Export Composition and Growth.

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ABSTRACT

The relationship between exports and growth has been formalized in the Export-Led-Growth (ELG) hypothesis. A huge literature has grown around the testing of this hypothesis, with mixed results and scepticism regarding direction of causality. The importance of the composition, rather than the volume of a country's export basket has been given less attention in the literature. This study, using the technique applied by Rodrik, Hausman and Hwang (2006), aims to present the importance of export composition in economic growth. Using World Development Indicators data across ten export sectors for a sample of countries ranging from 77 to 117, an index PRODY is calculated to measure the "sophistication" level of each export sector. The underlying thought for this calculation is the Heckscher-Ohlin view of the global economy, whereby richer countries should export more technologically sophisticated goods. An EXPY index of the sophistication of each country's export basket is calculated from the weighted sum of PRODY values, with weight given to the share of each sector in each country's exports. EXPY is included in a balanced panel growth regression and evidence of a causal effect from EXPY to growth is found. When the panel is divided into upper and lower income countries, the effect is accentuated for lower-income countries, giving rise to interesting policy implications for economic development.

1 INTRODUCTION

The idea that trade can be the engine of economic growth goes back as far as Adam Smith, and his theories on specialization. Despite this long historical theoretical link, throughout the twentieth century many writers offered their views on why trade was bad for development. Authors such as Prebisch and Singer developed theories such as the “Import Substitution Industrialization” theory. This was based on the view that a secular decline in raw materials prices would cause the gap between developed and developing countries to worsen due to the fact that developing countries usually exported heavily in raw materials. Therefore, poorer countries would need to industrialize to develop, and to do this would need protection in the form of trade barriers in order to nurture indigenous infant industry. Marxist writers went further and said that poor countries should not trade at all with the so-called “north”. Despite these anti-trade theories, there exists a vast literature on the links between trade and economic growth and development. A lot of the literature consists of analysis and testing of the Export-Led Growth (ELG) hypothesis. This hypothesis states that promotion of the export sector is the best way to achieve economic growth. This is a valid hypothesis and there are many explanations as to why exports are a crucial way to obtain growth. The demand-side argument is that domestic markets severely limit the scope for sales of a domestically produced product, and that exports open domestic industries up to foreign markets, hugely increasing the potential demand for the product. This increase in potential market size can lead to increasing returns, whereas the home market may have been too small to achieve optimal scale. The economies of scale that can be achieved from exporting lead to increased capacity utilization, which results in greater product variety and productivity gains. Greater exposure to world markets may induce competitive pressures and may spur innovation and facilitate technological advancement and knowledge spillovers into the domestic economy, that lead to technological upgrading and efficiency gains in production and management practices. Evidence of this effect, which will be cited quite

[1]regularly, comes in Gorg and Strobl (2005). Exports also generate much-needed foreign exchange, which can be used to provide the public funds needed to divert production towards the most growth-enhancing industries. This specialization towards more productive export industries and away from relatively inefficient sectors increases human capital through an increase in the general skill level of the country. Another argument for the ELG hypothesis is that it may be seen as part of the product and industry lifecycle hypothesis. This hypothesis describes economic growth as a cycle that begins with exports of primary goods. Over time, economic growth and knowledge change the structure of the domestic economy, including consumer demand, which propels the more technology-intensive domestic industry to begin exporting. As domestic demand ebbs, economic growth arises from technologically advanced exports.

The author's view, which sets the context for the rest of this paper, is that trade is not an end in itself. It is not simply the case that a country can simply increase its exports *per se* and be sure of experiencing economic growth, but rather it is the composition and the concentration of these exports that counts.

The structure of a country's export basket is the important factor in encouraging economic growth through exports. How the structure of a country's export basket comes about can be viewed through the lens of Heckscher-Ohlin trade theory. This theory assumes identical production technology everywhere and assumes that the only difference between countries is in their relative abundances of capital and labour. The varying factor proportions between countries determine a country's basket of goods produced. Countries that produce technologically more intensive goods are those with a relatively high capital-labour ratio. Another possibility is that the level of human capital in such countries is high, which is evidenced by a high skilled-to-unskilled labour ratio. Such countries are usually developed countries. Poorer countries usually have a lower capital-labour ratio, a low skilled-to-unskilled labour ratio and thus, produce goods that are more labour intensive and less technologically sophisticated. In general, one can posit that

countries tend to export goods whose production makes intensive use of resources of which they have a relatively large supply and, conversely, to import goods which require large inputs of resources that are locally scarce. Later exponents of Heckscher-Ohlin theory, e.g. Mayer & Wood (2001) regard the following three resources as those whose variation affects export composition: skill (human capital acquired through education or training), land (meaning natural resources of all sorts) and labour. Capital is omitted as it has become an almost completely freely tradable commodity and, therefore, cannot be regarded as giving a country a relative comparative advantage from being part of its resource endowment. If a country has a comparative advantage in a resource such as zinc or copper or labour, it can easily obtain the capital needed to develop this resource and to set up an export industry around this resource. While this is a very simplistic model with many strong assumptions, the basic findings of it are very relevant to any analysis of export composition across countries. While this paper will not look in detail at the explanation behind countries' export compositions, this Heckscher-Ohlin analysis will provide a good background that can be referred to when looking at the results presented in Section 3.

Section 2 will provide a review of the literature on the ELG hypothesis, and, more specifically on the link between export composition and growth. Section 3 will take from the work of Hausmann, Hwang and Rodrik (2005), who calculate an index, which they call EXPY, which is a measure of the sophistication of a country's export basket. It is this index that forms the main empirical section of this paper. Further detail on the intuition behind this index and its calculation will be provided in Section 3. Section 3 will also provide the sources and explanation of all data used. In Section 4, standard growth regressions will be presented, with the inclusion of EXPY for each country as an independent variable. A more formal analysis of the effect of export composition on growth will be possible from these regressions. Conclusions will be drawn from the study in Section 5.

2 LITERATURE REVIEW

A brief overview of the Export-Led Growth (ELG) literature will be carried out, before moving on to the literature on export composition. There are many plausible reasons within trade theory to support the ELG hypothesis. Broadly, the focus of the ELG debate is on whether a country is better served by orienting trade policies towards export promotion or import substitution. Examples such as the economic success of the outward-oriented Asian "tiger" economies would seem to suggest the ELG hypothesis is valid. The effectiveness of export promotion as an engine for economic growth is, in the end, an empirical issue.

Most authors who look at the ELG hypothesis will cite the same logical reasons for supporting the ELG in their introductions. Where they differ however, is in their methods of testing the hypothesis. They vary in the econometric techniques used, in the samples of countries used, and in the indicator for exports used.

