestingly India has the lowest rate of adult literacy, lagging considerably behind even China and Malaysia.

Table I : Population Size and Age Distribution

| Country | Total Population 2003(millions) | Total Population Age 15-64(millions) | Population** % | | |
|---|------------------------------------|---|-------------------|---------------|----------|
| | | | Ages 5-14 | Ages 15-64 | Ages 65+ |
| Outsourcing Nations | | | | | |
| United States | 292.6 | 194.2864 | 21.1 | 66.4 | 12.5 |
| France | 60.0 | 39.12 | 18.7 | 65.2 | 16.1 |
| U.K. | 55.4 | 36.3424 | 18.4 | 65.6 | 16.1 |
| Service exporting nations | | | | | |
| India | 1070.8 | 666.0376 | 32.8 | 62.2 | 5.0 |
| China | 1300 | 891.8 | 24.2 | 68.6 | 7.2 |
| Philippines, | 80.2 | 47.7992 | 36.5 | 59.6 | 3.9 |
| Malaysia | 24.4 | 15.2256 | 33.3 | 62.4 | 4.3 |
| Mexico. | 104.3 | 64.666 | 32.9 | 62 | 5.1 |
| Eastern Block Countries | | | | | |
| : Russia | 144.6 | 101.5092 | 16.9 | 70.2 | 12.9 |
| Czech Republic | 10.0 | 7.04 | 15.8 | 70.4 | 13.8 |
| Hungary | 10.2 | 6.94 | 16.5 | 68.8 | 14.6 |
| Poland | 38.6 | 26.0164 | 18.2 | 69.4 | 12.4 |
| Developed Countries in Outsourcing | | | | | |
| Ireland | 4.0 | 2.536 | 21.4 | 67.4 | 11.2 |
| Canada | 31.6 | 21.7408 | 18.4 | 68.8 | 12.8 |
| South Africa | 46.9 | 29.7346 | 32.1 | 63.4 | 4.5 |

Source : World Development Indicators, 2004

Also presented is the Human /Development Index, value for each of the countries for the year 2003 (see Table II) The HDI index provides a useful summary measure of human well being.

India's HDI value of .602 is the lowest among developing nations including China (.745), Malaysia (.796) and Mexico (.81). Most of the developed countries enjoy a HDI value of at least .90 or above. The Eastern Block nations also appear to be doing well by this indicator and enjoy a HDI value above .80 typically. Though the HDI index provides a useful summary of human well being, it does not appear to be able to offer any insight into what determines comparative advantage. Clearly the overall story of services exports does not get explained by overall indicators of development such as the HDI.

Table II : Adult Literacy and Human Development Index

| Country | Adult Literacy 2003(%ages of pop aged 15 and above | Human Development Index – HDI value)2003 |
|---|---|---|
| Outsourcing Nations | | |
| United States | 100 | .944 |
| France | 100 | .938 |
| U.K. | 100 | .939 |
| Service exporting nations | | |
| India | 61.0 | .602 |
| China | 90.3 | .755 |
| Philippines, | 92.6 | .758 |
| Malaysia | 88.7 | .796 |
| Mexico. | 90.3 | .814 |
| Eastern Block Countries | | |
| Russia | 99.4 | .795 |
| Czech Republic | 100 | .874 |
| Hungary | 99.3 | .862 |
| Poland | 100 | .858 |
| Developed Countries in Outsourcing | | |
| Ireland | 100 | .946 |
| Canada | 100 | .949 |
| South Africa | 82.4 | .658 |
| | | |

Source : Human Development Report 2005

B. Secondary and Tertiary Levels of Education

Primary education can be broadly lumped, along with adult literacy, as something which contributes to the overall level of social development and is probably associated with strong externality effects both socially, developmentally and environmentally. For purposes of analyzing the definition of human capital as related to services outsourcing, it is likely that higher levels of education are required. Therefore a much more important measure of human capital is the number of students who complete secondary and tertiary education.

This paper compares statistics for enrollment ratios, both at the secondary school level and the tertiary level. Secondary education is defined as doing education beyond the primary level. Enrolment in Tertiary education requires completion of secondary school education. Gross enrolment ratio is defined as enrolment irrespective of age group as a percentage of the age group that officially corresponds to that educational age group; hence this ratio can sometimes be more than 100%. The net enrolment ratio corresponds to children of official school age enrolled in the school to the population of the corresponding official school age. Obviously the net enrollment ratio provides a more realistic picture of the current state of education in a country; however this data is not always available. Where the net enrollment ratio was not available, the gross ratio has been used.