Early work examining the ELG hypothesis includes that of Michaely (1977) and Balassa (1978). These papers use the rank correlation technique with Michaely using averaged GNP per capita growth and averaged growth in export share, and Balassa using average growth in real GNP and growth in real exports. Both authors find a statistically significant positive export-economic growth relationship. Michaely's findings must be qualified further however, as he finds that a minimum threshold of development is needed before the association can exist. This is a plausible hypothesis that appears quite regularly in the literature – that the poorest countries cannot use exports as an engine for growth; they must first reach a certain 'threshold' level of development before this is possible. Balassa also carries out an OLS growth regression with averaged GNP growth as the independent variable, and averaged growth in real exports, averaged labour force growth, averaged domestic investment as a share of output and averaged foreign investment as a share of output as the dependant variables. From this growth regression, he also finds a positive export-economic growth relationship, although the results from a simple OLS regression must be viewed with caution, as they do not take the possible endogeneity of exports into account. Giles and Williams

(2000) claim that the positive association that these types of cross-country studies find “is as compatible with GLE as with ELG or feedback effects”, where GLE refers to Growth-Led Exports and the issue of reverse causality.

Other studies to carry out variants of OLS growth regressions include Balassa (1981), Jaffee (1985), Kohli and Singh (1989), Fosu (1990) and Park and Prime (1997). All of these studies use some combination of investment, education or human capital, population growth and labour force growth, along with export growth or export share of GDP, as their dependent variables. All find a positive relationship between exports and economic growth. Once more, any OLS cross-country results must be viewed skeptically.

The work of Feder (1983) is seen as something of a seminal contribution to the export literature. According to Ibrahim and MacPhee (2003), this study was “the first attempt to model an explicit link between trade and growth”. In the study, Feder hypothesizes that there is one mechanism causing the link between trade and growth, namely the higher productivity of the export sector relative to the domestic non-export sector. Feder puts forward a number of reasons as to why this productivity differential can lead to increased growth across the whole economy. Examples of reasons for the export sector becoming more productive include the need for domestic management practices to become more efficient in the face of stiff foreign competition; increased awareness of technical progress abroad creating incentives for innovation at home; firms taking advantage of economies of scale due to the ability to increase production in the face of the increased demand from new markets. Feder tested his proposition using a dataset of 31 developing countries for the years 1964-73. He found the productivity differential to be significant for all countries.

With reference to the impact of the export sector on the rest of the economy, Feder (1983) proposed the following reasons for an externality effect from the export to the domestic sector: the training of higher quality labour; a steady flow of imported inputs; introduction of new production techniques. Feder tested this hypothesis and found a positive and statistically significant externality coefficient.

Ibrahim and MacPhee (2003) themselves use Feder's model but apply new data for 30 developing countries from the years 1974 to 1993. Feder's

extremely strong support for the ELG is not supported by their econometric analysis. They found that for 18 of the 30 countries analyzed, there is a positive and statistically significant productivity differential for the export sector relative to the domestic sector and that 13 countries have positive and significant externality coefficients. Support for Feder's hypothesis is still found, but it is not as strong. Interestingly from the viewpoint of this study the authors find that the export-non-export differential seems to be strongest in those countries that export manufactured products rather than primary goods. They also find that "strong – or moderate – outward orientation, a well-diversified export structure and highly processed export products generally characterize countries with export sectors that generate positive externalities for the non-export sector".

Unlike the cross-country literature, there is much less consensus on the ELG hypothesis in the time-series literature. There is a much higher proportion of authors who reject the ELG hypothesis than in the cross-country literature. Giles and Williams (2000), in their survey of the empirical literature on the ELG, point out that 74 per cent of the time series literature reviewed used some form of Granger's causality test, with the other 26 per cent using time series data to estimate regression models that do not incorporate dynamic effects. Emphasis is put on the 'atheoretical' nature of Granger's test, in that no *a priori* restrictions are put on the relationships between the variables of interest.

Examples of time-series studies that find support for the ELG hypothesis include Abou-Stait (2005) for Egypt, Awokuse (2002) Canada. In contrast to these two studies, Henriques and Sadorsky (1996) find that economic growth in fact precedes exports, i.e., support for the GLE (Growth-Led Exports) hypothesis. Others find bi-directional causality, and some, such as Darrat (1986), Grabowski *et al.* (1990) and Serletis (1992) find no causality at all for some of the countries or time periods of their study.

Herzer, Nowak-Lehmann and Siliverstovs (2004) examine the ELG hypothesis for Chile using annual time series data in a production function framework. It differs from other time series work in that it disaggregates total exports into primary and manufactured exports, looking at their effect on productivity growth, rather than simply on the effect of aggregate exports.

Primary product exports were found to have a statistically significant negative impact, whereas manufacturing exports were found to have a statistically significant positive impact on non-export GDP. These results were shown to be robust to different estimation techniques. The authors claim, “in connection with the theoretical foundations underpinning our model, the estimation results can be interpreted as evidence of productivity-enhancing effects of manufactured exports and of productivity-limiting effects of primary exports”. They identify one of the main issues put forward in the introduction to this paper when trying to explain the link between export composition and growth: “manufactured exports might offer greater potential for knowledge spillovers and other externalities than primary exports”.

Crespo-Cuaresma and Wörz (2005) group manufacturing industries into two broad groups, referred to as low and high-technology activities, based on the classification by Hatzichronoglou (1997). This is a classification based on R&D intensity in a specific industry taking into account purchases of intermediaries and capital goods from other sectors. In their model GDP growth is regressed on share of investment in GDP, population growth, non-manufacturing exports, low-technology exports and high technology or technology-intensive exports. High-tech exports are found to have a significant positive effect, with low technology manufacturing now exhibiting a significant negative effect.

One final interesting result from this study arises when the sample of countries is divided into OECD and non-OECD countries. For the group of industrialized countries, there is no significant effect of the productivity differential of the export sector relative to the domestic sector on economic growth. This significant positive effect exists only for developing countries. This would concur with the view of Balassa (1981): ‘for given increments of capital, labour and exports, the rate of economic growth will be higher the lower is the level of development’. Thus, the authors conclude that developing countries can experience gains from opening up to international trade via “improved resource allocation as a result of their exposure to international competition”, while learning effects and other positive externalities are found to not be of much importance.

In Greenaway *et al.* (1999) exports are disaggregated further in this study into fuel, food, metals, other primary, machinery, textiles, and other manufactures, making it the most similar in terms of aggregation to this paper. They introduce exports into a traditional growth theory framework, with GDP per capita being explained by initial GDP (to pick up ‘catch up’ effects), level of secondary school enrollment, a terms of trade index, population, share of investment in GDP and, in the first regression, an export ratio variable, and secondly, share of each export sector in GDP. The first regression carried out is, thus, effectively a test of the ELG hypothesis. Even after controlling for endogeneity of the export variable and correcting the dependent variable for growth accounting effects, the export variable still has a positive and statistically significant effect on economic growth. Once exports are divided into the above-mentioned categories, fuels, metals and textiles appear to be the most important drivers of economic growth. The authors point out that this should be expected, due to the relative importance of the textile sector to developing countries and due to metals and fuels being inputs in industrialized countries.

Schott (2006) provides a useful theoretical explanation for export composition. Embedded within the Hecksher-Ohlin framework, he is able to explain China’s export composition, which is more sophisticated than would be expected, which is also found in the empirical section of this paper. The reason proffered relates to factor distribution “lumpiness”. As a whole, China should specialise in labour-intensive goods due to its factor endowment. However, the reality is there are certain areas within the country that are in fact skill-abundant, thus having a comparative advantage in skill-intensive products. Thus China’s export composition is not as labour-intensive as one would expect at first glance. This phenomenon is to be expected in larger countries, which by definition should have a higher level of factor variation within their borders. It is certainly a possible explanation for some results in this paper.

The studies that have most influenced this paper are Hausmann, Hwang and Rodrik (2005); '*What you export matters*', and Rodrik (2006); '*What's so special about China's exports?*' These studies are the first to make use of the PRODY and EXPY indices as methods of calculating measures of export

sophistication. Details on the intuition behind these indices and their calculation are included in Section 3. The authors argue, citing Hausmann and Rodrik (2003); '*Economic development as self-discovery',* that it is not only the normal fundamentals such as endowments and institutional quality that determine a country's specialization pattern, but also the number of entrepreneurs in a country that embark on ventures which, if successful, will lead to huge positive externalities for other potential investors in that economy. It is this characteristic which the authors refer to as the "idiosyncratic" element in the determination of a country's export composition, i.e., that which cannot be explained by normal fundamentals. They argue that such entrepreneurs are effectively testing the cost structure of the economy for all other potential investors, carrying huge personal risk as they delve into the "unknown". While if they succeed, the emulation of their venture by other investors in effect "socializes" the externality, if they do not succeed, the losses remain private. This leads to a sub-optimal amount of the knowledge externality in the economy unless the government can find a way to internalize the externality. An example of such a mechanism being put in place is the Korean government's subsidizing and offering of cheap bank credit to many firms, particularly in the electronics industry. This was done with the aim of overcoming the sub-optimal provision of the positive externality associated with enterprising projects. Where the Korean government differed from other state-sponsored schemes was through their controlling of the available credit through state-owned commercial banks. They were very quick to pull support for enterprises if available information suggested that productivity would lag. They could freeze bank credit on any poorly performing ventures that they had aided. Through this scheme, only truly exceptional performers made it through, the result being the spectacular performance of the Korean economy as the century wore on, with the electronics industry serving as an engine for economic growth. As an example of the government's ruthlessness, only three of the top ten performing government-aided enterprises in 1965 made it onto the same list in 1975, with only seven from the 1975 list making it onto the 1985 list. Taiwan's similar economic success has its roots in an identical strategy aimed at the textiles industry, which started in the 1950's, as did Japan with its computer industry.

The link between this hypothesis and the calculation of PRODY and EXPY indices can be summarized by quoting Hausmann, Hwang and Rodrik (2005): “some traded goods are associated with higher productivity levels than others and … countries that latch on to higher productivity goods (through the cost discovery process just described) will perform better”. It is through this thought process and with this logic that the authors justify the calculation of PRODY and EXPY. These indices aim to identify products that have high sophistication levels and, therefore, growth-enhancing effects. Once identified, it is postulated that countries that can position themselves such that their export basket is comprised mainly of goods with high levels of PRODY (thus ensuring a high EXPY level as EXPY is the weighted sum of the PRODY values of goods exported) are the countries with the greatest potential for growth and development. The authors find some interesting results. Two of the most important results are those for China and India. These are two countries that have experienced great growth in recent years. The results from this study show both countries, and in particular China, to have EXPY levels far greater than would have been expected given their income levels. It is this revelation that inspired Rodrik (2006) to investigate further in the study *‘What’s so special about China’s exports?’* China and India’s relatively high EXPY ratings imply that these countries are exporting a range of goods that is far more sophisticated than one would have thought. As was demonstrated in the work of Schott (2006), China does not fit into the multiple-cone equilibrium of the Heckscher-Ohlin framework, which suggests that it would produce only low-skilled labour-intensive goods, in line with its factor endowments. The fact that this is not the case for China can be explained by Schott’s idea of lumpiness of the distribution of factors within the country, with some areas high in physical and human capital accounting for the surprisingly sophisticated export structure, perhaps more so than by the self-discovery idea of Hausmann and Rodrik (2003). The Indian case has proven even harder to explain. It is the Information Technology (IT) sector that has been the motor for India's high economic growth, yet India is certainly not a country that would be expected to have a comparative advantage in IT. It has low levels of IT penetration indicators, has not latched on to any other high-tech sectors, and is relatively highly endowed in low-skilled workers. One

reason given is the fact that work sent from the US at close of business that is being processed in cities such as Bangalore is ready at the start of business in the US due to the time difference, making this outsourcing a very efficient option. The proficiency of many Indians in the English language, along with the impressive structure of Indian Institutes of Technology, are also mentioned.

In summarizing the work of Hausmann *et al.* (2005), the clear implication is, like in many of the studies cited above, that gains from trade occurring due to globalization are not unlimited and unqualified. For a country to gain from trade, it must be able to latch onto certain industries that are placed highly along the quality spectrum, proxied in this study by the PRODY index.

3 EMPIRICS

3.1 EXPY Calculation

It would be constructive at this point to introduce Balassa's (1965) concept of Revealed Comparative Advantage (RCA). RCA for country i and industry j is defined as

$$RCA_{ij} = \frac{X_{ij} / X_i}{\sum_{i=1} X_{ij} / X_i}$$

If we take the example of Ireland's RCA for Insurance and Financial services, the figure calculated is the share of Ireland's export share in this industry relative to the share of motor vehicles in total world exports. From this calculation, we can say that if $RCA_{\text{Ireland, Insurance and Financial Services}} > 1$, then Ireland has a Revealed Comparative Advantage in this sector. This is the essence of the Balassa measure. RCA is used as a weight for every country exporting in a sector below in the calculation of PRODY, which is the proxy measure used here of a product or sector's Total Factor Productivity.