Table III shows the figures for school enrollment ratios. A study of school enrolment ratios provides a somewhat incomplete picture as key figures for India and China were not available. Then net secondary school ratio was high for the developed and Eastern block countries and was much lower for developing nations. Though figures for both India and China were not available it can be assumed that they would follow the same pattern as those for other developing nations.

With respect to primary schooling most countries in the developed group showed that a high proportion of the population in the relevant age group were enrolled for primary education. The figure for secondary education continued to be high for US, France, UK, Canada, Ireland and the Eastern Block nations : Russia, Czeck Republic, Hungary and Poland. However the deviation between the developed and developing countries becomes more marked when it comes to secondary school enrollments. The developed group, i.e., US, UK and France continue to enjoy secondary school enrollments in the nineties, but the percentage of enrollments falls steeply for India and China. The Eastern block countries however clearly continue to enjoy high levels of student enrollments varying from 92% for Russia and Poland (91%) to 75% for Hungary. (See Table III)

With respect to percentage of students in relevant age group enrolled in tertiary education, the US (71%) is the leader, closely followed by Russia (68%). Most of the other nations have 50% or more enrolled in tertiary education. Both India and China have an appalling 10% and 13%, respectively as the proportion of students in the

relevant age group enrolled in tertiary education. Though expected, these results seem to be sharply in contradiction to the expectation that these nations are actually abundant in highly educated human capital. Remember, a comparative advantage in services requires more than a literate population. Most services are highly intensive in educated manpower and therefore require highly educated manpower.

This seemingly contradictory result can be resolved by differentiating between the absolute numbers of educated manpower and the proportions of educated manpower. What matters for determining factor abundance is not just the relative importance of a group relative to the whole population, but also the total stock or numbers available in a particular category. Table IV shows the relative size distribution of the school age population for the different age groups :

- Primary 5-14 years
- Secondary 15 -19
- Tertiary 20-29

Using these population age distribution figures we can calculate the total size of the population in each of the school going strata and then work out the numbers enrolled at the primary, secondary and tertiary level for each country. This is shown in Table 4.

Analysis of the actual numbers shows a dramatically different picture relating to human wealth. Both India and China have the highest numbers of students in the age group 20 - 29, which represents the age range in which tertiary education occurs. The numbers in Table IV can be used to calculate the number of students enrolled in each stage of education. This is shown in Table V.

Table III : School/ College Enrolment Ratios

% of relevant age group

| | Net Primary enrolment ratio (%) | Net secondary enrolment ratio(%) 2001/2 | Net tertiary enrolment ratio(%) 2001/2 | Tertiary students in science, maths, 2001/2 ⁵ |
|---|---------------------------------|--|---|--|
| Outsourcing Nations | | | | |
| United States | 94 | 87 | 71 | |
| France | 100 | 92 | 54 | - |
| U.K. | 100 | 95 | 59 | 21 |
| Service exporting nations | | | | |
| India | 83 | 48(figs for gross) | 11 | 20 |
| China | ⁹³ | - | 13 | - |
| Philippines, | 93 | 56 | 30 | 25 |
| Malaysia | 21(figs for 1991) | 5(figs for 1991) | 2 | 40 |
| Mexico. | 99 | 58 | 20 | 31 |
| Eastern Block Countries | | | | |
| : Russia | 114(gross figure) | 92 | 68 | - |
| Czech Republic | 90 | 88 | 30 | 31 |
| Hungary | 90 | 75 | 40 | 21 |
| Poland | 98 | 91 | 55 | 20 |
| Developed Countries in Outsourcing | | | | |
| Ireland | 90 | 80(figs for 90-1 | 47 | 25 |
| | 100 | 98 | 59 | 20 |
| Canada | | | | |
| South Africa | 90 | 62 | 15 | 17 |