EXPY is a measure of the sophistication of a country's export basket. In order to calculate EXPY for each country, PRODY must first be calculated, which is a weighted average of the incomes of the countries exporting a good. Because higher-income countries tend to be more capital-abundant, and thus through the lens of the Heckscher-Ohlin framework should produce more skill or capital-intensive goods, this RCA-weighted average of incomes is a valid proxy for the productivity or sophistication of a particular export good. Let countries be indexed by *j* and sectors be indexed by *k*. Total exports of country *j* are thus given by

$$X_j = \sum_k x_{jk}$$

By denoting the per-capita GDP of country *j* as Y_j, the following expression for $PRODY_k$ is arrived at:

$$PRODY_k \equiv \sum_j \frac{x_{jk} / X_j}{\sum_j (x_{jk} / X_j)} Y_j$$

What this means is that PRODY is an RCA-weighted average of the incomes of countries exporting that good, where the weights correspond to the RCA of each country in good *k*. The mapping of an RCA-weighted index to productivity has the potential to cause controversy. Yi (2003) points to the work of Davis (1995) to allay such fears. Davis presents a model in which interindustry trade is determined by Heckscher-Ohlin forces, while intraindustry trade is determined by Ricardian forces. Davis' theoretical framework confirms a positive relationship between the relative productivity of an industry and its RCA. Yi also calculates correlation between manufacturing relative TFP measures drawn from Harrigan (1997a, 1997b, 1999) and RCAs computed from OECD input-output tables for 1985. The correlation found is .31, which is taken to be sufficient to demonstrate a link between the two. This gives us the theoretical and empirical backing to continue with PRODY being used as a proxy for Total Factor Productivity in an industry. To quote form Yi: As the number of goods for which a country has higher relative productivity increases, exports from that industry will increase, as will the country's RCA.

This quantitative index also allows the idea of Hausmann *et al*. (2005) regarding the "idiosyncratic" element of the determination of a country's export basket to be factored in, whereby certain countries will have export baskets that are more sophisticated than would have been expected in a H-O world, given their endowment. Some examples of this appear in the results section, where countries appear towards the top of global EXPY standings despite having a per-capita GDP that would lead us to predict a much lower EXPY value.

Focus can now be turned to the calculation of the EXPY index for each country *j*. $EXPY_j$ is defined as the sophistication level associated with a country's export basket. It is calculated simply as the weighted sum of the PRODY values for each sector *k* where the weights are the value share of sector *k* in country *j*'s export basket.

$$EXPY_j = \sum_k \frac{x_{jk}}{X_j} PRODY_k$$

This gives the weighted averages of the GDP per capita of all countries exporting the same goods as country *j*, where the weights are as described

above. This can then be interpreted as the quality or sophistication level of country *j*'s export basket. Some aforementioned reasons can be cited to explain the importance of a high EXPY value. These include the greater potential for knowledge and technology spillovers into the domestic sector from skill and capital intensive activities, the exposure to more efficient foreign management practices and the incentive for innovation brought about by exposure to foreign competition.

To put the values that countries attain given the data in this paper in context, it is possible to put lower and upper bounds on EXPY. 2003 values are arbitrarily cited for demonstration purposes (see Table 2). The lower bound would be attained if a country had 100% of its exports in the sector with the lowest PRODY rating. In this paper that would imply an EXPY of $5,331million, in 2003, which would be attained if a country had 100% of its exports in the Agricultural Raw Materials sector. The upper bound, on the other hand, would be attained if a country had 100% of its exports in the sector with the highest PRODY score. In this paper, for 2003, this would imply an EXPY value of $16,579million, which would be attained if a country had 100% of its exports in the Insurance and Financial Services sector.

In this, the first empirical section of this paper, EXPY values for samples of countries for the years 1980, 1985, 1990, 1995, 2000 and 2003 will be calculated. In doing this the sectors with the highest PRODY values will be identified. The countries that have the highest EXPY values and how these values have evolved over time will also be identified, thus giving an idea of which countries have derived the greatest advantage from their export basket. The calculation of PRODY and EXPY values attempts to identify the most growth-enhancing sectors and to show which countries are employing the "best" export strategies.

3.2 Data and Methodology

GDP per capita data are from the World Development Indicators (WDI) for 2005, obtained from the World Bank. The series used is GDP per capita, PPP (constant 2000 international $). By using such a measure for GDP, correction is made both for differences across time (inflation) and differences across

countries (deviations from purchasing power parity). This means that all PRODY and EXPY calculated using this measure of income will be fully comparable across all time periods and countries.

All export data have also been taken from the WDI. The years examined are 1980, 1985, 1990, 1995, 2000 and 2003. The data are given in millions of current US Dollars. For the years 1980, 1985 and 1990, total exports are broken down by country into 9 sectors, which come in two categories. The first category is referred to as ”Merchandise Exports”. This category contains the following sectors:

- Agricultural Raw Materials
- Food
- Ores and Metals
- Fuels
- Manufacturing

The second category is referred to as “Commercial Service Exports”, and contains the following sectors:

- Transport Services
- Travel Services
- Insurance and Financial Services
- Computer and Communications Services

The only difference between this breakdown and that for the years 1995, 2000 and 2003 is that the sector entitled “Manufacturing” no longer exists and is instead broken down and replaced by the sectors entitled “High-Tech Manufacturing” and “Low-Tech Manufacturing”. This leads to a total of 10 sectors for the final three years examined. A limitation of this data is that the level of aggregation does not allow for heterogeneity within sectors to be accounted for. For example, within a sector such as Manufacturing, there are products with hugely varying sophistication levels, yet a PRODY value is given for the sector as a whole. This means that countries that could in fact be exporting quite different products within a given sector are being attributed the same value for that sector in the calculation of their EXPY value. Despite this,

the data does still allow a good opportunity for global trends in trade to be observed over the sample period.

The size of the sample of countries for which EXPY could be calculated is reported in Table 1. It ranges from a maximum of 117 in 2000 to a minimum of 77 in 1990. One reason for this inconsistency is that a number of the countries reporting in the latter years of the survey did not exist until the early 1990's. They include the former Yugoslav states such as Croatia, Slovenia etc., and former Soviet states such as Armenia, Estonia, Latvia, Lithuania, Belarus, Ukraine, etc., as well as the Czech Republic and Slovakia. Aside from the fact that these countries are missing, however, one must be very wary of smaller sample sizes, as the non-reporting of data is generally found to be highly negatively correlated with income.

The data that were used in calculating PRODY and EXPY for each year will now be specified. Separate PRODY scores are calculated for each of the years in the sample, applying the WDI export data to the formula specified in Section 3.1. The PRODY score for each separate year is used in calculating each country's EXPY value for that particular year. An alternative approach is used by Hausmann *et al*. (2005). They calculate PRODY values for each year, but then take an average figure from the three years that had the highest number of countries reporting. It is this average PRODY value that is used to calculate EXPY in each year. This method is disadvantageous as it fails to take account of changes in global trade patterns over the period. Rather, it simply tracks how the composition has changed within countries, with no regard for the fact that the sophistication of sectors, as measured by the RCA-weighted sum of the countries exporting them, may also change over time. The downside to using PRODY for each year is that there should be a tendency for EXPY to grow over time, seeing as PRODY should grow with GDP growth. Despite this expectation, we still see PRODY figures drop across certain time periods, meaning that EXPY figures can indeed decrease over time if export baskets are oriented towards the wrong sectors. It is not lost on the author however that this property does render the ordinal ranking of EXPY more important than the cardinal. It is still felt that this is a worthwhile approach in that the global trends in trade are not glossed over by using an average PRODY figure.

In the results section, it is clear that over the different years of the sample, the importance of some sectors, notably the Insurance and Financial Services sector, has increased relentlessly, while other sectors have remained stagnant and have even decreased in their sophistication levels, proxied by the weighted average of the incomes of the countries exporting them. The issue of non-comparability of data does not arise, as the data used are PPP-adjusted, constant 2000 international $, meaning that even if PRODY is calculated for different years using different income levels, they are still fully comparable.

An advantage of the methodology used to calculate PRODY is explained using an example. The rationale behind using comparative advantage as a weight is so that country size does not distort the rankings. If weighted averages were not used, the raw figures for the exports of the world's richest countries would render the data for poorer countries negligible. As an example, the exports of Agricultural Raw Materials for Benin and Brazil will be examined. In 2000, Benin's exports in this sector amounted to $281.82million, whereas Brazil's amounted to $2.62billion. This figure for Benin accounted for 54.37% of their exports in 2000, whereas the figure for Brazil accounted for a mere 4.15%. This means that in the weighted method of calculating PRODY for Agricultural Raw Materials, Benin's income will have a larger weighting than Brazil's income, even though Brazil's absolute volume of Agricultural Raw Materials exports is far larger than Benin's. This property means that the results expected by the underlying Heckscher-Ohlin framework are more likely to occur. Low-income countries with heavy dependence on low-sophistication sectors will account for relatively larger amounts of the PRODY figure for these sectors, with rich countries' incomes, due to their small export share in these sectors such as Agricultural Raw Materials, not giving much weight to that sector's PRODY. Conversely, rich counties with relatively large export shares in more sophisticated sectors will drive high PRODY values for these sectors.

3.3 Results

PRODY results for each year are given in Table 2. Some interesting patterns can be seen in the evolution of global trade from these results. In 1980, the

most sophisticated sector going by the countries that exported it was the Computer and Communications sector. The lowest PRODY values were those for the Food sector, followed by Agricultural Raw Materials and Ores and Metals. This ranking is consistent with the predictions of Heckscher-Ohlin theory, whereby the least sophisticated sectors are those produced by countries that have relatively high labour-capital ratios or alternatively unskilled-skilled labour ratios, i.e., lower income countries. This is borne out in the PRODY results obtained here in that the three sectors mentioned above are those that generally take up a high proportion of the export basket of countries with low per-capita GDPs. When considering the top of the rankings the same intuition holds, as High-Tech Manufacturing and the Insurance and Financial sector are those that hold the highest PRODY values across all years. These are the sectors that would be expected to take up relatively higher proportions of skill and capital-abundant countries' export baskets. It can be said from these rankings that the PRODY results are consistent with the underlying theoretical framework. An interesting case is that of the Insurance and Financial Services sector. At the start of the sample period, it had a PRODY value of $7,489million, leaving it fourth of the nine sectors at the time. This sector has increased steadily every year since, and in 2003 was the most sophisticated of the ten export sectors, with a PRODY value of $16,579million. This shows an important trend in global trade towards so-called "weightless" service exports. This sector does not comprise a large percentage of any particular country's export basket, but its high values are instead driven by steady (between 5% and 10%) shares in the export baskets of all the world's richest countries such as the USA, UK, Switzerland, Germany, France, Belgium and even Ireland. Other notable trends include the decline in fuel in the eighties followed by a revival in its sophistication level to over $9,000million by 2003, the steady increase of the Transport sector, reaching over $10,000million for 2003, and the continued appearance of the primary sectors of Agricultural Raw Materials, Food and Ores & Metals at the bottom of the PRODY rankings. These are important trends that must be taken into account, and which are influential in the evolution of countries' EXPY values over time.

Moving onto the results for EXPY, the twenty highest and twenty lowest EXPY values are shown for each year in Table 4. The global average for EXPY is given in Table 3.

In each year, there are always some countries that have disproportionately high EXPY values due to a reliance on one particular sector, thus not truly reflecting a strong export composition. An example is that of Petro-states such as Algeria, which in 1980 had 95% of its exports in Fuel. In 1980, Fuel was ranked 3rd out of the nine sectors in terms of PRODY. Over the sample it hovers around 6th or 7th in the rankings. Its PRODY value of between $6,500million and $9,600million is nonetheless high enough that if exceptionally large (often over 90%) proportions of exports lie within it, it will lead to disproportionately high EXPY ratings. Countries such as Congo and Trinidad & Tobago in 1980 and Nigeria in 2000 also have similar fuel-dominated EXPY values. While these countries still do not feature towards the top of the global EXPY rankings, this huge reliance on Fuel ensures that they hover around the global average. Without Fuel having such a high PRODY relative to other sectors prominent in countries of similar GDP, it would be expected that the above-mentioned countries would feature at the bottom end of the rankings, where countries of similar GDP per capita find themselves. These other low-income countries are those that fit into the underlying theoretical framework, with high percentages of their exports in the low PRODY sectors such as Agricultural Raw Materials, Food and Ores & Metals. An example of a lower-income country that has gained from its export composition is Egypt, which in 1980 had 23% of its exports in Transport, 11% in Travel, 9% in Computers and Communications, 9% in Agricultural Raw Materials, 4% in Food, 6% in Manufacturing along with 36% in Fuel. This is an example of a so-called “second world” country that has a well-diversified, relatively highly productive export basket, managing to stay above the global average from 1980 to 1995. Most European countries (along with the USA and Canada) that appear in the top twenty in any given year are developed countries that do not rely heavily on any given sector, but have quite high proportions of their export basket in all the high-PRODY sectors. This is not the case for Japan and Korea, and even Germany, which feature at the top of the early EXPY ratings, however. These countries had up to 80% of their

exports in Manufacturing in these early years, ensuring very high PRODY values. The former is clearly the situation to which developing countries would aspire in the long run. It is often, however, very difficult to move towards this aim in the short run, due to what some commentators on export composition and growth, such as Michaely (1977) and Tyler (1981), have termed the "threshold effect". This means that countries must attain a certain level of development before they will see the gains from the composition of their exports. One possible reason for this is that low income is usually correlated with poor institutional quality and poor governance, two causes that are often cited when explaining poor (in particular African) countries' lack of economic growth.

In the latter years of the sample, some unexpected countries are seen towards the top of the EXPY tables. The majority of these countries have high reliance on certain sectors, just as the Petro-states mentioned above, but in this case the reliance is on more stable, less risk-bearing, higher PRODY sectors such as High and Low-Tech Manufacturing. See Tables 4e and 4f for rankings. In 2003, the Philippines had 61% of its exports in High-Tech Manufacturing and 22% in Low-Tech Manufacturing, with all other sectors taking up just 15%. These figures are almost identical for 2000. Singapore shows similar trends, though without such an extreme concentration. The same two sectors take up 69% in 1995, and 74% in 2000 and 2003. Singapore also had higher GDP per capita and higher growth over 1995, 2000 and 2003, something which could be attributed to its higher level of economic development, thus rendering it better able to exploit the gains from its exports.