Source : World Development Report 2004

⁵ Source Human Development Report 2005

Table IV: Relative Size Distribution of School Age Population

| Country | Distribution of Students by age (2002) | | | | | |
|---|--|--|------------------------------|---|----------------------------|---|
| | dist of students Age 5-15 % | Number of students Age 5-15 (millions) | dist of students Age 15-19 % | Number of students Age 15-19 (millions) | dist of students Age 20-29 | Number of students Age 20-29 (millions) |
| Outsourcing Nations | | | | | | |
| United States | 14 | 40.964 | 7 | 20.482 | 13 | 38.038 |
| France | 13 | 7.8 | 7 | 4.2 | 14 | 8.4 |
| U.K. | 13 | 7.202 | 6 | 3.324 | 13 | 7.202 |
| Services exporting nations | | | | | | |
| India | 25 | 267.7 | 9 | 96.372 | 17 | 182.036 |
| China | 18 | 234 | 7 | 91 | 16 | 208 |
| Philippines, | 24 | 19.248 | 11 | 8.22 | 18 | 14.436 |
| Malaysia | 22 | 5.368 | 10 | 2.44 | 18 | 4.392 |
| Mexico. | 23 | 23.989 | 11 | 11.47 | 19 | 19.817 |
| Eastern Block Countries | | | | | | |
| : Russia | 13 | 18.798 | 8 | 11.568 | 15 | 21.69 |
| Czech Republic | 12 | 1.2 | 7 | .7 | 17 | 1.7 |
| Hungary | 12 | 1.224 | 7 | .714 | 16 | 1.632 |
| Poland | 14 | 5.404 | 9 | 3.474 | 15 | 5.79 |
| Developed Countries in Outsourcing | | | | | | |
| Ireland | 15 | .6 | 9 | .36 | 16 | .64 |

Sources: OECD/UIS WEI and UN Population Division.

Table V : Number of Students Enrolled in Primary, Secondary, Tertiary Level of Education

| Country | No. of students enrolled (2001/2)(millions)** | | | |
|---|---|---|---|---|
| | Net students in primary enrolment 2001/2 | Net students secondary enrolment ratio 2003/3 | Gross Students enrolment in Tertiary education (students) 2001-02 | Gross Tertiary Students enrolled in science, engineering and maths 1998-2003 ^s |
| Outsourcing Nations | | | | |
| United States | 38.506 | 17.82 | 27.0 | |
| France | 7.8 | 3.864 | 4.536 | |
| U.K. | 7.202 | 3.158 | 4.25 | 1.51 |
| Service exporting nations | | | | |
| India | 222.2 | 46.26 | 20.02 | 36.4 |
| China | 217.6 | | 27.04 | |
| Philippines, | 17.9 | 4.94 | 4.33 | 3.609 |
| Malaysia | 1.127 | .122 | .0878 | 1.76 |
| Mexico. | 23.75 | 6.66 | 3.96 | 6.14 |
| Eastern Block Countries | | | | |
| : Russia | 21.43 | 10.64 | 14.7 | |
| Czech Republic | 1.08 | .616 | .51 | .527 |
| Hungary | 1.01 | .536 | .653 | .343 |
| Poland | 5.29 | 3.16 | 3.18 | 1.15 |
| Developed Countries in Outsourcing | | | | |
| Ireland | .54 | .288 | .30 | .16 |
| Canada | 4.108 | 2.168 | 2.610 | .89 |
| | | | | |
| | | | | |

Source : Figures calculated on the basis of figures Table 4 and Table 3

** Number of students in each stage of education is estimated as follows: First estimates of the number of students in the age groups 5-15, 15-19 and 20-29 were calculated using the population figures for 2002 for each country. The age distribution of students was obtained from data from the UN population division and the OECD(Refer to Table IV). These were then used as the base for determining school enrolments at the primary, secondary and tertiary levels. Net and gross enrollment ratios were available from the World Development Report (refer Table III). These along with the population base figure derived in Table IV were used to calculate numbers of students enrolled in primary, secondary and tertiary levels of education.

The actual numbers of students enrolled in each stage of education are presented in Table V. The figures are estimates and should be treated with caution; nevertheless some conclusions can be drawn from an analysis. Firstly it is clear that if tertiary students are taken, then the US and China with 27 million students and India with 20million students have a significant lead over all the other countries. They are followed at some distance by Russia with approximately 14 million students. Britain, France, Philippines, Poland follow with between 3-4 million students educated at this level. Many of the Eastern Block countries such as Hungary, Czeck Republic have estimated bases of tertiary students which are below a million. Similarly, though Ireland and Canada are often mentioned as being countries which are also active in the IT and ITES sectors, the base of tertiary level educated labour is miniscule in comparison with the larger economies.

For purposes of human capital the level of tertiary students enrolled in maths, science and engineering would be a key indicator of the level of development of the population. Most countries appeared to have between 20-25% of the total number of students in tertiary studies, in the area of sciences. However what matters for determining comparative advantage is not the relative proportion of such students but the overall numbers. In terms of numbers India leads the fray. Unfortunately data for China and US was not available on this parameter.