Another example of a country that experienced rapid growth is Malaysia. For the years 1990, 1995 and 2000, Malaysia averaged 9% growth. This was one of the success stories of the "Asian Tiger" era, which also included Singapore, as discussed above, along with Korea and Taiwan. As can be seen from Tables 4c to 4e, in this period Malaysia features very high up the list of EXPY values, as does Korea. From the results presented in this paper, these countries can also be shown to confirm the importance of diversifying exports into high productivity-enhancing activities in order to achieve growth. A similar situation to the East Asian countries discussed above exists for China, the major rising economic power. It is a source of

major comment and debate, with Hausmann, Hwang and Rodrik (2005) giving it special mention, and Rodrik (2006) focusing purely on China's exports. China has an EXPY value on a par with Switzerland, the UK, Germany, France and Japan and the USA in the years 1995, 2000 and 2003. These are countries that had income levels several times larger than China's in these years. On examination of the data which goes back quite a number of years, the comparison can be made that China's EXPY in the 1980's was merely in the middle of the global rankings, whereas it has shot up to rival that of the major economic powers since the mid nineties. This time period is in line with the period of China's rapid and unprecedented economic growth, which is causing such comment and analysis worldwide. Rodrik's (2006) hypothesis is that this rapid growth has been fuelled in no small way by China having an export basket consisting of high-PRODY goods. This hypothesis is confirmed by the findings in this paper, particularly when the comparison with China's earlier EXPY values is taken into account. Again, like Singapore, the Philippines and Malaysia, the major reliance is on the Manufacturing sectors. However, a closer look at the data reveals that China's export basket is certainly moving in a healthy direction. In 1995, it had 8% in high-tech Manufacturing and 68% in low-tech. By 2000 these figures had become 15% and 64%, respectively, and by 2003 were 22% and 59%, respectively. As can be seen, China has been moving into higher technology, more productivity-enhancing, skill-intensive sectors as the economic boom has progressed. This progression can be used as part explanation for this rapid growth, as argued by Rodrik (2006).

At the opposite end of the rankings, examples such as that of Benin can be cited, with 26% of its exports in Agricultural Raw Materials and 46% in food in 2003. These are the low-skill sectors that the Heckscher-Ohlin framework associates with low-income countries, and are those that offer the least possibilities for knowledge spillovers and other positive externalities into the domestic economy. Similar situations exist for the majority of countries cited in the bottom twenty listed in Tables 4a to 4f. A surprising entry in this list is Iceland for 2000. Despite having an impressive GDP per capita of some $28,000, Iceland's export basket is not composed of products that would be expected for such an income. The main driver of the low EXPY is Food, taking

up 44%, while Ores & Metals take up 13%, with both Manufacturing sectors and Insurance and Financial Services accounting for just 10% altogether. Similar anecdotal evidence is available for other primary-oriented exporters such as Argentina in 1985 and New Zealand in 1990. These countries were also plagued with low growth over the period, with New Zealand growing by less than 1% up until 2000, when it catapulted to 4%. Argentina in fact experienced negative growth in each year of the sample since 1985, although this country has had many other well-documented problems regarding its macroeconomic management. These examples can be tied in with the literature on the natural resource curse and “Dutch disease”

The impact of EXPY on growth has been presented in an anecdotal form in this section, with many examples given of countries that have grown in tandem with increased sophistication of their export baskets. This relationship will be tested formally in the next section using panel regression analysis.

4 GROWTH REGRESSIONS

4.1 Data and Methodology

Attention will now be turned to the relationship between EXPY and growth. For the growth regressions, the y-variable is GDP growth (annual %). This series was also taken from the WDI (2005) database, along with population growth (annual %). As an indicator for educational attainment, the percentage of the over 25 population for whom secondary education is the highest level achieved is used. This was obtained from Barro and Lee's "International Data on Educational Attainment: Updates and Implications" published in 2000. The share of investment in GDP is also included in the growth regression. This data was obtained from the Penn World Table database. As the data came from different sources, it was inevitable that certain countries would have missing observations in some of the series. As a result, the final sample size for the balanced panel is 50 countries, for the years 1980, 1985, 1990, 1995 and 2000, thus leading to 250 observations. A list of the countries included in the panel is given in Table 5.

4.2 Regressions and Results

A panel regression is carried out using the random effects estimator with GDP growth (annual %) as the dependent variable, and education, investment/GDP, population growth and EXPY as the independent variables. This is referred to as Regression 1 in the results, which are given in Table 7. EXPY enters into this panel with a positive impact of 0.00061, significant at the 1% level. This means that a one-unit increase in EXPY leads to a 0.00061 of a per cent increase in growth. Considering EXPY values average between $8,000 and $10,000 (where the unit is millions of dollars), a more relevant observation would be that a 1,000-unit increase in EXPY (equating to in and around a 10% increase) leads to approximately a three fifths of a percent increase in growth. This is significant at the one percent level. Increases (and decreases) of over 500 units have occurred regularly across the 5-year periods in the sample studied, meaning that this is not a negligible impact. Aside from EXPY, the education variable shows no significant effect on

growth in this sample, while population growth and the investment to GDP ratio show the expected positive effects, significant at the one percent level.

The balanced panel was then divided into two sub-samples, high and low-income countries. These are defined by the WDI (2005). The sample of high-income countries comprised those defined as “high-income, OECD”, “high-income, non-OECD” and “upper middle income”, with a sample size of 30. The low-income sub sample comprised countries defined as “lower middle income” and “low-income”, with a sample size of 20. The division of the countries between these two samples is given in Tables 6a and 6b. The aim was to investigate whether or not some of the results could be attributed to a strong influence from one of the income groups. The same regression as before was carried out with the regression of the high-income countries referred to as Regression 2 and the regression of low-income countries referred to as Regression 3. Results are given in Table 7.

For the sub-sample of high-income countries, the impact of EXPY remains almost identical at 0.63 of a percent for a 1000-unit increase in EXPY. This is significant at the one percent level. A more interesting result is that for the sub-sample of lower income countries. For this sample the impact of EXPY is significant only at the 5% level, but has an increased effect of three-quarters of a percent on growth for a 1000-unit increase. Population growth is significant at the 1% level for both sub-samples, with there being a stronger effect for lower income countries, as would be expected. The investment to GDP ratio is significant at the 1% level for rich countries, while only at the 10% level for lower income countries. It also has a greater impact on lower income countries. The importance of the results found in this section should not be underestimated. It has been found that export sophistication can have growth-enhancing effects, with countries that increase the sophistication of their export basket by roughly 10-12% standing to increase growth by three fifths of a percent. A more interesting observation is that the effect of EXPY on growth is compounded when low-income countries are viewed, with the effect rising to three-quarters of a percent on growth. This observation for low-income countries has interesting connotations for economic development, leading to policy implications that should be the subject of further debate and discussion.