IV CROSS COUNTRY REGRESSION ANALYSIS

A key hypothesis that is to be established is the importance of human capital in services outsourcing. The earlier sections have broadly established the importance of human capital in services outsourcing. Analysis of human capital estimates also appear to support the comparative advantage that countries such as India and China enjoy in services outsourcing. To take the analysis forward there is a need to establish causal variables using a cross country regression analysis. Such an analysis presupposes that there are certain regularities across countries in the pattern of services exports which will show up. Given the short time period for the regressions and also the paucity of data, the regression analysis was conducted for a larger panel of nations than were included for the analysis of human capital in the earlier sections. The countries which have been included are the one for which the age distribution of the labour force is available. (A list of the 35 panel countries for the regression is shown in the Appendix.)

Services outsourcing as a phenomenon is of relatively recent origin starting off in the late 1990s when American Express outsourced some function to India. A major causal factor underlying the rapid growth in services outsourcing have been dramatic innovations in computing technology, the internet and dramatic reductions in the cost of telecommunications. A rough cut off point for the genesis of services outsourcing can be put in the year 2000 when India, in particular benefited widely from the so called '2000 bug'. Given this it makes little sense to carryout statistical analysis of services outsourcing prior to this period. The analysis uses data on developed and developing

countries for the sample period 2000- 2003. More up to date data on outsourcing is unfortunately not available.

The dependent variable for the cross country regressions is the value of other computer, information communications and other commercial service exports (COMPSEX) available from IMF Statistics. However for the years 2000 and 2001 the data for other commercial services also includes insurance and financial services. For 2002, 2003 other services are further decomposed into insurance and financial services and computers, information, communication and other commercial services. It is this last category which is generally thought to comprise services outsourcing. The regression is therefore estimated for these two years separately and also for other services category including insurance and financial services for 2000-2003 (COMPSEX). Typically export demand functions have a fairly standard format. However this equation is not an export demand function in the standard sense. What is of importance is to determine the causal factors underlying size of the service exports. A pooled cross country represents in some sense an average pattern being observed across nations.

The actual value of services exports has been used as the dependent variable rather than share, because as noted earlier analysis of shares of business services in either total commercial service exports or even of GDP may be deceptive. Why? Because a large country, such as the US, may be the largest supplier of business services to the world, however the share of such exports in its total services exports or even GDP may be much smaller. Many small nations, with small absolute values of services exports may actually end up with large shares. Further analysis of shares of GDP is important from the

perspective of understanding the structure of production of a particular country. However if the objective is to understand the factors underlying services exports the value of exports may be a better dependent variable.

Two dependent variables have been used for the estimation:

- i. Dollar value of exports of computer, information, communication and other commercial services (COMPSERX)
- ii. Other commercial services : Dollar value of exports of computer, information, communication and other commercial services + insurance and financial services (COMSERX)

B. Independent variables

Based on the earlier discussion one of the most important independent variables would obviously be human capital estimates. This variable can be captured crudely by size of total population in millions, and more accurately by size of tertiary educated labour force(TERT). Though preliminary runs showed both variables to be highly significant it was decided to drop population and go with size of tertiary educated students as a proxy for human capital as there is likely to be a strong correlation between the two.

The size of the tertiary educated labour force is calculated as follows: First estimates of the number of students in the age groups 5-15, 15-19 and 20-29 were calculated using the population figures for 2002 for each country. The age distribution of students was obtained from data from the UN population division and the OECD. Once the number of students in each age group has been estimated, the number of tertiary educated students can be calculated. Primary education, literacy and even secondary education, as discussed

earlier were not thought to be relevant to services outsourcing. Addition of these variables would not add much meaningfully to the regression equations.

A key issue on which outsourcing hinges on is the dramatically lower costs provided by developing nations such as India and China. This again is dependent on the significantly lower wages of skilled labour in these nations. Per capita GDP is taken as a rough indicator of the relative differences in labour cost across countries. Of course this is a rough proxy as per capita GDP would represent an average value of GDP accruing to all categories of labour including unskilled. Nevertheless if we compare per capita GDP for US in 2003, it is \$37600. The per capita GDP for India in that year is \$570. US PCGDP is approximately 65 times that of India's! However the skilled wage differential between India and the US is usually pegged at 10 times at the bottom end of the skill pyramid and only a quarter at the top end. Thus Call Centre employees may cost in salary terms one tenth the US salary, but the salary of an experienced, well qualified computer Indian professional may be a quarter of their US counterparts. Given this use of per capita GDP may overstate the cost differentials existing between developed and developing nations, particularly as the focus is on skilled labour which will naturally earn far more than the per capita GDP as a premium to skill. Nevertheless for lack of adequately comparative data on cross country labour costs this variable has been used.