5 CONCLUSION

The export led growth (ELG) hypothesis states that an increase in the volume of exports can drive economic growth. In this paper, the principal aim was to go further than this, and test whether it was the composition of exports, rather than the volume, that was more important for economic growth. Reasons cited for why this may be the case included the fact that exporting in more sophisticated sectors allows the transmission of knowledge and skills into the domestic economy through exposure to foreign competition and more efficient modern business practices. These competitive pressures spur innovation and technological advancement at home, leading to an increased skill level in the domestic economy. The explanation for why a country exports the type of products that it does was given through the Heckscher-Ohlin framework, whereby countries produce and export goods for which they have a comparative endowment advantage. Countries that have high capital-labour and high skilled-unskilled labour ratios are typically rich, developed countries. It is for this reason that the weighted average of the GDP per capita of all countries exporting a product is used as a proxy for product sophistication in this paper. This weighted average is known as PRODY. The weights in PRODY calculation correspond to revealed comparative advantage in the particular sector.

PRODY was calculated for 11 sectors across 6 different years. The results were in line with the underlying theoretical framework, with the highest PRODY figures being for sectors exported predominantly by developed countries such as High-Tech Manufacturing and Insurance and Financial Services. The lowest PRODY values were for primary sectors, which typically take up a higher share of less developed countries' exports.

The sophistication level of a country's export basket is then calculated simply as the weighted average of the PRODY for each sector, where the weights are the value share of each sector in the country's exports. This gives an index referred to as EXPY. The results section in this study shows that developed countries such as Japan, Germany, France, USA, UK and in later years Ireland, take their place towards the top of global EXPY rankings. It can also be seen, interestingly, that growing countries such as China, Singapore,

Malaysia and the Philippines have also been toward the top of the global tables over the years. This surprising result, given these countries' GDP per capita levels, can be viewed as evidence that a high EXPY level can be an engine for economic growth.

To test this anecdotal evidence more formally, in Section 4 panel growth regressions were reported with EXPY included as an explanatory variable along with the standard education, population growth and investment variables. EXPY entered into this model with a positive effect, significant at the one percent level. An increase of roughly 10% in EXPY increases GDP growth by three fifths of a percentage point. This formalized the hypothesis of the paper. Even more interestingly, when the countries of the panel were divided into poor and rich countries, the effect stayed identical for rich countries, and increased further to three quarters of a percentage point for the poor countries of the sample. These important findings have implications for thinking in economic development, in that perhaps underdeveloped countries need to be encouraged to diversify their export baskets towards more sophisticated sectors in order to move away from their current economic status. Clearly, there is a great deal of complexity involved in such a move, and much investment in capital, human and otherwise, required, which should be the subject of much discussion in further research.

An economy must align its export composition so as to be able to latch onto highly sophisticated export sectors. In the case where the export sector is reliant on foreign investment, it must also however have the systems available for learning to take place so that knowledge diffusion can occur into the domestic economy. It seems that the combination of these two is the ideal, yet difficult-to-attain, situation for a country to be in, in order to ensure that the gains from its exports are converted into increases in economic growth. Such a strategy should be adopted to help sustain economic growth, particularly in the developing countries of the world.

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APPENDIX

Year	Sample Size
1980	80
1985	81
1990	77
1995	104
2000	117
2003	110

Table 1: Sample Size by Year

Year	1980	1985	1990	1995	2000	2003
Sector						
Agri. Raw Materials	5083.87	6682.73	6299.65	6474.05	6139.13	5331.75
Food	5855.20	6175.54	5870.32	6130.19	6772.26	5792.91
Fuel	8030.03	7463.18	6552.56	8964.72	8530.52	9343.17
Ores & Metals	6747.52	7463.70	6659.71	7760.63	7038.08	6502.98
Manufacturing	11553.56	11899.33	12122.81	N/A	N/A	N/A
High-Tech Manuf.	N/A	N/A	N/A	17321.66	17093.29	16017.65
Low-Tech Manuf.	N/A	N/A	N/A	11845.26	12292.71	10555.93
Computers & Comms.	17263.81	9400.49	9715.12	9109.63	11827.83	12904.14
Insurance & Financial	7489.70	9067.62	11406.31	12569.59	14072.13	16579.22
Transport	8280.93	8863.63	8748.92	8958.21	10793.94	10191.14
Travel	7395.41	8147.23	8473.82	8536.35	9630.41	8278.30

Table 2: PRODY Results by Year and Sector

Year	EXPY
1980	8435.15
1985	8737.97
1990	8942.59
1990	9428.86
2000	10386.08
2003	9436.22

Table 3: Global EXPY Average by Year

Country	EXPY
Japan	11240.54
Germany	11014.88
Switzerland	10957.31
France	10844.11
Korea, Rep.	10834.47
Sweden	10724.07
United Kingdom	10639.13
Italy	10596.81
Belgium	10501.5
Bangladesh	10484.85
Israel	10401.04
Finland	10037.16
Austria	10007.52
United States	9921.992
Singapore	9773.524
Greece	9675.116
Portugal	9673.243
Nepal	9631.769
Netherlands	9569.192
Spain	9560.237
Togo	7577.24
Guatemala	7544.356
Ecuador	7536.391
Malaysia	7529.904
Benin	7491.324
Turkey	7449.222
St. Vincent and the Grenadines	7373.32
New Zealand	7333.241
Cameroon	7292.006
Bolivia	7178.171
Central African Republic	7100.727
Iceland	7077.966
Fiji	7009.06
Nicaragua	6797.034
Madagascar	6777.974
Malawi	6769.975
Honduras	6766.189
Burkina Faso	6729.044
Ghana	6641.015
Mali	6013.305

Table 4a: Selected EXPY Results for 1980

Country	EXPY
Japan	11504.07
Korea, Rep.	11182.90
Germany	11020.61
Switzerland	10848.03
Italy	10645.84
Sweden	10594.23
Finland	10472.58
Belgium	10378.50
Oman	10375.74
Austria	10283.99
Israel	10257.72
Malta	10190.23
Portugal	10158.17
United States	10122.24
France	10121.20
Hungary	10059.91
United Kingdom	10013.00
Ireland	9960.37
Canada	9928.69
Bangladesh	9907.59
Saudi Arabia	7876.17
Sudan	7871.44
Fiji	7770.79
Belize	7770.06
Costa Rica	7765.92
Argentina	7717.82
Congo, Rep.	7648.94
Bolivia	7580.67
Algeria	7575.97
Kenya	7543.03
Guatemala	7525.48
Iceland	7415.91
Chile	7394.70
Paraguay	7309.95
Ecuador	7258.17
Madagascar	7203.73
Cote d'Ivoire	7097.63
Papua New Guinea	7014.24
Nicaragua	7009.59
Malawi	6809.56
Solomon Islands	6720.51
Honduras	6719.74