Finally an important pattern that has been observed vis a vis services exports is that countries which tend to be big exporters of services are also big importers of services. Thus the size of other services imports (COMLM) and size of computer, information,

communication and other commercial imports (COMPSERM) have been respectively included in the regressions.

Two forms of the equation were estimated: one was standard log formulation which is used commonly in most cross country regression work. Also the raw data, i.e. \$(millions) value of computer, information and other commercial exports was regressed on per capita GDP in dollar terms, size of tertiary educated labour force in millions and dollar value of service imports (COMPSERM, and COMLM respectively). Interestingly the R^2 value for the raw data regressions was much higher than for the log linear form of the equation. Both forms of the estimated equation are presented in Table VI and Table VII below.

The Estimated Equation

Two forms of the estimated equation were tested:

1. $\text{Log}(\text{COMPSERX}) = C + \beta_1 \text{LOG}(\text{PCGDP}) + \beta_2 \text{Log}(\text{TERT}) + \beta_3 \text{Log}(\text{COMPSERM})$
2. $(\text{COMPSERX}) = C + \beta_1(\text{PCGDP}) + \beta_2(\text{TERT}) + \beta_4(\text{COMPSERM})$

B. Results

The results of both regression forms support the basic hypothesis that size of tertiary labour force is an important determinant of services exports. The regressions for the raw data showed strong adjusted R^2 values above .8 for both dependent variables. All three independent variables were highly significant with positive coefficients. Thus computer and business service exports are positively related to PCGDP, size of tertiary educated

labour force and size of computer and business service imports. The positive coefficient on services imports suggests that there is strong intra industry trade related to services. The log form the of the equation comparatively poorer fits in terms of R^2 . However the basic pattern being observed in terms of significance and signs of the independent variables was similar.

Table VI : OLS Estimates of Other Services Exports (Sample of 35 countries for period 2000 - 2003

| Independent Variables | Dependent Variables | |
|-----------------------|---------------------|----------|
| | CompserX | ComserX |
| Constant | -9594.98 | -8670.24 |
| | -4.21 | -3.866 |
| | .000 | .000 |
| PCGDP | 0.337 | 0.317 |
| | 3.026 | 2.739 |
| | .004 | .007 |
| TERT | 1164.595 | 1005.31 |
| | 5.786 | 4.528 |
| | 0.000 | .000 |
| COMPSERM | 0.902 | |
| | 9.592 | |
| | 0.000 | |
| COMLM | | 1.003 |
| | | 11.692 |
| | | .000 |
| R2 - adj | 0.83 | 0.809 |
| | | |
| F Stat | 112.903 | 147.474 |
| | | |
| Obs (N) | 69 | 104 |

TableVII : OLS Estimates of Other Services Exports (Sample of 34 countries for period 2000 – 2003(Using the Log form of the Equation)

| Using the Log form of the equation | | |
|---|---------------------|----------|
| | Dependent Variables | |
| Independent Variables | LCompserX | LComserX |
| Constant | 0.158 | 0.491 |
| | 0.244 | 0.065 |
| | 0.805 | 0.948 |
| LPCGDP | 0.643 | 0.639 |
| | 3.482 | 4.651 |
| | 0.001 | 0 |
| LTERT | 0.553 | 0.478 |
| | 3.25 | 3.57 |
| | 0.002 | 0.001 |
| LCOMPSERM | 0.218 | |
| | 1.48 | |
| | 1.500 | |
| LCOMLM | | 0.283 |
| | | 2.304 |
| | | 0.023 |
| R2 - adj | 0.309 | 0.374 |
| F Stat | 11.292 | 21.328 |
| Obs (N) | 69 | 102 |

IV. CONCLUSIONS AND POLICY IMPLICATIONS

To determine comparative advantage this paper looked at population size and various proxies for human capital including the school enrollment at the primary, secondary and tertiary levels. An important finding is that analysis of ratios or percentages is often misleading when trying to determine comparative advantage. For example both India and China figured as having the lowest enrollment ratios, as a proportion of the relevant age group, for tertiary education. Yet, apart from the US, India and China have the highest numbers of students enrolled in tertiary education institutions.

A cross country analysis is also insightful because it helps put into perspective the relative standing of different nations. For example the Eastern block countries are aggressively trying to enter outsourcing and this is a threat to be taken seriously. However the analysis based on comparative advantage and human capital shows that they have relatively small numbers in the tertiary category. Similarly Ireland, in the developed group, is doing well in the area of IT; but again the basic size of the educated manpower force in Ireland is so small as to be virtually negligible.

The findings are further corroborated by some preliminary regression analysis which suggests that cross country human capital base is a significant causal variable in determining services exports. Further it seems countries with high levels of services exports are also characterized by high levels of imports of services suggesting a substantial degree of intra industry trade in services category as well.

REFERENCES

1. R. Solow, "A Contribution to the Theory of Economic Growth," *Quart. J. Econ.* 70:1, pp. 65–94.1956
2. J. Temple, "Growth Effects Of Education And Social Capital In The OECD Countries," *OECD Economic Studies* No. 33, 2001/II
3. R.E. Lucas, "On the mechanics of economic development", *Journal of Monetary Economics*, 22, 3-42 (1988).
4. P. Romer, "Endogenous Technological Change," *J. Polit. Econ.* 89:5, pp. S71–S102, 1990
5. Economic Survey,(2005), *Ministry of Finance, Economic Division, Government of India.*
6. *Amiti and Wei*, Amiti, M., and Shang-Jin Wei(Oct 2004) "Fear of Service Outsourcing:Is It Justified?" *IMF Working Paper, WP/04/186*
6. Leontief, Wassily, "Domestic Production and Foreign Trade: The American Capital Position Reexamined, "Proceedings of the American philosophical Society 97, September 1953
7. OECD, "*The Well-being of Nations: The Role of Human and Social Capital*, Paris: OECD 18, 2001
8. Bas van Leeuwen,(2004) "Literature on the relation between human capital and economic growth: definitions and problems," International Institute of Social History, [Online],Available : www.iisg.nl/research/humancapital.pdf
9. J. Mincer, *Schooling, Earnings, and Experience*. NY: Columbia U. Press, 1974.

10. H. Uzawa, "Optimum Technical Change in an Aggregative Model of Economic Growth," *International Economic Review*, Vol. 6 (1965), 18-3, 1965.
11. P. Romer, "Endogenous Technological Change," *J. Polit. Econ.* 89:5, pp. S71–S102, 1990.
12. R. Nelson, and E. Phelps, "Investment in Humans, Technology Diffusion and Economic Growth," *American Economic Review*, Vol. 56 (2) 69-75, 1966.
13. R. J. Barro, and Jong-Wha Lee. "International Comparisons of Educational Attainment," *J. Monet. Econ.* 32:3, pp. 363–94, 1993.
14. R. J. Barro, and Jong-Wha Lee, "International Data on Educational Attainment: Updates and Implications," *CID Working Paper No. 42*, Center for International Development, Harvard University, April 2000
15. P. Romer, "Human Capital and growth: Theory and Evidence," *Carnegie-Rochester Conference Series on Public Policy: Unit Roots, Investment Measures and Other Essays*, Vol. 32 (1990), pp. 251-285.
16. R.J. Barro, "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, May 1991.
17. J. Benhabib, and M. Spiegel. "The Role of Human Capital in Economic Development:

Evidence from Aggregate Cross-Country Data,” *J. Monet. Econ.* 34:2, pp.143–74, 1994.

18. Alan b. Krueger *and* Mikael Lindahl,”Education for Growth:

Why and For Whom?” *Journal of Economic Literature* Vol. XXXIX pp. 1101–1136,

Dec. 2001

19. J.R.W. TEMPLE, “The new growth evidence”, *Journal of Economic Literature*,
37(1), 112-156, (1999).

20. , Ludger Wößmann, .”Specifying Human Capital,”*Journal of Economic Surveys*,
Vol. 17 (3), 239-270, 2003.

21. Robert J. Barro, and Xavier Sala-i-Martin, *Economic Growth*. NY: McGraw-Hill,
1995.

22. Robert J. Barro, *Determinants of Economic Growth: A Cross-Country Empirical
Study*,

Lionel Robbins Lectures. Cambridge, MA: MIT Press, 1997.

23. Simon Commander “Brains: what can they do for development?

“,SussexDevelopment Lecture , London Business School and EBRD, (2004).