Table 4b: Selected EXPY Results for 1985

Country	EXPY
Japan	11599.74
Korea, Rep.	11419.42
Germany	11263.8
Switzerland	11216.63
Italy	10986.61
Sweden	10858.42
Finland	10831.37
Israel	10678.01
Haiti	10633.66
United Kingdom	10627.47
Bangladesh	10579.71
Austria	10579.65
Pakistan	10569.71
Romania	10479.02
Portugal	10450.01
China	10411.09
France	10394.04
United States	10340.39
Ireland	10253.34
Singapore	10247.53
New Zealand	7756.265
Togo	7551.698
Benin	7548.784
Madagascar	7463.049
Paraguay	7433.935
Chile	7390.05
Papua New Guinea	7361.125
Cameroon	7262.146
Venezuela, RB	7210.254
Bolivia	7009.306
Oman	6848.872
Honduras	6845.472
Algeria	6812.414
Niger	6801.22
Ecuador	6771.767
Nicaragua	6686.092
Mali	6684.734
Angola	6600.508
Malawi	6399.443
Yemen, Rep.	6373.623

Table 4c: Selected EXPY Results for 1990

Country	EXPY
Singapore	12911.65
Japan	12592.72
Korea, Rep.	12273.23
Malaysia	12103.80
Ireland	12098.47
Switzerland	11671.28
United Kingdom	11612.70
Germany	11604.18
United States	11465.59
Sweden	11401.37
Finland	11329.21
China	11291.24
Mexico	11278.95
Israel	11195.98
Italy	11167.11
France	11038.92
Slovenia	10985.21
Thailand	10845.04
Bangladesh	10842.60
Slovak Republic	10734.10
Peru	8086.19
Paraguay	8049.69
Chile	8017.57
Costa Rica	7981.65
Cameroon	7849.95
Belize	7834.58
Moldova	7824.43
Benin	7816.55
Ecuador	7798.68
Ethiopia	7794.46
Madagascar	7754.12
Nicaragua	7620.50
Iceland	7539.89
Cote d'Ivoire	7538.64
Honduras	7030.54
Sudan	7000.20
Guinea-Bissau	6911.73
Uganda	6827.68
Malawi	6816.15
Burundi	6454.96

Table 4d: Selected EXPY Results for 1995

Country	EXPY
Philippines	14642.62
Singapore	13749.91
Malta	13602.72
Ireland	13414.14
Malaysia	13365.53
Japan	13214.37
Korea, Rep.	13026.83
Hong Kong, China	12845.07
United States	12509.51
Sweden	12479.96
Israel	12461.39
Finland	12445.38
Switzerland	12438.03
United Kingdom	12424.2
Germany	12380.53
Hungary	12342.27
Mexico	12317.1
China	12282.42
France	12038.11
Thailand	11994.47
Guinea	8693.475
Iceland	8673.727
Yemen, Rep.	8578.505
Guyana	8556.405
Peru	8540.134
Belize	8538.364
Ecuador	8488.333
Honduras	8479.462
Gabon	8465.627
Zambia	8450.648
Sudan	8444.499
Chile	8335.389
Ghana	8270.33
Cote d'Ivoire	8231.598
Papua New Guinea	7990.006
Nicaragua	7900.007
Burkina Faso	7825.986
Benin	7618.023
Malawi	7382.859
Burundi	6903.44

Table 4e: Selected EXPY Results for 2000

Country	EXPY
Philippines	13440.36
Singapore	12868.03
Ireland	12262.80
Malaysia	12121.61
Korea, Rep.	11825.90
Hong Kong, China	11823.49
Switzerland	11714.00
Japan	11671.37
United Kingdom	11611.91
China	11457.76
United States	11341.67
Israel	11260.27
Hungary	11189.06
Finland	11081.28
Germany	11079.33
Sweden	10963.22
Mexico	10884.57
Austria	10777.89
Czech Republic	10741.05
Netherlands	10734.11
Ecuador	8027.85
Papua New Guinea	7925.43
Mozambique	7850.17
Peru	7828.46
Guinea	7809.60
Rwanda	7787.61
Mali	7775.52
Côte d'Ivoire	7709.51
Tanzania	7652.08
Chile	7643.14
Honduras	7614.90
Ghana	7507.36
Uganda	7347.64
Nicaragua	7197.89
Sierra Leone	7153.21
Burkina Faso	6687.18
Benin	6652.58
Malawi	6606.49
Cambodia	6453.48
Burundi	6146.75

Table 4f: Selected EXPY Results for 2003

Argentina	Kenya
Australia	Korea, Rep.
Austria	Malawi
Bangladesh	Malaysia
Bolivia	Mexico
Brazil	Netherlands
Canada	New Zealand
Chile	Nicaragua
Colombia	Norway
Costa Rica	Pakistan
Ecuador	Panama
Egypt, Arab Rep.	Paraguay
El Salvador	Peru
France	Portugal
Germany	Singapore
Greece	Spain
Guatemala	Sweden
Honduras	Switzerland
India	Syrian Arab Republic
Ireland	Tunisia
Israel	Turkey
Italy	United Kingdom
Jamaica	United States
Japan	Uruguay
Jordan	Venezuela, RB

Table 5: Countries Included in Panel Growth Regression 1 below. ***Sample Size: 50***

Argentina	Mexico
Australia	Netherlands
Austria	New Zealand
Canada	Norway
Chile	Panama
Costa Rica	Portugal
France	Singapore
Germany	Spain
Greece	Sweden
Ireland	Switzerland
Israel	Turkey
Italy	United Kingdom
Japan	United States
Korea, Rep.	Uruguay
Malaysia	Venezuela, RB

Table 6a: High Income Countries Included in Panel Growth Regression 2 below. ***Sample Size: 30***

Bangladesh	Jamaica
Bolivia	Jordan
Brazil	Kenya
Colombia	Malawi
Ecuador	Nicaragua
Egypt, Arab Rep.	Pakistan
El Salvador	Paraguay
Guatemala	Peru
Honduras	Syrian Arab Republic
India	Tunisia

Table 6b: Low Income Countries Included in Panel Growth Regression 3 below.
Sample Size: 20

Dependent variable: Growth of GDP per capita
Panel Regression with Random Effects Estimator

	(1)	(2)	(3)
Education	-.008782	.0008525	-.0593951
	(-.42)	(.04)	(-0.86)
Inv/GDP	.0959904	.0992929	.1593681
	(2.97)***	(2.55)***	(1.84)*
Population Growth	1.490726	1.090207	1.716145
	(5.26)***	(3.21)***	(2.72)***
EXPY	.000612	.0006293	.0007625
	(3.59)***	(3.35)***	(2.19)**

Robust z-statistics in parentheses
*Significant at 10% level; ** significant at 5% level; *** significant at 1% level

Table 7: Panel Regression Results